Trenchless 101 in General

Using HDD to Install Sewers Council of Oak Bay

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And NASTT-BC

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Questions as we proceed

David O'Sullivan
Owner of PW Trenchless Const. Inc

- Experience in Horizontal Directional Drilling
- Queensborough sewer system 3 contracts 5 to 6km 200 to 300mm
- Coquitlam 300m of 250mm in late 90's
- North Surrey 400m of 900mm

Purpose of this Presentation

We will introduce you to various methods of trenchless construction.

We will demonstrate the benefits / limitations of HDD

As they are used in a Municipal situation.

1 The working area required for various pipe sizes

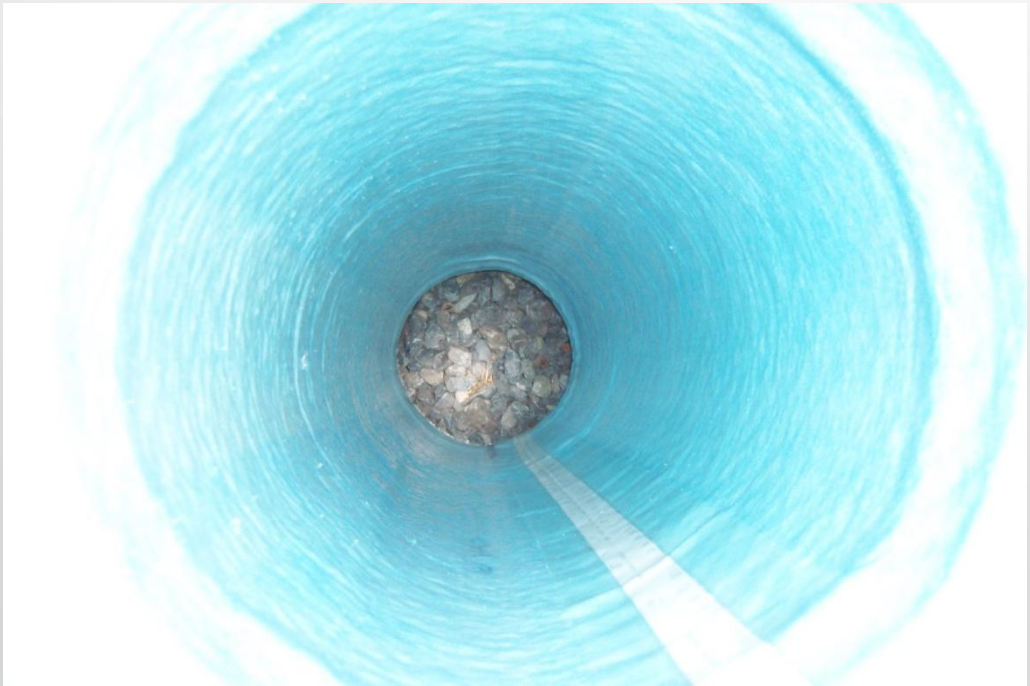
2 The limitations based on geotechnical considerations.

3 The limitations on economically delivering a small section of a project using HDD.

TT in BC

Cured in Place Pipe (CIPP) Rehabilitation

- Flexible resin-impregnated tube installed into an existing pipe then cured to a solid finish – new pipe in an old.



