



# Horizontal Direction Drilling: An Innovative Solution to Water Line Projects in the Urban Environment

PNWS - AWWA Spokane, WA  
Friday May 10, 2013 – 4:00 PM Session

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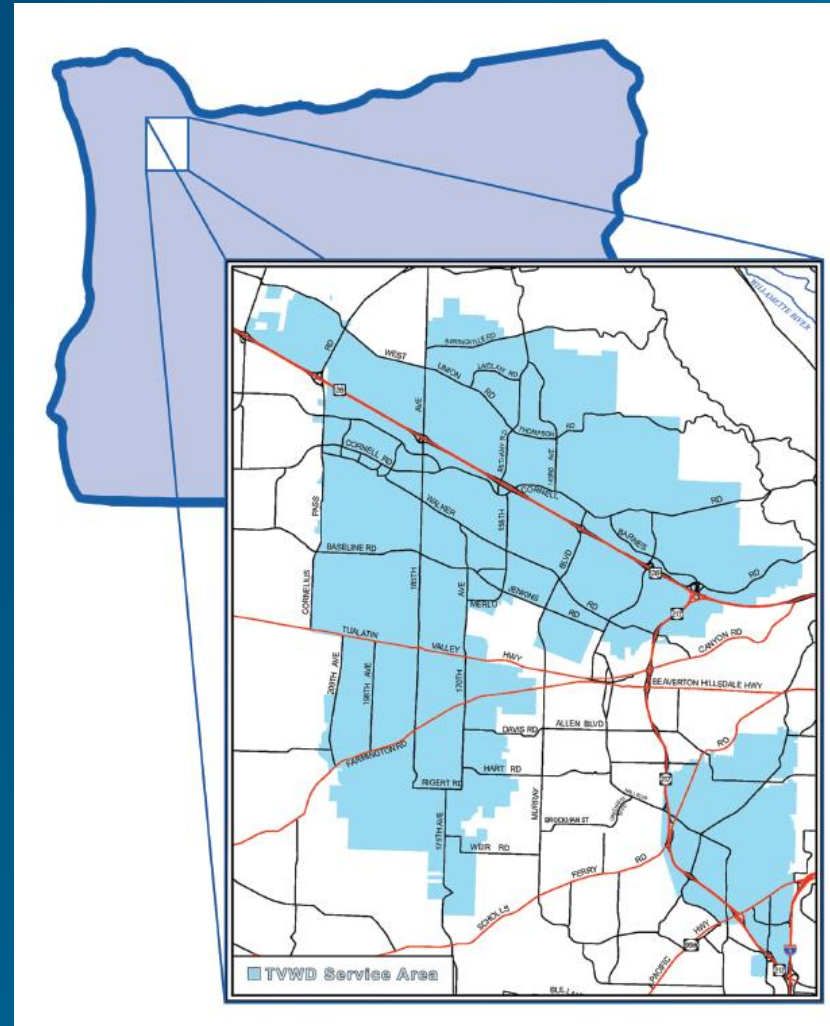
JACOBS ASSOCIATES

# Introduction

- Present case history for 5 trenchless installations in the Portland metro area
- Discuss issues associated with pipeline construction in an urban setting
- Discuss advantages / disadvantages to using horizontal directional drilling (HDD)
- Discuss lessons learned

# Introduction

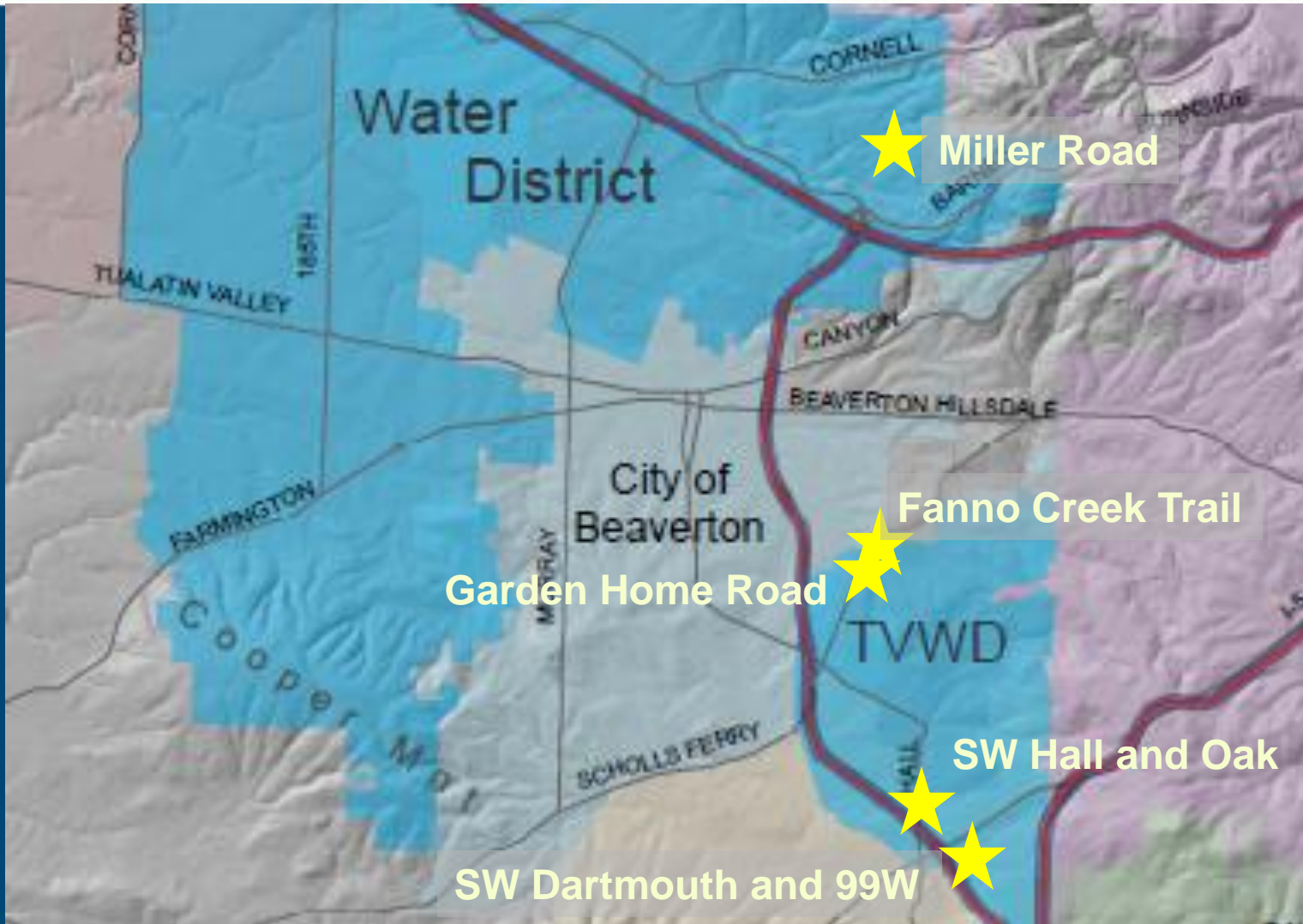
- Service area includes:  
Parts of Beaverton, Hillsboro, Tigard, and unincorporated Washington County
- Serve over 200,000 people
- ~20 MGD
- ~769 miles of pipe



