Sanitary Conveyance and Treatment Improvements – Western Regional: Progressive Design-Build Project
Presentation Overview

- Project Introduction
- Alternatives Analysis
  - Alignment Analysis
  - Geological/Hydrogeologic Conditions
  - Construction Methods
- Alternative Project Delivery
- Project Update
- Conclusion
PROJECT INTRODUCTION
MCES: SCAT-WR Project Location

WRWRF

DRPTP
Dryden Rd. Pretreatment Facility

- Constructed in 1970s
- Environmental Laboratory
- Coarse and Fine Screening
- 60 MGD Capacity
- 5 Horizontal Centrifugal and 1 Dry-pit Submersible Pumps
- Services southern portions of Montgomery County
- Two miles of 54” Forcemain to WRWRF
CURRENT DRYDEN PTP PROCESS

Coarse Screens

Fine Screens

Grit Removal

Pumping

Screw Conveyors

Drag Out Conveyor

Compactor

Hopper Lift

Disposal
Western Regional Water Reclamation Facility

- Constructed in 1970’s
- Flow from DRPTP, Opossum Creek Pump Station, and Appvion, Inc.
- Permitted Capacity of 60 MGD Peak and 20 MGD Avg. Day
- Two-stage Activated Sludge Plant
First Stage Aeration
First Stage Clarifiers
Second Stage Aeration
Second Stage Clarifiers
Tertiary Filters and Chlorine Contact Tank
Opossum Creek Screen Building
Aerobic Digesters
Solids Thickening
Drain Pump Station
ALTERNATIVES ANALYSIS
Alignment Alternatives Analysis

Evaluation Criteria:

• Geotechnical Consideration
• Community Impacts
• R/W & Easements
• Impacts to Existing Infrastructure
• Well Fields and Source Water Protection Areas
• Constructability and Construction Risk

• Environmental, Archeological, and Historical
• Regulatory Requirements
• Schedule and Construction Duration
• Operation & Maintenance
• Cost
• Delivery Approach
Geotechnical & Hydrogeological Conditions

- Fill
- Alluvium
  - Fine to coarse grained soils deposited from flooding
- Glacial Till
  - Lenses of silts and clays
- Glacial Outwash
  - Sand
  - Gravel
  - Cobbles and boulders
Simplified Geologic Profile

LEGEND:
- Alluvial Deposits (Silt, Sand & Clay)
- Sand & Gravel (Outwash or Kame)
- Glacial Till or Clay-Dominated Soil
- Ordovician Shale/Limestone Bedrock

Groundwater Potentiometric Surface

Major Hydrogeologic Units
1. Upper Outwash Aquifer
2. Lower Outwash Aquifer
Groundwater Contamination
3D Groundwater Model
Conveyance Construction Method Alternatives

**FORCE MAIN**
- Likely Dual 36” Diameter due to Wide Flow Rate Range
- Likely installed using HDD and Open Cut techniques
- Requires Air Release Valves

**Conventional Gravity Sewer**
- Diameter Dependent on Slope
- Significant Obstacles, May Prove Impractical

**GRAVITY MICROTUNNEL**
- 72” OR 84”
- Slurry Construction
- Approximately 40 – 55 ft. Below Grade

**Large Diameter Tunnel**
- 12 – 14 ft. Finished Diameter
- 65 – 80 ft. Below Grade
- Provides 4 – 6 MG of Storage
Construction Methods:

Horizontal Directional Drilling

Open-Cut

Microtunneling
Construction Methods:

- EPB TBM
- Cutterhead
- Chamber
- Tail Shield/Grouting
- Lining
- Bulkhead
- Erector
- Screw Conveyor
- Mixing Arms
Construction Methods: FORCE MAIN – Horizontal Directional Drilling (HDD)

The HDD Process

Design Criteria:
- **Cover**: 15-20 feet
- **Curvature/Radii**: 600 feet (100*nominal dia. drill pipe)
- **Entry angle of pipe**: 8-20°
- **Exit angle of pipe**: 5-12°
Construction Methods: MICROTUNNEL

Design Criteria:
- Closed Face/Slurry
- Wide Range in Soil Materials (Proficient in Clean Sands/Gravels)
- Capable of Counterbalancing Hydrostatic/Earth Pressures

- Max Drive Lengths: ~2,000 ft
- Cover: 2 tunnel diameters
- Curvature/Radii: min. 1,150 ft (400 ft with jack control)
- Working Shafts: Water tight
Construction Methods: EPB or SLURRY TBM

Design Criteria:

