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Date:
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ARCADIS Project No.:
NY001464.1107.00001

Subject:
Preliminary Results of Groundwater Interim Remedial Measure Modeling, Operable Unit 3 (Former Grumman Settling Ponds), Bethpage, New York.

Introduction

This memo has been prepared to document the modeling conducted in support of the development of a Groundwater Interim Remedial Measure (IRM) for Operable Unit 3 (Former Grumman Settling Ponds), located in Bethpage, New York. Specifically, this memo discusses the selected preliminary remedial design: "Pump and Treat without Local Recharge", which is explained further below and described in the Groundwater IRM Work Plan, dated November 14, 2007, currently under review by the New York State Department of Environmental Conservation (NYSDEC).

Groundwater IRM Design Goals

The Groundwater IRM is being designed to accomplish the following goals.

- Mitigate the off-site migration of volatile organic compounds (VOCs) in groundwater where total VOCs exceed 50 micrograms per liter (µg/L), through the implementation of a groundwater pump and treat system that will extract groundwater along the former Grumman Plant 24 Access Road property, south of the Bethpage Community Park.

- Comply with applicable NYSDEC Standards, Criteria, and Guidance Values (SCGs).

Model Scenario Configuration

For the simulations described herein, the current, NYSDEC-accepted regional groundwater flow model for the Northrop Grumman/Navy, Bethpage, NY sites was utilized. For this effort, the model focused specifically on Bethpage Park and the surrounding area.

Multiple simulations were conducted to assess various pumping and recharge configurations of the "Pump and Treat without Local Recharge" scenario. Extraction well screen settings, pumping rates, and the number of wells were varied and the effect of the changes evaluated with respect to containment of VOCs in groundwater.

The scenario that best met the IRM design goals in a technically efficient manner included four extraction wells (identified as Wells EW-1 through EW-4) simulated as pumping along the former Grumman Plant 24 Access Road. Spacing between the extraction wells was approximately 300 ft. Moving across the former Grumman Plant 24 Access Road from west to east, each well was simulated to pump continuously at rates of 30, 75, 75, and 30 gallons per minute (gpm), respectively; with wells screened from 20 to -2, 41 to 22, 41 to 22, and 18 to -5 ft relative to mean sea level (ft msl), respectively. The irregular and inconsistent screen zone settings are directly related to the distribution of VOCs observed in the subsurface and hydrogeologic conditions.

The treated effluent from the IRM will be discharged to one of the basins located on the Naval Weapons Industrial Reserve Plant (NWIRP) property such that there will be no hydraulic interference at the extraction wells.

Model Simulation Results

Simulation results are best observed through the use of particle tracking techniques. Figures 1 through 8 indicate particle pathlines of particles initialized in the uppermost eight model layers (where VOCs have been observed) within and around the Bethpage Park. The impact that the extraction wells have on flow is significant as particles are shown to be drawn towards and captured by the four extraction wells. With the exception of several particles started outside the Park boundary in Model Layers 1 and 2 (the uppermost layers, i.e. the water table), particle tracking results indicate full containment from the water table to Model Layer 8 (approximately -17 ft msl) throughout the footprint of groundwater exhibiting detectable concentrations of VOCs.

Figure No. 1
Model Layer 1
Groundwater Pump and Treat Simulation for Bethpage Park, Northrop Grumman Corporation, Bethpage, New York.
Head Contour Interval is 0.5 ft.#

