CHAPTER 7

Environmental Impacts of Postulated Accidents Involving Radioactive Materials

The purpose of this section is to review and analyze a sufficiently robust spectrum of design basis accidents (DBA) and severe accidents to bracket the postaccident radiological consequences for the spectrum of reactors under consideration and provide results for use in this report. Analysis of severe accidents and mitigation of those accidents will be deferred until the COL stage.

7.1 Design Basis Accidents

The radiological consequences of potential DBAs are assessed to demonstrate that the alternative advanced reactors can be sited at the EGC ESP Site without undue risk to the health and safety of the public. The selection and evaluation of accidents is based upon USNRC regulatory guidance to the extent practical. Short-term (USNRC, 1983) site dispersion factors at the exclusion and LPZ boundaries that are based on measured site data are used to perform the assessments. The radioactivity released to the environs for DBAs is provided by the reactor supplier based upon their standard safety analysis reports or as specified in their PPE listing as being representative of the bounding DBA environmental release. The activities released to the environs are considered to be indicative of the performance of major structures, systems, and components intended to mitigate the consequences of accidents.

7.1.1 Selection of Design Basis Accidents

Accidents have been selected to cover a spectrum of design basis events and reactor types. Consistent with regulatory objectives for determining site suitability, the selection includes low probability accidents postulated to result in significant releases of radioactivity to the environs. As such, the evaluations include light water reactor (LWR) Loss of Coolant Accidents (LOCAs) that presume substantial fuel damage in the core followed by the release of significant amounts of fission products into a containment building. In addition, accidents of higher frequency but with lower potential for significant releases are considered, in order to permit quantitative assessment of the spectrum of potential risks at the EGC ESP Site.

It is not necessary or practical to analyze the DBAs associated with the alternative reactor types that could be deployed at the EGC ESP Site, but rather to include a bounding and representative set (in terms of frequency and consequences) that can be used to demonstrate site suitability.

The considered spectrum of accidents focused on the LWR designs because of their recognized postulated accident bases and the availability of data. Accidents of lesser severity (and higher frequency) for some of the newer reactor types being considered are not as well defined, and the application of accepted analytical conservatisms applied to LWRs through regulatory guides and standard review plans is not applicable based upon their unique design characteristics.

Selected accidents identified in Regulatory Guide 1.183, vendor design certification packages, vendor technical summary documents, and USNRC standard review plans for safety analyses were reviewed to establish the spectrum of accidents considered.

The following conditions and results were used in selecting DBAs for demonstrating site suitability:

- Advanced Reactors for which Design Certification DBA data are available:
  - AP1000: The AP1000 Design Control Document (Westinghouse, 2002), provides descriptions of the accidents and the technical data used to

determine the radiological consequences for DBAs at a generic site. The AP1000 evaluations consider the major DBAs identified in Regulatory Guide 1.183 and NUREG-1555. This information is part of the design certification licensing submittal for the AP1000, and is similar to the required analyses previously submitted for the certified AP600 reactor. The DBA assessments are evaluated to demonstrate EGC ESP Site suitability.

– ABWR: The ABWR Design Control Document (GE, 1997), provides descriptions of the accidents and the technical data used to determine the radiological consequences for DBAs at a generic site. This information was used by GE to obtain the design certification of the ABWR. The technical information and results are extended to the EGC ESP Site assessment.

- Non-Certified Advanced Reactor Designs:

  Non-certified advanced reactor designs are screened and selected for assessment using the DBAs identified by the reactor vendors as having the potential to result in the limiting off-site radiological consequences.

  – ESBWR: The DBAs postulated for the ABWR are expected to bound the ESBWR postaccident design assessment. The ESBWR limiting DBAs will be assessed using the alternate source term (AST) methods and guidance contained in Regulatory Guide 1.183 as opposed to the TID 14844 source term methods and NUREG-0800 guidance used for the ABWR certification. To demonstrate EGC ESP Site suitability, a conservative ESBWR LOCA assessment is provided.

  – IRIS: The low core power level and advanced design features (such as the elimination of large loop piping) of the IRIS will limit the environmental releases of radioactivity after DBAs relative to other LWRs being considered. Although the DBAs are not well finalized for this advanced concept, the vendor anticipates that postaccident radiological consequences will be well bounded by the AP600 and AP1000 evaluations. Therefore, no IRIS-specific dose assessments are performed.

  – ACR-700: The LOCA with loss of emergency core cooling is considered the most limiting DBA for the ACR-700. The source term bases and approaches utilized to license this reactor type outside the U.S. have a number of similarities to USNRC regulatory guidance. There are, however, some differences in interpretation and implementation of this guidance. Therefore, the ACR-700 LOCA is analyzed to demonstrate that this reactor plant can be sited at the EGC ESP Site and also to provide a quantitative dose perspective for this design relative to the other alternatives.

- Gas Cooled Advanced Reactor Designs

  The regulatory guidance and review standards described in USNRC publications are directed toward LWR technology and are not typically applicable to the assessment of the gas-cooled reactors.

  Depressurization events are usually the critical considerations for gas-cooled reactors. The terms coolant, primary coolant, and pressure boundary when used with gas reactor technology differ from the equivalent LWR usage. Coolant in the LWR context implies keeping the core cool in order to avoid fuel damage; maintaining the primary coolant pressure boundary is a critical safety function. The pressure boundary function in the gas reactors is to contain the helium that removes heat from the core and transfers the energy to the power conversion unit. Core geometry, however, is physically maintained under normal and postulated accident conditions. Thus, loss of helium coolant does not result in significant fuel damage. This fact, and the much lower core power levels and associated fission product inventory for the gas reactors, result in bounding post-accident environmental releases that are substantially less than the LWRs.

  The GTMHR and PBMR use mechanistic accident source terms and postulate relatively small environmental releases compared with the water reactor technologies. The limiting DBA environmental releases specified by the gas reactors vendors are provided in Table 7.1-1. Based on these projections of limiting environmental releases, the postaccident radiological dose consequences would result in less than 0.2 percent of the 10 CFR 50.34 acceptance criteria limits. Consequently, the DBAs that would be associated with the gas reactor technologies are not considered to be a major factor in assessing EGC ESP Site suitability.

The above rationale provides the basis for the spectrum of limiting DBAs selected for evaluation in assessing the EGC ESP Site suitability. The selection predominately includes the LWR accidents identified in Regulatory Guide 1.183 and its appendices as important considerations for assessing the safety of nuclear plants at the EGC ESP Site.

- Main steam line breaks (AP1000 and ABWR)
- Reactor coolant pump locked rotor (AP1000)
- Control rod ejection (AP1000)
- Control rod drop (ABWR)
- Small line break outside containment (AP1000 and ABWR)
- Steam generator tube rupture (AP1000)
- LOCA (AP1000, ABWR, ESBWR, and ACR-700)
- Fuel handling accident (AP1000 and ABWR)

7.1.2 Evaluation of Radiological Consequences

Doses for the selected DBAs were evaluated at the EAB and LPZ. These doses must meet the site acceptance criteria in 10 CFR 50.34 and 10 CFR 100. Although the emergency safety features are expected to prevent core damage and mitigate releases of radioactivity, the surrogate LOCAs analyzed presume substantial meltdowns of the core with the release of significant amounts of fission products. The postulated LOCAs are expected to more closely approach 10 CFR 50.34 limits than the other DBAs of greater frequency but with less magnitude. For these accidents, the more restrictive dose limits in Regulatory Guide 1.183 and the NUREG-0800, Standard Review Plan, were used to make certain that the accidents were acceptable from an overall risk perspective (USNRC, 2000 and USNRC, 1987).

The evaluations used short-term accident chi/Qs. The chi/Qs were determined using Regulatory Guide 1.145 methods with on-site meteorology data (USNRC, 1983). The site 50th percentile chi/Qs from Table 2.7-52 of the SSAR were used in these evaluations.

The 0- to 2-hour Chi/Q value is used for the 2-hour release duration with the greatest dose consequences at the EAB.

- EAB
  - 0 to 2 hrs
- LPZ
  - 0 to 8 hrs
  - 8 to 24 hrs
  - 1 to 4 days
  - 4 to 30 days

The accident doses are expressed as total effective dose equivalents (TEDEs) consistent with 10 CFR 50.34. The TEDE consists of the sum of the committed effective dose equivalent (CEDE) from inhalation and the deep dose equivalent (DDE) from external exposure. The CEDE is determined using dose conversion factors in Federal Guidance Report 11 (USEPA, 1988). The DDE is taken the same as the effective dose equivalent from external exposure and the dose conversions in Federal Guidance Report 12 (USEPA, 1993) are applied.

7.1.3 Source Terms

Time-dependent activities released to the environs are used in the dose evaluations. These activities are based on the analyses used to support the reactor vendors' standard safety analysis reports. The different reactor technologies use different source terms and approaches in defining the activity releases.

The ABWR source term is based on Technical Information Document (TID)-14844 (USAEC, 1962).

The ESBWR and the AP1000 source term and approach to assessing accidents are based on the AST methods and guidance outlined in Regulatory Guide 1.183.

The ACR–700 source term definition is similar to the TID-14844 approach.

As noted, the GT-MHR and PBMR use a mechanistic approach to arrive at their accident source terms.

7.1.4 Postulated Accidents

This section identifies the postulated accidents, the resultant activity release paths, the important accident parameters and assumptions, and the credited mitigation features used in the EGC ESP Site dose consequence assessments. An overall summary of the results of the evaluated accident doses appears in Table 7.1-2. This table also compares the environmental doses to the recommended limits based on Regulatory Guide 1.183 and NUREG-0800. Table 7.1-2 shows that the evaluated dose consequences meet the accident-specific acceptance criteria invoked in Section 7.1.2.

The analysis approach for evaluating the AP1000 design basis accidents discussed in the following subsections is based upon the EAB and LPZ doses provided by Westinghouse and given in Chapter 15 of the AP1000 Design Control Document, Tier 2, Revision 2 and the ratio of the ESP Site Chi/Q value to the AP1000 representative site Chi/Q value for each post accident time period. The AP1000 representative site Chi/Q values used in the evaluations are given in Table 7.1-2A. Based upon the revisions made to the Chi/Q values by Westinghouse to support the final AP1000 design certification, the EAB doses presented in Tables 7.1-2, 7.1-5, 7.1-6, 7.1-11, 7.1-13, 7.1-16, 7.1-17, 7.1-19, 7.1-23 and 7.1-31 will increase by approximately 3.6% and the LPZ doses will remain bounding.

7.1.4.1 Main Steam Line Break Outside Containment (AP1000)

The bounding AP1000 steam line break for the radiological consequence evaluation occurs outside containment. The facility is designed so that only one steam generator experiences an uncontrolled blowdown even if one of the main steam isolation valves fail to close. Feedwater is isolated after the rupture and the faulted steam generator dries out. The secondary side inventory of the faulted steam generator is released to the environs along with the entire amount of iodine and alkali metals contained in the secondary side coolant.

The reactor is assumed to be cooled by steaming down the intact steam generator. Activity in the secondary side coolant and primary to the secondary side leakage, contribute to releases to the environment from the intact generator. During the event, primary to secondary side leakage is assumed to increase from the technical specification limit of 150 gpd per steam generator to 500 gpd (175 lbm/hr) per steam generator for the intact and faulted steam generators.

The alkali metals and iodines are the only significant nuclides released during a main steam line break. Noble gases are also released; however, there would be no significant accumulations of the noble gases in the steam generators prior to the accident since they are rapidly released during normal service. Noble gases released during the accident would primarily be due to the increase in primary to secondary side leakage assumed during the event. Reactor coolant leakage to the intact steam generator would mix with the existing inventory and increase the secondary side concentrations. This effect would normally be offset by alkali and iodine partitioning in the generator. However, for conservatism, the calculated activity release assumes the primary to secondary side activity in the intact generator that is also leaked directly to the environment. The calculated doses are based on activity releases that assume:

- Duration of accident – 72 hrs

- Steam generator initial mass – 3.03E+05 lbm
- Primary to secondary leak rate – 175 lb/hr in each steam generator
- Steam generator initial iodine and alkali metal activities – 10 percent of design basis reactor coolant concentrations at maximum equilibrium conditions
- Reactor coolant alkali activity – 0.25 percent design basis fuel defect inventory
- Reactor coolant noble gas activity – limit of 280 microcurie per gram (μCi/g) dose equivalent Xe-133
- Accident initiated iodine spike – 500 times the fuel release rate that occurs when the reactor coolant equilibrium activity is 1.0 μCi/g dose equivalent Iodine-131
- Preexisting iodine spike – reactor coolant at 60 μCi/g dose equivalent Iodine-131
- Fuel damage - none

The activities released to the environment for the accident initiated and preexisting iodine spike cases are shown in Tables 7.1-3 and 7.1-4, respectively.

The vendor calculated time-dependent off-site doses for a representative site. The doses were reevaluated using the EGC ESP Site short-term accident dispersion characteristics in Table 2.3-52 of the SSAR.

The TEDE doses for the accident initiated iodine spike are shown in Table 7.1-5. The doses at the EAB and LPZ are a small fraction of the 25-roentgen equivalent man (rem) TEDE identified in 10 CFR 50.34 (USNRC, 2000). A “small fraction” is defined as 10 percent or less in the Standard Review Plan and Regulatory Guide 1.183. The doses for the preexisting iodine spike are shown in Table 7.1-6. These doses also meet the TEDE dose guidelines of 10 CFR 50.34.

7.1.4.2 Main Steam Line Break Outside Containment (ABWR)

This ABWR event assumes that the largest steam line instantaneously ruptures outside containment downstream of the outermost isolation valve. The plant is designed to automatically detect the break and initiate isolation of the line. Mass flow would initially be limited by the flow restrictor in the upstream reactor steam nozzle and the remaining flow restrictors in the three unbroken main steam lines feeding the downstream end of the break. Closure of the main steam isolation valves would terminate the mass flows out of the break.

No fuel damage would occur during this event. The only sources of activity are the concentrations present in the reactor coolant and steam before the break. The mass releases used to determine the activity available for release presume maximum instrumentation delays and isolation valve closing times. The iodine and noble gas activities in the water and steam masses discharged through the break are assumed to be released directly to the environs without hold-up or filtration. Salient features of the analyzed accident include:

- Duration of accident – 2 hrs
- Main steam isolation valve closure – 5 seconds

- Mass releases from break – steam 12,870 kilograms; water 21,950 kilograms
- Reactor coolant maximum equilibrium activity – corresponding to an offgas release rate of 100,000 μCi/s referenced to a 30 minute decay
- Preexisting iodine spike – corresponding to an offgas release rate of 400,000 μCi/s referenced to a 30 minute decay
- Fuel damage – none

The activity released to the environment for the maximum activity and preexisting spike cases is shown in Table 7.1-7.

The calculated doses for the maximum allowed equilibrium activity at full power operation are shown in Table 7.1-8. The calculated doses for the preaccident iodine spike are shown in Table 7.1-9. The EAB and LPZ doses are a small fraction of the 25-rem TEDE dose guidelines of 10 CFR 50.34.

7.1.4.3 Locked Rotor (AP1000)

The AP1000 locked rotor event is the most severe of several possible decreased reactor coolant flow events. This accident is postulated as an instantaneous seizure of the pump rotor in one of four reactor coolant pumps. The rapid reduction in flow in the faulted loop causes a reactor trip. Heat transfer of the stored energy in the fuel rods to the reactor coolant causes the reactor coolant temperature to increase. The reduced flow also degrades heat transfer between the primary and secondary sides of the steam generators. The event can lead to fuel cladding failure, which results in an increase of activity in the coolant. The rapid expansion of coolant in the core combined with decreased heat transfer in the steam generator causes the reactor coolant system pressure to increase dramatically.

Cool down of the plant by steaming off the steam generators provides a pathway for the release of radioactivity to the environment. In addition, primary side activity, carried over due to leakage in the steam generators, mixes in the secondary side and becomes available for release. The primary side coolant activity inventory increases due to the postulated failure of some of the fuel cladding with the consequential release of the gap fission product inventory to the coolant. The significant releases from this event are the iodines, alkali metals, and noble gases. No fuel melting occurs. Analysis of the dose consequences presumes:

- Duration of accident – 1.5 hrs
- Steam released – 6.48E+05 lbm
- Primary/secondary side coolant masses – 3.7E+05 lbm/6.06E+05 lbm
- Primary to secondary leak rate – 350 lbm/hr
- Steam generator initial iodine and alkali metal activities – 10 percent of design basis reactor coolant concentrations at maximum equilibrium conditions
- Reactor coolant alkali activity – 0.25 percent design basis fuel defect inventory
- Reactor coolant noble gas activity – limit of 280 μCi/g dose equivalent Xe-133

- Preexisting iodine spike – reactor coolant at 60 □Ci/g dose equivalent Iodine-131
- Fission product gap activity fractions – Regulatory Guide 1.183, regulatory position C.3.2
- Fraction of fuel gap activity released – 0.16
- Partition coefficients in steam generators - 0.01 for iodines and alkali metals
- Fuel damage - none

The preexisting iodine spike has little impact since the gap activity released to the primary side becomes the dominant mechanism with respect to off-site dose contributions. The activities released to the environment are shown in Table 7.1-10.

The vendor calculated the time-dependant off-site doses for a representative site. The doses were reevaluated using the EGC ESP Facility short-term accident dispersion characteristics in Table 2.3-52 of the SSAR. The TEDE doses for the locked rotor accident are shown in Table 7.1-11. The doses at the EAB and LPZ are a small fraction of the TEDE identified in 10 CFR 50.34.

7.1.4.4 Control Rod Ejection (AP1000)

This AP1000 accident is postulated as the gross failure of one control rod mechanism pressure housing resulting in ejection of the control rod cluster assembly and drive shaft. The failure leads to a rapid positive reactivity insertion, potentially leading to localized fuel rod damage and significant releases of radioactivity to the reactor coolant.

Two activity release paths contribute to this event. First, the equilibrium activity in the reactor coolant and the activity from the damaged fuel are blown down through the failed pressure housing to the containment atmosphere. The activity can leak to the environment over a relatively long period due to the containment's design basis leakage. Decay of radioactivity occurs during hold-up inside containment prior to release to the environs.

The second release path is from the release of steam from the steam generators following the reactor trip. With a coincident loss of off-site power, additional steam must be released in order to cool down the reactor. The steam generator activity consists of the secondary side equilibrium inventory plus the additional contributions from reactor coolant leaks in the steam generators. The reactor coolant activity levels are increased for this accident since the activity released from the damaged fuel mixes into the coolant prior to being leaked to the steam generators. The iodines, alkali metals, and noble gases are the significant activity sources for this event. Noble gases entering the secondary side are quickly released to the atmosphere via the steam releases through the atmospheric relief valves. A small fraction of the iodines and alkali metals in the flashed part of the leak flow are available for immediate release without benefit of partitioning. The unlashed portion mixes with secondary side fluids where partitioning occurs prior to the release as steam.

The dose consequences analyses are performed using guidance in Regulatory Guides 1.77 and 1.183 (USAEC, 1974 and USNRC, 2000). Salient features of the analysis of activity releases include:

- Duration of accident – 30 days

- Steam released - 1.08E+05 lbm
- Secondary side coolant mass – 6.06E+05 lbm
- Primary to secondary leak rate – 350 lbm/hr
- Containment leak rate – 0.1 percent per day
- Steam generator initial iodine and alkali metal activities – 10 percent of design basis reactor coolant concentrations at maximum equilibrium conditions
- Reactor coolant alkali metal activity – 0.25 percent design basis fuel defect inventory
- Reactor coolant noble gas activity – limit of 280 μCi/g dose equivalent Xe-133
- Preexisting iodine spike – reactor coolant at 60 μCi/g dose equivalent Iodine-131
- Fraction of rods with cladding failures – 0.10
- Fission product gap activity fractions:
  - Iodines – 0.10
  - Noble gases – 0.10
  - Alkali metals – 0.12
- Fraction of fuel melting – 0.0025
- Fraction of activity released from melted fuel:
  - Iodines – 0.5
  - Noble gases – 1.0
- Iodine chemical form – per Regulatory Guide 1.183 position C.3.5
- Containment atmosphere activity removal rates – 1.7/hr for elemental iodines, and 0.1/hr for particulate iodines and alkali metals
- Partition coefficients in steam generators - 0.01 for iodines and 0.001 for alkali metals

The preexisting iodine spike has little impact since the gap activity released from the failed cladding and melted fuel become the dominant mechanisms contributing to the radioactivity released from the plant. The activities released to the environment for the 30-day accident duration are shown in Table 7.1-12.

The vendor calculated the time-dependent off-site doses for a representative site. The doses were reevaluated using the EGC ESP Site short-term accident dispersion characteristics in Table 2.3-52 of the SSAR. The doses at the EAB and LPZ shown in Table 7.1-13 are well within the 25-rem TEDE identified in 10 CFR 50.34.

7.1.4.5 Rod Drop Accident (ABWR)

The design of the ABWR fine motion control rod drive system has several new unique features compared with BWR locking piston control rod drives. The new design precludes the occurrence of rod drop accidents in the ABWR. No radiological consequence analysis is required.

7.1.4.6 Steam Generator Tube Rupture (AP1000)

The AP1000 steam generator tube rupture accident assumes the complete severance of one steam generator tube. The accident causes an increase in the secondary side activity due to reactor coolant flow through the ruptured tube. With the loss of off-site power, contaminated steam is released from the secondary system due to the turbine trip and dumping of steam via the atmospheric relief valves. Steam dump (and retention of activity) to the condenser is precluded due to the assumption of loss of off-site power. The release of radioactivity depends on the primary to secondary leakage rate, the flow to the faulted steam generator from the ruptured tube, the percentage of defective fuel in the core, and the duration/amount of steam released from the steam generators.

The radioiodines, alkali metals, and noble gases are the significant nuclide groups released during a steam generator tube rupture accident. Multiple release pathways are analyzed for the tube rupture accident. The noble gases in the reactor coolant enter the ruptured steam generator and are available for immediate release to the environment. In the intact loop, iodines and alkali metals leaked to the secondary side during the accident are partitioned as the intact steam generator is steamed down until switchover to the residual heat removal system occurs. In the ruptured steam generator, some of the reactor coolant flowing through the tube break flashes to steam while the unflashed portion mixes with the secondary side inventory. Iodines and alkali metals in the flashed fluid are not partitioned during steam releases while activity in the secondary side of the faulted generator is partitioned prior to release as steam. The following assumptions have been used:

- Duration of accident – 24 hrs
- Total flow through ruptured tube – 3.85E+05 lbm
- Steam release from faulted steam generator – 3.32E+0+5 lbm
- Steam released from intact steam generator – 1.42E+06 lbm
- Steam release duration – 13.2 hrs
- Primary/secondary side initial coolant masses – 3.8E+05 lbm/3.7E+05 lbm
- Primary to secondary leak rate – 175 lbm/hr in the intact steam generator
- Reactor coolant noble gas activity – limit of 280 µCi/g dose equivalent Xe-133
- Reactor coolant alkali activity – 0.25 percent design basis fuel defect inventory
- Steam generator initial iodine and alkali metal activities – 10 percent of design basis reactor coolant concentrations at maximum equilibrium conditions
- Preexisting iodine spike – reactor coolant at 60 µCi/g dose equivalent Iodine-131
- Accident initiated iodine spike – 335 times the fuel release rate that occurs when the reactor coolant equilibrium activity is 1.0 µCi/g dose equivalent Iodine-131
- Partition coefficients in steam generators – 0.01 for iodines and alkali metals
- Off-site power and condenser – lost on reactor trip

- Fuel damage - none

The activities released to the environment for the accident-initiated and preexisting iodine spike cases are shown in Tables 7.1-14 and 7.1-15, respectively.

The vendor calculated the time-dependent off-site doses for a representative site. The doses were reevaluated using the EGC ESP Site short-term accident dispersion characteristics in Table 2.3-52 of the SSAR. The TEDE doses for the steam generator tube rupture accident with the accident-initiated iodine spike are shown in Table 7.1-16. The preexisting iodine spike doses are shown in Table 7.1-17. The doses at the EAB and LPZ are a small fraction of the 25-rem TEDE identified in 10 CFR 50.34.

7.1.4.7 Failure of Small Lines Carrying Primary Coolant Outside of Containment (AP1000)

Small lines carrying reactor coolant outside the AP1000 containment include the reactor coolant system sample line and the chemical and volume control system discharge line to the radwaste system. These lines are not continuously used. The failure of the discharge line is neither significant nor analyzed. The flow (about 100 gpm) leaving containment is cooled below 140°F and has been cleaned by the mixed bed demineralizer. The reduced iodine concentration, low flow, and temperature make this break non-limiting with respect to off-site dose consequences.

The reactor coolant system sample line break is the more limiting break. This line is postulated to break between the outboard isolation valve and the reactor coolant sample panel. Off-site doses are based on a break flow limited to 130 gpm by flow restrictors with isolation occurring at 30 minutes.

Radioiodines and noble gases are the only significant activities released. The source term is based on an accident initiated iodine spike that increases the iodine release rate from the fuel by a factor of 500 throughout the event. The activity is assumed to be released to the environment without decay or hold-up in the auxiliary building. Conditions used to determine activity releases include:

- Duration of accident – 0.5 hrs
- Break flow rate – 130 gpm
- Reactor coolant noble gas activity – limit of 280 µCi/g dose equivalent Xe-133
- Reactor coolant equilibrium iodine activity - 1.0 µCi/g dose equivalent Iodine-131
- Accident initiated iodine spike – 500 times the fuel release rate that occurs when the reactor coolant equilibrium activity is 1.0 µCi/g dose equivalent Iodine-131
- Fuel damage - none

The activities released are shown in Table 7.1-18.

Based on the vendor calculated off-site doses for a representative site, the time-dependent doses were reevaluated using the EGC ESP Site short-term accident meteorology in Table 2.3-52 of the SSAR. The results are shown in Table 7.1-19. The resulting doses at the EAB and LPZ are a small fraction of the 25-rem TEDE in 10 CFR 50.34.

7.1.4.8 Failure of Small Lines Carrying Primary Coolant Outside of Containment (ABWR)

This event consists of a small steam or liquid line break inside or outside the ABWR primary containment. The bounding event analyzed is a small instrument line break in the reactor building. The break is assumed to proceed for ten minutes before the operator takes steps to isolate the break, SCRAM the reactor, and reduce reactor pressure.

The iodine in the flashed water is assumed to be transported to the environs by the heating, ventilation and air conditioning (HVAC) system without credit for treatment by the standby gas treatment system. The other activities in the reactor water make only small contributions to the off-site dose and are neglected. The activity release assumes:

- Duration of the accident – 8 hrs
- Standby gas treatment system – not credited
- Reactor building release rate – 200 percent/hr
- Mass of reactor coolant released – 13,610 kilograms
- Mass of fluid flashed to steam – 2,270 kilograms
- Iodine plateout fraction – 0.5
- Reactor coolant equilibrium activity – maximum permitted by technical specifications corresponding to an offgas release rate of 100,000 µCi/s referenced to a 30-minute decay.
- Iodine spiking – accident initiated spike
- Fuel damage – none

The activity released to the environs is shown in Table 7.1-20. The calculated EAB and LPZ doses are shown in Table 7.1-21. The doses are a small fraction of the 25-rem TEDE limit in 10 CFR 50.34.

7.1.4.9 Large Break Loss of Coolant Accident (AP1000)

The core response analysis for the AP1000 demonstrates that the reactor core maintains its integrity for the large break LOCA. However, significant core degradation and melting is assumed in this DBA. The assumption of major core damage is intended to challenge various accident mitigation features and provide a conservative basis for calculating site radiological consequences. The source term used in the analysis is adopted from NUREG-1465 and Regulatory Guide 1.183 with the nuclide inventory determined for a three-region equilibrium cycle core at end of life (USNRC, 1995; USNRC, 2000; and Westinghouse, 2002).

The activity released consists of the equilibrium activity in the reactor coolant and the activity released from the damaged core. The AP1000 is a leak before break design; therefore, the coolant is assumed to blow down to the containment for 10 minutes. One-half of the iodine and the noble gases in the blowdown stream are released to the containment atmosphere.

The core release starts after the 10-minute blowdown of reactor coolant. The fuel rod gap activity is released over the next half hour followed by an in-vessel core melt that lasts 1.3

hrs. Iodines, alkali metals, and noble gases are released during the gap activity release. During the core melt phase, five additional nuclide groups are released including the tellurium group, the noble metals group, the cerium group, and the barium and strontium group.

Activity is released from the containment via the containment purge line at the beginning of the accident. After isolation of the purge line, activity continues to leak from the containment at its design basis leak rate. There is no emergency core cooling leakage activity because the passive core cooling system does not pass coolant outside of the containment. A coincidental loss of off-site power has no impact on the activity release to the environment because of the passive designs for the core cooling and fission product control systems. Important bases for determining activity releases and off-site doses include:

- Duration of accident – 30 days
- Reactor coolant noble gas activity – limit of 280 μCi/g dose equivalent Xe-133
- Reactor coolant equilibrium iodine activity – 1.0 μCi/g dose equivalent Iodine-131
- Reactor coolant mass – 3.7E+05 lbm
- Containment purge flow rate – 8,800 cfm for 30 seconds
- Containment leak rate – 0.1 percent per day
- Core activity group release fractions – Regulatory Guide 1.183, regulatory position C.3.2
- Iodine chemical form – Regulatory Guide 1.183, regulatory position C.3.5
- Containment airborne elemental iodine removal rate – 1.7/hr until decontamination factor (DF) of 200 is reached
- Containment atmosphere particulate removal rate – 0.43/hr to 0.7/hr during first 24 hrs

Table 7.1-22 gives the activities released to the environment for the AP1000 large break LOCA.

Based on the vendor calculated off-site doses for a representative site, the time-dependent doses were reevaluated using the EGC ESP Site short-term accident meteorology in Table 2.3-52 of the SSAR. Table 7.1-23 provides the EAB and LPZ doses. Both doses meet the dose guideline of 25-rem TEDE in 10 CFR 50.34. The activity released from the core melt phase of the accident is the greatest contributor to the off-site doses. The EAB dose in Table 7.1-23 is given for the two-hour period, during which, the dose is greatest at this location. The initial two hours of the accident is not the worst two-hour period because of the delays associated with cladding failure and fuel damage.

7.1.4.10 Large Break Loss of Coolant Accident (ABWR)

This ABWR event postulates piping breaks inside containment of varying sizes, types, and locations. The break type includes steam and liquid process lines. The emergency core cooling analyses show that the core temperature and pressure transients caused by the breaks are insufficient to cause fuel cladding perforation. Although no fuel damage occurs, conservative assumptions from Regulatory Guide 1.3 (USAEC, 1974a) are invoked in order to conservatively assess postaccident fission product mitigation systems and the resultant off-site doses.

One hundred percent of the core-inventory noble gases and 50 percent of the iodines are instantaneously released from the reactor to the drywell at the beginning of the accident. Of the iodines, 50 percent are assumed to immediately plateout, which leaves 25 percent of the inventory airborne and available for release. Following the break and depressurization of the reactor, some of the noncondensable fission products are purged into the suppression pool. The suppression pool is capable of retaining iodine, thereby, reducing the overall concentration in the primary containment atmosphere.

Postaccident fission products are released from the primary containment via two principal pathways including leakage to the reactor building and leakage along the main steam lines. The leakage to the reactor building is due to the containment penetrations and emergency core cooling equipment leaks. The iodine activity in the reactor building is filtered through the standby gas treatment system prior to release to the environment. The gas treatment system is started and begins removing iodine from the reactor building atmosphere 20 minutes after start of the accident. The main steam line leakage is due to leaks past the main steam line isolation valves that close automatically at the beginning of the accident. The primary leakage path is through the drain lines downstream of the outboard isolation valves to the main condenser. A secondary pathway is through the main steam lines to the turbine. Activity reaching the main condenser and the turbine is held up before leaking from the turbine building to the environment. Iodine plateout occurs in the turbine, main condenser, and the steam/drain lines. Key features of the analysis of activity released include:

- Duration – 30 days
- Core power level – 4,005 MWt
- Fraction of noble iodine and noble gases released – Regulatory Guide 1.3, regulatory positions C.1.a and C.1.b
- Iodine chemical form – Regulatory Guide 1.3, regulatory position C.1.a
- Suppression pool iodine decontamination factor – 2.0 for particulate and elemental iodine (includes allowance for suppression pool bypass)
- Primary containment leakage – 0.5 percent/day
- Main steam isolation valve total leakage – 66.1 liters/minute
- Condenser leakage rate – 11.6 percent/day
- Condenser iodine removal:
  - Elemental and particulate iodine – 99.7 percent
  - Organic iodine – 0.0 percent
- Delay to achieve design negative pressure in reactor building – 20 minutes

- Reactor building leak rate during draw down – 150 percent/hr
- Standby gas system filtration – 97 percent efficiency
- Standby gas system exhaust rate – 50 percent/day

The activities released from the reactor and turbine buildings are given in Table 7.1-24. The doses at the EAB and LPZ are summarized in Table 7.1-25. The doses are within the 25-rem TEDE guidelines of 10 CFR 50.34.

7.1.4.11 Large Break Loss of Coolant Accident (ESBWR)

This ESBWR event postulates piping breaks inside containment of varying sizes, types and locations. The break type includes steam and liquid process lines. The emergency core cooling analyses show that the core temperature and pressure transients caused by the breaks are insufficient to cause fuel cladding perforation. Although no fuel damage occurs, conservative assumptions from Regulatory Guide 1.183 are invoked in order to conservatively assess postaccident fission product mitigation systems and the resultant off-site doses.

One hundred percent of the core-inventory noble gases, 30 percent of the iodines, 25 percent of the core cesium, and minor fractions (less than 1 percent) of the remaining core inventory are released from the reactor to the drywell over a 2-hour period at the beginning of the accident. The natural deposition of iodine within the drywell is credited in the analysis for the first day of the event. Following the break and depressurization of the reactor, some of the non-condensable fission products are removed by condensation within the Passive Containment Cooling System (PCCS). The PCCS is capable of retaining iodine thereby reducing the overall concentration in the primary containment atmosphere.

Postaccident fission products are released from the primary containment via two principal pathways: primary containment leakage and leakage of contaminated steam past the main steam isolation valves. The leakage to the reactor building is due to the containment penetrations. This leakage is distributed between the reactor building (50 percent), the external events shield building (45 percent), and a small fraction is released directly to the environment (5 percent). No credit is taken for any charcoal filtration systems for these paths. The main steam line leakage is due to leaks past the main steam line isolation valves, which close automatically at the beginning of the accident. The primary leakage path is through the drain lines downstream of the outboard isolation valves to the main condenser. A secondary pathway is through the main steam lines to the turbine. Activity reaching the main condenser and the turbine is held up before leaking from the turbine building to the environment. Key features of the analysis of activity released include:

- Duration – 30 days
- Core power level – 4,000 MWt
- Fraction of iodine, noble gases, and other core isotopes released – Regulatory Guide 1.183, regulatory position 3.2
- Iodine chemical form – Regulatory Guide 1.183, Appendix A, regulatory position 2

- Passive Containment Cooling System Decontamination Factor – 1.5 for particulate and elemental iodine
- Primary containment leakage – 0.5 percent/day
- Main steam isolation valve total leakage – 150 cfh
- Condenser leakage rate – 12.0 percent/day

The activities released to the environment are given in Table 7.1-26. The doses at the EAB and LPZ are summarized in Table 7.1-27. The doses are within the 25-rem TEDE guidelines of 10 CFR 50.34.

7.1.4.12 Large Break Loss of Coolant Accident (ACR-700)

The limiting design basis event for the ACR-700 is a large LOCA with coincident loss of emergency core cooling. In this accident, the heat transport system coolant is discharged into containment via the break. Without emergency core cooling injection, the fuel bundles start to heat up, which causes the pressure tube to sag and contact the calandria tube. With contact between the pressure tube and calandria, heat is transferred from the fuel channel to the moderator. In this severe accident, the heavy water in the moderator acts as the heat sink and the heat is transferred to the service water. The integrity of the pressure tube, calandria tube, and the heat transfer system core cooling geometry are maintained.

The ACR-700 source term consists of 100 percent of the core-inventory noble gases and 50 percent of the iodines. These quantities are released from the fuel at the beginning of the accident. Ninety-five percent of the iodine enters containment as CsI and dissolves as non-volatile iodine in water. The remaining 5 percent of the iodine is released inside containment as volatile elemental and organic iodines. Under the oxidizing and high radiation environment following an accident, some non-volatile iodide in water would react and become volatile and partition into the gas phase. Elemental iodine, however, is rapidly removed by adsorption on surfaces inside containment. A net reduction factor of 14 is applied to the elemental iodine based on analysis of the re-evolution and removal mechanisms during the accident.

The ECC pumps and valves, which operate during the accident, are located in the long term cooling rooms outside the reactor containment building. The rooms have a sump to collect ECC leakage and a pump to return the radioactive fluids to the reactor building. Although the rooms' ventilation systems are isolated following a LOCA signal, it is possible that iodine flashed from the ECC leakage can leak past the ventilation dampers to the environment.

The contribution from ECC leakage outside the containment is analyzed assuming 50 percent of the core iodine inventory (as elemental iodine) is uniformly distributed in the containment sump water during recirculation. ECC leakage at greater than design conditions is assumed to occur for the duration of the postaccident period. In addition, a passive component failure (such as an ECC pump seal or valve packing) is assumed to occur 24 hours after start of the LOCA.

The dose contribution from containment bypass following a LOCA is small and may be neglected. Activity can be released from the steam generator main steam relief valves in a crash cool down of the plant during a LOCA. Even under conditions of chronic steam generator tube leakage during the LOCA, the contribution is several orders of magnitude less than the LOCA leakage contribution, and hence is neglected. Containment bypass due to operation of the containment ventilation system is not considered credible. Two independent means of rapidly isolating containment ventilation lines are provided for in the ACR generic design. This dual failure consideration offers a very high reliability of containment isolation and reduces this potential impairment mechanism.

The containment isolation systems are credited with isolating fluid systems that are not required to operate during the accident. The design basis includes a double barrier at the containment penetration with automatic closure of redundant valves. The normally sub-atmospheric containment isolates on a high-pressure signal (approximately ½ psig) during the accident, effectively promoting isolation prior to fission product release.

Features of the analysis of radioactivity released to the environment include:

- Duration – 30 days
- Core power level – 2059 MWt
- Core noble gas and iodine release fractions to containment – similar to TID-14844
- Iodine chemical form – similar to Regulatory Guide 1.183, regulatory position C.3.5
- Containment leak rate – 0.5 percent per day for 24 hours; 0.25 percent thereafter
- Containment isolation – within 5 seconds after large LOCA
- Onset of fission product release from core – after containment isolation
- Iodine removal – factor of 14 removal for elemental iodines
- Containment dousing spray – not credited
- Containment ventilation filtration – not credited
- Sump water volume during recirculation – greater than 1000 m^3
- ECC leakage – 1 gal/hour based on Regulatory Guide 1.183, Appendix A, paragraph 5.2
- ECC passive failure – 50 gpm for 30 minutes at 24 hours
- Flashing fraction – 0.1 based on Regulatory Guide 1.183, Appendix A, paragraph 5.5
- ECC iodine chemical form – consistent with Regulatory Guide 1.183, Appendix A, paragraph 5.6
- ECC pump room isolation and hold-up – not credited

The activity released during the large LOCA is shown in Table 7.1-28. The resulting doses at the EGC ESP Site EAB and LPZ are summarized in Table 7.1-29. The EAB and LPZ doses are within the 25-rem TEDE guidelines in 10 CFR 50.34.

7.1.4.13 Fuel Handling Accidents (AP1000)

The AP1000 fuel handling accident (FHA) can occur inside containment or in the fuel handling area of the auxiliary building. The accident postulates the dropping of a fuel assembly over the core or in the spent fuel pool. The cladding of the fuel rods is assumed breached and the fission products in the fuel rod gaps are released to the reactor refueling cavity water or spent fuel pool. There are numerous design or safety features to prevent this accident. For example, only one fuel assembly is lifted and transported at a time. Fuel racks are located to prevent missiles from reaching the stored fuel. Fuel handling equipment is designed to prevent it from falling on to the fuel, and heavy objects cannot be carried over the spent fuel.

Spent fuel-handling operations are performed under water. Fission gases released from damaged fuel bubble up through the water and escape above the refueling cavity water or the spent fuel pool surfaces. For FHAs inside containment, the release to the environment can be mitigated by automatically closing the containment purge lines after detection of radioactivity in the containment atmosphere. For accidents in the spent fuel pool, activity is released through the auxiliary building ventilation system to the environment.

The refueling and fuel transfer systems are designed such that the damaged fuel has a minimum depth of 23 ft of water over the fuel. This depth of water provides for effective scrubbing of elemental iodine released from the fuel. Organic iodine and noble gases are not scrubbed and escape.

The off-site doses are analyzed by only crediting the scrubbing of iodine by the refueling water. Hence, fuel handling accidents inside containment and the auxiliary building are treated in the same manner. Cesium iodide, which accounts for about 95 percent of the gap iodine, is nonvolatile and does not readily become airborne after dissolving. This species is assumed to completely dissociate and reevolve as elemental iodine immediately after damage to the fuel assembly. The dose activity released presumes:

- Core thermal power – 3,468 MWt
- Decay time after shutdown – 100 hrs
- Activity release period – 2 hrs
- One of 157 fuel assemblies in the core is completely damaged
- Maximum rod radial peaking factor – 1.65
- Iodine and noble gas fission product gap fractions - Regulatory Guide 1.183, regulatory position C.3.2 (USNRC, 2000)
- Iodine chemical form – Regulatory Guide 1.183, regulatory position C.3.5
- Pool decontamination for iodine – Regulatory Guide 1.183, Appendix B
- Filtration – none

The radioactivity released to the environment is given in Table 7.1-30.

The resulting doses at the EAB and LPZ are summarized in Table 7.1-31. The doses are applicable to fuel handling accidents inside containment and in the spent fuel pool in the auxiliary building (10 CFR 50). The EAB and LPZ doses are well within the 25-rem TEDE guidelines in 10 CFR 50.34. "Well within" is taken as being within 25 percent of the guideline limit consistent with the guidance in Regulatory Guide 1.183 and NUREG-0800, Standard Review Plan (USNRC, 2000 and 1987).

7.1.4.14 Fuel Handling Accidents (ABWR)

The ABWR fuel handling accident is postulated as the failure of the fuel assembly lifting mechanism resulting in the dropping of a fuel assembly on to the reactor core. Fuel rods in the dropped and struck assemblies are damaged releasing radioactive gases to the pool water.

The activity released in the pool water bubbles to the surface and passes to the reactor building atmosphere. The normal ventilation system is isolated, the standby gas treatment system started, and effluents are released to the environment through this system. The gas treatment system is credited with maintaining the reactor building at a negative pressure after 20 minutes. Pool water is credited with removal of elemental iodine released from the failed rods. Guidance from Regulatory Guide 1.25 is used in performance of the analysis. Key aspects include:

- Core thermal power – 4,005 MWt
- Decay time after shutdown – 24 hrs
- Activity release period from pool – 2 hrs
- Total number of fuel rods damaged – 115 in dropped and struck assemblies
- Radial peaking factor – 1.5
- Iodine and noble gas fission product gap fractions - Regulatory Guide 1.25, regulatory position C.1.d
- Iodine chemical form – Regulatory Guide 1.25, regulatory position C.1.e
- Pool decontamination for iodine – Regulatory Guide 1.25, regulatory position C.1.f
- Delay to achieve design negative pressure in reactor building – 20 minutes
- Reactor building leak rate during draw down – 150 percent/hr
- Standby gas system filtration – 99 percent efficiency
- Standby gas system exhaust rate – 50 percent/day

The radioactivity released to the environment is provided in Table 7.1-32.

The doses at the site EAB and LPZ are summarized in Table 7.1-33. Activity remaining in the reactor building after two hours is assumed filtered and released without benefit of decay over the next six hours to determine the LPZ dose. Although assumptions in Regulatory Guide 1.25 are used, the off-site dose conversions are made using the guidance in Regulatory Guide 1.183 (USAEC, 1972 and USNRC, 2000). The EAB and LPZ doses are shown to be well within the 25-rem TEDE guidelines of 10 CFR 50.34.

7.2 Severe Accidents

This section discusses the probabilities and consequences of accidents of greater severity than the design basis accidents. As a class, they are considered less likely to occur, but because their consequences could be more severe, they are considered important both in terms of impact to the environment and off-site costs. These severe accidents, can be distinguished from design basis accidents in two primary respects: (1) they involve substantial physical deterioration of the fuel in the reactor core, including overheating to the point of melting, and (2) they involve deterioration of the capability of the containment system to perform its intended function of limiting the release of radioactive materials to the environment. In NUREG-1437, the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* [GEIS], the USNRC generically assessed the impacts of severe accidents during license renewal periods, using the results of existing analyses and site-specific information to conservatively predict the environmental impacts of severe accidents for each plant during the renewal period (USNRC, 1996). This methodology is used as a basis for evaluating the severe accident environmental impacts of a new nuclear power plant that may be built on the EGC ESP Site.

7.2.1 Applicability of Existing Generic Severe Accident Studies

Section 5.3.3 of NUREG-1437 presents a thorough assessment of impacts of severe accidents during the license renewal period by the USNRC staff. Methodologies therein were developed to evaluate each of the dose pathways by which a severe accident may result in adverse environmental impacts and to estimate off-site costs of severe accidents. This assessment methodology and the resulting conclusions are considered, for reasons discussed below, broadly applicable beyond the license renewal context, including evaluation of severe accident impacts associated with determining site suitability for a nuclear power plant. The three NUREG-1437 pathways for release of radioactive material to the environment from severe accidents, i.e., atmospheric, air to surface water, and groundwater to surface water, are discussed in this section. The economic impacts from severe accidents are also comparatively evaluated in this section.

The GEIS evaluations and conclusions are based on existing assessments of severe accident impacts presented in numerous Final Environmental Statements (FES) published after 1980 and for a representative set of U.S. plants and sites in NUREG-1150. The GEIS results are expressed as a range of values in terms of risk of severe accident impact per reactor-year of operation. The USNRC later confirmed, in 61 FR 28480, that "the analyses performed for the GEIS represent adequate, plant-specific estimates of the impacts from severe accidents…" (USNRC, 1996a).

As described in the GEIS, the purpose of the evaluation of severe accidents was "to use, to the extent possible, the available severe accident results, in conjunction with those factors that are important to risk and that change with time to estimate the consequences of nuclear plant accidents for all plants for a time period that exceeds the time frame of existing analyses." This estimation process was completed by predicting increases or decreases in consequences as the plant lifetime was extended past the normal license period by considering the projected changes in the risk factors. The primary assumption in this analysis was that regulatory controls ensure that the physical plant condition (i.e., the predicted probability of and radioactive releases from an accident) is maintained at a constant level during the renewal period; therefore, the frequency and magnitude of a release remains relatively constant. In other words, significant changes in consequences would result only from changes in the plant's external environment. The logical approach, then, would be to incorporate the most significant environmental factors into calculations of consequences for subsequent correlation with existing analyses (which use the consequence computer codes).

The staff concluded in NUREG-1437 that the primary factors affecting risk are the site population (which reflects the number of people potentially at risk to severe accident exposure) and wind direction (which reflects the likelihood of exposure). Secondary factors, such as terrain, rainfall, and wind stability, also have some effect on risk, but their impact was judged to be much smaller than the effects of population and wind direction. These factors were included in the FES analyses whose results are the bases for the GEIS analyses. Consequently, their effects are indirectly considered in the prediction of future risks and are reflected within the uncertainty bounds generated by the regression of the FES risk values. To ensure that the existing FES analyses covered a range of secondary factors representative of the total population of plants, the more significant secondary factors were also examined in the GEIS. Variations in these factors (precipitation, 50-mi population, 0-mi population in the direction of highest wind frequency, general terrain and emergency planning) were found to be enveloped by the FES analyses and thus reasonably accounted for in the GEIS evaluation of severe accidents.

Detailed severe accident consequence (early and latent fatalities and total dose) evaluations were not available for all plants considered in the GEIS. Therefore, a predictor for these consequences was developed using correlations based upon the calculated results from the existing FES severe accident analyses. This predictor was then used to infer the future consequence level of all individual nuclear plants. Correlations were developed using two environmental parameters that are available for all plants. This correlation process was well described in NUREG-1437.

While the NUREG-1437 discussions dealt with the environmental impacts of accidents during operation after license renewal. The primary assumption for this evaluation was that the frequency (or likelihood of occurrence) of an accident at a given plant would not increase during the plant lifetime (inclusive of the license renewal period) because regulatory controls ensure the plant's licensing basis is maintained and improved, where warranted. The GEIS use of severe accident risk per reactor-year of operation as the principal metric for evaluating severe accident environmental impacts and the assumption that this risk remains constant over the life of the plant are equally applicable and appropriate in both the license renewal and ESP/COL context. Therefore, the thorough generic analysis of severe accident impacts presented in the GEIS also provides an appropriate basis and method for evaluating severe accident impacts for early site permitting.

However, it was recognized that the changing environment around the plant is not subject to regulatory controls and introduces the potential for changing risk. Thus, the site-specific environmental considerations, i.e., population and meteorology, were evaluated in the GEIS and are considered in the following sections.

Specifically, the following evaluation of the significant factors associated with the environment shows these factors for the EGC ESP Site are not substantially different from those factors identified for previously analyzed sites. Thus, it follows that the environmental impacts for the EGC ESP Site will not be substantially different from the acceptable environmental impacts identified for the previously analyzed sites.

7.2.2 Evaluation of Potential Severe Accident Releases

EGC has identified the significance of the impacts associated with each issue as either Small, Moderate, or Large, consistent with the criteria that USNRC established in 10 CFR 51, Appendix B, Table B-1, Footnote 3 as follows:

- SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small.
- MODERATE - Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attribute of the resource.
- LARGE - Environmental effects are clearly noticeable and are sufficient to destabilize any important attributes of the resource.

In accordance with National Environmental Policy Act practice, EGC considered ongoing and potential additional mitigation in proportion to the significance of the impact to be addressed (i.e., impacts that are small receive less mitigative consideration than impacts that are large).

7.2.2.1 Evaluation of Potential Releases via Atmospheric Pathway

The site-specific significant factors of demography and meteorology are considered in the evaluation of the atmospheric exposure pathway for the EGC ESP Site. For this evaluation, NUREG-1437 calculates an exposure index (EI) for use in comparing the relative risk for the current fleet of nuclear power plants.

