



**King County**

## South Magnolia CSO Control Project



Technical Information Session  
January 21, 2012

# Meeting Purpose

- Provide project update
- Address community questions and concerns about the new gravity sewer pipeline alignment
- Provide next steps and opportunities for public participation



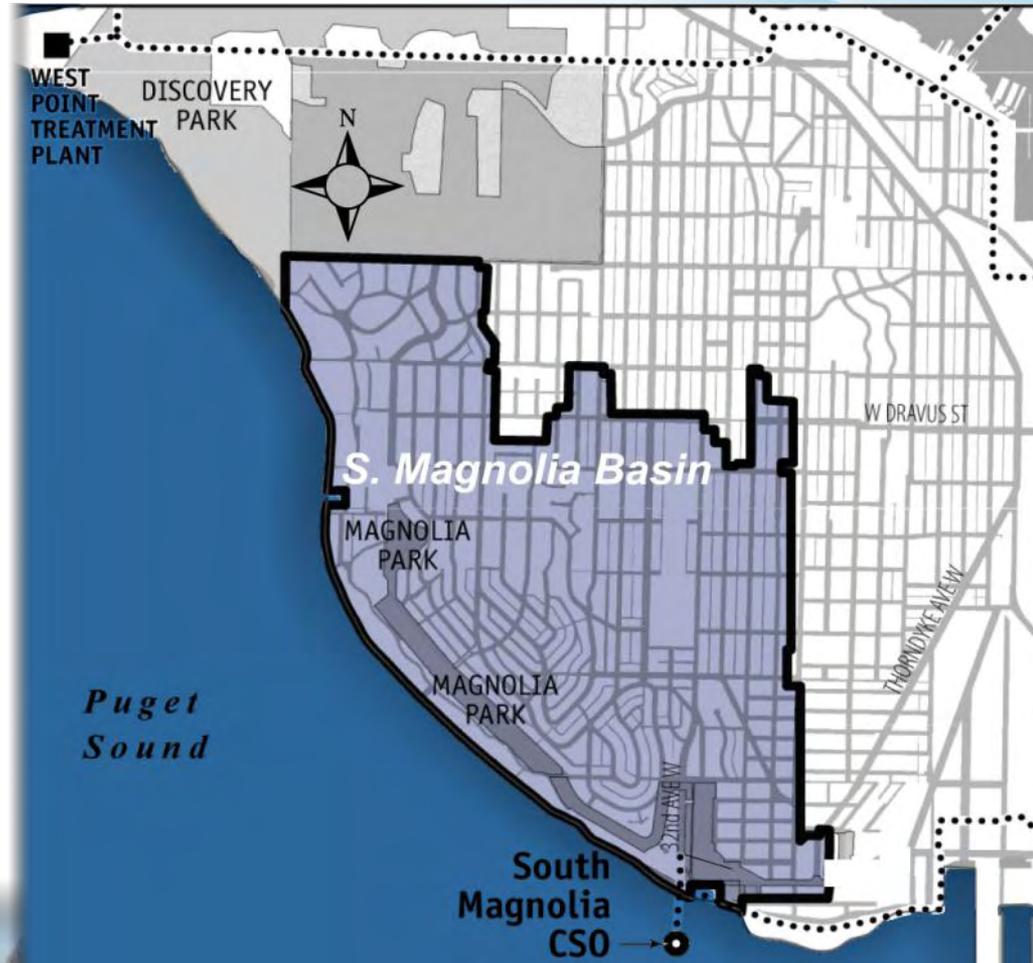
# Agenda

- Team Introduction
- Project Update
  - Gravity sewer pipeline alignment
  - Geotechnical Investigations- summary of first phase
  - How the pipeline will be installed
  - How the system will operate
- Next Steps



# Why the Project is Needed

- From January-November 2011, 21 CSOs occurred in South Magnolia
- Current standards administered by Ecology allow no more than one untreated event per year on average
- Compliance deadlines are defined in the West Point TP NPDES permit



# Project Update

- Summer 2011
  - Final Facility Plan Submitted
  - Design Phase Begins
- Summer / Fall 2011
  - Announce Tank Location
  - Geotechnical Field Investigations
- Early 2012-
  - Identify pipeline alignment
  - Determine configuration of the underground storage tank and odor control/electrical facility
  - Continue property acquisition process
- Final Design complete December 2012



# Overview of Design Elements

- Underground storage tank
- Gravity sewer pipeline
- Diversion structure



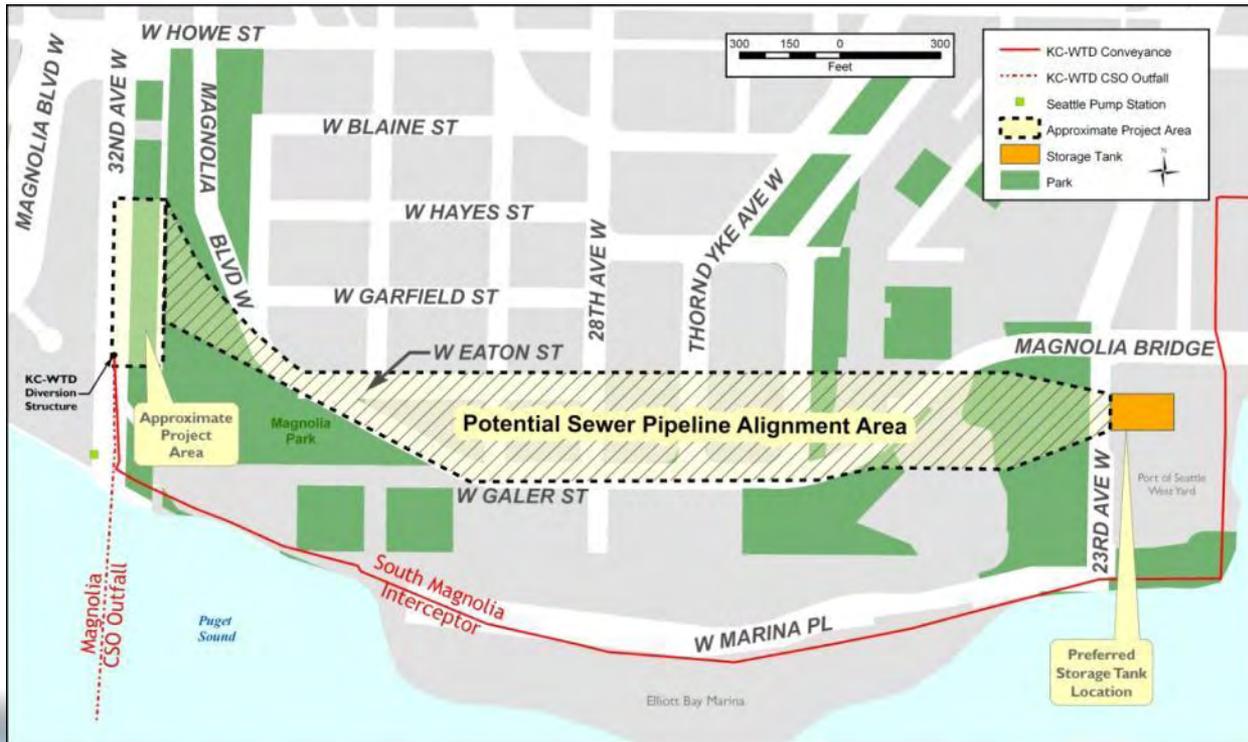
# King County's Tank Location: Terminal 91 West Yard

- February 15, 2012 meeting to discuss tank layout
- Endpoint for conveyance
- Pipeline construction staging will occur here



# Gravity Sewer Pipeline Alignment

Approximately 3,000 lineal feet of gravity sewer pipeline will be installed deep underground to connect the storage tank with a diversion structure on 32<sup>nd</sup> Avenue West



# How We Evaluated Pipeline Alignments

- Geotechnical conditions
  - Good soils encountered along all alignments
- Pipeline installation constraints
- Conveyance system hydraulics and operations
- Other considerations:
  - Protecting slope stability
  - Avoiding bridge piers and other structures



# Eaton Alignment

- Bridge and wall structures
- Pipeline installation issues



# Galer Alignment

- New diversion structure alignment optimal
- Most favorable hydraulics
- Best pipeline constructability



# Results of Preliminary Geotechnical Investigation

- Glacially consolidated materials
- Typical of soils in region
- Good construction soils
- Many successful projects