# Issues with urban pipeline construction

- **ROW Constraints**
- **Limited Construction Schedule and Area**
- **Hydraulic Considerations**
- **Traffic Congestion**
- **Utility conflicts**
- **Complex geology**
- **Maintain positive public image**

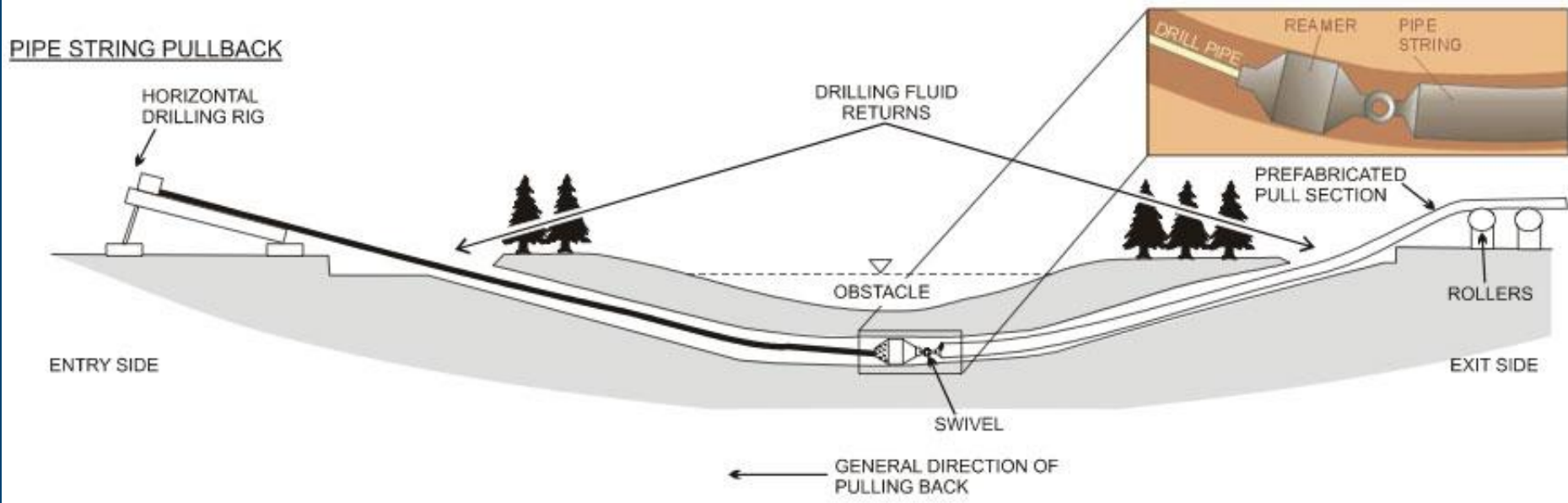
# Project Locations



# Project Design

- **Design considerations:**
  - ◆ Construction methodology
  - ◆ Pipe type
  - ◆ Soils analysis
  - ◆ Profile
  - ◆ Conflict management
  - ◆ Cost