NUREG-1437 provides the following discussion of EI:

> *"Population, which changes over time, defines the number of people within a given distance from the plant. Wind direction, which is assumed not to change from year to year, helps determine what proportion of the population is at risk in a given direction, because radionuclides are carried by the wind. Therefore, an EI relationship was developed by multiplying the wind direction frequency (fraction of the time per year) for each of 16 (22.5°) compass sectors times the population in that sector for a given distance from the plant and summing all products.…Population varies with population growth and movement, and with the distance from any given plant. As the population changes for that plant, the EI also changes (the larger the EI, the larger the number of people at risk). Thus, EI is proportional to risk and an EI for a site for a future year can be used to predict the risk to the population around that site in that future year."*

Thus, the EI is a function of population surrounding the plant, weighted by the site-specific wind direction frequency, and is, therefore, a site-specific parameter. Because meteorological patterns, including wind direction frequency, tend to remain constant over time, the site meteorology will not be significantly different for the EGC ESP Site than the meteorology considered in NUREG-1437 for the Clinton site and only population can significantly affect the resulting risk in any given year of reactor operation.

However, the 50-mi population projections for the EGC ESP Site (i.e., ~914,000) are not significantly different than for the Clinton site as projected for the year 2050 in Table 5.3 of NUREG-1437, (i.e., ~870,000). Thus, the EGC ESP Site EI will not be significantly different from those established in NUREG-1437 for the Clinton site.

Two EIs were evaluated in NUREG-1437. A 10-mi EI was found to best correlate with early fatalities, and a 150-mi EI was found to best correlate with latent fatalities and total dose. Using these indices, it was determined that the risk of early and latent fatalities from individual nuclear power plants is small and represents only a small fraction of the risk to which the public is exposed from other sources.

The 10-mi EI for the Clinton site was 760, as shown in NUREG-1437, Table 5.7, for the year 2050. The 10-mi EI range provided (in Table 5.7 of NUREG-1437) for the current generation of nuclear power plant sites has a low of 96 and a high of 18,959. Thus, the EGC ESP Site is expected to be within the range of risk calculated for the existing fleet of nuclear power plants.

The 150-mi EI for the CPS Site was 1,418,383, as shown in NUREG-1437, Table 5.8, for the year 2050. The 150-mi EI range provided (in Table 5.8 of NUREG-1437) for the current generation of nuclear power plant sites has a low of 132,195 and a high of 2,863,844. Thus, the EGC ESP Site is expected to be within the range of risk calculated for the existing fleet of nuclear power plants.

Thus, the EGC ESP Site risks for the atmospheric exposure pathway will be within the range of those considered as "Small" in NUREG-1437. Section 5.5.2.1 of NUREG-1437 indicated these predicted effects of a severe accident "are not expected to exceed a small fraction of that risk to which the population is already exposed."

7.2.2.2 Evaluation of Potential Releases via Atmospheric Fallout onto Open Bodies Of Water

This section examines such radiation exposure risk for a nuclear power reactor at the EGC ESP Site in the event of a severe reactor accident in which radioactive contaminants are released into the atmosphere and subsequently deposited onto open bodies of water. In the GEIS, the drinking water pathway was treated separately while the aquatic food, swimming, and shoreline pathways were addressed collectively. Population dose estimates for both the drinking water and aquatic food pathways were then compared with estimates from the atmospheric pathway.

As reported in NUREG-1437, analyses for both the drinking water and aquatic food pathways were performed with and without considering interdiction. In the case of the drinking-water pathway, the Great Lakes and the estuarine sites are bound by those of a previous site evaluation (i.e., Fermi); while small river sites with relatively low annual flow rates, long residence times, and large surface-area-to-volume ratios may potentially not be bound by the previous analysis. In all cases, however, interdiction can reduce relative risk to levels at or below that of the previous acceptable analysis and significantly below that for the atmospheric pathway. River sites that may have relatively high concentrations of contaminants but which remove contaminants within short periods of time (hours to several days) are amenable to short-term interdiction. A similar level of reduced risk can be achieved at those sites with longer residence times (months) by more extensive interdictive measures.

For the aquatic food pathway, population dose and population exposure per reactor-year are directly related to aquatic food harvest. For river sites, un-interdicted population exposure is an order of magnitude lower than that for the atmospheric pathway. For Great Lakes sites, the un-interdicted population exposure is a substantial fraction of that predicted for the atmospheric pathway but is reduced significantly by interdiction. For estuarine sites with large annual aquatic food harvests, dose reduction of a factor of 2 to 10 through interdiction provides essentially the same population exposure estimates as the atmospheric pathway.

For these reasons, population dose for the drinking-water pathway was found to be a small fraction of that for the atmospheric pathway. Risk associated with the aquatic food pathway was found to be small relative to the atmospheric pathway for most sites and essentially the same as the atmospheric pathway for the few sites with large annual aquatic food harvests.

Environmental parameters important for input in performing the above analyses, and for use in analyses of additional sites, are (1) the surface area of the receiving body, (2) the volume of water in the body, and (3) the flow rate. In the absence of rigorous site-specific analyses, these data can provide estimates of the extent of contamination in the receiving water body and the residence time of the contaminant in the affected water body. Comparing these estimates and site environmental parameters with those for the previously evaluated site, i.e., Fermi, can provide some indication of the comparative hazard associated with drinking contaminated surface water among sites and the need for site-specific analyses. Accounting for population and meteorological data in the comparison can provide further indication of relative risk among sites.

The above-identified environmental parameters have been identified in the GEIS for the Clinton site. These same parameters are applicable for the EGC ESP Site (since these environmental parameters are generally constant for a given site and no major changes have been identified that would impact these parameters), thus, the drinking-water pathway and the aquatic food, swimming, and shoreline pathways for the EGC ESP Site are comparable to those considered in the GEIS evaluation. Therefore, the risk from the air fallout to a water body exposure pathway generally compares favorably with the risk to the population from atmospheric releases and the EGC ESP Site risks for the water body exposure pathway will also be within the range of those considered as “Small” in NUREG-1437.

7.2.2.3 Evaluation of Potential Releases to Groundwater

This section discusses the potential for radiation exposure from the groundwater pathway as the result of postulated severe accidents at a nuclear reactor on the EGC ESP Site. Severe accidents are the only accidents capable of producing significant groundwater contamination.

As identified in NUREG-1437, groundwater contamination due to severe accidents has been evaluated generically in NUREG-0440, Liquid Pathway Generic Study (LPGS) (USNRC, 1978). The LPGS assumes that core melt with subsequent basemat melt-through occurs, and evaluates the consequences. The LPGS examines six generic sites using typical or comparative assumptions on geology, adsorption factors, etc.

Per NUREG-1437, the LPGS results are believed to provide generally conservative uninterdicted population dose estimates in the six generic plant-site categories. Five of these categories are site groupings in common locations adjacent to small rivers, large rivers, the Great Lakes, oceans, and estuaries. In a severe accident, contaminated groundwater could reach nearby surface water bodies, and the population could be exposed to this source of contamination through drinking of surface water, ingestion of finfish and shellfish, and shoreline contact. Exposure by drinking contaminated groundwater is considered to be minor or nonexistent in these five categories because of a limited number of drinking-water wells. The sixth category is a “dry” site located either at a considerable distance from surface water bodies or where groundwater flow is away from a nearby surface water body. In this case, the only population exposure results from drinking contaminated groundwater.

NUREG-1437 concludes that the risk from the groundwater exposure pathway generally contributes only a small fraction of that risk attributable to the population from the atmospheric pathway but in a few cases may contribute a comparable risk.

In the GEIS analysis, site-specific information on groundwater travel time; retention-adsorption coefficients; distance to surface water; and soil, sediment, and rock characteristics is compared with previous groundwater contamination analyses. Previous analyses are contained in the LPGS and site-specific FESs. These environmental parameters have been identified in the GEIS for the Clinton site. These same parameters are applicable for the EGC ESP Site (since these environmental parameters are generally constant for a given site and no major changes have been identified that would impact these parameters); thus, the groundwater pathway for the EGC ESP Site is comparable to those considered in the GEIS evaluation.Therefore, the risk from the groundwater exposure pathway generally compares favorably with the risk to the population from atmospheric releases and the EGC ESP site risks for the groundwater exposure pathway will also be within the range of those considered as “Small” in NUREG-1437.

7.2.3 Evaluation of Economic Impacts of Severe Accidents

This section discusses the potential economic impact as the result of postulated severe accidents at a nuclear reactor on the EGC ESP Site. Similar to Section 7.2.2.1, the EI is used as a predictor of cost because, as identified in the GEIS, the cost should be dependent upon the economic impact in the same way and for the same reason that population dose estimates are dependent on the EI values.

As noted in NUREG-1437, FES analyses used the “Calculation of Reactor Accident Consequences” (CRAC) computer code to calculate off-site severe accident costs for the area contaminated by the accident. The off-site costs that were considered relate to avoidance of adverse health effects and are categorized as follows:

- Evacuation costs;
- Value of crops contaminated and condemned;
- Value of milk contaminated and condemned;
- Costs of decontamination of property where practical; and

- Indirect costs resulting from the loss of use of property and incomes derived therefrom (including interdiction to prevent human injury).

For those FES analyses that addressed severe accidents, the off-site accident costs were estimated to be to be as high as 6 billion dollars to 8 billion dollars (1994 dollars) but with accident probabilities that were extremely low (1E-6 years), as would be expected for this class of events. Because key variables (used in the FES cost analyses) are strongly related to population density, NUREG-1437 further evaluated the FES results using normalization techniques and the 150-mile EI values. This evaluation, which included the Clinton site, demonstrated that the FES cost predictions remained valid, even considering population changes represented by the EI values.

In addition, the generic NUREG-1437 predicted conditional land contamination is small (10 ac/yr at most). This is also consistent with (USNRC 1975) and a 1982 study on siting criteria (USNRC, 1982) which predicts small conditional land contamination values. The GEIS concluded that land contamination values for the evaluated plants can be considered representative of all plants since they cover the major vendor and containment types and include sites at the upper end of annual rainfall. However, even considering that land contamination values can vary at other sites, it is not expected that predicted land contamination from plants at other sites would vary more than 1 or 2 orders of magnitude from the values listed above and would, therefore, still be a small impact.Based on the evaluations of the expected economic costs and land contamination as a result of a severe accident, the GEIS concludes in Section 5.5.2.4 that the conditional impacts in both cases are of small significance for all plants. As for other aspects of the GEIS evaluation of severe accident impacts, this evaluation and conclusion is broadly applicable to beyond the license renewal context. Thus the economic impacts and land contamination resulting from postulated severe accidents at a new nuclear reactor or reactors on the EGC ESP Site should be comparable as well (i.e., within the range of those considered as "Small" in NUREG-1437).

7.2.4 Consideration of Commission Severe Accident Policy

In 1985, the USNRC adopted a Policy Statement on Severe Reactor Accidents Regarding Future Designs and Existing Plants (USNRC, 1985). This policy statement indicated:

> *"The Commission fully expects that vendors engaged in designing new standard (or custom) plants will achieve a higher standard of severe accident safety performance than their prior designs. This expectation is based on:*
>
> *The growing volume of information from industry and government-sponsored research and operating reactor experience has improved our knowledge of specific severe accident vulnerabilities and of low-cost methods for their mitigation. Further learning on safety vulnerabilities and innovative methods is to be expected.*
>
> *The inherent flexibility of this Policy Statement (that permits risk-risk tradeoffs in systems and sub-systems design) encourages thereby innovative ways of achieving an improved overall systems reliability at a reasonable cost.*
>
> *Public acceptance, and hence investor acceptance, of nuclear technology is dependent on demonstrable progress in safety performance, including the reduction in frequency of*

accident precursor events as well as a diminished controversy among experts as to the adequacy of nuclear safety technology."

Thus, implementation of the Commission's Severe Accident Policy can be expected to show that the environmental impact of any new reactor(s) on the EGC ESP Site will be within the range of risk previously determined to be "Small."

A significant factor in the risk associated with the plant design is the frequency of the considered accident sequences. As indicated above, the designs certified in accordance with 10 CFR 52 are expected to exhibit a "higher standard of severe accident safety performance than the prior designs." The ABWR is a currently certified design under 10 CFR 52, Appendix A, and is considered to be representative of advanced light water reactor standard designs. The USNRC Safety Evaluation Report (SER) for the ABWR states "the ABWR design and the submittals made for the ABWR in the SSAR meet the intent of the Commission's Policy Statement on Severe Reactor Accidents Regarding Future Designs and Existing Plants" (USNRC, 1994). Similar findings have been made for the other currently certified designs, i.e., the System 80+ and the AP-600. Thus, the Severe Accident Policy Statement expectations have been met for each of the three advanced standard designs considered to-date by the USNRC and are expected to continue to be met for future design certifications and COL approvals.

7.2.5 Conclusion

- The GEIS concludes, based on the generic evaluations presented, that the probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to ground water and societal and economic impacts from severe accidents are "Small" for all plants.
- As described above, the methodology and evaluations of the GEIS are applicable to the consideration of new plants in the ESP and/or COL context. Evaluation of site specific factors for purposes of this application have shown that the EGC ESP Site is within the range of sites considered in the GEIS. Thus we conclude that the GEIS conclusion is applicable to the EGC ESP Site.
- Use of pertinent site specific information to confirm the applicability of existing generic analyses is consistent with USNRC staff plans for addressing severe accident environmental impacts at ESP as identified in SECY-91-041 (USNRC, 1991).

In summary, the environmental impacts considered in NUREG-1437 evaluations include potential radiation exposures to individuals and to the population as a whole, the risk of near- and long-term adverse health effects that such exposures could entail, and the potential economic and societal consequences of accidental contamination of the environment. These impacts could be severe, but due to their low likelihood of occurrence, the impacts are judged to be small. This conclusion is based on (1) considerable experience gained with the operation of similar facilities without significant degradation of the environment; (2) the requirement that in order to obtain a license the applicant must comply with the applicable Commission regulations and requirements; and (3) a previously analyzed assessment of the risk of design-basis and severe accidents (USNRC, 1999).

Specifically, based on the USNRC and industry implementation of the 1985 policy statement, the generic NUREG-1437 risk evaluations, and the EGC ESP Site specific demography and meteorology, the probability weighted consequences of atmospheric and (surface and ground) water pathways, and the societal and economic impacts for severe accidents for a future nuclear power plant on the EGC ESP Site will also be "Small."

7.3 Severe Accident Mitigation Alternatives

The purpose of severe accident mitigation alternatives (SAMA) is to review and evaluate plant-design alternatives that could significantly reduce the radiological risk from a severe accident by preventing substantial core damage (i.e., preventing a severe accident) or by limiting releases from containment in the event that substantial core damage occurs (i.e., mitigating the impacts of a severe accident) (USNRC, 1999).

No design has been selected and SAMAs cannot be meaningfully discussed in this ESP application. SAMAs are design issues evaluated during standard design certification, and any discussion is more appropriately developed when a certified design is selected and submitted in a COL application. The design of the reactor and analyses of projected severe accidents are major contributing factors in the determination of SAMAs. In order to determine whether mitigation alternatives are cost beneficial, severe accident analyses must be included in these evaluations. A design has not been selected; therefore, these mitigation alternatives cannot be meaningfully evaluated in this Application for the EGC ESP.

7.4 Transportation Accidents

The assessment of transportation accidents is provided in Section 3.8.

CHAPTER 7

References

Chapter Introduction

None

Section 7.1

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Section 7.4

None

CHAPTER 7

Tables

TABLE 7.1-1

PBMR Design Basis Event Curies Released to Environment by Interval

Isotope	**0 to 2 hr**	**2 to 720 hr**
C-14	3.87E+02	0
Br-83	2.00E-02	0
Br-84	8.00E-02	0
Br-85	4.70E-01	0
I-131	0	2.43E+01
I-132	1.10E-01	5.00E-02
I-133	3.00E-02	8.11E+00
I-134	3.80E-01	0
I-135	7.00E-02	7.90E-01
I-136	1.00E-02	0
Kr-83m	2.42E+00	2.00E-02
Kr-85m	7.14E+00	6.40E-01
Kr-85	2.60E+00	1.96E+00
Kr-87	9.84E+00	2.00E-02
Kr-88	1.69E+01	5.60E-01
Kr-89	5.85E+00	0
Kr-90	2.92E+00	0
Kr-91	1.39E+00	2.88E+00
Xe-131m	4.90E-01	8.19E+00
Xe-133m	1.38E+00	4.72E+02
Xe-133	6.01E+01	0
Xe-135m	2.36E+00	1.90E+00
Xe-135	9.28E+00	0
Xe-137	6.17E+00	0
Xe-138	1.13E+01	0
Xe-139	1.78E+00	0
Xe-140	7.90E-01	0

TABLE 7.1-1

PBMR Design Basis Event Curies Released to Environment by Interval

Isotope	0 to 2 hr	2 to 720 hr
Sr-90	2.00E-05	0
Cs-137	3.00E-04	0

Note: Bounding activities released based on PBMR and GT-MHR.

TABLE 7.1-2

Comparison of Reactor Types for Limiting Off-Site Dose Consequences

Design Basis Accident	ESP EAB Dose TEDE (rem)	Vendor EAB Dose TEDE (rem)	ESP/Vendor EAB X/Q Ratio	ESP LPZ Dose TEDE (rem)	Vendor LPZ Dose TEDE (rem)	ESP/Vendor LPZ X/Q Ratio
AP1000 Reactor						
Main Steam Line Break						
Accident-initiated Iodine Spike						
0 -2 hrs	4.75E-02	8.00E-01	5.93E-02			
0 - 8 hrs				1.61E-02	6.4E-01	2.52E-02
8 - 24 hrs				1.20E-02	4.2E-01	2.85E-02
24 -96 hrs				2.16E-02	6.3E-01	3.43E-02
Total	**4.75E-02**	**8.00E-01**		**4.97E-02**	**1.69E+00**	
Preexisting Iodine Spike						
0 -2 hrs	4.15E-02	7.00E-01	5.93E-02			
0 - 8 hrs				6.04E-03	2.40E-01	2.52E-02
8 - 24 hrs				2.28E-03	8.00E-02	2.85E-02
24 -96 hrs				4.45E-03	1.30E-01	3.43E-02
Total	**4.15E-02**	**7.00E-01**		**1.28E-02**	**4.50E-01**	
Reactor Coolant Pump Locked Rotor						
0 -2 hrs	1.48E-01	2.50E+00	5.93E-02			
0 - 8 hrs				1.51E-02	6.00E-01	2.52E-02
Total	**1.48E-01**	**2.50E+00**		**1.51E-02**	**6.00E-01**	
Control Rod Ejection Accident						
0 -2 hrs	1.78E-01	3.00E+00	5.93E-02			
0 - 8 hrs				3.53E-02	1.4E+00	2.52E-02
8 - 24 hrs				7.41E-03	2.6E-01	2.85E-02
24 -96 hrs				1.58E-03	4.6E-02	3.43E-02
96 - 720 hrs				5.45E-04	1.2E-02	4.55E-02
Total	**1.78E-01**	**3.00E+00**		**4.48E-02**	**1.72E+00**	
Steam Generator Tube Rupture						
Accident-initiated Iodine Spike						
0 -2 hrs	8.90E-02	1.50E+00	5.93E-02	-	-	-

TABLE 7.1-2

Comparison of Reactor Types for Limiting Off-Site Dose Consequences

Design Basis Accident	ESP EAB Dose TEDE (rem)	Vendor EAB Dose TEDE (rem)	ESP/Vendor EAB X/Q Ratio	ESP LPZ Dose TEDE (rem)	Vendor LPZ Dose TEDE (rem)	ESP/Vendor LPZ X/Q Ratio
0 – 8 hrs				4.53E-03	1.80E-01	2.52E-02
8 – 24 hrs				2.05E-03	7.2E-02	2.85E-02
Total	**8.90E-02**	**1.50E+00**		**6.60E-03**	**2.52E-01**	
Preexisting Iodine Spike						
0 –2 hrs	1.78E-01	3.00E+00	5.93E-02	-	-	
0 - 8 hrs				8.06E-03	3.20E-01	2.52E-02
8 - 24 hrs				7.41E-04	2.60E-02	2.85E-02
Total	**1.78E-01**	**3.00E+00**		**8.80E-03**	**3.46E-01**	
Small Line Break						
0 -2 hrs	7.71E-02	1.30E+00	5.93E-02			
0 - 8 hrs				7.56E-03	3.00E-01	2.52E-02
Total	**7.71E-02**	**1.30E+00**		**7.56E-03**	**3.00E-01**	
Fuel Handling Accident						
0 -2 hrs	1.42E-01	2.40E+00	5.93E-02			
0 - 8 hrs				1.51E-02	6.00E-01	2.52E-02
Total	**1.42E-01**	**2.40E+00**		**1.51E-02**	**6.00E-01**	
Loss of Coolant Accident						
1 - 3 hrs	1.47E+00	2.48E+01	5.93E-02			
0 - 8 hrs				2.32E-01	9.20E+00	2.52E-02
8 - 24 hrs				9.41E-03	3.30E-01	2.85E-02
24 -96 hrs				1.06E-02	3.10E-01	3.43E-02
96 - 720 hrs				1.32E-02	2.90E-01	4.55E-02
Total	**1.47E+00**	**2.48E+01**		**2.65E-01**	**1.01E+01**	
ABWR						
Main Steam Line Break						
Max Equilibrium Iodine Activity						
0 -2 hrs	3.43E-03	1.32E-01	2.60E-02			

TABLE 7.1-2
Comparison of Reactor Types for Limiting Off-Site Dose Consequences

Design Basis Accident	ESP EAB Dose TEDE (rem)	Vendor EAB Dose TEDE (rem)	ESP/Vendor EAB X/Q Ratio	ESP LPZ Dose TEDE (rem)	Vendor LPZ Dose TEDE (rem)	ESP/Vendor LPZ X/Q Ratio
0 - 8 hrs				3.28E-04	1.50E-02	2.18E-02
Total	**3.43E-03**	**1.32E-01**		**3.28E-04**	**1.50E-02**	
Preexisting Iodine Spike						
0 -2 hrs	6.85E-02	2.63E+00	2.60E-02			
0 - 8 hrs				6.54E-03	3.00E-01	2.18E-02
Total	**6.85E-02**	**2.63E+00**		**6.54E-03**	**3.00E-01**	
Control Rod Drop Accident	*Not Applicable to the ABWR design*					
Small Line Break						
0 -2 hrs	2.97E-03	1.14E-01	2.60E-02			
0 - 8 hrs				5.75E-04	2.64E-02	2.18E-02
Total	**2.97E-03**	**1.14E-01**		**5.75E-04**	**2.64E-02**	
Fuel Handling Accident						
0 -2 hrs	8.04E-02	3.09E+00	2.60E-02			
0 - 8 hrs				9.78E-03	4.49E-01	2.18E-02
Total	**8.04E-02**	**3.09E+00**		**9.78E-03**	**4.49E-01**	
Loss of Coolant Accident						
0 - 2 hrs	2.35E-01	9.04E+00	2.60E-02			
0 - 8 hrs				3.78E-02	1.73E+00	2.18E-02
8 - 24 hrs				3.20E-02	1.08E+00	2.97E-02
24 -96 hrs				1.65E-01	2.99E+00	5.51E-02
96 - 720 hrs				5.29E-01	3.92E+00	1.35E-01
Total	**2.35E-01**	**9.04E+00**		**7.63E-01**	**9.73E+00**	

TABLE 7.1-2A

Ratio of EGC ESP 50% Accident Site Chi/Q Values to AP1000 Final Design Approval (FDA) Chi/Q Values

Post Accident Time Period (hr)	EGC ESP Site Chi/Q Values(sec/m^3)	AP1000 Chi/Q Values (sec/m^3)	Chi/Q Ratio
			EGC Site / AP1000 FDA
EAB[1] 0 - 2	3.56E-05	6.00E-04	5.93E-02
LPZ			
0 - 8	3.40E-06	1.35E-04	2.52E-02
8 -24	2.85E-06	1.00E-04	2.85E-02
24 -96	1.85E-06	5.40E-05	3.43E-02
96 - 720	1.00E-06	2.20E-05	4.55E-02

Note 1: 2 hour period with greatest EAB dose consequences.

TABLE 7.1-3
AP1000 Main Steam Line Break Curies Released to Environment by Interval - Accident-Initiated Iodine Spike

Isotope	0 to 2 hr	2 to 8 hr	8 to 24 hr	24 to 96 hr
I-130	6.84E-01	3.33E+00	5.27E+00	3.30E+00
I-131	3.92E+01	1.92E+02	5.18E+02	1.35E+03
I-132	9.12E+01	3.26E+02	7.46E+01	6.00E-01
I-133	7.75E+01	3.81E+02	7.54E+02	8.34E+02
I-134	3.03E+01	6.23E+01	8.85E-01	2.78E-06
I-135	5.57E+01	2.59E+02	2.61E+02	5.82E+01
Kr-85m	2.30E-01	3.82E-01	2.26E-01	2.03E-02
Kr-85	9.47E-01	2.83E+00	7.47E+00	2.17E+01
Kr-87	9.24E-02	4.49E-02	1.76E-03	2.84E-07
Kr-88	3.77E-01	4.59E-01	1.34E-01	2.72E-03
Xe-131m	4.28E-01	1.27E+00	3.26E+00	8.78E+00
Xe-133m	5.31E-01	1.51E+00	3.45E+00	6.69E+00
Xe-133	3.95E+01	1.15E+02	2.87E+02	7.03E+02
Xe-135m	1.02E-02	4.44E-05	0	0
Xe-135	1.04E+00	2.31E+00	2.78E+00	1.11E+00
Xe-138	1.34E-02	3.81E-05	0	0
Cs-134	1.91E+01	6.52E-01	1.72E+00	5.00E+00
Cs-136	2.84E+01	9.57E-01	2.47E+00	6.69E+00
Cs-137	1.38E+01	4.70E-01	1.24E+00	3.61E+00
Cs-138	1.02E+01	3.41E-03	1.48E-06	0

TABLE 7.1-4
AP1000 Main Steam Line Break Curies Released to Environment by Interval - Preexisting Iodine Spike

Isotope	0 to 2 hr	2 to 8 hr	8 to 24 hr	24 to 96 hr
I-130	4.98E-01	4.74E-01	6.95E-01	4.36E-01
I-131	3.37E+01	4.05E+01	1.03E+02	2.67E+02
I-132	4.02E+01	1.39E+01	2.68E+00	2.16E-02
I-133	6.03E+01	6.35E+01	1.17E+02	1.30E+02
I-134	8.24E+00	5.47E-01	4.77E-03	1.50E-08
I-135	3.56E+01	2.73E+01	2.51E+01	5.60E+00
Kr-85m	2.30E-01	3.82E-01	2.26E-01	2.03E-02
Kr-85	9.47E-01	2.83E+00	7.47E+00	2.17E+01
Kr-87	9.24E-02	4.49E-02	1.76E-03	2.84E-07
Kr-88	3.77E-01	4.59E-01	1.34E-01	2.72E-03
Xe-131m	4.28E-01	1.27E+00	3.26E+00	8.78E+00
Xe-133m	5.31E-01	1.51E+00	3.45E+00	6.69E+00
Xe-133	3.95E+01	1.15E+02	2.87E+02	7.03E+02
Xe-135m	1.02E-02	4.44E-05	0	0
Xe-135	1.04E+00	2.31E+00	2.78E+00	1.11E+00
Xe-138	1.34E-02	3.81E-05	0	0
Rb-86	*	*	*	*
Cs-134	1.91E+01	6.52E-01	1.72E+00	5.00E+00
Cs-136	2.84E+01	9.57E-01	2.47E+00	6.69E+00
Cs-137	1.38E+01	4.70E-01	1.24E+00	3.61E+00
Cs-138	1.02E+01	3.41E-03	1.48E-06	0

Note: * = Rb-86 contribution considered negligible for this accident.

TABLE 7.1-5
AP1000 Main Steam Line Break - Accident-Initiated Iodine Spike

Time	Exclusion Area Boundary Dose TEDE (rem)	Low Population Zone Dose TEDE (rem)
0 to 2 hrs	4.75E-02	--
0 to 8 hrs	--	1.61E-02
8 to 24 hrs	--	1.20E-02
24 to 96 hrs	--	2.16E-02
96 to 720 hrs	--	0
Total	4.75E-02	4.97E-02

TABLE 7.1-6
AP1000 Main Steam Line Break - Preexisting Iodine Spike

Time	Exclusion Area Boundary Dose TEDE (rem)	Low Population Zone Dose TEDE (rem)
0 to 2 hrs	4.15E-02	--
0 to 8 hrs	--	6.04E-03
8 to 24 hrs	--	2.28E-03
24 to 96 hrs	--	4.45E-03
96 to 720 hrs	--	0
Total	4.15E-02	1.28E-02

TABLE 7.1-7
ABWR Main Steam Line Break Outside Containment

Isotope	Maximum Equilibrium Value for Full Power Operation Curies Released 0 to 2 hr	Preexisting Iodine Spike Curies Released 0 to 2 hr
I-131	1.97E+00	3.95E+01
I-132	1.92E+01	3.84E+02
I-133	1.35E+01	2.70E+02
I-134	3.78E+01	7.54E+02
I-135	1.97E+01	3.95E+02
Kr-83m	1.10E-02	6.59E-02
Kr-85m	1.94E-02	1.16E-01
Kr-85	6.11E-05	3.68E-04
Kr-87	6.59E-02	3.97E-01
Kr-88	6.65E-02	4.00E-01
Kr-89	2.67E-01	1.60E+00
Kr-90	6.89E-02	4.19E-01
Xe-131m	4.76E-05	2.86E-04
Xe-133m	9.16E-04	5.51E-03
Xe-133	2.56E-02	1.54E-01
Xe-135m	7.81E-02	4.59E-01
Xe-135	7.30E-02	4.38E-01
Xe-137	3.32E-01	2.00E+00
Xe-138	2.55E-01	1.53E+00
Xe-139	1.17E-01	7.00E-01

TABLE 7.1-8
ABWR Main Steam Line Break Outside Containment -Maximum Equilibrium Value for Full Power Operation

Dose Type	EAB (rem)	LPZ (rem)
Thyroid	6.64E-02	6.34E-03
Whole Body	1.46E-03	1.39E-04
TEDE	3.43E-03	3.28E-04

TABLE 7.1-9
ABWR Main Steam Line Break Outside Containment - Preexisting Iodine Spike

Dose Type	EAB (rem)	LPZ (rem)
Thyroid	1.33E+00	1.27E-01
Whole Body	2.89E-02	2.76E-03
TEDE	6.85E-02	6.54E-03

TABLE 7.1-10
AP1000 Locked Rotor Accident Curies Released to Environment

Isotope	0 to 1.5 hr
I-130	4.15E+00
I-131	1.83E+02
I-132	1.33E+02
I-133	2.31E+02
I-134	1.44E+02
I-135	2.04E+02
Kr-85m	4.09E+02
Kr-85	3.77E+01
Kr-87	6.05E+02
Kr-88	1.05E+03
Xe-131m	1.87E+01
Xe-133m	1.02E+02
Xe-133	3.33E+03
Xe-135m	1.63E+02
Xe-135	8.01E+02
Xe-138	6.48E+02
Rb-86	6.69E-02
Cs-134	5.83E+00
Cs-136	1.85E+00
Cs-137	3.42E+00
Cs-138	3.05E+01

TABLE 7.1-11
AP1000 Locked Rotor Accident, 0 to 1.5 hr Duration - Preexisting Iodine Spike

Time	Exclusion Area Boundary Dose TEDE (rem)	Low Population Zone Dose TEDE (rem)
0 to 2 hr	1.48E-01	--
0 to 8 hr	--	1.51E-02
8 to 24 hr	--	0
24 to 96 hr	--	0
96 to 720 hr	--	0
Total	1.48E-01	1.51E-02

TABLE 7.1-12
AP1000 Control Rod Ejection Accident Curies Released to Environment by Interval - Preexisting Iodine Spike

Isotope	0 to 2 hr	2 to 8 hr	8 to 24 hr	24 to 96 hr	96 to 720 hr
I-130	5.93E+00	7.28E+00	4.32E+00	4.06E-01	5.88E-04
I-131	1.64E+02	2.45E+02	2.31E+02	6.20E+01	3.33E+01
I-132	1.90E+02	9.94E+01	9.85E+00	1.65E-02	0
I-133	3.29E+02	4.40E+02	3.18E+02	4.56E+01	4.81E-01
I-134	2.18E+02	2.85E+01	1.37E-01	8.96E-08	0
I-135	2.91E+02	2.97E+02	1.19E+02	4.79E+00	1.46E-04
Kr-85m	2.85E+02	6.48E+01	3.87E+01	3.53E+00	5.01E-05
Kr-85	1.24E+01	5.60E+00	1.49E+01	6.70E+01	5.71E+02
Kr-87	4.86E+02	2.60E+01	1.03E+00	1.67E-04	0
Kr-88	7.49E+02	1.18E+02	3.49E+01	7.18E-01	1.68E-08
Xe-131m	1.22E+01	5.46E+00	1.42E+01	5.72E+01	2.31E+02
Xe-133m	6.62E+01	2.81E+01	6.49E+01	1.69E+02	1.06E+02
Xe-133	2.18E+03	9.58E+02	2.40E+03	8.53E+03	1.68E+04
Xe-135m	2.18E+02	5.30E-02	4.33E-09	0	0
Xe-135	5.39E+02	1.72E+02	2.09E+02	8.69E+01	3.58E-01
Xe-138	8.89E+02	1.38E-01	3.19E-09	0	0
Rb-86	3.70E-01	7.27E-01	6.96E-01	1.73E-01	6.79E-02
Cs-134	3.15E+01	6.22E+01	6.03E+01	1.55E+01	1.03E+01
Cs-136	8.98E+00	1.75E+01	1.67E+01	4.10E+00	1.31E+00
Cs-137	1.83E+01	3.62E+01	3.51E+01	9.04E+00	6.05E+00
Cs-138	1.13E+02	7.05E+00	1.68E-03	0	0

TABLE 7.1-13
AP1000 Control Rod Ejection Accident - Preexisting Iodine Spike

Time	Exclusion Area Boundary Dose TEDE (rem)	Low Population Zone Dose TEDE (rem)
0 to 2 hr	1.78E-01	--
0 to 8 hr	--	3.53E-02
8 to 24 hr	--	7.41E-03
24 to 96 hr	--	1.58E-03
96 to 720 hr	--	5.45E-04
Total	1.78E-01	4.48E-02

TABLE 7.1-14
AP1000 Steam Generator Tube Rupture Accident Curies Released to Environment by Interval - Accident Initiated Iodine Spike

Isotope	0 to 2 hr	2 to 8 hr	8 to 24 hr
I-130	7.30E-02	1.19E-02	3.13E-02
I-131	4.90E+00	1.15E+00	3.55E+00
I-132	5.79E+00	1.75E-01	2.30E-01
I-133	8.79E+00	1.68E+00	4.73E+00
I-134	1.12E+00	1.18E-03	5.21E-04
I-135	5.15E+00	6.01E-01	1.36E+00
Kr-85m	5.67E+01	1.91E+01	2.50E-02
Kr-85	2.25E+02	1.07E+02	4.44E-01
Kr-87	2.46E+01	3.56E+00	3.02E-04
Kr-88	9.44E+01	2.61E+01	1.80E-02
Xe-131m	1.02E+02	4.82E+01	1.96E-01
Xe-133m	1.26E+02	5.83E+01	2.19E-01
Xe-133	9.37E+03	4.41E+03	1.75E+01
Xe-135m	3.61E+00	5.78E-03	0
Xe-135	2.51E+02	1.00E+02	2.35E-01
Xe-138	4.78E+00	4.99E-03	0
Rb-86	*	*	*
Cs-134	1.65E+00	6.35E-02	2.27E-01
Cs-136	2.45E+00	9.30E-02	3.30E-01
Cs-137	1.19E+00	4.58E-02	1.64E-01
Cs-138	5.71E-01	3.07E-06	6.00E-07

Note: * = Rb-86 contribution considered negligible for this accident.

TABLE 7.1-15
AP1000 Steam Generator Tube Rupture Accident Curies Released to Environment by Interval - Preexisting Iodine Spike

Isotope	0 to 2 hr	2 to 8 hr	8 to 24 hr
I-130	1.81E+00	6.12E-02	2.90E-01
I-131	1.22E+02	5.97E+00	3.32E+01
I-132	1.43E+02	8.53E-01	2.08E+00
I-133	2.19E+02	8.68E+00	4.41E+01
I-134	2.78E+01	5.16E-03	4.57E-03
I-135	1.28E+02	3.06E+00	1.26E+01
Kr-85m	5.67E+01	1.91E+01	2.50E-02
Kr-85	2.25E+02	1.07E+02	4.44E-01
Kr-87	2.46E+01	3.56E+00	3.02E-04
Kr-88	9.44E+01	2.61E+01	1.80E-02
Xe-131m	1.02E+02	4.82E+01	1.96E-01
Xe-133m	1.26E+02	5.83E+01	2.19E-01
Xe-133	9.37E+03	4.41E+03	1.75E+01
Xe-135m	3.61E+00	5.78E-03	0
Xe-135	2.51E+02	1.00E+02	2.35E-01
Xe-138	4.78E+00	4.99E-03	0
Rb-86	*	*	*
Cs-134	1.65E+00	6.35E-02	2.27E-01
Cs-136	2.45E+00	9.30E-02	3.30E-01
Cs-137	1.19E+00	4.58E-02	1.64E-01
Cs-138	5.71E-01	3.07E-06	6.00E-07

Note: * = Rb-86 contribution considered negligible for this accident.

TABLE 7.1-16
AP1000 Steam Generator Tube Rupture - Accident-Initiated Iodine Spike

Time	Exclusion Area Boundary Dose TEDE (rem)	Low Population Zone Dose TEDE (rem)
0 to 2 hr	8.90E-02	--
0 to 8 hr	--	4.53E-03
8 to 24 hr	--	2.05E-03
24 to 96 hr	--	0
96 to 720 hr	--	0
Total	8.90E-02	6.59E-03

TABLE 7.1-17
AP1000 Steam Generator Tube Rupture - Preexisting Iodine Spike

Time	Exclusion Area Boundary Dose TEDE (rem)	Low Population Zone Dose TEDE (rem)
0 to 2 hr	1.78E-01	--
0 to 8 hr	--	8.06E-03
8 to 24 hr	--	7.41E-04
24 to 96 hr	--	0
96 to 720 hr	--	0
Total	1.78E-01	8.80E-03

TABLE 7.1-18
AP1000 Small Line Break Accident Curies Released to Environment - Accident Initiated Iodine Spike

Isotope	0 to 0.5 hr
I-130	1.90E+00
I-131	9.26E+01
I-132	3.49E+02
I-133	2.01E+02
I-134	1.58E+02
I-135	1.68E+02
Kr-85m	1.24E+01
Kr-85	4.40E+01
Kr-87	7.00E+00
Kr-88	2.21E+01
Xe-131m	1.99E+1
Xe-133m	2.50E+01
Xe-133	1.84E+02
Xe-135m	2.60E+00
Xe-135	5.20E+01
Xe-138	3.60E+00
Cs-134	4.20E+00
Cs-136	6.20E+00
Cs-137	3.00E+00
Cs-138	2.20E+00

TABLE 7.1-19
AP1000 Small Line Break Accident, 0- to 0.5-hr Duration - Accident-Initiated Iodine Spike

Time	Exclusion Area Boundary Dose TEDE (rem)	Low Population Zone Dose TEDE (rem)
0 to 2 hr	7.71E-02	--
0 to 8 hr	--	7.56E-03
8 to 24 hr	--	0
24 to 96 hr	--	0
96 to 720 hr	--	0
Total	7.71E-02	7.56E-03

TABLE 7.1-20
ABWR Small Line Break Outside Containment - Activity Released to Environment

Isotope	Curies Released 0 to 2 hr	Curies Released 0 to 8 hr
I-131	1.84E+00	3.81E+00
I-132	1.61E+01	3.22E+01
I-133	1.24E+01	2.55E+01
I-134	2.68E+01	5.14E+01
I-135	1.78E+01	3.62E+01
Total	7.50E+01	1.49E+02

TABLE 7.1-21
ABWR Small Line Break Outside Primary Containment

Dose Type	EAB (rem)	LPZ (rem)
Thyroid	6.10E-02	1.20E-02
Whole Body	1.14E-03	2.16E-04
TEDE	2.97E-03	5.75E-04

TABLE 7.1-22
AP1000 Design Basis Loss of Coolant Accident Curies Released to Environment by Interval

Isotope	0 to 1 hr	1 to 3 hr	0 to 8 hr	8 to 24 hr	24 to 96 hr	96 to 720 hr
Halogen Group						
I-130	5.62E+00	4.92E+01	7.80E+01	2.96E+00	1.11E+00	1.99E-02
I-131	1.54E+02	1.44E+03	2.36E+03	1.56E+02	3.74E+02	1.12E+03
I-132	1.79E+02	1.18E+03	1.67E+03	7.64E+00	2.29E-02	0
I-133	3.11E+02	2.80E+03	4.51E+03	2.16E+02	1.63E+02	1.62E+01
I-134	1.96E+02	7.51E+02	1.02E+03	1.26E-01	1.07E-07	0
I-135	2.75E+02	2.27E+03	3.50E+03	8.31E+01	9.55E+00	4.95E-03
Noble Gas Group						
Kr-85m	6.74E+01	1.31E+03	3.77E+03	1.87E+03	1.71E+02	2.43E-03
Kr-85	3.08E+00	7.32E+01	2.96E+02	7.05E+02	3.17E+03	2.70E+04
Kr-87	9.54E+01	1.14E+03	1.94E+03	4.97E+01	8.11E-03	0
Kr-88	1.70E+02	2.95E+03	7.26E+03	1.70E+03	3.49E+01	8.16E-07
Xe-131m	3.07E+00	7.28E+01	2.94E+02	6.79E+02	2.74E+03	1.11E+04
Xe-133m	1.68E+01	3.92E+02	1.54E+03	3.15E+03	8.21E+03	5.15E+03
Xe-133	5.49E+02	1.30E+04	5.19E+04	1.16E+05	4.11E+05	8.10E+05
Xe-135m	1.44E+01	2.14E+01	3.59E+01	2.14E-07	0	0
Xe-135	1.32E+02	2.85E+03	9.64E+03	1.01E+04	4.21E+03	1.73E+01
Xe-138	5.31E+01	6.69E+01	1.20E+02	1.58E-07	0	0
Alkali Metal Group						
Rb-86	3.32E-01	2.61E+00	4.26E+00	9.37E-02	2.03E-03	1.05E-02
Cs-134	2.81E+01	2.22E+02	3.63E+02	8.06E+00	1.88E-01	1.59E+00
Cs-136	8.01E+00	6.30E+01	1.03E+02	2.25E+00	4.72E-02	2.03E-01
Cs-137	1.64E+01	1.29E+02	2.11E+02	4.70E+00	1.10E-01	9.39E-01
Cs-138	1.06E+02	2.06E+02	3.19E+02	6.92E-04	0	0
Tellurium Group						
Sr-89	3.23E+00	7.56E+01	1.19E+02	2.87E+00	6.54E-02	4.60E-01
Sr-90	2.78E-01	6.52E+00	1.03E+01	2.48E-01	5.82E-03	4.97E-02
Sr-91	3.77E+00	8.14E+01	1.22E+02	1.74E+00	2.76E-03	1.44E-05
Sr-92	3.45E+00	6.13E+01	8.30E+01	3.26E-01	1.06E-05	0
Sb-127	8.55E-01	1.98E+01	3.11E+01	7.13E-01	1.16E-02	1.60E-02
Sb-129	2.25E+00	4.43E+01	6.28E+01	4.83E-01	1.01E-04	1.00E-09
Te-127m	1.10E-01	2.58E+00	4.06E+00	9.83E-02	2.27E-03	1.77E-02

TABLE 7.1-22
AP1000 Design Basis Loss of Coolant Accident Curies Released to Environment by Interval

Isotope	0 to 1 hr	1 to 3 hr	0 to 8 hr	8 to 24 hr	24 to 96 hr	96 to 720 hr
Te-127	7.99E-01	1.72E+01	2.57E+01	3.65E-01	5.63E-04	2.72E-06
Te-129m	3.76E-01	8.80E+00	1.38E+01	3.33E-01	7.47E-03	4.79E-02
Te-129	1.50E+00	1.89E+01	2.32E+01	8.54E-03	7.27E-10	0
Te-131m	1.15E+00	2.62E+01	4.05E+01	8.29E-01	6.86E-03	1.60E-03
Te-132	1.14E+01	2.65E+02	4.15E+02	9.42E+00	1.44E-01	1.60E-01
Ba-139	3.83E+00	5.30E+01	6.63E+01	4.73E-02	2.03E-08	0
Ba-140	5.71E+00	1.33E+02	2.10E+02	5.00E+00	1.05E-01	4.41E-01
Noble Metals Group						
Mo-99	7.63E-01	1.77E+01	2.76E+01	6.19E-01	8.79E-03	7.72E-03
Tc-99m	6.09E-01	1.26E+01	1.83E+01	1.94E-01	1.08E-04	2.73E-08
Ru-103	6.07E-01	1.42E+01	2.23E+01	5.38E-01	1.21E-02	8.11E-02
Ru-105	3.59E-01	7.08E+00	1.01E+01	7.97E-02	1.82E-05	2.40E-10
Ru-106	2.00E-01	4.67E+00	7.36E+00	1.78E-01	4.16E-03	3.46E-02
Rh-105	3.70E-01	8.48E+00	1.32E+01	2.76E-01	2.64E-03	8.48E-04
Lanthanide Group						
Y-90	2.90E-03	6.65E-02	1.04E-01	2.32E-03	3.25E-05	2.75E-05
Y-91	4.19E-02	9.71E-01	1.53E+00	3.69E-02	8.43E-04	6.09E-03
Y-92	3.70E-02	6.93E-01	9.64E-01	5.77E-03	5.86E-07	0
Y-93	4.75E-02	1.02E+00	1.53E+00	2.25E-02	4.05E-05	2.91E-07
Nb-95	5.64E-02	1.31E+00	2.06E+00	4.95E-02	1.11E-03	7.23E-03
Zr-95	5.61E-02	1.30E+00	2.05E+00	4.94E-02	1.13E-03	8.29E-03
Zr-97	5.35E-02	1.19E+00	1.81E+00	3.26E-02	1.38E-04	7.58E-06
La-140	6.06E-02	1.38E+00	2.14E+00	4.58E-02	4.84E-04	1.97E-04
La-141	4.69E-02	8.98E-01	1.26E+00	8.69E-03	1.31E-06	0
La-142	3.58E-02	5.15E-01	6.53E-01	6.67E-04	6.96E-10	0
Nd-147	2.19E-02	5.06E-01	7.95E-01	1.89E-02	3.88E-04	1.49E-03
Pr-143	4.93E-02	1.14E+00	1.79E+00	4.27E-02	9.01E-04	3.95E-03
Am-241	4.23E-06	9.81E-05	1.54E-04	3.74E-06	8.75E-08	7.48E-07
Cm-242	9.98E-04	2.31E-02	3.64E-02	8.81E-04	2.04E-05	1.64E-04
Cm-244	1.22E-04	2.84E-03	4.47E-03	1.08E-04	2.53E-06	2.16E-05
Cerium Group						
Ce-141	1.37E-01	3.19E+00	5.02E+00	1.21E-01	2.71E-03	1.72E-02

TABLE 7.1-22
AP1000 Design Basis Loss of Coolant Accident Curies Released to Environment by Interval

Isotope	0 to 1 hr	1 to 3 hr	0 to 8 hr	8 to 24 hr	24 to 96 hr	96 to 720 hr
Ce-143	1.25E-01	2.85E+00	4.42E+00	9.20E-02	8.29E-04	2.34E-04
Ce-144	1.03E-01	2.41E+00	3.80E+00	9.19E-02	2.14E-03	1.77E-02
Pu-238	3.22E-04	7.51E-03	1.18E-02	2.86E-04	6.71E-06	5.73E-05
Pu-239	2.83E-05	6.60E-04	1.04E-03	2.52E-05	5.90E-07	5.04E-06
Pu-240	4.15E-05	9.69E-04	1.53E-03	3.69E-05	8.65E-07	7.39E-06
Pu-241	9.33E-03	2.17E-01	3.42E-01	8.30E-03	1.94E-04	1.66E-03
Np-239	1.60E+00	3.69E+01	5.76E+01	1.27E+00	1.67E-02	1.17E-02

TABLE 7.1-23
AP1000 Design Basis Loss of Coolant Accident

Time	Exclusion Area Boundary Dose TEDE (rem)	Low Population Zone Dose TEDE (rem)
1 to 3 hr	1.47E+00	--
0 to 8 hr	--	2.32E-01
8 to 24 hr	--	9.41E-03
24 to 96 hr	--	1.06E-02
96 to 720 hr	--	1.32E-02
Total	1.47E+00	2.65E-01

Notes: 2-hr period with greatest EAB dose shown. LOCA based on Regulatory Guide 1.183 (USNRC, 2000).

