



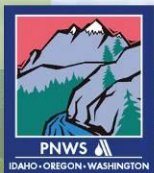
Painting 23 Acres of Steel Water Tanks

Jerry Duppong, Corrosion Specialist, CH2M HILL
Brigitte McCarty, Project Manager, AWWD
Matt Leach, Construction Manager, CH2M HILL



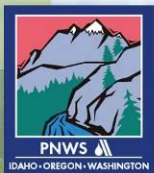
Project Description

- Painting and structural modifications
- Two projects
- Schedule A
 - Canyon Park (3 MG)
- Schedule B
 - Reservoir No. 2 (28 MG)
 - Reservoir No. 3 (20 MG)



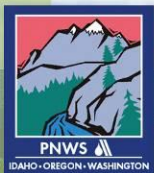
Predesign Activities

- Record review
 - Dimensions
 - Construction components
 - Type of paint and repaint dates
- Visual Observations
- Physical Testing
 - Metal thickness
 - Paint thickness
 - Metal content



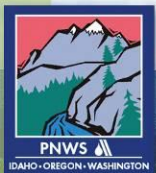
Schedule A – Canyon Park

- 3 MG ground level steel tank
- 72 feet diameter, 92 feet tall at center
- 1982 construction
- Self supporting steel roof
- 60,000 sq ft (interior and exterior)
- Impressed current cathodic protection



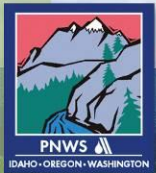
Canyon Park Interior

- Coal tar enamel (wall and floor)
 - Up to 1/2-inch thick
 - Fair to poor adhesion
 - Water behind coating
 - Low lead levels
- Coal tar solution (roof)
 - Nominal 16 mils thick
 - Very poor condition



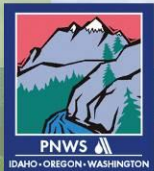
Canyon Park Exterior

- Zinc primer, aluminum alkyd finish
- Original paint (no recoat)
- Relatively good condition on wall
- Poor condition on roof (rust in places)
- 3 to 5 mils thick
- Lead content 3.6%

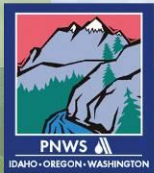
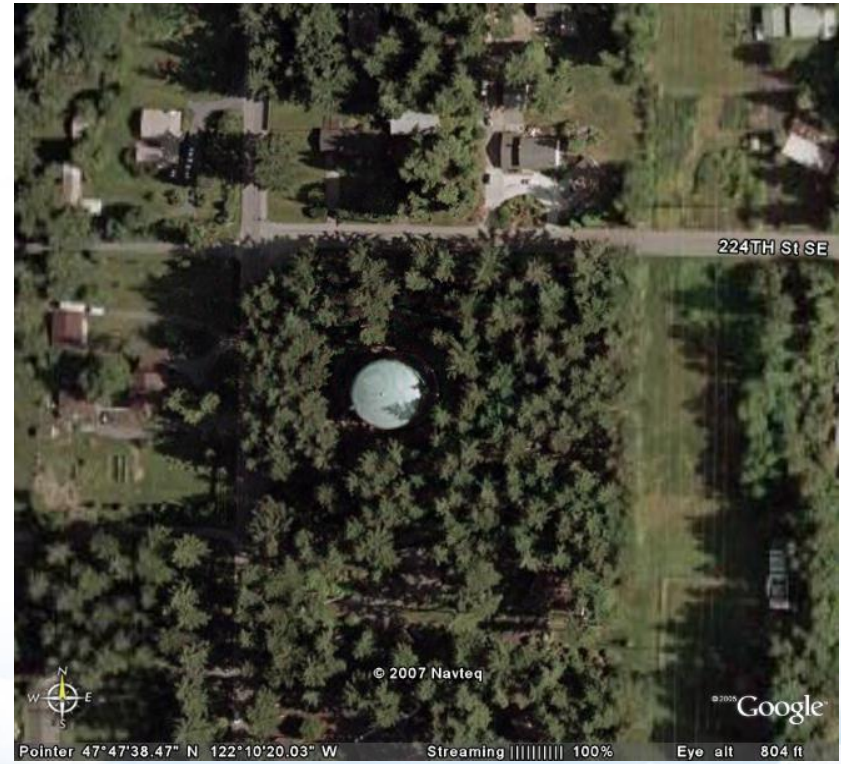


Schedule B - Reservoirs 2 and 3

- 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
- 930,000 square feet, interior and exterior
- Impressed current cathodic protection systems

