

Guide for Optimal Replacement of  
Highway Operations Equipment

## NCHRP Project 13-04

AASHTO Subcommittee on Maintenance  
Conference

Providence, RI  
August 1, 2017

# Project Outputs

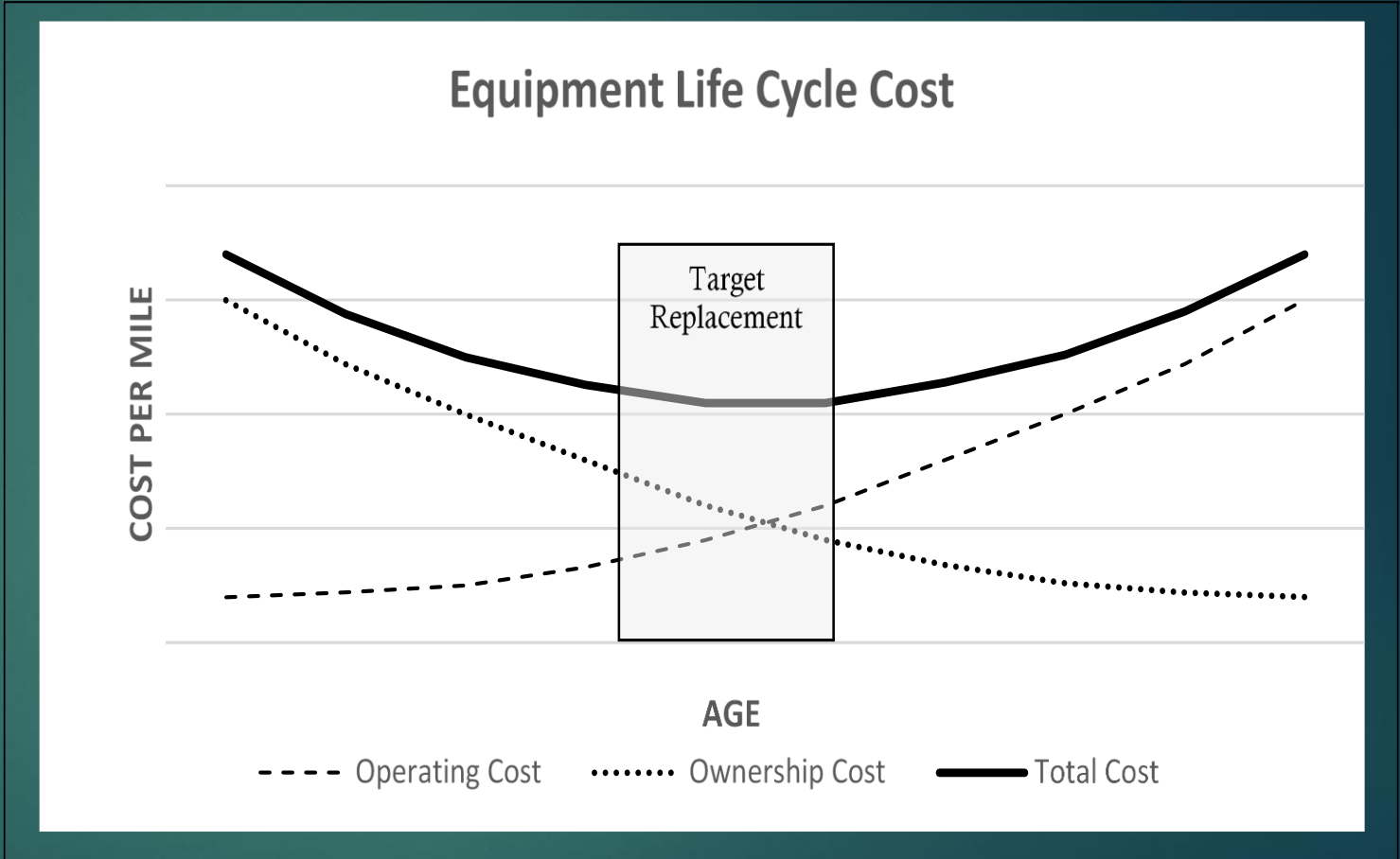
Guide

Excel-based Tool

Tool User Manual

Final Project Report

# Life-Cycle Cost Analysis



# Making Replacement Decisions is a Process

## Data

Collect data – a continuous process  
Perform rigorous data cleanup before inputting to LCCA

## Analyze

Customize replacement factors to agency operating environment  
Use LCCA to determine optimal life cycles

## Decisions

Fit to available replacement dollars  
Incorporate condition and mission criticality  
Determine replacement priorities

# Replacement Factors

- Age
- Utilization
- Depreciation
- Maintenance and repair cost
- Fuel cost
- Downtime
- Obsolescence
- Replacement cost
- Purchase cost
- Cost of money