*Early phase borings were completed Fall 2011*

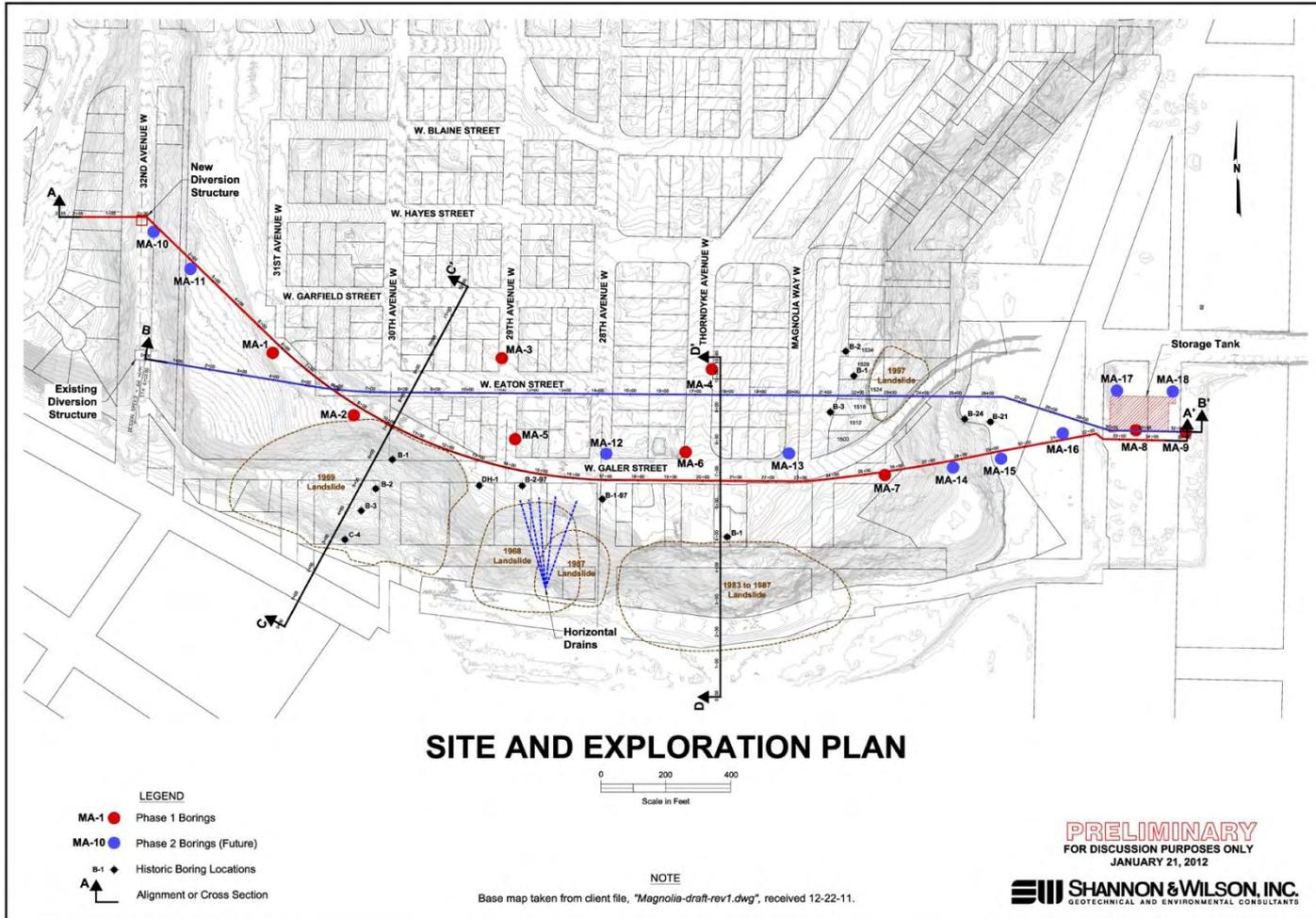


# Sources of Geologic Information

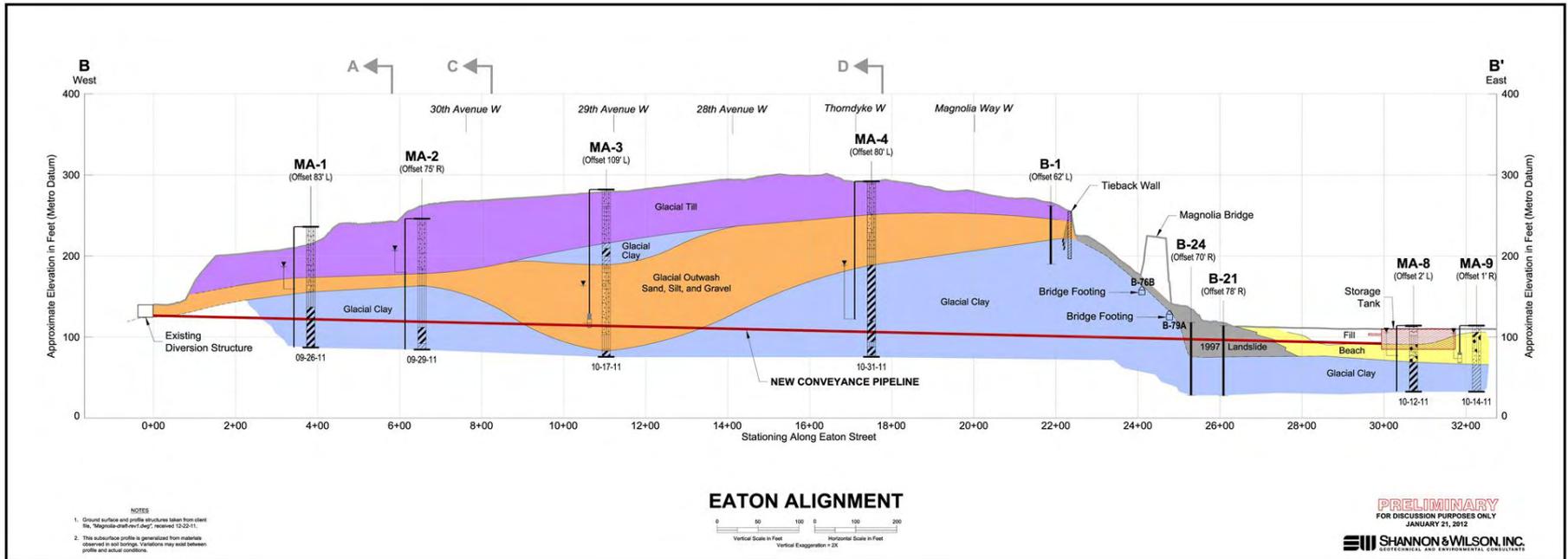
- Drilled and sampled a total of nine (9) borings
  - Two (2) borings along the Eaton alignment
  - Five (5) borings along the Galer alignment
  - Two (2) borings at the storage tank
- Past geotechnical investigations
  - Magnolia bridge replacement
  - Dames & Moore horizontal groundwater drains
  - 1968, 1969, 1983-1987, and 1997 landslides
  - Information from residents



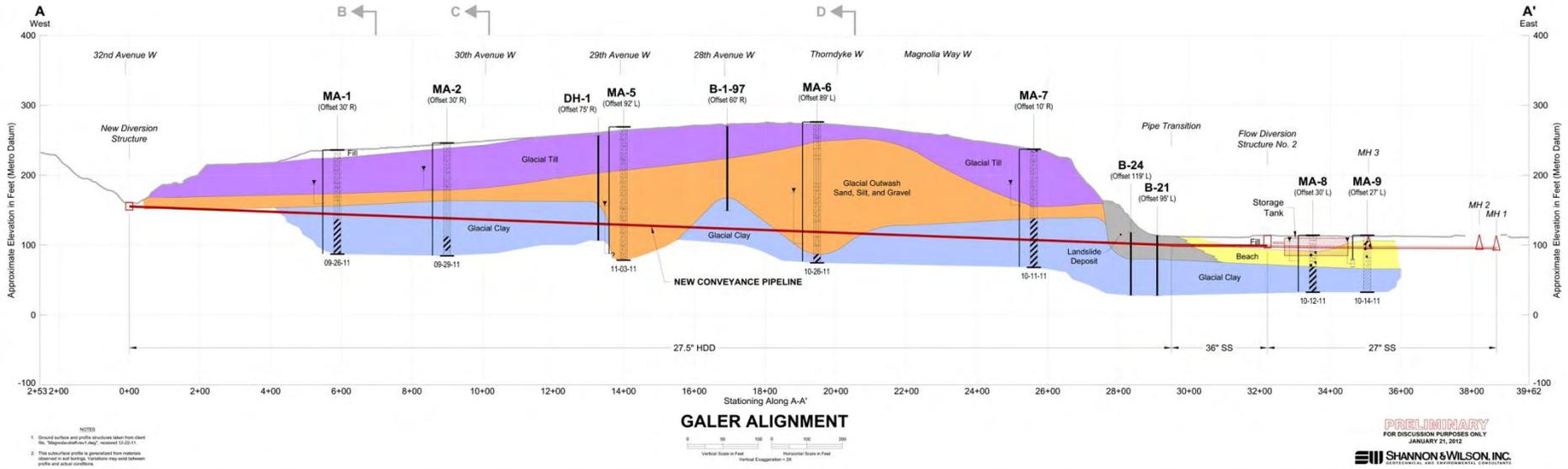
# Geotechnical Investigations Inform Alignment



