MEMORANDUM

To: Groundwater Advisory Council
From: H. Bokuniewicz
Re: Minutes of the meeting of 3 June 2013
Date: June 5, 2013

PRESENT:

N. Bartilucci
H. Bokuniewicz
J. Browne
S. Colabufo
P. Granger
D. Paquette
K. Roberts
M. Scorca
W. Spitz
J. Tamborski
S. Terracciano
A. Woodroff

REGRETS:

M. Alarcon
C. Gallagher
L. Koppelman
R. Liebe
R. Mazza
M. Nofi
A. Rapiejko

1. There were no comments of the minutes of the last meeting (13 May, 2013).

2. There were few new developments concerning the decision by NYC to terminate USGS monitoring. Newsday published a letter-to-the-editor from Gerald Ottavino (Point Lookout Civic Association) after our last meeting. Mr. Ottavino deplored the loss of the USGS program and suggested that, without data, the City may dismiss criticisms of future water supply plans as "speculative conjuncture". The city has apparently been in discussion with the American Water Corporation to provide water from wells in Nassau County to NYC while repairs to the underground aqueducts are underway.

3. The detection of radium in wells in Bethpage was briefly discussed. Concentrations were about 3 picocuries per liter (pCi/L) (= 6.66 dpm/L). There had been some speculation that this was due to a historical surface source from the Grumman industrial site, the radium used to illuminate deals. It may be due to the release of naturally occurring radium from the aquifer materials due to chemical condition in a contaminant plume like low oxygen or high chlorinity. In an earlier study at SBU on the north fork by Nathan Epler, radium concentrations over 1 dpm/L were found in anoxic groundwater. In research applications, dissolved radium can be removed by filtering the water through Mn-oxide impregnated acrylic fiber (Moore, W.S., 1976. Sampling Ra-228 in the deep ocean. Deep-Sea Research 23 (7), 647–651; Moore, W.S., Reid, D.F., 1973. Extraction of radium from natural waters using manganese-impregnated acrylic fibers. Journal of Geophysical Research 78 (36), 8880–8886 and Reid, D.F., Key, R.M., Schink, D.R., 1979. Radium, thorium, and actinium extraction from seawater using an improved manganese-oxide-coated fiber. Earth and Planetary Science Letters 43 (2), 223–226).

4. Joe Tamborski talked about his research using thermal infrared imagery (TIR) to detect groundwater plumes at the shoreline. Joe is a graduate student at Stony Brook and recently was awarded a NASA fellowship involving his research.

   Because groundwater tends to be at the average annual temperature, it is cooler than surface water in the summer and warmer in the winter. As it seeps into open water at the shoreline, it can be detected as a temperature anomaly on TIR images. Some studies elsewhere have used this technique, as, for example, in Ireland. Satellite images give the largest viewing window but the poorest spatial resolution. LANDSAT and ASTER ETM + TPR imagery is free. LANDSAT 8 has just been launched. Aerial TIR imagery from fixed-wing aircraft provides higher resolution data in a 2 km swath, but it can be the most expensive. Commercial companies may charge $40,000 for a survey including image processing. TIR imagery from fixed-wing aircraft has been used, for example, in Hawaii where half-meter spatial resolution was obtained. There, temperature anomalies were associated with elevated levels of nitrate and phosphate presumably from groundwater seeps. A similar study was done in Spain.

   Researchers at SBU had experimented with the techniques in Port Jefferson Harbor from both fix-wing aircraft and helicopters. The TIR camera costs about $10,000. Flights are usually flown at about 1000 feet. The helicopter platform allows the highest spatial resolution but the smallest viewing window. Flights cost about $550.hour. The images are oblique and have to be post-processed to remove distortion. Temperature anomalies were detected at the Port Jefferson and Stony Brook Harbor although some were due to heating over shallow sand bars rather than groundwater seeps. The best viewing conditions are at low tide when the hydraulic gradients are largest and groundwater discharge is consequently the greatest. There should be low winds; the image is of the surface of the water and even light winds can mix the water, obliterating the temperature anomaly. A large salinity difference also helps to bring buoyant groundwater to the surface where it can be detected. Viewing from the seaward side facing land tends to result in less obliquity and deeper water reduces interference from sediments. The greatest temperature contrasts are expected in late July and August or January and February. Winter viewing, however, can be confounded by snow melt surface runoff. (In addition, the camera cannot shoot through windows, so flying around at 1000 feet with the windows open can be uncomfortable in February).

   The groundtruthing is critical. The TIR imagery must be verified on the ground, or "ground truthed". Temperature-conductivity sensors, seepage meters and geochemical tracers (Radium, Radon) have been used. The radon technique will be influenced by local geology and the presence of clay layers. The USGS (Jack Monti, 1986) has demonstrated the importance of clay layers to contribute radiation in gamma logs.