TABLE 7.1-24
ABWR LOCA Curies Released to Environment by Interval

Isotope	0 to 2 hr (Ci)	0 to 8 hr (Ci)	8 to 24 hr (Ci)	24 to 96 hr (Ci)	96 to 720 hr (Ci)
I-131	2.60E+02	3.74E+02	9.23E+02	8.70E+03	6.22E+04
I-132	3.52E+02	3.85E+02	3.24E+01	0	0
I-133	5.41E+02	7.43E+02	1.18E+03	3.32E+03	6.76E+02
I-134	5.14E+02	5.15E+02	0	0	0
I-135	5.14E+02	6.47E+02	3.32E+02	1.68E+02	0
Kr-83m	3.26E+02	9.00E+02	4.32E+01	0	0
Kr-85m	8.44E+02	3.74E+03	4.36E+03	7.03E+02	0
Kr-85	4.09E+01	3.49E+02	2.19E+03	2.18E+04	2.86E+05
Kr-87	1.20E+03	2.17E+03	8.92E+01	2.70E+00	0
Kr-88	2.12E+03	7.14E+03	3.43E+03	2.97E+02	0
Kr-89	1.81E+02	1.81E+02	0	0	0
Xe-131m	2.13E+01	1.72E+02	1.12E+03	9.52E+03	6.22E+04
Xe-133m	3.00E+02	2.48E+03	1.38E+04	7.59E+04	7.27E+04
Xe-133	7.63E+03	6.11E+04	3.77E+05	2.78E+06	8.41E+06
Xe-135m	4.87E+02	4.87E+02	0	0	0
Xe-135	9.26E+02	5.51E+03	1.52E+04	1.17E+04	0
Xe-137	5.14E+02	5.14E+02	0	0	0
Xe-138	2.00E+03	2.00E+03	0	0	0

TABLE 7.1-25
ABWR Design Basis Loss of Coolant Accident

Dose Type	EAB (rem)	LPZ (rem)
Thyroid	4.96E+00	2.15E+01
Whole Body	1.02E-01	1.79E-01
TEDE	2.35E-01	7.63E-01

TABLE 7.1-26
ESBWR Design Basis Loss of Coolant Accident Curies Released to Environment by Interval

Isotope	0 to 1.4 hr	1.4 to 3.4 hr	0 to 8 hr	8 to 24 hr	24 to 96 hr	96 to 720 hr
Halogen Group						
I-131	9.28E+01	2.85E+02	8.72E+02	1.60E+03	5.09E+03	6.64E+03
I-132	1.21E+02	3.11E+02	7.18E+02	4.42E+02	1.02E+03	4.80E+02
I-133	1.89E+02	5.56E+02	1.62E+03	2.09E+03	2.36E+03	1.50E+02
I-134	1.01E+02	1.09E+02	2.31E+02	0	0	0
I-135	1.66E+02	4.42E+02	1.16E+03	6.90E+02	1.40E+02	0
Noble Gas Group						
Kr-85m	1.09E+02	7.25E+02	2.90E+03	3.83E+03	6.40E+02	0
Kr-85	3.56E+00	2.96E+01	1.75E+02	1.24E+03	1.23E+04	1.99E+05
Kr-87	1.30E+02	5.02E+02	1.09E+03	7.00E+01	0	0
Kr-88	2.43E+02	1.42E+03	4.72E+03	2.82E+03	1.10E+02	0
Xe-133	7.68E+02	6.36E+03	3.70E+04	2.46E+05	1.89E+06	6.68E+06
Xe-135	2.02E+02	1.66E+03	8.14E+03	2.44E+04	1.90E+04	1.00E+02
Alkali Metal Group						
Rb-86	4.50E-02	1.30E-01	4.03E-01	7.37E-01	2.40E+00	2.91E+00
Cs-134	1.36E+01	3.95E+01	1.22E+02	2.28E+02	7.90E+02	1.26E+03
Cs-136	3.64E+00	1.06E+01	3.25E+01	5.90E+01	1.87E+02	2.04E+02
Cs-137	8.14E+00	2.37E+01	7.32E+01	1.37E+02	4.72E+02	7.58E+02
Tellurium Group						
Sr-89	4.70E+00	2.15E+01	6.27E+01	1.19E+02	4.03E+02	5.85E+02
Sr-90	3.33E-01	1.53E+00	4.45E+00	8.55E+00	2.94E+01	4.75E+01
Sr-91	5.62E+00	2.36E+01	6.07E+01	5.03E+01	2.00E+01	0
Sr-92	4.78E+00	1.60E+01	3.30E+01	4.90E+00	1.00E-01	0
Sb-127	9.76E-01	4.43E+00	1.28E+01	2.23E+01	5.73E+01	3.06E+01
Sb-129	2.85E+00	1.08E+01	2.44E+01	8.60E+00	6.00E-01	0
Te-127	9.51E-01	4.36E+00	1.26E+01	2.33E+01	6.51E+01	4.80E+01
Te-127m	1.28E-01	5.89E-01	1.72E+00	3.29E+00	1.14E+01	1.78E+01
Te-129	3.11E+00	1.30E+01	3.19E+01	2.69E+01	6.22E+01	8.50E+01
Te-129m	8.43E-01	3.87E+00	1.13E+01	2.13E+01	7.14E+01	9.80E+01
Te-131m	1.58E+00	7.02E+00	1.97E+01	2.86E+01	4.23E+01	5.30E+00
Te-132	1.57E+01	7.10E+01	2.04E+02	3.51E+02	8.55E+02	4.00E+02
Ba-139	4.82E+00	1.21E+01	2.15E+01	5.00E-01	0	0

TABLE 7.1-26
ESBWR Design Basis Loss of Coolant Accident Curies Released to Environment by Interval

Isotope	0 to 1.4 hr	1.4 to 3.4 hr	0 to 8 hr	8 to 24 hr	24 to 96 hr	96 to 720 hr
Ba-140	8.33E+00	3.81E+01	1.11E+02	2.06E+02	6.49E+02	7.04E+02
Noble Metals Group						
Co-58	3.24E-03	1.49E-02	4.33E-02	8.27E-02	2.80E-01	4.18E-01
Co-60	3.88E-03	1.78E-02	5.19E-02	9.91E-02	3.43E-01	5.56E-01
Mo-99	1.02E+00	4.61E+00	1.32E+01	2.22E+01	5.11E+01	1.95E+01
Tc-99m	8.91E-01	4.09E+00	1.19E+01	2.14E+01	5.21E+01	2.06E+01
Ru-103	7.81E-01	3.58E+00	1.04E+01	1.98E+01	6.64E+01	9.34E+01
Ru-105	4.37E-01	1.65E+00	3.78E+00	1.37E+00	1.10E-01	0
Ru-106	2.12E-01	9.78E-01	2.84E+00	5.42E+00	1.87E+01	2.97E+01
Rh-105	3.91E-01	1.79E+00	5.17E+00	8.43E+00	1.44E+01	2.40E+00
Lanthanide Group						
Y-90	4.85E-03	3.54E-02	1.90E-01	1.35E+00	1.33E+01	4.16E+01
Y-91	5.78E-02	2.69E-01	8.07E-01	1.72E+00	6.26E+00	9.31E+00
Y-92	4.03E-01	3.88E+00	1.58E+01	1.50E+01	1.10E+00	0
Y-93	6.74E-02	2.84E-01	7.36E-01	6.44E-01	2.80E-01	0
Zr-95	7.55E-02	3.47E-01	1.01E+00	1.92E+00	6.51E+00	9.66E+00
Zr-97	7.42E-02	3.24E-01	8.77E-01	1.04E+00	9.00E-01	2.00E-02
Nb-95	7.14E-02	3.28E-01	9.56E-01	1.83E+00	6.33E+00	1.02E+01
La-140	1.37E-01	1.14E+00	6.70E+00	4.90E+01	4.12E+02	7.42E+02
La-141	6.45E-02	2.38E-01	5.32E-01	1.59E-01	9.00E-03	0
La-142	4.57E-02	1.21E-01	2.21E-01	7.00E-03	0	0
Pr-143	7.23E-02	3.33E-01	9.75E-01	1.92E+00	6.67E+00	7.94E+00
Nd-147	3.22E-02	1.47E-01	4.27E-01	7.93E-01	2.46E+00	2.52E+00
Am-241	3.72E-06	1.71E-05	4.98E-05	9.62E-05	3.37E-04	5.87E-04
Cm-242	9.81E-04	4.50E-03	1.31E-02	2.51E-02	8.58E-02	1.34E-01
Cm-244	5.29E-05	2.43E-04	7.08E-04	1.35E-03	4.69E-03	7.55E-03
Cerium Group						
Ce-141	1.89E-01	8.71E-01	2.53E+00	4.79E+00	1.60E+01	2.18E+01
Ce-143	1.80E-01	8.05E-01	2.26E+00	3.37E+00	5.37E+00	8.00E-01
Ce-144	1.23E-01	5.64E-01	1.64E+00	3.14E+00	1.08E+01	1.71E+01
Pu-238	1.67E-04	7.68E-04	2.24E-03	4.28E-03	1.48E-02	2.39E-02
Pu-239	4.24E-05	1.95E-04	5.68E-04	1.09E-03	3.78E-03	6.16E-03

TABLE 7.1-26
ESBWR Design Basis Loss of Coolant Accident Curies Released to Environment by Interval

Isotope	0 to 1.4 hr	1.4 to 3.4 hr	0 to 8 hr	8 to 24 hr	24 to 96 hr	96 to 720 hr
Pu-240	5.31E-05	2.44E-04	7.10E-04	1.36E-03	4.70E-03	7.53E-03
Pu-241	9.14E-03	4.20E-02	1.22E-01	2.34E-01	8.14E-01	1.30E+00
Np-239	2.37E+00	1.07E+01	3.06E+01	5.05E+01	1.09E+02	3.50E+01

TABLE 7.1-27
ESBWR Design Basis Loss of Coolant Accident

Time	EAB Dose TEDE (rem)	LPZ Dose TEDE (rem)
0 to 2 hr	3.10E-01	--
0 to 8 hr	--	8.94E-02
8 to 24 hr	--	7.06E-02
24 to 96 hr	--	1.68E-01
96 to 720 hr	--	1.41E-01
Total	3.10E-01	4.69E-01

Note: LOCA based on Regulatory Guide 1.183

TABLE 7.1-28
ACR-700 Design Basis Large LOCA - Curies Released to Environment by Interval

Isotope	0 to 2 hr	0 to 8 hr	8 to 24 hr	24 to 96 hr	96 to 720 hr
I-131	7.76E+01	3.06E+02	5.84E+02	1.56E+04	4.24E+03
I-132	8.55E+01	1.71E+02	1.61E+01	1.42E+01	0
I-133	1.59E+02	5.78E+02	7.75E+02	1.52E+04	6.20E+01
I-134	8.91E+01	1.12E+02	5.10E-02	0	0
I-135	1.37E+02	4.12E+02	2.49E+02	2.36E+03	0
Kr-83m	2.09E+03	3.76E+03	1.91E+02	0	0
Kr-85m	5.70E+03	1.52E+04	5.67E+03	2.60E+02	0
Kr-85	4.50E+01	1.81E+02	3.63E+02	8.13E+02	6.78E+03
Kr-87	7.98E+03	1.18E+04	1.50E+02	0	0
Kr-88	1.45E+04	3.21E+04	5.20E+03	5.30E+01	0
Kr-89	8.64E+02	8.64E+02	0	0	0
Xe-131m	2.52E+02	1.00E+03	1.94E+03	3.91E+03	1.55E+04
Xe-133m	1.40E+03	5.37E+03	9.16E+03	1.19E+04	7.45E+03
Xe-133	4.56E+04	1.79E+05	3.35E+05	5.94E+05	1.16E+06
Xe-135m	1.78E+03	1.79E+03	0	0	0
Xe-135	3.74E+03	1.21E+04	1.01E+04	2.10E+03	9.00E+00
Xe-137	1.89E+03	1.89E+03	0	0	0
Xe-138	6.78E+03	6.79E+03	0	0	0

TABLE 7.1-29
ACR-700 Large Loss of Coolant Accident

Time	EAB Dose TEDE (rem)	LPZ Dose TEDE (rem)
0 to 2 hr	3.77E-01	-
0 to 8 hr	-	7.84E-02
8 to 24 hr	-	2.56E-02
24 to 96 hr	-	2.73E-01
96 to 720 hr	-	3.95E-02
Total	3.77E-01	4.16E-01

TABLE 7.1-30
AP1000 Fuel Handling Accident - Curies Released to Environment

Isotope	0 to 2 hrs (Ci)
I-130	3.52E-02
I-131	2.90E+02
I-132	1.54E+02
I-133	1.91E+01
I-134	0
I-135	1.36E-02
Kr-83m	0
Kr-85m	2.68E-03
Kr-85	1.10E+03
Kr-87	0
Kr-88	0
Kr-89	0
Xe-131m	5.36E+02
Xe-133m	1.29E+03
Xe-133	6.94E+04
Xe-135m	4.37E-01
Xe-135	1.32E+02
Xe-137	0
Xe-138	0

Note: Activity is based on a 100-hr shutdown before fuel movement begins. Source term and pool DF are based on Regulatory Guide 1.183 (USNRC, 2000).

TABLE 7.1-31
AP1000 Fuel Handling Accident

Time	Exclusion Area Boundary Dose Total Effective Dose Equivalent (rem)	Low Population Zone Dose Total Effective Dose Equivalent (rem)
0 to 2 hrs	1.42E-01	--
0 to 8 hrs	--	1.51E-02
8 to 24 hrs	--	0
24 to 96 hr	--	0
96 to 720 hrs	--	0
Total	1.42E-01	1.51E-02

TABLE 7.1-32
ABWR Fuel Handling Accident - Curies Released to Environment by Interval

Isotope	0 to 2 hrs (Ci)	2 to 8 hrs (Ci)
I-131	1.23E+02	1.82E+00
I-132	1.52E+02	1.29E+00
I-133	1.27E+02	1.77E+00
I-134	6.16E-06	2.13E-08
I-135	2.06E+01	2.52E-01
Kr-83m	6.43E+00	4.57E+00
Kr-85m	8.54E+01	9.14E+01
Kr-85	4.78E+02	6.76E+02
Kr-87	1.23E-02	6.51E-03
Kr-88	2.43E+01	2.21E+01
Kr-89	8.14E-11	1.00E-20
Xe-131m	0	0
Xe-133m	8.35E+01	1.18E+02
Xe-133	1.10E+03	1.52E+03
Xe-135m	2.81E+04	3.95E+04
Xe-135	2.21E+02	2.34E+00
Xe-137	6.38E+03	7.84E+03
Xe-138	2.07E-10	2.81E-19
Xe-138	0	0

Notes: Activity is based on a 24-hr shutdown before fuel movement begins. Source term and pool DF are based on Regulatory Guide 1.25 (USAEC, 1972).

TABLE 7.1-33
ABWR Fuel Handling Accident

Dose Type	EAB (rem)	LPZ (rem)
Thyroid	1.97E+00	1.91E-01
Whole Body	2.82E-02	5.56E-03
TEDE	8.04E-02	9.78E-03

CHAPTER 8

Need For Power

The Applicant is not currently seeking approval for the construction or operation of nuclear reactor(s) at the CPS as part of this Application for the EGC ESP. Although, the Applicant believes future demand for power will warrant future construction of additional generating capacity, 10 CFR 52.18 and 52.17(a)(2) do not require the evaluation of a need for power to be provided in an ESP application. Therefore, this evaluation will be provided at the time an application for a construction permit or COL is submitted, in accordance with the applicable regulations (USNRC, 1999).

CHAPTER 8

References

10 CFR 52. Code of Federal Regulations. "Early Site Permits, Standard Design Certifications, and Combined Licenses for Nuclear Power Plants."

U.S. Nuclear Regulatory Commission (USNRC). *Standard Review Plans for Environmental Reviews of Nuclear Power Plants*. NUREG-1555. Office of Nuclear Reactor Regulation. October 1999.

CHAPTER 9

Alternatives to the Proposed Action

This chapter identifies alternatives to the proposed action in three ways. It identifies the impact of No Action; it reviews possible energy resources that could be used as alternatives to the proposed action; and it reviews alternative sites to determine if any are obviously superior to the EGC ESP Site. The review contained herein is in keeping with the effects from deregulation of the electric generation industry.

Efforts to deregulate the electric utility industry began with passage of the National Energy Policy Act of 1992. Provisions of this Act required electric utilities to allow open access to their transmission lines and encouraged development of a competitive wholesale market for electricity. The market place no longer follows traditional organizational, power production, transmission and sales patterns that were the norm when the nation's current nuclear fleet were constructed and licensed. The Act did not mandate competition in the retail market, leaving that decision to the states (NEI, 2000).

In December of 1997, the State of Illinois began the process of restructuring its retail electricity market (i.e., deregulation) by enacting the Illinois Electric Service Customer Choice and Rate Relief Act of 1997 (also known as the Illinois Electricity Choice Law). This Act eliminates regulated generation service areas and enables customers of electric distribution companies in the state to purchase electricity from their choice of electric generation suppliers by May 1, 2002. Electric generation supply is based on customers' needs and preferences (ICC, 1999). As discussed below, the regulatory imposition of competition among electric generators affects the need for power and the selection of alternatives for the EGC ESP Facility.

Before Illinois enacted its Electricity Choice Law, primarily two entities, electric utilities and the Illinois Commerce Commission, made decisions regarding reasonable alternatives for meeting electrical demands in Illinois. As a result of the Electricity Choice Law, the Illinois Commerce Commission no longer has a formal role in assessing Illinois's electricity needs or mandating additional capacity. Instead, market forces are expected to spur innovation, attract competition, drive the appropriate supply/demand balance, and attract new power suppliers to the State (IPCB, 2000). Therefore, generators of electric power in the State of Illinois are solely responsible for decisions regarding reasonable alternatives for meeting electrical demands.

Since the Illinois Electricity Choice Law was enacted, the IEPA has received more than 60 applications for construction of new generating facilities. Citizens, local governments, and legislators objected to several of the proposed plants. In response, the Illinois Pollution Control Board conducted hearings to evaluate whether additional siting or other regulations in connection with the construction of proposed plants should be recommended. The Illinois Pollution Control Board recommended that the IEPA adopt new rules that would tighten restrictions on air emissions from new power plants and require public participation in the construction permit process, but stated that the IEPA does not have the authority to consider other issues related to the siting of a proposed facility (e.g., need for a proposed power plant, aesthetics, etc.) during permitting (IPCB, 2000).

It is not clear whether EGC or another supplier would ultimately construct new generating units. The decision to actually construct a new facility would be driven by market conditions. However, regardless of which entities construct and operate new generating facilities, certain environmental parameters would be constant among these alternative power sources.

Chapter 9 addresses reasonable alternatives to the EGC ESP Facility. The chapter evaluates what alternative actions might be undertaken, which alternatives are not reasonable and why and, for reasonable alternatives, what the associated environmental impacts might be. The impacts are then compared to those associated with the proposed action.

In determining the level of detail and analysis to be provided, the Applicant relied on the USNRC decision-making standard in that the discussion of alternatives:

> *"…shall be sufficiently complete to aid the Commission in developing and exploring, pursuant to section 102(2)(E) of NEPA, 'appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.' To the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form." (10 CFR 51.45(b)(3)).*

Further, for consistency of alternate siting criteria, the process outlined in NUREG-1555 was employed.

This environmental report supports USNRC decision-making by providing sufficient information to clearly indicate whether an alternative would have a smaller, comparable, or greater environmental impact than the proposed action. Providing additional details or analysis would serve no function if it only brings to light the additional adverse impacts of alternatives to the EGC ESP Facility. This approach is consistent with regulations of the Council on Environmental Quality, which provide that the consideration of alternatives (including the proposed action) should enable reviewers to evaluate their comparative merits (40 CFR 1500-1508). This chapter includes sufficient details about alternatives and siting to establish the basis for necessary comparison to the discussions of impacts of the proposed action.

The chapter also identifies and evaluates a set of alternative sites for the proposed EGC ESP Facility. The objective of the evaluation is to verify that there is no 'obviously superior site' for the eventual construction and operation of a new nuclear facility.

9.1 No-Action Alternative

"No Action" means the USNRC denies the application for an ESP and no other generating station (either nuclear or non-nuclear) is constructed and operated.

The impacts of the No-Action Alternative are closely-related to a need for power, which has not been discussed in this ER; under Part 52, an analysis of the need for power is not required to issue an ESP (10 CFR 52.17).

As stated in NUREG-1555, *Standard Review Plans for Environmental Reviews of Nuclear Power Plants* (USNRC, 1999):

> *"The no-action alternative would result in the facility not being built, and no other facility would be built or other strategy implemented to take its place. This would mean that the electrical capacity to be provided by the project would not become available."*

Under the "No Action" alternative, the need for power would need to be met by other alternative means that involve no new generating capacity. These alternatives would include such approaches as demand-side management, energy conservation, and power purchased from other electricity providers. These alternatives are discussed in Section 9.2.1. Given the fact that the early site permit might not be used for twenty or more years, it is not feasible to evaluate other aspects of the need for power in a meaningful way at the ESP stage. Therefore, the need for power will not be evaluated as part of this ESP.

9.2 Energy Alternatives

The EGC ESP Facility will be constructed and operated as a merchant independent power producer (also referred to as a "merchant plant" or "merchant generator"). The power produced will be sold on the open wholesale market, without specific consideration to supplying a traditional service area or satisfying a reserve margin objective. Thus, discussion of the "relevant service area" for this facility is irrelevant and inconsistent with the facility's sales objectives and thus does not provide a means to evaluate the site in the context of a service territory, as has been historically the practice. Therefore, for the purposes of this alternatives analysis, the "region of interest" has been defined as the State of Illinois rather than the more traditional "relevant service area." The delineation of this region of interest is in keeping with current deregulation policies and the proposed location of the facility within the State of Illinois.

Alternatives that do not require new generating capacity were considered, and these include energy conservation and Demand-Side Management (DSM). Other alternatives that do require the construction of new generating capacity such as wind, geothermal, oil, natural gas, hydropower, Municipal Solid Wastes (MSW), coal, photovoltaic (PV) cells, solar power, wood waste/biomass, and energy crops were also analyzed. The technologies under consideration for the project were not regarded as alternatives.

While alternative energy technologies are reviewed here for the purposes of this ER, their availability was not important in selecting emerging nuclear technologies as the superior alternative. The decision to develop a nuclear power plant on land adjacent to the existing CPS was based on market factors such as the proximity to an already-licensed station, the ability to incorporate existing environmental permits in the operation and plant parameters, property ownership, and other location features conducive to the plant's intended merchant generating objective.

Alternatives that do not require new generating capacity are discussed in Section 9.2.1, while alternatives that do are discussed in Section 9.2.2. In Section 9.2.2, some of the alternatives that require new generating capacity were eliminated from further consideration and discussion based on their availability in the region, overall feasibility, and environmental consequences. In Section 9.2.3, the alternatives that were not eliminated based on these factors addressed in Section 9.2.2 are investigated in further detail relative to specific criteria such as environmental impacts, reliability, and economic costs.

9.2.1 Alternatives That Do Not Require New Generating Capacity

In 1997, Illinois General Assembly enacted the Electric Service Customer Choice and Rate Relief Law. It noted that the citizens and businesses of the State of Illinois had been well served by a comprehensive electrical utility system that had provided safe, reliable, and affordable service. The electrical utility system in the State had historically been subject to State and federal regulation, aimed at assuring the citizens and businesses of the State of safe, reliable, and affordable service, while at the same time assuring the utility system of a safe return on investment.

The Assembly noted that competitive forces were affecting the market for electricity as a result of federal regulatory and statutory changes and the activities of other states.

Competition in the electric services market created opportunities for new products and services for customers and lower costs for users of electricity. Long-standing regulatory relationships needed to be altered to accommodate the competition that fundamentally altered the structure of the electric services market.

Lawmakers saw that, with the advent of increasing competition in the industry, the State had a continued interest in assuring that the safety, reliability, and affordability of electrical power was not sacrificed to competitive pressures, and to that end, intended to implement safeguards to assure that the industry continued to operate the electrical system in a manner that would serve the public's interest. Under the existing regulatory framework, the industry had been encouraged to undertake certain investments in its physical plant and personnel to enhance its efficient operation, the cost of which it had been permitted to pass on to consumers. It recognized that the State had an interest in providing the existing utilities a reasonable opportunity to obtain a return on investments on which they depended in undertaking those commitments in the first instance which, at the same time, not permitting new entrants into the industry to take unreasonable advantage of the investments made by the formerly regulated industry.

The Assembly dictated that a competitive wholesale and retail market must benefit all Illinois citizens. They told the Illinois Commerce Commission to act to promote the development of an effectively competitive electricity market that operates efficiently and is equitable to all consumers. Consumer protections were put in place to ensure that all customers continue to receive safe, reliable, affordable, and environmentally safe electric service.

They further determined that all consumers must benefit in an equitable and timely fashion from the lower costs for electricity that result from retail and wholesale competition and receive sufficient information to make informed choices among suppliers and services.

To that end, in Illinois, merchant generators do not have to request the permission from the Illinois Commerce Commission (ICC) for siting approval or demonstrate to the ICC that they are needed to meet energy demand. The ICC is also not involved in any formal energy planning for the State.

This section is intended to provide an assessment of the economic and technical feasibility of supplying the demand for energy without constructing new generating capacity. Specific elements may to include:

- Initiating conservation measures (including implementing DSM actions),
- Reactivating or extending the service life of existing plants within the power system,
- Purchasing power from other utilities or power generators, and
- A combination of these elements that would be equivalent to the output of the project and therefore eliminate its need.

All of the above elements have been traditionally connected with an electric utility that supplies power within its service territory and not for a merchant generator whose revenue is derived from the sale of electricity generated from its own power plants. Therefore, alternatives that do not require additional generating capacity are not considered reasonable alternatives to colocating a new merchant power plant with the CPS in Illinois. Nonetheless, an evaluation of these alternatives was performed within the context of emerging energy demands.

9.2.1.1 Initiating Conservation Measures

Historically, state regulatory bodies have required regulated utilities to institute programs designed to reduce demand for electricity. DSM programs included energy conservation and load modification measures. In the current deregulated Illinois market, EGC anticipates that it will not be able to offer competitively priced power if it has to retain an extensive conservation and load-modification-incentive program. However, EGC has evaluated the DSM alternative as a mitigative technique to the proposed action.

Traditionally, DSM programs either conserved energy or allowed the electric company to reduce customers' load requirements during periods of peak demand. DSM programs generally fall into the following categories:

9.2.1.1.1 Conservation Programs

- Educational programs that encourage the prudent use of energy
- Financial incentives to businesses and private customers
- Government - private partnerships to encourage conservation of energy resources.

9.2.1.1.2 Energy Efficiency Programs

- Discounted residential rates for homes that met specific energy efficiency standards
- Energy audit programs that provided residential energy audits and encouraged efficiency upgrades
- Incentive programs that encouraged customers to replace old, inefficient appliances or equipment with new high-efficiency appliances or equipment
- Government partnerships that assisted federal facilities in meeting mandated energy efficiency goals through design and installation of high-efficiency lighting systems and computerized energy management.

9.2.1.1.3 Load Management Programs

- Standby generator programs – encouraged customers to permit their electricity provider to switch loads to the customer's standby generators during periods of peak demand
- Interruptible service program – encouraged customers to allow blocks of their load to be interrupted during periods of peak demand
- Real time pricing – encouraged customers to discontinue electricity usage during specific times

Traditional utilities annually projected the summer and winter peak power, annual energy requirements, and impacts of DSM. Market and regulatory conditions, which provided the initial support for utility-sponsored conservation and DSM efforts during the late 1970s and early 1980s, can be broadly characterized by:

- Increasing long-term marginal prices for capacity and energy production resources

- Forecasts projecting increasing demand for electricity across the nation
- General agreement that conditions outlined above would continue for the foreseeable future
- Limited competition in the generation of electricity
- Economies of scale in the generation of electricity, which supported the construction of large central power plants, and
- The use of average embedded cost as the basis for setting electricity prices within a regulated context.

These market and regulatory conditions have undergone dramatic changes in a deregulated market, as previously described. Changes that have significantly impacted the cost effectiveness of utility-sponsored DSM, can be described as follows:

1. A decline in generation costs, due primarily to technological advances that have reduced the cost of constructing new generating units (e.g., the combined cycle gas generating facility), and
2. National energy legislation, which has encouraged wholesale competition through open access to the transmission grid, as well as state legislation designed to facilitate retail competition.

Consistent with (1) and (2) above, the typical electric utility planning environment has more recently been considering lower energy prices than during earlier periods, shorter planning horizons, lower reserve margins, and increased reliance on market prices to direct resource planning.

Other significant changes accompanying the newly deregulated marketplace include the following:

- The adoption of increasingly stringent national appliance standards for most major energy-using equipment and the adoption of energy efficiency requirements in state building codes. These mandates have further reduced the potential for cost-effective electric utility-sponsored measures.
- In states that are currently transitioning into deregulation, third parties are increasingly providing energy load management services and products in competitive markets at prices that reflect their value to the customer. Market conditions can be expected to continue this shift among providers of cost-effective load management.

For these reasons, EGC determined that DSM programs, which are primarily directed toward load management, are not a sufficient substitute for the generation contemplated by the EGC ESP Facility.

9.2.1.2 Reactivating or Extending Service Life of Existing Plants

Fossil plants slated for retirement tend to be ones that are old enough to have difficulty in economically meeting today's restrictions on air contaminant emissions. In the face of increasingly stringent environmental restrictions, delaying retirement, or reactivating plants in order to compensate for the closure of a large base-loaded plant, would require major construction to upgrade or replace plant components. EGC concludes that the environmental impacts of such a scenario are bounded by its coal- and gas-fired alternatives discussed in Section 9.2.2.

9.2.1.3 Purchasing Power from Other Utilities or Power Generators

In a traditional alternatives analysis for examining the energy alternative to utility generation capacity, the purchased power alternative meant that the utility would meet a portion of its service territory demand using power that it purchased from another utility. Deregulation, however, has changed this traditional analysis. First, the end-user could purchase electricity from another entity (in this case, from a company other than EGC). Second, EGC expects retail competition to decrease generators' incentives to provide wholesale power to competing companies for resale, thus reducing the availability of power for EGC to purchase and resell competitively.

Because Illinois is a net exporter of power and would be fully deregulated, EGC assumes that in-state power could be purchased. For example, in 1999 Illinois exported 76 million kilowatt-hours of electricity (USDOE/EIA, 2001a). The GEIS, in Section 8.3, evaluated the environmental impacts of thirteen alternative energy sources (USNRC, 1996). EGC assumes that the generating technology producing purchased power would be one of the alternatives that were analyzed, and that the environmental impact from the alternative would occur to meet the market need.

Imported power from Canada or Mexico is unlikely to be available to supply the equivalent capacity of the EGC ESP Facility. In Canada, 62 percent of the country's electricity capacity is derived from renewable sources, principally hydropower (USDOE/EIA 2001). Canada has plans to continue developing hydroelectric power, but the plans generally do not include large-scale projects (USDOE/EIA, 2001). Canada's nuclear generation is projected to decrease by 1.7 percent by 2020, but its share of power generation in Canada is projected to decrease from 14 percent currently to 13 percent by 2020 (USDOE/EIA 2001). EIA projects that total gross U.S. imports of electricity from Canada and Mexico will gradually increase from 47.4 billion kilowatt-hours in 2000 to 66.1 billion kilowatt-hours in year 2005, and then gradually decrease to 47.4 billion kilowatt-hours in year 2020 (USDOE/EIA 2001). It is anticipated that the amount of electricity available for import from Canada and Mexico follows the amount of electricity that would be available for export from Canada and Mexico.

EGC has evaluated conventional and prospective purchase power supply options that could be reasonably implemented. In 1999, Unicom's subsidiary ComEd, completed a sale of its fossil-fuel-fired coal, gas, and oil units to Midwest Generation. As part of the sale, Unicom entered into long-term purchase contracts with Midwest Generation to provide firm capacity and energy (ComEd, 1999). Because these contracts are part of current and future capacity, however, EGC does not consider these power purchases to be a feasible source of power to satisfy the purchased power alternative.

If power were to be purchased from sources within the United States or a foreign country, the generating technology likely would be one of those described in this ER (probably coal, natural gas, or nuclear). The description of the environmental impacts of other technologies described here is representative of the purchased electrical power alternative to the EGC ESP Facility. Thus, the environmental impacts of imported power would still occur, but would be located elsewhere within the region, nation, or another country.

9.2.2 Alternatives That Require New Generating Capacity

While many methods are available for generating electricity and many combinations or mixes can be assimilated to meet system needs, such expansive consideration would be too unwieldy to reasonably examine given the purposes of the alternatives analysis. In keeping with the USNRC's evaluation of alternatives to license renewal, a reasonable set of alternatives should be limited to analysis of single discrete electrical generation sources and those electric generation technologies that are technically reasonable and commercially viable (USNRC, 1996). Accordingly, EGC has not evaluated mixes of generating sources. The impacts from coal- and gas-fired generation presented in this chapter bounds the impacts from any generation mixture of the two technologies.

The current mix of power generation options in Illinois is one indicator of the feasible choices for electric generation technology within the state. EGC evaluated Illinois electric generation capacity and utilization characteristics. "Capacity" is the categorization of the various installed technology choices in terms of its potential output. "Utilization" is the degree to which each choice is actually used.

In 1999, Illinois's electric industry had a total generating capacity of 34,338 megawatts-electric. As Figure 9.2-1 indicates, this capacity includes units fueled by coal (46.7 percent); nuclear (31.2 percent); oil (3.2 percent); dual (e.g., oil/gas)-fired (0.9 percent); hydroelectric (0.1 percent); and other (2.3 percent) (USDOE/EIA, 2001).

Based on 1999 generation data, Illinois's electric industry provided approximately 164 terawatt hours of electricity. As Figure 9.2-2 depicts, Illinois's generation utilization was primarily from nuclear (50 percent), followed by coal (45.3 percent), gas (3.4 percent), oil (0.5 percent), other (0.7 percent), and hydroelectric (0.1 percent) (USDOE/EIA 2001).

The difference between capacity and utilization is the result of preferential usage by electricity suppliers. For example, in 1999, nuclear energy represented 31.2 percent of Illinois's installed capability, but produced 50 percent of the electricity generated (USDOE/EIA 2001, Tables 4 and 5). This reflects Illinois's preferential reliance on nuclear energy as a base-load generating source.

This section identifies alternatives that EGC has determined are not reasonable and the EGC basis for this determination. EGC's ESP application is premised on the installation of a facility that would primarily serve as a large base-load generator and that any feasible alternative would also need to be able to generate base-load power. In performing this evaluation, EGC relied heavily upon USNRC's Generic Environmental Impact Statement (GEIS) (USNRC, 1996).

The GEIS is useful for the analysis of alternative sources because the USNRC has determined that the technologies of these alternatives will enable the agency to consider the relative environmental consequences of an action given the environmental consequences of other activities that also meet the purpose of the proposed action. To generate the reasonable set of alternatives used in the GEIS, the USNRC included commonly known generation technologies and consulted various state energy plans to identify the alternative generation sources typically being considered by state authorities across the country. From this review, the USNRC had established a reasonable set of alternatives to be examined. These alternatives include wind energy, PV cells, solar thermal energy, hydroelectricity, geothermal energy, incineration of wood waste and MSW, energy crops, coal, natural gas, oil, and delayed retirement of existing non-nuclear plants. The USNRC has considered these alternatives pursuant to its statutory responsibility under NEPA. Although the GEIS is for license renewal, the alternatives analysis in the GEIS can be compared to the proposed action to determine if the alternative represents a reasonable alternative to the proposed action.

Each of the alternatives are assessed and discussed in the subsequent sections relative to the following criteria:

- The alternative energy conversion technology is developed, proven, and available in the relevant region within the life of the ESP permit.
- The alternative energy source provides baseload generating capacity equivalent to the capacity needed, and to the same level as the proposed EGC ESP Facility.
- The alternative energy source does not result in environmental impacts in excess of a nuclear plant, and the costs of an alternative energy source do not exceed the costs that make it economically impractical.

Each of the potential alternative technologies considered in this analysis are consistent with national policy goals for energy use, and are not prohibited by federal, state, or local regulations. These criteria were not factors in evaluating alternative technologies.

Based on one or more of these criteria, several of the alternative energy sources were considered technically or economically infeasible after a preliminary review and were not considered further. Alternatives that were considered to be technically and economically feasible were assessed in greater detail in Section 9.2.3.

9.2.2.1 Wind

Wind resource maps usually identify areas by wind power class (See Figure 9.2-3). Although some midwestern states like North and South Dakota, as well as parts of Iowa, have excellent potential (Class 6 and above) for development of wind generation, the potential for generation is more intermittent in Illinois (ELPC, 2001).

In general, areas identified as Class 4 and above are regarded as potentially economical for wind energy production with current technology. The Department of Energy's Wind Program and National Renewable Energy Laboratory (NREL) wind resource maps for Illinois show that there are scattered areas in central and northern Illinois with the classification of Class 4 with the total of these sites capable of 3000 MWe of potential installed capacity for wind generation. The most favorable of these sites are located southeast of Quincy, the greater Bloomington area, north of Peoria, the Mattoon area, and between Sterling and Aurora (USDOE/EERE, 2004b). EGC does not own or have rights to build a wind generating station on these sites.

At a Class 4 site, the average annual output of a wind power plant is typically about 25 percent of the installed capacity (USDOE/EERE, 2004b). For example, a wind farm on all of the land area identified as Class 4 by NREL within Illinois would generate an average annual output of 750 MWe. In fact, the National Electric Reliability Council (NERC) credits wind capacity at approximately 17 percent (USNRC, 2004). More optimistic assessments place the capacity factor for a Class 4 wind facility at about 29 percent, rising to 35 percent in 2020 based upon assumed improvements in technology (ELPC, 2001). However, even using such numbers would not affect the conclusions presented below (e.g., land usage per average MWe would decrease proportionately with increasing capacity factors, but would still be several times higher than the land usage for a nuclear plant).

As a result of advances in technology and the current level of financial incentive support within Illinois, a number of additional areas with a slightly lower wind resource (Class 3+) may also be suitable for wind development. These would, however, operate at an even lower annual capacity factor and output than that used by NREL for Class 4 sites.

In Illinois, the total amount of Class 4 and 3+ lands is about 1800 km2 (695 mi^2, or 444,800 acres) and the wind potential from these sites is about 9000 MWe of installed capacity (USDOE/EERE, 2004b).

In any wind facility, the land use could be significant. Wind turbines must be sufficiently spaced to maximize capture of the available wind energy. If the turbines are too close together, one turbine can impact the efficiency of another turbine. A 2 MWe turbine requires only about a quarter of an acre of dedicated land for the actual placement of the wind turbine, leaving landowners with the ability to utilize the remaining acreage for some other uses that do not impact the turbine, such as agricultural use.

For illustrative purposes, if all of the resource in Class 3+ and 4 sites were developed using 2 MWe turbines, with each turbine occupying one-quarter acre, 9000 MWe of installed capacity would utilize 1125 acres just for the placement of the wind turbines alone. Based upon the NERC capacity factor, this project would have an average output of 1530 MWe (approximately 0.73 acres / MWe). This is a conservative assumption since Class 3+ sites will have a lower percentage of average annual output, but it is being used here for illustrative purposes. In contrast, the EGC ESP Facility (operating at 90 percent capacity) would have an average annual output of 1962 MWe (2180 MWe * 0.9) and would only occupy approximately 461 acres (approximately 0.23 acres / MWe).

Although wind technology is considered mature, technological advances may make wind a more economic choice for developers than other renewables (CEC, 2003). Technological improvements in wind turbines have helped reduce capital and operating costs. In 2000, wind power was produced in a range of $0.03 - $0.06 / kWh (depending on wind speeds), but by 2020 wind power generating costs are projected to fall to $0.03 - $0.04 / kWh (ELPC, 2001).

The installed capital cost of a wind farm includes planning, equipment purchase and construction of the facilities. This cost, typically measured in $/kWe at peak capacity, has decreased from more than $2,500/kWe in the early 1980's to less than $1,000/kWe for wind farms in the U.S. Illinois Rural Electric Cooperative recently installed a single 1.65 MWe turbine at a cost of $1.7 million (Halstead, 2004). This cost includes the purchase of the turbine itself, construction of access roads and foundations, and connection to the transmission system. This decrease in construction costs is due primarily to improvements in wind turbine technology, but also to the general increase in wind farm sizes. Larger wind farms in windy areas benefit from economies of scale in all phases of a wind project from planning to decommissioning, as fixed costs can be spread over a larger total generating capacity. These "economies of scale" may not be available in the region of interest, given the availability of the resource (CEC, 2003).

As an example of cost, a wind generating facility that has an installed capacity of 75 MWe can produce power at a levelized rate of $0.049/kWh. With the Federal Production Tax Credit (PTC), the cost is reduced to $0.027 - $0.035/kWh. The PTC primarily reduced the tax burden and operating costs for wind generating facilities, which was vital to financing of facilities. The PTC expired in December 2003 and has not been renewed, even though it has support in the 2003 Energy Policy Act (U.S. Senate, 2003). As a result, a smaller number of completed wind projects in Illinois are anticipated. As the General Manager of the Illinois Rural Electric Cooperative explains "The energy bill stalled in Congress last fall, and still has not been passed, so right now there's not an authorization for production tax credits for new turbines. As a consequence, you're not going to have new turbines being installed by developers until that production tax credit returns. And the economics are such that you absolutely have to have a substantial body of grants and support as we do, and/or the production tax credits" (Halstead, 2004). As a tax credit, the PTC represented 1.8 cent per kWh of tax-free money to the project owner. If the owner did not receive the tax credit and wanted to recoup the 1.8 cents per kWh with taxable revenue from electricity sales, the owner would have to add at least 1.8 cents and possibly as much as 2.8 cents to the sales price of each kWh, assuming a 36-percent marginal tax rate.

The Energy Information Agency's (EIA) *Annual Energy Outlook 2004 with projections to 2025* assumes no extension of the PTC beyond 2003. Further, the EIA projects that the levelized cost of electricity generated by wind plants coming on line in 2006 (over a 20-year financial project life) would range from approximately 4.5 cents per kilowatthour at a site with excellent wind resources to 5.7 cents per kilowatthour at less favorable sites (USDOE/EIA, 2004a). In contrast, the levelized cost for electricity from new natural gas combined-cycle plants is 4.7 cents per kWh, and for new coal-fired plants, the projected cost in 2007 is 4.9 cents per kWh (USDOE/EIA, 2004a). Nuclear plants are anticipated to produce power in the range of 3.1 to 4.6 cents per kWh (USDOE, 2002) (USDOE, 2004).

In addition to the construction and operating and maintenance costs for wind farms, there are costs for connection to the transmission grid. Any wind project would have to be located where the project would produce economical generation and that location may be far removed from the nearest possible connection to the transmission system. A location far removed from the power transmission grid might not be economical, as new transmission lines will be required to connect the wind farm to the distribution system. Existing transmission infrastructure may need to be upgraded to handle the additional supply. Soil conditions and the terrain must be suitable for the construction of the towers' foundations. Finally, the choice of a location may be limited by land use regulations and the ability to obtain the required permits from local, regional and national authorities. The further a wind energy development project is from transmission lines, the higher the cost of connection to the transmission and distribution system. A recent report to Congress on wind resource locations and transmission requirements in the upper Midwest (Upper Midwest for this report was defined as the States of North and South Dakota, Minnesota, Illinois, Iowa, Nebraska, and Wisconsin) concluded, "Transmission in the upper Midwest is generally constrained. In addition, because power generation is often transmitted over long distances to metropolitan centers, the upper Midwest has voltage and stability issues that must be considered. Since it is more economic to transmit wind from remote areas, developing more wind energy in remote areas may aggravate these voltage and stability issues (USDOE/EERE, 2004a)." In contrast, the EGC ESP site is located in southern Illinois, and is located near interties with the adjoining transmission systems.

The distance from transmission lines at which a wind developer can profitably build depends on the cost of the specific project. Consider, for example, the cost of construction and interconnection for a 115-kV transmission line that would connect a 50 MWe wind farm with an existing transmission and distribution network. The EIA estimated, in 1995, the cost of building a 115-kV line to be $130,000 per mile, excluding right-of-way costs (USDOE/EIA, 2004b). This amount includes the cost of the transmission line itself and the supporting towers. It also assumes relatively ideal terrain conditions, including fairly level and flat land with no major obstacles or mountains (more difficult terrain would raise the cost of erecting the transmission line.). In 1993, the cost of constructing a new substation for a 115-kV transmission line was estimated at $1.08 million and the cost of connection for a 115-kV transmission line with a substation was estimated to be $360,000 (USDOE/EIA, 1995).

In 1999, the USDOE analyzed the total cost of installing a wind facility in various NERC regions. They first looked at the distribution of wind resources and excluded land from development based on the classification of land. For example, land that is considered wetlands and urban are totally excluded whereas land that is forested has 50 percent of its land excluded. They then characterized those resources that were sufficiently close to existing 115- to 230-kV transmission lines, classified them into three distinct zones, and applied an associated standard transmission fee for connecting the new plant with the existing network. They then used additional cost factors to account for the greater distances between wind sites and the existing transmission networks. Capital costs were added based on whether the wind resource was technically accessible now and whether it could be economically accessible by 2020. Based on this USDOE analysis, Illinois has no known economically useful wind resources (USDOE/EIA, 1999a).

Another consideration on the integration of the wind capacity into the electric utility system is the variability of wind energy generation. Wind-driven electricity generating facilities must be located at sites with specific characteristics to maximize the amount of wind energy captured and electricity generated (ELPC, 2001). In addition, for transmission purposes, wind generation is not considered "dispatchable," meaning that the generator can control output to match load and economic requirements. Since the resource is intermittent, wind, by itself, is not considered a firm source of baseload capacity. The inability of wind alone to be a dispatchable, baseload producer of electricity is inconsistent with the objectives for the EGC ESP Facility.

Finally, wind does have environmental impacts, in addition to the land requirements posed by large facilities. First, some consider large-scale commercial wind farms to be an aesthetic problem. In one case, residents opposing the Cordelia Hills wind project in Solano County, northeast of San Francisco, reportedly did not want to see turbines sited nearby, even though the hills chosen for the project already had numerous electronic relays and transmission lines. Aesthetic impacts were also a key factor behind opposition to wind development at Tejon Pass, one of the most scenic areas close to Los Angeles (NWCC, 1997). Second, high-speed wind turbine blades can be noisy, although technological advancements continue to lessen this problem. Finally, wind facilities sited in areas of high bird use can expect to have fatality rates higher than those expected if the wind facility were not there. Water within the vicinity of wind turbines, such as sites around the Great Lakes, may attract waterfowl and shorebirds, increasing the collision potential for water bird species, although other factors such as adjacent habitats and movement patterns would also greatly influence mortality near these water sources (NWCC, 2001). Land use and aesthetic impacts could be moderate to large, while other impacts to human health and the environment would be small. The environmental impacts of wind power are discussed in more detail in Table 9.2-7.

EGC has concluded that, due to the inability of wind power to generate baseload power, the projected land use impacts of development of Class 3+ and Class 4 sites in Illinois, the cost factors in construction and operation, along with the impacts associated with development, and cost of additional transmission facilities to connect all of these turbines to the transmission system, wind by itself is not a feasible alternative to the EGC ESP.

Wind power could be included in a combination of alternatives to the EGC ESP. The study of combinations is discussed in Section 9.2.3.3.

9.2.2.2 Geothermal

As illustrated by Figure 8.4 in the GEIS, geothermal plants might be located in the western continental United States, Alaska, and Hawaii, where hydrothermal reservoirs are prevalent. However, because there are no known high-temperature geothermal sites in the region of interest, EGC concludes that geothermal is not a reasonable alternative.

9.2.2.3 Hydropower

A small portion (about 80 MW) of Illinois utility generating capacity is hydroelectric. As the GEIS points out in Section 8.3.4, hydropower's percentage of United States generating capacity is expected to decline because hydroelectric facilities have become difficult to site as a result of public concern over flooding, destruction of natural habitat, and destruction of natural river courses. According to the U.S. Hydropower Resource Assessment for Illinois (INEL, 1997), there are no remaining sites in Illinois that would be environmentally suitable for a large hydroelectric facility.

The GEIS (Section 8.3.4) estimates land use of 1,600 mi^2 per 1,000 MWe generated by hydropower. Based on this estimate, a project the size of the EGC ESP Facility would require flooding more than 3,520 mi^2 resulting in a large impact on land use. Further, operation of a hydroelectric facility would alter aquatic habitats above and below the dam, which would impact existing aquatic species.

EGC has concluded that, due to the lack of suitable sites in Illinois and the amount of land needed (approximately 3,520 mi^2), in addition to the adverse environmental impacts, hydropower is not a reasonable alternative.

9.2.2.4 Solar Power

Solar energy is dependent on the availability and strength of sunlight (strength is measured as kWh/m^2). Solar power is considered an intermittent source of energy. This section addresses solar power alone and only those solar technologies capable of being connected to a transmission grid. Combinations of solar power with other generating sources are discussed in Section 9.2.3.3.

Solar power is not generally considered a baseload source. Storage technologies have not advanced to a point where solar power can be considered as feasible alternatives to large baseload capacity (USDOE/EERE, 2004e). However, all solar technologies provide a fuel-saving companion to a baseload source. These technologies can be divided into two groups. The first group concentrates the sun's energy to drive a heat engine (concentrating solar power systems). The other group of solar power technologies directly converts solar radiation into electricity through the photoelectric effect by using photovoltaics (also known as PV).

In Illinois, solar energy varies from 4-5 $kWh/m^2/day$ in the summer to as low as 2-3 $kWh/m^2/day$ in the winter (see figure 9.2-4). The areas with the highest amount of solar radiation are in the southwestern part of the state, with radiation rates of 6-7 kWh/m^2 at the brightest time of a summer day, but most of Illinois falls in the range of 5.5-6 kWh/m^2. This resource is relatively low, particularly when compared to the southwestern United States. For example, parts of southern California can generate 10-12 kWh/m^2 of solar radiation during the brightest part of summer days. From a national resource availability perspective, then, it can be seen that the region of interest is not an attractive location for development of solar power. In addition to the relatively low amount of solar resource available, solar radiation varies by month (USDOE/NREL, 2004c). Solar energy also has a definite diurnal characteristic – the sun does not shine at night. Recognizing the comparative "abundance" of solar energy in the region of interest and the intermittent nature of solar-based electricity generation, various solar technologies are discussed below.

9.2.2.4.1 Concentrating Solar Power Systems

Concentrating solar power plants only perform efficiently in very sunny locations, specifically the arid and semi-arid regions of the world (USDOE/EERE, 1999). This does not include Illinois.

Concentrating solar plants produce electric power by converting the sun's energy into high-temperature heat using various mirror configurations. The heat is then channeled through a conventional generator, via an intermediate medium (i.e., water or salt). Concentrating solar plants consist of two parts: one that collects the solar energy and converts it to heat, and another that converts heat energy to electricity.

Concentrating solar power systems can be sized for "village" power (10 kW) or grid-connected applications (up to 100 MW). Some systems use thermal energy storage (TES), setting aside heat transfer fluid in its hot phase during cloudy periods or at night. These attributes, along with solar-to-electric conversion efficiencies, make concentrating solar power an attractive renewable energy option in the Southwest of the United States and other Sunbelt regions worldwide (USDOE/EERE, 2004d). Others can be combined with natural gas. This type of combination is discussed in Section 9.2.3.3.

There are three kinds of concentrating solar power systems—troughs, dish/engines, and power towers—classified by how they collect solar energy (USDOE/EERE, 2004d). Each is briefly discussed below.

Trough systems: The sun's energy is concentrated by parabolically curved, trough- shaped reflectors onto a receiver pipe running along the inside of the curved surface. This energy heats oil flowing through the pipe and the heat energy is then used to generate electricity in a conventional steam turbine generator.

A collector field comprises many troughs in parallel rows aligned on a north-south axis. This configuration enables the single-axis troughs to track the sun from east to west during the day to ensure that the sun is continuously focused on the receiver pipes. Individual trough systems currently can generate about 80 MWe. Experimental trough systems in California can currently generate approximately 300 MWe.

Current storage capacity at trough plants is minimal – most plant only have a storage capacity of 25 percent. Trough designs can incorporate TES allowing for electricity generation several hours into the evening. Currently, all parabolic trough plants are "hybrids," meaning they use fossil-fueled generation to supplement the solar output during periods of low solar radiation. This type of combination is discussed in Section 9.2.3.3.

Dish/engine systems: A dish/engine system is a stand-alone unit composed primarily of a collector, a receiver, and an engine. The sun's energy is collected and concentrated by a dish-shaped surface onto a receiver that absorbs the energy and transfers it to the engine's working fluid. The engine converts the heat to mechanical power in a manner similar to conventional engines—that is, by compressing the working fluid when it is cold, heating the compressed working fluid, and then expanding it through a turbine or with a piston to produce work. The mechanical power is converted to electrical power by an electric generator or alternator.

Dish/engine systems use dual-axis collectors to track the sun. The ideal concentrator shape is parabolic, created either by a single reflective surface, multiple reflectors, or facets. Many options exist for receiver and engine type, including Stirling engine and Brayton receivers.

