





GROUND INVESTIGATION GUIDELINES

04.3 - DEEP EXCAVATIONS

What do we need to know?

General Information Needed

<ul style="list-style-type: none"> Anticipated location and depth of temporary and permanent support systems 		<p>Scheme layout drawings & available GI records</p>	<p>Sampling</p> <p>Cohesive Soils : U100/U76/Mazier (transported soils or saprolites)</p> <p>Piston (v.soft-soft soils)</p> <p>Granular soils: Bulk samples, SPT split spoon U100/U76 & disturbed samples</p> <p>Rock: Double tube coring to prove rock. Air foam/mud flush (& triple tube drilling) through fault gouge or hydrothermally altered rock.</p> <p>Groundwater</p>
<ul style="list-style-type: none"> Geological Model Thickness & type of material to be excavated, including variability Depth to competent strata 		<p>Drillholes, geophysics, cone penetration tests, probing, trial pits</p>	
<ul style="list-style-type: none"> Groundwater profile Variability of groundwater conditions (i.e. tidal, transient, artesian)? Risk of settlement due to dewatering etc. 		<p>Locate piezometers at permeability contrasts</p> <p>*Instrumentation</p>	
<ul style="list-style-type: none"> Adjacent structures sensitive to movement? Existing utilities or structures (water/gas mains, tunnels, cables, etc)? 		<p>Existing plans</p> <p>Pre-condition surveys, including settlement markers and tilt plate, for existing adjacent structures.</p> <p>Base-line monitoring</p>	

Typical Properties to be Determined

<ul style="list-style-type: none"> Properties of material to be excavated Properties of ground beneath excavation Properties of adjacent underlying ground Look for layers of high or low permeability that could affect dewatering 	<p>Earth pressures acting on support systems (temporary & permanent)</p> <p>Water pressures acting on support systems (seepage)</p> <p>Stability and bearing capacity of base of excavation</p> <p>Settlement/movement parameters</p> <p>Parameters for soil/structure interaction of support system/ surrounding ground</p> <p>Likely depth of penetration of support system for stability/ groundwater cut-off</p> <p>GW inflow and the need for recharge wells (to control settlement)</p>	<p>Others:</p> <ul style="list-style-type: none"> Chemical properties of ground & variability Contamination of excavated material for disposal
---	---	---

Typical Required Design Parameters

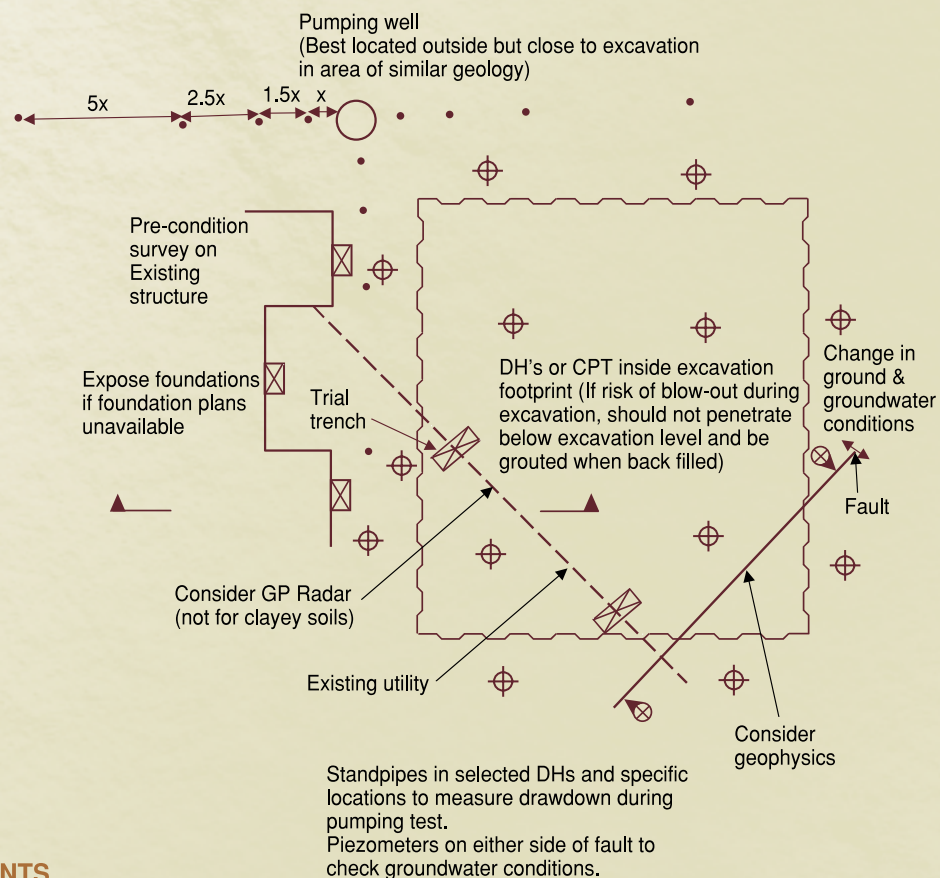
<p>In situ tests: CPT, SPT, In situ density, impression packer/BH televiewer, pressuremeter</p>	<p>Laboratory Tests: PSD, PI, natural w%, shear box, undrained triaxial, oedometer, effective stress shear strength</p>	<p>**Groundwater testing: Water pressure profile Packer tests Permeability tests Pumping tests</p>	<p>Chemical Tests: Cl. pH, SO₃, redox</p>	<p>Contamination Tests: EPD Tech Circular 1-1-92, PROPECC PN3/94, ETWB 34/2002, PNAP 152 & 155</p>
---	---	---	--	--

