Appendix IV. Preliminary Geomorphological Investigations for Wastebeds 1-8, Onondaga Lake Project (by GRA)

PRELIMINARY GEOMORPHOLOGICAL OBSERVATIONS FOR WASTEBEDS 1-8, ONONDAGA LAKE PROJECT

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Geoarcheology Research Associates (GRA) has been contracted by the Public Archaeology Facility (PAF) to examine the geomorphic contexts of properties slated for remedial measures as part of the Onondaga Lake Project, which is sponsored by Honeywell and being conducted by Parsons. GRA's role is to evaluate whether project areas are intact and contain buried deposits with the potential for archeological materials. Evaluations are based on reviewing historical documents compiled by PAF (Hohman 2004 and Hohman and Versaggi 2009), the background literature on the geological and natural setting of Onondaga Lake, and examining logs from geotechnical and soil borings conducted in select portions of the project areas. A brief field visit on December 17, 2009 provided opportunities to inspect the project area first-hand. This document presents initial observations of Wastebeds 1-8. Recommendations are made for use in the planning of upcoming fieldwork.

Wastebeds 1-8 run parallel to 2.1 miles of Onondaga Lake's southwest shoreline. The entire site covers approximately 404 acres (Figure 1). The topography consists of an approximately 200 ft wide shoreline terrace along the eastern third of the project area with the remainder of the project area dominated by high wastebeds. A small terrace and shoreline are found below the high wastebeds along the northern side of the project, while the northeastern portion of the project area is a steep promontory. Elevations range from approximately 363 ft along the shoreline to 430 ft at the highest point atop the wastebeds. The lake level is at 362.5 ft. The wastebeds consist primarily of Solvay waste. Extensive geotechnical borings have been conducted across the project area for developing an interim remedial measure (IRM) for Wastebeds 1-8. This summary report is an evaluation of the geomorphic context and the archeological potential of Wastebeds 1-8.

The project area was significantly different prior to historical manipulations of Onondaga Lake. In 1822 the water levels of the lake were lowered to present levels to facilitate an outlet to the Seneca River (Hohman 2004 and Crawford 2009). Before lowering water levels much of the current project area would have been marshes, swamps, salt springs, and areas immediately offshore. After the drop in water levels more land was created and the area became known as Geddes Marsh. In addition the natural course of Ninemile Creek flowed through the project area

until it was channelized and diverted around the wastebeds in 1926. Solvay waste was emplaced directly atop the Geddes Marsh with perimeter berms constructed around the margins of the wastebeds. The wastebeds were in use until 1943 and the site is now currently owned by the State of New York and Onondaga County.

Logs from geotechnical borings conducted in association with the remediation project serve as the basis for our stratigraphic interpretations. The geotechnical descriptions, and especially the geologic cross sections, provide enough detail to preview the subsurface stratigraphy. A generalized stratigraphy for the project area consists of (from bottom to top): bedrock, tills, and fining upward glacio-lacustrine sands to clay capped by marl and peats. The sequence is buried by Solvay waste (Crawford 2009). The former channel of Ninemile Creek is represented across the project area as a wedge of sand and gravel inset into the marl unit. Stratigraphic units that have no archeological potential are those which were either deposited prior to pre contact settlement or register lake-bottom contexts. Those strata include till, glacio-lacustrine sequences of fining upward sand to clay, and marl beds. Units with archeological potential consist of peats, organic soils, and paleo-shoreline sandy facies, as well as alluvial sediments of Ninemile Creek.

The lower terrace and shoreline positions have stratigraphic sequences reflecting submerged landforms attendant to higher lake levels of Onondaga Lake. Boring logs reviewed from the lower terrace portion along the eastern margins of the project area have a stratigraphic sequence of Solvay waste and fill immediately overlying marl. Some cores preserve trace organics as well as fragments and lenses of peat. However, there are no distributional configurations suggestive of an intact marsh surface or living surface. The marl is described as light olive gray wet sand and silt, with trace shell fragments, a sulfur odor, and occasional bands of organic lenses. Along the southern and eastern shorelines and lower terrace of the project area the marl is typically encountered below approximately 6.5 ft of fill and extends to depths of 30 ft below ground surface.

Logs from borings along the shorelines on the northern side of the project area reflect a similar stratigraphy, but when compared with the southern and eastern shorelines the former have shallower depths of fill (such as approximately 4 ft of fill in SB-160/MW-29) and the upper portions of the underlying marl are more peat-like. In core SB-160/WM-29 the top of the marl is described as black silt that is organically enriched with traces of roots, few shells, and few gravels, which is suggestive of terrestrial or near-shore settings. A further indication that nearshore or possibly terrestrial sediments are preserved along the northern shore is derived from borings placed along the edges of the high wastebeds (e.g. SB-18, SB-19). These borings yielded peat at approximately 30-40 ft below ground surface, which correlates altitudinally with peat-like materials from shoreline boring SB-160/WM-29. Elevations for the peat-like top of the marl are approximately at 361 ft asl. This elevation is *below* the elevation of the historical water levels (362.5 ft), and therefore it should also be below pre contact levels. However, early historical maps depict this area as a former shoreline, which when compared with documentation of the remainder of the project area it has experienced the least amount of disturbance. These findings

support the recommendations made in GRA's preliminary observations for the Shoreline Survey, which recommended limited deep testing in APE along the northern shoreline.