Dish/engine systems are not commercially available yet, although ongoing demonstrations indicate the potential for commercial viability. Individual dish/engine systems currently can generate about 25 kW of electricity. More capacity is possible by connecting dishes together. These systems can be combined with natural gas generation and the resulting hybrid provides continuous power generation. This type of combination is discussed in Section 9.2.3.3.

Power tower systems: The sun's energy is concentrated by a field of hundreds or even thousands of mirrors (called "heliostats") onto a receiver located on top of a tower. This energy heats molten salt flowing through the receiver, and the salt's heat energy is then used to generate electricity in a conventional steam turbine generator. The molten salt retains heat efficiently, so it can be stored for hours or even days before it loses its capacity to generate electricity. Solar Two, a demonstration power tower located in the Mojave Desert in California, generated about 10 MW of electricity before the project was discontinued in 1999.

In these systems, the molten salt at 550°F is pumped from a "cold" storage tank through the receiver, where it is heated to 1,050°F and then on to a "hot" tank for storage. When power is needed from the plant, hot salt is pumped to a steam generating system that produces steam to power a turbine generator. From the steam generator, the salt is returned to the cold tank, where it is stored and eventually reheated in the receiver.

With TES, power towers can operate at an annual capacity factor of 65 percent which means they can potentially operate for 65 percent of the year without the need for a back-up fuel source. Without energy storage, solar technologies like this are limited to annual capacity factors near 25 percent. The power tower's ability to operate for extended periods of time on stored solar energy separates it from other solar energy technologies.

Concentrating solar energy systems have a close resemblance to most power plants operated by the nation's power industry and their ability to provide central generation. Concentrating solar power technologies utilize many of the same technologies and equipment used by conventional power plants, simply substituting the concentrated power of the sun for the combustion of fossil fuels to provide the energy for conversion into electricity. This "evolutionary" aspect—as distinguished from "revolutionary" or "disruptive"—allows for easy integration into the transmission grid. It also makes concentrating solar power technologies the most cost-effective solar option for the production of large-scale electricity generation (10 MWe and above).

While concentrating solar power technologies currently offer the lowest-cost solar electricity for large-scale electricity generation, these technologies are still in the demonstration phase of development and cannot be considered competitive with fossil- or nuclear-based technologies (CEC, 2003). Current technologies cost 9 to 12 cents per kilowatt-hour (kWh). New innovative hybrid systems that combine large concentrating solar power plants with conventional natural gas combined cycle or coal plants can reduce costs to $1.5 per watt and drive the cost of producing electricity from solar power to below 8 cents per kWh (USDOE/EERE, 2004b). This type of combination is discussed in Section 9.2.3.3. Future advances are expected to allow electricity from solar power to be generated for 4 to 5 cents per kWh in the next few decades (USDOE/EERE, 2004d). In contrast, nuclear plants are anticipated to produce power in the range of 3.1 to 4.6 cents per kWh (USDOE, 2002) (USDOE, 2004).

9.2.2.4.2 Photovoltaic Cells

The second main method for capturing the sun's energy is through the use of photovoltaics. A typical PV or solar cell might be a square that measures about 4 inches (10 cm) on a side. A cell can produce about 1 watt of power—more than enough to power a watch, but not enough to run a radio.

When more power is needed, some 40 PV cells can be connected together to form a "module." A typical module is powerful enough to light a small light bulb. For larger power needs, about 10 such modules are mounted in PV "arrays," which can measure up to several meters on a side. The amount of electricity generated by an array increases as more modules are added.

"Flat-plate" PV arrays can be mounted at a fixed-angle facing south, or they can be mounted on a tracking device that follows the sun, allowing them to capture more sunlight over the course of a day. Ten to 20 PV arrays can provide enough power for a household; for large electric utility or industrial applications, hundreds of arrays can be interconnected to form a single, large PV system (USDOE/EERE, 2004b). According to USDOE estimates, land use for this technology is approximately 2.5 ac to 12 ac/MWe (USDOE/NREL, 2004b).

Some PV cells are designed to operate with concentrated sunlight, and a lens is used to focus the sunlight onto the cells. This approach has both advantages and disadvantages compared with flat-plate PV arrays. Economics of this design turns on the use of as little of the expensive semiconducting PV material as possible, while collecting as much sunlight as possible. The lenses cannot use diffuse sunlight, but must be pointed directly at the sun and move to provide optimum efficiency. Therefore, the use of concentrating collectors is limited to the west and southwest areas of the country. According to the USDOE estimates, land use for this method is approximately 5 ac to 12 ac/MWe (USDOE/NREL, 2004a).

Available photovoltaic cell conversion efficiencies are in the range of approximately 15 percent (15 percent) (Siemens, 2004). The average solar energy falling on a horizontal surface in the Illinois region in June, a peak month for sunlight, is approximately 4 to 5 kWh/m^2 per day (USDOE/EERE, 2004b). If an average solar energy throughout the year of approximately 5 kWh/m^2 per day and a conversion efficiency of 15 percent were used, photovoltaic cells would yield an annual electricity production of approximately 274 kWh/m^2 per year in Illinois. At this rate of generation, generating base-loaded electricity equivalent to the EGC ESP Facility would require approximately 62,726,715 m^2 [(2180 MWe (See ER Sec. 3.7.2) *0.9 * 8760 hr/yr * 1000 kW/MW / 274 kWh/m^2/yr)] or approximately 63 km^2 (24 mi^2) of PV arrays.

The same values that drive the PV system market also set the wide range of PV costs. The high range of capital costs of $5 to $12 per watt is offset by low operating costs, measured in kWh. The 20-year life-cycle cost ranged from 20 to 50 cents per kWh (USDOE/EERE, 2004f).

Currently, photovoltaic solar power is not competitive with other methods of producing electricity for the open wholesale electricity market. When determining the cost of solar systems, the totality of the system must be examined. There is the price per watt of the solar cell, price per watt of the module (whole panel), and the price per watt of the entire system. It is important to remember that all systems are unique in their quality and size, making it difficult to make broad generalizations about price. The average PV cell price was $2.40 per peak watt in 2000 and the average per peak watt cost of a module was $3.46 in the same year (USDOE/EIA, 1999). The module price however does not include the design costs, land, support structure, batteries, an inverter, wiring, and lights/appliances. With all of these included, a full system can cost anywhere from $7 to $20 per watt (Fitzgerald, 2004). Costs of PV cells in the future may be expected to decrease with improvements in technology and increased production. Optimistic estimates are that costs of grid-connected PV systems could drop to $2,275 per kW and to $0.15 to $0.20 per kWh by 2020 (ELPC, 2001). These costs would still be substantially in excess of the costs of power from a new nuclear plant.

9.2.2.4.3 Environmental Impacts

Land use and aesthetics are the primary environmental impacts of solar power. Land requirements for each of the individual solar energy technologies is large, compared to the land used for the EGC ESP Facility. The land required for the solar generating technologies discussed here ranges from 3 to 12 ac/MWe compared to 0.23 acres per MWe for nuclear. In addition, this land use is pre-emptive; land used for solar facilities would not be available for other uses such as agriculture.

Depending on the solar technology used, there may be thermal discharge impacts. These impacts are anticipated to be small. During operation, PV and solar thermal technologies produce no air pollution, little or no noise, and require no transportable fuels.

There are environmental impacts of PV related to manufacture and disposal. The process to manufacture PV cell is similar to the production of a semiconductor chip. Chemicals used in the manufacture of PV cells include cadmium and lead. Potential human health risks also arise from the manufacture and deployment of PV systems, since there is a risk of exposure to heavy metals such as selenium and cadmium during use and disposal (CEC, 2004). There is some concern that landfills could leach cadmium, mercury, and lead into the environment in the long term. Generally, PV cells are sealed and the risk of release is considered slight, however, the long-term impact of these chemicals in the environment is unknown. Another environmental consideration with solar technologies is the lead-acid batteries that are used with some systems. The impact of these lead batteries is lessening, however, as batteries become more recyclable, batteries of improved quality are produced and better quality solar systems that enhance battery lifetimes are created (Real, et. al., 2001).

9.2.2.4.4 Summary

Solar power alone cannot be used to generate baseload power, because of the intermittent nature of the resource. Therefore, solar power alone is not a reasonable alternative to the baseload generating facility being considered for the Clinton site. Solar power in combination with storage facilities (e.g., power troughs with molten salt storage) can be used to generate baseload power. However, such a facility is still in the developmental stage and such facilities (and solar facilities in general) are not economically competitive alternatives to the proposed EGC ESP Facility because the resource is intermittent and incoming solar radiation is low for most of the year throughout the region of interest. Additionally, there are potential environmental impacts associated with any large-scale solar generation facilities. Land use and aesthetic impacts would most likely be large compared to a nuclear plant.

The solar resource could contribute to a competitive combination of alternative energy sources. This combination of alternatives is discussed in Section 9.2.3.3.

9.2.2.5 Wood Waste (and Other Biomass)

The use of wood waste to generate electricity is largely limited to those states with significant wood resources, such as California, Maine, Georgia, Minnesota, Oregon, Washington, and Michigan. Electric power is generated in these states by the pulp, paper, and paperboard industries, which consume wood and wood waste for energy, benefiting from the use of waste materials that could otherwise represent a disposal problem. However, the largest wood waste power plants are 40 to 50 MW in size.

Nearly all of the wood-energy-using electricity generation facilities in the United States use steam turbine conversion technology. The technology is relatively simple to operate and it can accept a wide variety of biomass fuels. However, at the scale appropriate for biomass, the technology is expensive and inefficient. Therefore, the technology is relegated to applications where there is a readily available supply of low-, zero-, or negative-cost delivered feedstocks.

Further, as discussed in Section 8.3.6 of the GEIS, construction of a wood-fired plant would have an environmental impact that would be similar to that for a coal-fired plant, although facilities using wood waste for fuel would be built on smaller scales. Like coal-fired plants, wood-waste plants require large areas for fuel storage, processing, and waste disposal (i.e., ash). Additionally, operation of wood-fired plants has environmental impacts, including impacts on the aquatic environment and air.

EGC has concluded that, due to the lack of significant wood resources in Illinois and the lack of an obvious environmental advantage, wood energy is not a reasonable alternative.

9.2.2.6 Municipal Solid Waste

As discussed in Section 8.3.7 of the GEIS, the initial capital costs for municipal solid waste plants are greater than for comparable steam turbine technology at wood-waste facilities. This is due to the need for specialized waste separation and handling equipment.

The decision to burn municipal solid waste to generate energy is usually driven by the need for an alternative to landfills, rather than by energy considerations. The use of landfills as a waste disposal option is likely to increase in the near term; however, it is unlikely that many landfills will begin converting waste to energy due to the numerous obstacles and factors that may limit the growth in MSW power generation. Chief among them are environmental regulations and public opposition to siting MSW facilities.

Estimates in the GEIS suggest that the overall level of construction impacts from a waste-fired plant should be approximately the same as that for a coal-fired plant. Additionally, waste-fired plants have the same or greater operational impacts (including impacts on the aquatic environment, air, and waste disposal). Some of these impacts would be moderate, but still larger than the proposed action.

EGC has concluded that, due to the high costs and lack of obvious environmental advantages, burning municipal solid waste to generate electricity is not a reasonable alternative.

9.2.2.7 Energy Crops

In addition to wood and municipal solid waste fuels, there are several other concepts for fueling electric generators, including burning energy crops, converting crops to a liquid fuel such as ethanol (ethanol is primarily used as a gasoline additive), and gasifying energy crops (including wood waste). As discussed in Section 8.3.8 of the GEIS, none of these technologies has progressed to the point of being competitive on a large scale or of being reliable enough to replace a base-load plant.

Further, estimates in the GEIS suggest that the overall level of construction impacts from a crop-fired plant should be approximately the same as that for a wood-fired plant. Additionally, crop-fired plants would have similar operational impacts (including impacts on the aquatic environment and air). In addition, these systems have large impacts on land use, due to the acreage needed to grow the energy crops.

EGC has concluded that, due to the high costs and lack of obvious environmental advantage, burning other biomass-derived fuels is not a reasonable alternative.

9.2.2.8 Petroleum Liquids (Oil)

Illinois has several oil-fired units; however, they produce less than one percent of the State's electricity. The cost of oil-fired operation is much more expensive than nuclear or coal-fired operation. The high cost of oil has prompted a steady decline in its use for electricity generation. From 1997 to 1998, production of electricity by oil-fired plants dropped by about 39.9 percent in Illinois (USDOE/EIA, 1998).

Also, construction and operation of an oil-fired plant would have environmental impacts. For example, Section 8.3.11 of the GEIS estimates that construction of a 1,000-MWe oil-fired plant would require about 120 ac. Additionally, operation of oil-fired plants would have environmental impacts (including impacts on the aquatic environment and air) that would be similar to those from a coal-fired plant (USNRC, 1996).

EGC has concluded that, due to the high fuel costs and lack of obvious environmental advantage, oil-fired generation is not a reasonable alternative.

9.2.2.9 Fuel Cells

Phosphoric acid fuel cells are the most mature fuel cell technology, but they are only in the initial stages of commercialization. Two hundred turnkey plants have been installed in the United States, Europe, and Japan. Recent estimates suggest that a company would have to produce about 100 MW of fuel cell stacks annually to achieve a price of $1,000 to $1,500 per kilowatt. However, the current combined production capacity of fuel cell manufacturers only totals about 60 MW per year (KE, 2002). EGC believes that this technology has not matured sufficiently to support production for a base load facility. EGC has concluded that, due to the cost and production limitations, fuel-cell technology is not a reasonable alternative.

9.2.2.10 Coal

Coal-fired steam electric plants provide the majority of electric generating capacity in the U.S., accounting for about 56 percent of the electric utility industry's net generation and 43 percent of its capacity in 1992 (USDOE/EIA, 1994). Conventional coal-fired plants generally include two or more generating units and have total capacities ranging from 100 MWe to more than 2,000 MWe. Coal is likely to continue to be a reliable energy source well into the future (USDOE/EIA, 1993), assuming environmental constraints do not cause the gradual substitution of other fuels.

The U.S. has abundant low-cost coal reserves, and the price of coal for electric generation is likely to increase at a relatively slow rate. Even with recent environmental legislation, new coal capacity is expected to be an affordable technology for reliable, near-term development and for potential use as a replacement technology for nuclear power plants (USNRC, 1996).

The environmental impacts of constructing a typical coal-fired steam plant are well known because coal is the most prevalent type of central generating technology in the U.S. The impacts of constructing a 1,000-MWe coal plant at a greenfield site can be substantial, particularly if it is sited in a rural area with considerable natural habitat. An estimated 1,700 ac would be needed, and this could amount to the loss of about 3 mi^2 of natural habitat and/or agricultural land for the plant site alone, excluding land required for mining and other fuel cycle impacts (USNRC, 1996).

EGC defined the coal-fired alternative as consisting of four 550-MWe units. EGC chose this configuration to be equivalent to the gas-fired alternative described below. This equivalency makes impact characteristics most comparable, facilitating impact analysis

Table 9.2-3 describes assumed basic operational characteristics of the coal-fired units. EGC based its emission control technology and percent-control assumptions on alternatives that the USEPA has identified as being available for minimizing emissions (USEPA, 1998). For the purposes of analysis, EGC has assumed that coal and lime (calcium oxide) would be delivered by rail after upgrading the existing rail spur into CPS.

Based on the well-known technology, fuel availability, and generally understood environmental impacts associated with constructing and operating a coal-fired power generation plant, it is considered a competitive alternative and is therefore examined further in Section 9.2.3.

9.2.2.11 Natural Gas

EGC has chosen to evaluate gas-fired generation, using combined-cycle turbines, because it has determined that the technology is mature, economical, and feasible. A scenario, for example, of four units with a net capacity of 2,200 MWe could be assumed to equal the EGC ESP Facility total net capacity. However, EGC’s experience indicates that, although customized unit sizes can be built, using standardized sizes is more economical. Existing manufacturers’ standard-sized units include a gas-fired combined-cycle plant of 550-MWe net capacity, consisting of two 184-MWe gas turbines (e.g., General Electric Frame 7FA) and 182 MWe of heat recovery capacity.

EGC assumed four 550-MWe units, having a total capacity of 2,200 MWe, as the gas-fired alternative at the EGC ESP Site. This provides the approximate EGC ESP capacity for estimating the environmental impacts of this alternative. Any shortfall in capacity could be replaced by other methods, such as purchasing power. However, for the reasons discussed above, EGC did not analyze a mixture of these alternatives and purchased power.

Table 9.2-5 describes assumed basic operational characteristics of the gas-fired units. As for the coal-fired alternative, EGC based its emission control technology and percent-control assumptions on alternatives that the EPA has identified as being available for minimizing emissions (USEPA, 1998). For the purposes of analysis, EGC has assumed that there would be sufficient gas availability.

Based on the well-known technology, fuel availability, and generally understood environmental impacts associated with constructing and operating a natural gas-fired power generation plant, it is considered a competitive alternative and is therefore examined further in Section 9.2.3.

9.2.3 Assessment of Reasonable Alternative Energy Sources and Systems

This chapter evaluates the environmental impacts from what EGC has determined to be reasonable alternatives to the EGC ESP Facility: coal-fired generation, and gas-fired generation.

EGC has identified the significance of the impacts associated with each issue as Small, Moderate, or Large. This characterization is consistent with the criteria that USNRC established in 10 CFR 51, Appendix B, Table B-1, Footnote 3 as follows:

- SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small.
- MODERATE - Environmental effects are sufficient to alter noticeably, but not to destabilize, any important attribute of the resource.
- LARGE - Environmental effects are clearly noticeable and are sufficient to destabilize any important attributes of the resource.

In accordance with National Environmental Policy Act (NEPA) practice, EGC considered ongoing and potential additional mitigation in proportion to the significance of the impact to be addressed (i.e., impacts that are small receive less mitigative consideration than impacts that are large).

9.2.3.1 Coal-Fired Generation

The USNRC evaluated environmental impacts from coal-fired generation alternatives in the GEIS (USNRC, 1996) and concluded that construction impacts could be substantial, due in part to the large land area required (which can result in natural habitat loss) and the large workforce needed. USNRC pointed out that siting a new coal-fired plant where an existing nuclear plant is located would reduce many construction impacts. USNRC identified major adverse impacts from operations as human health concerns associated with air emissions, waste generation, and losses of aquatic biota due to cooling water withdrawals and discharges.

The coal-fired alternative defined by EGC in Section 9.2.2.10 would be located at the EGC ESP Site.

9.2.3.1.1 Air Quality

Air quality impacts of coal-fired generation are considerably different from those of nuclear power. A coal-fired plant would emit sulfur dioxide (SO_2, as SO_x surrogate), oxides of nitrogen (NO_x), particulate matter (PM), and carbon monoxide (CO), all of which are regulated pollutants. As Section 9.2.2.10 indicates, EGC has assumed a plant design that would minimize air emissions through a combination of boiler technology and post-combustion pollutant removal. EGC estimates the coal-fired alternative emissions to be as follows:

SO_x = 8,127 tons per year

NO_x = 2,054 tons per year

CO = 2,118 tons per year

PM:

PM = 292 tons per year

PM_{10} (particulates having a diameter of less than 10 microns) = 67 tons per year

Table 9.2-1 presents the methodology and basis for the above emission figures.

Coal combustion results in emissions of heavy metals such as mercury, hazardous air pollutants such as benzene, polychlorinated dibenzo-p-dioxins, and polychlorinated dibenzo-fuiana.

In 1999, emissions of SO_2 and NO_X from Illinois's generators ranked 7th and 4th highest nationally, respectively (USDOE/EIA, 2002). In fact, seventeen Illinois generators were cited in the Clean Air Act Amendments of 1990 as requiring that by 1995 they be in compliance with stricter emission controls for SO_2 and NO_x. The acid rain requirements of the Clean Air Act Amendments capped the nation's SO_2 emissions from power plants. Each company having fossil-fuel-fired units was allocated SO_2 allowances. To be in compliance with the Act, the companies must hold enough allowances to cover their annual SO_2 emissions. EGC, having no fossil units, would have to purchase allowances from the open market to operate a fossil-fuel-burning plant at the EGC ESP Site. A company that has fossil units might also have the option of shutting down existing capacity and applying credits from that plant to the new one, thus mitigating the air quality impacts of these generating sources.

Both SO_2 and NO_X will increase with operation of a new coal-fired plant at the EGC ESP Site. In order to operate a fossil-fuel-fired plant at the site, EGC would have to obtain sufficient pollution credits to cover annual emissions either from the set-aside pool or by purchasing pollution credits from other sources.

While this option is available, it is unlikely that it will be feasible for a new generating facility. In October 1998, EPA promulgated the NO_x State Implementation Plan Call regulation that requires 22 states, including Illinois, to reduce their NO_x emissions by over 30 percent to address national ozone transport (USEPA, 2001). The regulation imposes a NO_x "budget" to limit the NO_x emissions from each state. The IEPA allocated NO_x credits among the existing electrical generating units in the State (IAC, 2000). Beginning May 31, 2004, each electrical generating unit must hold enough NO_x credits to cover its annual NO_x emissions. A small percentage of NO_x credits was set aside for new sources.

The likelihood, however, of buying setoffs for a new facility is extremely remote, if at all possible. This being the case, the coal-fired alternative, while possible, will not be economically feasible since there are no mitigating efforts (like emissions trading) to make the alternative worthwhile. In addition, emission credits' trading generally applies to non-attainment areas. The site that EGC has chosen as the preferred site is located in an attainment area, making emission credit trading not effective as a mitigation technique.

The USNRC did not quantify coal-fired emissions, but implied that air impacts from fossil fuel generation would be substantial. The USNRC noted that adverse human health effects from coal combustion have led to important federal legislation in recent years and that public health risks, such as cancer and emphysema, have been associated with coal combustion. USNRC also mentioned global warming and acid rain as potential impacts. EGC concludes that federal legislation and large-scale concerns, such as global warming and acid rain, are indications of concerns about destabilizing important attributes of air resources. However, SO_2 emission allowances, NO_x emission offsets, low NO_x burners, overfire air, fabric filters or electrostatic precipitators, and scrubbers are regulatorily imposed mitigation measures. As such, EGC concludes that the coal-fired alternative may have moderate to large impacts on air quality; the impacts may be clearly noticeable and may destabilize air quality in the area.

9.2.3.1.2 Waste Management

EGC concurs with the GEIS assessment that the coal-fired alternative would generate substantial solid waste. The coal-fired plant, using coal having an ash content of 6.9 percent, would annually consume approximately 8,500,000 tons of coal (Table 9.2-1). Particulate control equipment would collect most (99.9 percent) of this ash, approximately 584,000 tons per year. Illinois regulations encourage recycling of coal-combustion by-products. ComEd, as the former owner of certain fossil fuel electric generating facilities now currently owned by Mid-West Generation historically recycled 87 percent of its coal ash (ComEd, 2000). Assuming continuation of this waste mitigation measure, the coal-fired alternative would generate approximately 76,000 tons of ash per year for disposal.

SO_x-control equipment, annually using nearly 150,000 tons of calcium oxide, would generate another 443,000 tons per year of waste in the form of scrubber sludge. EGC estimates that ash and scrubber waste disposal over a 40-yr plant life would require approximately 234 ac (a square area with sides of approximately 3,200 ft). Table 9.2-4 shows how EGC calculated ash and scrubber waste volumes.

With proper placement of the facility, coupled with current waste management and monitoring practices, waste disposal would not destabilize any resources. There would be space within the EGC ESP Site footprint for this disposal. After closure of the waste site and revegetation, the land would be available for other uses. For these reasons, EGC believes that waste disposal for the coal-fired alternative would have moderate impacts; the impacts of increased waste disposal would be clearly noticeable, but would not destabilize any important resource and further mitigation of the impact would be unwarranted.

9.2.3.1.3 Other Impacts

Construction of the power block and coal storage area would impact approximately 300 ac of land and associated terrestrial habitat. Because most of this construction would be in previously disturbed areas, impacts would be minimal. Visual impacts would be consistent with the industrial nature of the site. As with any large construction project, some erosion, collection of lake sedimentation, and fugitive dust emissions could be anticipated, but would be minimized by using best management practices. It is assumed that construction debris from clearing and grubbing could be disposed of on site and municipal waste disposal capacity would be available. Socioeconomic impacts would result from the approximately 250 people needed to operate the coal-fired facility. EGC believes that these impacts would be small due to the mitigating influence of the site’s proximity to the surrounding population area. Cultural resource impacts would be unlikely, due to the previously disturbed nature of the site, and could be, if needed, minimized by survey and recovery techniques.

Impacts to aquatic resources and water quality would be minimized but could be construed as moderate due to the plant's use of a new cooling water system. The new stacks, boilers, and rail deliveries would be an incremental addition to the visual impact from existing CPS structures and operations. Coal delivery would add noise and transportation impacts associated with unit-train traffic.

EGC believes that other construction and operation impacts would be small. In most cases, the impacts would be detectable, but they would not destabilize any important attribute of the resource involved. Due to the minor nature of these impacts, mitigation would not be warranted beyond that mentioned.

9.2.3.1.4 Design Alternatives

The CPS Site location lends itself to coal delivery by rail.

Use of cooling towers as the cooling mechanism for coal-fired generation would reduce cooling water intake and discharge water usage by 90 percent when compared to once thru cooling as is used currently by the CPS. Use of cooling towers would reduce impingement, entrainment, and thermal impacts, increase consumptive water use through evaporation, and introduce a visual impact (100-foot-high mechanical towers or 600-foot-high natural draft towers). Wet/dry cooling towers may be used to reduce makeup water consumption to match water demand with available water supply.

9.2.3.2 Natural Gas Generation

The USNRC evaluated environmental impacts from gas-fired generation alternatives in the GEIS, focusing on combined-cycle plants. Section 9.2.2.11 presents EGC's reasons for defining the gas-fired generation alternative as a combined-cycle plant on the EGC ESP Site. Land-use impacts from gas-fired units on the site would be less than those of the coal-fired alternative. Reduced land requirements, due to construction on the existing site and a smaller facility footprint would reduce impacts to ecological, aesthetic, and cultural resources as well. As discussed under "Other Impacts," an incremental increase in the workforce could have socioeconomic impacts. Human health effects associated with air emissions would be of concern, but the effect would likely be less than those presented by coal-fired generation. Aquatic biota losses due to cooling water withdrawals would be exacerbated by the concurrent operation of CPS.

The gas-fired alternative defined by EGC in Section 9.2.2.11 would be located at the EGC ESP Site.

9.2.3.2.1 Air Quality

Natural gas is a relatively clean-burning fossil fuel. Also, because the heat recovery steam generator does not receive supplemental fuel, the combined-cycle operation is highly efficient (56 percent vs. 33 percent for the coal-fired alternative). Therefore, the gas-fired alternative would release similar types of emissions, but in lesser quantities than the coal-fired alternative. Control technology for gas-fired turbines focuses on the reduction of NO_x emissions. EGC estimates the gas-fired alternative emissions to be as follows:

- SO_x = 177 tons per year
- NO_x = 568 tons per year

- CO = 120 tons per year
- PM = 99 tons per year (all particulates are PM_{10})

Table 9.2-2 presents the methodology and basis for the above emission figures.

The Section 9.2.3.1 discussion of regional air quality, Clean Air Act requirements, and the NO_x State Implementation Plan Call is also applicable to the gas-fired generation alternative. NO_x effects on ozone levels, SO_x allowances, and NO_x emission offsets could be issues of concern for gas-fired combustion. The emissions from a gas-fired plant are substantial. EGC concludes that emissions from a gas-fired alternative located at the EGC ESP Site may noticeably alter local air quality, but may not destabilize regional resources. Air quality impacts would therefore be moderate, but substantially larger than those of nuclear generation.

9.2.3.2.2 Waste Management

Gas-fired generation would result in almost no waste generation, producing minor (if any) impacts. EGC concludes that gas-fired generation waste management impacts would be small.

9.2.3.2.3 Other Impacts

Similar to the coal-fired alternative, the ability to construct the gas-fired alternative on the EGC ESP Site would reduce construction-related impacts relative to construction on a greenfield site.

To the extent practicable, EGC would route the gas supply pipeline along previously disturbed rights-of-way to minimize impacts. However, this would still be a costly (i.e., approximately $1 million/mi) and potentially controversial action with ecological impacts from installation of a minimum of 2.5 mi of buried 24-in. gas pipeline to the EGC ESP Site. An easement encompassing 30 to 40 ac would need to be graded to permit the installation of the pipeline. Construction impact would be minimized through the application of best management practices that minimize soil loss and restore vegetation immediately after the excavation is backfilled. Construction would result in the loss of some less mobile animals (e.g., frogs and turtles). Because these animals are common throughout the area, EGC expects negligible reduction in their population as a result of construction. EGC does not expect that installation of a gas pipeline would create a long-term reduction in the local or regional diversity of plants and animals. In theory, these impacts from construction of a pipeline could be reduced or eliminated by locating the gas-fired plant at a different site adjacent to an existing pipeline.

The USNRC estimated in the GEIS that 110 ac would be needed for a plant site; this much previously disturbed acreage is available at the EGC ESP Site, reducing loss of terrestrial habitat. Aesthetic impacts, erosion and sedimentation buildup, fugitive dust, and construction debris impacts would be similar to the coal-fired alternative, but smaller because of the reduced site size. Socioeconomic impacts would result from the approximately 150 people needed to operate the gas-fired facility as estimated in the GEIS. EGC expects this number to be closer to 40 to 80 workers for a plant this size. EGC believes that these impacts would be small due to the mitigating influence of the site's proximity to the surrounding population area.

Use of cooling towers as the cooling mechanism for gas-fired generation would reduce cooling water intake and discharge by 90 percent when compared to once thru cooling as is used currently by the CPS. Use of cooling towers would also reduce impingement, entrainment, and thermal impacts, increase consumptive water use through evaporation, and introduce a visual impact (100-foot-high mechanical towers or 600-ft-high natural draft towers). Wet / dry cooling towers may be used to reduce makeup water consumption to match water demand with available water supply.

9.2.3.3 Combination of Alternatives

This section examines combinations of alternatives that could generate baseload power in an amount equivalent to the proposed EGC ESP Facility.

As discussed in Section 9.2.2.1, the capacity of the EGC ESP facility is 2180 MWe, with an annual energy output of about 17,200,000 MWh. There are a number of combinations of alternatives that have the potential of producing this baseload capacity and output.

Because of the intermittent nature of the resource and the lack of cost-effective technology, wind and solar are not sufficient on their own to generate the equivalent baseload capacity or output of the EGC ESP Facility, as discussed in Section 9.2.2.1 and 9.2.2.4. As shown in Sections 9.2.3.1 and 9.2.3.2, fossil-fired generation generates baseload capacity, but environmental impacts are greater than the EGC ESP Facility. It is conceivable, however, that a combination of alternatives (renewables in combination with fossil-fired generation) might be cost-effective and have less environmental impact than the EGC ESP Facility.

There is a multitude of possible combinations when considering the power sources and the output of each source. For the renewal of licenses pursuant to 10 CFR, Part 54, the NRC has already determined that expansive consideration of combinations would be too unwieldy given the purposes of the alternative analysis (USNRC, 1996). However, the combination alternative analysis should be sufficiently complete to aid the Commission in its analysis of alternative sources of energy pursuant to the National Environmental Policy Act (NEPA). The following analysis provides the basis for an evaluation of a reasonable combination of alternative energy sources to the EGC ESP Facility that is required by NEPA.

9.2.3.3.1 Determination of Alternatives

Many possible combinations of alternatives could satisfy the baseload capacity requirements of the EGC ESP Facility. Some combinations can include renewable sources, such as wind and solar. As discussed earlier in Section 9.2.2.1 and 9.2.2.4, wind and solar do not, by themselves, provide a reasonable alternative energy source to the baseload power to be produced by the EGC ESP Facility. However, wind and solar, in combination with fossil fuel-fired plant(s), may be a reasonable alternative to nuclear energy produced by the EGC ESP Facility.

The EGC ESP Facility is to operate as a baseload merchant independent power producer. The power produced will be sold on the wholesale market, without specific consideration to supplying a traditional service area or satisfying a reserve margin objective. The ability to generate baseload power in a consistent, predictable manner meets the business objective of the EGC ESP Facility. Therefore, when examining combinations of alternatives to the EGC ESP Facility, the ability to generate baseload power must be the determining feature when analyzing the reasonableness of the combination. This section reviews the ability of the combination alternative to have the capacity to generate baseload power equivalent to the EGC ESP Facility.

When examining a combination of alternatives that would meet the business objectives similar to that of the EGC ESP Facility, any combination that includes a renewable power source (either all or part of the capacity of the EGC ESP Facility) must be combined with a fossil-fueled facility equivalent to the generating capacity of the EGC ESP Facility. This combination would allow the fossil-fueled portion of the combination alternative to produce the needed power if the renewable resource is unavailable and to be displaced when the renewable resource is available. For example, if the renewable portion is some amount of potential wind generation and that resource became available, then the output of the fossil-fueled generation portion of the combination alternative could be lowered to offset the increased generation from the renewable portion. This facility, or facilities, would satisfy business objectives similar to those of the EGC ESP Facility in that it would be capable of supporting fossil-fueled baseload power.

Coal - and gas – fired generation have been examined in Sections 9.2.3.1 and 9.2.3.2, respectively, as having environmental impacts that are equivalent to or greater than the impacts of the EGC ESP Facility. Based on the comparative impacts of these two technologies, as shown in Table 9.2-6, it can be concluded that a gas-fired facility would have less of an environmental impact than a comparably sized coal-fired facility. In addition, the operating characteristics of gas-fired generation are more amenable to the kind of load changes that may result from inclusion of renewable generation such that the baseload generation output of 2180 MWe is maintained. “Clean Coal” power plant technology could decrease the air pollution impacts associated with burning coal for power. Demonstration projects show that clean coal programs reduce NO_x, SO_x, and particulate emissions. However, the environmental impacts from burning coal using these technologies, if proven, are still greater than the impacts from natural gas (USDOE/NETL, 2001). Therefore, for the purpose of examining the impacts from a combination of alternatives to the EGC ESP Facility, a facility equivalent to that described in Section 9.2.3.2 (gas-fired generation) will be used in the environmental analysis of combination alternatives. The analysis accounts for the reduction in environmental impacts from a gas-fired facility when generation from the facility is displaced by the renewable resource. The impact associated with the combined-cycle natural gas-fired unit is based on the gas-fired generation impact assumptions discussed in Section 9.2.3.2. Additionally, the renewable portion of the combination alternative would be any combination of renewable technologies that could produce power equal to or less than the EGC ESP Facility at a point when the resource was available. The environmental impacts associated with wind and solar generation schemes are outlined in Sections 9.2.2.1 and 9.2.2.4, respectively. This combination of renewable energy and natural gas fired generation represents a viable mix of non-nuclear alternative energy sources.

For the purpose of the economic comparison of a combination of alternatives, a coal plant in combination with the renewable resource was analyzed. Coal is used for the purposes of the economic comparison because coal plants generate power at a lower cost than gas plants.

9.2.3.3.2 Environmental Impacts

The environmental impacts associated with a gas-fired facility sized to produce power equivalent to the EGC ESP Facility have already been analyzed in Section 9.2.3.2. Depending on the level of potential renewable output included in the combination alternative, the level of impact of the gas-fired portion will be comparably lower. If the renewable portion of the combination alternative were not enough to displace the power produced by the fossil fueled facility, then there would be some level of impact associated with the fossil fueled facility. Consequently, if the renewable portion of the combination alternative were enough to fully displace the output of the gas-fired facility, then, when the renewable resource is available, the output of fossil fueled facility could be eliminated, thereby eliminating its operational impacts. The lower the output of the renewable portion of the combination alternative, the closer the impacts approach the level of impact described in Section 9.2.3.2 for gas-fired generating facilities.

Determination of the types of environmental impacts of these types of 'hybrid' plants or combination of facilities can be surmised from analysis of past projects.

For instance, in 1984, Luz International, Ltd. built the Solar Electric Generating System (SEGS) plant in the California Mojave Desert. The SEGS technology consists of modular parabolic-trough solar collector systems, which use oil as a heat transfer medium. One unique aspect of the Luz technology is the use of a natural-gas-fired boiler as an oil heater to supplement the thermal energy from the solar field or to operate the plant independently during evening hours. SEGS I was installed at a total cost of $62 million (~$4,500/kW) and generates power at 24 cents/kWh (in 1988 real levelized dollars). The improvements incorporated into the SEGS III-VI plants (~$3,400/kW) reduced generation costs to about 12 cents/kWh, and the third-generation technology, embodied in the 80-MW design at an installed cost of $2,875/kW, reduced power costs still further, to 8 to 10 cents/kWh. Because solar energy is not a concentrated source, the dedicated land requirement for the Luz plants is large compared to conventional plants--on the order of 5 ac/MW (2 ha/MW) (USDOE/NREL, 2004b), compared to 0.23 acres per MWe for a nuclear plant.

In Illinois, the solar thermal source is approximately 4.5 kWh/m^2; the SEGS units were built in an area of where the solar source is 5.5 kWh/m^2. Using the above metrics for land use and the solar source of 4.5 kWh/m^2 per day in Illinois, a similar SEGS unit within the region of interest would require dedicated land of approximately 6 acres/MWe (USDOE/EERE, 2004b), compared to 0.23 acres per MWe for a nuclear plant. Land use for generating baseload equivalent to the EGC ESP Facility would require approximately 13,000 acres (20 mi^2)(2180 MWe *6 acres/MW). Additionally, given the lower thermal source in Illinois, the capital costs for the solar portion of the hybrid plant would be proportionally greater than for the SEGS.

In the case of parabolic trough plants, all plants of this type of solar technology are configured in combination with a fossil fueled generation component. A typical configuration is a natural gas-fired heat or a gas steam boiler/reheater coupled to the trough system. Troughs also can be integrated with existing coal-fired plants. With the current trough technology, annual production nationwide is about 100 kWh/m^2 (USDOE/EERE, 2004d). Parabolic trough plants require a significant amount of land; typically the use is preemptive because parabolic troughs require the land to be graded level. A report, developed by the California Energy Commission (CEC), notes that 5 to 10 acres per MWe is necessary for concentrating solar power technologies such as trough systems (CEC, 2004).

The environmental impacts associated with a solar and a wind facility equivalent to the EGC ESP Facility have already been analyzed in Sections 9.2.2.1 and 9.2.2.4, respectively. It is reasonable to expect that the impacts associated with an individual unit of a smaller size would be similarly scaled. None of the impacts would be greater than those discussed in Sections 9.2.2.1 and 9.2.2.4. If the renewable portion of the combination alternative is unable to generate an equivalent amount of power as the EGC ESP Facility, then the combination alternative would have to rely on the gas-fired portion to meet the equivalent capacity of the EGC ESP Facility. Consequently, if the renewable portion of the combination alternative has a potential output that is equal to that of the EGC ESP Facility, then the impacts associated with the gas-fired portion of the combination alternative would be lower but the impacts associated with the renewable portion would be greater. The greater the potential output of the renewable portion of the combination alternative, the closer the impacts would approach the level of impact described in Sections 9.2.2.1 and 9.2.2.4.

The environmental impacts associated with a gas-fired facility and equivalent renewable facilities are shown in Table 9.2-7 and summarized in Table 9.2-6. The gas-fired facility alone has impacts that are larger than the EGC ESP Facility; some environmental impacts of renewables are also greater than or equal to the EGC ESP Facility.

The combination of a gas-fired plant and wind or solar facilities would have environmental impacts that are equal to or greater than those of a nuclear facility.

- All of the environmental impacts of a new nuclear plant at the EGC ESP Site and all of the impacts from a gas-fired plant are small, except for air quality impacts from a gas-fired facility (which are moderate). Use of wind and/or solar facilities in combination with a gas-fire facility would be small, and therefore would be equivalent to the air quality impacts from a nuclear facility.
- All of the environmental impacts of a new nuclear plant at the EGC ESP Site and all of the impacts from wind and solar facilities are small, except for land use and aesthetic impacts from wind and solar facilities (which range from moderate to large). Use of a gas-fired facility in combination with wind and solar facilities would reduce the land usage and aesthetic impacts from the wind and solar facilities. However, at best, those impacts would be small, and therefore would be equivalent to the land use and aesthetic impacts from a nuclear facility.

Therefore the combination of wind and solar facilities and gas-fired facilities is not environmentally preferable to the EGC ESP Facility.

9.2.3.3.3 Economic Comparison

As noted earlier, the combination alternative must generate power equivalent to the capacity of the EGC ESP Facility. The USDOE has estimated the cost of generating electricity from a gas-fired facility (4.7 cents per kWh), a coal facility (4.9 cents per kWh), as well as wind (5.7 cents per kWh for sites similar to those in the region of interest), and solar (4 to 5 cents per kWh). The cost for gas-fired facility in combination with a renewable facility would increase, because the facility would not be operating at full availability when it is displaced by the renewable resource. As a result, the capital costs and fixed operating costs of the gas facility would be spread across fewer kWh from the gas facility, thereby increasing its cost per kWh. The projected cost associated with the operation a new nuclear facility similar to the EGC ESP Facility is in the range of 3.1 to 4.6 cents per kWh (USDOE, 2002) (USDOE, 2004). The projected costs associated with all other forms of generation other than the EGC ESP Facility are greater than the EGC ESP Facility. Therefore, the cost associated with the operation of the combination alternative would not be competitive with the EGC ESP Facility.

9.2.3.3.4 Summary

Wind and solar facilities in combination with fossil facilities could be used to generate baseload power and would serve the purpose of the EGC ESP Facility. However, wind and solar facilities in combination with fossil facilities would have equivalent or greater environmental impacts relative to a new nuclear facility at the EGC ESP Site. Similarly, wind and solar facilities in combination with fossil facilities would have higher costs than a new nuclear facility at the EGC ESP Site. Therefore, wind and solar facilities in combination with fossil facilities are not preferable to the EGC ESP Facility.

9.2.4 Conclusion

As shown in detail in Tables 9.2-6 and 9.2-7, based on environmental impacts, EGC has determined that neither a coal-fired, nor a gas-fired, nor a combination of alternatives, including wind and solar facilities, would provide an appreciable reduction in overall environmental impact relative to a nuclear plant. Furthermore, each of these types of alternatives, with the possible exception of the combination alternative, would entail a significantly greater environmental impact on air quality than would a nuclear plant. To achieve the small air impact in the combination alternative, however, a moderate to large impact on land use would be needed. Therefore, EGC concludes that neither a coal-fired, nor a gas-fired, nor a combination of alternatives would be environmentally preferable to a nuclear plant. Furthermore, these alternatives would have higher economic costs, and therefore are not economically preferable to a nuclear plant.

9.3 Alternative Sites

This section identifies and evaluates a set of alternatives for the proposed EGC ESP Site. The objective of this evaluation is to verify there is no "obviously superior site" for the eventual construction and operation of a new nuclear unit.

The EGC ESP Facility will be constructed and operated by an unregulated merchant generator as a "merchant plant." This means that there is no regulatory structure in place to guarantee a return on investments, and many of the decisions affecting the location of the plant are based on factors such as cost, ease of construction, and the ability to transmit the power to customers. The facility will operate in the competitive marketplace created by the National Energy Policy Act of 1992 and subsequent actions by the FERC to impose open transmission requirements. These changes have fundamentally altered both the marketplace for electricity and the makeup of electricity generating companies.

Additionally, existing nuclear sites have also changed the way alternatives are reviewed and selected, since a new plant could be located at these sites. Existing sites offer decades of environmental and operational information about the impact of a nuclear plant on the environment. These sites are licensed nuclear facilities, thus, the USNRC has found them to be acceptable relative to other undeveloped sites in the region of interest. The USNRC recognizes (in NUREG-1555, ESRP, Section 9.3(III)(8)) that proposed sites may not be selected as a result of a systematic review (USNRC, 1999):

> *"Recognize that there will be special cases in which the proposed site was not selected on the basis of a systematic site-selection process. Examples include plants proposed to be constructed on the site of an existing nuclear power plant previously found acceptable on the basis of a NEPA review and/or demonstrated to be environmentally satisfactory on the basis of operating experience, and sites assigned or allocated to an applicant by a State government from a list of State-approved power-plant sites. For such cases, the reviewer should analyze the applicant's site-selection process only as it applies to candidate sites other than the proposed site, and the site-comparison process may be restricted to a site-by-site comparison of these candidates with the proposed site. As a corollary, all nuclear power plant sites within the identified region of interest having an operating nuclear power plant or a construction permit issued by the NRC should be compared with the applicant's proposed site."*

In addition to looking at other nuclear power plant sites in Illinois, EGC's site selection was also based on an evaluation of undeveloped sites (commonly known as "greenfields"), and previously developed sites (commonly known as "brownfields"). These sites are not obviously superior to existing nuclear sites in the region of interest. Ultimately, the proposed location was chosen based on the applicant's ability to colocate an additional power facility at an existing nuclear power facility near Clinton, Illinois, and transmit power to the wholesale marketplace. The existing facility currently operates under a USNRC license, and the proposed location has already been found acceptable under the requirements for that license. Further, operational experience at the existing facility has shown that the environmental impacts are small, and operation of a new facility at the site should have essentially the same environmental impacts.

The traditional "relevant service area" does not necessarily provide a meaningful way to evaluate the alternative sites because once the facility is built it will generate power for sale to consumers in a deregulated marketplace. For the purposes of this review, the "region of interest" (ROI) is defined as the State of Illinois rather than the "relevant service area." This is due to current deregulation policies, the proposed location in the State of Illinois, the availability of transmission capabilities in the state, and market flexibility. The ROI is explained below in Section 9.3.1.

The decision to colocate the new nuclear power facility at the EGC ESP Site near Clinton, Illinois was based on market factors and a comparison of the seven existing nuclear sites within the state and an evaluation of postulated brownfield and greenfield sites. The review process outlined in this section was consistent with the special case noted in NUREG-1555, ESRP, Section 9.3(III)(8), and took into account the advantages already present at existing nuclear facilities within the ROI (USNRC, 1999). The evaluation of alternative sites, and a comparison with greenfield and brownfield sites focused on whether there are any sites that are obviously superior to the EGC ESP Site.

9.3.1 Site Preferences and the Region of Interest

9.3.1.1 Site Preferences

The review procedure described in this chapter compares and evaluates existing nuclear sites within the ROI. The candidate site criteria described in NUREG-1555 are incorporated into the site review in Section 9.3.3. This section explains the Applicant's preference for an existing nuclear site. The following preference factors influenced the decision to review existing nuclear sites within the ROI.

- There are benefits offered by existing nuclear sites. For example, colocated sites offer existing infrastructure and other advantages.
- The environmental impacts of an existing unit are known and the impacts of a new unit should be comparable to those of the operating nuclear plant.
- Site physical criteria, primarily geologic/seismic suitability, have been characterized at existing sites; these criteria are important in determining site suitability.
- Transmission is available and the existing sites have nearby markets.
- Existing nuclear plants have local support and the availability of experienced personnel.

Initially, candidate sites within the ROI were identified and screened. Given the factors listed above, colocating a facility at the EGC ESP Site became the preferable alternative. The EGC has made agreements with AmerGen for access to and control of the proposed site at Clinton. The CPS has been a licensed facility there since 1987, and the site has a proven record of environmental, health, socioeconomic, and market performance

As discussed in Sections 9.3.3.1 and 9.3.3.2, the economically and environmentally preferable alternative for the EGC ESP Facility is colocation; therefore, the consideration of alternative sites within the region of interest focused primarily on sites with an existing nuclear power facility. It considered additional issues such as environmental impacts, land use, transmission congestion, proximity to population centers, and economical viability. The assessment was focused on existing nuclear sites controlled by EGC within the identified ROI, and evaluations were also performed of hypothetical greenfield and brownfield sites. A site-by-site comparison of candidate sites with existing power plants did not result in identification of a site obviously superior to the EGC ESP Site as the preferred site.

9.3.1.2 Region of Interest

NUREG-1555 provides that the ROI includes the state where the candidate site is located, so that alternatives sites may be considered for review (USNRC, 1999). The basis for the ROI is the candidate site's location within the State of Illinois. There are sufficient existing nuclear sites that meet the threshold criteria discussed below. The ROI also was the geographic area considered in searching for a comparative evaluation of greenfield and brownfield sites. While power generated at the proposed facility will be sold in a deregulated marketplace, the potential for line loss, flexibility of transmission, and the proximity of EGC's customer base limits the ROI to the State of Illinois. The topography, ecology, and socioeconomics throughout the region are roughly the same. Generally, the region is rural/agricultural with pockets of heavy population near important waterways such as the Mississippi River and Lake Michigan, or in traditionally populated areas such as the State Capital and university sites.

9.3.1.3 The Candidate Site

The candidate site is reviewed at length in this ER. This section reviews the EGC ESP Site in relation to the selection criteria suggested in NUREG 1555, ESRP 9.3 in order to consider whether the site is "obviously superior" to other candidate sites. The criteria are more fully discussed in Section 9.3.3.

9.3.1.3.1 Consumptive Use of Water

Clinton Lake is specifically available for cooling. The lake/impoundment of Salt Creek was constructed for the CPS, and includes the UHS. The UHS is a submerged impoundment located within Clinton Lake that provides emergency cooling water. There are other small lakes and ponds, both man-made and natural, scattered throughout the region. Most of these other water bodies are used for farming and recreation. Salt Creek is a tributary of the Sangamon River.

There is no groundwater used at the CPS, and it is not anticipated that groundwater will be used at the EGC ESP Facility (see Chapter 5).

9.3.1.3.2 No Further Species Endangerment

As noted in Chapters 4 and 5, there are no endangered species in the vicinity of the site. Important species and habitats are presented in Table 2.4-3.

9.3.1.3.3 Effects on Spawning Grounds

The Clinton Lake State Recreation Area, along with adjacent recreation areas, is designated as an important habitat for some species. Table 2.4-1 identifies those species and their habitats. There are no identified spawning grounds at the EGC ESP Site.

9.3.1.3.4 Effluent Discharge and Water Quality

The CPS discharges blowdown water through a discharge canal into Clinton Lake. As noted in Chapter 5, the proposed plant will also discharge any blowdown water through the canal and into Clinton Lake. One target established for the EGC ESP Facility is to maintain the cumulative discharge rate within CPS NPDES permit conditions. It is not anticipated that construction and operation of the EGC ESP Facility at the EGC ESP Site will adversely affect water quality.

9.3.1.3.5 Preemption and Other Land Use Issues

Land in the region is designated primarily for agricultural use (92.5 percent). However, the land inside the CPS Site boundary (including the candidate site) is zoned industrial; approximately 0.6 percent is designated industrial within the region. Approximately 6 percent of the land in the region is classified for recreational use, and 1.5 percent has been designated for residential use. There are 10 areas within the region specifically reserved for state recreation areas, historical sites, or wildlife areas. Figure 2.2-5 shows the land use designations within the region.