Slip Lining

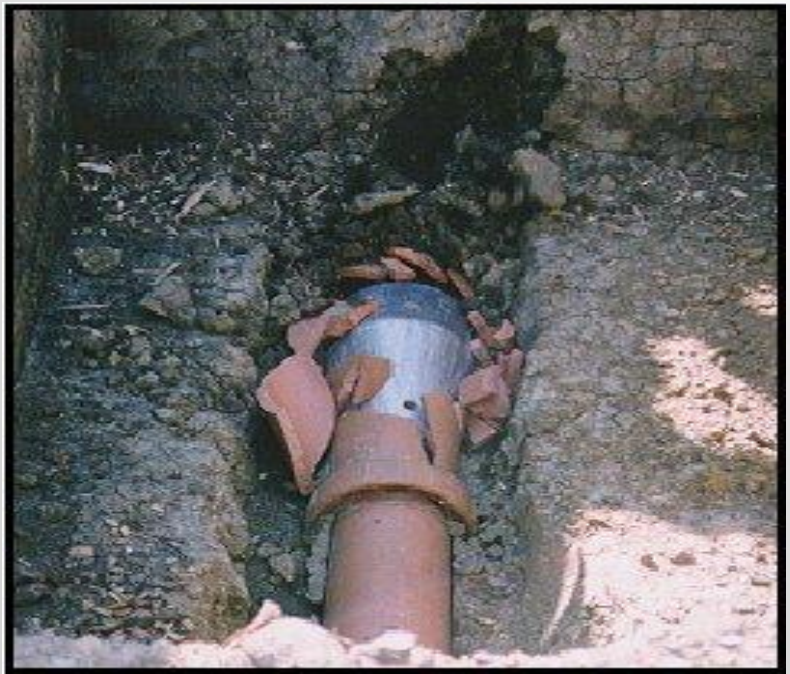
More Sliplining in Delta

2012

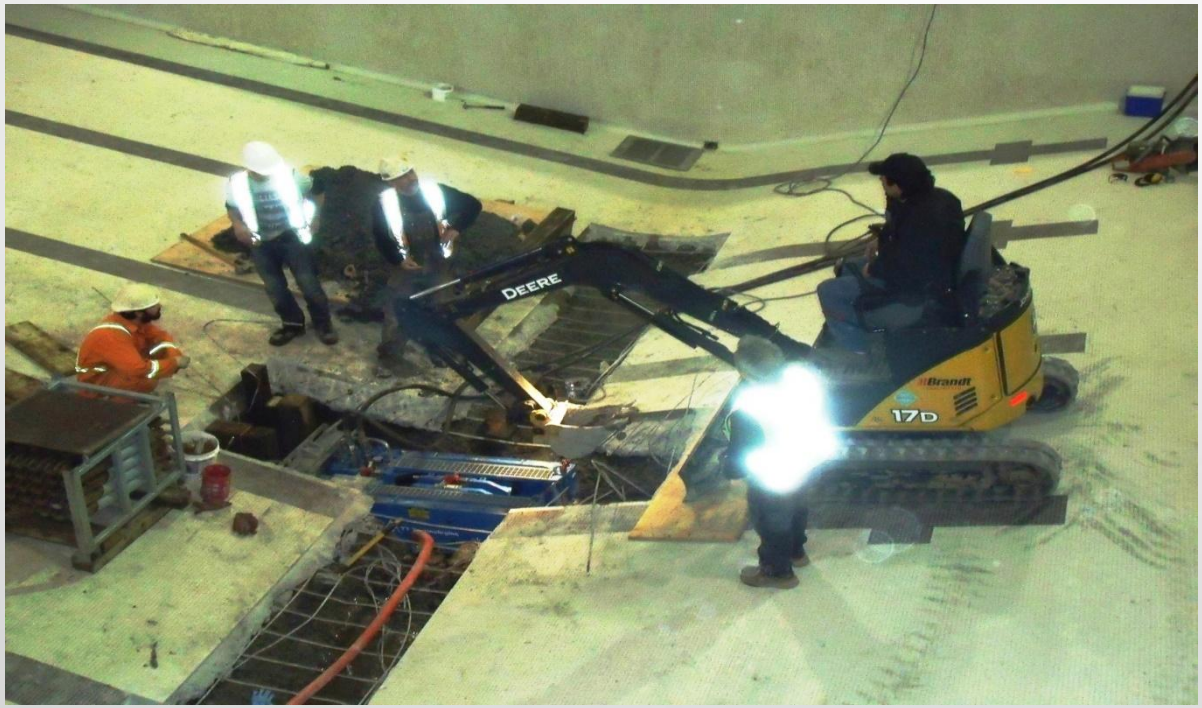
Pipe Jacking

Pipe Bursting
Replacement / Upgrading

- Bursting the existing pipe while pulling new pipe in place behind – new pipe in the same trench.



