1.0 INSTALLATION AND SAMPLING OF OFF-SITE TEMPORARY WELLS

A total of four temporary wells (2 shallow and 4 deep) will be installed to determine the eastern and western extent of the plume to the north of the Site. These wells will be installed on private land as identified as listed on Table 1.0 and shown on Figure 1.0. The temporary shallow wells will be screened at a depth of 15 feet below ground surface (ft bgs) within the shallow groundwater bearing zone. The temporary deep wells will be screened at a depth of approximately 25 ft bgs or 1 foot above the elevation of the clay layer within the deeper portion of the groundwater bearing zone.

The temporary wells will be advanced using Geoprobe drilling methods. Each temporary well will be constructed of 1-inch diameter schedule 40 polyvinyl chloride (PVC) riser and 5-foot lengths of 0.010 slot PVC well screen. The screen will be surrounded by a native sand pack wherein the soil will be allowed to fall around the well screen as the rods are retracted. A bentonite chip seal will be installed above the sand pack and hydrated, if needed. The remainder of the well annulus will be backfilled to within 2 feet of the surface with bentonite chips.

Following installation, the temporary wells will be developed using a peristaltic pump. Prior to sampling, the wells will be purged for a minimum of ten minutes. Stabilization parameters (pH, conductivity, and temperature) will be collected after several minutes. Well development will continue until at least three consecutive readings of pH, conductivity, and temperature have been attained within 10 percent of each other. Following well development and confirmation of three consecutive readings the well will be sampled for tritium analysis. Samples will be collected by filling bottles directly from the discharge line of the peristaltic pump at the end of the pumping period.

1.1 SAMPLE HANDELING PROCEDURE

Sample bottles will be labeled to include a sample identification number, place of collection, date of collection, and analyses to be performed. Each sample will be labeled with a unique sample identification number that will facilitate tracking and cross-referencing of sample information. The sample numbering system is described below:

Example: GW-060102-XX-001
Where:
GW - designates types of sample (GW-Groundwater)
060102 - designates date of collection presented as month/day/year
XX - sampler's initials
001 - sequential number starting with 001

Chain-of-custody records will be used to track samples from the time of collection to the arrival of samples at the laboratory or receipt by an Exelon representative. Each sample container being delivered to the designated laboratory or given to an Exelon representative will contain a chain-of-custody form. Once the sample container has been delivered to the project laboratory or Exelon representative a signature will be provided to document the delivery of the container. The chain-of-custody form consists of four copies that

are distributed to the sampler, to the shipper, to the contract laboratory/Exelon representative, and to the project office file.

2.0 FURTHER DELINEATION OF TRITIUM PLUME AT DEPTH

Twelve temporary wells will be installed along the north-south and east-west profiles of the tritium plume to determine the plume depth, as listed on Table 1.0 and shown on Figure 1.0. The temporary wells will be screened in the deeper portion of the shallow aquifer groundwater zone at approximately 25 ft bgs or the top of the local impermeable clay unit. In order to understand the relationships between the clay unit and tritium migration the elevation of the clay unit will be identified using Geoprobe drilling methods. Prior to well installation of key location soil samples will be collected using a macrocore liner in order to identify the depth of the clay unit. At the other nearby locations the top of the clay will be "tagged" by the Geoprobe tool.

Once the clay unit has been identified the temporary monitoring wells will be installed approximately one foot above the clay, with 5 ft long screens and developed and sampled as discussed in section 1.0

3.0 DETERMINE IF RELEASES FROM THE BLOWDOWN LINE WERE AT DEPTH

To determine the vertical extent of tritium releases from the blowdown line, ten temporary wells will be installed along the blowdown line in the vicinity of the known aerial extent of the tritium plume as listed on Table 1.0 and shown on Figure 1.0. These wells will be screened at depths greater than the existing blowdown line wells, namely the "BL" series wells. The temporary wells will be screened in the deeper portion of the shallow aquifer groundwater zone at approximately 25 ft bgs or the top of the local impermeable clay unit. Prior to well installation soil samples will be collected using a macrocore liner in order to identify the depth of the clay unit.

Once the clay unit has been identified the temporary monitoring wells will be installed approximately one foot above the clay, with 5 ft deep screens and developed and sampled as discussed in section 1.0.