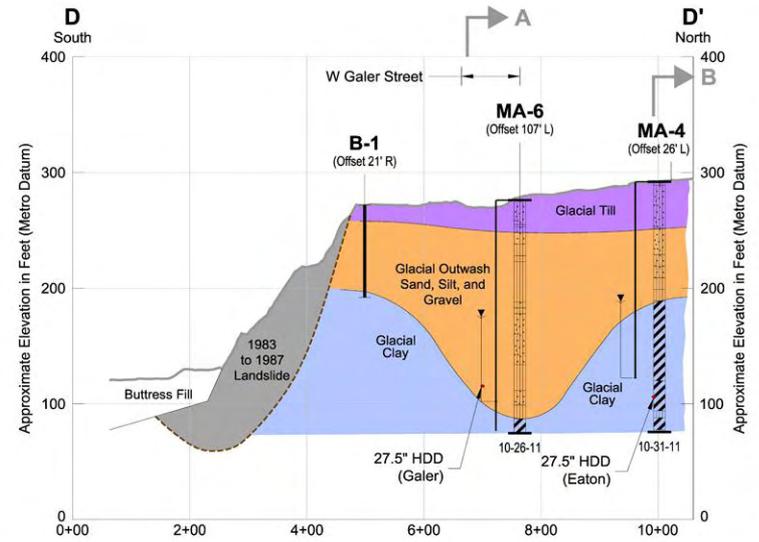
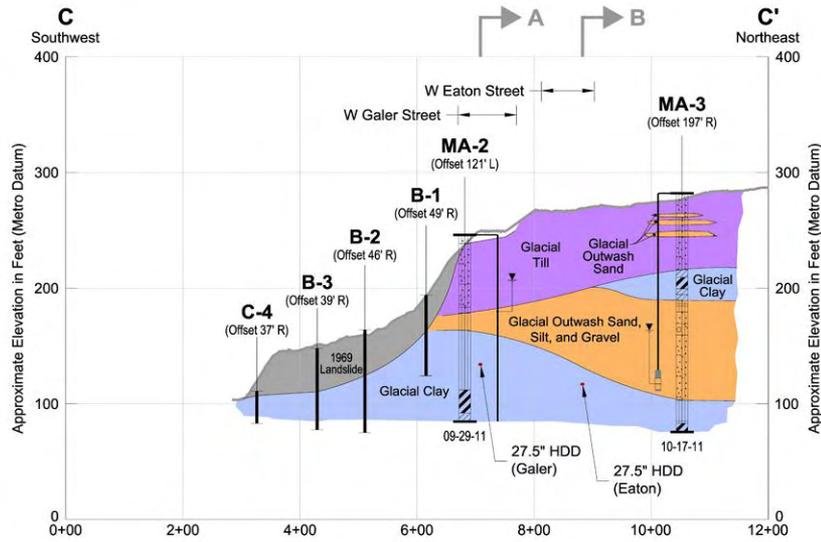
# Eaton Alignment Soils



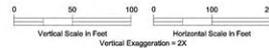
# Galer Alignment Soils



# Geologic Sections



**CROSS SECTIONS C-C' AND D-D'**



**NOTES**

1. Ground surface and cross section structures taken from client file, "Magnolia-draft-ev1.dwg", received 12-22-11.
2. These subsurface cross sections are generalized from materials observed in soil borings. Variations may exist between cross sections and actual conditions.

**PRELIMINARY**  
FOR DISCUSSION PURPOSES ONLY  
JANUARY 21, 2012

**SHANNON & WILSON, INC.**  
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

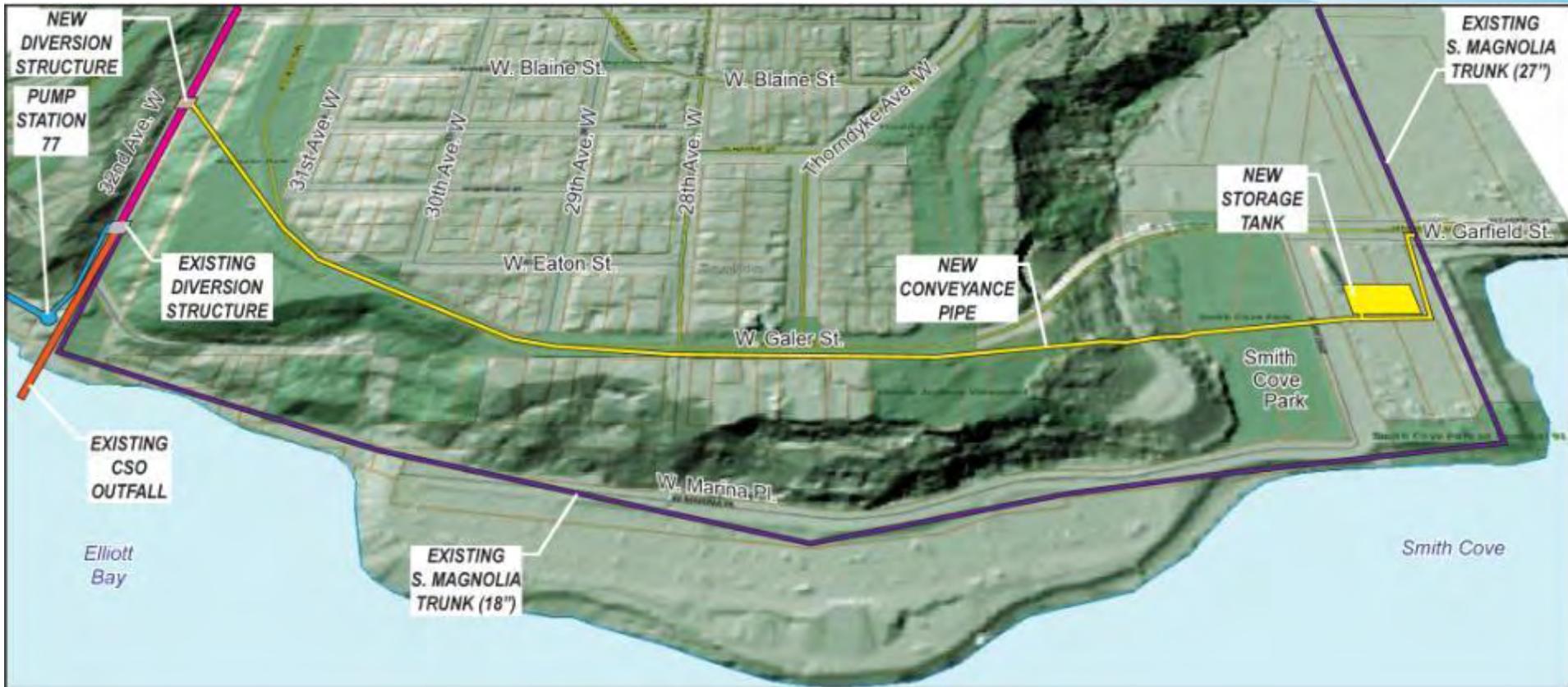


# Geologic Monitoring

- Groundwater elevation
- Ground movement
- Monitoring:
  - Schedule of measurements
    - Initial readings taken in November 2011
    - Readings performed seasonally during design
    - Readings prior, during, and after pipe installation

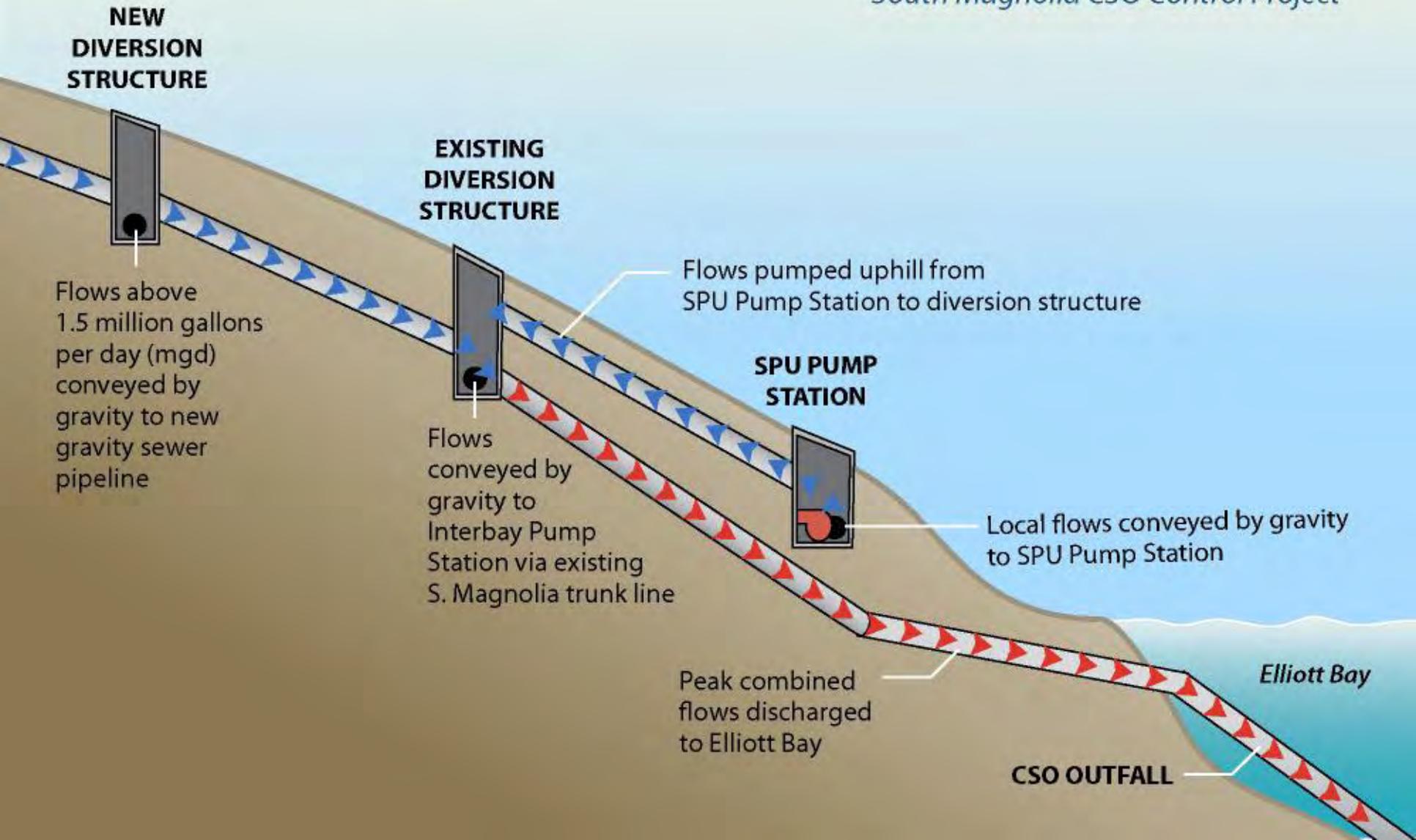


# System Operation



# Profile of Infrastructure on 32nd Avenue West

*South Magnolia CSO Control Project*



# Trenchless Technology for Pipeline Installation

- *Trenchless technologies are used for deep underground pipeline installations to avoid open trench excavation at the surface.*
- *Benefits include:*
  - *Avoiding sensitive environmental areas*
  - *Limited surface impacts- No surface impacts along West Galer or West Eaton streets*