North Van Pool
main drain replacement
using pipe bursting



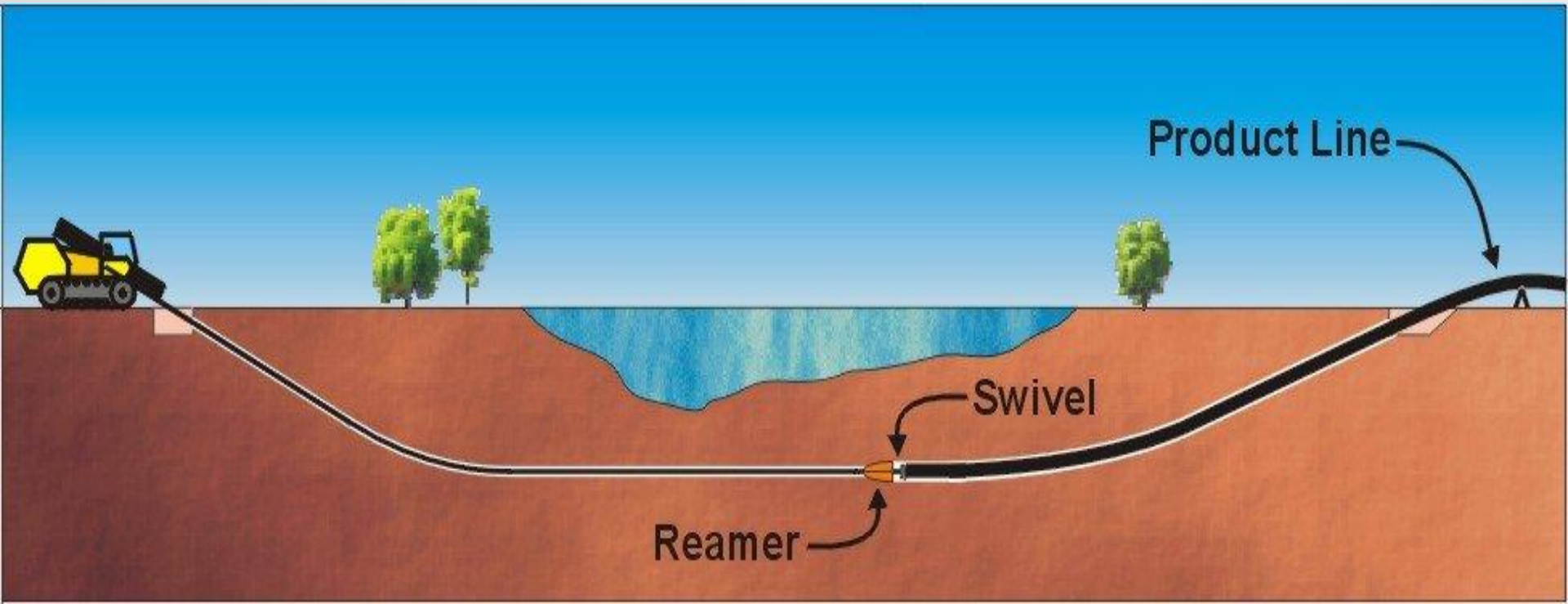
Lateral pipe bursting

Horizontal Directional Drilling

- 1 Space requirements to complete a HDD operation.
- 2 Limitations of HDD due to geotechnical issues.
- 3 Contractual ability to entice contractors to complete HDD competitively.

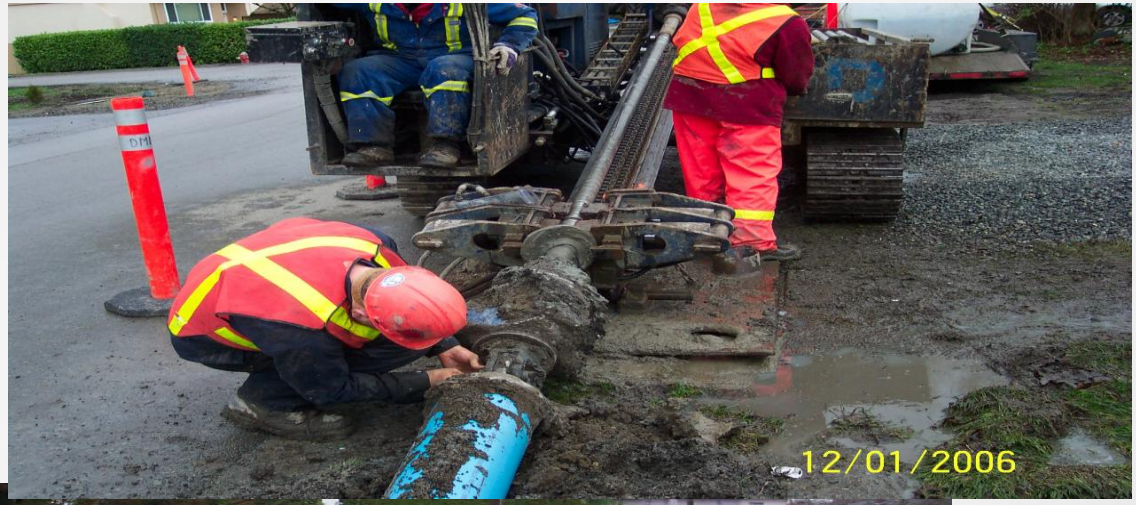
Horizontal Directional Drilling

New construction /Replacement



How HDD works

HDD in Richmond



Drilling of laterals Gravity or force main

THRUST	13,200 lbs
PULL BACK	8,800 lbs
TORQUE	442 ft lbs
THRUST SPEED	606 ft / min
BACKREAMING-DIAMETER	3″ / 4″ mm
OUTER PIPE-DIAMETER	>3″