Testing along the northern shore of Wastebeds 1-8 is recommended to confirm the presence of these deposits, and to assess whether they are indicative of former terrestrial settings or are near-shore marshes and wetlands. Deep testing is necessitated because of the thickness of Solvay waste present atop these deposits. Depending on conditions and circumstances either backhoe trenches, bucket augers, or a geoprobe could be used to test potentially sensitive deposits at approximately 4 ft below ground surface. Based on characteristics of soil development, sediment types, and facies relationships between deposits a geomorphologist should be able to determine if the peat-like marls are intact and if they derive from either terrestrial settings and have the potential to contain archeological deposits, or if they are from offshore wetlands or sub-littoral zones with little to no potential.

Logs from the promontory in the northeastern section of the project area and the high wastebeds that make up the western half of the project area show that both of these areas have very thick accumulations (30-50 ft) of Solvay waste overlying natural deposits. Portions of the promontory overlie the former channel course of Ninemile Creek. Deposits associated with the creek were identified in boring MW-04 and SB-17. In both cases marl overlies sand and gravel deposits of Ninemile Creek at depths of 39 ft and 51 ft below ground surface, respectively. Along the western half of the project area thick Solvay waste overlies a marl and peat horizon which becomes increasingly more organically enriched from east to west. This likely reflects buried landforms along the margin of Onondaga Lake that becoming more terrestrial landward from the lake basin. While these peat deposits have the potential to represent former terrestrial environments the thick waste deposits atop the peat is likely to have severely impacted the archeological potential of these sediments. First, as opposed to the northern shoreline locations which historical documentation suggests are relatively intact, the areas with high wastebed piles were likely subjected to greater disturbances. Such disturbance is presumed initially because of ground contouring for wastebed preparation. An additional source of disturbance is compression due to the weight of the wastes and contamination by leachate. No work is recommended in these areas.

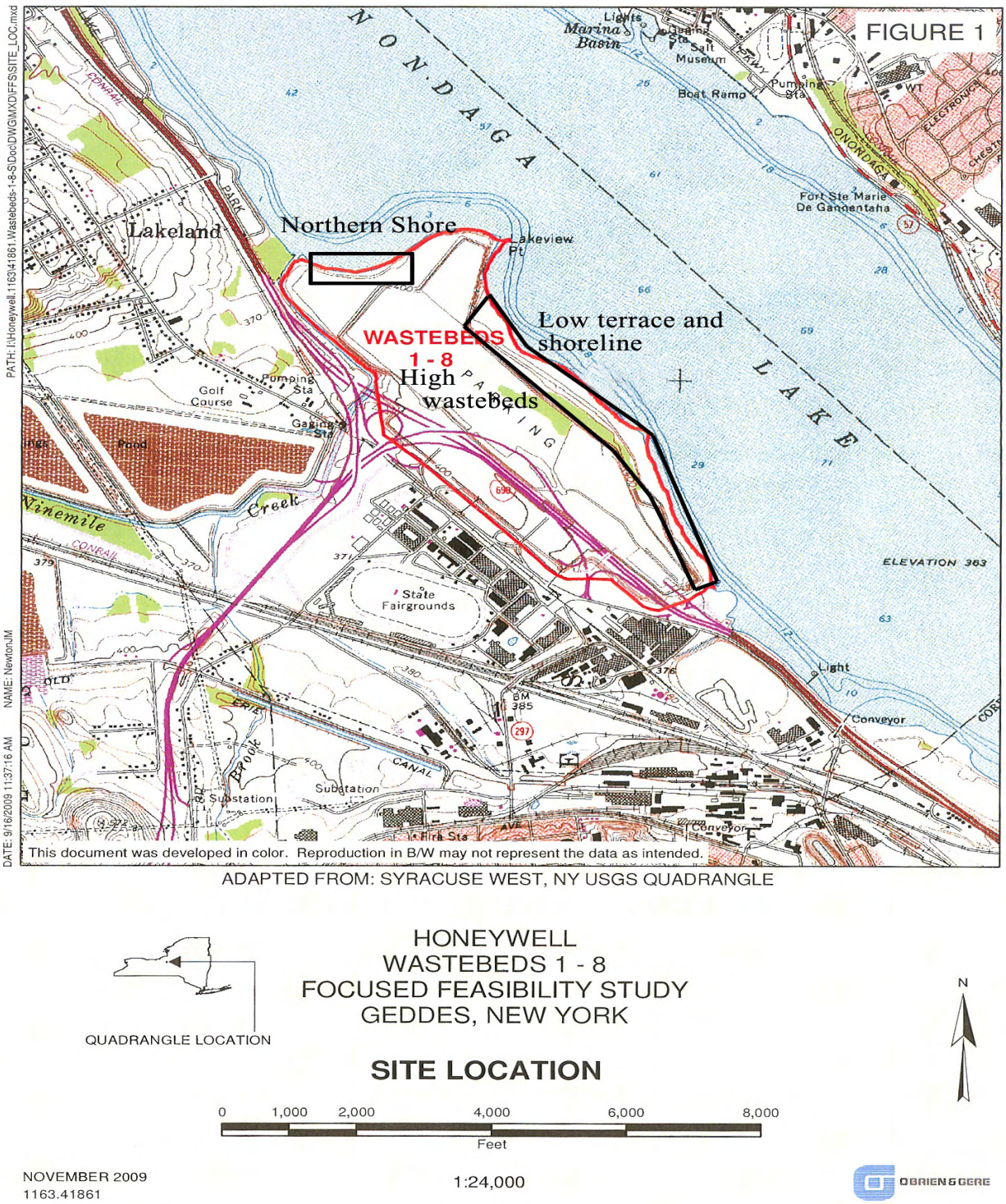

Figure 1. Wastebeds 1-8 with labels for areas discussed in the text (from Crawford 2009: Figure 1).

Works Cited

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2009 Focused Feasibility Study: Wastebeds 1 through 8 Geddes, New York. Report prepared for Honeywell. Prepared by O'Brien & Gere Engineers, Inc.

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