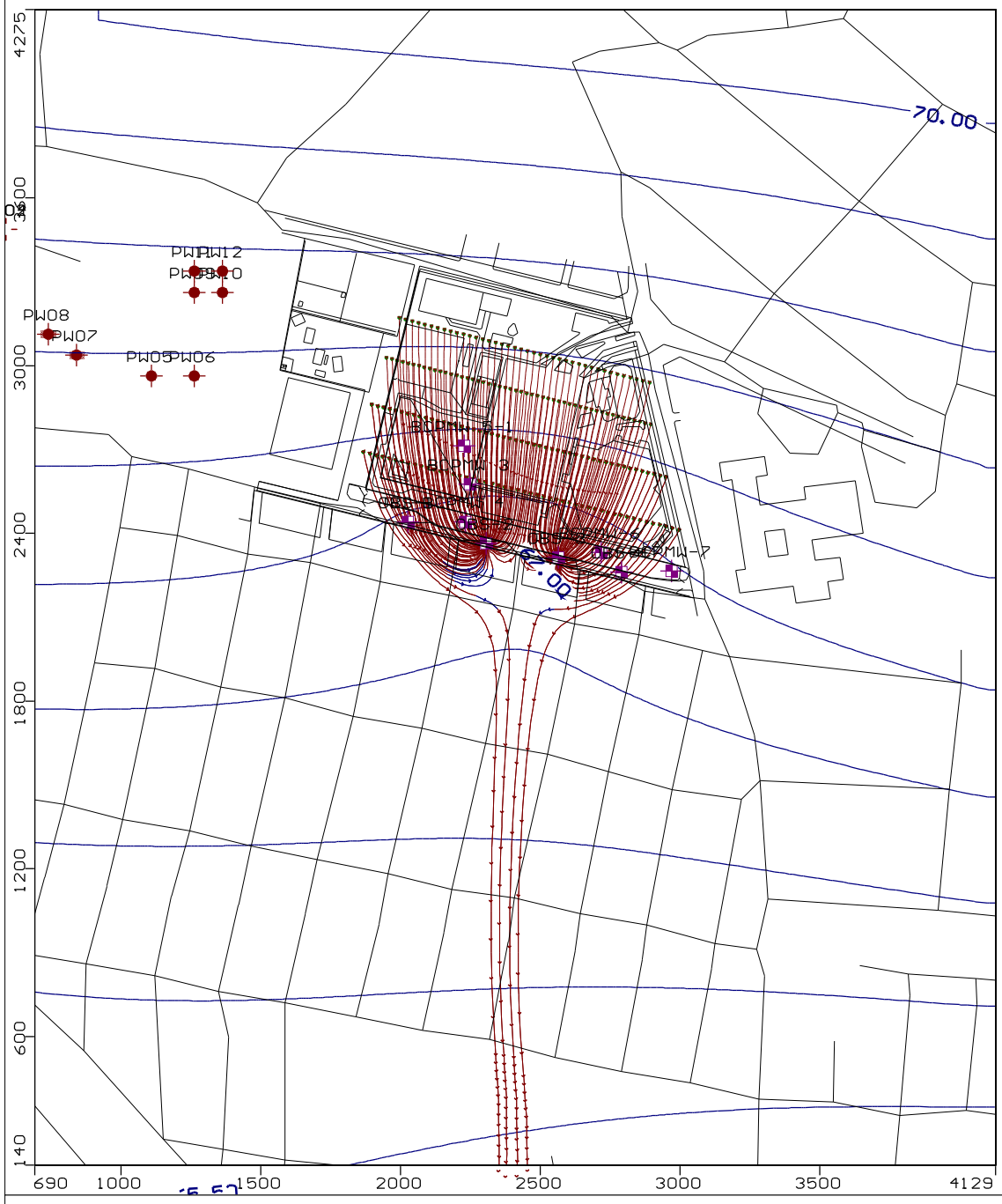

Figure No. 2
Model Layer 2
Groundwater Pump and Treat Simulation for Bethpage Park, Northrop Grumman Corporation, Bethpage, New York.
Head Contour Interval is 0.5 ft.#