4.0 RELEASE IDENTIFICATION AT VACUUM BREAKERS LOCATED OFF PROPERTY TO THE EAST

Investigations will be performed at eight vacuum breakers (VB) along the Blowdown line located to the east of the Station property in order to evaluate if groundwater has been impacted off property to the east along the Blowdown line. Eight clusters (one per VB) of temporary wells will be installed on the north side (downgradient) of the Blowdown line. Each cluster will comprise a shallow temporary well (screened to 15 ft bgs) well and deeper temporary well (screened to 25 ft bgs) well (16 wells total). As before each of the screened intervals is 5 ft in length. The locations are listed on Table 1.0 and shown on Figure 1.0.

Once the clay unit has been identified the temporary monitoring wells will be installed as on the Station Property, developed and sampled as discussed in section 1.0

5.0 LAND SURVEY ALL NEW TEMPORARY WELL LOCATIONS FOR DEPTH AN D ELEVATION

A comprehensive survey of the newly installed monitoring wells will be performed by Atwell-Hicks in order to update the existing site base map and provide control for producing updated groundwater contour maps at the Site. Elevations of the tops of the well casing and ground surface will be shot as well as the locations of the newly installed wells. The off-property vacuum breakers (VB) will also be surveyed for control purposes and future mapping needs.

6.0 INSTALLATION AND SURVEY OF STAFF GAUGES

Approximately five staff gauges will be installed and monitored for surface water elevations. The staff gauges will be installed in the cooling lake, and in key ponds and streams/ditches in the Site area.. The exact location of the staff gauges will be determined in the field. The locations will be determined after the water level data from the new temporary wells has been collected and evaluated.

The staff gauges will consist of either wood stakes and/or pipes that will be used to measure water elevations. Staff gauge locations will subsequently be surveyed for locations and reference elevation by Atwell-Hicks. It is possible that continuous reading instruments (i.e. pressure transducers) will be installed in the pond directly north of Smiley Road.

7.0 WEEKLY GROUNDWATER SAMPLING

CRA proposes the collection of groundwater samples for tritium analyses on a weekly basis. The sample locations will be determined following the completion of the field activities outlined above. Water levels will also be collected at these locations. The purpose of the weekly sample analysis is to evaluate the potential fluctuations in tritium concentrations near the blowdown line, within the aerial extent of the plume and within the perimeter ditch flowing north across the Site. Ditch sampling may be completed using ISCO type sampling equipment. Again, the selected locations will be developed upon review of the new Site data.

8.0 COMPREHENSIVE GROUNDWATER MONITORING

CRA proposes a comprehensive baseline groundwater sampling event following the completion of the weekly sampling events. Tritium samples will be collected from all locations with clustered temporary wells and from the leading edge of the plume to the north. Exact locations will be determined following the completion of the weekly groundwater sampling events. Water levels will also be collected from all monitoring points installed to date (including the staff gages and other surface water points) The purpose of the baseline event is to determine groundwater flow and quality across the Site area, and to validate previous results and conclusions.

9.0 DATA MANAGEMENT AND EVALUATION

CRA proposes to construct a Regional Database and Graphic Information System (GIS) that covers the length of the Blowdown line from the Exelon Nuclear Station to the Kankakee River and areas north and south of the Blowdown line. The existing on property and near north data collected to date north of VB-1,2 and 3 will be included in the data base. The database/GIS will include local site specific information as well as regional data such as private and public well data and locations. 1

The purpose of the Database/GIS is as follows:

i) To evaluate hydrogeology along the Blowdown line;
ii) To determine potential groundwater receptors; and
iii) To evaluate Blowdown line testing.

The Regional Database/GIS will be tied into the existing on-site (near property) Database/GIS currently being used. The near property Database/GIS will be used along with numerous other evaluations and assessments being performed by Exelon and CRA to support the remedial evaluations listed below:

i) Location of tritium releases from the Blowdown line;
ii) The nature and extent of tritium in groundwater (plume definition);
iii) The appropriate risk based (human health and ecological) remedial objectives;
iv) Identification of potential receptors to tritium in groundwater and risk evaluation;
v) A routine (longer term) groundwater monitoring program to address a potential risk, if any, from tritium in groundwater; and
vi) The identification of appropriate and feasible remediation methods.

[1] If warranted a three dimensional (3D) groundwater flow and tritium transport model may be developed to support predictive evaluations and to test current data sets. However, no modeling is anticipated to be performed at this time.

