

BOULDER TILL FILLED PLUNGE POOLS FOUND AT THE WORLD TRADE CENTER SITE, NYC, NY

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During construction in the 1970s of the slurrywall for the WTC Twin Towers, a rock ledge over a till filled valley was discovered at its SE corner. Its origin was explored during the detailed geotechnical investigation and subsequent excavation in 2008 for WTC Tower 4. The study revealed that the SE corner of the site is underlain by 2 large plunge pools and scores of potholes formed by stream erosion and later filled with glacial till. Differential erosion of the various rock types present created these features.

The bedrock at the WTC site is predominantly steeply inclined mid-Ordovician Walloomsac schist and calc-silicate interlayered with slivers of E-O Hartland schist, granofels, and gneiss. Late granitic pegmatites intrude across the site, particularly in the NW and SE corners. The rock at the western and southern edges of the Tower 4 site (and SE corner of the bathtub) is part of a massive body of pegmatite. The rocks to the north and east are predominantly aluminous schist with granofels.

During the Pleistocene, glacial ice advanced from the NW picking up rocks and red soil distinctly native to New Jersey. Meltwater streams flowing SE over the WTC site used the sediment and boulders to scour out and polish the softer and more micaceous layers of the schistose rock. As the granofels layers, and particularly the pegmatite, resisted erosion, plunge pools, whirlpools, potholes, and “waterslides” were selectively carved 17m down into the schistose bedrock (down to ~El. -34m). The polished rock surface, lack of striae, and overall configuration of the landforms suggest the features were formed by flowing water rather than glacial ice.

As ice advanced over the site, voids were filled with a dense till ranging from clay to polished, rounded cobbles and boulders. The boulders included rock slabs up to 5m in length. The largest of these were plucked loose from the sides of the basins, tipped over and incorporated into the mix, rather than transported from a far. In the west basin a rock slab sheltered a silt lens that contained a piece of wood, currently being tested for a ¹⁴C date. Till from NJ indicates the last advance from the NW, deemed responsible for the Harbor Hill moraine, is likely responsible for the landforms, though an older glacial event may have contributed to the formation. Final retreat of the glacier blanketed the site with lake strata.

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