9.3.1.3.6 Potential Effect on Aquatic and Terrestrial Environment

As noted in Chapters 4 and 5, wetland and floodplain forest areas are present along Salt Creek and North Fork of Salt Creek. Additionally, some floodplain forest areas can be found along Clinton Lake, north of the EGC ESP Facility (USFWS, 2002). Clinton Lake, and other waterbodies located within the site vicinity, provide a suitable habitat for a variety of waterfowl species. Waterfowl observed, or documented to occur within the site vicinity include the blue-winged teal, mallard, American widgeon, wood duck, lesser scaup, and Canada goose. In addition, migratory shorebirds were also observed during surveys. Common species identified include a variety of sandpipers and heron (CPS, 1972). Reptiles and amphibians that commonly occur within the site vicinity include various species of frogs, salamanders, snakes, and turtles (CPS, 1972).

The EGC ESP Facility is located on Clinton Lake, a 4,895-ac waterbody created as a cooling source for the CPS. Since its creation, Clinton Lake has become a resource for a variety of stocked and naturally occurring populations of fish species. Fisheries in watercourses of the site vicinity are consistent with fisheries commonly found in the central Illinois region. During extensive surveys performed in Salt Creek and the North Fork of Salt Creek, species collected include several species of shiner (common, bigmouth, red, sand, and redfin), bluntnose minnow, creek chub, white sucker, black bullhead, channel catfish, bluegill, largemouth bass, and crappie (CPS, 1972).

9.3.1.3.7 Population Characteristics

Major population centers (as defined by 10 CFR 100) include Decatur, the closest population center (22-mi south-southwest) with a population of 81,860 as of the year 2000. Other population centers within an 80-km (50-mi) radius include Champaign and Urbana with populations of 67,518 and 36,395, respectively. Otherwise, the vicinity's population is relatively low; Clinton, the nearest incorporated town, has a current population over 7,000. In addition, the population density for the vicinity is approximately 97 people per mi^2. The population within 10 mi of the site is expected to decrease through the year 2060 (see ER Table 2.5-2). Figure 2.5-2 shows the regional population centers.

9.3.2 Superiority of Existing Sites Within the Region of Interest

During initial review, EGC determined that the advantages of colocating the new facility with an existing nuclear power facility outweighed the advantages of any other probable siting alternative. The preferred siting alternative was, therefore, to colocate the EGC ESP Facility with the CPS Facility, an existing nuclear facility in Illinois. In addition to the factors assessed and described previously in this section, there are several advantages to colocating nuclear facilities as a general rule. Some of the potential environmental and market advantages include:

- The total number of required generating sites is reduced.
- Construction of new transmission corridors may not be required due to potential use of existing corridors.
- No additional land acquisitions will be necessary, and the applicant can readily obtain control of the property.
- The site has already gone through the alternatives review process mandated by the National Environmental Policy Act (NEPA), and was the subject of extensive environmental screening during the original selection process.
- The site development costs and environmental impact of any preconstruction activities are reduced.
- Construction, installation, and operation and maintenance costs are reduced because of existing site infrastructure.

Existing facilities where EGC could obtain access and control were preferred over the other sites within the region of interest. Sites that were originally designed for more generation than actually constructed also received preference.

The applicant considered colocating with the following existing nuclear power facilities within the region of interest:

- Braidwood Generating Station;
- Byron Generating Station;
- Clinton Power Station;
- Dresden Generating Station;
- LaSalle County Generating Station;
- Quad Cities Generating Station; and
- Zion Generating Station.

The CPS near Clinton, Illinois, was the preferred site. The proposed site is preferable to the sites of the other existing nuclear facilities within Illinois, primarily based upon the alternative site reviews described below.

9.3.3 Alternative Site Review

Regulatory Guide 4.2 notes: “The applicant is not expected to conduct detailed environmental studies at alternative sites; only preliminary reconnaissance-type investigations need be conducted” (USNRC, 1976). The alternatives described here are compared based on recently updated safety analysis report (USAR) information about the existing plants and the surrounding area, and existing environmental studies and Final

Environmental Impact Statements issued by the Atomic Energy Commission or USNRC. An undeveloped site (greenfield) and former industrial site (brownfield) were also considered for comparison in order to determine if they were obviously superior to an existing nuclear site.

9.3.3.1 Greenfield Site

An undeveloped (greenfield) site is useful as a bounding comparison for identifying impacts at the site, and this concept has been used by the USNRC in other licensing activities (USNRC, 1996), where the USNRC has developed generic characteristics of a greenfield site for comparison during license renewal. Some of the issues identified for greenfields in the USNRC's *Generic Environmental Impact Statement (GEIS) for License Renewal* can correlate with the issues the applicant faces in determining the superiority of the proposed site.

In order to maximize the advantages and minimize the disadvantages of the greenfield site, the applicant assumed the greenfield site would be in Illinois, have characteristics where cooling water would be available and where access to transmission lines would be available. Otherwise, the site would be undeveloped for generating capacity and no existing infrastructure would be available.

EGC has made some conservative assumptions using the characteristics of two potential greenfield sites in Illinois. One potential site, on the shores of Clinton Lake, has similar characteristics to the undeveloped areas around the lake. As noted in Chapter 2, the undeveloped greenfield site along Clinton Lake is close to transmission lines and transportation corridors, and a railway spur could likely be developed from the current CPS. The population near this greenfield site is also reported in Chapter 2. Another site is on the banks of the Illinois River near the Dresden Station and Collins Station, a large gas-fired generating plant. The land itself is cleared farm land and forest terrain. There is potential access to cooling water from the Illinois River and Mizan Creek. Additionally, there is a ComEd Transmission right-of-way adjacent to the property, and asphalt road frontage leads to IL Rt. 47 and IL Rt. 155. Land use is predominantly agricultural. The population around the site is characteristically rural, with low population similar to the Dresden site. There is a lessee living in a small farm house on the site.

A greenfield site is not considered environmentally preferable for a number of reasons including:

- The applicant does not own a suitable area with the required characteristics for a nuclear plant. The land (and/or access to it), including any easements, would have to be obtained from third parties.
- An undeveloped site would require an area of considerable size (USNRC, 1996), with a potentially adverse economic impact. The USNRC has determined that a new nuclear generating facility (e.g. an advanced light water reactor) would require 500 to 1,000 ac including an exclusion area. The exclusion area requirement would be mitigated by building at a greenfield inside the existing CPS exclusion area (the total area of the existing CPS Site is 13,700 ac, including the 5,000 ac Clinton Lake). According to Chapter 4, a total of 461 ac are included in the site boundary, and approximately 96 ac will be disturbed. (This area will likely be greater at either greenfield site, because much

of the area for the proposed ESP site has been cleared.) The greenfield area near Collins Station is approximately 500 ac, and could likely meet the land requirements. Although both greenfield sites have sufficient acreage for construction of the EGC ESP Facility, construction of the facility at these greenfields may disturb important habitats and resources that are not present at the EGC ESP Site.

- The USNRC notes that the impact of a new reactor at a greenfield would be severe but could be moderated somewhat by locating the plant at a current nuclear site (USNRC 1996). While the impact of this new plant at the CPS greenfield site would still be moderate, impact at the Collins Station site would be severe, since it is a relatively pristine site. Transmission and other issues could be moderated by the proximity of existing infrastructure.

- New transmission lines and corridors would be required to intertie with the existing system. Existing transmission lines near a potential CPS greenfield and at a potential Collins Station greenfield could be modified; however, new interties would be required. With the use of existing corridors, some disturbance would still occur at either greenfield site, since new transmission lines from the new plant to existing lines would require some clearing, grubbing and other construction (see Chapter 3.7).

- Terrestrial and aquatic resource impacts are expected to be greater than those experienced at an existing site (USNRC, 1996). These impacts are similar to the construction of any large energy generating facility (see Chapter 9.2.3). Destruction of wildlife and aquatic habitat would occur with construction of the plant, corridors, and intake and discharge structures. As noted in Chapters 4 and 5, most aquatic displacement from construction and operation may be temporary; loss of terrestrial habitat at the greenfield will be permanent. However, the site near Collins Station is part of the Prairie Parklands Resource Rich Area (RRA) , and is proximate to marshes, wetlands, and forests (INHS, 2003). The Heideke State Fish and Wildlife Area is also near the Collins Station greenfield (IDNR, 2003). Unlike the CPS greenfield, which has no critical habitat or endangered species, the second site is near critical habitat for the endangered upland sandpiper (INHS, 2003).

- Aesthetic and socioeconomic impacts from construction and operation of a new nuclear facility at the greenfield sites would be similar to those forecast for the EGC ESP Site in Chapters 4 and 5. Erosion, sedimentation, and fugitive dust are likely aesthetic impacts from construction, and operational impacts would include an increased workforce, increased transportation requirements, and public services would be affected.

In summary, the environmental impacts from construction and operation of a nuclear power plant at a greenfield site would be similar to or greater than those at the proposed CPS Site. Therefore, a greenfield site is not obviously superior to the EGC ESP Site.

9.3.3.2 Brownfield Site

A "brownfield" site is one that is released for redevelopment after cleanup under Resource Conservation and Recovery Act or Superfund programs (USEPA, 2002). Such sites have been recommended for redevelopment by the EPA, and general characteristics can be identified based on EPA reports describing such sites (USEPA, 2003). The sites reviewed here are former industrial facilities where existing buildings and other infrastructure have been removed to facilitate cleanup. The environmental consequences of building on a brownfield site will not be as severe as those noted for greenfield development.

There are no brownfield sites near Clinton. EGC has made some conservative assumptions based on available EPA information about two brownfield sites in Illinois to compare the brownfield site with an existing nuclear site. The EPA has recently identified example sites in Antioch and DePue, Illinois (USEPA, 2002). The site in Antioch, IL, is a former landfill where the remedy included a clay cap and an updated methane and leachate collection system. The site in DePue, IL, is a former zinc plant located along the Illinois River. Part of the site may be re-used as an industrial site, while remaining portions of the site may be set aside for a recreational or ecological resort. These sites serve as a baseline to identify characteristics of the hypothetical brownfield site.

The hypothetical brownfield site would be the site of a former industrial complex in Illinois. Generally, these sites are in areas where heavy industry has been the predominant land use. The hypothetical brownfield will be near an existing water source such as the Mississippi or Illinois River. This alternative site will not have all of the infrastructure currently available at the existing nuclear sites. Most potential brownfield sites in Illinois do not have the all of the required infrastructure, although some interties with existing transmission corridors may be close to the site.

The brownfield site is not considered environmentally preferable for the following reasons:

- New infrastructure requirements such as pipeline construction, transmission corridor development or expansion, supply line development (e.g., a rail spur or other transportation), and cooling systems, will incur economic costs and environmental impacts not associated with location of a plant at an existing nuclear site. These impacts would be greater than construction at an existing nuclear facility.
- Terrestrial habitat loss will be minimal, but aquatic habitat will be moderately affected. Some ecological impacts would occur as intake, heat sink, and discharge capabilities were constructed. For example, if the EGC ESP Facility were built at the DePue brownfield, there may be entrainment and impingement to the sports fisheries in the neighboring lake as a result of construction of intake structures.
- Aesthetic impacts would include impaired views from cooling towers, fugitive dust, erosion, and sedimentation. These impacts would likely be similar to those impacts forecast for the EGC ESP Site in Chapters 4 and 5.
- Socioeconomic and environmental justice impacts are assumed to occur at brownfield sites, since sites such as those considered in this evaluation are located in or near urban areas (Deason, 2001). Larger urban areas could accommodate changes in population brought about by the construction of a new nuclear generating facility. However, urban and industrial communities such as those near the Antioch and DePue sites may be disproportionately affected by development of a new nuclear plant in those areas, compared to the relatively homogeneous socioeconomic structure at Clinton. Other socioeconomic issues would be roughly similar to those forecast for the EGC ESP Site.

- Impacts associated with new transportation corridors, housing and other public services may be affected by an influx of an experienced workforce, however, necessary infrastructure will likely be available.
- Most brownfield example sites do not meet the size requirements for a new nuclear plant. These requirements would be more difficult to meet than the greenfield example site. Enough area for the proposed plant, site boundaries and exclusion area boundaries would likely be unavailable. For example, the Antioch site is 160 ac adjacent to a wetland and recreational lakes. The DePue site sits on 250 ac adjacent to a lake and other commercial and industrial development. According to Chapter 4, a total of 461 ac are included in the site boundary, and approximately 96 ac will be disturbed. The existing exclusion area boundary for the CPS exceeds 10,000 ac.

In summary, the environmental impacts from construction and operation of a nuclear power plant at a brownfield site would be greater than or equal to those at the proposed EGC ESP Site. Therefore, a brownfield site is not obviously superior to the EGC ESP Site.

9.3.3.3 Existing Nuclear Facilities in the ROI

Since development of greenfield or brownfield sites was not considered obviously superior, EGC preferred siting a proposed nuclear power facility adjacent to an existing facility. There are six existing nuclear power facility sites in Illinois that were considered as potential siting alternatives. The discussion below reviews information about the sites that assist the applicant in a site-by-site comparison. This review is based on siting and safety criteria outlined in 10 CFR 100, and as identified in the updated safety analysis reports (USARs) and environmental reports for each site. These reports provide the most recent information about the sites. Each site was reviewed using the site characteristic criteria noted in NUREG 1555, ESRP 9.3. They are:

- Consumptive use of water should not cause significant adverse effects on other users.
- There should not be any further endangerment of federal, state, regional, local, and affected Native American tribal listed threatened, endangered, or candidates species.
- There should not be any potential significant impacts to spawning grounds or nursery areas of populations of important aquatic species on federal, state, regional, local, and affected Native American tribal lists.
- Discharges of effluents into waterways should be in accordance with federal, state, regional, local, and affected Native American tribal regulations and would not adversely impact efforts to meet water quality objectives.
- There would be no preemption of or adverse impacts on land specially designated for environmental, recreational, or other special purposes.
- There would not be any potential significant impact on terrestrial and aquatic ecosystems including wetlands, which are unique to the resource area.
- Population density and numbers conform to 10 CFR 100.

Using the available information, EGC then determined whether there were any environmentally preferred sites among the candidate sites, and then identified whether economic, technological or institutional factors outweighed the proposed EGC ESP Site. This approach is similar to the two part "obvious superiority" test outlined in NUREG 1555. This review performs "only preliminary reconnaissance-type investigations" based on environmental information available (USNRC, 1976). For purposes of review, EGC assumed that the EGC ESP Facility would be the bounding case for each candidate site. The applicant performed sufficient review to determine whether the sites met the candidate criteria and if there were obviously superior sites. The proposed EGC ESP Site is not summarized here since it is the subject of this ER. Rather, the alternative sites are summarized below, and compared with the proposed EGC ESP Site in Table 9.3-1.

9.3.3.3.1 Braidwood Generating Station

Braidwood Generating Station is located in northeastern Illinois about 50-mi southwest of Chicago and about 20-mi south-southwest of Joliet. The site is located primarily on flat agricultural land that has been scarred by strip coal mining. The site itself is located primarily on a former strip mining area. The roughly rectangular site occupies about 4,457 ac, and the main cooling pond occupies about 2,537 ac. The cooling pond is located on a former strip mine area. Water for the pond is withdrawn from, and eventually returned to, the Kankakee River. The Kankakee River is a popular recreational area and supports numerous sports such as fishing and hunting. Despite its proximity to Joliet and Chicago, the area is not heavily industrialized, and remains an agricultural area. Braidwood was originally developed for four units; two are operational (EGC, 2000). It is assumed that a new nuclear facility at the area would have roughly the same general environmental impact as the existing facility.

9.3.3.3.1.1 Consumptive Use of Water

Cooling water for the plant is obtained from the Kankakee River, and is held in the cooling pond. There is little public consumptive use of the water, although downstream uses include fishing and other recreational activities (EGC, 2000). Makeup water for the pond is pumped from the river screen house on the Kankakee River via pipeline to the northeast corner of the cooling pond. Blowdown water is discharged from the plant by pipeline to the blowdown outfall structure and discharge flume to the Kankakee River. The existing Braidwood units withdraw greater than 50 million gallons of water per day, with corresponding discharge. The 1973 ER predicts withdrawals up to 150 million gpd by the year 2020, anticipating the operation of 4 units (ComEd, 1973). However, the EGC ESP Facility may use a number of cooling systems options that do not require this kind of consumption. Consumptive use of water predicted for the EGC ESP Facility cooling systems is described in Table 5.2-2. Consumptive use is expected to be minimal for the EGC facility.

Groundwater has not been used at the Braidwood Station during plant operation. All plant water requirements are currently met from the Kankakee River. For a detailed review of site and regional conditions, please see the Braidwood USAR (EGC, 2000). There are approximately 31 wells within the vicinity used for public supply of groundwater. There is large-scale industrial and municipal use of groundwater around Joliet, and studies show that a resulting cone of depression could affect groundwater use around the Braidwood facility (EGC, 2000).

9.3.3.3.1.2 No Further Species Endangerment

The Goose Lake Prairie Nature Preserve is located 9-mi northwest of the plant, along the borders of the Dresden Facility. Some sensitive habitats and species exist there, including the upland sandpiper. The Kankakee Nature Preserve is also approximately 13 mi from the facility, and hosts some sensitive species and plants. There have been no reported observations of sensitive species and plants within the facility boundaries (EGC, 2000).

9.3.3.3.1.3 Effects on Spawning Grounds

There is no evidence of spawning grounds on the facility or in the vicinity.

9.3.3.3.1.4 Effluent Discharge and Water Quality

Blowdown water is discharged into the Kankakee River. Stormwater discharge and other effluents are occasionally discharged into the river, but they do not exceed the limits set forth in the station's National Pollution Discharge Elimination System (NPDES) permit. However, with new units, additional permitting would be required. As noted in Section 5.2, one target established for the EGC ESP Facility is to maintain the cumulative discharge rate within CPS permit conditions. For the purposes of this review, it is anticipated that the bounding case for the proposed facility would be the existing permits at Braidwood.

9.3.3.3.1.5 Preemption and Other Land Use Issues

No land would be preempted for additional facilities built at the station.

9.3.3.3.1.6 Potential Effect on Aquatic and Terrestrial Environment

Terrestrial habitats in the area are characterized as reclaimed strip mining sites. The strip mine spoil habitat is different from the surrounding agricultural habitat. Most species have adjusted to both habitat types. The site boundaries are characterized by overgrown drainage, fallow fields, and woodlands. There is marshy habitat created by water-filled strip mine spoil. Mammals and bird species are adapted to the various habitats. Important small game species have also been observed at the site, including ring-necked pheasants, bobwhite, rabbits, mourning dove, and big game is likewise observed. The cooling pond serves as some habitat for migrating water fowl, but there have been no adverse affects noted from operation of the existing facilities (ComEd, 1973).

The Kankakee River is the aquatic habitat most affected by site operations. The river supports sport fishing opportunities, but there is no commercial fishing (EGC, 2000). Aquatic life within the Braidwood cooling pond is similar to that in Dresden Lake, about 10-mi downstream from the Braidwood site. As with Dresden, the major impact of to the aquatic environment is entrainment and impingement as a result of the intake and discharge structures (ComEd 1973, EGC, 2000).

9.3.3.3.1.7 Population Characteristics

Projected population of the area suggests that the population (including transient population) within 10 mi of the Braidwood Station will reach nearly 86,000 by the year 2020. The population between 10 and 50 mi includes the Chicago metroplex, and the total population is predicted to reach more than 5 million by the year 2020. The low population zone (LPZ) is predicted to include 1,465 people by the year 2020 (EGC, 2000).

The closest population centers over 25,000 include Joliet, with a predicted 2020 population of 85,000, and Kankakee, with a projected population of 31,065. There are approximately 22 urban centers within a 30-mi radius of the site (EGC, 2000).

The population density within 10 mi of the site is estimated to be approximately 187 people per mi^2 by the year 2020. The predicted density for the 50-mi radius from the site is 653 people per mi^2 by the year 2020 (EGC, 2000).

9.3.3.3.2 Byron Generation Station

A construction permit was issued for the Byron Station in 1975; Unit 1 and has been operating since approximately 1984, and Unit 2 has been operating since approximately 1985. The Byron Station is located in northern Illinois, 3.7-mi south-southwest of the city of Byron, and 2.2-mi east of the Rock River, in Ogle County. The site is situated in the approximate center of the county in a predominately agricultural area. The Byron Station occupies approximately 1,782 ac of land. This area consists of the main site area and the transmission and pipeline corridor to the Rock River. The main site area occupies approximately 1,398 ac, while the corridor occupies the remaining 384 ac. Byron is a two-unit operational nuclear generating facility with 495-ft-high twin cooling towers that help cool the pressurized water reactors. EGC owns and operates the facility. There are no industrial, institutional, commercial, recreational, or residential structures on the site, other than those used by EGC in the normal conduct of its utility business. The development of the site for uses other than power generation and agriculture is not planned (EGC, 2002). It is assumed that a new nuclear facility at the area would have roughly the same general environmental impact as the existing facility.

9.3.3.3.2.1 Consumptive Use of Water

The major source of plant makeup water is the Rock River. Rock River is nonnavigable for commercial purposes, but remains a popular recreation area. Boating, fishing, and water-skiing are popular pastimes on the river. The only other uses for Rock River are industrial water and some irrigation (EGC, 2002). Plant blowdown water is discharged to the Rock River.

While some surface water is used at the site, makeup can be supplied to the cooling towers by two deep wells. Generally, most of the water for domestic, municipal, and industrial use in the region is obtained from groundwater sources. The major unit is the St. Peter Sandstone within the Cambrian-Ordovician Aquifer, although minor supplies commonly are obtained from the shallower glacial drift and dolomite aquifers. There are seven public water supply systems within 10 mi of the plant site. All use groundwater wells for water supply. Due to the relatively low level of urbanization around the site area and the small amount of on-site use, it is unlikely that future increases in groundwater withdrawal in the area would have much effect on the groundwater supply at the site (EGC, 2002).

A site groundwater monitoring program was begun in December of 1975. This monitoring program was performed (1) to define existing conditions as a base for future comparisons; (2) to monitor the effects of construction; (3) to check for either plant operation or groundwater use by others; and (4) to protect off-site groundwater users in case of detrimental changes in groundwater quality. The site groundwater monitoring program was not part of any radiological monitoring program. Six domestic and agricultural water wells were monitored for monthly changes in piezometric levels. Three of the water wells are now owned by EGC and are located on the inside perimeter of the Byron site boundaries. The other three wells are on the outside perimeter of the site boundary. Data from this monitoring program indicated no changes in groundwater chemistry or piezometric levels attributable to excavation, grouting, groundwater pumping, or other activities at the Byron site (EGC, 2002).

In addition to this site groundwater monitoring program, the detailed site geotechnical investigation identified an area of groundwater contaminated by toxic materials prior to the purchase of the land by Commonwealth Edison and EGC. The operation of the Byron Station is not expected to effect groundwater at the site (EGC, 2002). Consumptive use of water predicted for the EGC ESP Facility cooling systems is described in Table 5.2-2. Consumptive use is expected to be minimal.

9.3.3.3.2.2 No Further Species Endangerment
At the time early environmental assessments were made of the Byron facilities, all large-scale construction activities had been completed and operation was in full force. No evidence has been found to indicate that construction or operation of a new nuclear plant would have any detrimental effects on the area around the facility (USNRC, 1982).

9.3.3.3.2.3 Effects on Spawning Grounds
The Byron Station received its construction permit in 1975, and operating licenses were issued for both units in the mid-1980s. No spawning grounds or otherwise sensitive ecosystems were noted. It is expected that no adverse effect on spawning grounds will occur with the construction and operation of new units at the facility (USNRC, 1982).

9.3.3.3.2.4 Effluent Discharge and Water Quality
Byron operates under a NPDES permit issued by the State of Illinois. The early environmental reports note that water quality may be affected by chemical discharge (USNRC, 1982). It is not anticipated that discharges from a new facility will exceed current limits. As noted in Section 5.2, one target established for the EGC ESP Facility is to maintain the cumulative discharge rate within CPS permit conditions. For the purposes of this review, it is anticipated that the bounding case for the proposed facility would be the existing permits at Byron.

9.3.3.3.2.5 Preemption and Other Land Use Issues
Land use within the 5-mi radius of the Byron Station is agricultural. There is little industry in the vicinity, and that is primarily developed for supporting the agrarian economy. Wheat, corn, and soybeans are the primary products (EGC, 2002).

Illinois State Route 2, which is the closest major highway to the site, is located 2.5-mi west of the plant and has an annual average traffic flow per 24-hr period that ranges from 4,000 cars between Byron and Oregon to 8,800 cars in Oregon. State Routes 72 and 64 are also well traveled, having 24-hr annual averages that exceed 2,000 cars (EGC, 2002).

The Rock River is the major waterway for the area surrounding the Byron site, although it is considered nonnavigable to commercial traffic in this vicinity. It is a popular recreation spot (EGC, 2002). Construction and operation of new nuclear units are not expected to preempt these uses.

9.3.3.3.2.6 Potential Effect on Aquatic and Terrestrial Environment
Currently, the Byron Station uses the Rock River for makeup water and blow down is likewise discharged into the river (EGC 2002). Water from Rock River will likely serve these functions for any new units placed on the site.

Sport fisheries and other aquatic and terrestrial habitats could be temporarily affected by a construction of the EGC ESP Facility at this site. The Rock River is a popular recreational river. It is not expected that construction and operation of a new nuclear plant will significantly affect the water quality of the river.

Terrestrial effects are also expected to be limited to short-term displacement during construction. Earlier reports and current reviews indicate that wildlife inhabit undisturbed areas at the Byron site; this trend is expected to continue.

9.3.3.3.2.7 Population Characteristics

The site currently meets population criteria for 10 CFR 100. The population for the 10-mi radius around the Byron Station is projected to be approximately 31,616 by the year 2020, or 101 people per mi^2. That population generally lives between 5 and 10 mi from the site. The regional population in the 10- to 50-mi radius is expected to reach 1,514,138 people by the year 2020, with 269 people per mi^2 (EGC, 2002).

The primary population center is Rockford, 17 mi to the northeast of the plant. The projected 2020 population is 246,700. DeKalb, about 28-mi east-southeast of the plant, has a projected 2020 population of more than 73,000. The population density is generally at its greatest between 10 to 20 mi from the Byron Station (EGC, 2002).

There are 28 industries within 10 mi of the site. There are 16 schools within the 10-mi radius, and it is anticipated that most of the students live in the same radial area (EGC, 2002).

Transient populations are expected to be composed primarily of recreational users. The transient population is estimated at 43,617 due to the influx of recreational users to the vicinity (EGC, 2002).

There are several recreational facilities in the LPZ, which is defined for Byron as a 3-mi radius from the plant. Peak daily usage of these areas occurs on the weekends (EGC, 2002).

9.3.3.3.3 Dresden Generating Station

The Dresden Nuclear Power Station site consists of approximately 953 ac. It is a three-unit station. The site boundaries generally follow the Illinois River to the north, the Kankakee River to the east, a county road from Divine extended eastward to the Kankakee River on the south, and the Elgin, Joliet and Eastern Railway right-of-way on the west (EGC, 2003).

Unit 1 is located in the northeast quadrant of the site with an intake canal extending west from the Kankakee River and a discharge canal extending north to the Illinois River. Unit 1 was officially retired on August 31, 1984, but its major structures are still present and intact. It is now designated a nuclear Historic Landmark by the American Nuclear Society. Unit 2 is located on the site directly west of and adjacent to Unit 1. The location of Unit 3 is directly west of and adjacent to Unit 2 (EGC, 2003). Units 2 and 3 are operational.

Portions of the area outside the station footprint have been leased to a neighboring farmer for grazing cattle and raising crops. Hunting is also permitted outside security areas. A microwave relay tower belonging to International Bell Telephone system is located approximately 1,000 ft from the reactor building. A meteorological tower is located approximately 3,000 ft from the reactor building (EGC, 2003). It is assumed that a new nuclear facility at the area would have roughly the same general environmental impact as the existing facility.

9.3.3.3.3.1 Consumptive Use of Water

Dresden's primary source of makeup water is the Kankakee River, with discharge flowing into the Illinois River. Earlier environmental reports on the Dresden Station note little discernable effect caused by consumptive use of surface water or groundwater. The top of the Cambrian-Ordovician aquifer is 500 to 800 ft below the surface and use of surface water for cooling and other activities at a new plant would not affect aquifer levels. However, shallow aquifers were affected by initial construction of the units in the late 1960s and EGC assumes that the same effect would occur if a new facility were built at the site. Some change in the pattern of surface water runoff was noted, although the impacts were considered indiscernible (USNRC, 1972).

The station only draws water from the deep aquifer in small amounts, compared to other consumptive uses in the area. It is expected that the continued use of groundwater will not have any significant impact on shallow aquifers or water use in the area. The two operating units use indirect closed cycle systems, and the effect on surface water use is minimal (EGC, 2003). The bounding case for this report also plans cooling towers, as described in Chapter 3, that will mitigate consumptive water use. Consumptive use of water predicted for the EGC ESP Facility cooling systems is described in Table 5.2-2. Consumptive use is expected to be minimal.

9.3.3.3.3.2 No Further Species Endangerment

At the time early environmental assessments were made of the Dresden facilities, all large-scale construction activities had been completed and operation was in full force. Recent environmental reviews show that three Illinois-listed threatened and endangered species have been collected in the vicinity of the site (EGC, 2003a). It is not expected that construction or operation of a new nuclear plant would have any detrimental effects on the area around the facility.

9.3.3.3.3.3 Effects on Spawning Grounds

The Dresden site has been operated as a nuclear plant since the early 1960s. No spawning grounds or otherwise sensitive ecosystems have been noted. It is expected that no adverse effect on spawning grounds will occur with the construction and operation of new units at the facility (EGC, 2003a).

9.3.3.3.3.4 Effluent Discharge and Water Quality

Dresden operates under a NPDES permit issued by the State of Illinois. The early environmental reports note that water quality of the Illinois River may be affected by chemical discharge (USNRC, 1972).

It is not anticipated that discharges from a new facility will exceed current limits. As noted in Section 5.2, one target established for the EGC ESP Facility is to maintain the cumulative discharge rate within CPS permit conditions. For the purposes of this review, it is anticipated that the bounding case for the proposed facility would be the existing permits at Dresden.

9.3.3.3.3.5 Preemption and Other Land Use Issues

Current land use is industrial. Given the fact that the entire Dresden site has been a large power generating facility since 1965, the current land use is not expected to change. However, the Dresden site does not have additional available land within the boundaries. In order to build a new facility, an operating unit or Unit 1 would require decommissioning. The area around Dresden has become increasingly urbanized, and it is expected that the trend will continue. The construction and operation of a new nuclear facility at the site would not be expected to affect the land use patterns of the area.

9.3.3.3.3.6 Potential Effect on Aquatic and Terrestrial Environment

The major rivers within 5 mi of the plant are the Illinois, Des Plaines, and Kankakee rivers. The Kankakee River joins the Des Plaines River, east of the plant, to form the Illinois River, which extends along the north boundary of the site. The closest navigational channel is on the Illinois River, located approximately 0.5-mi north of the plant. The closest river lock is the Dresden Island Lock, approximately 1-mi northwest of the plant (EGC, 2003).

Sport fisheries and other aquatic and terrestrial habitats could be affected by a proposed new facility at this site, as well as decommissioning activities. The Illinois River is an industrial river. Although water quality has improved somewhat through environmental regulation and cleanup efforts, large commercial and sports fisheries are virtually nonexistent. Increased turbidity, commercial traffic (e.g. barges), and effluent discharges unrelated to the operation of the Dresden facility have contributed to a decrease in vegetation and other aquatic life in the river. It is not expected that construction and operation of a new nuclear plant will significantly affect the water quality of the river.

The Kankakee River serves as the existing station's source of cooling water, and would likely provide cooling water for any new facility. The Kankakee is a small river. It is several degrees cooler than the Illinois River, and supports a sports fishery. Entrainment and impingement are both noted at the intake of the existing units, and are expected to continue during the operations of a new facility (USNRC, 1972).

Terrestrial effects are also expected to be limited to short-term displacement during construction. Earlier reports and current reviews indicate that wildlife inhabit undisturbed areas at the Dresden site; this trend is expected to continue (USNRC, 1972; EGC, 2003a).

9.3.3.3.3.7 Population Characteristics

The Dresden site currently meets the population requirements of 10 CFR 100. The LPZ for the station is an area within a 5-mi radius. The population within the 5-mi radius area is 8,948. The nearest resident population within the LPZ is contained in a cluster of cottages along the west shore of the Kankakee River; the nearest line of cottages is just outside the exclusion area boundary (EAB). The estimated population of this cluster of homes is approximately 280. The other closest residences are widely separated in several directions from the station. A single residence is located approximately 0.6-mi southeast of the station on the east shore of the Kankakee River (EGC, 2003).

The closest significant residential concentration of over 1,000 residents is 3- to 4-mi northeast of the station along the Illinois River (EGC, 2003).

The Chicago metropolitan area lies within 50 mi of the site.

9.3.3.3.4 LaSalle County Station

The LaSalle County Station is a 2-unit, 3060 ac site located in Brookfield Township of LaSalle County in northeastern Illinois. The Illinois River is 5-mi north of the site. The major transportation routes near the site include the Illinois River, approximately 3-mi north of the northern boundary; IL State Highway 170, 0.5-mi east of the eastern boundary of the site; and Interstate Highway 80, 8-mi north of the northern site boundary. The Chicago, Rock Island, & Pacific RR, approximately 3.25-mi north of the northern site boundary, is the closest operable RR line (EGC, 2002a).

It is assumed that a new nuclear facility at the area would have roughly the same general environmental impact as the existing facility.

9.3.3.3.4.1 Consumptive Use of Water

The Illinois River is the primary surface water source for the facility. The river is an important source of commercial and recreational navigation. Surface consumption is primarily by neighboring industrial and agricultural use. The LaSalle County Station does not significantly affect surface water use from the Illinois River, because a 2058 ac cooling lake was created to provide water for cooling and discharge.

Groundwater is used at LaSalle County Station to supply the water requirements for the plant systems, makeup demineralizer and potable supply (EGC, 2002a).

Groundwater is obtained from two deep wells in the Cambrian-Ordovician Aquifer, which underlies the site. Each well is equipped with a deep well submersible pump with a rated capacity of 300 gpm. The water is stored in a 350,000-gallon, ground level tank prior to distribution to the demineralizer and domestic systems. Maximum groundwater use is presently estimated to be approximately 521,600 gpd. The maximum water requirements for each system and the percentage of the total used are as follows: makeup demineralizer, 479,600 gpd (92 percent); potable supply, 15,000 gpd (3 percent); sand filter backwash, 11,500 gpd (2 percent); and recreational supply, 15,500 gpd (3 percent) (EGC, 2002a). The use of water for the EGC ESP Facility depends on the cooling system and plant design selected. Consumptive use of water predicted for the EGC ESP Facility cooling systems is described in Table 5.2-2. It is expected to be minimal.

Groundwater for public use within 10 mi of the site is obtained predominantly from wells in the Cambrian-Ordovician Aquifer. A large cone of depression has developed in the potentiometric surface of the Cambrian-Ordovician Aquifer in response to continuous and increasing withdrawals of groundwater at the major municipal and industrial pumping centers along the Illinois River (EGC, 2002a). However LaSalle County Station groundwater use does not create a significant impact on the groundwater at the site.

9.3.3.3.4.2 No Further Species Endangerment

Bald eagle and peregrine falcon are known to occur in LaSalle County. Other listed threatened or endangered species (Indiana bat and timber rattlesnake) are known to occur in LaSalle County. However, sightings are rare and occur along the bluffs of the Illinois River, offsite from the LaSalle County Station. Most sightings have been determined to be incidental during migration, and not an indication of an established population. None of these threatened or endangered species occur on the site, since there is no suitable habitat available in the site boundaries. There are no records of endangered aquatic species on this stretch of the Illinois River (USNRC, 1972).

9.3.3.3.4.3 Effects on Spawning Grounds

No spawning grounds or otherwise sensitive ecosystems have been noted. It is expected that no adverse effect on spawning grounds will occur with the construction and operation of new units at the facility.

9.3.3.3.4.4 Effluent Discharge and Water Quality

LaSalle County Station operates under a NPDES permit issued by the State of Illinois. The early environmental reports note that water quality may be affected by chemical discharge; there is no record that NPDES limits have been exceeded during operation of the existing plants. As noted in Section 5.2, one target established for the EGC ESP Facility is to maintain the cumulative discharge rate within CPS permit conditions. For the purposes of this review, it is anticipated that the bounding case for the proposed facility would be the existing permits at the Station.

9.3.3.3.4.5 Preemption and Other Land Use Issues

Land use remains predominantly agricultural. No new land will be preempted if new units are placed on the site.

9.3.3.3.4.6 Potential Effect on Aquatic and Terrestrial Environment

No long term negative effects are anticipated if new units were placed at the LaSalle County Station site. Three groups of terrestrial bird life (waterfowl, upland game, and raptors) use the area, but no difference in the populations has been attributed to the operation of the LaSalle Station. Mammalian species have likewise adjusted to the station's operations, and no change in range or viability of these populations has been noted. The applicant expects that the population will remain stable if new units are placed at the site. However, some temporary displacement is expected as a result of construction of new units (see Chapter 4).

Adverse impacts to aquatic environments are not expected to result from operation of new units at the site. The Illinois River is best characterized as a recovering river system, and abundance and diversity of aquatic species and habitats is restricted by upstream pollutants, commercial and recreational boat traffic, and continuing habitat alteration. These factors arise from offsite use of the river corridor; operation of the current LaSalle County Station is not a significant factor in the overall quality of aquatic habitats in the vicinity of the plant.

9.3.3.3.4.7 Population Characteristics

The LaSalle County Station site currently meets the population requirements of 10 CFR 100, and overall population is consistent with a rural, agrarian community. The population within 5 mi is expected to grow to 1,273 by the year 2020, which maintains the low population density of 16.20. The density reflects the continuing rural character of the site. The population within 50 mi is expected to reach 1.6 million by the year 2020. Population growth is expected to occur in the 35- to 50-mi range, as population centers like Joliet continue to grow, and Chicago suburbs expand. It is expected that population density in the 50-mi radius will grow to approximately 211.1 people per mi^2. However, it is predicted that the density between 40 and 50 mi will increase to 292.7 people per mi^2. Low density expected to continue inside the 10-mi radius (EGC, 2002a).

Transient populations will include recreational users. Some parks outside the 5-mi radius generally expect over one-half million visitors each year. However, no projections are available for the area within the 5-mi radius (EGC, 2002a).

The LPZ has no schools, industry or other facilities. It is anticipated that the population within the LPZ will be approximately 502 in the year 2020 (EGC, 2002a).

The nearest population center is Ottowa, with a projected population of 25,904 by the year 2020. The population density in the year 1980 within 50 mi of the LaSalle County Station is projected to be approximately 141 people per mi^2. By the year 2020, the density is projected to reach 211 people per mi^2 (EGC, 2002a).

9.3.3.3.5 Quad Cities Generating Station

The Quad Cities Generating Station is a two-unit facility on the east bank of the Mississippi River opposite the mouth of the Wapsipinicon River, and about 3-mi north of Cordova, Illinois. The facility was licensed and began operations in 1973. It is roughly the same design as the Dresden Units 2 and 3, described above. The site is about 20-mi northeast of the Quad Cities (Davenport, Iowa; Rock Island, Moline, and East Moline, Illinois). Topographic relief at the site is low and relatively flat. The station elevation represented by the ground floor level of the reactor building, is 595 ft above msl datum. The ground surface drops off abruptly at the bank of the river, forming a bluff about 30-ft high. The station is located on a 784-ac tract of land and has a 310-ft cooling tower.

It is assumed that a new nuclear facility at the area would have roughly the same general environmental impact as the existing facility.

9.3.3.3.5.1 Consumptive Use of Water

Cooling water is obtained from the Mississippi river. Water for other industrial and home use comes from the river and wells in the area. Groundwater sources in the area come from three aquifer systems composed of unconsolidated alluvial and outwash sand and gravel deposits, shallow Silurian dolomite formations, and the Cambrian-Ordovician aquifer. Neither groundwater use nor surface water use has been adversely affected by the continuing operation of the facility.

The facility obtains water for circulation cooling and other plant uses from the Mississippi River. The facility operates open cycle per an agreement with the states of Illinois and Iowa. No groundwater is used to operate the plant (EGC, 2003c). Consumptive use of water predicted for the EGC ESP Facility cooling systems is described in Table 5.2-2. Consumptive use is expected to be minimal.

9.3.3.3.5.2 No Further Species Endangerment

There has been no indication that endangered or threatened species will be affected by the operation of a new nuclear facility at the site. No evidence has been found to indicate that construction or operation of a new nuclear plant at the Quad Cities site would have any detrimental effects on the area around the facility (EGC, 2003b).

9.3.3.3.5.3 Effects on Spawning Grounds

The Quad Cities site has been operated as a nuclear plant since the early 1970s. EGC is not aware of any federally-listed endangered or threatened terrestrial species at the Quad Cities site. However, relatively few threatened and endangered terrestrial species have been recorded in the counties crossed by the transmission corridors associated with Quad Cities, including bald eagle, the Indiana bat, two orchid species, snails and reptiles (EGC, 2003b).

Pool 14 of the Upper Mississippi River harbors a diverse freshwater mussel community, including one federally-listed species, the Higgins' eye pearly mussel (*Lampsilis higginsi*) (EGC, 2003b). *Lampsilis higginsi* has historically been found in Pool 14 up- and downstream of Quad Cities, with highest densities and spawning areas in the vicinity of Cordova, Illinois, some 1.5- to 3.5-mi downstream of the Station (EGC, 2003b).

9.3.3.3.5.4 Effluent Discharge and Water Quality
Quad Cities currently operates under a NPDES permit issued by the State of Illinois. As noted in Section 5.2, one target established for the EGC ESP Facility is to maintain the cumulative discharge rate within CPS permit conditions. For the purposes of this review, it is anticipated that the bounding case for the proposed facility would be the existing permits at the Station.

9.3.3.3.5.5 Preemption and Other Land Use Issues
Land use around the station is a combination of agriculture and industrial uses (EGC, 2003c). Some land in the region been set aside for recreational and environmental use; the Mississippi River supports a large sport fishery as well as commercial and recreational boating. It is not expected that current land use at Quad Cities will change or expand, and there will be no preemption or adverse effects on land that has been set aside for environmental or recreational uses.

9.3.3.3.5.6 Potential Effect on Aquatic and Terrestrial Environment
The woody islands and sloughs near the site are popular habitats for waterfowl as well as small game animals such as squirrel, rabbit, muskrat, beaver, and mink. The upper Mississippi Wildlife and Fish Refuge is located opposite the site. Ducks and geese rely on the refuge for nesting and other habitat. There are marshy wetlands along the banks of the river across from and above the site, but none are apparent within the site boundaries (EGC, 2003b).

Industrial waste discharges unrelated to the operation of the Quad Cities site have occasionally affected aquatic habitat in the river. The river pool at Quad Cities encompasses a variety of aquatic habitats and communities. These habitats are diverse and represent important variety for aquatic and terrestrial ecosystems. The river provides important habitat for sport and commercial fisheries as well as the biota that support those fisheries. Major Mississippi River habitats around the station include channel habitats, border habitats, side channel habitats, river lake and pond habitat, slough habitat, and island lake habitat (EGC, 2003b).

9.3.3.3.5.7 Population Characteristics
The site currently meets the population requirements of 10 CFR 100. The population distribution around the site is quite low with typical rural characteristics. Within a 5-mi radius of the site, the 1980 population density is approximately 72 people per mi^2 and is less than 10 people per mi^2 in some areas. The nearest population center is Clinton, Iowa (population approximately 32,828) located 8.5 mi to the northeast. Southwest of the site, at distances of 15 to 20 mi, are the Quad-Cities of Rock Island, Moline, and East Moline, Illinois, and Davenport, Iowa. Total population and density from the site out to a distance

of 25 mi are approximately 449,082 and 229 people per mi^2, respectively. Davenport, Iowa, is the largest population center within 50 mi, with a population of over 100,000. Population growth near the plant has been slow and generally consistent with the rural population growth rate in the Quad Cities area of about 1 percent per year maximum. There are no known factors that would change the 1 percent maximum rural growth rate in the foreseeable future (EGC 2003c).

9.3.3.3.6 Zion Generating Station

Zion Generating Station is located on the west shore of Lake Michigan about 40-mi north of Chicago, Illinois, and about 42-mi south of Milwaukee, Wisconsin. The site is in the extreme eastern portion of the city of Zion, Illinois (Lake County). It is on the west shore of Lake Michigan, approximately 6-mi north-northeast of the center of the city of Waukegan, Illinois, and 8-mi south of the center of the city of Kenosha, Wisconsin. The site comprises approximately 250 ac, which are owned by the EGC. The site is traversed from west to east by Shiloh Boulevard near the northern property boundary.

The facility is a former nuclear facility that has been converted into a voltage-stabilizing facility. The two reactors were shut down in early 1998. The unit's generators were converted to synchronous condensers (EGC, 1998).

The most current information is from the Zion decommissioning SAR prepared in 1998. However, some of the existing environmental information from the 1972 final environmental statement has been used to postulate impacts from siting a new nuclear facility at Zion. The Zion station is currently in SAFSTOR. The Zion facilities still exist; however, they are currently used for synchronous condenser operations. It is assumed that a new nuclear facility at the area would have roughly the same general environmental impact as the existing facility.

9.3.3.3.6.1 Consumptive Use of Water

The plant's cooling water is drawn from Lake Michigan. The Lake County Public Water District operates a water intake about 1-mi north of the site and about 3,000 ft out in the Lake. Operation of a new plant will not result in releases greater than 10 CFR 20 limits at the point of discharge, and consequently, normal operation should not result in significant radioactivity concentrations in drinking water. The topography of the site and its immediate environs is relatively flat with elevations varying from the lake shoreline to approximately 20 ft above the level of the lake. Approximately 2-mi west of Lake Michigan is a topographical divide causing surface water drainage west of the divide to flow away from the lake while the east drainage flows toward the lake (EGC, 1998).

At the time of operation, the Zion facility used more than 1.5 million gpm water in its cooling system, along with minor consumption. The domestic water was obtained from the City of Zion's system. It is assumed that for a new plant, consumptive water use would also come from the City of Zion (USNRC, 1972b). However, consumptive use of water for the EGC ESP Facility depends on the cooling system and plant design selected. Bounding requirements for consumptive use of water from the EGC ESP Facility are described in Table 5.2-2. Consumptive use is expected to be minimal.

9.3.3.3.6.2 No Further Species Endangerment
The Final Environmental Statement contained no reviews of endangered species to determine whether operation of the station would lead to further species endangerment. The current information shows that no endangered species have been identified at the site. However, Lake Michigan provides an important habitat and spawning grounds for several species.

9.3.3.3.6.3 Effects on Spawning Grounds
There is no indication from available data that there are any spawning grounds in the vicinity of the site. Generally, inshore regions with sand-gravel bottoms are considered valuable spawning grounds in the Great Lakes ecosystem, and it is anticipated that additional impacts from construction and operation of a new facility at the site will affect these areas.

9.3.3.3.6.4 Effluent Discharge and Water Quality
Aside from cooling water discharge, some industrial effluent and stormwater will be discharged. As noted in Section 5.2, one target established for the EGC ESP Facility is to maintain the cumulative discharge rate within CPS permit conditions. For the purposes of this review, it is anticipated that the bounding case for the proposed facility would be the permits historically issued at the Station.

9.3.3.3.6.5 Preemption and Other Land Use Issues
The Zion Station site was acquired in the 1950s, and has been used as a generating facility and synchronous condenser site. Land use at the site and surrounding vicinity is expected to remain industrial. It is not anticipated that any additional land will be preempted if the site were used for a new nuclear facility.

9.3.3.3.6.6 Potential Effect on Aquatic and Terrestrial Environment
The terrestrial ecology around the site is characterized by dunes, prairie, forest, and beach environments. There is a unique dune environment in the vicinity of the site, but there was no history of adverse impacts from operation of the Zion nuclear facility. There may be some temporary adverse impacts from construction of the EGC ESP Facility at Zion, as noted in the construction impacts discussion of this ER (see Chapter 4). There is no evidence of permanent adverse environmental impacts on terrestrial ecology if a new facility were to be built on this site.

The primary aquatic ecology is Lake Michigan. The lake is characterized by low nutrient concentrations and biological productivity. Near the Zion site, inshore waters are characterized as mesotrophic or intermediate, with respect to nutrients. Substantial declines in fish populations have occurred in Lake Michigan due to pollution and other uses. Nothing in the USNRC's environmental statement or the decommissioning SAR indicate that operation of a facility at the site would adversely affect aquatic environments (USNRC, 1972b; EGC, 1998).

9.3.3.3.6.7 Population Characteristics
The Zion station is less than 50 mi from Chicago, with a current population of more than 5 million. Additionally, The Waukegan-North Chicago area is predominantly an industrial region with 144 manufacturing establishments. The product of the largest of these manufacturing firms is pharmaceuticals and chemicals. The most predominant product of

the remainder is in the metallurgical and fabricated metal products field. The Zion-Winthrop Harbor area is a small industrial region. A portion of this industry is located between the western boundary of the site and the Chicago and Northwestern RR tracks, approximately 0.8-mi west of the plant location, and is light in nature. There are no schools or hospitals within 1 mi of the station. The site is bordered on the north and the south by the Illinois Beach State Park (EGC, 1998). The centers of the communities of Zion and Winthrop Harbor are located 1.6 mi and 2.5 mi, respectively, from the plant location.

The estimated population within 5 mi of the site for the year 2000 was 88,700 persons (USNRC, 1972b). The 2002 population for Lake County is over 600,000. The Chicago/Cook County population is estimated at 5.3 million (US Census Bureau, 2003).

9.3.3.3.7 Site Comparison Summary

All sites generally meet the criteria outlined in NUREG-1555. However, three of the six candidate sites (e.g., Byron, Quad Cities, and Dresden) do not have enough remaining land at the site to construct and operate a new nuclear facility while remaining operational. The applicant has already determined that early retirement of existing plants is not preferable (see Section 9.2.4). Therefore, construction of new units on these sites would entail a loss of existing generating capacity, which would largely offsite the benefits of operation of the new units. The three remaining candidate sites (e.g., Braidwood, LaSalle, and Zion) have available land, but the impacts of construction and operation there would be greater than or equal to those postulated for the EGC ESP Site.

Braidwood and LaSalle may provide alternative sites, but neither is obviously superior, based on the site review. Braidwood is closer to larger population centers; as noted in the Braidwood USAR, the projected population within the vicinity is 187 per mi^2. The LPZ is expected to reach nearly 2,000 people by 2020. Thus, impacts from severe accidents at Braidwood will be greater than or equal to the proposed EGC ESP Site. At the LaSalle County Station, the population within 5 mi is expected to grow to 1,273 by the year 2020, which maintains the low population density of 16.20. It is predicted that the density between 40 and 50 mi will increase to 292.7 people per mi^2 by 2020. The site comparison showed that impacts of the EGC ESP Facility at Braidwood or LaSalle would be equal to those postulated for the EGC ESP Site.