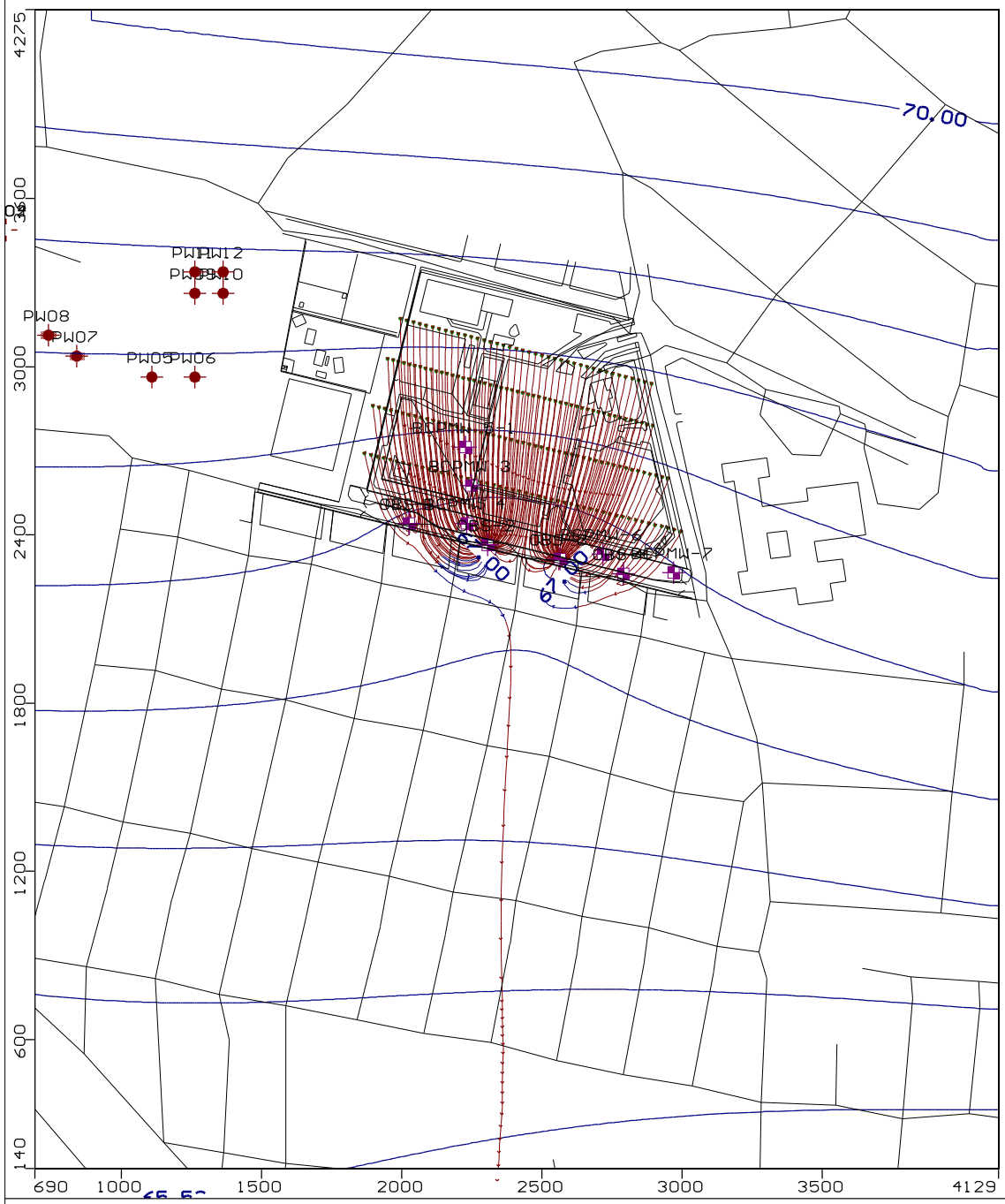

Figure No. 3
Model Layer 3
Groundwater Pump and Treat Simulation for Bethpage Park, Northrop Grumman Corporation, Bethpage, New York.
Head Contour Interval is 0.5 ft.#