Limitations of HDD

- Entrance slope and stabilization of "on grade" section
- Ability to maintain grade due to equipment and experience.
- Ability to maintain grade due to soil conditions

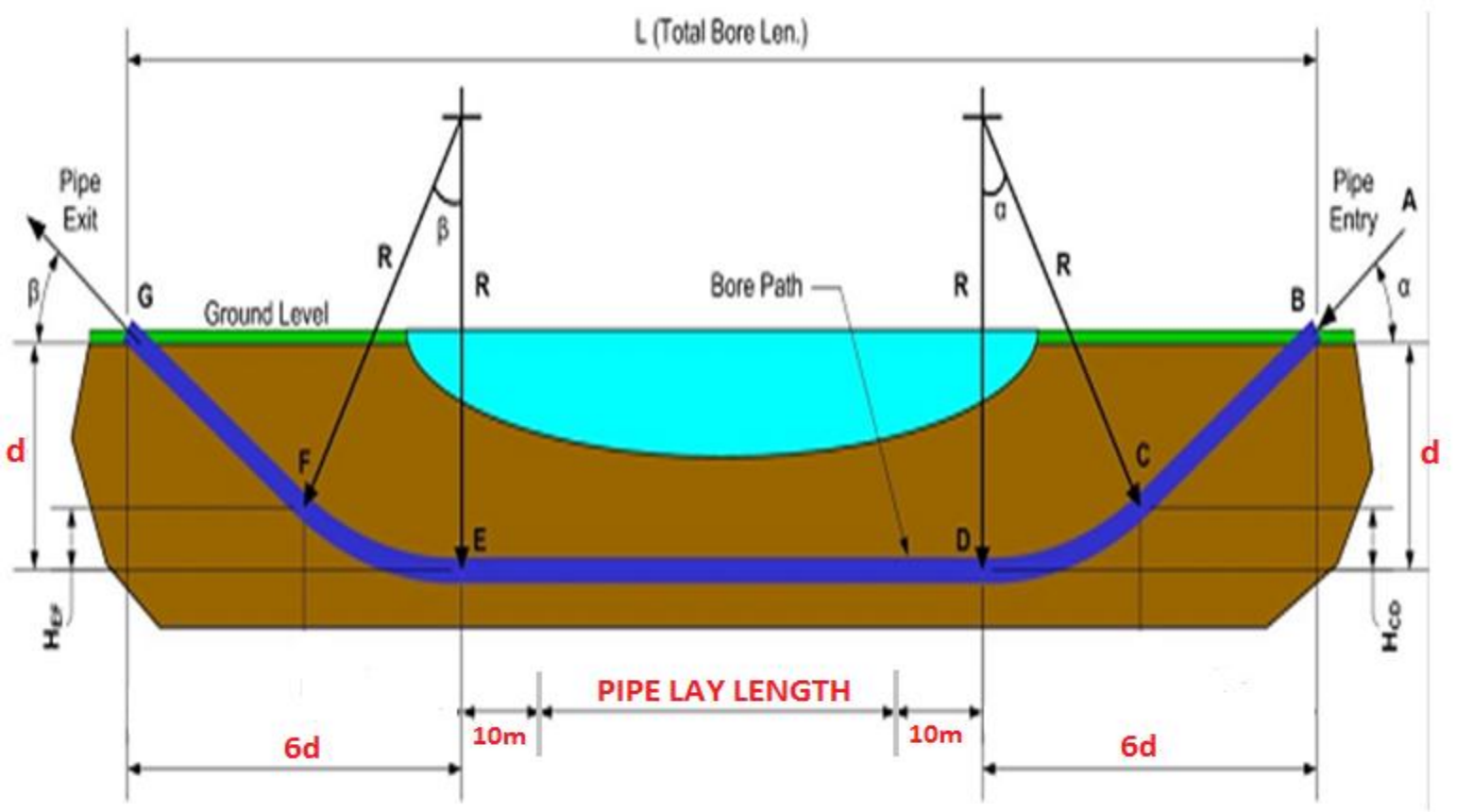
Working space
Entrance/Exit slopes

- The driller needs to get the drill head on line/grade and level.
- Required distance about 6X(12 deg) depth plus 10m plus the rig footprint 10 m, total about 38m .
- Total length before usable “tunnel”
- The exit needs almost the same working area. The rig area is slightly smaller ,say 33m.
- This is based on installing a 400mm pipe using a 65,000 lb rig.