# Background: Horizontal Directional Drilling Technology



# 33,000 lb Capacity Drill Rig – Fanno Creek Trail 10" HDD





# 100,000 lb Capacity Drill Rig – Garden Home 14" HDD



# 500,000 lb Capacity Drill Rig – Miller Rd 20" HDD



# Mud Reclamation System – Miller Rd HDD



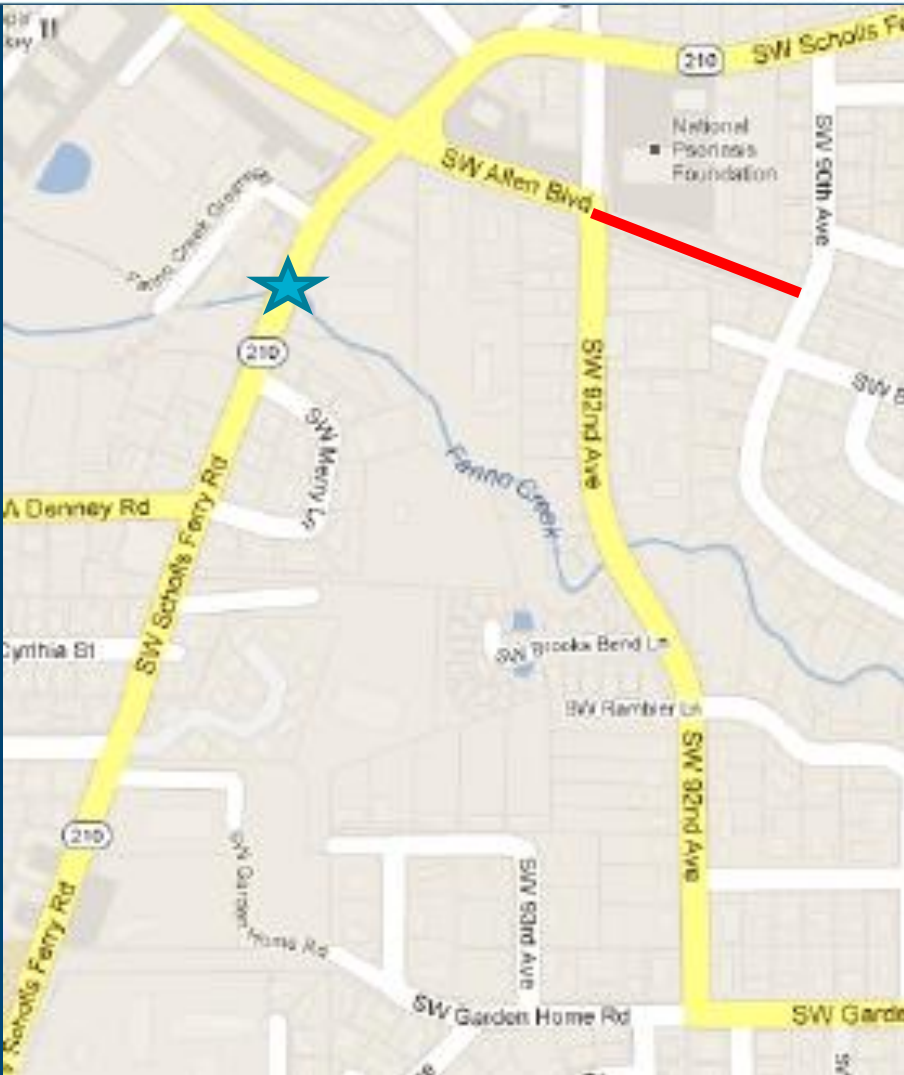
# HDPE Fusion Machine







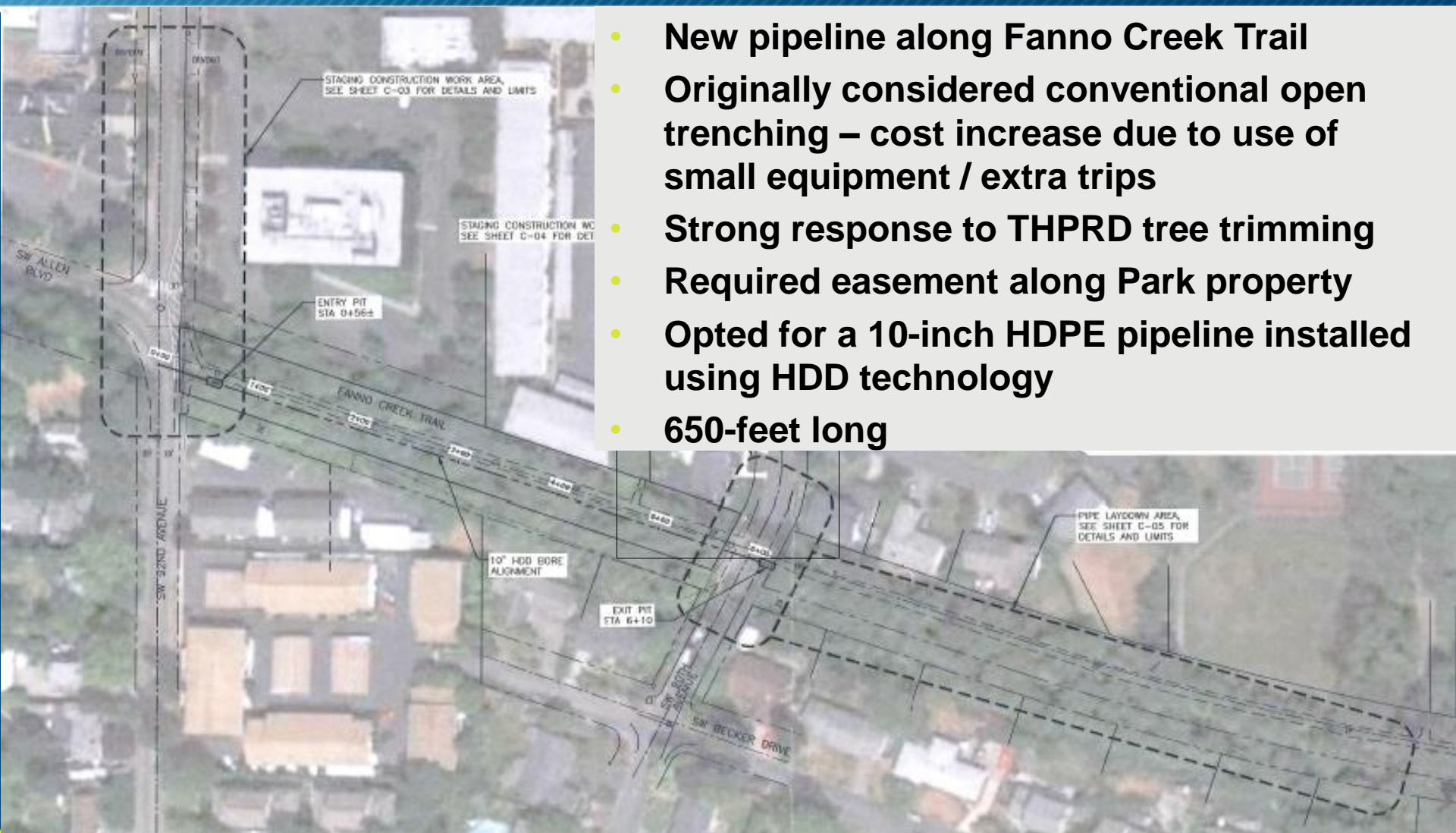
# Fanno Creek HDD Project



- Bridge Replacement
- Lose 8-inch pipeline
- Need to provide fire-flow capacity
- Limited space on bridge
- Other utility conflicts
- Modeled options