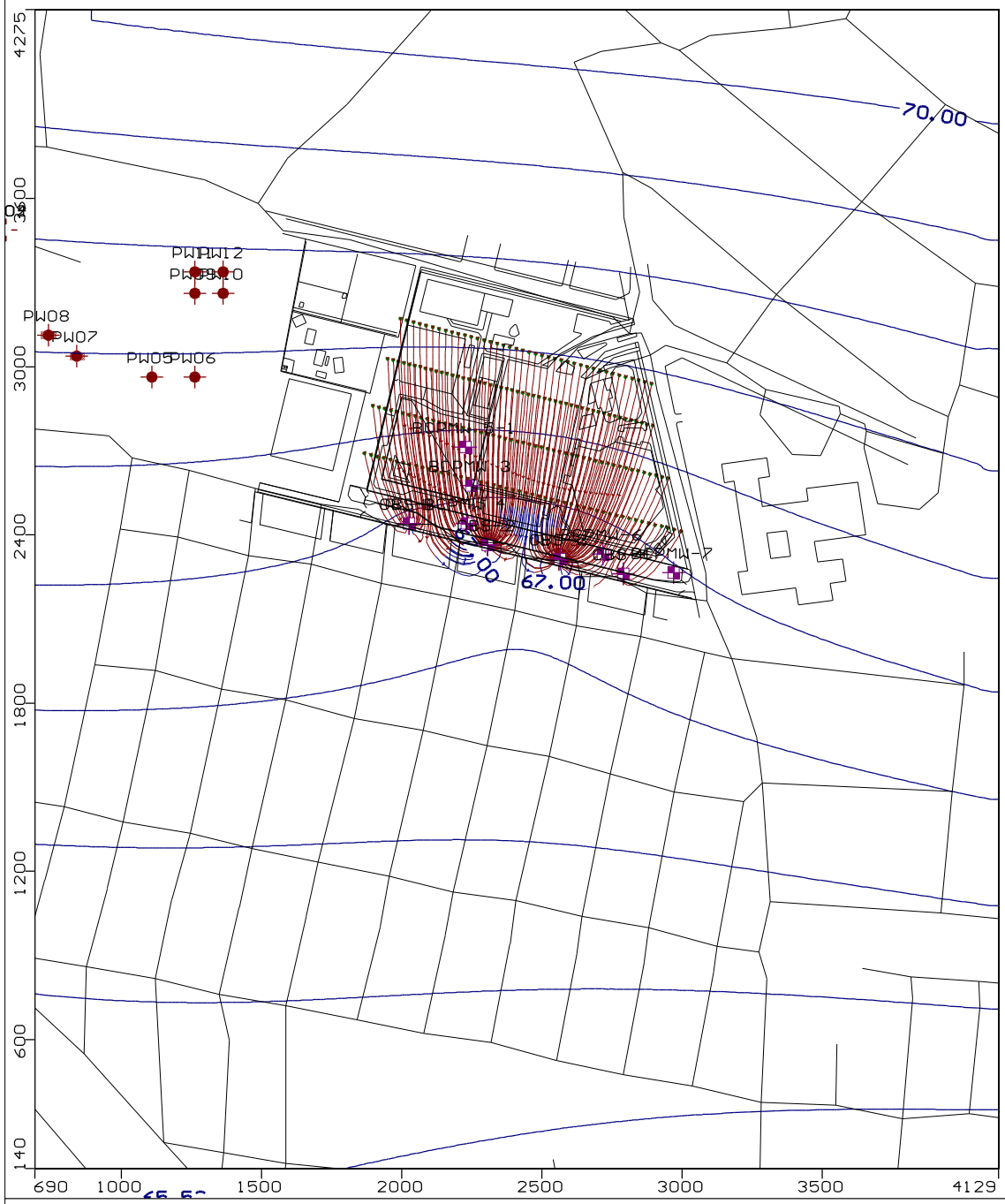

Figure No. 4
Model Layer 4
Groundwater Pump and Treat Simulation for Bethpage Park, Northrop Grumman Corporation, Bethpage, New York.
Head Contour Interval is 0.5 ft.#