# Installation Technologies We Assessed

- *Horizontal direction drill (HDD)*
- *Microtunneling*
- *Earth pressure balance machine (EPBM)*
- *Open shield jacking*
- *HDD is preferred method*
  - *Most economical*
  - *No intermediate shafts needed*
  - *Conducive method for required pipe size*

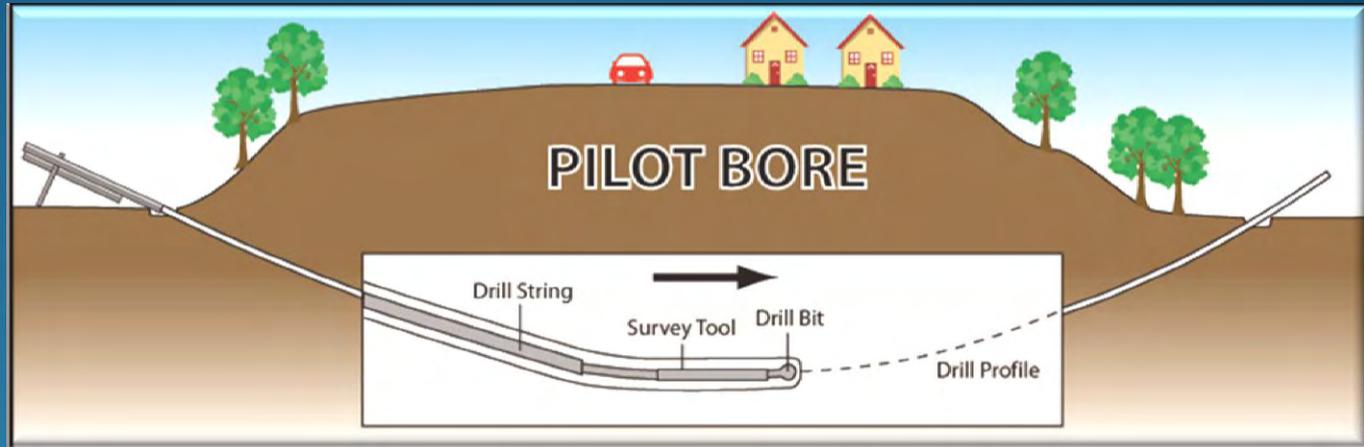
# Horizontal Direction Drilling (HDD) Overview

*Three main steps:*

- 1. Pilot bore*
- 2. Reaming pass*
- 3. Pipe pullback*

# Step 1. Drilling the pilot bore

An initial drilling step establishes a pilot hole. The surrounding soils are stabilized with drilling mud.



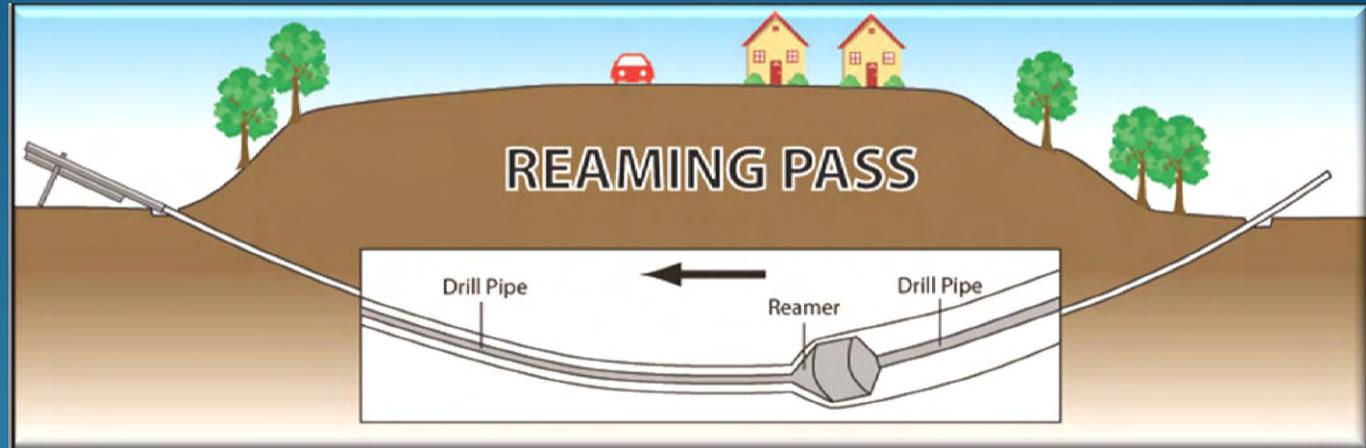
A drilling engineer steers the drill bit using special survey tools.



Tracking devices at the surface track the drill bit location during the initial bore.

# Step 2. Reaming pass

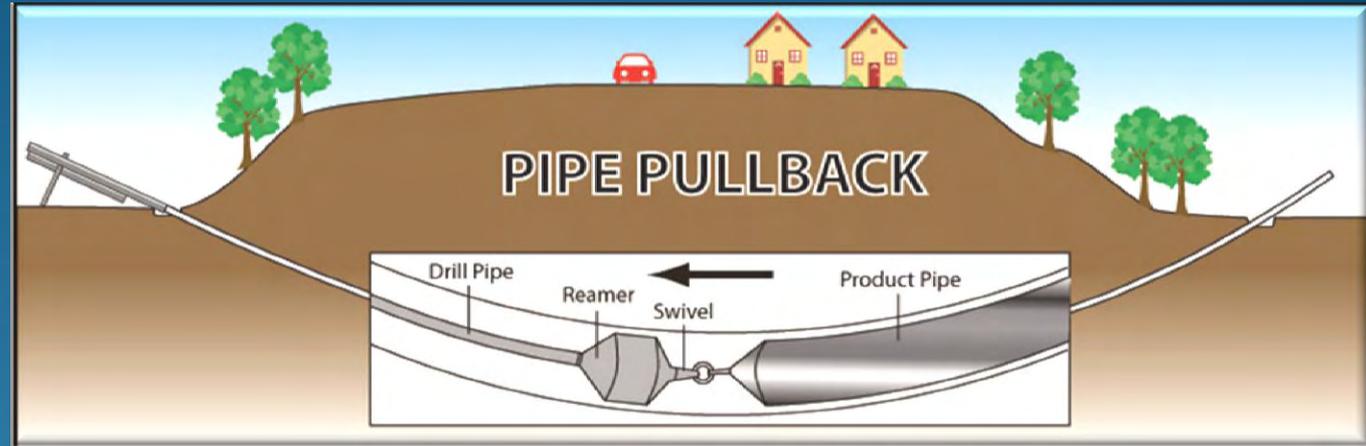
The pilot hole is then enlarged to the final pipe size using a reamer. The drilling mud excavated in this step is collected and recycled.



Specific equipment is used for drilling in different conditions. Both drill bits and reaming heads for the Magnolia Project will be selected based on the soil types found at the drill depth.

# Step 3. Pipe pullback

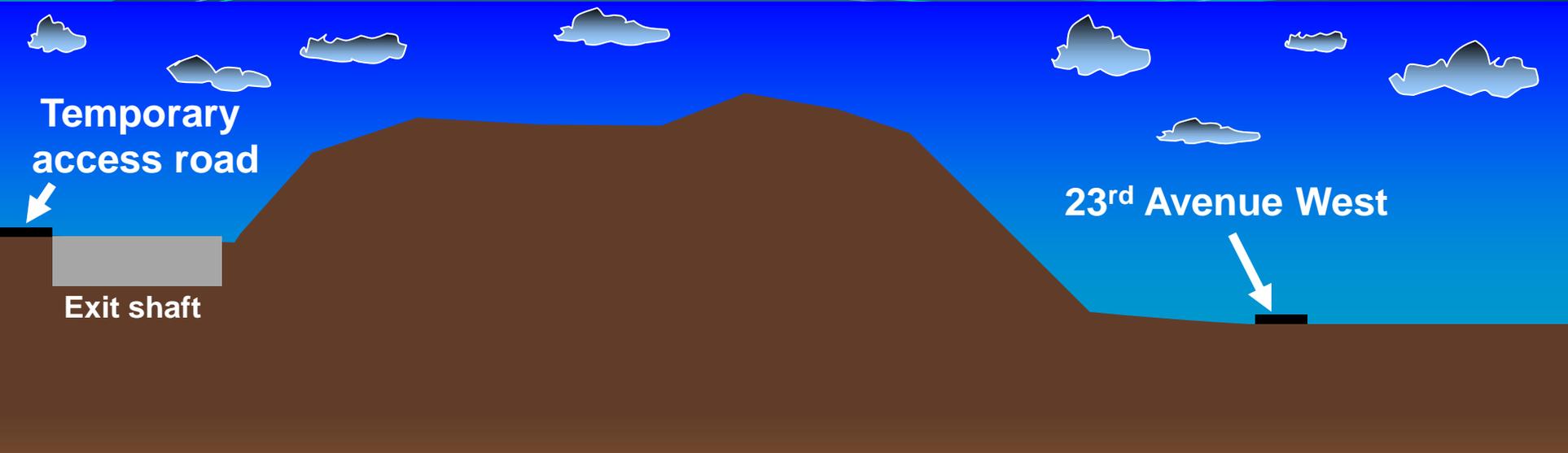
The final pipeline is then pulled back through the prepared bore hole.