# Depreciation

- This is not an accounting depreciation
- Based on actual salvage value of unit
- Average salvage values from DOT data
- Depreciation curves based on utilization



# Overhead

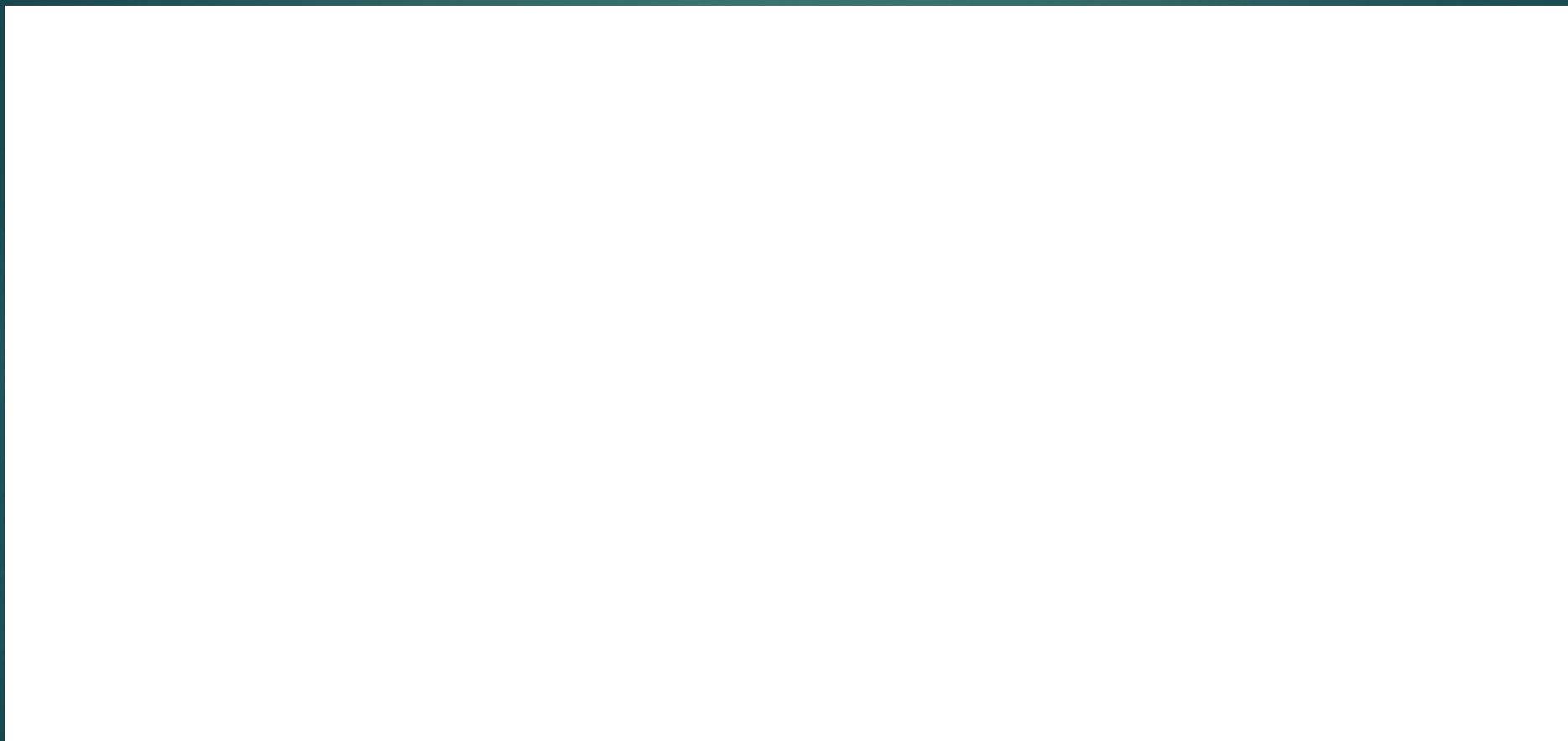
- Mechanic hourly do not fully recognize overhead
- Overhead for warehouse, not chargeable mechanic time
  - True operating costs are understated
  - Tool has factor to include overhead
- Guide provides examples of how to calculate

# Downtime

- Most DOTs are not tracking and recording downtime
  - Is a real and significant equipment cost
- Cost is manifested in highway maintenance and operations
  - Tool allows for hourly downtime cost
  - Based on existing equipment rental rates



# Tool Demonstration



# Future Work

- ▶ **Build tool in more robust software**
- ▶ **Begin tracking downtime**
- ▶ **Determine true mechanic hourly rate**
- ▶ **Need to commit resources**
- ▶ **Develop Training**