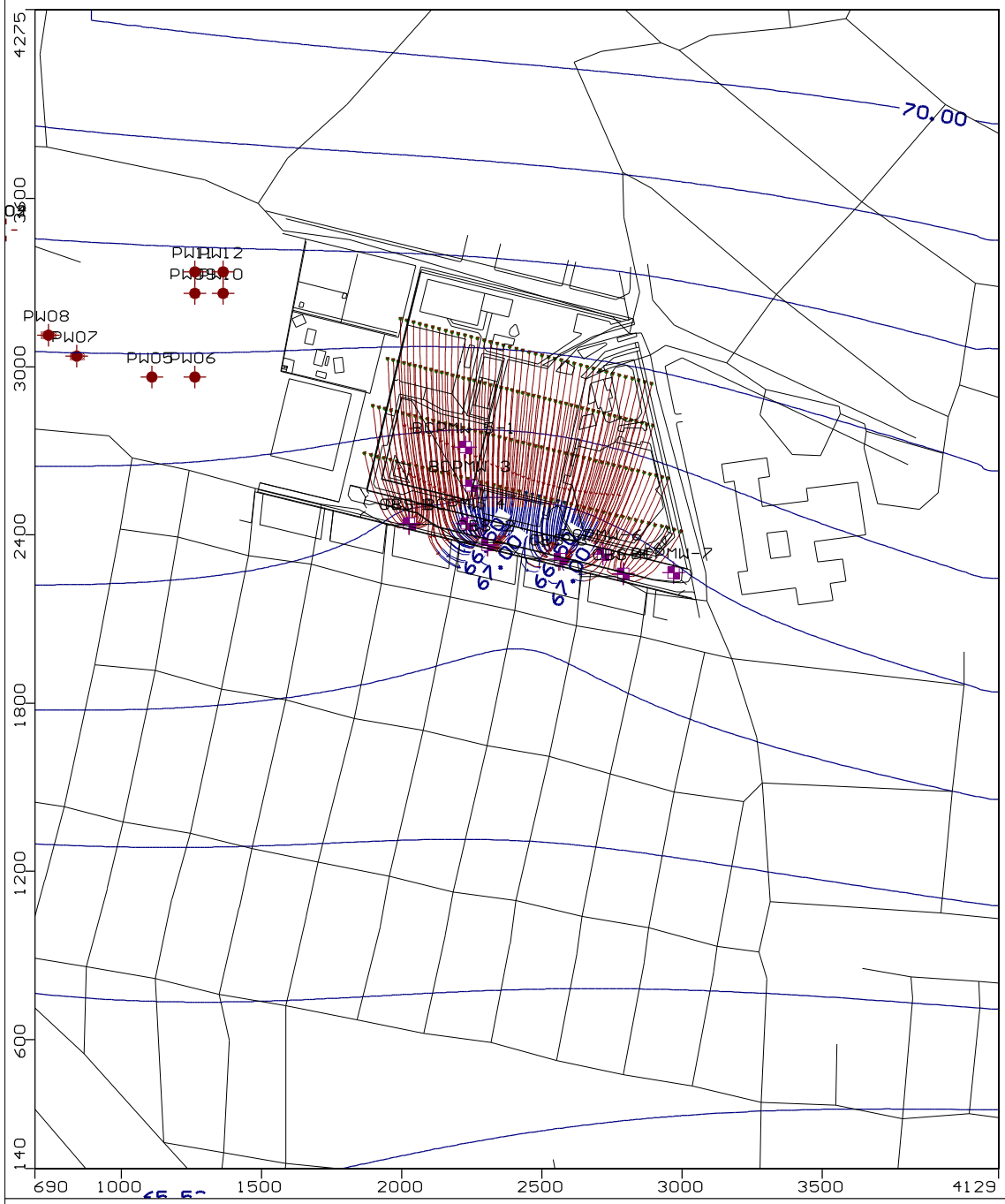

Figure No. 5
Model Layer 5
Groundwater Pump and Treat Simulation for Bethpage Park, Northrop Grumman Corporation, Bethpage, New York.
Head Contour Interval is 0.5 ft.#