Heavy equipment is used to lift the pipe and pull it through the prepared bore hole.

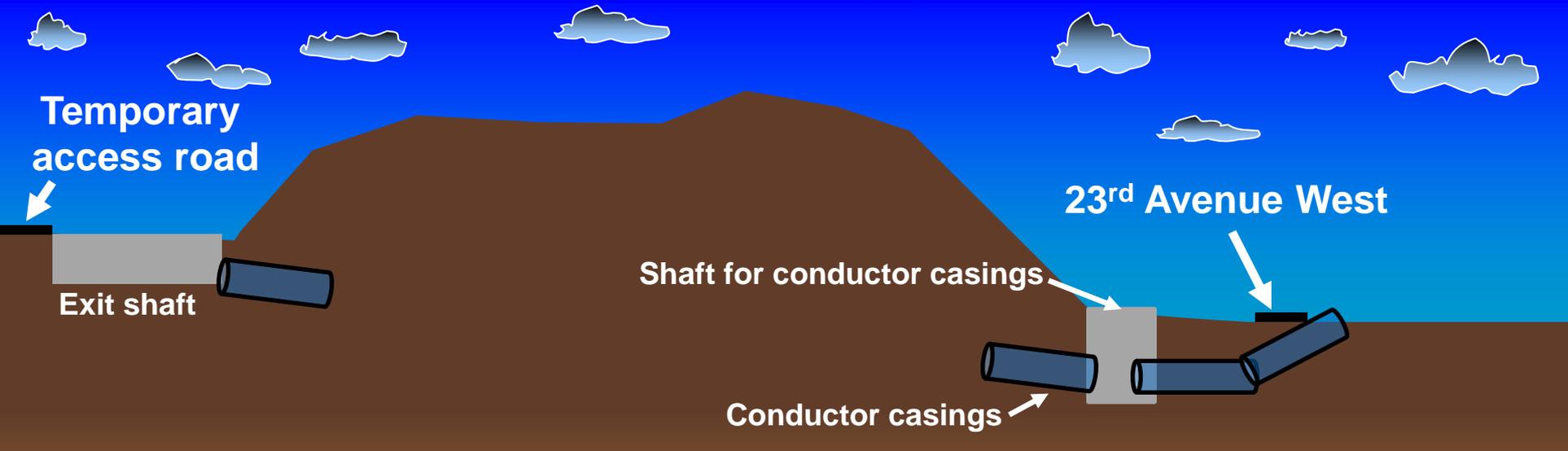


# HDD Construction Sequence in Magnolia



Step 1 – Construct exit shaft and temporary road near the future location of the new 32<sup>nd</sup> Ave diversion structure.

# HDD Construction Sequence in Magnolia

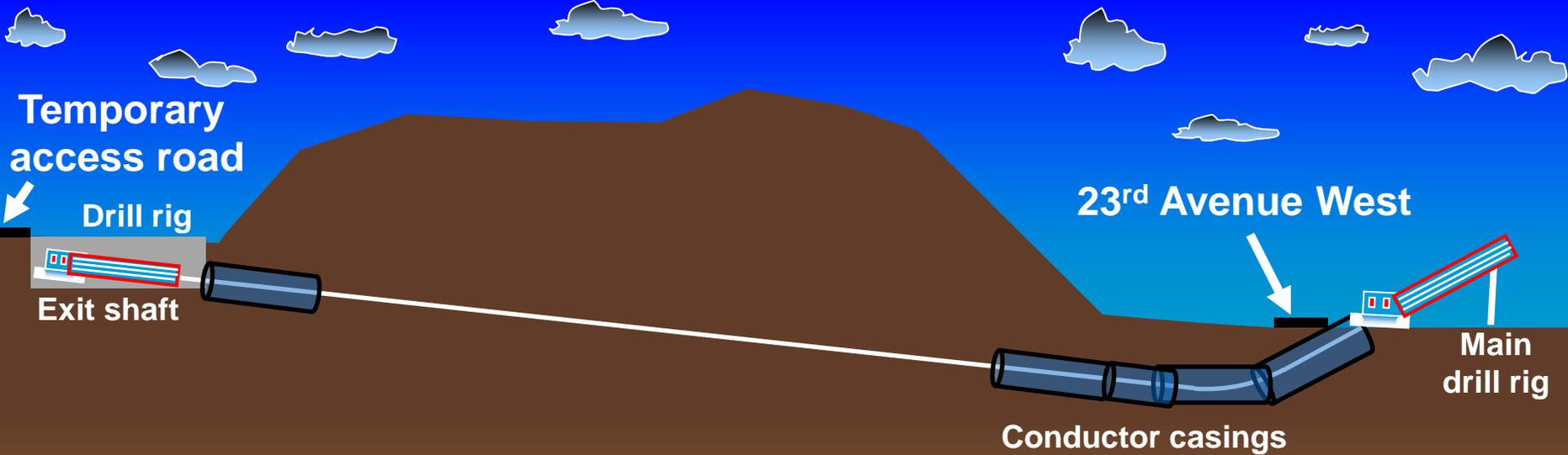


Step 2 – Construct shaft and install steel conductor casings underneath 23<sup>rd</sup> Ave W and into the bluff to protect roadway and surface soils.



*Example of conductor casing installation*

# HDD Construction Sequence in Magnolia

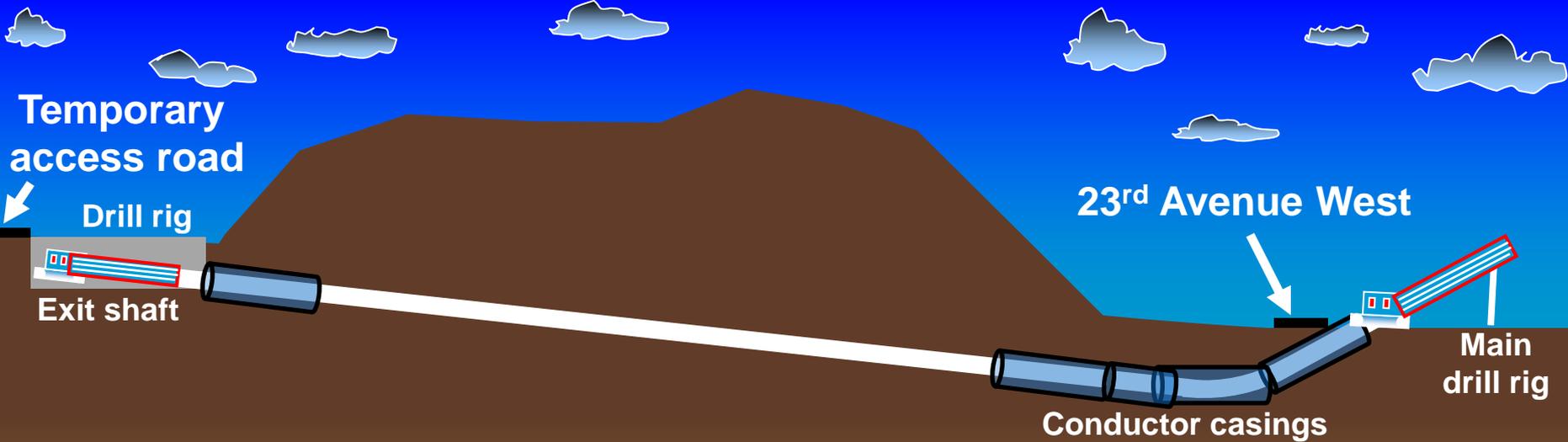


Step 3 – Mobilize drill rigs on each side of the project and drill the pilot bore from the east side of 23<sup>rd</sup> Ave W to the exit shaft at 32<sup>nd</sup> Ave W.