OUTLINE OF FUTURE GROUNDWATER INVESTIGATIONS
BRAIDWOOD TRITIUM PROJECT
Conestoga-Rovers & Associates
12-7-05

1.0 Overall Goals of Additional "data gap" Studies

1.1 To fill in data gaps in the current understanding of the lateral extent of the tritium plume

1.2 To fill in data gaps in the current understanding of the vertical extent of the tritium plume

1.3 To fill in data gaps related to leak identification along the blowdown line

1.4 To confirm recent sample results and to develop a baseline for future groundwater data comparisons

2.0 Field Program Proposed to be completed in the Next 4 to 6 Weeks

2.1 Off-site Temporary Well installation (TW)

- 2.1.1 At two locations on private land
- 2.1.2 To look at east and west extent of plume to the north
- 2.1.3 Focus initially on shallow zone
- 2.1.4 Install TWs with Geoprobe
- 2.1.5 Sample with low flow techniques as in the past for tritium analyses

2.2 Further Definition of Tritium Plume at Depth

- 2.2.1 Need to monitor the deeper portions of the shallow groundwater zone (15 to 25 ft depth) in order to define plume "depth"
- 2.2.2 Install deeper TWs at 12 locations along north-south and east-west profiles in the path of the plume
- 2.2.3 Each of the deeper TWs will be drilled to confirm the top of the clay (glacial till unit) in order to better understand the role of the clay in groundwater and plume movement
- 2.2.4 Sample with low flow techniques as in the past for tritium analyses

2.3 Determine if Releases from the Blowdown Line Were at Depth

- 2.3.1 Need to determine if possible/potential releases of water from the blowdown line manifested at depth and migrated into the groundwater zone deeper than the current monitoring points (e.g. the BL sampling points)
- 2.3.2 Install deeper TWs at 10 locations along the Blowdown line in the vicinity of the tritium plume

2.3.3 Each of the deeper TWs will be drilled to confirm the top of the clay (glacial till unit) in order to better understand the role of the clay in groundwater and plume movement

2.3.4 Sample with low flow techniques as in the past for tritium analyses and also for chloride and sodium (indicator parameters for water flowing continuously in the line)

2.4 Release Identification at Vacuum Breakers Located Off Property to the East

2.4.1 Purpose is to quickly evaluate if groundwater has been impacted by releases of water from the Vacuum Breaker valves (VB) line

2.4.2 Investigations will be performed at 8 VBs along the Blowdown line

2.4.3 A Cluster of TWs will be installed on the near north side (downgradient direction) of each VB. Each cluster will comprise a shallow (15 ft deep) and a deeper (25 ft deep) TW.

2.4.4 As above all deep TW will be drilled to the top of the clay (glacial till) unit.

2.4.5 Sample the TWs with low flow techniques as in the past for tritium analyses and also for chloride and sodium (indicator parameters for water flowing continuously in the line)

2.5 Land Survey all new TW locations for depth and elevation

2.6 Install and Survey In Staff Gages (surface water elevation monitoring) such as the on the cooling lake and on key ponds and streams/ditches in the Site area

2.7 Comprehensive Monitoring of Groundwater Across the Site

2.7.1 In order to develop a baseline of groundwater flow and quality across the Site area (three subject VBs on the property)

2.7.2 To be performed to validate previous results and conclusions

2.7.3 Complete a full round of water level measurements at all monitoring points installed to date (to be performed over a one or two day period).

2.7.4 Collect groundwater samples from key monitoring points in the plume area

2.7.5 Samples will be collected from all locations with clustered TWs (e.g. with a deep and shallow TW) and from the "leading edge" of the plume to the north.

3.0 Data Management and Evaluations

3.1 Construct a Regional Database and Graphic Information System (GIS) that covers the length of the Blowdown line from the Station to the Kankakee River and also areas to the north and south (approximately 6 x 6 square mile area)

3.2 Regional Database/GIS will be tied into the existing on-site (near property database/GIS already being used. The regional database/GIS will be used to evaluate hydrogeology along the blowdown line, potential groundwater users, blowdown line testing and etc. The near property database/GIS will be used to support various evaluations described in 3.4 below.

3.3 Potential groundwater flow and tritium transport modeling if warranted. Based upon the data gap studies and results from other analyses a 3D groundwater flow and transport model would be developed to support predictive evaluations and to test current data sets. (Not scheduled at this time)

3.4 Perform groundwater and chemical evaluations as needed to support conclusions regarding specifically:

- Location of releases of tritium from the blowdown line;
- The nature and extent of the tritium in groundwater (plume definition);
- The appropriate risk based (human health and ecological) remedial objective;
- Identification of potential receptors to tritium in groundwater and determination if risk exists to those receptors;

- The necessary program to monitor groundwater in the future to address a potential risk, if any, from tritium in groundwater; and
- Methods of remediation of the identified releases (if required)