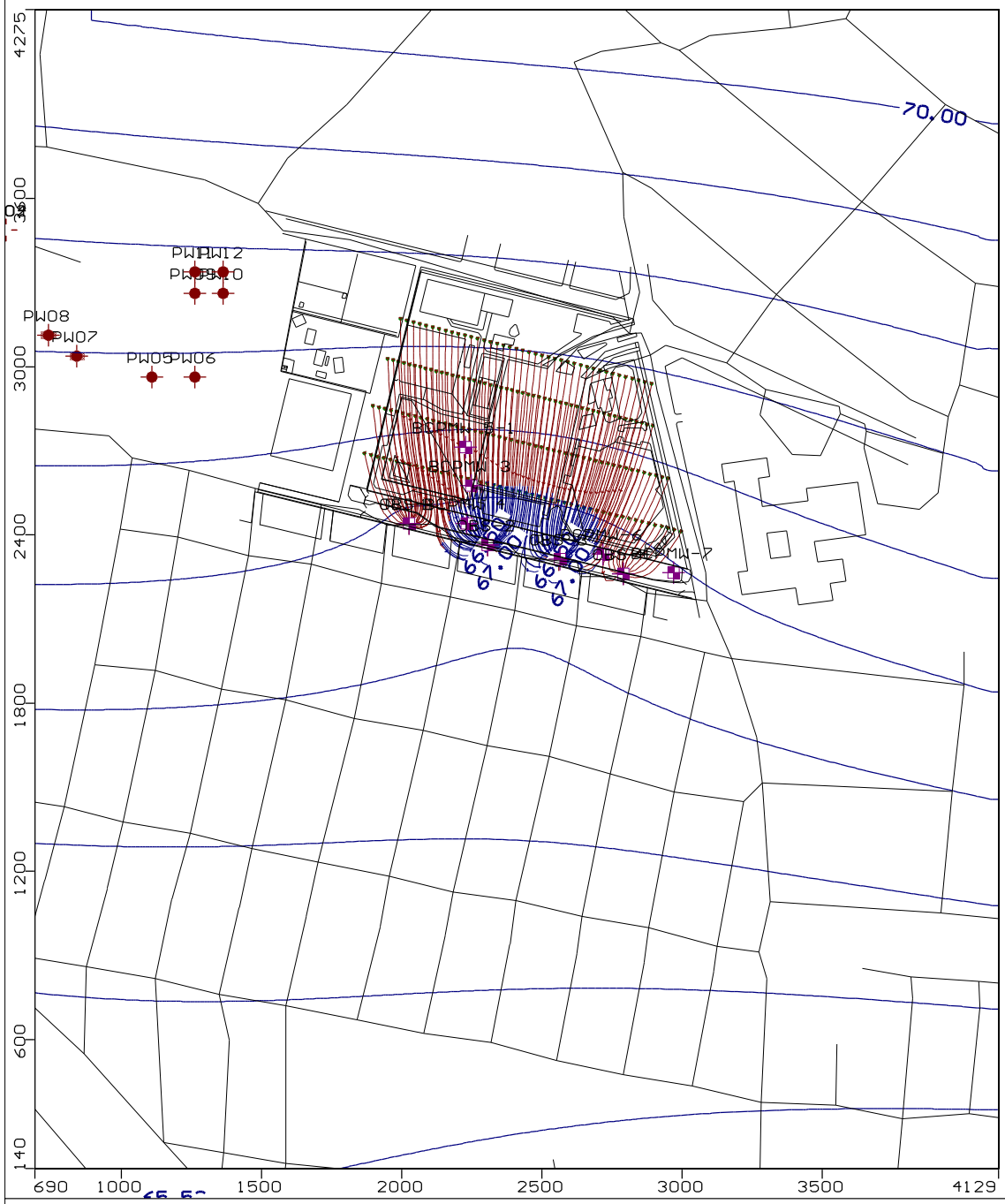

Figure No. 6
Model Layer 6
Groundwater Pump and Treat Simulation for Bethpage Park, Northrop Grumman Corporation, Bethpage, New York.
Head Contour Interval is 0.5 ft.#