*Examples of different drill bits used for pilot bores*

# HDD Construction Sequence in Magnolia

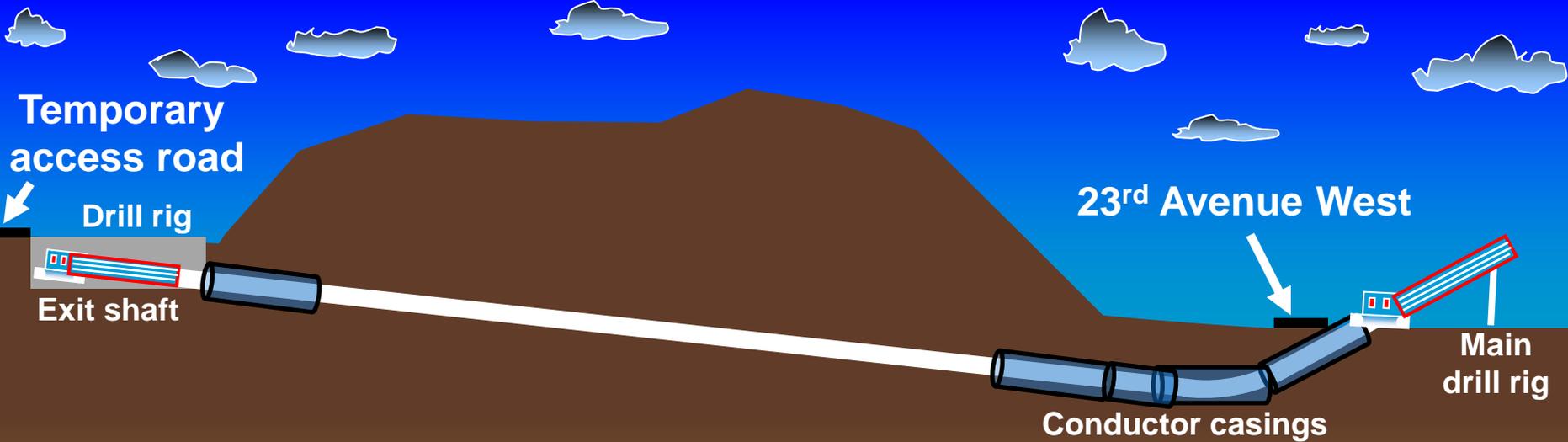


Step 4 – Enlarge the borehole by reaming from the main drill rig at 23rd Ave W to the exit shaft at 32nd Ave W.



Examples of various reaming heads used depending on site soil conditions

# HDD Construction Sequence in Magnolia

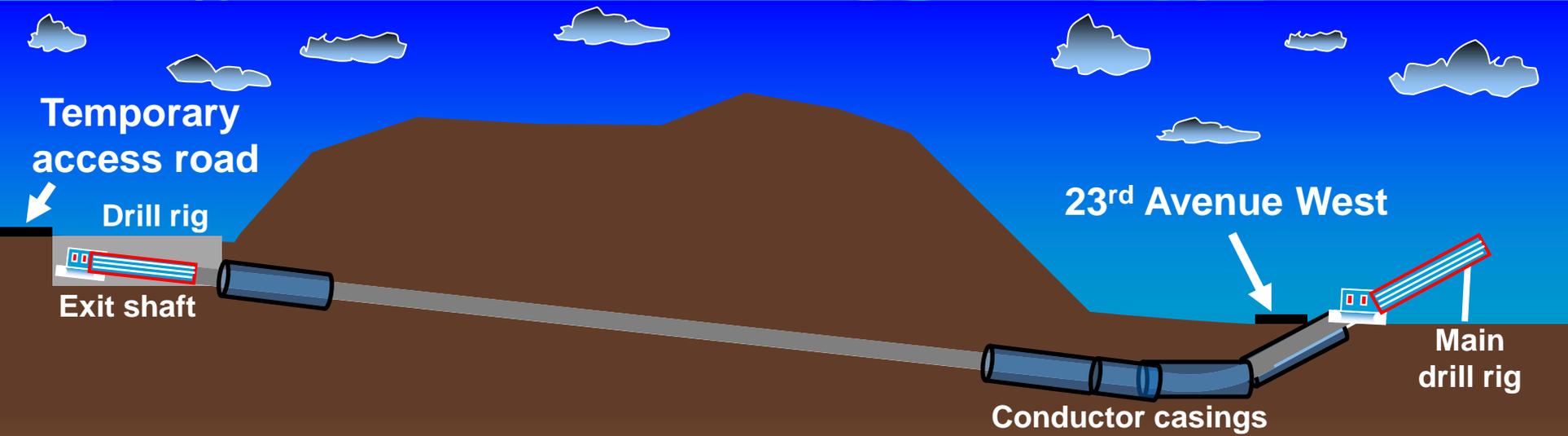


Step 5 – While drilling, pipe sections are fused together and prepared for pullback.



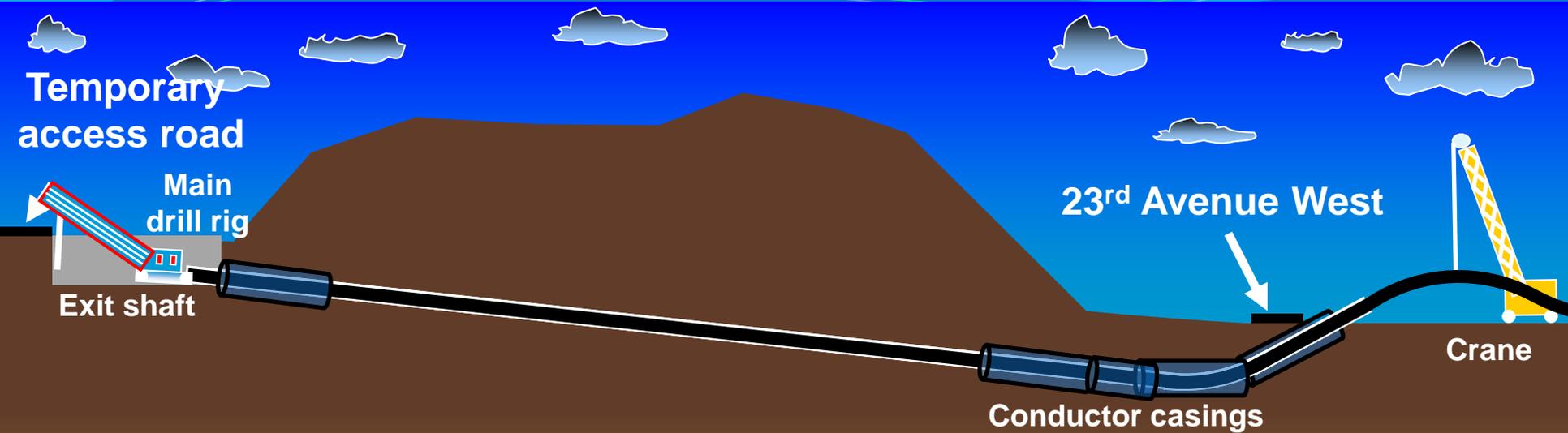
*Pipe sections may be fused together on site or off site, depending on site space constraints.*

# HDD Construction Sequence in Magnolia



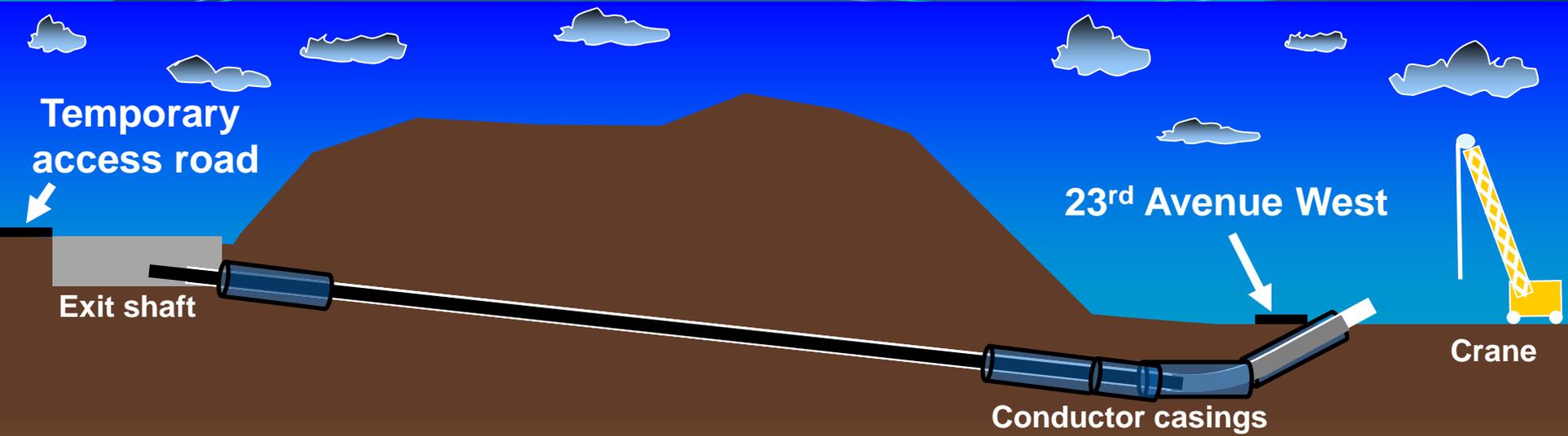
Step 6 – Perform final swab (mud pass) of the borehole to ensure integrity.