Zion provides another alternative, and other than the proposed EGC ESP Facility, presents a viable alternative from a market view. The site is linked to existing transmission facilities and the transmission flow pattern around Chicago lends itself to additional generation north of the city. Unlike any of the other candidate sites, Zion is no longer operational. However, the Waukegan-North Chicago area near Zion is predominantly an industrial region with 144 manufacturing establishments and an urban population similar to other Chicago suburbs. The greater Chicago area is home to more than 5 million people. Zion is on the shores of Lake Michigan, and, as noted in Section 9.3.3.3.6, environmental impacts from construction and operation of the EGC ESP Facility at Zion would be equal to or greater than the impacts postulated for the EGC ESP Site. Because Zion is also in a highly populated and industrialized area, impacts from severe accidents and socioeconomic factors would be disproportionately greater than or equal to those predicted for the EGC ESP Site.

The EGC ESP Site is the environmentally preferred site among the candidate sites:

- The postulated consumptive use of water at the EGC ESP Site is less than or equal to water use at other sites.
- The EGC ESP Site does not contain any critical habitat or occurrence of listed threatened or endangered species. Therefore, the impact to any endangered species is less than or equal to the impact postulated for the other candidate sites.
- The EGC ESP Site does not contain spawning grounds for any threatened or endangered species. Most other sites record no endangered species or spawning areas in the site vicinity. Quad Cities, as a bounding case, is near an important spawning area. Thus, the impact to any spawning areas are less than or equal to other candidate sites.
- The EGC ESP Site impact review (see Chapters 4 and 5) does not postulate effluent discharge beyond the limits of existing NPDES permits or regulations. Based on the information available for the candidate sites, the impacts from effluent discharge are less than or equal to other candidate sites.
- The EGC ESP Site review postulates no preemption or land use changes for construction and operation of the proposed facility. Likewise, it is not anticipated that preemption or other land use changes would be required to co-locate a facility at any of the candidate sites. Therefore impact would equal at all sites.
- Terrestrial and aquatic impacts at the EGC ESP Site are noted in Chapters 4 and 5. The potential impact of a new nuclear facility on terrestrial and aquatic environments at the other sites varies, depending on the location of the site. However, with the exception of the Quad Cities site, it is anticipated that the impacts will be generally equal to those postulated for the EGC ESP Site.
- Each site generally meets the population criteria of 10 CFR 100. However, candidate sites like Zion and Braidwood are located in largely urban areas with high population density, and construction or operation may result in disproportionate impacts in those areas. Therefore, the impact on population density would be greater than the EGC ESP Site. The impact at other candidate sites would be similar to those postulated for the EGC ESP Site.
- The EGC ESP Site does not require decommissioning or dismantlement of an existing facility as required for Byron, Quad Cities or Dresden.

Therefore, none of the other existing nuclear sites is obviously superior to the EGC ESP Site on the basis of environmental considerations. Table 9.3-1 reviews the criteria in relation to all seven sites.

Although the preferred candidate sites are not obviously superior to the proposed EGC ESP Site, the applicant also considered the second test for superiority by reviewing economic, technological, and institutional factors. Three additional criteria were used to further evaluate these factors: 1) Ability to transmit to demand centers; 2) Not proximate to population centers; and 3) Ease of construction. The candidate sites are evaluated using these additional review criteria in the following sections.

9.3.3.3.8 Ability to Transmit to Demand Centers

Since the site will eventually support a merchant generating plant, EGC must consider opportunities the site offers for transmitting generated power to customers who buy it. Each candidate site, including Clinton, has existing transmission corridors that may, according to discussions with the transmission operator and ComEd, be expanded to accommodate new power lines. However, early discussions with ComEd and Illinois Power noted that the southern end of Illinois has relatively sparse transmission and light loads as opposed to the heavily loaded lines serving Chicago. All sites except the EGC ESP Facility are in northern Illinois, and are affected by transmission congestion around the major metropolitan areas around Chicago and the Quad Cities (USDOE, 2001). Section 3.7 also describes the transmission systems and load requirements in southern Illinois.

Transactions between the Midwest, Southeastern, and Eastern transmission grids are limited because they are interconnected at only a few points through interties (USDOE, 2001). For example, electricity and pricing spikes in the Midwest in the summer of 1998 were caused in part by transmission constraints limiting the availability of the region to import electricity from other regions of the country that had available electricity (USDOE, 2001). Additionally, high levels of congestion are found from Minnesota to Wisconsin, the Midwest through the Mid-Atlantic, and often power must be routed through the Chicago hub (USDOE, 2002). Transmission capacity limits are predicted to affect reliability throughout the Great Lakes Region (USDOE, 2001). On the other hand, the existing site at Clinton offers more flexible transmission opportunities, since power can be transmitted to the Chicago hub, and south through other interconnections.

A high or medium score indicates that additional nuclear power generated at the site could be transmitted to different markets. Six of the seven sites were rated with medium ability, and the EGC ESP Site was rated with high ability, primarily because the site has direct interties in multiple directions, and flexible access opportunities to other markets. Therefore, the EGC ESP Site is preferable with respect to transmission.

9.3.3.3.9 Not Proximate to Population Centers

Sites with low populations within their vicinity were scored high. For example, the proposed EGC ESP Site is located about 6 mi from the Town of Clinton, and the smaller Town of Dewitt is also in the vicinity. Both towns (and other smaller towns in the vicinity) have low populations, and thus, the EGC ESP Site scores high. Sites that scored medium are in rural areas, but are nearer to large populations. For example, the other sites are located closer to the Chicago area, such as Zion and Braidwood, or are relatively close to other metropolitan areas, such as Quad Cities. These sites were not rated high because of their proximity to the larger population bases. Therefore, the EGC ESP Site is preferable with respect to its lack of proximity to population centers.

9.3.3.3.10 Ease of Construction

The ability to achieve cost savings and potential ease of construction at an existing nuclear site is an important additional factor in selecting a site. For example, the EGC ESP Site scored high because only one unit is currently constructed, when most existing infrastructure at the facility was intended for two units. Thus, the EGC ESP Site presents opportunities in land availability and infrastructure that are not present at some of the other two-unit candidate sites, such as Quad Cities, Dresden, and Byron. The sites undergoing decommissioning (i.e., Zion) actually scored higher than the alternative sites with existing units because the decommissioning process has already begun and the dismantling process can shortly follow. One site (i.e., Dresden) with three units (two operating and one decommissioned) also scored medium. Sites with two existing and operating units scored low (e.g., Byron, Dresden, and Quad Cities), based on available land within the site boundaries for new construction, and the fact that one or both units would need to be removed from operation to acquire space for construction.

9.3.3.3.11 Summary

Table 9.3-2 summarizes how each existing site was rated based on the factors described in this section. This table shows that the EGC ESP Site scored high in each secondary category.

9.3.4 Conclusions

The EGC ESP Site was chose as the preferred site for reasons described below.

- Alternative greenfield, brownfield, and nuclear sites offer no environmental advantages. In fact, construction and operation of a new nuclear plant at each of the alternative sites would entail environmental impacts that are equal to or greater than those at the EGC ESP Site.
- The EGC ESP Site is the best location from which to transmit generated power to demand centers. As noted above, congestion and reliability issues through the Chicago hub and surrounding areas have been documented in national grid studies. These reliability issues, as well as congestion problems north of Chicago into Wisconsin and the upper Midwest, make the EGC ESP Site a more reliable site. These studies also indicate that transmission constraints hinder a generator's ability to sell cheap Midwest power to the south during periods of peak demand (USDOE, 2001). The EGC ESP Site is positioned to produce and transmit power through the Chicago hub if necessary, but the sparse transmission and light loads on the existing system will also allow reliable power transmission through interties to the Southeastern and Eastern grids. This is an important advantage over the other sites. The capability of these systems to support future market demand weighed heavily in favor of the EGC ESP Site.
- Other sites are located in more suburban areas and lack the flexibility in site characteristics and areal extent that the EGC ESP Site possesses, and present potentially disproportionate socioeconomic and environmental impacts.
- The facility at the EGC ESP Site was originally designed for two units, and much of the existing infrastructure can be utilized in the construction and operation of a new unit.

In summary, there are no alternative sites that are obviously superior to the EGC ESP Site in the region of interest.

9.4 Alternative Facility Systems

The design for the EGC ESP Facility has not yet been selected. The detail in this section depends on the selection of a vendor design, and the design of individual components of the system. As noted elsewhere in this ER (see Chapter 3, Chapter 4, and Chapter 5), the bounding parameters of a number of facility designs were used to develop the composite parameters for the site. Based on the evaluations provided in this ER, the site will accommodate the operational and environmental requirements for any one of them. Therefore, alternative facility systems will be discussed at the COL stage, when the full spectrum of design alternatives will be available.

CHAPTER 9

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Section 9.4

None

CHAPTER 9

Tables

TABLE 9.2-1
Air Emissions from Coal-Fired Alternative

Parameter	Calculation	Result
Annual coal consumption	$4\text{ units}\times\frac{583\text{ MW}}{\text{unit}}\times\frac{10{,}200\text{ Btu}}{\text{kW}\times\text{hr}}\times\frac{1{,}000\text{ kW}}{\text{MW}}\times\frac{\text{lb}}{9{,}648\text{ Btu}}\times\frac{\text{ton}}{2{,}000\text{ lb}}\times 0.85\times\frac{24\text{ hr}}{\text{day}}\times\frac{365\text{ day}}{\text{yr}}$	8,470,288 tons of coal per year
SO_x[a,c]	$\frac{38\times 1.01\text{ lb}}{\text{ton}}\times\frac{\text{ton}}{2{,}000\text{ lb}}\times(1-95/100)\times\frac{8{,}470{,}288\text{ tons}}{\text{yr}}$	8,127 tons SO_x per year
NO_x[b, c]	$\frac{9.7\text{ lb}}{\text{ton}}\times\frac{\text{ton}}{2{,}000\text{ lb}}\times(1-95/100)\times\frac{8{,}470{,}288\text{ tons}}{\text{yr}}$	2,054 tons NO_x per year
CO[c]	$\frac{0.5\text{ lb}}{\text{ton}}\times\frac{\text{ton}}{2{,}000\text{ lb}}\times\frac{8{,}470{,}288\text{ tons}}{\text{yr}}$	2,118 tons CO per year
PM[d]	$\frac{10\times 6.9\text{ lb}}{\text{ton}}\times\frac{\text{ton}}{2{,}000\text{ lb}}\times(1-99.9/100)\times\frac{8{,}470{,}288\text{ tons}}{\text{yr}}$	292 tons PM per year
PM_{10}[d]	$\frac{2.3\times 6.9\text{ lb}}{\text{ton}}\times\frac{\text{ton}}{2{,}000\text{ lb}}\times(1-99.9/100)\times\frac{8{,}470{,}288\text{ tons}}{\text{yr}}$	67 tons PM_{10} per year

[a] USEPA, 1998, Table 1.1-1.
[b] USEPA, 1998, Table 1.1-2.
[c] USEPA, 1998, Table 1.1-3.
[d] USEPA, 1998, Table 1.1-4.

Notes: CO = carbon monoxide
NO_x = oxides of nitrogen
PM = particulate matter
PM_{10} = particulate matter having diameter nominally less than 10 microns
SO_2 = sulfur dioxide

TABLE 9.2-2
Air Emissions from Gas-Fired Alternative

Parameter	Calculation	Result
Annual gas consumption	$4\,\text{unit} \times \frac{572\,\text{MW}}{\text{unit}} \times \frac{6{,}120\,\text{Btu}}{\text{kW} \times \text{hr}} \times \frac{1{,}000\,\text{kW}}{\text{MW}} \times 0.85 \times \frac{\text{ft}^3}{1{,}021\,\text{Btu}} \times \frac{24\,\text{hr}}{\text{day}} \times \frac{365\,\text{day}}{\text{yr}}$	102,118,571,753 ft^3 per year
Annual Btu input	$\frac{102{,}118{,}571{,}753\ \text{ft}^3}{\text{yr}} \times \frac{1{,}021\,\text{Btu}}{\text{ft}^3} \times \frac{\text{MM Btu}}{10^6\,\text{Btu}}$	104,263,061 MMBtu per year
SO_x[a]	$\frac{0.0034\,\text{lb}}{\text{MM Btu}} \times \frac{\text{ton}}{2{,}000\,\text{lb}} \times \frac{104{,}263{,}061\,\text{MMBtu}}{\text{yr}}$	177 tons SO_x per year
NO_x[b]	$\frac{0.0109\,\text{lb}}{\text{MM Btu}} \times \frac{\text{ton}}{2{,}000\,\text{lb}} \times \frac{104{,}263{,}061\ \text{MMBtu}}{\text{yr}}$	568 tons NO_x per year
CO[b]	$\frac{0.0023\,\text{lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2{,}000\,\text{lb}} \times \frac{104{,}263{,}061\ \text{MMBtu}}{\text{yr}}$	120 tons CO per year
PM[a]	$\frac{0.0019\,\text{lb}}{\text{MMBtu}} \times \frac{\text{ton}}{2{,}000\,\text{lb}} \times \frac{104{,}263{,}061\ \text{MMBtu}}{\text{yr}}$	99 tons filterable PM per year
PM_{10}[a]	$\frac{99\ \text{tons TSP}}{\text{yr}}$	99 tons filterable PM_{10} per year

[a] USEPA, 2000, Table 3.1-2.
[b] USEPA, 2000, Table 3.1 database.

Notes: Btu = British thermal units
CO = carbon monoxide
MM = million
NO_x = oxides of nitrogen
PM = particulate matter
PM_{10} = particulate matter having diameter less than 10 microns
SO_2 = sulfur dioxide
TSP = total suspended particulates

TABLE 9.2-3
Coal-Fired Alternative

Characteristic	Basis
Unit size = 550 MW ISO rating net[a]	Set to match capacity of gas-fired alternative
Unit size = 583 MW ISO rating gross[a]	Calculated based on 6 percent onsite power
Number of units = 4	Calculated to be approximate to EGC ESP facility net capacity of 2,200 MW
Boiler type = tangentially fired, dry-bottom	Minimizes nitrogen oxides emissions (USEPA, 1998).
Fuel type = bituminous, pulverized coal	Typical for coal used in Illinois
Fuel heating value = 9,648 Btu/lb	1999 value for coal used in Illinois (USDOE/EIA, 2000)
Fuel ash content by weight = 6.9 percent	1999 value for coal used in Illinois (USDOE/EIA, 2000)
Fuel sulfur content by weight = 1.01 percent	1999 value for coal used in Illinois (USDOE/EIA, 2000)
Uncontrolled NO_X emission = 9.7 lb/ton Uncontrolled CO emission = 0.5 lb/ton Uncontrolled SO_x emission = 38.4 lb/ton	Typical for pulverized coal, tangentially fired, dry-bottom, with low- NO_x burner (USEPA, 1998)
Uncontrolled PM = 10 lb/ton Uncontrolled PM_{10} = 2.3 lb/ton	Typical for pulverized coal, tangentially fired, dry-bottom (USEPA, 1998)
Heat rate = 10,200 Btu/kWh	Typical for coal-fired single-cycle steam turbines (USDOE/EIA, 2000)
Capacity factor = 0.85	Typical for large coal-fired units (Exelon Corporation experience)
NO_X control = low NO_X burners, overfire air and selective catalytic reduction (95 percent reduction)	Best available and widely demonstrated for minimizing NO_X emissions (USEPA 1998).
Particulate control = fabric filters (baghouse- 99.9 percent removal efficiency)	Best available for minimizing particulate emissions (USEPA, 1998)
SO_x control = Wet scrubber –lime (95 percent removal efficiency)	Best available for minimizing SOx emissions (USEPA, 1998)

[a] The difference between “net” and “gross” is electricity consumed onsite.

Notes: Btu = British thermal unit
CO = carbon monoxide
ISO rating = International Standards Organization rating at standard atmospheric conditions of 59°F, 60 percent relative humidity, and 14.696 pounds of atmospheric pressure per square inch
kWh = kilowatt hour
lb = pound
MW = megawatt
NO_X = nitrogen oxides
PM = particulate matter
PM_{10} = particulate matter nominally less than 10 microns diameter
SO_x = sulfur oxides

TABLE 9.2-4
Solid Waste from Coal-Fired Alternative

Parameter	Calculation	Result
Annual SO_x generated[a]	$\frac{8{,}470{,}2887 \text{ ton coal}}{\text{yr}} \times \frac{1.01 \text{ ton S}}{100 \text{ ton coal}} \times \frac{64.1 \text{ ton } SO_2}{32.1 \text{ ton S}}$	170,833 tons of SO_x per year
Annual SO_x removed	$\frac{170{,}833 \text{ ton } SO_2}{\text{yr}} \times (95/100)$	162,291 tons of SO_x per year
Annual ash generated	$\frac{8{,}470{,}288 \text{ ton coal}}{\text{yr}} \times \frac{6.9 \text{ ton ash}}{100 \text{ ton coal}} \times (99.9/100)$	583,865 tons of ash per year
Annual lime consumption[b]	$\frac{170{,}833 \text{ ton } SO_2}{\text{yr}} \times \frac{56.1 \text{ ton CaO}}{64.1 \text{ ton } SO_2}$	149,512 tons of CaO per year
Calcium sulfate[c]	$\frac{162{,}291 \text{ ton } SO_2}{\text{yr}} \times \frac{172 \text{ ton } CaSO_4 \bullet 2H_2O}{64.1 \text{ ton } SO_2}$	435,477 tons of $CaSO_4 \cdot 2H_2O$ per year
Annual scrubber waste[d]	$\frac{149{,}512 \text{ ton CaO}}{\text{yr}} \times \frac{(100-95)}{100} + 354{,}653 \text{ ton } CaSO_4 \bullet 2H_2O$	442,952 tons of scrubber waste per year
Total volume of scrubber waste[e]	$\frac{442{,}952 \text{ ton}}{\text{yr}} \times 40 \text{ yr} \times \frac{2{,}000 \text{ lb}}{\text{ton}} \times \frac{ft^3}{144.8 \text{ lb}}$	244,724,862 ft^3 of scrubber waste
Total volume of ash dispensed onsite[f,g]	$\frac{583{,}865 \text{ ton}}{\text{yr}} \times \frac{100-87}{100} \times 40 \text{ yr} \times \frac{2{,}000 \text{ lb}}{\text{ton}} \times \frac{ft^3}{100 \text{ lb}}$	60,721,960 ft^3 of ash
Total volume of solid waste disposed onsite	$244{,}724{,}862 \text{ ft}^3 + 60{,}721{,}960 \text{ ft}^3$	305,446,822 ft^3 of solid waste
Waste pile area (acres)	$\frac{305{,}446{,}822 \text{ ft}^3}{30 \text{ ft}} \times \frac{\text{acre}}{43{,}560 \text{ ft}^2}$	234 acres of solid waste
Waste pile area (ft × ft square)	$\sqrt{(305{,}446{,}822 \text{ ft}^3/30\text{ft})}$	3,191 feet by 3,191 feet of solid waste

[a] Calculations assume 100 percent combustion of coal.
[b] Lime consumption is based on total SO_2 generated.
[c] Calcium sulfate generation is based on total SO_2 removed.
[d] Total scrubber waste includes scrubbing media carryover.
[e] Density of $CaSO_4 \cdot 2H_2O$ is 144.8 lb/ft^3.
[f] Density of coal bottom ash is 100 lb/ft^3 (FHA, 2000).
[g] Assumed 87 percent of ash is recycled.

Notes: S = sulfur
SO_2 = sulfur dioxide
CaO = calcium oxide (lime)
CaSO $\cdot 2H_2O$ = calcium sulfate dihydrate

TABLE 9.2-5
Gas-Fired Alternative

Characteristic	Basis
Unit size = 550 MW ISO rating net:[a] Two 184-MW combustion turbines and a 182-MW heat recovery boiler	Manufacturer's standard size gas-fired combined cycle plant
Unit size = 572-MW ISO rating gross:[a] Two 191.4-MW combustion turbines 189.3-MW heat recovery boiler	Calculated based on 4 percent onsite power
Number of units = 4	Calculated to be approximate to EGC ESP Facility net capacity of 2,200 MW
Fuel type = natural gas	Assumed
Heat rate = 6,120 Btu/kWh	Manufacturer's listed heat rate for General Electric Frame 7FA unit.
Fuel heating value = 1,021 Btu/ft^3	1999 value for natural gas used in Illinois (USDOE/EIA, 2000)
NO_X emission = 0.0109 lb/MMBtu	Typical for large SCR-controlled gas fired units with water-steam injection (USEPA, 2000)
CO emission = 0.00226 lb/MMBtu	Typical for large SCR-controlled gas fired units with water-steam injection (USEPA, 2000)
Uncontrolled SO_x emission = 0.0034 lb/ton	Typical for gas-fired units (USEPA, 2000)
Uncontrolled PM emission = 0.0066 lb/MMBtu	Typical for gas-fired units (USEPA, 2000)
Uncontrolled PM_{10} emission = 0.0066 lb/MMBtu	Typical for gas-fired units (USEPA, 2000)
Capacity factor = 0.85	Typical for large gas-fired base load units
NO_X control = selective catalytic reduction (SCR) with steam/water injection (90 reduction)	Best available for minimizing NO_X emissions (USEPA, 2000)

[a] The difference between "net" and "gross" is electricity consumed on site.

Notes: Btu = British thermal unit
CO = carbon monoxide
ft^3 = cubic foot
ISO rating = International Standards Organization rating at standard atmospheric conditions of 59°F, 60 percent relative humidity, and 14.696 pounds of atmospheric pressure per square inch
kWh = kilowatt hour
MM = million
MW = megawatt
NO_X = nitrogen oxides
PM = particulate matter
PM_{10} = particulate matter nominally less than 10 microns diameter

TABLE 9.2-6
Impacts Comparison Summary

Impact Category	Proposed Action (EGC ESP)	Coal-Fired Generation	Gas-Fired Generation	Combinations
Land Use	Small	Small	Small	Small to Large
Water Quality	Small	Small	Small	Small
Air Quality	Small	Moderate to Large	Moderate	Small to Moderate
Ecological Resources	Small	Small	Small	Small
Threatened and Endangered Species	Small	Small	Small	Small
Human Health	Small	Moderate	Small	Small
Socioeconomics	Small	Small	Small	Small
Waste Management	Small	Moderate	Small	Small
Aesthetics	Small	Small	Small	Small to Large
Cultural Resources	Small	Small	Small	Small
Accidents	Small	Small	Small	Small

Notes: SMALL – Environmental effects are not detectable or are so minor that they will neither destabilize not noticeably alter any important attribute of the resource.
MODERATE – Environmental effects are sufficient to alter noticeably, but not destabilize, any important attribute of the resource.
LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.
10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 3.

TABLE 9.2-7

Impacts Comparison Detail

Proposed Action (EGC ESP)	Coal-Fired Generation	Gas-Fired Generation	Combination
EGC ESP for 20 years, followed by construction, operation, and decommissioning.	New construction at the CPS site.	New construction at the CPS site.	New construction at the CPS site and construction for solar/wind installations throughout region of interest.
Upgrade existing switchyard and transmission lines.	Upgrade existing switchyard and transmission lines.	Upgrade existing switchyard and transmission lines.	Upgrade existing switchyard and transmission lines. Construction of transmission and rights-of-way for renewable generation.
	Upgrade existing rail spur.	Construct 2.5 miles of gas pipeline along existing rights-of-way.	Construct 2.5 miles of gas pipeline along existing rights-of-way.
	Four 550-MW tangentially-fired, dry bottom units; capacity factor 0.85.	Four 550-MW units, each consisting of two 184-MW combustion turbines and a 182-MW heat recovery boiler; capacity factor 0.85.	Four 550-MW units, each consisting of two 184-MW combustion turbines and a 182-MW heat recovery boiler; capacity factor 0.85 maximum and probably less depending upon the amount of generation by renewable sources.
			Renewable energy sources: combination of solar and wind turbine technologies to produce up to 2180 MWe when resource is available.
New cooling water system with potential construction of new cooling towers.	New cooling water system with potential construction of new cooling towers.	New cooling water system with potential construction of new cooling towers.	New cooling water system with potential construction of new cooling towers. Depending on solar technology utilized, cooling water may also be needed.

TABLE 9.2-7

Impacts Comparison Detail

Proposed Action (EGC ESP)	Coal-Fired Generation	Gas-Fired Generation	Combination
	Pulverized bituminous coal, 9,648 Btu/pound; 10,200 Btu/kWh; 6.9% ash; 1.01% sulfur; 9.7 pound/ton nitrogen oxides; 8,470,288 tons coal/yr.	Natural gas, 1,021 Btu/ft^3; 6,120 Btu/kWh; 0.0034 lb sulfur/MMBtu; 0.0109 lb NO_x/MMBtu; 102,118,571,753 ft^3 gas/yr.	Natural gas, 1,021 Btu/ft^3; 6,120 Btu/kWh; 0.0034 lb sulfur/MMBtu; 0.0109 lb NO_x/MMBtu; 102,118,571,753 ft^3 gas/yr when operating at capacity mentioned above. Effluents would be scaled based on level of renewable generation.
	Low NO_x burners, overfire air, and selective catalytic reduction (95% NO_x reduction efficiency).	Selective catalytic reduction with steam/water injection.	Selective catalytic reduction with steam/water injection.
	Wet scrubber – lime desulfurization system (95% SO_x removal efficiency); 149,512 tons limestone/yr.		
	Fabric filters (99.9% particulate removal efficiency.		
580 workers	250 workers	25-40 workers	40-50 workers

TABLE 9.2-7
Impacts Comparison Detail

Proposed Action (EGC ESP)	Coal-Fired Generation	Gas-Fired Generation	Combination	
			Gas-fired	Renewable
Land Use Impacts				
SMALL – Construction at CPS would be in previously disturbed areas. Facility would consist of approximately 150 acres.	SMALL – Construction at CPS would be in previously disturbed areas. The plant would upgrade existing rail spur and use transportation corridors. Forty years of ash and scrubber waste disposal would require 234 acres and construction of the power block and coal storage areas would impact approximately 200 acres.	SMALL – Construction at CPS would be in previously disturbed areas. 110 acres for facility; pipeline could be routed along existing rights-of-way and would require an additional 40 acres for easement.	SMALL – Construction at CPS would be in previously disturbed areas. 110 acres for facility; pipeline could be routed along existing rights-of-way and would require an additional 40 acres for easement.	SMALL to LARGE – Impacts are dependent on the level of renewables included in the combination alternative. Wind/solar siting and building of transmission access infrastructure could remove substantial amounts of land throughout the ROI and would remove substantially more land per MWe produced when compared to any other form of generation. Land use impacts for wind are discussed in 9.2.2.1; for solar technologies see 9.2.2.4.
Water Quality Impacts				
SMALL – Construction impacts minimized by use of best management practices. Operational impacts minimized by use of best management practices by use of new cooling water system.	SMALL – Construction impacts minimized by use of best management practices. Operational impacts minimized by use of best management practices by use of new cooling water system.	SMALL – Smaller cooling water demands (then coal), inherent in combined-cycle design. Construction of pipeline could cause temporary erosion and sedimentation in streams crossed by right-of-way.	SMALL – Smaller cooling water demands (then coal), inherent in combined-cycle design. Construction of pipeline could cause temporary erosion and sedimentation in streams crossed by right-of-way.	SMALL - Some water use and quality issues will occur depending on solar technology used.

TABLE 9.2-7
Impacts Comparison Detail

Proposed Action (EGC ESP)	Coal-Fired Generation	Gas-Fired Generation	Combination	
			Gas-fired	Renewable
		Air Quality Impacts		
SMALL – Construction impacts minimized by use of best management practices. Operational impacts are negligible.	MODERATE to LARGE – 8,127 tons SO_x/yr 2,054 tons NO_x/yr 2,118 tons CO/yr 292 tons PM/yr 67 tons PM_{10}/yr	MODERATE – 117 tons SO_x/yr 568 tons NO_x/yr 120 tons CO/yr 99 tons PM_{10}/yr[a]	SMALL to MODERATE – 117 tons SO_x/yr 568 tons NO_x/yr 120 tons CO/yr 99 tons PM_{10}/yr[a] These would be reduced based on the level of renewable generation.	SMALL - Small risk of fugitive emissions from manufacture of PV cells, or accidental leaks.
		Ecological Resource Impacts		
SMALL – Construction of power block would impact up to 150 acres of terrestrial habitat, potentially displacing various species. Potential new cooling towers would reduce impingement, entrainment, and thermal impacts to aquatic species.	SMALL – Construction of the power block and coal storage areas and 40 years of ash/sludge disposal would impact approximately 300 acres of terrestrial habitat, displacing various species. Potential new cooling towers would reduce impingement, entrainment, and thermal impacts to aquatic species.	SMALL – Construction of power block would impact up to 150 acres of terrestrial habitat, potentially displacing various species. Potential new cooling towers would reduce impingement, entrainment, and thermal impacts to aquatic species.	SMALL – Construction of power block would impact up to approximately 150 acres of terrestrial habitat, potentially displacing various species. Potential new cooling towers would reduce impingement, entrainment, and thermal impacts to aquatic species.	SMALL - Avian mortality remains an issue at wind farms; heavy metals (e.g., cadmium) in PV cells can lead to a variety of impacts, depending on organism and exposure.
		Threatened and Endangered Species		
SMALL – No resident threatened and endangered species are known to occur at the site or along transmission corridors.	SMALL – No resident threatened and endangered species are known to occur at the site or along transmission corridors.	SMALL – No resident threatened and endangered species are known to occur at the site or along transmission corridors.	SMALL – No resident threatened and endangered species are known to occur at the site.	SMALL – Siting and routing of additional transmission corridors for wind/solar installations can be altered to minimize impacts, however, altered siting may remove resources from availability.

TABLE 9.2-7

Impacts Comparison Detail

Proposed Action (EGC ESP)	Coal-Fired Generation	Gas-Fired Generation	Combination	
			Gas-fired	**Renewable**
		Human Health Impacts		
SMALL – Impacts associated with noise are not anticipated. Radiological exposure is not considered significant. Risk from microbiological organisms minimal due to thermal characteristics at the discharge and lack of innoculant. Risk due to transmission-line induced currents minimal due to conformance with consensus code.	MODERATE – Adopting by reference GEIS conclusion that risks such as cancer and emphysema from emissions are likely (USNRC, 1996).	SMALL – Adopting by reference GEIS conclusion that some risk of cancer and emphysema exists from emissions (USNRC, 1996).	SMALL – Adopting by reference GEIS conclusion that some risk of cancer and emphysema exists from emissions (USNRC, 1996).	SMALL - Small carcinogen exposure risk noted from leaching materials during PV cell manufacture and at installations.
		Socioeconomic Impacts		
SMALL – The socioeconomic impacts for this option are discussed in Section 3.8 and Section 4.8. Public service impacts are not anticipated. Location in low population area without growth controls minimizes potential for housing impacts. Plant contribution to county tax base may be significant, and continued plant operation would benefit county. Capacity of public water supply and transportation infrastructure minimizes potential or related impacts.	SMALL – Increase in permanent work force at CPS by 250 workers could affect surrounding counties, but would be mitigated by site's proximity to metropolitan areas within the region.	SMALL – Increase in permanent work force at CPS by 25-40 workers could affect surrounding counties, but would be mitigated by the site's proximity to metropolitan areas within the region.	SMALL – Increase in permanent work force at CPS by 40-50 workers could affect surrounding counties, but would be mitigated by the site's proximity to metropolitan areas within the region.	SMALL – Potential minor impacts from reliability and transmission congestion. These transmission issues are more likely with wind. Land values may increase due to lease revenue to landowners from wind installations.
		Waste Management Impacts		
SMALL – Non-radiological impacts will be negligible. Radiological impacts will be small.	MODERATE – 583,865 tons of coal ash per year and 442,952 tons of scrubber sludge per year would require 234 acres over the 40-year term.	SMALL – Almost no waste generation.	SMALL – Almost no waste generation.	SMALL - Used PV cells contain potential hazardous wastes, but chemicals are sealed within the cell. Waste minimization practices also limits waste issues for used cells. Potential for leaching at landfills unknown.

TABLE 9.2-7

Impacts Comparison Detail

Proposed Action (EGC ESP)	Coal-Fired Generation	Gas-Fired Generation	Combination	
			Gas-fired	Renewable
Aesthetic Impacts				
SMALL – Visual impacts would be consistent with the industrial nature of the site.	SMALL – Visual impacts would be consistent with the industrial nature of the site.	SMALL – Visual impacts would be consistent with the industrial nature of the site.	SMALL – Visual impacts would be consistent with the industrial nature of the site.	SMALL to LARGE - Visual/auditory impacts of wind/solar installations could be substantial but could be mitigated through placement. Placement to mitigate this impact may remove resources from availability. The amount of the impact will depend on the amount of resource used.
Cultural Resource Impacts				
SMALL – Impacts to cultural resources would be unlikely due to developed nature of the site.	SMALL – Impacts to cultural resources would be unlikely due to developed nature of the site.	SMALL – Impacts to cultural resources would be unlikely due to developed nature of the site.	SMALL – Impacts to cultural resources would be unlikely due to developed nature of the site.	SMALL - Impacts to cultural resource of renewable portion and additional transmission infrastructure can be mitigated through placement. Placement to mitigate this impact may remove resources from availability.
Impacts of Accidents				
SMALL – Although the consequences of accidents could potentially be high, the overall risk of accidents is low given the low probability of an accident involving a significant release of radioactivity.	SMALL – Impacts of accidents in coal-fired plants are not applicable.	SMALL – Impacts of accidents in gas-fired plants are not applicable.	SMALL – Impacts of accidents in gas-fired plants and wind/solar are not applicable.	

TABLE 9.2-7

Impacts Comparison Detail

Proposed Action (EGC ESP)	Coal-Fired Generation	Gas-Fired Generation	Combination	
			Gas-fired	Renewable

[a] All total suspended particulates (TSP) for gas-fired alternative is PM10.

Notes: SMALL – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE – Environmental effects are sufficient to alter noticeably, but not destabilize, any important attribute of the resource.

LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 3.

Btu = British thermal unit

MW = Megawatt

MWe = Megawatt electric

Ft^3 = cubic foot

NO_x = oxides of nitrogen

gal = gallon

PM_{10} = particulate matter having diameter less than 10 microns

GEIS = Generic Environmental Impact Statement (USNRC, 1996)

SHPO = State Historic Preservation Office

kWh = kilowatt-hour

SO_x = sulfur oxides

lb = pound

TSP = total suspended particulates

MM = million

yr = year

PV = photovoltaic

ROI = Region of Interest

TABLE 9.3-1
Illinois Nuclear Station Comparison – General Criteria for All Sites

Site	Consumptive Use of Water	No Further Species Endangerment	Effects on Spawning Grounds	Effluent Discharge/ Water Quality	No Preemption or Adverse Impacts to Land Use	Potential Effects on Aquatic and Terrestrial Ecology	Population Characteristics
Braid-wood	Minor consumptive use	No record of endangered species on the site	No potential significant impacts noted	Discharges anticipated to be within current regulatory limits	No preemption or change to land use – site licensed for 4 units	Effects expected to be similar to current impacts	Meets 10 CFR 100 Site is within 50 mi of Chicago and in industrialized suburbs with potentially disproportionate environmental impacts
Byron	Consumptive groundwater use (for cooling and potable water)	No record of listed threatened or endangered species	No record of spawning grounds at the site	Discharges anticipated to be within current regulatory limits	Site licensed for 2 units; currently operating at license capacity – new construction would require additional area	Effects expected to be similar to current impacts	Meets 10 CFR 100
Clinton	Minor consumptive use	No record of listed threatened or endangered species	No record of spawning grounds at the site	Discharges anticipated to be within current regulatory limits	Site licensed for 2 units – 1 unit operating No preemption or additional land use	Effects expected to be similar to current impacts	Meets 10 CFR 100
Dresden	Minor consumptive use	No record of listed threatened or endanger species	No record of spawning grounds at site	Discharges anticipated to be within current regulatory limits	3 units, 2 units operating 1 unit not operational. No additional land available at the site	Effects expected to be similar to current impacts	Meets 10 CFR 100
LaSalle	Groundwater used for makeup, systems, and potable supply.	Occur in vicinity, but not at site	No record of spawning grounds at site	Discharges anticipated to be within current regulatory limits	2 units operating – licensed for 4 units. No additional land required.	Effects expected to be similar to current impacts	Meets 10 CFR 100
Quad Cities	Minor consumptive use	None at site- listed aquatic species present about 1.5 mi from site.	None at site – Essential Habitat and spawning area about 1.5 mi. from site	Discharges anticipated to be within current regulatory limits	Site licensed for 2 units; currently operating at license capacity – new construction would require additional area	Effects expected to similar to current operation; essential habitat may be affected	Meets 10 CFR 100

TABLE 9.3-1
Illinois Nuclear Station Comparison – General Criteria for All Sites

Site	Consumptive Use of Water	No Further Species Endangerment	Effects on Spawning Grounds	Effluent Discharge/ Water Quality	No Preemption or Adverse Impacts to Land Use	Potential Effects on Aquatic and Terrestrial Ecology	Population Characteristics
Zion	Minor consumptive use	No listed threatened or endangered species reported	No spawning grounds reported, but site presents characteristics common to inshore spawning grounds on Lake Michigan	Discharges anticipated to be within current regulatory limits	Current plant not operational. No expected preemption or adverse impacts to land use	Effects similar to operation of proposed EGC ESP Facility at the EGC ESP Site	Meets 10 CFR 100 Site is in an urbanized, industrial area with potentially disproportionate environmental impacts.

TABLE 9.3-2
Illinois Nuclear Station Comparison Alternatives

Site	Ability to Transmit to Demand Centers	Not Proximate to Population Centers	Ease of Construction	Comments
Braidwood	Medium	Medium	Medium/High	Braidwood is affected by the transmission bottleneck around the Chicago hub, and is also near population centers in Northeastern Illinois. Two licensed units are currently operational – Land is available for additional units.
Byron	Medium	High	Low	Byron is affected by the transmission bottleneck around the Chicago hub, despite its rural location. Both licensed units are currently operational – no additional land is available for new units.
Clinton	High	High	High	Clinton's rural location and low population in southern Illinois allows flexibility in transmission. The site was approved for two units. One unit was built, and the area reserved for the second unit is available for construction.
Dresden	Medium	High	Low	Dresden is affected by the transmission bottleneck around the Chicago hub, despite its rural location. The site meets 10 CFR 100. Two units are operational, and a third unit is a Nuclear Historic Landmark. There is no available land within site boundaries to colocate a new nuclear facility, and therefore the site scores low for ease of construction.
LaSalle	Medium	High	Medium/High	LaSalle's location meets 10 CFR 100 population requirements, but it is affected by the transmission bottleneck around the Chicago hub. Both units are currently operational. Land is available for construction of a new unit.
Quad Cities	Medium	Medium	Low	Quad Cities is affected by the transmission bottleneck around major metropolitan areas such as the Quad Cities, and is also near population centers in Northwestern Illinois. Both units are currently operational – there is no available land at the site for additional units.
Zion	Medium/High	Low	Medium/High	Zion is also affected by the transmission bottleneck around the Chicago hub, and is the most affected by Chicago's population. The units are not operational, and the facility is decommissioned. The two units were converted into a voltage stabilization facility to relieve pressure on Illinois Power lines during peak demand periods – the units would require dismantling for siting a new plant, and the stabilization function would probably be lost. Construction may require demolition of existing structures; otherwise ability to build is high.

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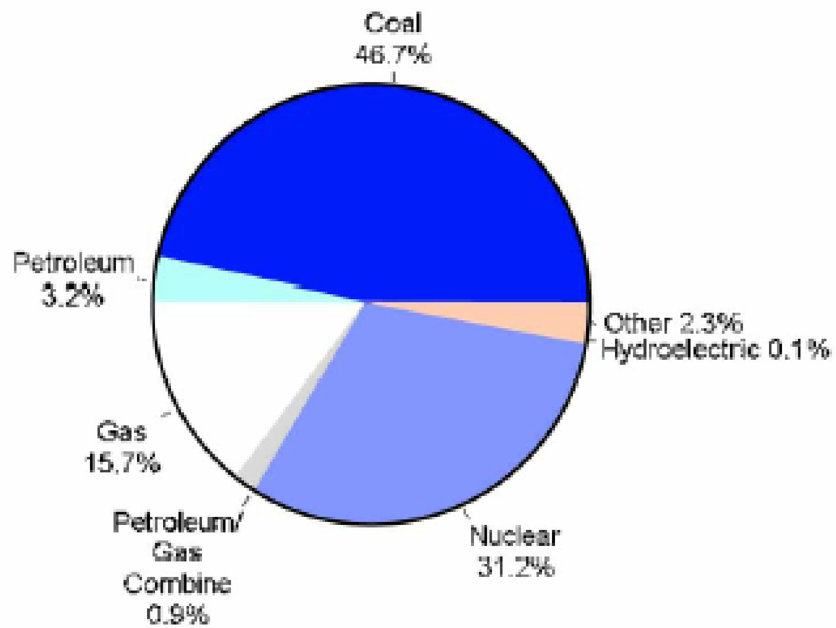
Figure 9.2-1

Industry Generating Capacity in Illinois by Primary Energy Source, 1999

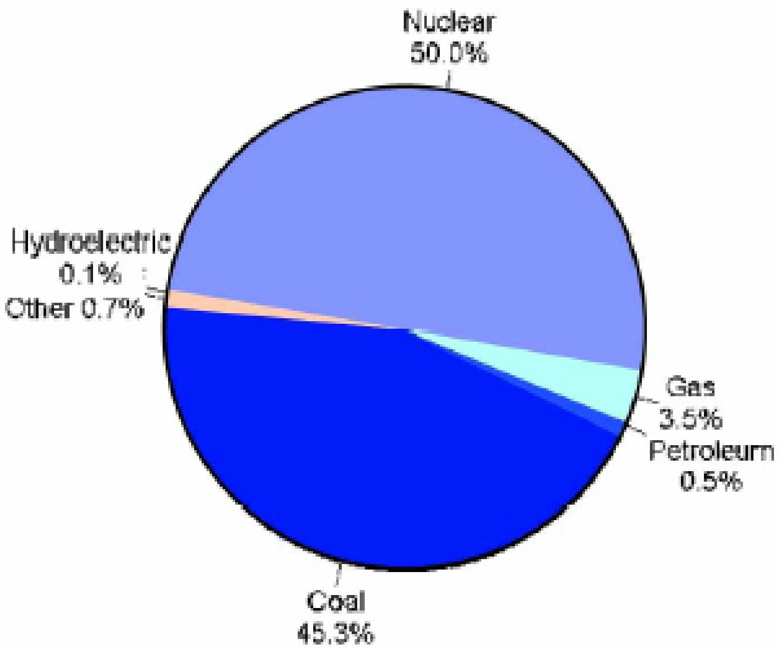


Legend

Not to Scale

Environmental Report for the EGC Early Site Permit

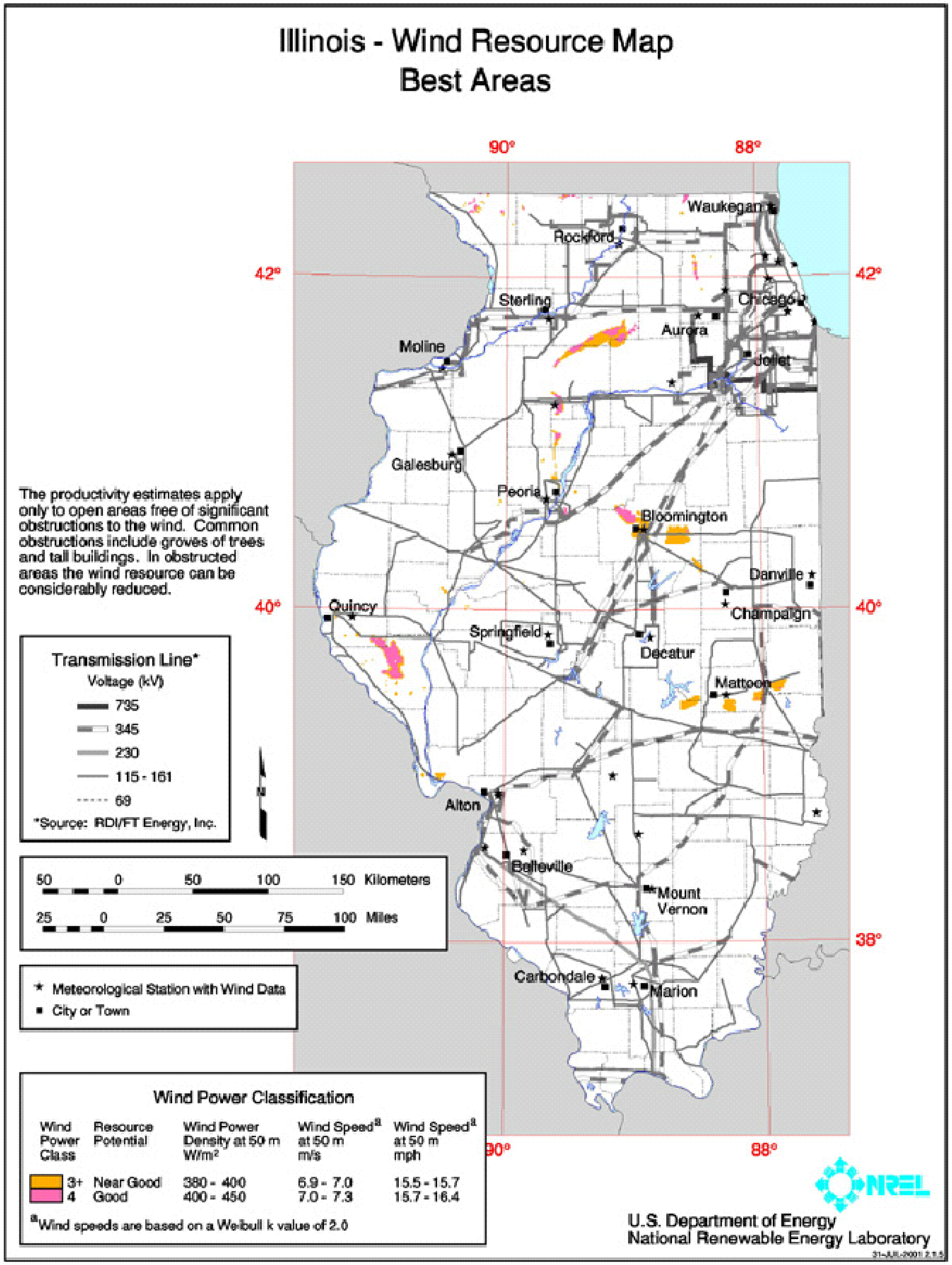
Figure 9.2-2
Industry Generation Utilization in Illinois by Energy Source, 1999



Legend

Not to Scale

Figure 9.2-3
Illinois Wind Resource Map

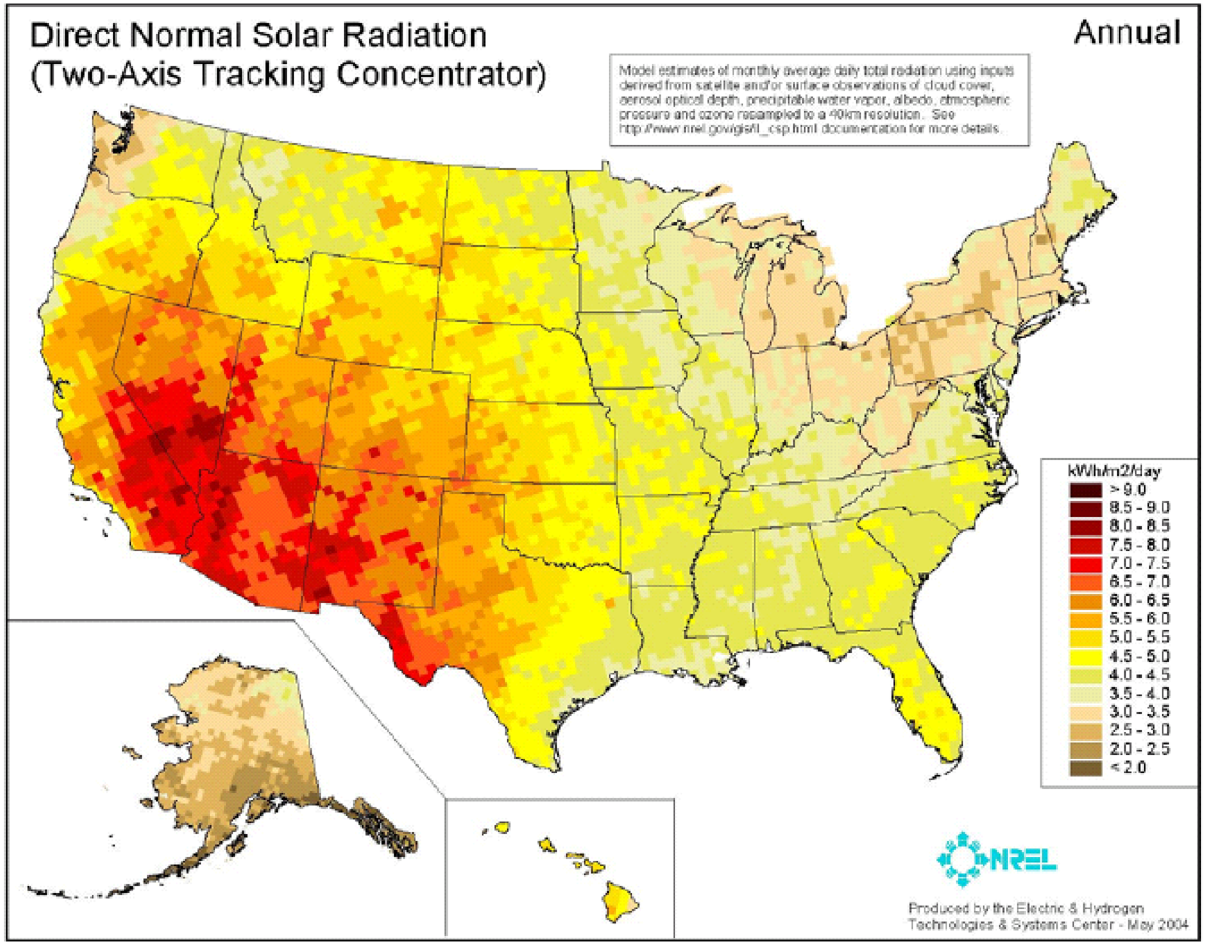


Source: USDOE, 2004

Not to Scale

Environmental Report for the EGC Early Site Permit

Figure 9.2-4
Direct Normal Solar Radiation Map



Source: USDOE, 2004

Not to Scale

CHAPTER 10

Environmental Consequences of the Proposed Action

This chapter provides a description of the environmental consequences of construction and operation of the EGC ESP Facility within and surrounding the EGC ESP Site. The chapter is organized into the following sections:

- Unavoidable Adverse Environmental Impacts (Section 10.1);
- Irreversible and Irretrievable Commitments of Resources (Section 10.2);
- Relationship Between Short-Term Uses and Long-Term Productivity of the Human Environment (Section 10.3); and
- Benefit-Cost Balance (Section 10.4).

