Painting 23 Acres of Steel Water Tanks

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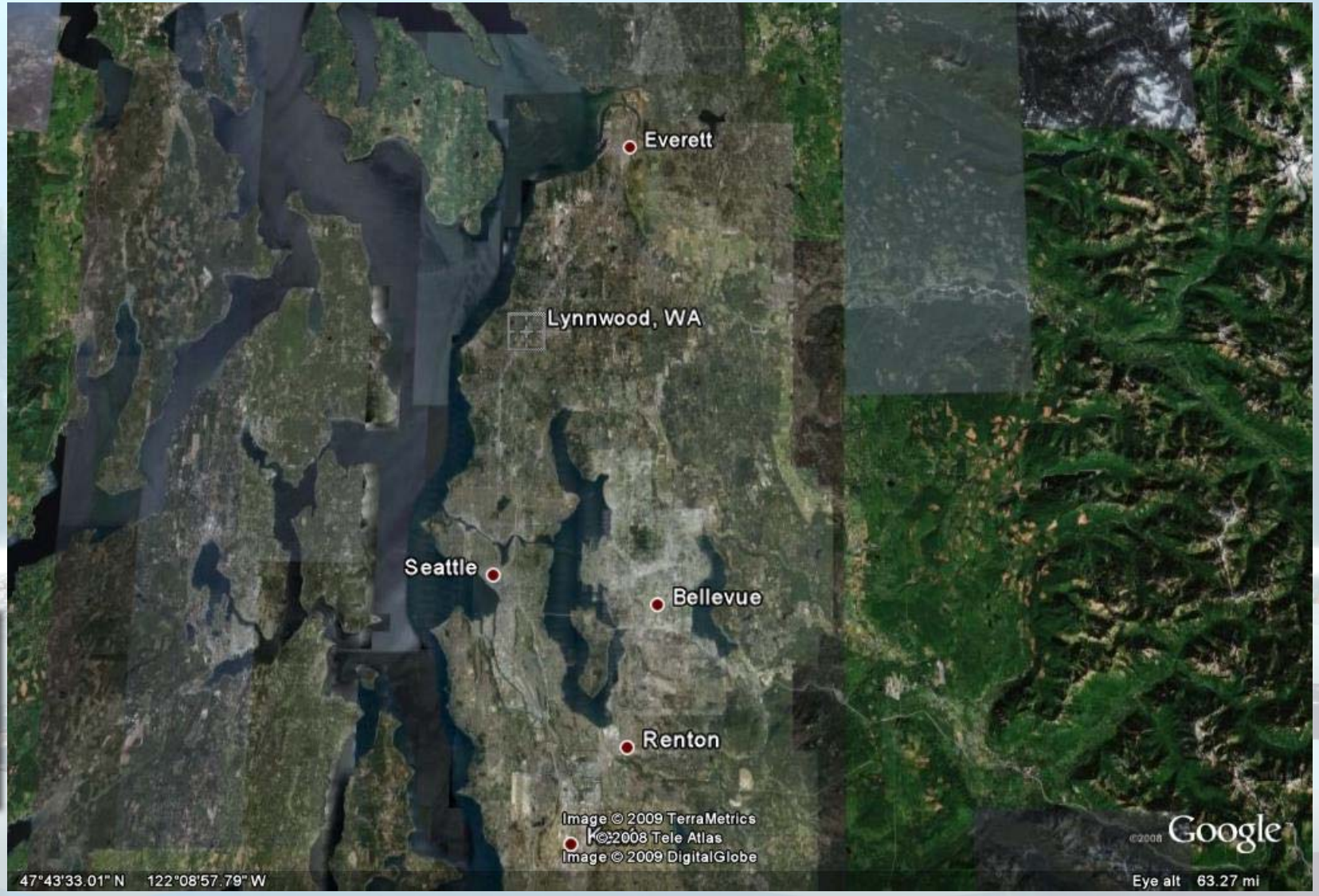
Project Location



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Alderwood Water and Wastewater District (AWWD)

- One of the largest WDs in Northwest
- Approx. 66 square miles
- 44,000 service connections
- Serves 150,000 people
- Max day delivery of 50 MGD
- Owns/maintains 9 water storage tanks
  - Total Storage Capacity of 95 MG

Project Scope

- Repaint 3 Water Reservoirs
  - Predesign
  - Design
  - Bid period assistance
  - Construction Services
    - Inspection
    - Construction management
    - Technical
  - Warranty Inspections