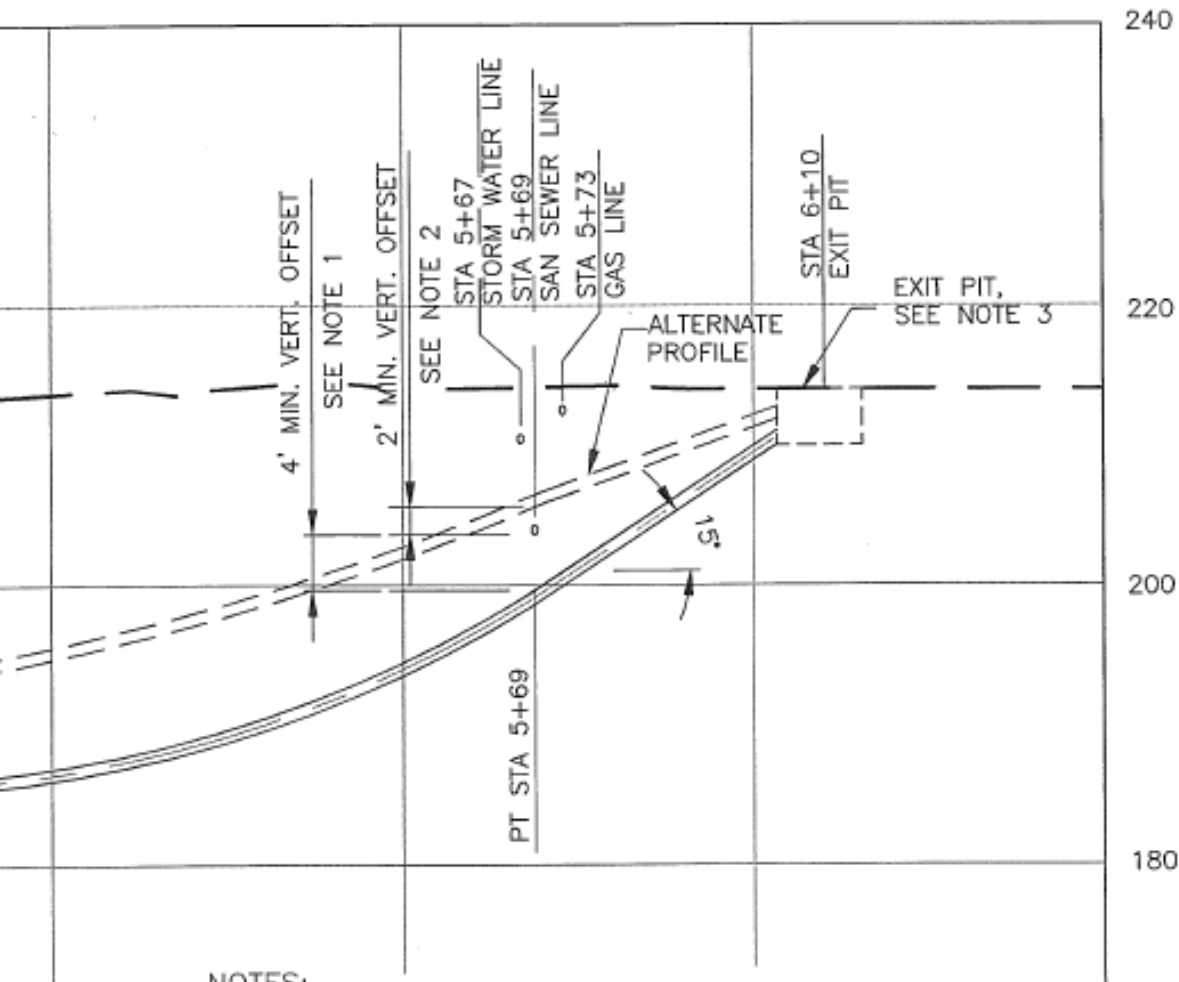
# Fanno Creek Trail HDD

- New pipeline along Fanno Creek Trail
- Originally considered conventional open trenching – cost increase due to use of small equipment / extra trips
- Strong response to THPRD tree trimming
- Required easement along Park property
- Opted for a 10-inch HDPE pipeline installed using HDD technology
- 650-feet long





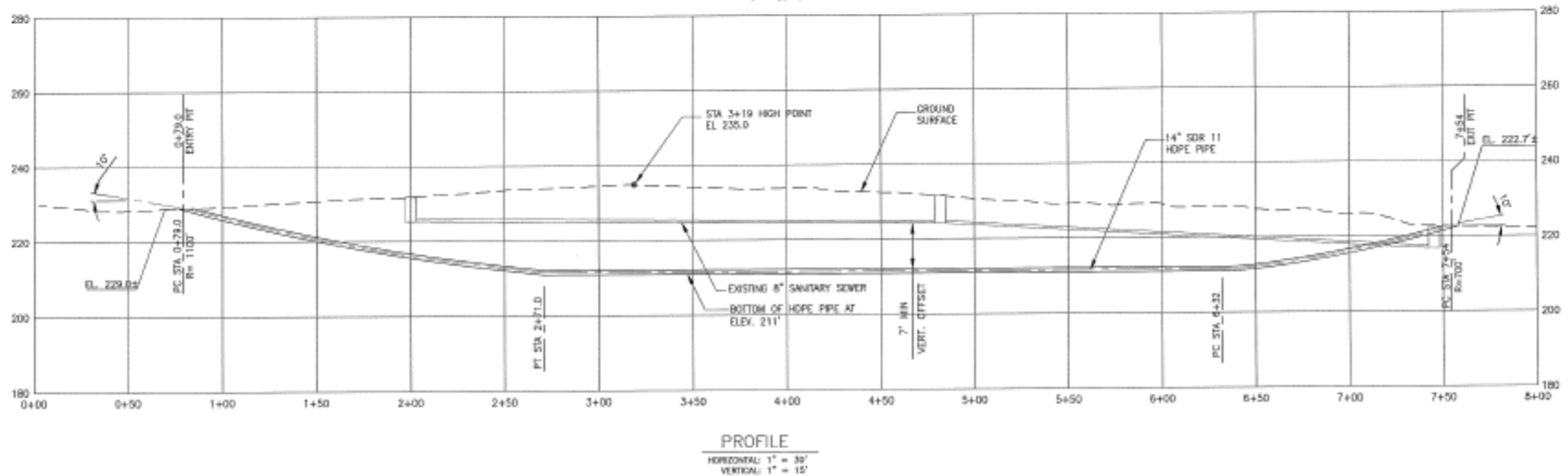
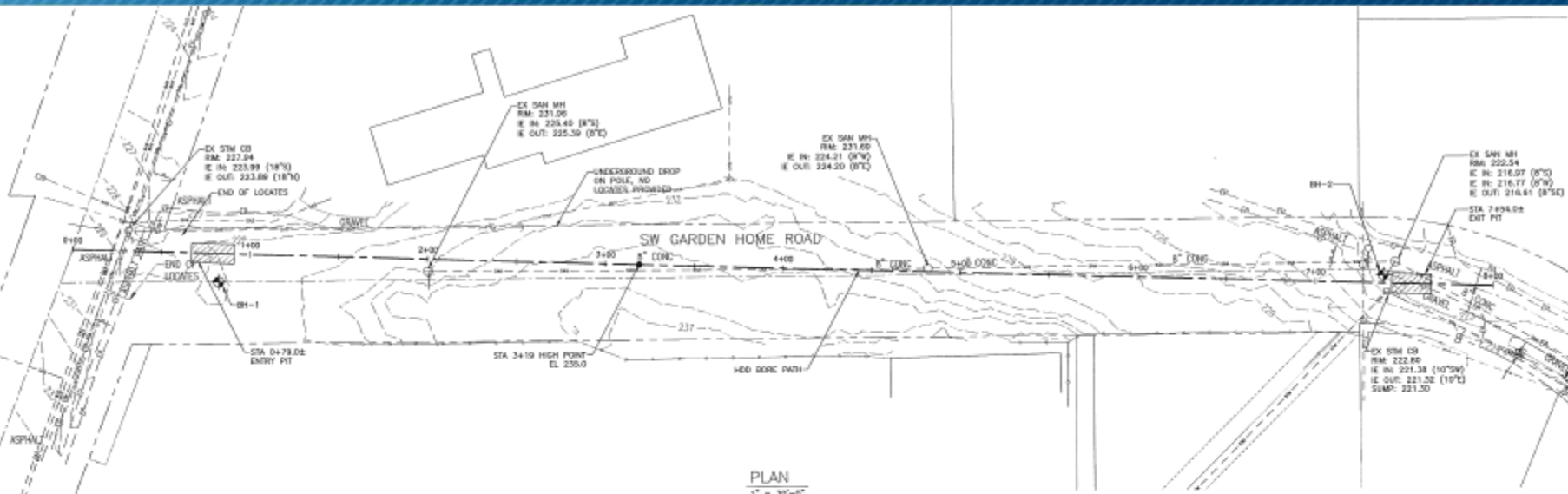
# Fanno Creek – Design Challenges