- Suitable Ground – Firm, Raveling, Running, Flowing, Squeezing
- Large Hydrostatic Heads
- Most Proficient in Fine Grained Soils that are Readily Plasticized
- Coarse Grained Soils Require Polymer Foams
- Employs 1-Pass Tunneling with Pre-Cast Concrete Segments
- 84-inch to 40+ feet
- Shallow Horizontal & Vertical Curves
- Grades up to 5%
- Pipe Jacking Capabilities
## Conveyance Alignment Alternatives

<table>
<thead>
<tr>
<th>Alignment Type</th>
<th>Force Main</th>
<th>Gravity Micro Tunnel</th>
<th>Gravity Large Diameter Tunnel</th>
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<tr>
<td>North</td>
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<tr>
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<td>Central</td>
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<tr>
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### Evaluation Criteria
- Geotechnical Considerations
- Community Impacts
- R/W & Easements
- Impacts to Existing Infrastructure
- Well Fields and Source Water Protection Areas
- Constructability and Construction Risk
- Environmental Archeological Historical
- Regulatory Requirements
- Schedule and Construction Duration
- Operation & Maintenance
- Cost
- Delivery Approach

**Total Scores:**
- North: 157
- Central: 195
- South: 177

**Total Score:** 529
Alternative Project Delivery
Dryden Replacement Project Components

- Conveyance (72” Microtunnel)
- Pumping & Headworks at WRWRF
- New Environmental Laboratory, located at Spaulding
- Abandonment of Miami Shores Well Field
- Demolition or Abandonment of Existing DRPTP

Project Bundles Dependent on Delivery Methods
Project Influences and Reactions

Cost

Control

Risk

Schedule
# Cause and Effect

<table>
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<tr>
<th>CAUSE</th>
<th>POTENTIAL EFFECTS</th>
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<td><em>Lengthen Schedule, Increase Risk, Reduce Control</em></td>
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<td>Reduce Schedule</td>
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**Control = Quality?**
Most Common Delivery Methods

- Design-Bid-Build (Traditional)
- Fixed Price Design-Build
- Progressive Design-Build
- Construction Management at Risk

Others: Design-Build-Operate
Design-Build-Finance-Operate-Maintain

Alternative Delivery (Collaborative Delivery)
Prescriptive Versus Performance Approach

- Delivery methods offer varying degrees of control
- Level of trust should be greater with less Prescriptive approaches
- Performance basis = Speed

- DBB
- CMAR
- PDB
- FPDB

Prescriptive

Performance
Delivery Models

Increasing Collaboration
# Project Deliver Summary

<table>
<thead>
<tr>
<th>Delivery Method</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tr>
<td>Design-Bid-Build</td>
<td>Most Owner Control&lt;br&gt;Predictable Final Costs&lt;br&gt;Competitively Bid&lt;br&gt;Engineer Represents Owner’s Interests&lt;br&gt;Process Well Understood</td>
<td>Longest Schedule&lt;br&gt;Most Risk to Owner&lt;br&gt;Subject to Change Orders&lt;br&gt;Least Control Over Contractor Selection&lt;br&gt;No Contractor Input to Design</td>
</tr>
<tr>
<td>Fixed Price Design-Build</td>
<td>Single Contract&lt;br&gt;Shortest Schedule&lt;br&gt;Cost Established Early</td>
<td>Least Owner Control Over Design&lt;br&gt;Subject to Change Orders</td>
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<tr>
<td>Progressive Design-Build</td>
<td>Single Contract&lt;br&gt;Shorter Schedule Than CMAR and DBB&lt;br&gt;Qualifications-Based Selection</td>
<td>Pace of decision making process&lt;br&gt;Owner’s resources needed</td>
</tr>
<tr>
<td>Construction Management at Risk</td>
<td>CM/GC Selected Based on Qualifications&lt;br&gt;Cost Updated Throughout Design&lt;br&gt;Construction Can Begin Before Design Completed&lt;br&gt;Control Over Contractor Selection</td>
<td>Owner Responsible for Gaps in Design&lt;br&gt;Longer Schedule Than FPDB or PDB</td>
</tr>
</tbody>
</table>
MCES Project Delivery Requirements

- Single Contract
- Streamlined Procurement Process
- Lower Risk
- Cost Stability (GMP)
- Quals Based Selection
- Collaborative Project

Progressive Design Build
SCAT-WR Project Update

- DB selected; contract under negotiation
- NTP: Beginning of Q3 2019
- Estimated Project Cost $70M
- Expected Project Completion: Q1 2023
Questions?