For purposes of this ER, the site is defined as the property within the fenceline (see Figure 2.1-3). The vicinity is the area within a 6-mi radius from the centerpoint of the powerblock footprint. The region of the site is the area between the 6-mi radius and the 50-mi radius from the centerpoint of the powerblock footprint.

10.1 Unavoidable Adverse Environmental Impacts

This section will discuss potential environmental consequences for the preconstruction and construction phases, as well as during regular facility operations.

10.1.1 Preconstruction and Construction

The following is a list from Section 4.6.2 that indicates potential adverse environmental impacts that may be encountered during construction activities:

- Noise;
- Dust/air pollution;
- Erosion and sedimentation;
- Discharges from potential pollutant sources (effluents, wastes, spills, and material handling);
- Traffic;
- Surface water impacts;
- Groundwater impacts;
- Land use protection/restoration;
- Water use protection/restoration;
- Terrestrial ecosystem impacts;
- Aquatic ecosystem impacts;
- Socioeconomic impacts; and
- Radiation exposure to construction workers.

The identified impacts have been discussed in Section 4.6.3. In the discussion of Chapter 4, it was concluded that these potential impacts will be considered minor impacts or having no impact on the site. In addition, local, state, and federal regulations and guidelines will be met during preconstruction and construction phases.

Table 10.1-1 provides a description of the potential minor environmental impacts that could occur during preconstruction and construction of the EGC ESP Facility, as well as actions that will be taken to mitigate such impacts. For a more detailed discussion of the proposed potential impacts during the preconstruction and construction phases, please refer to Chapter 4.

10.1.2 Facility Operation

The following is a list from Section 5.10 that indicates potential adverse environmental impacts that may be encountered during construction activities:

- Noise;
- Dust/air pollutants;
- Erosion and sedimentation controls;
- Effluents and wastes;
- Traffic control;
- Land use impacts;
- Water-related impacts;
- Water use impacts;
- Cooling system impacts;
- Radiological impacts from normal operations;
- Environmental impacts of waste;
- Transmission system impacts;
- Uranium fuel cycle impacts;
- Socioeconomic impacts; and
- Decommissioning impacts.

The identified impacts have been discussed in Section 5.10. In the discussion in Chapter 5, it was concluded that these potential impacts will be considered to have minor or no effects on the site. In addition, local, state, and federal regulations and guidelines will be met during preconstruction and construction phases.

Table 10.1-2 provides a description of the potential minor environmental impacts that may occur during regular facility operations, as well as actions that will be taken to mitigate such impacts. For a more detailed discussion of the proposed potential impacts during normal facility operation, please refer to Chapter 5.

10.2 Irreversible and Irretrievable Commitments of Resources

This section gives a summary of the irreversible environmental commitments and the irretrievable material commitments of resources associated with the construction and operation of the EGC ESP Facility. The section is organized into the following sections:

- Irreversible Environmental Commitments (Section 10.2.1); and
- Irretrievable Material Commitments of Resources (Section 10.2.2).

10.2.1 Irreversible Environmental Commitments

The following areas are evaluated below for irreversible environmental commitments:

- Land use;
- Hydrological and water use;
- Ecological (terrestrial and aquatic);
- Socioeconomic;
- Radiological; and
- Atmospheric and meteorological.

10.2.1.1 Land Use

The proposed location of the site is currently in partial use by the CPS. When the CPS was built, the site was zoned as industrial along Clinton Lake and designed for the CPS, as well as an additional generation unit. The transmission lines for the EGC ESP Site are expected to be constructed along existing rights-of-way; therefore, no new property will need to be acquired. The only new land use commitment is the small area within Clinton Lake where the cooling water intake structure will be built. The area that will be taken up by the intake structure is insignificant in comparison to the remaining area of the lake. Thus, since the area that will be lost is insignificant, there will be no irreversible environmental commitment.

10.2.1.2 Hydrological and Water Use

The water that will be used for the project is expected to be drawn from Clinton Lake. Clinton Lake is a man-made lake designed specifically for two units at the CPS. Water that is expected to be lost during the cooling process is water vapor that has evaporated from the cooling towers. This amount is assumed to be nearly insignificant in comparison to the total volume of Clinton Lake, which is 74,200 ac-ft at normal pool. Of the total volume of discharged water, a portion will evaporate from the lake surface, a portion will pass over or through the Clinton Lake Dam to the downstream Salt Creek, and the remaining portion will be drawn back to the plant intake and go through the heating and cooling cycle again. Run-off from the upstream watershed will compensate for the loss of water through evaporation. Therefore, there will be a negligible irreversible hydrological commitment.

10.2.1.3 Ecological

The primary non-industrial land that is expected to be utilized during construction is the right-of-way, which is expected to have a minimal short-term or long-term impact on terrestrial ecology. A small area of Clinton Lake below the water surface will also be disturbed for the installation of the new intake structure. Construction of the intake structure is anticipated to have a minimal impact on aquatic life, and therefore, no irreversible ecological commitment.

10.2.1.4 Socioeconomic

The EGC ESP Facility will not draw from the community's socioeconomic standing, but will produce jobs, revenue, and tax revenues. The EGC ESP Facility is expected to have no irreversible socioeconomic commitments, and will add to the economic growth of the surrounding region.

10.2.1.5 Radiological

The EGC ESP Facility is expected to operate continuously until decommissioning. After the decommissioning process, it is assumed there will be no irreversible radiological commitments other than the actual material that was used during operation. The amount of radioactive material to be used is explained in Section 10.2.2.

10.2.1.6 Atmospheric and Meteorological

While the EGC ESP Facility is in operation, it is expected that there will be very few pollutants discharged into the air. Water vapor will be the main constituent of any emissions released into the atmosphere. The EGC ESP Facility will probably have back-up diesel generators, but they will only be used in the event of an emergency. In addition, the EGC ESP Facility will also operate auxiliary boilers and gas turbines, which will discharge air emissions. Federal, state, and local guidelines and regulations will be met, and any necessary air permits will be secured before operations begin, although diesel generators that are used only for backup will not likely require permits. Since these emissions will have no bearing on the meteorological aspects of the region, it is assumed that there will be no irreversible atmospheric or meteorological commitments.

10.2.2 Irreversible Material Commitments of Resources

Any plans for construction must be deferred to the COL phase since the design of the facility has not yet been chosen. This report discusses the proposition of building the facility at the selected site, but does not discuss the actual construction details. Once the design of the facility has been chosen, the staff will be able to discuss the materials that are irreversibly committed to construction and operation.

10.3 Relationship Between Short-Term Uses and Long-Term Productivity of the Human Environment

This section provides a summary of any use of land or the surrounding environment that will be precluded due to the construction, operation, and decommissioning of the EGC ESP Facility.

10.3.1 Construction Preemptions and Productivity

As summarized in Section 10.1, any short-term preemptions due to construction are very limited. Since the construction of the CPS, the entire site has been zoned as industrial. Also, the site was designed to accommodate an additional power generation unit. Therefore, no land will be converted to a different zone status. During construction, portions of the Clinton Lake State Recreation Area may be closed to the public. It is assumed that this will be temporary, and the closed areas will reopen upon the completion of construction.

It is probable that some wildlife will be disturbed during construction. Terrestrial wildlife may be disturbed while additional transmission lines are being constructed on existing rights-of-way, and aquatic wildlife may be disturbed during the construction of the submerged cooling water intake structure within Clinton Lake. Once construction is completed, it is assumed that the wildlife that was disturbed will return to their original habitats.

Ambient noise levels will also increase during construction activities, but most construction will take place during regular business hours to minimize disturbance to local residents. The OSHA, federal, and local guidelines will be met to reduce noise levels. There may be a slight increase in air emissions due to dust, concrete facility operations, and fuel burning equipment that will be used during construction. Precautions will be taken to reduce emissions, required regulations will be upheld, and required permits will be acquired. None of these potential impacts are expected to have any long-term effect on the surroundings. The benefits of construction greatly outweigh any possible preemptions, and impacts are anticipated to be minor. Construction jobs will be created to support the local economy and stimulate economic growth. In addition, facility construction will decrease tax burdens on the local taxpayers by supplying local municipal governments with additional tax funding.

There are no anticipated long-term environmental impacts or preemptions due to construction of the EGC ESP Facility.

10.3.2 Operations Preemptions and Productivity

As summarized in Section 10.1, any short-term preemptions due to plant operations are very limited. Since the exact model of the reactor has not yet been chosen, the cooling system specifications are estimated based on the generalizations made about the facility. Safety-related cooling towers of the mechanical draft type will be located adjacent to the facility. Either mechanical draft or natural hyperbolic draft type cooling towers will be provided for the normal (non-safety) plant cooling services. Both wet mechanical draft cooling and dry mechanical draft cooling are under consideration. If dry mechanical draft cooling towers will be used, there will be no impacts on the environment. If wet mechanical draft cooling towers will be used, there will be a mist plume at the top of the tower. The mist plume allows for the possibility of minor salt drift, fogging, and icing to occur. However, any effects resulting from this will be too minor to impact the environment outside of the site.

It is expected that the cooling water discharge from the EGC ESP Facility will slightly increase the temperature of Clinton Lake. A combination of wet/dry cooling may be used in order to minimize the use of cooling water. Since the cooling tower blowdown will be cooled to within 15°F of the wet bulb temperature, the thermal discharges to the lake from the EGC ESP Facility will be limited.

There will be an increase in ambient noise levels due to the operation of the facility. Most of the noise pollution will be the result of industrial equipment, and the effects are expected to remain primarily within the site boundaries. Larger, louder pieces of equipment will be used conservatively, and their use will be limited on weekends.

The volume of traffic on local roads will slightly increase due to the number of employees commuting to the facility. It is assumed that the employees will be evenly distributed throughout the region. Based on the evaluation provided in Section 4.1.1.2, the roads are equipped to handle an increase in traffic volume.

Air emissions are anticipated to increase slightly as a result of burning fuel for equipment, but federal, state, and local regulations and guidelines will be met, and permits will be secured, as necessary.

Radiological monitoring programs will be enacted to measure and reduce radiation levels emitted by the facility. These impacts will not have any significant negative long-term impacts on the surrounding environment.

The benefits of the EGC ESP Facility greatly outweigh any environmental impacts. The purpose of the power plant is to generate approximately 2,180 MWe of electricity, as estimated in the PPE for the potential reactors under consideration for a regionally deregulated market. In addition, it will help to decrease energy costs for customers located within the region. The principal long-term benefit of the facility is represented by the production of electrical energy. The economic productivity of the facility, when used for this purpose, will be much larger than that from the current site use. It is assumed that the short-term impacts of the land use will be eliminated when the facility is decommissioned.

The project will also create permanent jobs for the local community. It is assumed that the income of the employees will be reinvested into local businesses, thus, promoting economic growth within the region. The taxes collected from the proposed site are expected to help provide funding to several regional municipal governments that are in need of additional funds to help decrease the burden on taxpayers.

In conclusion, the negative aspects of facility construction and operation, as they affect the human environment, are outweighed by the positive long-term enhancement of regional productivity through the generation of electrical energy, creation of jobs, and stimulation of the local economy.

10.4 Benefit-Cost Balance

This section provides a summary of the benefits and tradeoffs considered in the decision to colocate the EGC ESP Facility at the CPS.

The guidelines provided by NUREG-1555, ESRP 10.4 expect a discussion of the benefits and costs associated with construction and operation of the EGC ESP Facility at the CPS (USNRC, 1999). Costs and benefits of construction and operation of the facility are not considered because 10 CFR 52.17(a)(2) does not require an assessment of benefits for this ER. Further, recent proposed revisions to NUREG-0800 and the Draft Review Standard (RS) 002 state that ESRP 10.4 need not be included in the ESP ER.

CHAPTER 10

References

Chapter Introduction

None

Section 10.1

10 CFR 20. Code of Federal Regulations. "Standards for the Protection Against Radiation."

Section 10.2

None

Section 10.3

None

Section 10.4

10 CFR 52.17. Code of Federal Regulations. "Contents of Applications."

U.S. Nuclear Regulatory Commission (USNRC). *Standard Review Plans for Environmental Reviews of Nuclear Power Plants*. NUREG-1555. Office of Nuclear Reactor Regulation. October 1999.

CHAPTER 10

Tables

TABLE 10.1-1
Unavoidable Adverse Environmental Impacts During Preconstruction and Construction

Impact Category	Minor Impacts Based on Applicant's Proposal	Actions to Mitigate Impacts	Unavoidable Adverse Impacts
Land Use	None (Land is already zoned as industrial to support an additional power station, and transmission lines will be constructed in existing right-of-way corridors)	---[a]	None
Hydrological and Water Use	There may be minor sediment run-off into Clinton Lake from construction activities	The SWPPP outlines the actions that will mitigate sediment run-off during the construction phase	None
Ecological (Terrestrial)	Wildlife may temporarily be disturbed by construction of transmission lines in existing rights-of-way	Construction is temporary, and disturbed wildlife is expected to return upon completion of construction	None
Ecological (Aquatic)	Construction of the cooling water intake structure will impact open water habitats of Clinton Lake	Wetlands and floodplains will be restored; there is expected to be only minor displacement of open waters and shoreline habitat	None
Socioeconomic (Noise)	Noise related to construction	OSHA, federal, and local guidelines will be met to ensure noise is kept to a minimum	None
Socioeconomic (Traffic)	Traffic on the roads surrounding the site will increase during construction	Most traffic will occur during normal business hours, and the roads are equipped to handle the increase in traffic	None
Socioeconomic (Air emissions)	Air pollution due to dust, concrete plant operations, and fuel burning equipment	Applicable air pollution control regulations will be met, and permits will be secured where required	None
Socioeconomic (Recreational)	Portions of the Clinton Lake State Recreation Area may temporarily be closed due to disturbances by construction	Upon completion of construction, it is expected that any closed areas would reopen again	None
Radiological	Construction workers may be exposed to slightly higher radiation levels due to the CPS	The CPS has a series of structures to reduce radioactive emissions to the surrounding environment, and Radiological Monitoring Programs will be active. In 2001, all radioactivity levels were similar to pre-operational ambient radioactivity levels emitted by the natural environment	None
Atmospheric and Meteorological	None	---[a]	None
Environmental Justice	None	---[a]	None

[a] Data not available

TABLE 10.1-2
Unavoidable Adverse Environmental Impacts During Plant Operations

Impact Category	Minor Impacts Based on Applicant's Proposal	Actions to Mitigate Impacts	Unavoidable Adverse Impacts
Land Use	In the event that wet mechanical draft cooling is used for the cooling tower, there will be a mist plume from the cooling tower, which allows the potential for minor salt drift, fogging, and icing to occur	• Dry mechanical draft cooling is still under consideration • If wet mechanical draft cooling is used, the results from fogging, salt drift, and icing will be too minor to have any land impacts	None
Hydrological and Water Use	Discharged cooling water from the proposed facility may slightly increase the temperature of the lake	A combination of wet/dry cooling will most likely be used to minimize the use of water	None
Ecological (Terrestrial)	None	---[a]	None
Ecological (Aquatic)	Cooling water may change the thermal characteristics of Clinton Lake	EGC personnel will be monitoring the thermal characteristics of Clinton Lake according to Section 6.1	None
Socioeconomic (Noise)	During operational activities, the ambient noise levels of the surrounding areas will increase	OSHA, federal, and local guidelines will be met to ensure noise is kept to a minimum, as well as providing employees with ear protection	None
Socioeconomic (Traffic)	Traffic during operations will be significantly lower than during construction	Most traffic will occur during normal business hours, and the roads are equipped to handle the increase in traffic	None
Socioeconomic (Air emissions)	Emissions from fuel-burning will occur from vehicular traffic	Applicable air pollution control regulations will be met	None
Radiological	Potential for radiation doses to members of the public	A REMP will be established in accordance with 10 CFR 20.1501 (see Section 6.2)	None
Atmospheric and Meteorological	None	---[a]	None
Environmental Justice	None	---[a]	None