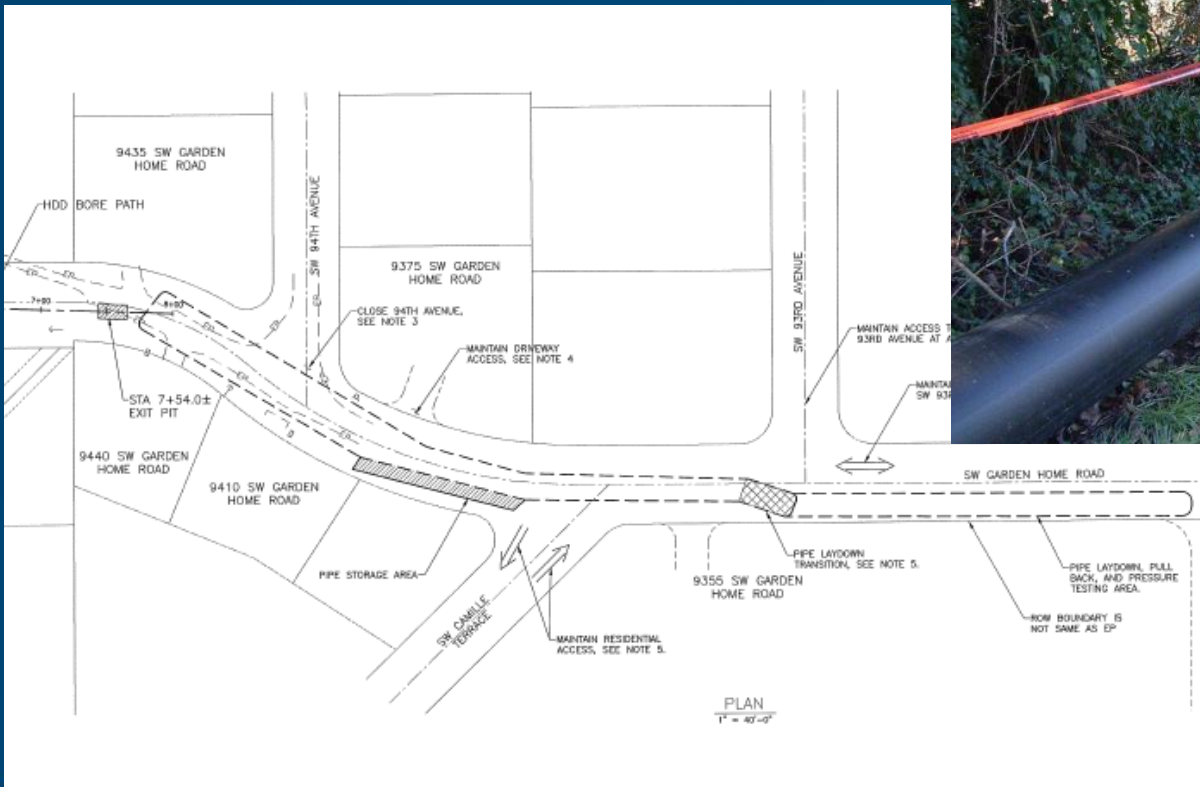
- **Utility Conflicts**



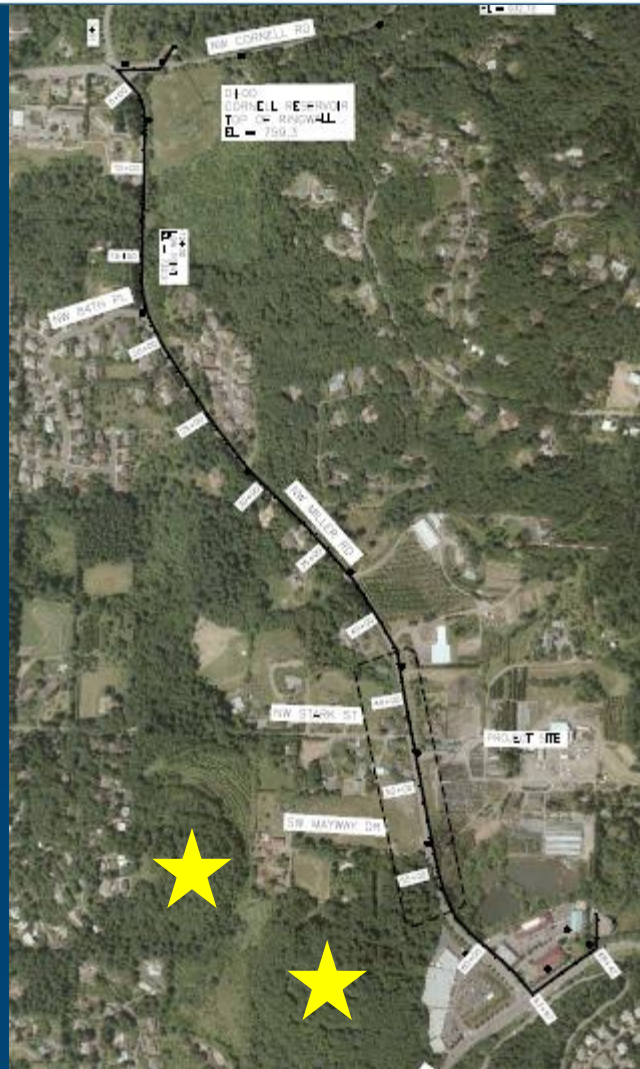
# Garden Home Road HDD



# Design Challenge – Contractor Ingenuity

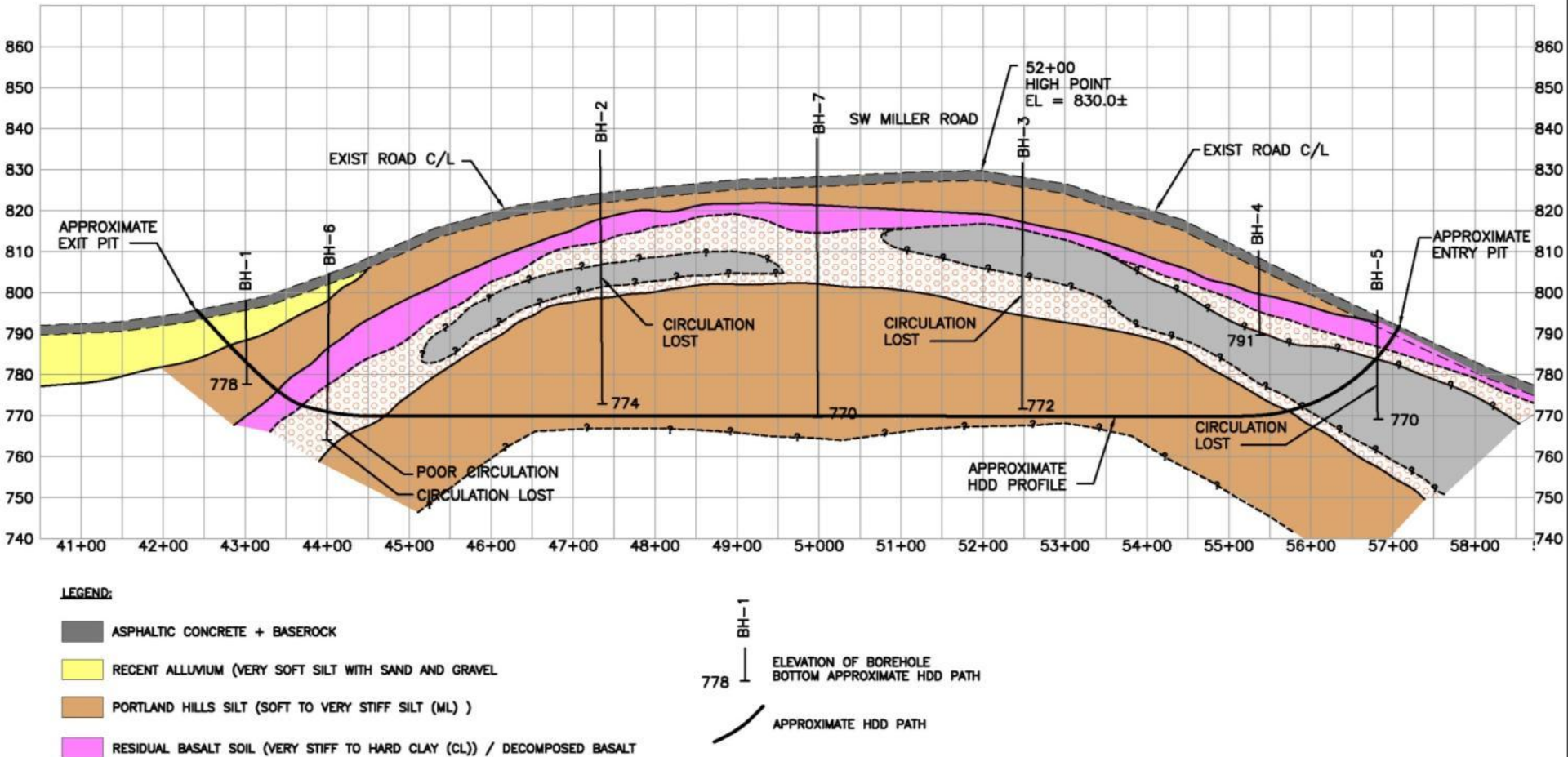


# Miller Road HDD



- Existing 16-inch between Cornell and Tuefel Reservoirs
- Miller Road hill restricted ability to balance tanks
- Allow system to float versus run on pump
- 1500' HDD through highpoint

# Miller Road – Complex Geology





# Miller Road Construction Challenges

- **Tight Timeframe due to County road paving schedule**
- **Slow pilot due to strong rock and swelling clays**
- **Collapse at north end due to soft soils and record rain in June 2012**
- **Hole collapse during reaming trapped reamer**
- **Contractor elected to upgrade to larger drill rig**