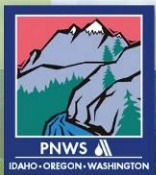


Reservoirs 2 and 3, Canyon Park



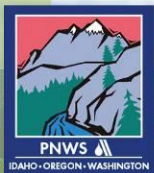
Reservoir 2 Interior

- 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



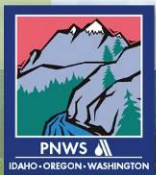
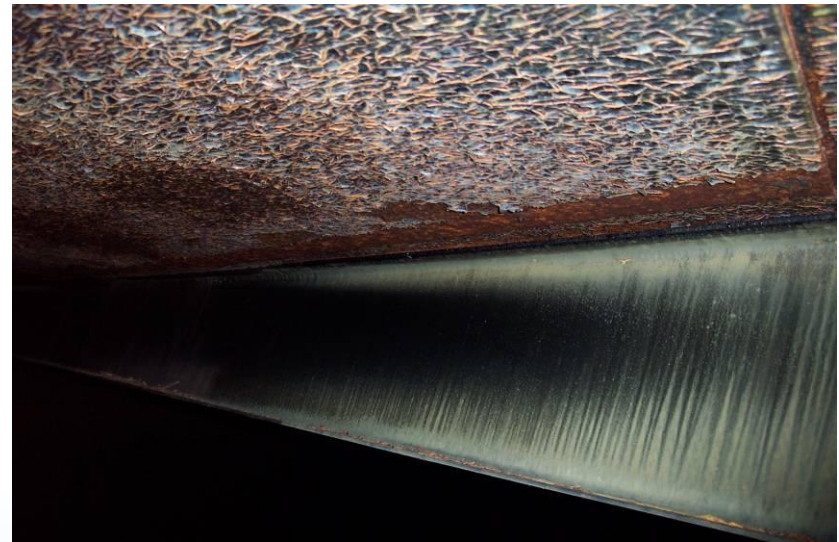
Reservoir 2 Exterior

- Lead based primer, aluminum alkyd finish
- Topcoated in 1992
- Good adhesion
- Nominal thickness of 6 mils
- Lead content 20%



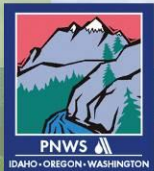
Reservoir 3 Interior

- Hot coal tar (walls, floor)
- Coal tar solution (ceiling)
- Low lead levels
- Similar conditions to Reservoir 2



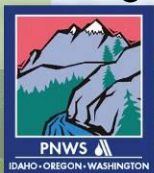
Reservoir 3 Exterior

- Zinc primer, aluminum alkyd finish
- Topcoated in 1992
- Fair adhesion of primer to steel
- Poor adhesion of finish to primer
- Nominal 6 mils thick
- Moderate lead (0.1%)



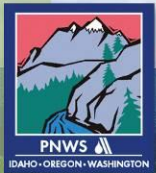
Conclusions/Recommendations

- Coal tar enamel near end of service life
- Coal tar solution on ceiling at end of service life
- Replace interior coatings of all three tanks
- Structural deterioration
 - Minimal on floors walls
 - Corrosion on Res 2 and 3 ceilings
- Exterior coatings
 - Reservoir 3/Canyon Park near end of service life
 - Reservoir 2 coatings in relatively good condition
- Replace exterior coatings on all three tanks



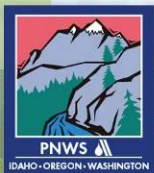
Design Considerations, Interior

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



Design Considerations, Exterior

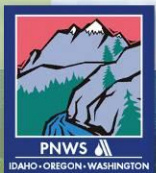
- Abrasive blast
- Epoxy primer, stripe coat
- Polyurethane enamel
- Containment required
 - Proximity to residences
 - Lead/dust
 - Alternatives allowed (self-contained equipment)
 - Roller/brush application required if alternative selected that does not include full containment



Design Considerations

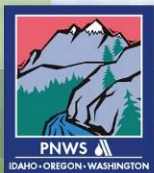
(Structural/Mechanical)

- Improvements for safety/access
 - Remove lower portions of ladders/stairs
 - Replace roof vents
 - Improve roof hatch security
 - Add equipment hatches (Res 2 and 3)
 - Add handrailing at Canyon Park
- Grout repairs
- Replace wash-down piping



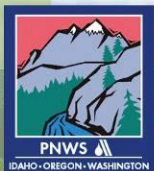
Design Considerations Other

- Cathodic protection
 - Reuse existing components
 - Leave CP off until end of paint warranty
- Three year warranty
- Requirements for handling waste
- Clean rooms/hygiene



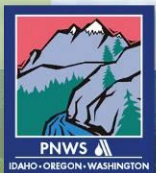
Bidding

- **Schedule A - Canyon Park**
 - Pre-bid meeting
 - Bid opening October 17, 2006
 - Low Bid (6)
 - \$617,360
 - Coatings Unlimited, Kent, WA
- **Schedule B – Reservoir 2 and 3**
 - Pre-bid meeting
 - Bid opening December 21, 2006
 - Low bid (3)
 - \$7,337,000
 - Dunkin and Bush, Redmond, WA



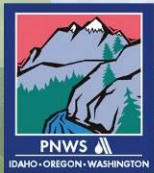
Construction Management

- CH2M HILL 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)



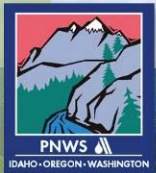
Canyon Park Construction

- November 27, 2006 - start
- March 6, 2007 – interior complete
- June 16, 2007 – exterior complete
- Total project duration – 149 days
- No complications or unexpected conditions