Schedules

Schedule A

- Canyon Park

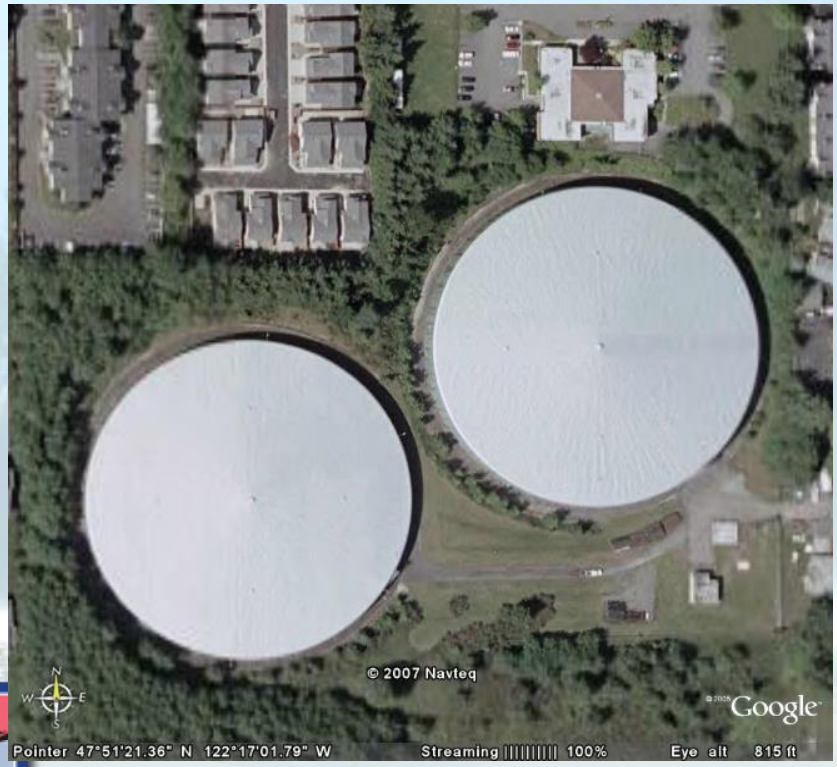
Schedule B

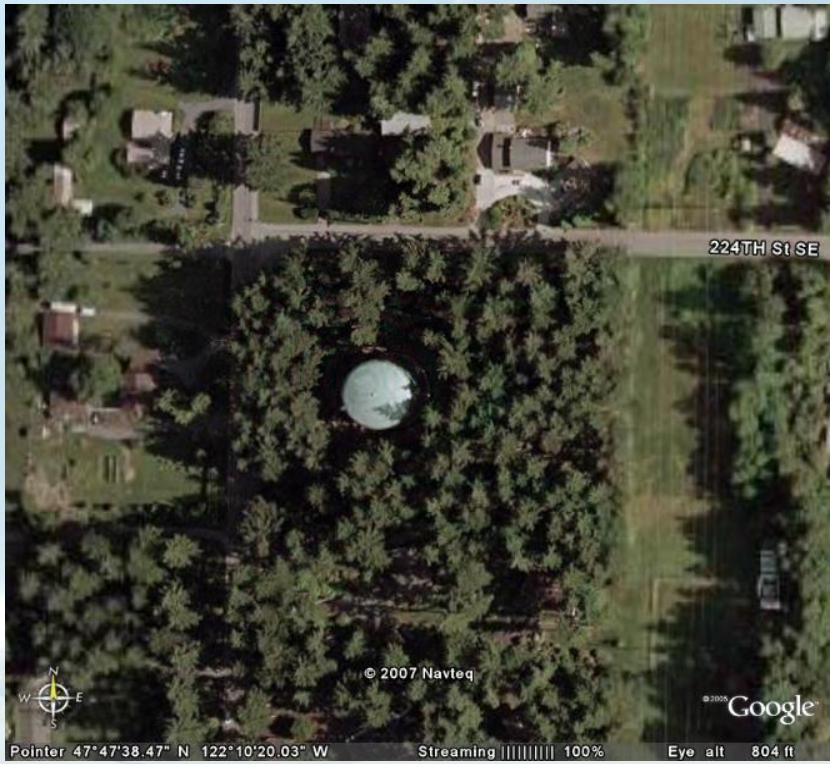
- Reservoir No. 2
- Reservoir No. 3

Reservoirs 2 and 3

- Reservoir 2
  - 28 MG ground level steel tank
  - 370 feet diameter, 45 feet high at center
  - 1968 construction
- Reservoir 3
  - 20 MG ground level steel tank
  - 370 feet diameter, 37 feet high at center
  - 1976 construction