# 100,000 lb Capacity Drill Rig – Miller Rd 20" HDD









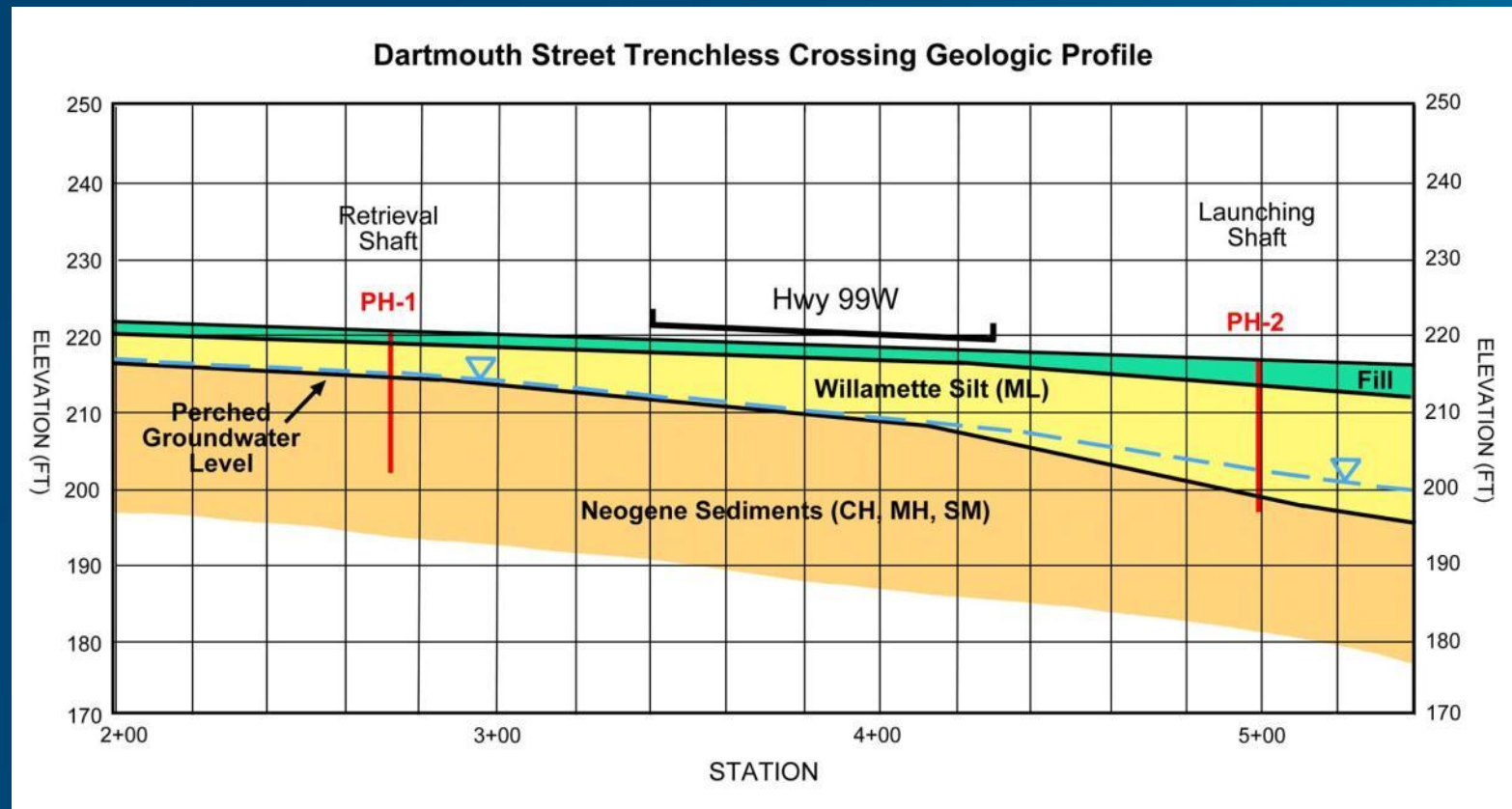


# SW Dartmouth and Highway 99W HDD



- Originally designed for Auger bore
- Redesigned for 650-foot HDD to avoid nightwork requirement
- Optimize layout to avoid traffic and access impacts

# Geologic Profile



# 100,000 lb Capacity Drill Rig – SW Dartmouth & Hwy 99W





# SW Dartmouth & Hwy 99W – 5 days after start of project...



# SW Dartmouth & Hwy 99W – 5 days after start of project...



# SW Dartmouth & Hwy 99W – 5 days after start of project...



# SW Dartmouth & Hwy 99W – Difficult to plan for everything - groundwater



# 3 weeks after start of construction...



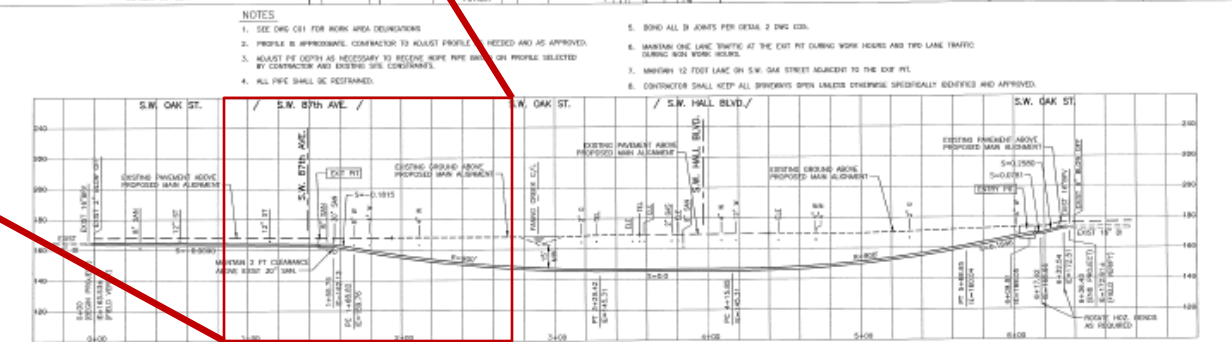
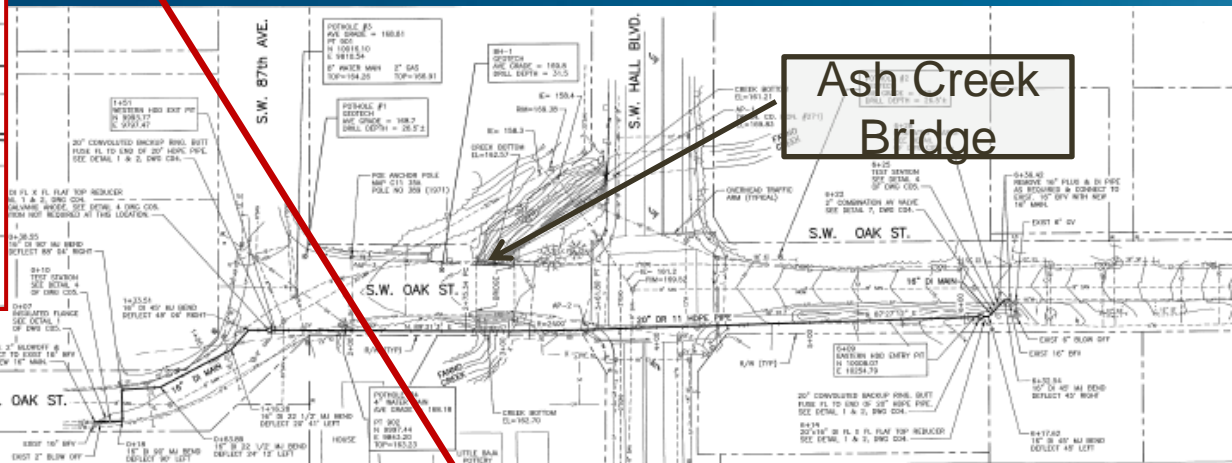
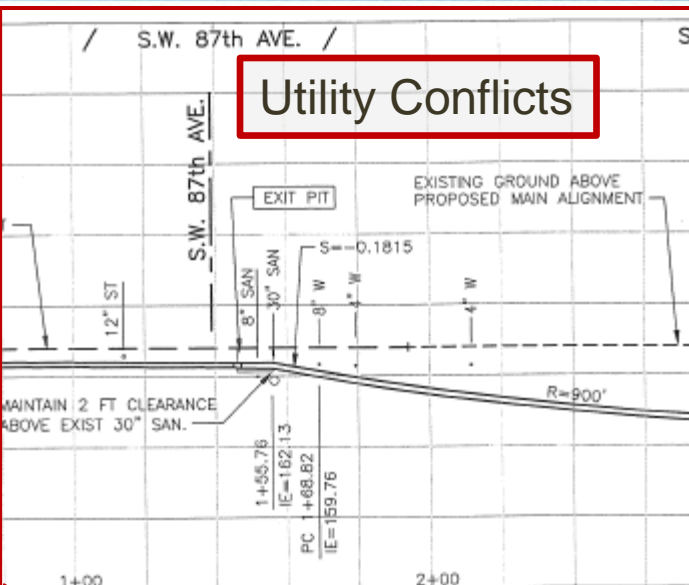
# 3 weeks after start of construction...