   The technique might also be useful in assessing storm drains or sewage outfalls. Since shallow sand bars would always results in heating of the water, comparing summer and winter images may be one way to remove the effects of sediments.

   It was suggested that USGS Water Supply papers in the 1950's or 1960's may contain some early thermal imagery.

   Jim Browne (Town of Hempstead) would like to apply TIR in Hempstead Bay but the presence of Kennedy Airport prevents overflights. There was some discussion whether good results could be achieved by mounting the camera on a pole at 40 or 50 feet elevation. We might try a test of this

option. Kites, balloons, drones or towed hang-gliders were also mentioned but the camera may just be too expensive to risk on such devices.

5. We are now preparing a proposal to Sea Grant to use this technique (among others) to look at the distribution of submarine groundwater discharge (SGD) at the shoreline of Smithtown Bay. Isolated summer hypoxia tends to occur in the Bay which may be fueled by nutrient input due to SGD. The proposal is due on 16 June. Letters of support would be helpful. (They can just be emailed to me).

6. Stephanie Rosenberg has completed a master's project at SBU on the aquifers and groundwater condition on Staten Island titled "Hydrology of Staten Island, New York". New well data was used to re-interpret pre-1988 sections and produce some new sections. The Lloyd Aquifer appears to be present above bedrock on Staten Island, capped by the Raritan Clay. A glacial moraine crosses the Island from the Narrows to Perth Amboy and the aquifer above the Raritan Clay is composed of various glacial deposits. The water-table is characterized by two mounds, in the north and south part of the Island. No groundwater is used for the potable water supply, but water table locations vary seasonally with precipitation.

   There was some discussion of possible hydraulic connections between the NJ deep aquifer and those on Long Island through Staten Island and the offshore. Apparently, there is some evidence of hydraulic head variations in NY associated with pumpage in NJ.

7. Sea Grant is sponsoring the second annual "Green Infrastructure Conference" will be held at BNL on June 12 <http://www.seagrant.sunysb.edu/articles/t/nysg-a-sponsor-of-2nd-annual-li-green-infrastructure-conf-expo-nonpoint-education-for-municipal-officials-nemo-press-release>. Judith Enck, the EPA Region 11 Administrator will speak. There may be a fee for registration.

   It was pointed out that recharge basins are considered in most places as green infrastructure. These have been used on Long Island for decades. Also, in more water stressed areas of the country, the recharge of treated wastewater is considered "reuse", while it is often merely "disposal" on Long Island. STPs in Nassau County almost all discharge into surface water. In Suffolk County, STP's are mostly smaller but most recharge treated wastewater via seepage pits.

   Years ago, a project was considered to pump treated wastewater from the (small) Cedar Creek STP (5 MGD) to recharge basins in East Meadow. There was an issue however, with TSS requirements of the SPDES permit. The Bay Park STP tried injection wells but fouling was a problem. Injection was intended to provide a groundwater mound as a barrier to salt water intrusion. Some fouling was due to the growth of Fe-bacteria on the screens, but entrained air bubbles and fine-grained particles driven into the pore space also reduced the hydraulic conductivity of the receiving aquifer.

8. The saltwater/freshwater symposium had been put on "ice" because of a lack of funds, but various salinity issues continue to be of interest. Paul Ponturo (H2M) was interested in distinguishing road salt contamination from seawater contamination, as might be due to flooding during SANDY. The USGS is pumping out coastal monitoring wells, including Lloyd observation wells, to purge SANDY's salt water contamination. They may be able to provide Jim Browne (Town of Hempstead) some samples from these wells for nutrient analyses.

   The SCWA (Ty Fuller) had done an extensive study of road salt. (Doug provided a Power Point on the topic from a presentation Ty gave at BNL). Bromine was used as s signature, but tracer amounts of cyanide might also be a distinguishing characteristic of road salt; cyanide is a

component of the anti-caking agent required for road salt. Recharge basins concentrate road salt into groundwater. Some wells in the middle of the Island, well away from the seawater/freshwater interface, show high chlorinity.

Multiple freeze-thaw cycles over a winter compound the problem of road salt because salt has to be re-applied after every freeze. Some of us remember when salting was not done, only sanding. Ca-Mg substitutes for salt are just too expensive for large scale applications.

The MS4-permitting program for storm-water runoff is only concerned with surface water. Groundwater is a Federal responsibility under the Safe Drinking Water Act, Under-ground Injection Control.

9. The impact and maintenance of recharge basins has long been an issue on Long Island. Rick Liebe apparently did a study once on dewatering recharge basins. Some, like at Roosevelt Field, are permanently wet, but these receive cooling water from stores in shopping malls. At other meetings, we have discussed the role of recharge basins in (a) flooding and flood control in Ronkonkoma, (b) maintaining the water table elevation in the SW Sewer district and (c) influences due to mounding on local groundwater flow directions.

10. Next meeting: TBA, some Monday in September.

HB/ed
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Revised June 6, input from W. Spitz #7