Notes: * Consideration should be given to early installation of geotechnical and structural instrumentation for the works to enable suitable baseline monitoring data to be obtained.

** If possible, pump wells should be located outside the planned excavated area to reduce risk of piping failure through the backfilled well during excavation. If it is necessary to install the well inside the excavation area, proper grouting with bentonite – cement on completion of the pump test will be required & should be specified.

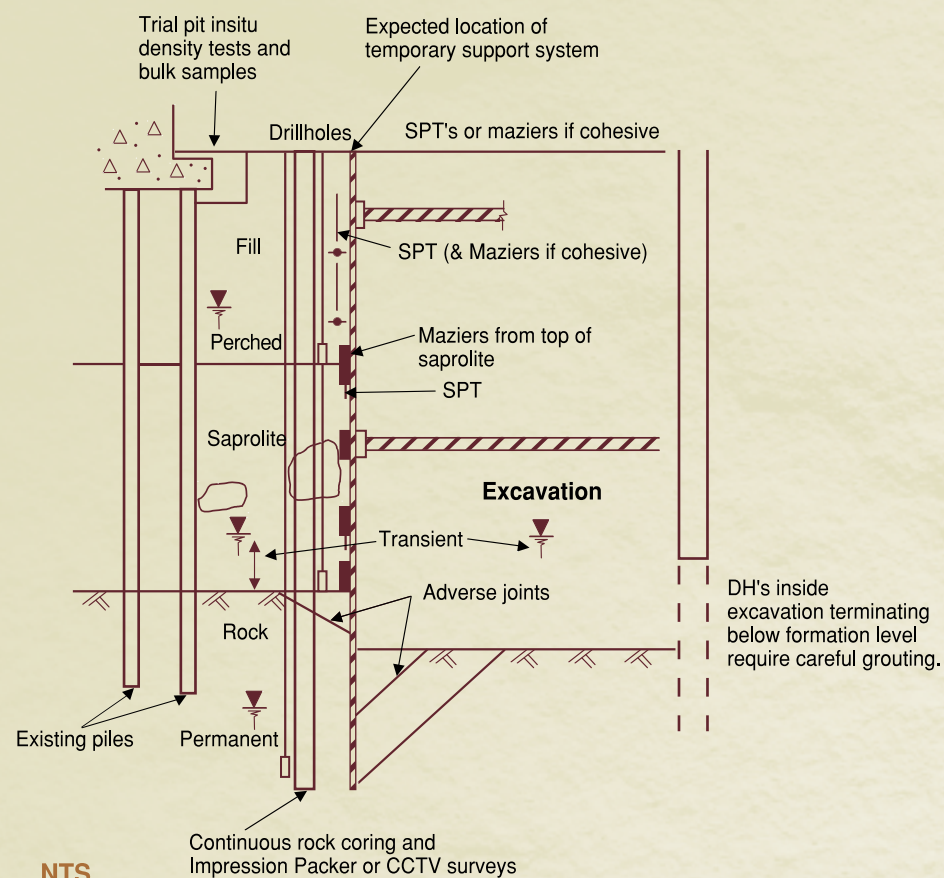
Deep Excavation - General Characteristics

Typical Plan



NTS

Typical Section



NTS

Legend

	Water table		Drillhole		Trial trench		SPT		Boulder		Pumping well
	Piezometer		Trial pit		Maziers		Bulk sample		Monitoring well		