# SW Dartmouth & Hwy 99W

- **“...this project went off without a hitch. An excellent example of the work the government is capable of with a little cooperation between agencies. Thanks to our Staff, TVWD and ODOT.” – City of Tigard**

# SW Hall Blvd and SW Oak Street HDD



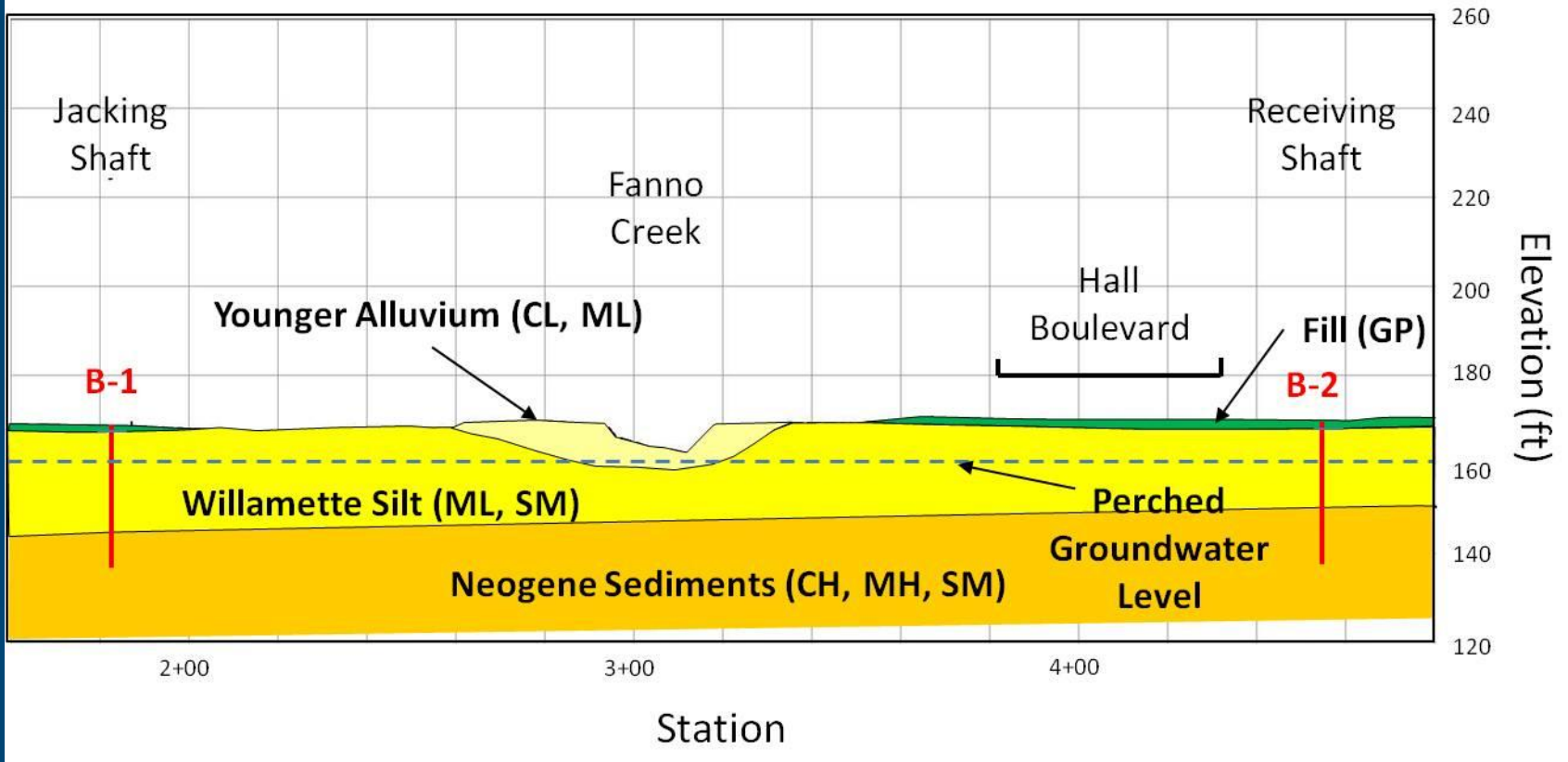
## NOTES

1. SEE DWG 081 FOR WORK AREA DEMARCATIONS
2. PROFILE IS APPROXIMATE. CONTRACTOR TO ADJUST PROFILE AS NEEDED AND AS APPROVED.
3. ADJUST PIPE DEPTH AS NECESSARY TO RECEIVE WORK PIPE FROM CONTRACTOR AND EXISTING USE CONFORMANCE.
4. ALL PIPE SHALL BE RESTRAINED.
5. BOND ALL D JOINTS PER DETAIL 2 DWG 030.
6. MAINTAIN ONE LANE TRAFFIC AT THE EXIT PIT DURING WORK HOURS AND TWO LANE TRAFFIC DURING NON WORK HOURS.
7. MAINTAIN 12 FOOT LANE ON S.W. OAK STREET ALIGNED TO THE BOX PIT.
8. CONTRACTOR SHALL KEEP ALL BRIGHS OPEN UNLESS OTHERWISE SPECIFICALLY IDENTIFIED AND APPROVED.



# Geologic Profile

## SW Oak and SW Hall Street Trenchless Crossing Geologic Profile















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# Benefits to Using HDD in Urban Environment

- **Cost effective** when compared to auger bore and long trenching alternatives
- **Avoids utilities and sensitive areas** including wetlands, park lands, and streams
- **Minimizes overall project footprint**
- **Minimizes impact to community** including traffic impacts and project duration



# Benefits to Using HDD in Urban Environment (continued)

- **Completion through a wide variety of geomedia**
- **Advance pipe procurement** can reduce project schedule and contractor bid costs
- **Opens doors to additional system optimization** by allows owner to complete projects that weren't viable otherwise.

# Challenges to HDD in Urban Environment

- **Subsurface can challenge the technique** – need appropriate geotechnical investigation
- **Fracout can occur** and the contractor must be prepared to handle a release – require a containment plan (and secondary) as a submittal
- **Procurement of pipe by contractor** can extend project schedule. HDPE can be a long lead item, particularly for larger diameter.

# Challenges to HDD in Urban Environment

- **Down time** is not your friend
- **There may be “surprises” waiting for you underground** (natural springs, additional groundwater, etc.) – be prepared to make adjustments.
- **Pipe staging can be an issue** – may require innovation.

# Additional Lessons Learned

- **Allowing contractor flexibility can help to reduce costs**
- **Too much flexibility may cause issues**
- **Include “pigging” in bid package**
- **Important to maintain good working relationship**

**HDD technology proved to be the best solution for these urban projects.**

**Questions?**