# HDD Construction Sequence in Magnolia



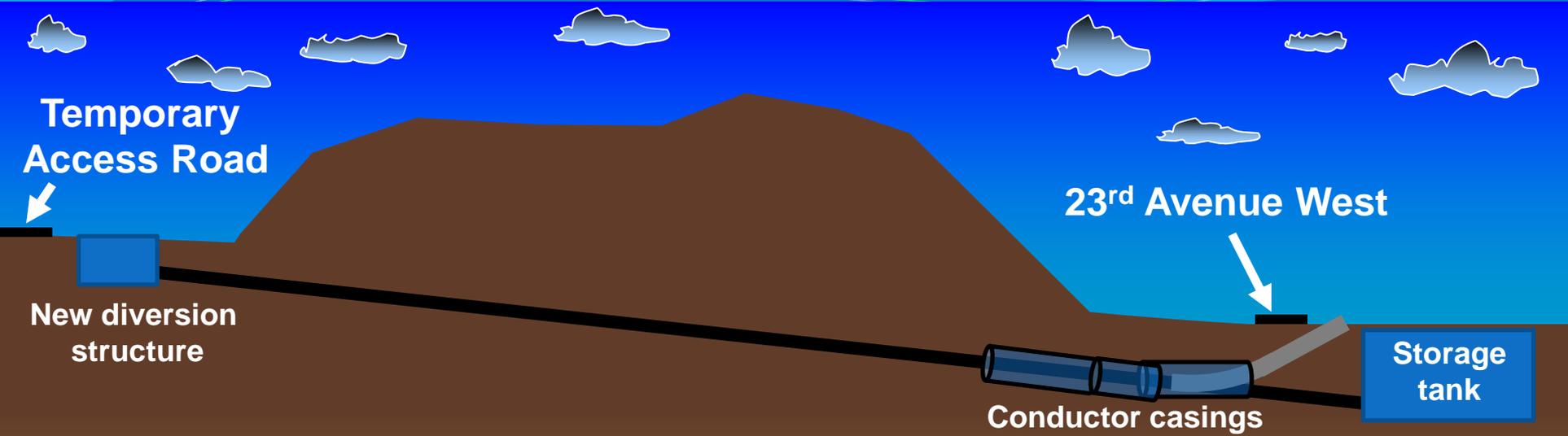
Step 7 – The drill rig at 32nd Ave W is removed and replaced with the main drill rig from 23rd Ave W. A crane is then mobilized at 23rd Ave W to lift the pipe into the borehole. The product pipe is connected to the drill string and pulled into the borehole by the main drill rig.

# HDD Construction Sequence in Magnolia



Step 8 – The space around the pipe at both ends of the product pipe is filled with grout.

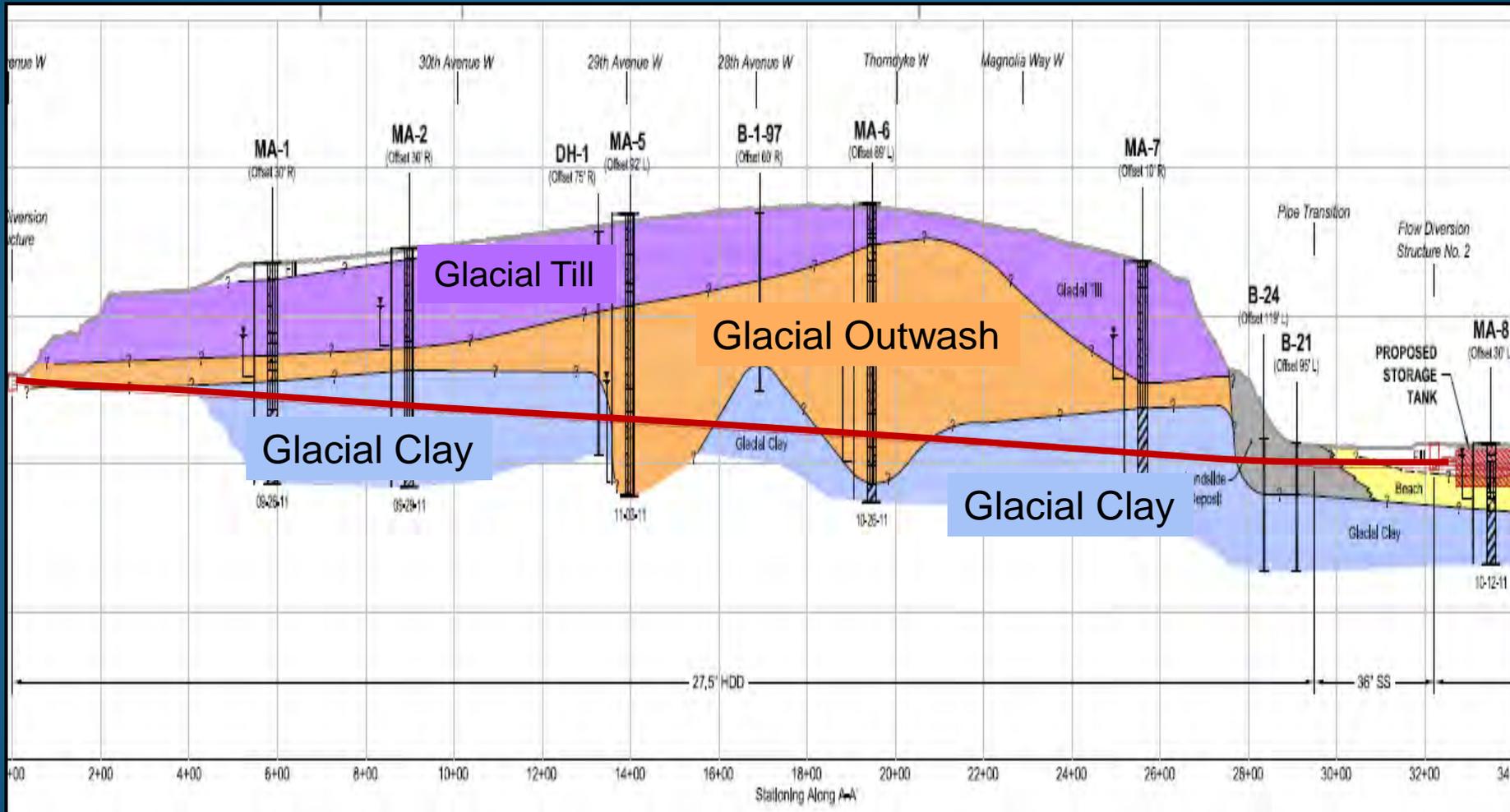
# HDD Construction Sequence in Magnolia



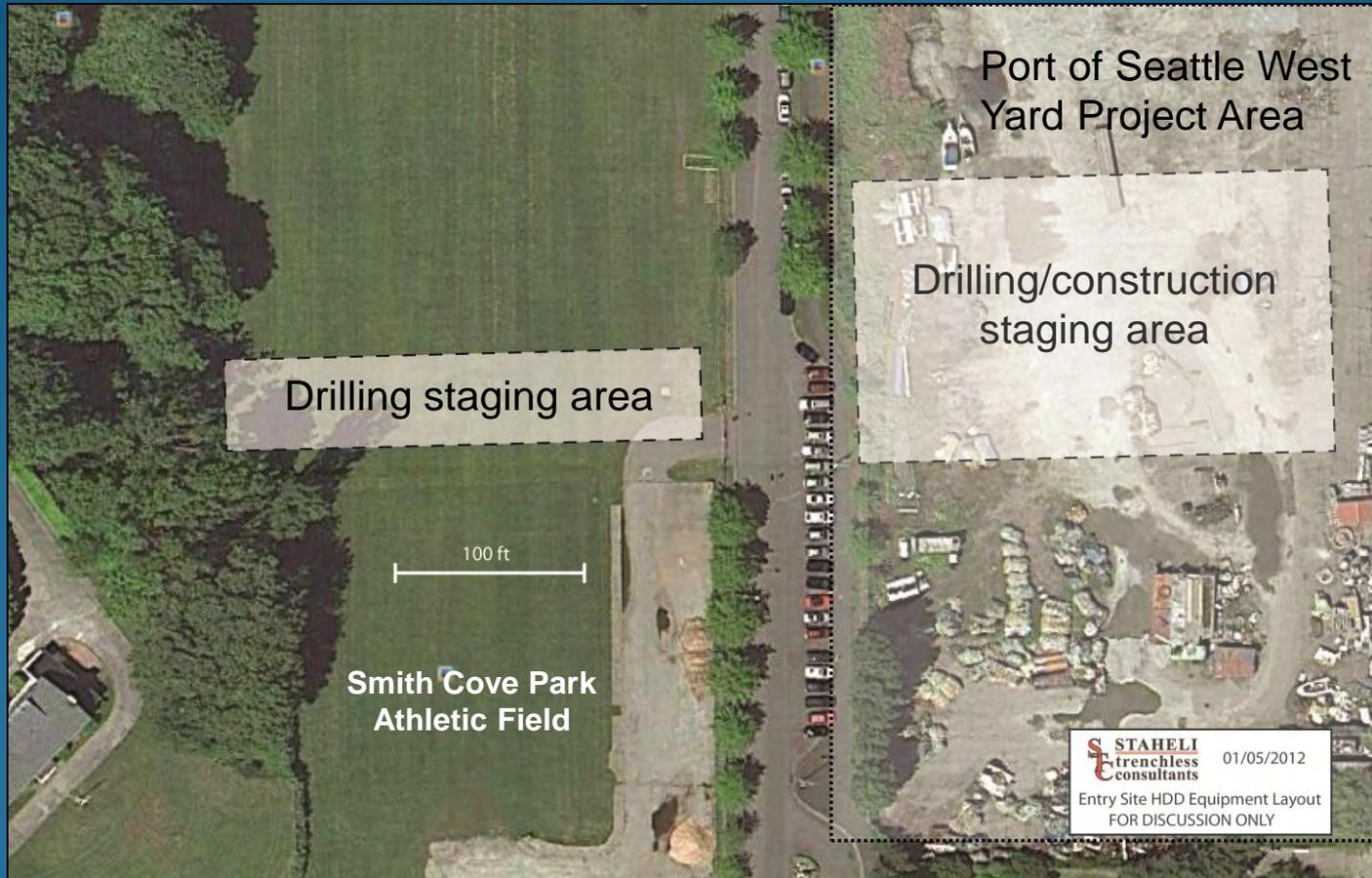
Step 9 – Connections will be made to the new the diversion structure and storage tank after they are constructed.