Reservoirs 2 and 3, Canyon Park





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Reservoir 2 - Interior

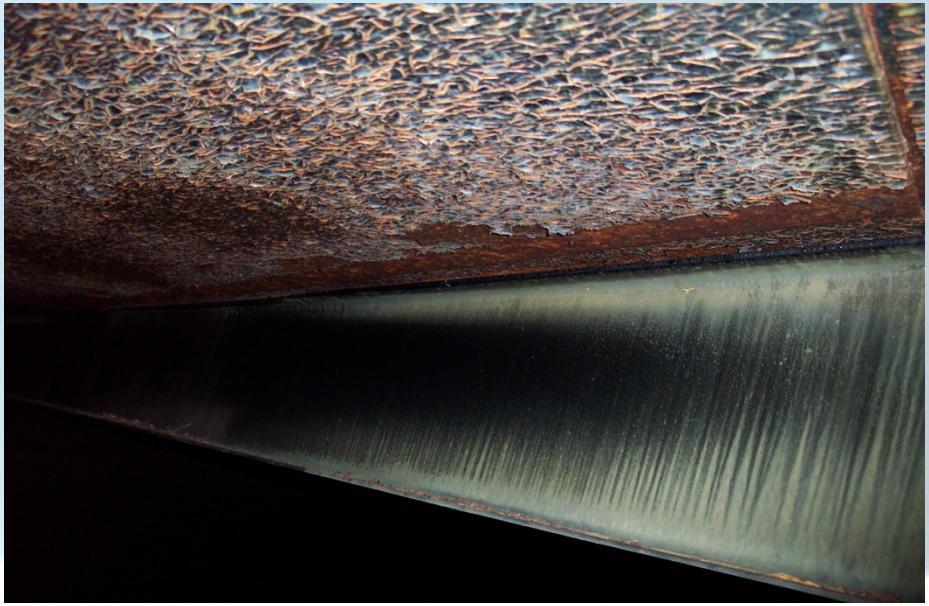
- Hot Coal Tar Enamel (wall and floor)
  - 50 to 300 mils thick
  - Puddles
  - Fair to good adhesion
- Coal Tar Solution (ceiling)
  - Very poor condition
  - Rust on ceiling
- Low levels of lead

Reservoir 2 - Exterior

- Lead based primer
- Aluminum alkyd finish
- Topcoated in 1992
- Good adhesion
- 6 mil thickness
- Lead content: 20%

Reservoir 3 - Interior

- Hot Coal Tar Enamel (walls, floor)
- Coal Tar Solution (ceiling)
- Low lead levels
- Similar conditions to Reservoir 2



Reservoir 3 Exterior

- Zinc rich primer
- Aluminum alkyd finish
- Topcoated in 1992
- Adhesion:
  - Primer to steel: adequate
  - Finish to primer: poor
- Nominal 6 mils thick
- Lead content: 0.1%

Conclusions/Recommendations

- Replace all coatings, interior and exterior
  - Hot Coal tar enamel near end of service life
  - Coal tar solution on ceiling at end of service life
  - Not feasible to prepare Res 3 for exterior repaint
  - Res 2, paint since contractor will be mobilized
- Structural deterioration
  - Minimal on floors or walls
  - Corrosion on ceilings, particularly rafters

Design Considerations, Interior

- Remove coal tar
- Abrasive blast
- Epoxy coat
  - NSF certified for potable water contact
  - 3 coats plus stripe
- Environmental controls
  - Dehumidifiers (winter work)
  - Filters (dust control)

Design Considerations, Exterior

- Abrasive blast
- Epoxy primer, stripe coat
- Polyurethane enamel
- Containment required
  - Proximity to residences
  - Lead/dust
  - Alternatives allowed (self-contained equipment)
  - Roller/brush application required if alternative selected that does not include full containment

Design Considerations, Structural

- Improvements for safety/access
  - Remove lower portions of ladders/stairs
  - Replace roof vents
  - Improve roof hatch security
  - Add equipment hatches

Other Design Considerations

- Cathodic protection
  - Reuse existing components
  - Leave CP off until end of paint warranty
- Three year warranty
- Replace wash-down piping
- Waste handling requirements
- Clean rooms/hygiene program

Bidding

- Schedule A - Canyon Park
  - Pre-bid meeting
  - Bid opening October 17, 2006
  - Low Bid
    - $617,360
    - Coatings Unlimited, Kent, WA
- Schedule B – Reservoir 2 and 3
  - Pre-bid meeting
  - Bid opening December 21, 2006
  - Low bid
    - $7,989,993
    - Dunkin and Bush, Redmond, WA