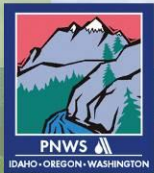


Canyon Park

(Dehumidifier)



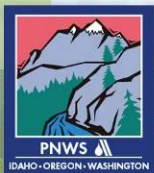
Canyon Park (Containment)



PNWS
IDAHO • OREGON • WASHINGTON

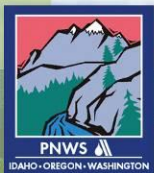
CH2MHILL

Canyon Park



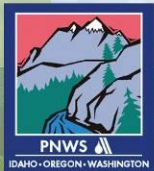
Reservoir 2 and 3 Construction

- Schedule
 - One tank must always be online
 - No interior work in 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)

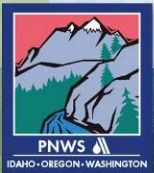


Reservoir 3 Exterior

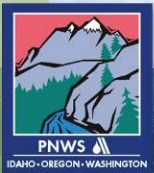
- Blast with self-contained equipment
 - Remote control blasters on wall
 - “Blastrac” on roof
 - Scaffolding with tent at knuckle
 - Weld splatter removed from welds (using grinders)
- Water quality monitoring during roof blast
 - Concerns about rust on roof entering water
 - Diver inspected water during blasting
 - Water quality monitored
- Roller and brush application
- Project Duration – 104 days



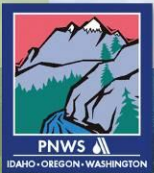
Reservoir 3 (Wall Blast)



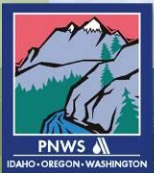
Reservoir 3 (Knuckle Containment)



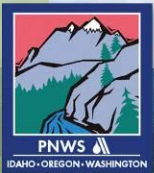
Reservoir 3 (Wall Painting)



Reservoir 3 (Roof Blast)

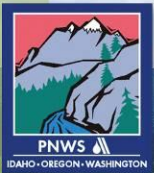


Reservoir 3 (Exterior Complete)





© Google

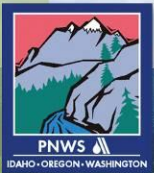


CH2MHILL

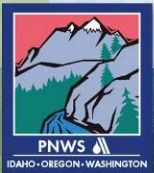
Reservoir 2 – ("Temporary" Power)



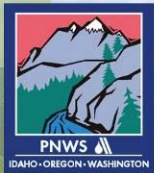
Reservoir 2 (Compressors)



Reservoir 2 (Dehumidifier/Filter)

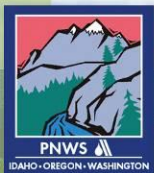


Reservoir 2 Interior



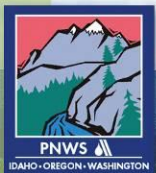
Reservoir 2 Interior

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



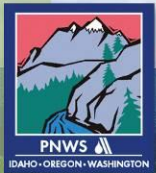
Reservoir 2 Structural

- Inspection after blasting
 - Rafter corrosion
 - Missing bolts
 - Rotated rafters
- Inspected all 1,700 rafters and girders by lift
- Repairs identified for 97 rafters
 - 1 foot to 15 feet long
 - Weld plates
 - Replace rotated rafters

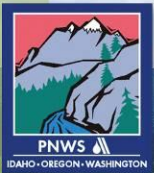


Reservoir 2

(Primer Complete, Ceiling and Walls)

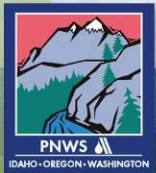


Reservoir 2 (Rafter Corrosion)



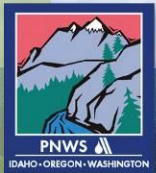
Reservoir 2

(Walls and Ceiling Complete)

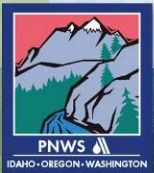


Reservoir 2

(Coal Tar Removal from Floor)

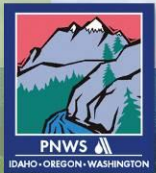


Reservoir 2 (Blastrac Floor)



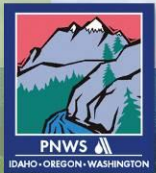
Reservoir 2

(Latest Challenge – April 19, 2008)



Reservoir 2

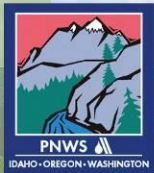
(Walls/Ceiling Complete, Floor Primed)



Schedule B

Summary to Date

- Appears contractor will meet District's deadline to place Res 2 online by June 3
- More than 500,000 square feet (11.4 acres) of steel blasted and painted
- 2.9 million pounds of abrasive used
- More than 7,500 gallons of paint applied
- Project approximately 50% complete
- Total surface area that will be coated – 23 acres (1,000,000 square feet)



Questions?