# Galer alignment

All soils along the Galer alignment are conducive for HDD

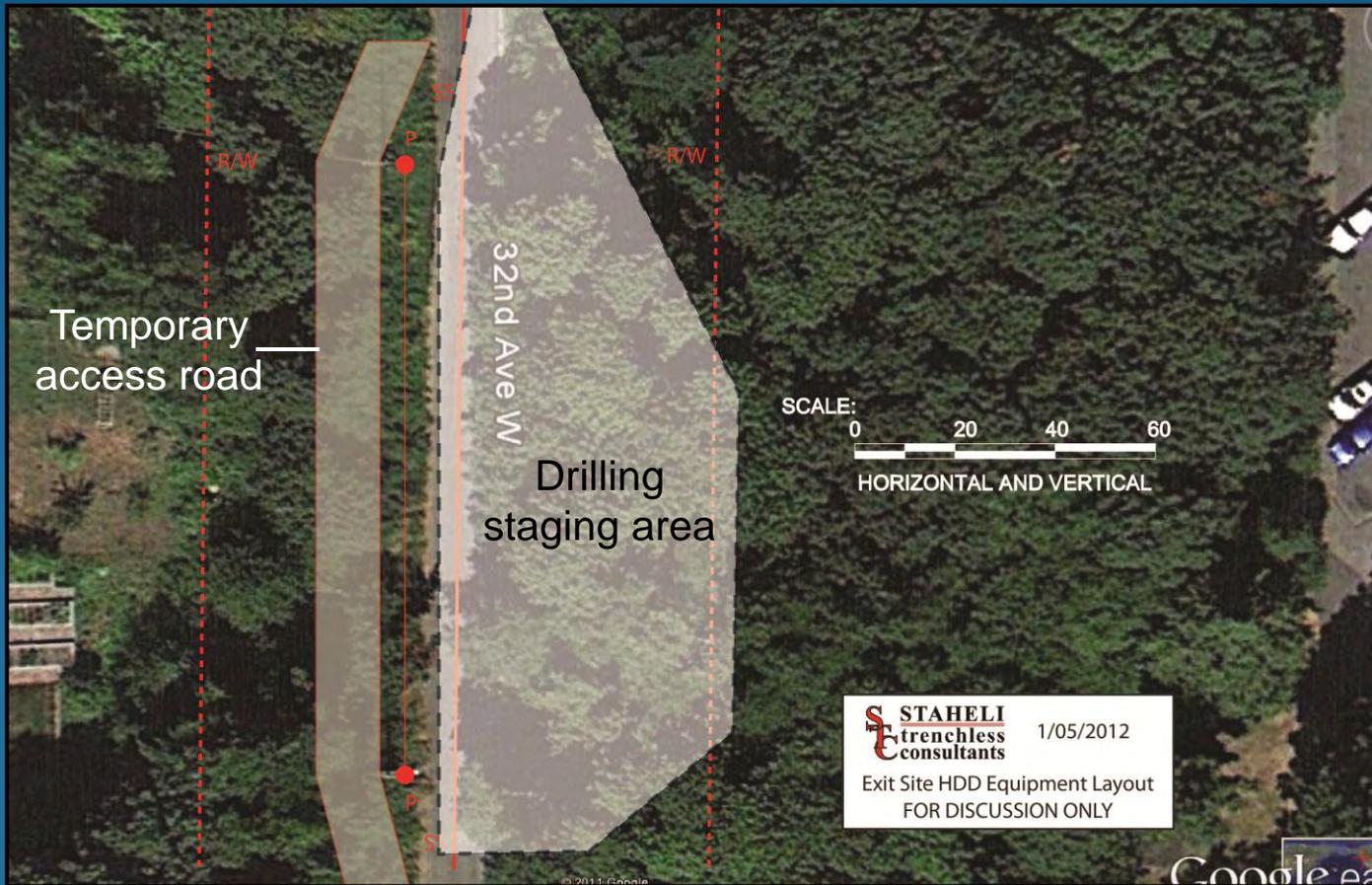


# 23rd Ave W staging areas



Drilling activities will be concentrated on the Port's West Yard at the east end of the project. A smaller work area to install casings will be located at Smith Cove Park.

# 32nd Ave W staging area



Drilling activities will occur in the right-of-way on 32nd Ave W. A temporary road will be installed to maintain access during construction.

# Project Area on 32nd Ave W

*Project area from the north (left) and south (below)*



*Area will be restored according to permit conditions*

# Bellevue HDD







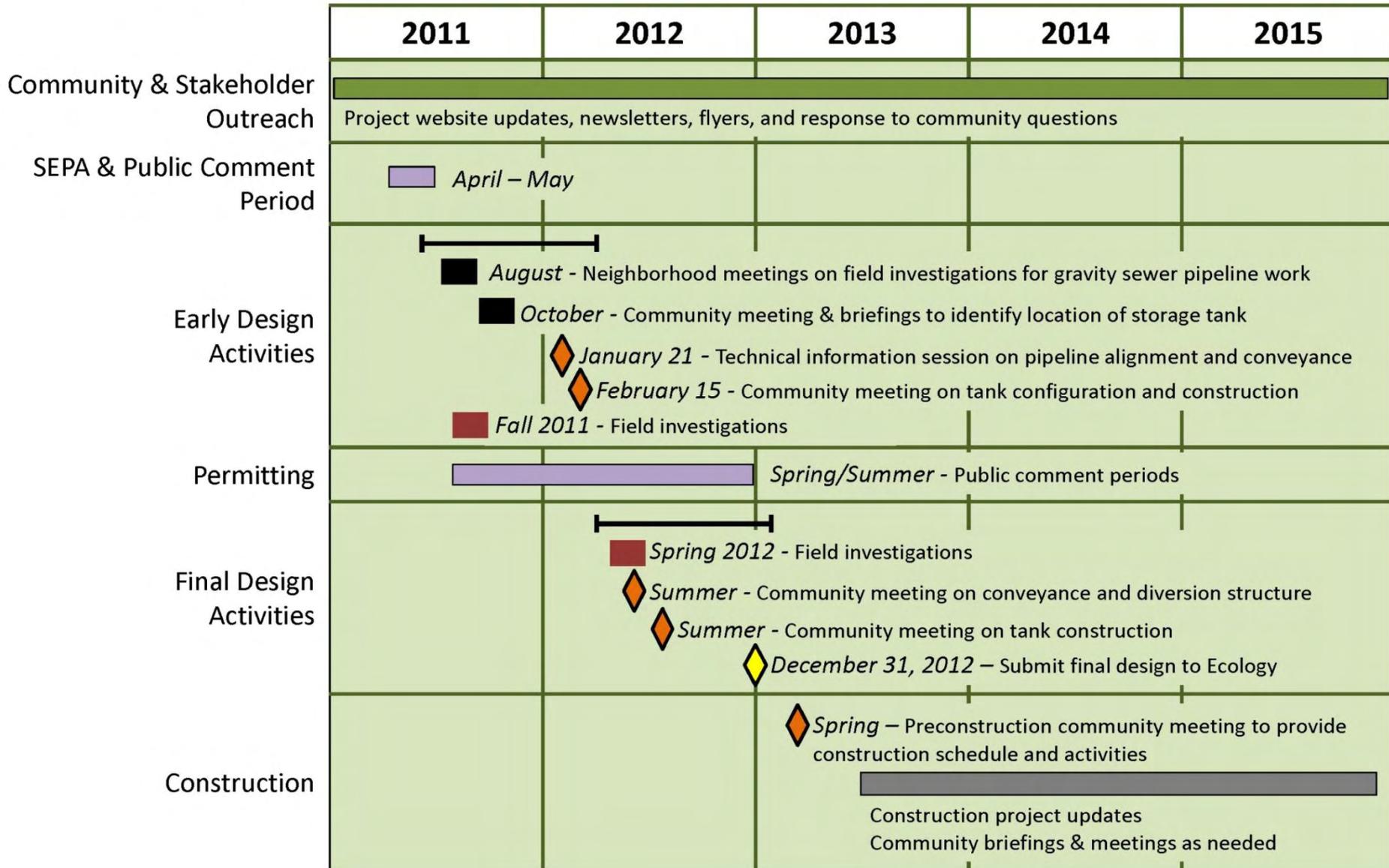


**Questions?**



# SOUTH MAGNOLIA

## CSO CONTROL PROJECT TIMELINE



# Contact Us

- Monica Van der Vieren at (206) 263-7301 or [Monica.vandervieren@kingcounty.gov](mailto:Monica.vandervieren@kingcounty.gov)
- More information on the web

[www.kingcounty.gov/environment/wtd/Construction/Seattle/SMagnoliaCSOStorage](http://www.kingcounty.gov/environment/wtd/Construction/Seattle/SMagnoliaCSOStorage)

