Decrypting Diversions:
Eliminating Drop Shafts with Preferential Offloading

Presentation by:
John Trypus – Director of Underground Engineering & Construction
Jessica Bastin – Manager of Planning and Design
Presentation Overview

• The Problem: Indianapolis’ CSOs
• The Solution: the DigIndy Program
• Focus on $avings
• Opportunities for Success!
• Next Steps
The Problem: Indy’s Combined Sewer Overflows

- ~ 3,200 miles of sewers
- ~ 270 lift stations
- ~ 31 square miles of combined sewer area served
- ~ 130 CSOs
- Raw sewage overflow occurs ~ 60+ times / typical year
- ~ 5 - 6 billion gallons OFs / yr
The Problem: Indy’s CSOs

• Multi-Faceted CSO Long Term Control Plan
  – Optimize existing system capacity
  – Expand and upgrade Advanced Wastewater Treatment Plants (AWTP)
  – Construct new storage and conveyance
The Problem: Indy’s CSOs

• Settlement between Citizens, Indianapolis, and Department of Justice / EPA
• Standard Consent Degree Conditions
  – How the Municipality expects to come into compliance with Clean Water Act
  – Schedule for completion including fines ($$) for non-compliance
  – Expected performance of CSO LTCP projects
The Solution: DigIndy Program

- **CSO Abatement Projects**
  - Eagle Creek CSO 033 - 2017
  - Upper Pogues Run – 2021

- **Deep Tunnel Program**
  - 6 deep tunnel segments
  - 28 miles deep rock tunnel
  - 18-foot finished diameter
  - 200 to 250 feet deep
  - 7 large diameter shafts,
  - Deep Rock Tunnel Connector, Eagle Creek Tunnel & DRTC Pump Station – 2017
  - White River & Lower Pogues Run Tunnels – 2021
  - Fall Creek & Pleasant Run Tunnel – 2025
A Focus on $avings

• Program Sequencing
  – TSSOP – *Tunnels System Sequencing Options Plan*
  – TEEPOP – *Tunnel Enhancement Evaluation Prioritization and Optimization Plan*

• Category Management
  – Leveraging the program

• Program Funding
  – Indiana Finance Authority SRF
A Focus on $avings

• Lessons Learned
  – Eagle Creek Tunnel
  – White River Tunnel Realignment

• System Optimization: Hydraulic Model Expansion Project
  – Upper Pogues Run
  – Decrypting Diversions and Drop Shafts
Value Engineering Philosophy

- Value Engineering is ongoing and part of every step
- It is an ongoing effort for refinement and optimization
- The model provides big-picture view of impacts, allowing for the rapid simulation of new ideas
What are Diversions and Drop Shafts?
Diversions and Drop/Vent Shafts

- Over 130 CSOs throughout the system
- Over 80 Diversion Structures
- 34 Drop/Vent Shafts
- 7 Large Diameter Shafts
- Shafts range in diameter from 3 to 50 feet
- Each Drop/Vent Shaft costs $6M to construct and leads to significant neighborhood disruptions

Optimizing the number of Drop/Vent Shafts = Cost $avings and Happier Customers
Background – Hydraulic Model

- Innovyze InfoWorks ICM updated from SWMM in 2012
- ~9,000 Node Model
- Continually updated existing and future conditions models to all available information and design plans
- Ongoing Model Buildout to all 12 inch and larger diameter sewer system-wide
- Used to confirm Level of Control (LOC) as part of post-construction monitoring
CSO 060 Drop Shaft

- Flow Monitoring
  - Feb 2005 to Nov 2006
  - 12 MGD peak flow
- 6-Month SCS Design Storm
  - 12 MGD peak flow
  - 0.5 MG total volume
- No modeled surcharging upstream or downstream of the regulator

CSO 060 Regulator
Weir Height = 1.8 feet
Capture Pipe Diameter = 10-12 inches
**Fall Creek – CSO 060 Modeled Alternatives**

**Alternative 1**
- Existing weir raised 2.0 feet
- Existing capture pipe diameter increased to 18 inches
- Overflow frequency and volume within LOC obligations for 1996-2000 typical year
- Minimal downstream surcharge
Alternative 2
• Bending weir to pipe crown
• Existing capture pipe diameter unchanged
• Overflow frequency and volume within LOC obligations for 1996-2000 typical year
• No downstream surcharge
• Utilizes upstream in-line storage
Lower Pogues Run – CSO 125

- CSO 125 has two diversions, one upstream to the much lower elevation interceptor, and one at the outfall structure.
- Relatively low flow bypassing upstream diversion for up to the Level of Control with only minor contributions downstream.
- Downstream capture pipe showed low slope and indications of blockage.
- Initial proposal was a dedicated drop shaft.
Lower Pogues Run – CSO 125

Increase weir height to divert flow to new capture pipe

Increase weir height to divert flow up to LOC to interceptor

New parallel 24 inch capture pipe
*The blue line represents future conditions HGL for a 6-Month SCS Design Storm, with the red line indicating existing conditions.
Pleasant Run Tunnel – Original Plan

- 50 CSOs
- 10 Dropshafts
- ~8 miles of tunnel
- ~4 miles of consolidation sewer
- Most Pleasant Run CSOs are relatively low flow and volume
- Tunnel provides more volume than is required for the Pleasant Run CSOs to achieve the Level of Control
Pleasant Run Tunnel – Modeling Team

Conceptually...

• If the interceptor has available capacity, it is easier to connect the tunnel, we free up capacity in the interceptor.

• Many CSOs do not need tunnel connections at all, or can be further consolidated at fewer dropshafts.

• If Pleasant Run Tunnel can easily accept additional flow, how can we best take advantage of that?
Pleasant Run Tunnel – Modeling Team

- Drop Shafts - 10 to 7
- Consolidation Sewer - 4 miles to 3 miles
- However, there are **limitations** to modeling
- Initial analysis was **too big picture**, with little time afforded for individual CSO areas
- Surface work not feasible and/or too disruptive
- Tunnel alignment change not feasible
Next Steps

- Continue to work with design team to further refine overall plan
- Incorporate and confirm progressively more detailed design plans into the model
- Improve and optimize as individual CSOs are focused on in greater detail
Conclusions

• It isn’t always a straight line between planning, design, and construction
• Sometimes it is important to take a step back, so you can take two forward
• Always have a mind toward optimization
• Use modeling to efficiently test new ideas
• Depend on design teams to determine detailed viability of modeling conclusions or identify issues
THANK YOU!

John Trypus – Director of Underground Engineering & Construction
(Office/Fax) 317.429-3954
(Mobile) 317.965-2223
jtrypus@citizensenergygroup.com

Jessica Bastin – Manager of Planning and Design Underground Engineering & Construction
(Office/Fax) 317.927.4596
(Mobile) 317.370.5265
jbastian@citizensenergygroup.com