Construction Management

- Full Time CM for both schedules
  - Preconstruction meetings to outline expectations
  - Weekly meetings
  - Pay requests
  - Submittal reviews
  - Work change directives
  - Requests for information (RFI's)
  - Change Orders
  - Technical site visits
  - Full time coating inspector (Quality Coatings Inspection and Consulting, Mt. Vernon, WA)

Construction

- Schedule
  - Operating requirements
    - One tank must always be online
    - Both tanks must be online in the summer
  - Dictated schedule
    - Reservoir 3 exterior (spring and summer 2007)
    - Reservoir 2 interior (fall 2007 to spring 2008)
    - Reservoir 2 exterior (spring and summer 2008)
    - Reservoir 3 interior (fall 2008 to spring 2009)

Mobilization

- Office trailer
- Clean room
- Storage (paint/tools)
- Sanitation
- Blasting equipment
- Tools and supplies
- Temporary power
- Electric compressors

Temporary Power

Compressors

Staging Area

Exterior Painting

- Pressure washed
- Blast with self-contained equipment
  - Remote control blasters on wall
  - Scaffolding with tent at knuckle
  - Weld splatter removed from welds (using grinders)
- Water quality monitoring (Reservoir 3)
  - Concerns about rust on roof entering water
  - Diver inspected water during blasting
  - Water quality monitored
- Roller and brush application

Wall Blast

Wall Blast

Wall Blast

Containment

Containment

Exterior Wall Painting

Roof Blast

Stripe Coating

Pressure Rolling

Exterior Complete

Interior Painting

Reservoir 2

- October 2007, begins roof blast
- Blasting time exceeds plan
  - Unexpected level of corrosion on roof
  - More surface area
  - Rafter to girder connections
  - Structural inspections and repairs

Structural Inspection

- Inspection after blasting
  - Rafter corrosion
  - Missing bolts
  - Rotated rafters
- Inspected all 848 rafters
- 97 rafters repaired
  - 1 foot to 15 feet long
  - Weld plates
  - Replace rotated rafters
- Replaced missing bolts
- No damage, wall/floor

Reservoir 2
(Rafter Corrosion)

Schedule Impact

- Blast, prime, inspect
- Reblast, reprime repairs
- Extra time to blast
- Considered:
  - Current production, shut down June 1
  - Increase production, complete by June 1
- Project team decided to increase production

Reservoir 2
(Blastrac Floor)

Reservoir 2

(Coal Tar Removal from Floor)