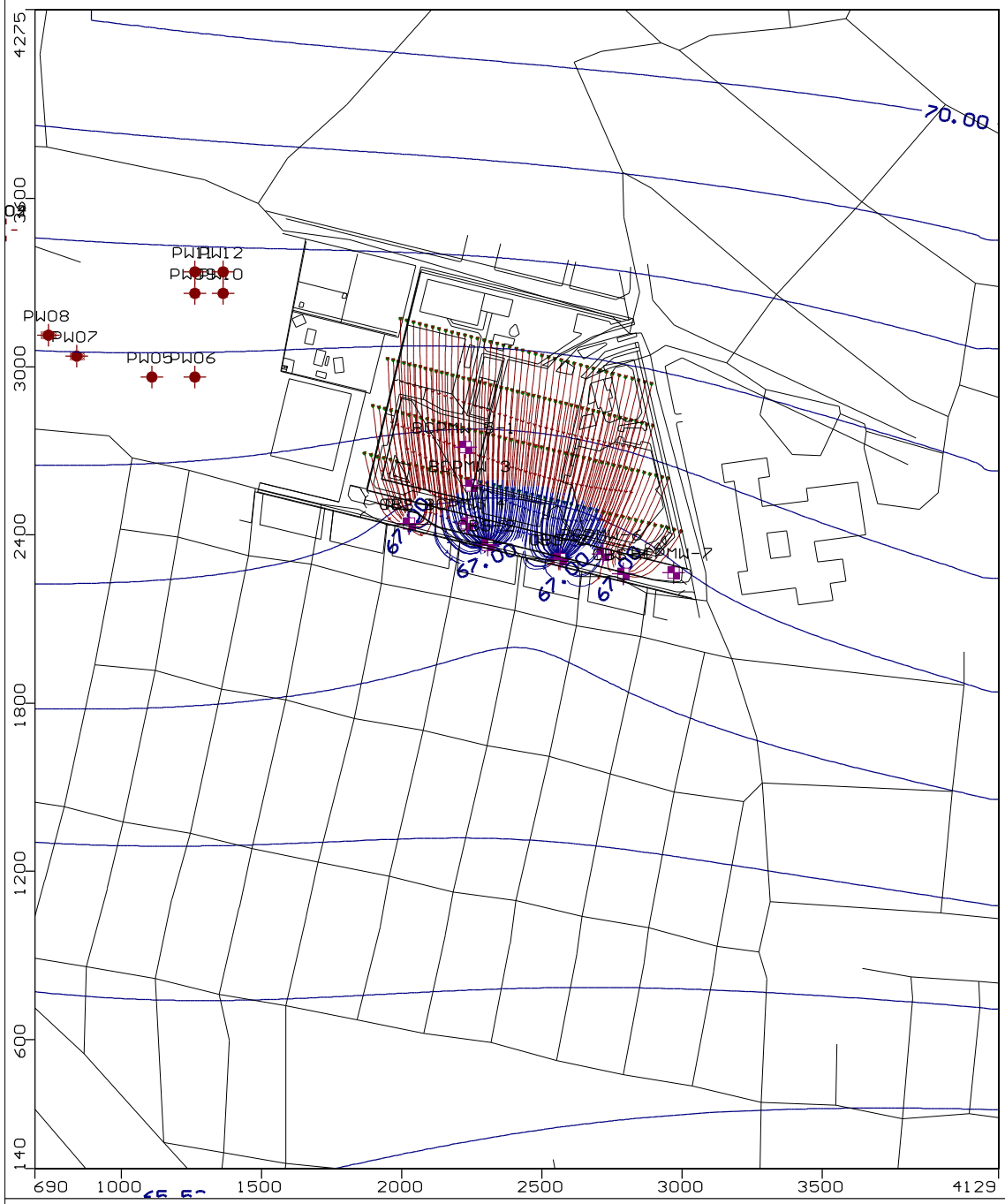

Figure No. 7
Model Layer 7
Groundwater Pump and Treat Simulation for Bethpage Park, Northrop Grumman Corporation, Bethpage, New York.
Head Contour Interval is 0.5 ft.#