HDD Machine in the Pit

- In some cases the HDD rig can be taken apart and lowered into the pit.
- Need 2nd pit to capture drilling muds.
- Large danger of destroying machine from flooding.(2 flooding in BC in 4 years)
- Entrance length still needs to be 15 to 20m
- Still need exit pit to be conventional 30 to 40m long

Bore path using HDD



Soil conditions

Ideal Drilling Soils

All the particle size is uniform and fairly cohesive

Here we have a silt/ clay / peat and sandy type soil.

Soils Not Suitable to Drilling

Note the soil particles are not uniform in size and not cohesive

Soil conditions at a central location

- HDD most suited to humongous type ground.
- Cobbles in gravel or a till type matrix cause problems.
- Sewers do not allow variations of horizontal alinement.
- Roots cause problems to small rigs.

Existing utilities and Project Limitations

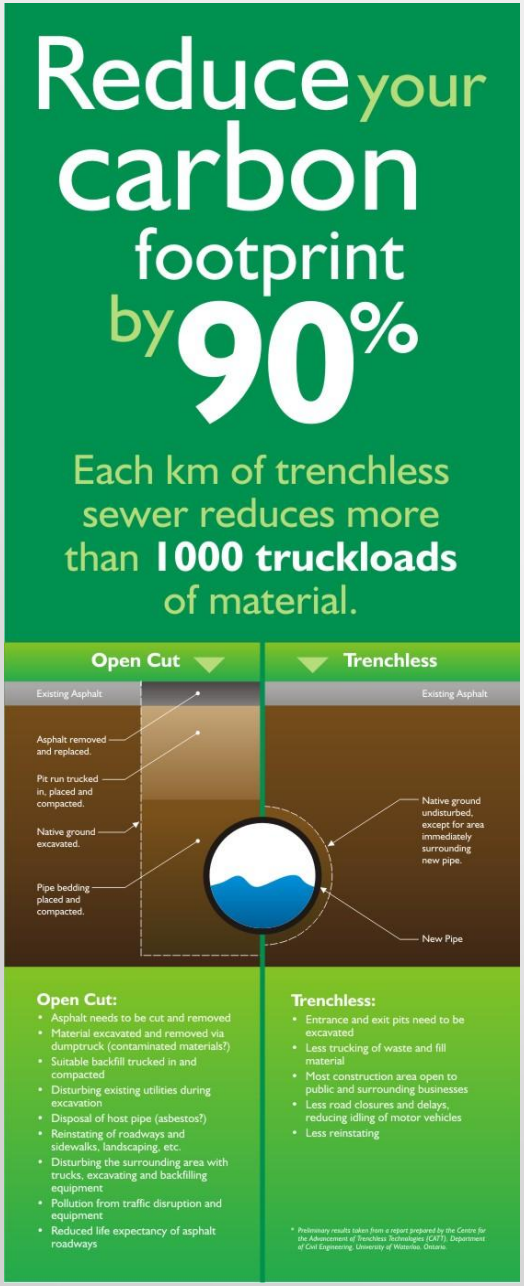
- HDD drills will tend to go towards the softest ground.
- No control of reamer locations see above
- Curved HDD uses large horizontal swath.
- Pipe reamers are toothed cones turning at 40,000lb of torque and will destroy anything in path.

Governing conditions in Oak Bay

- We need to install manholes approximately every 120m.
- We need to install sewer pipes from 150mm to 600mm in Dia
- Roads are curved
- Easements contain mature trees
- Easements are relatively short and non-linear
- Easements terminate perpendicular to some property lines
- Variable ground conditions

Contractual Constraints

- 400 mm pipe requires a 60,000 lb rig.
- 300mm pipe required a 45,000lb rig
- Limited availability in B.C.
- Each mobe /demobe costs $35,000.00



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Research Conclusion

Each Mile of open cut trench produces 1600 truckloads of material.

- Thank You