Reservoir 3 – Fasteners

Reservoir 3 – Interior Ceiling

Reservoir 3 – Rafter after Blast

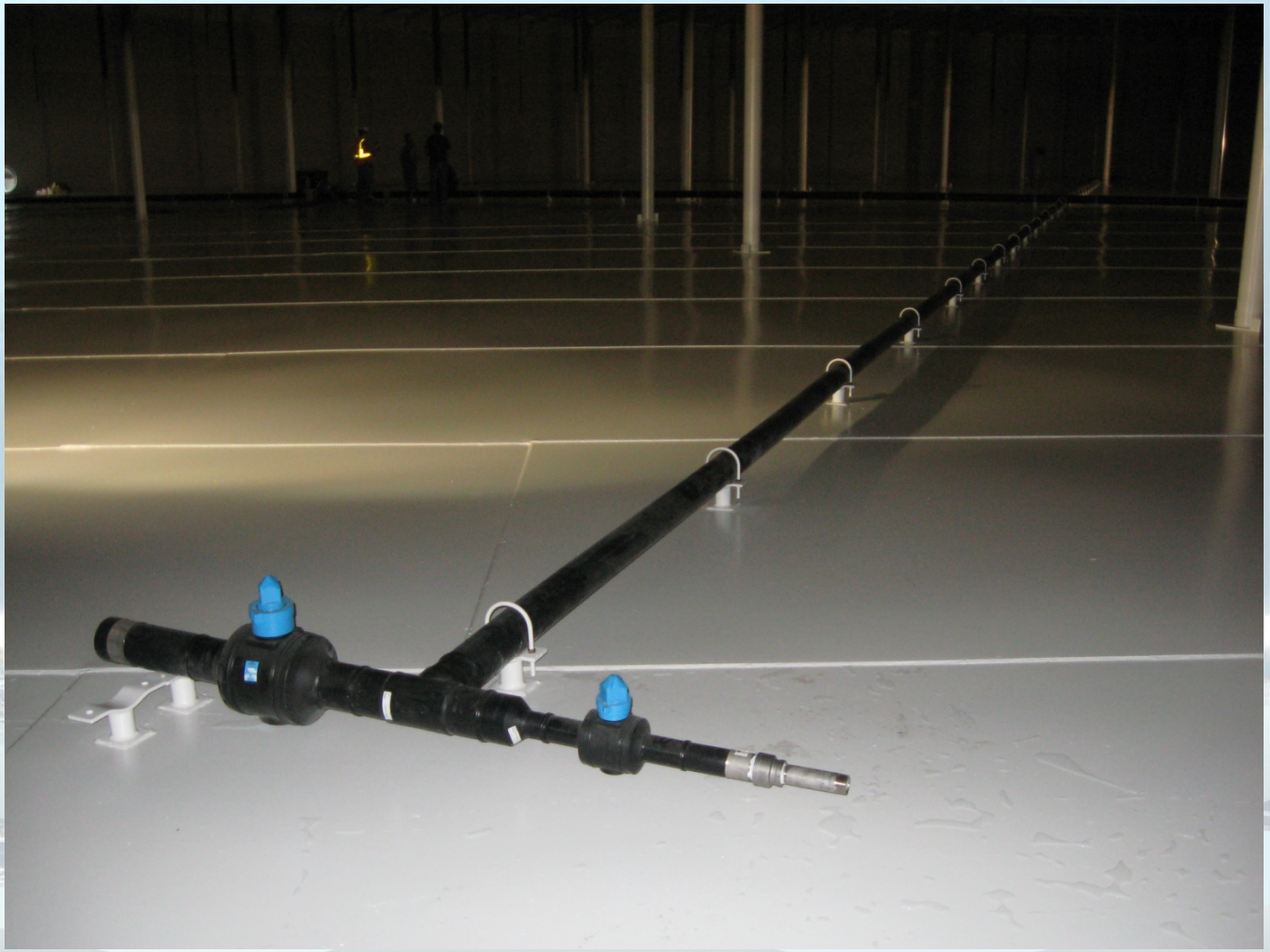
In the Beginning…

Ceiling and Walls, Primer

Ceiling and Walls, Complete

Ceiling, Walls, and Floor, Complete

Wash Down Piping



Work Summary

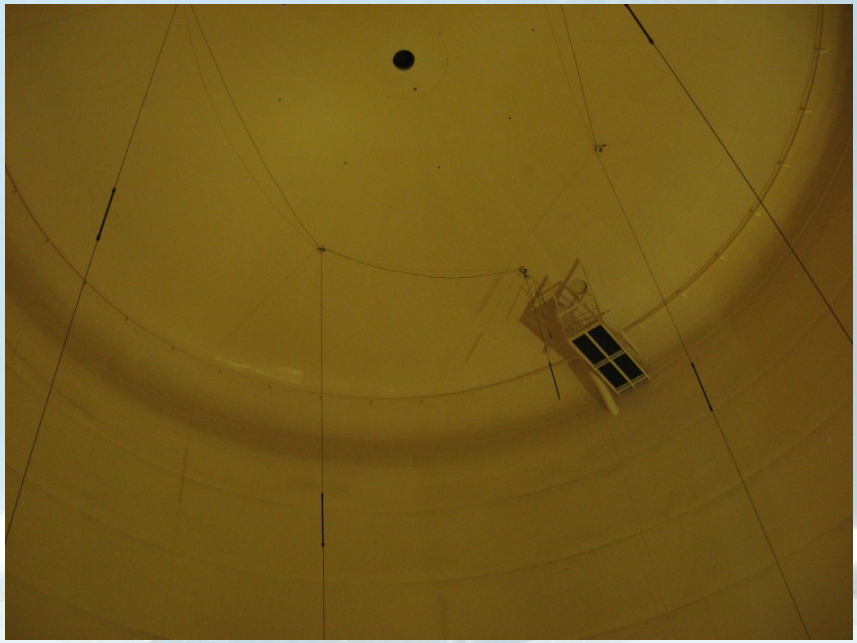
- Working Days
  - Res 3, Exterior – 100
  - Res 2, Interior – 250
  - Res 2, Exterior – 100
  - Res 3, Interior – 250
- Total Calendar Days
  - 900 (2.5 years)

A Few Statistics

- More than:
  - 1,000,000 sq ft blasted and painted
  - 10,000 gallons of paint applied
  - 2,500 tons of abrasive used
  - 2 miles of welds on tank walls
  - 3 miles of welds per horizontal surface
    - 10 miles of welds per tank
    - Does not include roof plate laps or rafter edges

Warranty Inspection

- 3 year warranty
- Checklists developed
- Up this year:
  - Canyon Park
  - Reservoir 3 exterior
- CP returned to service



Keys to a Successful Project

- Communication
  - Weekly meetings
- Contractor resources
- Quality control program
  - Contractor internal QA/QC
  - Owner's inspector
- Timely responses

Questions

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