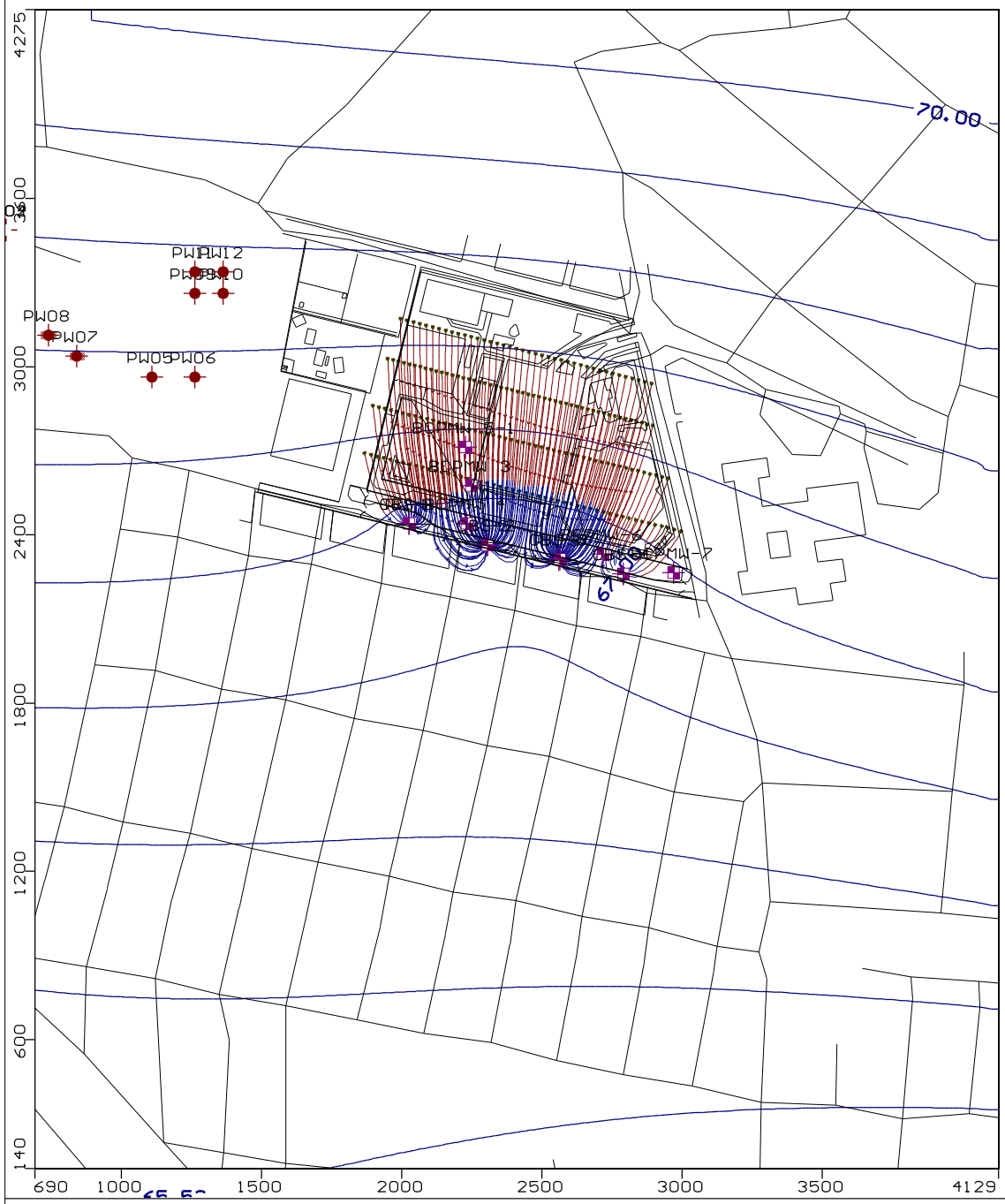

Figure No. 8
Model Layer 8
Groundwater Pump and Treat Simulation for Bethpage Park, Northrop Grumman Corporation, Bethpage, New York.
Head Contour Interval is 0.5 ft.#