[a] Data not available

APPENDIX A

Wells Within 15 mi from the Site

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
0	5	16043	120392152600	Schnake, Jeff	1	20011228	171	Water
0	5	16044	120392120500	Seaman, Rodney #1		19950817	188	Water
0	5	16045	120392151200	Tickle, Michael & Debbie	1	20010907	255	Water
0	5	16046	120390013500	Warner, C. M.		19320101	73	Water
0	5	16047	120392138800	Blue, June		19990319	280	Water
0	5	16048	120392081000	Gibbs, Jim	1	19860729	320	Water
0	5	16049	120390013600	Graham, Fred		19440501	81	Water
0	5	16050	120390013700	Cash, Homer		19460101	78	Water
0	5	16051	120392064100	Champaign Asphalt Co.	1	19750915	275	WTST
0	5	16052	120392064200	Champaign Asphalt Co.	2	19750918	305	WTST
0	5	16053	120392064300	Champaign Asphalt Co.	3	19751007	335	WTST
0	5	16054	120392079200	Smith, Roger Keith	3	19850619	71	Water
0	5	16056	120390013900	Gibson, R. L.		19470501	131	Water
0	5	16057	120390013800	Gibson, Rube		19451101	47	Water
0	5	16058	120390014000	Jackson, Andrew		19390101	78	Water
0	5	16059	120390014100	Wantland, Albert		19410101	61	Water
0	5	16060	120392071000	Wantland, Darrell	2	19770505	73	Water
0	5	16062	120392101900	Daniel, Sam & Carol	1	19920519	79	Water
0	5	16063	120392079900	Ill Dept of Conservation	1-85	19850920	255	Water
0	5	16064	120390056300	Lane, Ferrell K.		19710716	250	Water
0	5	16065	120392134000	Lane, Ken		19980627	270	Water
0	5	16066	120392077900	Arnold, Michael R.		19810810	61	Water
0	5	16068	120392096300	Jordan, Jerry & Mary	2	19890811	70	Water
0	5	16069	120392104000	Jordan, Mary C.	2	19921210	320	Water
0	5	16072	120390014600	McBride, Glenn	1	19400101	80	Water
0	5	16075	120392102000	Kovak, Pete	1	19920803	282	Water
0	5	16076	120392150500	Koyak, Pete		20010912	290	Water
0	5	16077	120392092900	O'Neill, Robert #1	1	19880926	275	Water
0	5	16078	120392134100	Thayer, Kevin		19980528	272	Water
0	5	16079	120392102100	Utterback, Russell #1	1	19921001	282	Water
0	5	16081	120392134200	Cooley, Jeff		19980630	276	Water
0	5	16082	120390014700	Sprague, Martin		19400101	43	Water
0	5	16083	120390014800	Atteberry		19460401	227	Water
0	5	16084	120392139400	Creek Township		19990324	42	Water
0	5	16085	120392101100	Daniels, James O.		19910627	41	Water
0	5	16086	120392071100	Harmon, Verneda	3	19760618	42	Water
0	5	16087	120392095900	Miller, John E. #1	1	19901017	290	Water
0	5	16088	120392130600	Riddle, Lorin		19971018	280	Water
0	5	16089	120390056100	Roberts, Chas.	1	19710520	38	Water
0	5	16090	120392091800	Shipp, Gowdy		19880623	40	Water
0	5	16091	120392143900	Trummel, Milton G.		20000615	59	Water
0	5	16092	120390014900	Ward, Ellen		19410101	68	Water
0	5	16093	120392093000	Webb, Minnie B.		19880926	50	Water
0	5	16094	120392118100	Cowles, Irvin		19520331	246	Water
0	5	16095	120392112500	Trimble, Timothy		19940620	270	Water
0	5	16096	120390015000	Thompson, Roy		19450101	67	Water
0	5	16097	120390015100	Emery, J. W.	1	19400101	75	Water
0	5	16098	120392066500	Weldon, Village of	1-77	19770209	360	WTST
0	5	16099	120392067900	Weldon, Village of	5	19780301	293	Water
0	5	16100	120390015200	Wise, Thelbert		19450401	73	Water
0	5	16145	120392145400	Riddle, Chris		20000411	257	Water
0	5	16146	120390016700	Shell, Doc		19360101	92	Water
0	5	16147	120392121400	Twist, Gary		19951212	280	Water
0	5	16148	120392097000	Twist, Rob		19890630	256	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
0	5	16149	120392150900	Coffman-Burgner Trust		20010829	268	Water
0	5	16150	120392064500	Weldon	3-75	19750101	295	WTST
0	5	16151	120392064000	Weldon, City of	2-75	19750101	358	WTST
0	5	16152	120392109600	Campell (Weldon, City of	1-62		175	WTST
0	5	16153	120392064400	Weldon	1-75	19750101	255	WTST
0	5	16178	120392097200	Griffin, Leta #1	1	19900418	275	Water
0	5	19220	120392115900	Payne, Agnes		19490716	86	Water
0	5	19221	120390053400	Payne, Richard		19690911	42	Water
0	5	19254	120392071900	Wagner, Merle G. #10	10	19781012	117	Water
0	5	19331	120392104400	Fiocchi, Tanda	1	19930512	67	Water
0	5	19332	120392132100	Luster, Larry M. Jr.		19970712	62	Water
0	5	19333	120392132200	Stone, Bill & Lori	1	19970604	60	Water
0	5	19334	120392125700	Strohkirch, Roy		19961103	115	Water
0	5	19335	120392125800	Toohill, Bob #1		19961016	59	Water
0	5	19336	120392097700	Zwick, Thomas		19900615	89	Water
0	5	19337	120392097800	Kuntz, Nancy & Steven #1	1	19900508	98	Water
0	5	19338	120392097900	Wilson, Rodney	2	19900829	68	Water
0	5	19342	120390023300	Hoblit, H. K.	1	19320101	70	Water
0	5	19343	120390023400	Wilson, P. K.		19400101	80	Water
0	5	19344	120392132300	Morris, Martin	1	19970529	80	Water
0	5	19345	120392140500	Phillips, Nick	3	19990515	310	Water
0	5	19346	120392102700	Snyder, George & Diana #1	1	19920409	289	Water
0	5	19347	120392100500	Spencer, Jessie L.		19911003	51	Water
0	5	19348	120390023500	Walker, Carl		19460101	87	Water
0	5	19349	120390023600	Warner, John Jr.		19400101	60	Water
0	5	19351	120392147000	Hall, Charles & Teresa		20000904	72	Water
0	5	19352	120392119500	Winchell, Mike		19950801	67	Water
0	5	19353	120390023700	Lampe, Henry		19451001	52	Water
0	5	19354	120392092100	Sanders, William N.	1	19880831	81	Water
0	5	19355	120390023800	Freudenstein, E. L.		19410101	50	Water
0	5	19356	120392098100	Thorpe Seed Co.		19890217	365	Water
0	5	19357	120392098200	Thorpe Seed Co. #5	5	19890222	375	Water
0	5	19358	120390023900	Lynch, Mrs. Ed		19400101	46	Water
0	5	19359	120390024000	Robison, Wm.	1	19400101	223	Water
0	5	19360	120392148700	Anderson, Patrick & Julie	2	20010719	75	Water
0	5	19361	120392093100	Campbell, Monte #1	1	19880831	352	Water
0	5	19362	120390051200	Dinsmore, Tom		19270101	81	Water
0	5	19363	120392092500	Harp Township	1	19880930	67	Water
0	5	19364	120392116400	Husted, Terry #1		19941221	340	Water
0	5	19365	120392067600	Methodist Church(Ill. Power)		19600101	90	Water
0	5	19366	120392098300	Moody, Larry	1	19900720	350	Water
0	5	19367	120392142000	Moody, Larry		19991116	69	Water
0	5	19369	120392068100	Illinois Power Co.	1	19780925	60	Water
0	5	19370	120392076100	Illinois Power Co.	1-78	19780915	60	WTST
0	5	19371	120392076200	Illinois Power Co.	2-78	19780925	60	WTST
0	5	19372	120392067500	Illinois Power Company		19771001	275	Water
0	5	19373	120390045200	Palmer, Byron	1		237	Water
0	5	19374	120390045300	Palmer, Byron	2		150	Water
0	5	19375	120390024200	Dawson, Noble		19461201	64	Water
0	5	19376	120390024300	Harrold, Olive	1	19400101	101	Water
0	5	19377	120392104500	IL Power Co. Clinton Power St.		19930719	86	Water
0	5	19378	120392111600	Illinois Power Co.	TH 2-80	19811231	260	Water
0	5	19379	120392111800	Illinois Power Co.	TH 1-81	19810102	320	Water
0	5	19380	120392111900	Illinois Power Co.	TH 2-81	19810105	260	Water
0	5	19381	120392136200	IL Power Clinton Station		19980804	310	Water
0	5	19382	120392063000	Illinois Power	1-74	19740701	413	WTST
0	5	19383	120392063100	Illinois Power	2-74	19740701	408	WTST
0	5	19384	120392063200	Illinois Power	3-74	19740801	413	WTST
0	5	19385	120392063300	Illinois Power	4-74	19740808	400	WTST
0	5	19386	120392076000	Illinois Power Co.	1	19810306	340	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
0	5	19387	120390054500	Illinois Power Company	1	19740925	353	Water
0	5	19388	120392062100	Illinois Power Company		19740901	340	WATRS
0	5	19389	120392121700	Illinois Power Company		19951214	90	Water
0	5	19390	120392106400	Illinois Power Company#TH5-74		19740814	358	Water
0	5	19392	120390024500	Ozark Pipe Line Co.		19260101	228	Water
0	5	19393	120392136300	Bray, Mike		19980729	90	Water
0	5	19394	120392125900	Lockwood, Jim #3		19960914	350	Water
0	5	19395	120392067800	Thomason,Gary & Holland,John		19780701	350	Water
0	5	19396	120392142100	White Oaks Estates	2	20000114	356	Water
0	5	19397	120392136400	Hulvey, Don		19981013	67	Water
0	5	19398	120392072100	Irvin, Robert	1	19770623	305	Water
0	5	19399	120392112700	Myers, Samuel		19940604	360	Water
0	5	19400	120392116100	Rice, Bob	1	19920904	62	Water
0	5	19401	120392102800	Szymkiewicz, Dave	1	19910425	360	Water
0	5	19402	120390024600	Wilson, R.	1	19400101	184	Water
0	5	19403	120392072200	Bruce, Vivian #1	1	19790503	53	Water
0	5	19404	120392116000	Griffith, Frank		19630807	45	Water
0	5	19405	120392098400	Koons, Robert Keith	1	19891018	45	Water
0	5	19406	120392112800	Scharff, John	1	19940302	55	Water
0	5	19407	120392136500	Ferguson, Dave		19980715	36	Water
0	5	19408	120392131000	Jordan, Mary		19971118	333	Water
0	5	19409	120392138000	Tedrick, Julie & Mark		19981109	66	Water
0	5	19410	120390056900	Best, Vachel		19711025	68	Water
0	5	19411	120392118800	Brannan, David #2		19950503	290	Water
0	5	19412	120392146200	Cisco, David		20001101	282	Water
0	5	19414	120390024700	Reeser		19390101	72	Water
0	5	19415	120390024800	Walker, Carl		19380101	70	Water
0	5	19416	120390025400	Miller, Floyd V.		19461101	42	Water
0	5	19417	120390025500	Spencer, Ray		19450501	38	Water
0	5	19418	120390025600	Walker, Carl (Mgr.)		19460701	115	Water
0	5	19419	120392112100	Illinois Power Co.	TH 1-80	19800630	340	Water
0	5	19420	120392112000	Lake Clinton Marina	TH 1-79	19790824	320	Water
0	5	19421	120392118400	Clinton Rec. Area	TH 4-81	19810425	280	Water
0	5	19422	120392095200	IL Power Co., Etal	2	19800424	340	Water
0	5	19430	120390025900	Keys Luella & Mary	1	19420101	128	Water
0	5	19431	120392116200	Crawford, F.G.		19550331	72	Water
0	5	19432	120390026000	Dawson, Noble		19390101	64	Water
0	5	19433	120390026100	Watson, Grover		19450501	72	Water
0	5	19436	120390026200	McConkey, Carl	1	19420101	52	Water
0	5	19438	120390055400	Monfort, Thomas N.		19710401	187	Water
0	5	19458	120390027600	Dawson, Noble		19420101	228	Water
0	5	19459	120392115400	Fleener, Al	1	19941004	64	Water
0	5	19460	120392139200	Hadden Builders		19981216	300	Water
0	5	19461	120392142300	Zimmerman, Paul	2	19981218	200	Water
0	5	19462	120392100800	Bowling, Steve	1	19910525	67	Water
0	5	19463	120392066600	Dewitt, Village of	1-77	19770214	300	WTST
0	5	19464	120392120700	Reeder, Nellie		19951011	60	Water
0	5	19465	120390027700	Garby, Lon #1	1	19390101	74	Water
0	5	19467	120390027800	Moore, C. H. Est.		19430101	175	WTST
0	5	19477	120390028200	Blue, Lela M.		19400201	74	Water
0	5	19478	120392121200	Reynolds, Don			208	Water
0	5	19479	120392134700	Reynolds, Don	1	19960401	176	Water
0	5	19480	120392080000	Reynolds, Donald L. #1	1	19850820	196	Water
0	5	19481	120392146400	Shofner, Dan	2	20001006	160	Water
0	5	19482	120392091500	Twist, Robert		19880531	100	Water
0	5	19483	120392124000	Holtzscher, Dale #1		19960608	70	Water
0	5	19484	120392113700	Sheets, Dale	1	19940420	65	Water
0	5	19485	120392103000	Stoffer, Jeff	1	19920911	186	Water
0	5	19486	120392066800	DeWitt, Village of	2-77	19770218	270	WTST
0	5	19487	120392068000	Dewitt City		19771001	169	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
0	5	19488	120392111700	Illinois Power Co.	TH 3-80	19801231	280	Water
0	5	19489	120390028300	Reeser, Rolin		19390901	70	Water
0	5	19490	120390028400	Baker, Garfield		19460101	92	Water
0	5	19492	120392128900	Ill Power Recreation Area TH#	1-80			WTST
0	5	19493	120392132600	Weldon Fertilizer & Lumber,Inc		19970829	62	Water
0	5	19494	120392119600	Weldon Fertilzer, Inc.		19950814	235	Water
0	5	19495	120390028500	Adams Estate	1	19420101	175	Water
0	5	22672	120392126200	Buchanan, Steve		19961024	175	Water
0	5	22683	120392087600	Dupree, Jack	1	19871018	77	Water
0	5	22684	120392113100	Sloat, Michael		19940126	265	Water
0	5	22685	120392081100	Snyder, George	1	19860731	293	Water
0	5	22686	120390032900	Spiddle, W. D.		19470901	77	Water
0	5	22687	120392143600	Cope, Christopher		20000511	65	Water
0	5	22688	120392137200	Dusck, Brad		19980728	81	Water
0	5	22689	120392135300	McGee, Robert F.		19980713	135	Water
0	5	22690	120392137300	McGee, Robert F.		19980721	77	Water
0	5	22691	120392142800	McGee, Ryan E.		19990817	81	Water
0	5	22692	120392113200	Rosenstock, John			300	Water
0	5	22693	120390058900	Thrasher, Richard	2	19720415	65	Water
0	5	22694	120392118900	While, Thomas J.		19950714	44	Water
0	5	22695	120392121800	While, Tom #2		19951226	120	Water
0	5	22696	120392098800	Wilson, Robert D.	1	19901213	73	Water
0	5	22697	120392079300	Wissmiller, George		19850701	269	Water
5	10	13759	121150058400	Welge, Fred		19400101	234	Water
5	10	13760	121150058500	Maroa Pump Station Water Well		19390101	258	Water
5	10	13761	121152223200	Phillips Pipeline Co.	2	19900720	305	Water
5	10	13762	121152248100	Section 5 Farm		19950318	273	Water
5	10	13763	121150058600	Ennis Estate		19440301	60	Water
5	10	13764	121150058700	Likens, Charles		19400101	59	Water
5	10	13766	121152232400	Hill, Craig	1	19921028	262	Water
5	10	13767	121152285800	Brelsfoard, Jason		20000304	262	Water
5	10	13768	121150058800	Myers,J.J.(Brandt, Mrs. Betty)		19410101	95	Water
5	10	13769	121152272200	Potrafka, Wayne		19980516	271	Water
5	10	13770	121152289200	Ulrey, Brent		20000814	270	Water
5	10	13771	121150058900	Willow Glen School		19391001	69	Water
5	10	13772	121152127200	Munch, Frank		19780621	228	Water
5	10	13773	121152293900	Pedigo, John	1	20010321	262	Water
5	10	13842	121150059400	Decatur, City of	9	19540201	287	Water
5	10	13843	121152270600	Dougherty, Dan		19970731	262	Water
5	10	13844	121152294300	Hogan, Stacey & Julie	1	20010503	256	Water
5	10	13845	121152127300	Miller, Ronald E.	1	19771001	215	Water
5	10	13846	121152230300	Naber, Tom	1	19920504	242	Water
5	10	15898	120392065600	Sprague, Paul		19751025	129	Water
5	10	15899	120392074600	Weldon Springs State Park		19710101	72	WTST
5	10	15901	120390011000	Ziegler, Frank		19410101	90	Water
5	10	15902	120390011100	Clark, J. A.	1	19400101	96	Water
5	10	15903	120392125200	Couve, Don #2		19960911	320	Water
5	10	15904	120392130900	DeWitt Co. Highway Depart.		19971016	314	Water
5	10	15905	120392131800	Dewitt Co. Highway Dept.		19970520	335	Water
5	10	15906	120392101400	Haynes, Dan	1	19920701	323	Water
5	10	15907	120392114600	Revere Ware Corp	VE-2	19921218	17	Water
5	10	15908	120392114500	Revere Ware Corp.	VE-1	19921218	17	Water
5	10	15909	120392114700	Revere Ware Corp.	VE-3	19921216	17	Water
5	10	15910	120392114800	Revere Ware Corp.	VE-4	19921218	17	Water
5	10	15911	120392114900	Revere Ware Corp.	VE-5	19921217	17	Water
5	10	15912	120390011200	Boline		19451201	173	Water
5	10	15913	120390011300	Clinton Sanitary District		19350101	84	Water
5	10	15914	120392092200	Cross Brothers	1	19880831	291	Water
5	10	15915	120392083100	Cyrulik, Welby	1	19871022	290	Water
5	10	15916	120392101500	Dupree, Jack	1	19920623	302	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
5	10	15917	120392075400	Holt, Earl	2	19800415	93	Water
5	10	15918	120392137800	Maxwell, Doug & Leilani		19981110	315	Water
5	10	15919	120390011400	Nichels, Archie		19451101	280	Water
5	10	15920	120392101600	Polen, Jim	2	19920521	288	Water
5	10	15921	120392101700	Polen, Jim	3	19920528	283	Water
5	10	15922	120392138600	Russell, Frank		19990324	295	Water
5	10	15923	120392100000	Texas Township Building	1	19910726	303	Water
5	10	15924	120392103600	Waters, Dave Constr.		19931130	289	Water
5	10	15925	120392103700	Waters, Dave Constr.		19931130	286	Water
5	10	15926	120392103800	Waters, Dave Constr.		19931130	286	Water
5	10	15927	120392115800	Waters, Dave Construction		19931130	286	Water
5	10	15928	120392148400	Crutcher, Merle & Margaret	1	20010624	144	Water
5	10	15929	120392145500	Crutchfield, Fred	1	19990818	276	Water
5	10	15930	120392135500	Hinds, Craig, Julie		19980908	294	Water
5	10	15931	120392112400	Norris, Mike	1	19940422	273	Water
5	10	15932	120392123800	Rittenhouse, Belinda #1		19960716	79	Water
5	10	15933	120392069600	S & K Enterprise	1	19780912	138	Water
5	10	15934	120392069500	S & K Enterprises	1	19780629	142	Water
5	10	15935	120390056700	Short, Robt.		19711120	128	Water
5	10	15936	120392145300	Underwood, James E.		20000802	291	Water
5	10	15937	120392144300	Woolridge, Rick		20000619	140	Water
5	10	15938	120392144700	Cummings, Joseph A.		20000608	282	Water
5	10	15946	120390059000	Gentry, William		19721015	127	Water
5	10	15948	120390058000	Thomas, Jerry		19720601	242	Water
5	10	15949	120392095800	Banta, Emily		19900622	284	Water
5	10	15950	120390011700	Hullinger, E. V.		19390101	143	Water
5	10	15951	120392152700	Purdue, Rodney	1	20011114	277	Water
5	10	15952	120392139500	Rohrscheib, Sid & Krista	1	19990521	275	Water
5	10	15953	120390061200	Cisco, Larry		19730712	88	Water
5	10	15954	120392087200	Clinton Landfill, Inc.	1	19880511	281	Water
5	10	15955	120392093900	Irvin, Stan	1	19840514	103	Water
5	10	15956	120392092300	Laws, Carl #1	1	19880930	280	Water
5	10	15957	120392118500	Martin, Warren		19950531	288	Water
5	10	15958	120392120000	Moore, C.H. Trust Estate#2			293	Water
5	10	15959	120390052900	Walden, Max	1	19680825	260	Water
5	10	15960	120392069900	Walden, Max	2	19761101	279	Water
5	10	15961	120392070000	Walden, Max	1	19770701	265	Water
5	10	15962	120390011800	Adams, William	1	19420101	134	Water
5	10	15963	120392149000	Clinton Landfill	EX-3	19961204	100	Water
5	10	15964	120392149200	Clinton Landfill	EX-5	20000404	92	Water
5	10	15965	120390011900	Gillen, Mrs. J. P.		19451101	103	Water
5	10	15966	120392123400	Ward, Gary		19960409	145	Water
5	10	15967	120390012000	Adams, William		19460401	25	Water
5	10	15968	120392077700	Berry, Walter		19801210	70	Water
5	10	15969	120390056000	Holt, Joe W. #2	2	19710703	68	Water
5	10	15970	120392117700	State of IL Capital Dev. Board		19941025	141	Water
5	10	15971	120392073300	Weldon Springs State Park				Water
5	10	15972	120392118000	Weldon Springs State Park		19550331	38	Water
5	10	15975	120390002400	Weldon Springs State Park #5	5	19590101	60	Water
5	10	15976	120392070100	Willis, Terry	3	19770520	142	Water
5	10	15977	120392094000	Willis, Terry		19840607	82	Water
5	10	15978	120392125300	Willis, Terry #2		19960912	145	Water
5	10	15979	120392096000	Austin, Larry #1	1	19900427	282	Water
5	10	15980	120392144000	Baker, Larry		20000624	270	Water
5	10	15981	120392141200	Danison, Pat		19991026	276	Water
5	10	15982	120392101800	LeBegue, Arlene	1	19920702	108	Water
5	10	15983	120392141300	McGuire, Larry	1	19990901	81	Water
5	10	15984	120390012200	Weaver, Solomon		19450101	120	WTST
5	10	15985	120392151800	Cook, Eric & Hallie	1	20010821	246	Water
5	10	15986	120392144500	Ward, Gary & Dolores	1	20000517	274	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
5	10	15987	120390054600	Bray, Jim & Lane	1	19701102	290	Water
5	10	15988	120392070400	Cent. IL Bldg. & Loan	3	19781201	253	Water
5	10	15989	120392070500	Cent. IL Bldg. & Loan	1	19781201	260	Water
5	10	15990	120392070200	Cent. IL Bldg.& Loan	2	19781201	248	Water
5	10	15991	120392070300	Cent. IL Bldg.& Loan	4	19781201	245	Water
5	10	15992	120392070600	Cent. IL Building & Loan	1	19780519	264	Water
5	10	15993	120390012300	Hartsock, Wm.		19410101	70	Water
5	10	15994	120392079600	Martin Auction Co. #1	1	19850924	230	Water
5	10	15995	120392152000	Murphy, Marvin	1	20011207	242	Water
5	10	15996	120392151100	Bruso, Harold & Sandra		20011009	74	Water
5	10	15997	120392087300	Lichtenwalter, Greg	1	19880505	280	Water
5	10	16019	120392131900	Curry, William L.		19970611	302	Water
5	10	16022	120392100300	Snyder, Dan	1	19910702	69	Water
5	10	16023	120390012700	Whitehead, Harvey		19451101	90	Water
5	10	16024	120392070900	Willoughby, Orville E. #11	11	19781018	232	Water
5	10	16025	120392135700	Cyrulick, Mike		19980831	300	Water
5	10	16026	120392141500	Hammer, Terry	1	19991208	86	Water
5	10	16027	120392151500	Hammer, Terry		20011019	76	Water
5	10	16028	120392075600	Michaels, Tom	1	19791201	260	Water
5	10	16029	120390012800	Radio Station W.H.O.W		19470601	77	Water
5	10	16030	120392114100	E. W. Andrews Trust		19940815	292	Water
5	10	16031	120390012900	Pond, Mrs. Nellie	1	19430101	109	Water
5	10	16032	120392103900	Marlow, Glenn	1	19931130	280	Water
5	10	16033	120390010800	Marlow, Herbert O.		19390101	116	Water
5	10	16041	120392151400	Rose, Richard		20011015	65	Water
5	10	16042	120390013400	Grady, T. C. Estate	1	19400101	66	Water
5	10	16067	120392094100	Dewitt Cty Sportsman Club	2	19841004	310	Water
5	10	16070	120392123900	Bieber, Bob #1		19960712	282	Water
5	10	16071	120392097100	Douglas, Dick	1	19901107	258	Water
5	10	16073	120392125000	Rearden, Don		19960817	282	Water
5	10	16074	120390056800	Buck, Sherman		19710817	103	Water
5	10	16080	120392135800	Wantland, Roger		19980923	70	Water
5	10	16101	120390015300	Curl, Charles		19460101	56	Water
5	10	16102	120392118600	Armstrong, Charles		19950606	67	Water
5	10	16103	120390047700	Fatheree, Bob			90	Water
5	10	16104	120390055700	Fatheree, Bob		19710510	166	Water
5	10	16105	120390049300	Harrold, Bernard		19520101	122	Water
5	10	16106	120392148100	Heiden, Kevin	1		151	Water
5	10	16107	120392104100	Matherly, Shelby	1	19930515	164	Water
5	10	16108	120390058800	Reynolds, Carl	4	19720615	62	Water
5	10	16109	120392115200	Rogers, Rodney & Pam	1	19940919	157	Water
5	10	16110	120392119000	Smith, John #1		19950615	167	Water
5	10	16111	120390015500	Warner, C. M.		19450101	89	Water
5	10	16112	120390015600	Warner, C. M.		19441001	62	Water
5	10	16113	120390015700	Hinz, Theo.		19410101	204	Water
5	10	16114	120392126400	Stroh, Rod		19961120	272	Water
5	10	16115	120390015800	Mettler, Minnie		19430101	67	WTST
5	10	16116	120392102200	Totten, Albert	1	19920507	273	Water
5	10	16117	120390015900	Ingham, Warner		19440501	75	Water
5	10	16118	120392118200	Doaks, Orville		19630824	162	Water
5	10	16119	120390016000	Fosnaugh, Geo.		19430101	68	WTST
5	10	16120	120392083400	Riley, Carl #1	1	19870420	260	Water
5	10	16121	120390016200	Waller, Hellen		19410101	111	Water
5	10	16122	120390049400	Miller, Ben		19370101	118	Water
5	10	16123	120390016300	Waller, George		19460101	98	Water
5	10	16124	120390016301	Waller, George		19460601	230	Water
5	10	16125	120390016400	Altman, Jacob		19400101	232	Water
5	10	16126	120390016500	Stillabower, W. A.		19400101	75	Water
5	10	16127	120392102300	Groves, Harold R. #2	2	19920618	257	Water
5	10	16128	120392096200	Kizer, Betty	1	19900702	276	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
5	10	16129	120392093300	Spencer, Alice			292	Water
5	10	16130	120392096500	Decatur, City of	36-1		350	Water
5	10	16131	120392096600	Decatur, City of	36-2		350	Water
5	10	16132	120392096700	Decatur, City of	36-3	19890420	360	Water
5	10	16133	120392096800	Decatur, City of	36-4		340	Water
5	10	16134	120392096900	Decatur, City of	36-5		342	Water
5	10	16135	120392121900	Decatur, City of	3	19891022	339	Water
5	10	16136	120392122100	Decatur, City of	5	19900928	316	Water
5	10	16137	120392122200	Decatur, City of	6	19901006	335	Water
5	10	16138	120392122400	Decatur, City of	8	19901116	340	Water
5	10	16139	120392122500	Decatur, City of	9	19901130	332	Water
5	10	16140	120392122600	Decatur, City of	10	19910122	320	Water
5	10	16141	120392122000	Decatur, City of #4		19891031	335	Water
5	10	16142	120392122300	Decatur, City of #7		19901026	349	Water
5	10	16143	120392071200	Reeser, Harold	1	19770929	73	Water
5	10	16144	120390016600	Reeser, Merle		19410101	150	Water
5	10	16154	120390016800	Campbell, Roy		19390101	91	Water
5	10	16155	120392077300	Wapella Test Hole	1	19840406	100	Water
5	10	16157	120392109700	Weldon City Test Hole	1-63		165	WTST
5	10	16158	120392105600	Weldon, City of	4-62		293	WTST
5	10	16159	120392109800	Weldon, City of	2-62		195	WTST
5	10	16160	120392109900	Weldon, City of	3-62		180	WTST
5	10	16161	120390038600	Weldon, Village of	3	19630101	167	Water
5	10	16162	120390055600	Weldon, Village of	1	19710301	166	WTST
5	10	16163	120390057900	Weldon, Village of	3	19720301	163	Water
5	10	16164	120390058500	Weldon, Village of #4	4	19721001	170	Water
5	10	16165	120390017000	Moore, Maria		19410101	134	Water
5	10	16166	120390017100	Leischner, Winnie G.	1	19400101	85	Water
5	10	16167	120390049000	Shinneman, Elmer		19680605	78	Water
5	10	16168	120392104200	Carr, Betty	2	19930803	98	Water
5	10	16169	120390017300	Martin, Juanita		19450401	235	Water
5	10	16170	120392071300	Baker, Kenneth #1	1	19790408	97	Water
5	10	16171	120392071400	Leischner, William b	1	19780721	107	Water
5	10	16172	120390017400	Odaffer, Ray		19460201	79	Water
5	10	16173	120390017500	Davis Estate		19440801	78	Water
5	10	16174	120392113400	C.H. Moore Estate	2	19940811	172	Water
5	10	16175	120390017600	Hunt, Florence		19410101	82	Water
5	10	16176	120390017700	Royce, John		19460101	79	Water
5	10	16177	120392067000	Wachob, Charles	1	19761126	88	Water
5	10	16179	120392151700	Miley, E.J. & Karen		20011002	210	Water
5	10	16180	120390017800	Walters, Oliver		19460101	212	Water
5	10	16181	121470018700	Husinga, H. B.		19410101	137	Water
5	10	16182	121470006600	Rogers, S. L.	2	19430101	173	Water
5	10	16183	121472042200	Kinnman, Mrs. Dick	1	19770330	209	Water
5	10	16184	121472078600	Walpole, Everence		19441001	84	Water
5	10	16185	121472079000	Odaffer, Wm.		19390101	87	Water
5	10	16186	121472119900	Remmers, John H.		19980507	94	Water
5	10	16187	121472107900	Kingston, Carl		19391231	90	Water
5	10	16188	121472078700	Kingston, Carle		19390101	90	Water
5	10	16189	120390017900	Galloway, John			290	Water
5	10	16190	120392123300	Bennett, Larry		19910501		Water
5	10	16191	120392091900	Garst Research Center #1	1	19880731	258	Water
5	10	16192	121472078800	Briggs, Dewey		19390101	93	Water
5	10	16193	121470025900	Briggs, Mrs. G. D.			200	Water
5	10	16194	121472078900	Oldwelder, John		19390101	81	Water
5	10	16195	121470006700	Prospect School		19310101	180	Water
5	10	16196	121470006800	Enterprise School, Dist.	91	19400101	85	Water
5	10	16203	121472101000	Deland-Weldon Unit 57 School				WTST
5	10	16204	121470025700	Ammann, John		19550101	290	Water
5	10	16205	121472095200	Hicks, Jack	1	19910830	83	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
5	10	16206	121472121800	Nichols, Robert		19980919	90	Water
5	10	16273	121472121900	Mennenga Const.	1	19980404	81	Water
5	10	16274	121472083700	Lane, Al		19390101	90	Water
5	10	19204	120392097300	Thorp Seed Co.		19890214	383	Water
5	10	19205	120392077200	Thorpe Seed Co. #1	1		89	Water
5	10	19206	120390019900	Honneman, Howard		19390101	96	Water
5	10	19207	120390020000	Mastin, M. C.		19470901	50	Water
5	10	19208	120390020100	Swearingen, Charles E.	1	19400101	46	Water
5	10	19209	120390020200	Walsh, James	1	19400101	52	Water
5	10	19210	120392106700	Wapella Grain Elevator	B-8		21	WTST
5	10	19211	120390020300	Wapella H. S.		19330101	312	Water
5	10	19212	120390020400	Woollen, Otis		19410101	111	Water
5	10	19213	120392106800	Walden, August	1		57	WTST
5	10	19215	120392097400	Hull, Jim #1	1	19890811	365	Water
5	10	19216	120390057800	Fleenor, James W. #1	1	19720425	335	Water
5	10	19217	120390020500	Ives, True		19450601	62	Water
5	10	19218	120390020600	Ives, True		19460401	60	Water
5	10	19219	120390020700	Welch, James		19390901	44	Water
5	10	19222	120390020800	Davenport, Geo.		19451001	59	Water
5	10	19223	120390020900	Decatur Farm Management	1	19400201	183	Water
5	10	19224	120392078800	Thayer, Marvin		19841022	137	Water
5	10	19225	120392124300	Douin, Tom #1		19960522	120	Water
5	10	19226	120392125600	Howard, Steve & Coni #1		19960718	206	Water
5	10	19227	120392139900	Lowe, Craig	1	19990706	183	Water
5	10	19228	120392143300	Mann, Walter	1	20000515	185	Water
5	10	19229	120392132000	Miller, Bill & Lisa	1	19970716	120	Water
5	10	19230	120390021100	Prudential Insurance Co.		19400101	175	Water
5	10	19231	120390021000	Sprague, Charles		19441201	106	Water
5	10	19232	120392140000	Denney, Ron & Marion	1	19990323	312	Water
5	10	19233	120392141600	Lang, Terry	1	19991124	121	Water
5	10	19234	120392134500	Norris, Rick		19980702	111	Water
5	10	19235	120390007100	Russell, Helen L. #4	4	19630401	178	Water
5	10	19236	120390021200	Strange, Ralph		19441001	100	Water
5	10	19237	120392126500	Sullivan, Rick #1		19970107	106	Water
5	10	19238	120392121600	Tilley, Mike #1		19951018	126	Water
5	10	19239	120392140400	Usinger, Chris	1	19981008	302	Water
5	10	19240	120392152200	Altorfer Ag. Machinery	1	20011113	330	Water
5	10	19241	120392146100	Bray, Mike		20001027	177	Water
5	10	19242	120392099100	Clintonia Township #1	1	19900723	318	Water
5	10	19243	120392097500	Connolly, Gary D.	1	19900725	57	Water
5	10	19244	120392136900	Rich, Charles B.		19981016	330	Water
5	10	19245	120392137000	Rockhold, Max T.		19981114	323	Water
5	10	19246	120392141700	Schmid, Jesse		19991110	336	Water
5	10	19247	120392137900	Sullivan, Rick & Kathy		19980714	194	Water
5	10	19248	120392106900	Ward, Frank	1		64	WTST
5	10	19249	120392066900	Midwest Freight Car Co. #1	1	19760921	335	Water
5	10	19250	120392130300	Thrall Car Mfg.		19971001	330	Water
5	10	19251	120390021300	Glenn, Frank		19400101	87	Water
5	10	19252	120392117200	Barnes, Jeff #2		19941210	325	Water
5	10	19253	120392077100	Thorpe Seed Co. #2	2	19831213	369	Water
5	10	19255	120390052000	I. C. R. R. #2	2	19230101	350	Water
5	10	19256	120392146500	Peterson, Corwin G.		20001011	332	Water
5	10	19257	120392104300	Finfrock, Gail	1	19931112	335	Water
5	10	19258	120392102400	Hall, James	1	19920514	332	Water
5	10	19259	120390021400	Lilliard, R.		19400601	113	Water
5	10	19260	120392092000	Nanbec Corporation	1	19880831	320	Water
5	10	19261	120392067300	Rich, C. R.	1	19770501	118	Water
5	10	19262	120392067400	Rich, C. R.	2	19770501	111	Water
5	10	19263	120392097600	Thayer, Marvin	1	19900510	330	Water
5	10	19264	120390021600	Provine, Ira		19420101	104	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
5	10	19265	120390021700	Provine, Ira		19460201	173	Water
5	10	19271	120392151600	Massey, Nick S		20011004	91	Water
5	10	19274	120390052600	Chenoweth, Ralph #10	10	19680815	120	Water
5	10	19275	120392102500	Cooper, Tom	1	19920423	104	Water
5	10	19276	120392146000	Fitzgerald, May Louise	2	20001108	279	Water
5	10	19277	120390021500	Lehman, Charles #1	1	19751110	306	Water
5	10	19278	120392143800	Lippert, Rob	1	20000718	76	Water
5	10	19279	120392126600	McKinley, Robert O. #1		19961212	294	Water
5	10	19280	120392147600	Parker, Rich	2	20010502	295	Water
5	10	19281	120392141900	Patterson, Wayne A.		19990629	75	Water
5	10	19282	120390054700	VanLoom, John		19701001	66	Water
5	10	19283	120390054800	VanLoom, John		19700801	70	Water
5	10	19284	120390054900	VanLoom, John		19701001	78	Water
5	10	19285	120390055000	VanLoom, John		19701001	76	Water
5	10	19286	120390055100	VanLoom, John		19701001	75	Water
5	10	19287	120390054200	VanLoom, John E.		19700701	78	Water
5	10	19288	120390055200	Brax, James	1	19700908	110	Water
5	10	19289	120392130400	Bray, Mike		19971002	103	Water
5	10	19290	120392106300	Evans, Norman #2		19950630	140	Water
5	10	19291	120390060000	Finfrock, G. G.		19730612	108	Water
5	10	19292	120390058100	Finfrock, Gale		19720708	94	Water
5	10	19293	120392062200	Finfrock, Gale D. #2	2	19740901	112	Water
5	10	19294	120390021900	Lillard, Russell		19440701	278	Water
5	10	19295	120392082700	Murphy, Gene		19870930	44	Water
5	10	19296	120392094500	North, Raymond	3	19840919	115	Water
5	10	19297	120390022000	Walker, Carl		19460101	115	Water
5	10	19298	120392063600	Westside Park Estates #3	3	19750901	86	Water
5	10	19299	120392102600	Cleary Buildings	1	19920624	105	Water
5	10	19300	120390022400	Clinton #4	4	19540101	372	Water
5	10	19301	120390022500	Clinton City #5	5	19450101	360	Water
5	10	19302	120390022600	Clinton City Well #4	4	19480701	345	Water
5	10	19303	120390051300	Clinton Theater		19360101	131	Water
5	10	19304	120392147400	Clinton, City	3	19230401	360	Water
5	10	19305	120390022100	Clinton, City of	test 54-1	19540101	360	WTST
5	10	19306	120390022200	Clinton, City of	test 54-2	19540101	349	WTST
5	10	19307	120390022300	Clinton, City of	test 54-3	19540101	343	WTST
5	10	19308	120390058200	Clinton, City of	1-72	19720511	360	WTST
5	10	19309	120390058600	Clinton, City of	2-72	19721018	350	WTST
5	10	19310	120390049900	Clinton, City of #1-71	1-71	19711116	320	WTST
5	10	19311	120390056600	Clinton, City of #2-71	2-71	19711118	349	WTST
5	10	19312	120390030900	Clinton, City of #8	8	19730701	352	Water
5	10	19313	120392112200	DeWitt County Bldg.	TH 1-84	19860531	360	Water
5	10	19314	120390059300	Marco Chemicals	1	19730101	356	Water
5	10	19315	120390022700	Pollock, Fred		19410101	100	Water
5	10	19316	120392082800	West Side Park	4	19871007	118	Water
5	10	19317	120390051400			19210101	374	Water
5	10	19318	120390022900	Ammon, Irvin		19460201	78	Water
5	10	19319	120390056400	Armstrong, John		19710815	81	Water
5	10	19320	120392111200	Clinton, City of	10	19890819	370	Water
5	10	19321	120392111300	Clinton, City of	11	19891005	370	Water
5	10	19322	120392111400	Clinton, City of	TH1-87	19870827	370	Water
5	10	19323	120392111500	Clinton, City of	TH2-87	19870902	370	Water
5	10	19324	120390023000	Jasper, W. J.		19441201	150	Water
5	10	19325	120392107100	Kaufman, S.	1-60		345	WTST
5	10	19326	120390059100	Rickgauer, Wayne	1	19721201	331	Water
5	10	19327	120390022800	Thompson, F.		19470801	84	Water
5	10	19328	120390023100	Warner, Lloyd		19450401	67	Water
5	10	19329	120392124500	Mears, Chet		19960819	81	Water
5	10	19330	120390023200	Stiver Estate		19440101	68	Water
5	10	19339	120392098000	Thorp Seed Co. #2	2	19900605	60	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
5	10	19340	120392107300	Thorp Seed Company	B-3		21	WTST
5	10	19341	120392107200	Thorp Seed Company #B-2			21	WTST
5	10	19423	120390025700	Jasper, Jesse		19401201	120	Water
5	10	19424	120392134600	Lamb, Anna	2	19980619	165	Water
5	10	19425	120392139100	Zimmerman, Jerry	1	19990203	69	Water
5	10	19426	120392093600	Seifert, Neva		19881231	75	Water
5	10	19427	120392098500	Snow, Bill		19900426	210	Water
5	10	19428	120392083500	Williams well		19880228	70	Water
5	10	19429	120392124100	Williams, Paul#2		19960425	231	Water
5	10	19434	120392102900	Danilson, John #2	2	19920925	200	Water
5	10	19435	120392100600	F/C Presbyterian Church	2	19911212	186	Water
5	10	19437	120392078400	Mid-America Commodities	1	19800528	197	Water
5	10	19439	120392100700	Sosamon, Loran	2	19911122	70	Water
5	10	19440	120392112900	Fruin, John C.	2	19940323	170	Water
5	10	19441	120390049600	Fuller, Mrs.		19370101	66	Water
5	10	19442	120392091400	Hammer, Bill	1	19880608	168	Water
5	10	19443	120392138100	Homann, Dan		19981214	174	Water
5	10	19444	120392132400	Johnson, Doug	1	19961017	219	Water
5	10	19445	120392107500	Reynolds, Fred	1-56			WTST
5	10	19446	120392104600	Gibbs, Jim	1	19930930	170	Water
5	10	19447	120392116700	Jones, Robert #1		19941007	175	Water
5	10	19448	120392147500	Rollins, Warren	1	20010403	179	Water
5	10	19449	120392133200	Trimble, David		19971208	50	Water
5	10	19450	120392143400	Trimble, David	2	20000410	171	Water
5	10	19451	120392142200	Croson, Don	1	20000202	175	Water
5	10	19452	120392105500	Evans, Dana	2	19940221	75	Water
5	10	19453	120392116300	Duncan, Carl			170	Water
5	10	19454	120392072000	Reynolds, Fred L. #1	1	19770816	84	Water
5	10	19455	120392132500	Roderick, Bret & Linda		19970618	195	Water
5	10	19456	120392152300	Watts, Jim		20020115	102	Water
5	10	19457	120390053300	Massey, Leland		19690810	45	Water
5	10	19468	120392142900	Dasher, Virgil			265	Water
5	10	19469	120390027900	Swigart, Carl		19290101	175	Water
5	10	19470	120392126000	Thomas, Helen #2		19961011	115	Water
5	10	19471	120390055800	Reeser, John			90	Water
5	10	19472	120392072300	Reeser, John	1	19770603	100	Water
5	10	19473	120390028000	Stensel Brothers		19440101	84	Water
5	10	19474	120392072400	Wisegarver, George #1	1	19770826	186	Water
5	10	19475	120392104700	Reynolds, Don	1	19931130	181	Water
5	10	19476	120390028100	Bosserman, School		19390801	73	Water
5	10	19496	120392117400	Baker, Garfield		19461231	92	Water
5	10	19497	120392115700	Gamboa, Jeff #1		19941025	88	Water
5	10	19498	120392072500	Barton, Duanne	11	19770705	97	Water
5	10	19499	120390028600	Wisegarver, Wayne		19460101	82	Water
5	10	19507	120390049800	Jack, Herman	1	19640101	190	Water
5	10	19508	120390050000	Jack, Herman #2	2	19640101	94	Water
5	10	19509	120392145900	Mozingo, John	1	20001111	170	Water
5	10	19510	120392078500	Resser, Raleigh	1		161	Water
5	10	19511	120390028700	Hurley, S. V.		19410101	82	Water
5	10	19512	120390028800	Duffner, Carl		19460101	155	Water
5	10	19513	120390028900	Stoddard, B. M.		19470201	97	Water
5	10	19532	120390029200	Maxwell, Floyd		19451201	85	Water
5	10	19533	120390029300	Graves, H. C.	1	19400101	95	Water
5	10	19534	120392107800	Lindsey, Robert & Vernel	1-67		105	WTST
5	10	19535	120390029400	King, A. J.		19410101	99	Water
5	10	19536	120392123500	Foster, Jim #1		19951121	72	Water
5	10	19537	121470018000	King, A.J.		19441001	94	Water
5	10	19546	121470017100	Lancaster, K. (Mrs.)		19440401	69	Water
5	10	19547	120390029500	Hursh, George		19410101	55	Water
5	10	19548	121472117600	Gamboa, Jeff	1-97	19971002	100	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
5	10	19549	121470008500	Fahrnkopf, Harrison		19440101	185	Water
5	10	22594	120392121000	Douglas, Gordon #2		19951020	64	Water
5	10	22595	120392119700	Feather, Sherri		19950810	32	Water
5	10	22616	120392079000	Atkins, Dave	1	19850411	98	Water
5	10	22617	120392120600	Barringer, John		19950928	345	Water
5	10	22618	120392104900	Bridges, Steve	1	19931111	345	Water
5	10	22621	120392119200	Ishmael, Robert		19950726	37	Water
5	10	22622	120390057700	McCrarry, A. D.		19711130	33	Water
5	10	22623	120392142700	St. Patricks Cemetary	1	19991014	70	Water
5	10	22624	120392120800	Theobald, Keith		19950810	365	Water
5	10	22625	120392119800	Short, Donald		19950809	62	Water
5	10	22626	120392148200	Snow, Lonnie		20010615	60	Water
5	10	22627	120392132700	Wood, Debra	1	19970624	120	Water
5	10	22628	120392094600	Karr, Richard	2	19841119	44	Water
5	10	22629	120390031300	Progress School	1	19380101	49	Water
5	10	22630	120392126100	Leggett, Clyde #2		19960829	80	Water
5	10	22631	120392105000	Swanzy, Mark	1	19931004	70	Water
5	10	22632	120392107900	Jahn, Elisha	1		70	WTST
5	10	22633	120390031400	Moore, Mary		19470201	73	Water
5	10	22634	120392142600	Shannon, Tim	2	19990708	55	Water
5	10	22635	120392133400	Adams, Madge	2	19980327	344	Water
5	10	22637	120392074800	Matson, Rick			370	Water
5	10	22642	120392132800	Akers, Tom & Linda	1	19970624	200	Water
5	10	22643	120392136600	Brouillette, Christian		19981002	188	Water
5	10	22646	120390055500	Pullen, Walter W. Est.		19710403	64	Water
5	10	22647	120392140700	Rich, Troy & Amy	1	19990601	196	Water
5	10	22648	120390031600	Davis, Grant	1	19390101	72	Water
5	10	22649	120392148500	Sampson, Bud	1	20010409	83	Water
5	10	22650	120390031700	Spray, Lyle		19450201	53	Water
5	10	22651	120390002300	Wapella City		19410101	78	Water
5	10	22652	120392063700	Wapella, Village of	2	19500101	79	Water
5	10	22653	120392094200	Wapella, Village of	3	19840923	80	Water
5	10	22654	120390031800	Welsh, Wm		19390101	78	Water
5	10	22655	120390031900	Reader		19390901	99	Water
5	10	22656	121132357800	Young, Bob	1	19991029	95	Water
5	10	22657	121132155700	Scheets, Steve	2	19860811	117	Water
5	10	22658	121132357900	Trent, Eldon	1		68	Water
5	10	22659	121130060600	Roberts, Howard W.		19680824	97	Water
5	10	22660	121132353800	Toohill, William		19980304	52	Water
5	10	22661	120390052100	Cope, C. E.		19370101	151	Water
5	10	22662	120392121300	Davis, Robert H. Est. #1		19951116	113	Water
5	10	22663	120392073100	Haas, Jack #2	2	19780815	129	Water
5	10	22664	120392145700	Priest, Bob	2	20001114	345	Water
5	10	22665	120392136700	Ryan, Raymond	2	19980804	50	Water
5	10	22666	120390032200	Ryan, Thomas		19430101	51	Water
5	10	22667	120392144100	Filkin, Gary	1	20000703	315	Water
5	10	22669	120392130200	Toohill, L & M	2	19970910	219	Water
5	10	22670	120390032400	Johnson, R. L.	2	19440801	27	Water
5	10	22671	120390032600	Quade, Arthur		19450901	102	Water
5	10	22673	120390032500	Lucker, Frank		19450301	195	Water
5	10	22674	120390032700	Reeder, John	2	19420101	66	Water
5	10	22675	120392135000	DiVerde, Charles		19980714	68	Water
5	10	22676	120392133500	Frautschi, Bill	1	19980504	90	Water
5	10	22677	120392133600	Halverson, Eric	1	19970603	103	Water
5	10	22678	120392137100	McClurg, David	1	19980505	106	Water
5	10	22679	120390032800	Davis, A. E.	1	19420101	82	Water
5	10	22680	120390053500	Houghan, N. J.		19690901	84	Water
5	10	22681	120392081800	Toohill, Lawrence #1	1	19870423	140	Water
5	10	22682	120392132900	Supilnyk, Roman & Eleanor		19970528	43	Water
5	10	22708	121130024900	Dolly, Geo. R.	2	19451101	154	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
5	10	22710	121132257300	Bane, Lois		19480722	75	Water
5	10	22711	121132384900	Castle, Verle		20010713	100	Water
5	10	22712	121130003300	Smith	1	19570101	105	Water
5	10	22713	121132151000	Toohill, Carl	1	19850516	52	Water
5	10	22714	121132141300	Toohill, Joseph #2		19800804	46	Water
5	10	22715	121132390600	Toohill, Timothy		20010720	65	Water
5	10	22716	121132257500	Razor, Leland		19660101	96	Water
5	10	22717	121132258300	Razor, Leland		19660701	60	Water
5	10	22718	121132257400	Razor, Leland		19580702	70	Water
5	10	22720	120390033000	Equitable Life Association		19400101	59	Water
5	10	22722	120390033200	Simson, Frank L.		19451001	188	Water
5	10	22723	120390033300	Vance, Bert		19450601	71	Water
5	10	22724	120392099700	Rutledge, Beryl W.		19661231	75	Water
5	10	22725	120392062400	Schumacher, Pete		19660101	76	Water
5	10	22726	120392067700	Vance, Lloyd	2	19780705	163	Water
5	10	22727	120392133700	Howe, Joe		19971003	55	Water
5	10	22728	120392073200	Dean, Don	1	19770511	73	Water
5	10	22729	120392078700	Dean, Donald	2	19810128	57	Water
5	10	22730	120392098900	Dean, Richard		19890831	50	Water
5	10	22731	120392117500	Russell, William H		19950126	67	Water
5	10	22732	120390033400	Britten, Newton		19400101	64	Water
5	10	22733	120392133800	Dean, Rick	1		200	Water
5	10	22734	120392081200	Pinson, Deon	1	19860925	150	Water
5	10	22735	120392093800	Ruthledge, William		19890131	37	Water
5	10	22736	120392103100	Voegtlin, David #1	1	19920828	165	Water
5	10	22737	120390055900	Wendell, Clint		19710301	105	Water
5	10	22738	120390033500	Swigart, Harry		19410101	54	Water
5	10	22739	120392091600	Brooks, Paul	1	19880615	140	Water
5	10	22740	120390053600	Simpson, Elma		19691103	84	Water
5	10	22741	120390050200	McCarty, John R.		19760701	157	Water
5	10	22742	120392099000	Hartsock, Fred R. #2	2	19900514	178	Water
5	10	22743	120392140200	Tucker, William D.		19990610	80	Water
5	10	22744	120392113800	Jones, Jeff	1	19940708	200	Water
5	10	22745	120392114300	Jones, Jeff		19940826	57	Water
5	10	22746	120390033700	Walden, Belle		19460201	50	Water
5	10	22747	120390033701	Walden, Belle		19460601	68	Water
5	10	22748	120392152800	Walden, William R.		20020111	40	Water
5	10	22749	120390033800	Equitable Assurance Co.		19390101	168	Water
5	10	22750	120392135400	Wendell, Lawrence	1	19980826	46	Water
5	10	22751	120392068900	Wendell, Steve		19380101	47	Water
5	10	22752	120390033900	Miller, Welby	1	19441001	203	Water
5	10	22753	120390034000	Miller, Welby	2	19441101	81	Water
5	10	22754	120390034100	Turner Sisters	1	19420101	64	Water
5	10	22755	120392116800	Warren, Shelby		19450903	190	Water
5	10	22756	120390034200	Warren, Welby		19450901	190	Water
5	10	22757	120390047800	Warren, Wilby		19580101	190	Water
5	10	22758	120392137400	Emerson, Tony	1	19981218	198	Water
5	10	22759	120392133900	Kane, Kevin	2	19980325	80	Water
5	10	22760	120390041301	Kelley	2	19870225	2672	WATRS
5	10	22761	120390034300	Kelley, R. M.		19400101	379	Water
5	10	22762	120390052700	Grady, Mrs. Julia	3	19681010	86	Water
5	10	22763	120390034400	Moody, John		19440801	148	Water
5	10	22764	120392082900	Walash, Robert		19870930	77	Water
5	10	22765	120392091700	Warren, Norma		19880531	48	Water
5	10	22766	120392082400	West, Philip		19870831	68	Water
5	10	22767	120392147900	Wright, Randy	1	20010425	213	Water
5	10	22813	120392133000	Yeagle, Robert	1	19970605	180	Water
5	10	22896	120390051000	Porter, Chas.			16	Water
5	10	22897	120390037100	Ready, R. C.			83	Water
5	10	22898	120392116500	Merriken, Dick	2	19911016	158	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
5	10	22899	120392145100	Mozingo, John		20000613	164	Water
5	10	22900	120390037200	Riggs, H. E.		19440501	77	Water
5	10	22901	120390037300	Schmall, A. H.		19460501	46	Water
5	10	22902	120392113300	West, Phil	1	19940609	74	Water
5	10	22903	120392094400	Zacharias, Bryce	1	19800904	170	Water
5	10	22905	120392109500	Glenn, Lester	1-56		185	WTST
5	10	22906	120392119300	Halcomb, Doug #2		19950725	100	Water
5	10	22909	120392061500	Reeser, Rod		19721004	77	Water
5	10	22910	120390060400	Reeser, Rodney M.	2	19721014	79	Water
5	10	22912	120392140300	Spieker, Lowell	2	19990511	75	Water
5	10	22914	120390048700	Walsh, Bob			250	Water
5	10	24917	121132244400	Wheet, Tony	2	19900111	101	Water
5	10	24918	121130053100	Custom Farm Service #1	1		165	Water
10	15	24986	121130095400	Elledge, Charles	1	19721110	95	Water
10	15	24987	121130087000	Evans, Evan	1	19700930	96	Water
10	15	24988	121132125100	Heavilin, Larry W.		19770817	77	Water
10	15	24989	121132237200	Krieg, Simon	3	19400101	64	Water
10	15	24990	121130087100	Petty, Cecil	1	19700930	100	Water
10	15	24991	121132344400	Zacholski, Sheila	1	19970729	97	Water
10	15	24992	121132375800	Bossingham, Phil	1	20001011	65	Water
10	15	24993	121132321300	D.C.A. Construction, Inc. #1		19950626	67	Water
10	15	24994	121132237300	Humphry Estate	1	19400101	68	Water
10	15	24995	121132370700	Wills, Michael	1	20000518	85	Water
10	15	24996	121132291400	Woodring, Bruce & Brenda	1	19920929	46	Water
10	15	11459	121152293800	Nelson, Bonnie		20010423	139	Water
10	15	11460	121152264500	Layton, William		19971118	141	Water
10	15	11461	121152246000	Village of Oreana	4	19900920	150	Water
10	15	11462	121152190400	Creekmur, John A.	1	19860805	157	Water
10	15	11669	121152259300	Myers, Ralph		19960827	241	Water
10	15	11670	121152276300	Sickbert, Gary		19980922	245	Water
10	15	11671	121152186200	Simpson, Ed	1	19841210	138	Water
10	15	11672	121150062500	Dunbar, Frank		19050101	132	Water
10	15	13680	121150057000	Stafford, Mrs.		19410101	115	Water
10	15	13689	121152294100	Cordes, Dennis	1	20010307	56	Water
10	15	13690	121152298600	Ruwe, Chad	1	20010820	56	Water
10	15	13691	121152290900	Sill, Lynn		20000826	45	Water
10	15	13709	121150057400	Ennis, George		19390101	84	Water
10	15	13710	121150057500	Maroa City Test	1	19390101	288	WTST
10	15	13711	121150092900	Maroa, City of	3	19390101	292	Water
10	15	13712	121150057600	Shoemaker, Joe		19410101	77	Water
10	15	13713	121152134400	Williams, Neal (Roger)		19630101	78	Water
10	15	13714	121152302100	Four Winds Trailers				Water
10	15	13715	121152126900	Jannusch, Hilton			60	Water
10	15	13716	121150057700	Reeser, Richard		19410101	236	Water
10	15	13717	121150096800	Tozer, Richard W.		19640101	75	Water
10	15	13718	121152249900	Brodnicki, Derek		19950523	58	Water
10	15	13719	121152256600	Brown, Gary		19960328	62	Water
10	15	13720	121152285400	King, William		19990524	70	Water
10	15	13721	121152223000	Maschoff, Charles	1	19791114	70	Water
10	15	13722	121152127000	Gall, Elsie	2	19771206	210	Water
10	15	13723	121150057900	Austin, George	1	19400101	80	Water
10	15	13724	121152276500	Stoutenborough, Jim		19980923	124	Water
10	15	13725	121152229100	Mashburn, Robert E.	1	19920305	293	Water
10	15	13726	121150058000	Parker Hatchery		19451001	88	Water
10	15	13727	121152285500	Tedder Realty (Mundt property)		19991012	75	Water
10	15	13728	121150058100	Harmony School	1	19400101	60	Water
10	15	13729	121152279900	Leach, Trevor		19990320	75	Water
10	15	13730	121152276600	Stahl, Ken		19981112	73	Water
10	15	13731	121152276700	Wilson, Don		19980909	71	Water
10	15	13732	121152223100	Stivers, Mark	1	19890629	181	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
10	15	13733	121152302500	Leach, Steve		20011212	202	Water
10	15	13734	121152211400	Gall, Elsie Mrs.		19840626	143	Water
10	15	13735	121152224500	Rohrschield, Bill	1	19910625	132	Water
10	15	13736	121152263700	Grider, Ken		19970904	190	Water
10	15	13737	121152249200	Landry, Terry		19941213	57	Water
10	15	13738	121152248000	Landry, Terry #1		19941201	220	Water
10	15	13739	121152251600	Sprague, Robert #1		19950804	56	Water
10	15	13740	121152280000	Rodgers, David		19980821	168	Water
10	15	13741	121152261900	Forsyth, Village of TH#	2-80			Water
10	15	13742	121152276800	Foulke, David		19981008	155	Water
10	15	13743	121152127100	Maroa Fertilizer			53	Water
10	15	13744	121150086700	Sronce, Robert	1	19670802	120	Water
10	15	13745	121152274200	Jones, A. Ray		19980521	48	Water
10	15	13746	121152286700	Jones, Ray A. & Phyllis J.		20000330	46	Water
10	15	13747	121152289600	Maxwell, Don		20000331	55	Water
10	15	13748	121152274900	McKee - Morrison EER		19980728	150	WTST
10	15	13749	121152285700	Morrison, Daniel	2	19990923	46	Water
10	15	13750	121152289700	Norton, Brian		20001116	33	Water
10	15	13751	121152276900	Pebbles, Neal		19980914	45	Water
10	15	13752	121152272100	Peebles, Neal & Rhonda	1		79	Water
10	15	13753	121152277000	Stiner, Robert	1	19981016	32	Water
10	15	13765	121150057800	Ennis Estate		19410101	235	Water
10	15	13774	121152223300	Ripley, Kevin	1	19890731	260	Water
10	15	13775	121152111100	Shuey, Don		19590101	220	Water
10	15	13776	121152223400	Taylor, Brad	1	19890420	280	Water
10	15	13777	121152277100	Agee, Dale		19981028	265	Water
10	15	13778	121152286300	Summers, Linn	1	19990720	270	Water
10	15	13779	121152192600	Voorees, William	1	19870529	270	Water
10	15	13780	121152195900	Maschoff, Leo	1	19871024	240	Water
10	15	13781	121150059100	Groves, Ott		19410101	155	Water
10	15	13782	121152270500	Moyer, Jim & Sandy		19970624	158	Water
10	15	13783	121152226500	Boyd, Dale	3	19640101	7	WTST
10	15	13784	121152237400	Boyd, Dale	4	19640101	10	WTST
10	15	13785	121152237500	Boyd, Dale	5	19640101	8	WTST
10	15	13786	121152237600	Boyd, Dale	6	19640101	11	WTST
10	15	13787	121152237700	Boyd, Dale	7	19640101	9	WTST
10	15	13788	121152237800	Boyd, Dale	8	19640101	8	WTST
10	15	13789	121152237900	Boyd, Dale	9	19640101	8	WTST
10	15	13790	121152238000	Boyd, Dale	10	19640101	11	WTST
10	15	13791	121152238100	Boyd, Dale	12	19640101	12	WTST
10	15	13792	121152238200	Boyd, Dale	13	19640101	7	WTST
10	15	13793	121152189800	Brinkman, Darrell	1	19860514	224	Water
10	15	13794	121152230900	Campbell, Bob		19920620	236	Water
10	15	13795	121152289900	Garner, Steve		20000919	200	Water
10	15	13796	121152205400	Hanback, David	1	19880930	242	Water
10	15	13797	121152181900	Horve, Mike	1	19791210	220	Water
10	15	13798	121152223500	Horve, Mike	1	19900721	242	Water
10	15	13799	121152231000	Kaufman, Kevin		19920620	242	Water
10	15	13800	121152237200	Kaufman, Teal	1	19931220	240	Water
10	15	13801	121152182000	Maltby, Dave		19801212	210	Water
10	15	13802	121152182100	McQuiggan, Tom	1	19791211	220	Water
10	15	13803	121152293700	Netherton, Brad		20010331	210	Water
10	15	13804	121152203400	Patterson, Bill		19880831	240	Water
10	15	13805	121152223600	Punches, Dennis	1	19890906	242	Water
10	15	13806	121152223700	Rainey, John	1	19901205	188	Water
10	15	13807	121152190600	Roberson, Alan	1	19860820	239	Water
10	15	13808	121152223800	Simmons, Roger		19891115	242	Water
10	15	13809	121152128100	Spesad, Gary	1	19781012	82	Water
10	15	13810	121152252200	Stout, Dan #1		19950903	270	Water
10	15	13811	121152182200	White & Maltby Inc.	1	19791206	82	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
10	15	13812	121152252300	Zimmerman, Parker		19950912	262	Water
10	15	13813	121152244700	Argenta School				WTST
10	15	13814	121152244800	Argenta, Village of				WTST
10	15	13815	121152226600	Boyd, Dale	1	19640101	8	WTST
10	15	13816	121152226700	Boyd, Dale	2	19640101	8	WTST
10	15	13817	121152226800	Boyd, Dale	11	19640101	7	WTST
10	15	13818	121152226900	Boyd, Dale	14	19640101	7	WTST
10	15	13819	121152227000	Boyd, Dale	15	19640101	11	WTST
10	15	13820	121152227100	Boyd, Dale	16	19640101	11	WTST
10	15	13821	121152227200	Boyd, Dale	17	19640101	9	WTST
10	15	13822	121152227300	Boyd, Dale		19640101		WTST
10	15	13823	121152227400	Boyd, Dale	19	19640101	8	WTST
10	15	13824	121152252400	Powers, Ken		19950831	242	Water
10	15	13825	121152246500	Village of Argenta (1-93)	3		270	Water
10	15	13826	121150066200	Argenta, Village Of T	1-61	19610607	254	WTST
10	15	13827	121150016200	Argenta, Village of	2	19610822	254	WTST
10	15	13828	121150059200	Argenta, Village of		19540301	233	Water
10	15	13829	121152291600	Conner, Dan		20001026	195	Water
10	15	13830	121152289300	Cobstill, Ian		20000816	216	Water
10	15	13831	121152232500	Rowe, Norman	1	19921014	226	Water
10	15	13832	121152251700	Rowe, Norman#1		19921014	226	Water
10	15	13833	121152291500	Jackson, Sidney		20001025	173	Water
10	15	13834	121152272300	Malone, Patrick		19980529	168	Water
10	15	13835	121150062600	Parr, Nathan			177	Water
10	15	13836	121152264900	Aukamp, Roger	2	19971120	136	Water
10	15	13837	121152285900	Eades, Paul & Tina	1	19991214	144	Water
10	15	13838	121152223900	Frank, Terry		19901108	242	Water
10	15	13839	121152297900	Nichols, Robert		20010728	135	Water
10	15	13840	121472070500	Martin, Edgar		19441201	87	Water
10	15	13841	121472070600	Rannabarger, Ralph		19440801	63	Water
10	15	13847	121150059500	Rannebarger, Earl		19450601	104	Water
10	15	13848	121150059600	Decatur, City of	7	19540201	300	Water
10	15	13849	121150101200	Friends Creek Park	1	19711101	305	Water
10	15	13850	121150093300	Chapman, Francis (Beebe)			100	Water
10	15	13851	121472108000	Padgett, Carol	1	19921012	228	Water
10	15	13852	121470025800	Chapman, Francis		19000101	100	Water
10	15	13853	121470027900	Chapman, Francis		19720301	193	Water
10	15	13854	121470028100	Miller, Walter	1	19720412	136	Water
10	15	13856	121470029000	Cisco Well	1-50*	19500101	111	Water
10	15	13857	121472103800	Cisco, Village of	4	19910403	294	Water
10	15	13858	121472114200	Ruch, Gary		19960808	242	Water
10	15	13859	121472070700	Cisco Grain Company		19450701	90	Water
10	15	13860	121152286000	Allen, Mark & Tammy		19990601	200	Water
10	15	13861	121152111400	Friends Creek Park	2	19750701	228	Water
10	15	13862	121150059700	Houston, Ross		19450501	80	Water
10	15	13863	121152257600	Johnson, Doug		19960612	260	Water
10	15	13864	121150059800	Decatur, City of	10	19540201	260	Water
10	15	13865	121152255300	Huber, Kim & Karen		19951204	262	Water
10	15	13866	121152229200	Lovelace, Robert	1	19920307	262	Water
10	15	13867	121152274300	McCoy, Dave		19980811	261	Water
10	15	13868	121150060000	Kendall, J. W.		19330101	94	Water
10	15	13869	121152127400	Walters, Gary		19780503	216	Water
10	15	13870	121472070900	Cook, Harry		19451101	100	Water
10	15	13871	121472040700	Reeves, Jeane	1-77	19770317	225	Water
10	15	13872	121472099400	Ater, Warren S.				WTST
10	15	13873	121472049700	Baker, Kim	1	19791017	213	Water
10	15	13874	121472065200	Gulley, Melvin H.			246	Water
10	15	13875	121470012200	Oplinger, Russell	1	19401107	111	Water
10	15	13876	121470019200	Qurrey, R. F.		19410101	94	Water
10	15	13877	121472110300	Clemments, Kent #1		19950425	110	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
10	15	13878	121470012300	Decatur, City of	15	19540701	256	Water
10	15	13879	121472086300	Brame, J. E.	1	19400101	37	Water
10	15	13880	121150060100	Decatur, City of	19	19540701	255	Water
10	15	13881	121152247100	Kendall, John W.		19640724	199	Water
10	15	13882	121152270700	Smith, Leslie L.		19970512	242	Water
10	15	13883	121150059900	Wilkinson, P. A.		19460901	49	Water
10	15	13884	121152256900	Guillou and Assoc., Inc	S	19880101	240	Water
10	15	13885	121152109900	Illinois, State of	1	19750201	230	Water
10	15	13886	121152270800	McKinney, Charles		19970415	230	Water
10	15	13887	121152257500	Musick, Ken #1		19960614	242	Water
10	15	13888	121152302200	Pride of the Prairie Rest Area				Water
10	15	13889	121152270900	Edwards, A. Dale		19961017	236	Water
10	15	13890	121152189700	Kaufman, Curtis	1	19860505	101	Water
10	15	13891	121152224000	Ferguson, Rodney	1	19900621	242	Water
10	15	13892	121152237300	Ferguson, Virgil	1	19930930	233	Water
10	15	13893	121150104300	Edwards, Elizabeth	1	19730112	218	Water
10	15	13894	121152210500	Pattengill, Loren Trust	1	19881130	235	Water
10	15	13895	121472088300	Marsh, Perry	1	19890725	220	Water
10	15	13898	121472052300	Coon, Opal		19841006	220	Water
10	15	13899	121472112700	Greenwood, Norman				Water
10	15	13900	121472099500	Canode, L. C.				WTST
10	15	13915	121472056500	Riley, Dean		19850504	133	Water
10	15	13916	121472053500	Prough, Larry	1	19800321	110	Water
10	15	13917	121472114800	Robson, Richard #1		19961010	85	Water
10	15	13918	121472038600	Bushanan Fennimore	1	19770516	103	Water
10	15	13919	121472071000	Clark, J. E.		19410101	52	Water
10	15	13920	121470029200	University of Ill. Farm	4	19721012	166	Water
10	15	13921	121472071100	University of Illinois*		19651220	195	Water
10	15	13922	121472092000	Bordson, Gary		19920212	130	Water
10	15	13923	121470030100	Zybell, Cory H. Estate*		19180101	163	Water
10	15	13924	121472124300	Carr, Steve	1-99	19990923	210	Water
10	15	13925	121472119800	Drake, Marty	1	19980518	106	Water
10	15	13926	121472120300	Franklin, Jeff	1	19980702	96	Water
10	15	13927	121472110900	Huisinga, David #1-95		19951024	125	Water
10	15	13928	121472123500	Huisinga, Doug	1	19990510	112	Water
10	15	13929	121472071200	Jackson, W. A.		19410101	89	Water
10	15	13930	121472126000	Marry, Mike	1	20000229	107	Water
10	15	13931	121472112500	Miller, Doug #1		19960214	110	Water
10	15	13932	121472110600	Morris, Richard #1		19950918	109	Water
10	15	13933	121472121500	Schweitzer, Mark	1	19980903	90	Water
10	15	13935	121472064700	Wells, Terry L.	1	19880624	154	Water
10	15	13936	121472118900	Whitney, Burl	1	19970626	91	Water
10	15	13961	121472120400	Carlson, Scott	1	19980701	110	Water
10	15	13976	121472099800	Monticello	1			WTST
10	15	13977	121472041200	Nelson, Dale	1-78	19780719	165	Water
10	15	13978	121472094200	Peddycoart, Richard		19930831	254	Water
10	15	13979	121472094300	Remmers, Floyd	1	19920422	124	Water
10	15	13980	121472124500	Warner, Paul	1	19990817	117	Water
10	15	13981	121472047100	Wolfe, Donald D.	1	19781123	210	Water
10	15	13982	121470006300	Allerton, Robert		19440501	178	Water
10	15	13983	121470012800	Decatur, City of	3	19540201	320	Water
10	15	13984	121470006500	Natioal Petro Chem Corp. TH	6	19510101	315	WTST
10	15	13985	121472073200	Allerton Farm-U. of Ill.	1-66	19660225	240	Water
10	15	13986	121470012900	Decatur, City of	8	19540201	268	Water
10	15	13987	121472073300	Allerton Farms-U.of Ill.	1-63	19630503	220	Water
10	15	13988	121472099900	Allerton Park	1-63			WTST
10	15	13989	121472094400	Gerht, Dennis #1	1	19921228	228	Water
10	15	13990	121472112800	Univ of Ill, 4-H Club Camp				Water
10	15	14000	121470018800	Allerton, R. H.		19410101	151	Water
10	15	14002	121152302300	Decatur, City of	2		255	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
10	15	14008	121472124600	Shaffer, Jeanie	1	19990903	277	Water
10	15	15822	120392105800	Aupperle-Tiemke, Ryan		19990330	101	Water
10	15	15823	120392146800	Edwards, Lisa & Floyd, Julie		20000717	116	Water
10	15	15824	120392120100	Holtman, Larry #1		19950819	273	Water
10	15	15825	120392130000	Piatt, John	1	19970517	290	Water
10	15	15826	120392120300	Stevens, Richard #1		19950817	260	Water
10	15	15827	120392120200	Wilson, LeRoy #1		19950821	275	Water
10	15	15828	120392143100	Carter, Claro		20000503	172	Water
10	15	15829	120392092700	Gibson, Dave & Cindy			110	Water
10	15	15830	120392069000	Moore, Daniel	9	19760804	147	Water
10	15	15831	120390009300	Rowe, A. N.		19320101	140	Water
10	15	15832	120392077400	Beck, Leroy		19810729	140	Water
10	15	15833	120392095400	Koshinski, Terry		19900912	272	Water
10	15	15834	120390009400	Bell, Arabella		19410101	90	Water
10	15	15835	120392115000	Benz, Ronald	1	19941011	42	Water
10	15	15836	120390054300	Beriz, Ronald #1	1	19700412	53	Water
10	15	15837	120392113900	Brown, Ellsworth		19940722	106	Water
10	15	15838	120392106000	Sturgeon, Ruth #1		19950324	135	Water
10	15	15843	120390056200	Ryan, Robert		19740101	92	Water
10	15	15844	120392114000	Stewart, Howard		19940818	83	Water
10	15	15845	120392131400	Cyrulick, Tom		19970813	232	Water
10	15	15846	120392120400	Cyrulik, Michael T.		19950908	240	Water
10	15	15847	120392095500	Cyrulik, Thomas	1	19891120	228	Water
10	15	15848	120392069100	Dobbs, Marie	13	19770824	189	Water
10	15	15849	120392137600	Henson, Dolores		19981215	60	Water
10	15	15850	120390009500	Johnson, Virsa O.		19460501	61	Water
10	15	15851	120390009600	Kennedy, James		19410101	89	Water
10	15	15852	120392095600	Knox, Roger	1	19901101	262	Water
10	15	15853	120392077500	Long, Bobbie		19810821	49	Water
10	15	15854	120392080600	Long, Dale	1	19860606	56	Water
10	15	15855	120392075200	Moletoris, Randolph		19791115	117	Water
10	15	15856	120392131500	Smith, John	1	19970520	260	Water
10	15	15857	120392131600	Smith, John	1	19970715	265	Water
10	15	15858	120392126300	Askins, Bruce		19961206	81	Water
10	15	15859	120392105900	Aupperle, Ryan	1	19990528	84	Water
10	15	15860	120392140900	Aupperle, Ryan		19990706	106	Water
10	15	15861	120392151000	Byers, Avon	1	20010906	110	Water
10	15	15862	120392079100	Dellinger, Melvin		19850430	40	Water
10	15	15863	120392141000	Dillow, Mark	1	19991112	103	Water
10	15	15864	120392144200	Gallone, Gary	1	20000714	98	Water
10	15	15865	120392141100	Hall, Lowell	1	19990830	104	Water
10	15	15866	120392137700	Huddleston, Roger Homes		19981009	80	Water
10	15	15867	120392143000	Jiles, Earl	1	20000403	116	Water
10	15	15868	120392081700	Knopp, John	1	19861015	84	Water
10	15	15869	120392145800	Koons, Kenneth	1	20001122	107	Water
10	15	15870	120390053100	McDavitt, Dale		19690627	182	Water
10	15	15871	120392144800	Sheering, John & Lisa	1	20000520	79	Water
10	15	15872	120392095700	Sullivan, Bernard		19900606	75	Water
10	15	15873	120392140800	Underwood, Neal & Debbie	1	19990831	112	Water
10	15	15874	120392152100	Willoughby, Gene	1	20011106	270	Water
10	15	15875	120392075300	Banning, Elmer #3	3	19800709	235	Water
10	15	15876	120392062600	Hoffer, Gertrude Est.		19740903	103	Water
10	15	15877	120390010200	Kenney Comm H S		19400101	258	Water
10	15	15878	120390010100	Kenny Comm. High Sch.,Dist.117		19400101	258	WTST
10	15	15879	120392069300	Rybolt Farm Museum	17	19771017	20	Water
10	15	15880	120392069200	Rybolt, Theron	15	19770916	46	Water
10	15	15881	120392145200	Van Hyning, Mike		20000731	28	Water
10	15	15882	120392146900	Williams, Paul		20000727	51	Water
10	15	15883	120390010300	Willoughby, Dewey		19460101	71	Water
10	15	15884	120390010400	Cantrell, H. K.		19400801	191	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
10	15	15885	120390002000	Kenney, Village of T.H.	1	19560901	266	WTST
10	15	15886	120390002700	Kenny, Illinois TH	2	19570101	249	WTST
10	15	15887	120392077600	Standard Oil Company		19810727	180	Water
10	15	15890	120392069400	Holland, Virginia	7	19770625	43	Water
10	15	15891	120390010500	Greene, J. M.		19400801	85	Water
10	15	15892	120390010600	Crosno, Harold		19450401	112	Water
10	15	15893	120392131700	Huffman, Randy		19970728	122	Water
10	15	15894	120392103500	Rogers, John	1	19931216	135	Water
10	15	15896	120390059700	Preston, Howard	3	19730610	95	Water
10	15	15897	120390049200				40	Water
10	15	15939	120392119100	Craig, Walter #1		19950614	110	Water
10	15	15940	120392066200	State of Illinois		19760717	131	Water
10	15	15941	120392069700	Tallent, Larry		19780601	55	Water
10	15	15942	120392069800	Winchell, Michael		19780601	47	Water
10	15	15943	120392080500	Martin, Ed	1	19860521	270	Water
10	15	15944	120392100100	McNees, Ben #1	1	19910730	253	Water
10	15	15945	120392144600	Bass, Mark		20000515	265	Water
10	15	15947	120392100200	Stevens, Rich	1	19910607	274	Water
10	15	15998	120392096100	Tindill, Mike	1	19891108	302	Water
10	15	15999	120392101000	Berringer, Ray	2	19910823	280	Water
10	15	16000	120392075500	Cleave, Mary	1	19801101	290	Water
10	15	16001	120392070700	Glenn, Charles	14	19770907	267	Water
10	15	16002	120390054400	Glenn, Jack		19700720	102	Water
10	15	16003	120392068200	Glenn, Jeff		19780701	95	Water
10	15	16004	120390060200	Hamblin, Robert	1	19730802	293	Water
10	15	16005	120390012400	Parker, Mrs.		19390101	99	Water
10	15	16006	120392141400	Short, Steve	1	19990630	63	Water
10	15	16007	120392138700	Visionary Builders		19990324	70	Water
10	15	16008	120390053200	Braden, Craig (Braden,David)		19690701	168	Water
10	15	16009	120392146300	Merrick, Mike & Kathy		20000703	310	Water
10	15	16010	120390059800	Preston, Larry	4	19730601	278	Water
10	15	16011	120390012500	Rybolt,Cora & Thomas,Carrie		19390101	140	Water
10	15	16012	120392130500	Shaw, Mary		19971030	161	Water
10	15	16013	120392135600	Thomas, Todd	1	19980710	183	Water
10	15	16014	120390012600	Braden, Vervin		19440101	147	Water
10	15	16015	120392116900	Little Galilee Christian #4		19941012	340	Water
10	15	16016	120390049700	Little Galilee Christian Ch	2	19740316	316	Water
10	15	16018	120392070800	Scott, Louise	10	19761010	273	Water
10	15	16020	120390032100	Eick, Laverne		19720401	97	Water
10	15	16021	120392150700	Howell, Zack	1	20010827	296	Water
10	15	16034	120390013000	Alsup			150	Water
10	15	16035	120390052400	Alsup Estate	1	19300101	142	Water
10	15	16036	120392077800	Perkins, Samuel E. #6	6	19831013	124	Water
10	15	16037	120390013200	Branden, V. L.	1	19400101	88	Water
10	15	16038	120390013300	Ford Sisters		19410101	63	Water
10	15	16039	120392087400	Harbach, Gillan & Nixon Inc #1	1	19880930	277	Water
10	15	16040	120392079400	Hoffman Trucking	1	19850926	270	Water
10	15	16197	121470006900	Goken, Mrs. O.	1	19400101	99	Water
10	15	16198	121472069400	Brock, Kenneth #1	1	19840906	107	Water
10	15	16199	121470026500	Troxell, Kenneth	2	19701228	121	Water
10	15	16200	121472079300	McFadden, H.S.		19100101	88	Water
10	15	16201	121472079400	Doyle, J. L.		19200101	115	Water
10	15	16202	121472079600	Wisegarver, Carter C. (Res.)		19200101	120	Water
10	15	16207	121472081600	Porter Bros.		19450801	85	Water
10	15	16208	121472079800	Barnes (Res.)		19350301	40	Water
10	15	16209	121472079900	Bickel, H. E. (Res.)		19050101	78	Water
10	15	16210	121472080200	Bickel, J. E. (Res.)		19230101	101	Water
10	15	16211	121472080000	Bowsher, C. P. (Garage)		19090101	40	Water
10	15	16212	121472080300	Bowsher, C.P. (Res.)		19160101	85	Water
10	15	16213	121472080100	City Park			80	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
10	15	16214	121472129700	De Land, City o	3	19520101	81	Water
10	15	16215	121470004400	Deland	B3	19610101	80	Water
10	15	16216	121470004500	Deland	4	19610101	79	Water
10	15	16217	121470007300	Deland City Test	3	19350101	165	WTST
10	15	16218	121470007500	Deland City Test	7	19350101	87	WTST
10	15	16219	121470007100	Deland City Test #1	1	19350101	165	WTST
10	15	16220	121470007200	Deland City Test #2	2	19350101	192	WTST
10	15	16221	121470007400	Deland City Test #4	4	19350101	98	WTST
10	15	16222	121470004100	Deland TH	B2	19610101	85	WTST
10	15	16223	121470004200	Deland TH	B1	19610101	90	WTST
10	15	16224	121470029100	Deland, Village of	1	19351201	83	Water
10	15	16225	121472050900	Deland, Village of	1-80	19801218	162	Water
10	15	16226	121472051000	Deland, Village of	2-80	19801223	179	Water
10	15	16227	121472051100	Deland, Village of	3-80	19801230	178	Water
10	15	16228	121472051200	Deland, Village of	1-81	19810206	171	Water
10	15	16229	121472054200	Deland, Village of	6		82	Water
10	15	16230	121472054300	Deland, Village of	7		79	Water
10	15	16231	121472081000	Dresback, J. R. #2	2	19200101	96	Water
10	15	16232	121472081100	Fonner, P. E. (Res.)	1	19160101	100	Water
10	15	16233	121472081300	Heller, Jim (Res.)	25		80	Water
10	15	16234	121472081400	High School	23	19200101	95	Water
10	15	16235	121472081500	Jones, Warren (Res.)	17		90	Water
10	15	16236	121470007600	Kidd, J. R.		19420101	103	Water
10	15	16237	121472080400	Madden (Res.)	21		75	Water
10	15	16238	121472080500	Myers, George (Res.)	5	19131231	48	Water
10	15	16239	121472080600	O'Brian, George	14	19150101	75	Water
10	15	16240	121472082000	Parrish, Sherman (Res.)	11		45	Water
10	15	16241	121472080700	Paugh, Grace (Res.)	6		80	Water
10	15	16242	121472080800	Pitts, J. M. (Res.)	13		76	Water
10	15	16243	121472081700	Porter, C. J.	22	19090101	76	Water
10	15	16244	121472081800	Porter, C. J.	4	19140101	76	Water
10	15	16245	121472081900	Reed, A.	38		76	Water
10	15	16246	121472082400	Reed, R. E.	1	19600101		WTST
10	15	16247	121472082100	Trenchard(sm town property	24		100	Water
10	15	16248	121472082200	Trenchard, G. R. (Res.)	3		100	Water
10	15	16249	121472082300	Troxel, Mrs. (Res.)	20		73	Water
10	15	16250	121472104300	Village of Deland	TH 1-82	19820331	90	Water
10	15	16251	121472104400	Village of Deland	TH 2-82	19820331	90	Water
10	15	16252	121472082600	Webb, Wilson (Res.)	15	19170101	70	Water
10	15	16253	121472082500	White, V. B. (Res.)	8		62	Water
10	15	16254	121472088900	Timmons, George	1			Water
10	15	16255	121472032900	Timmons, George*			90	Water
10	15	16256	121472111300	Garrett, John #2		19950907	98	Water
10	15	16257	121472082800	Rudisill #31	31	19200101	100	Water
10	15	16258	121472082700	Trigg, George #33	33	19200101	110	Water
10	15	16259	121472055900	Incobrasa Illinois Ltd.	1	19850404	110	Water
10	15	16260	121472042300	Chicap Pipe Line Co.	1-76	19760827	100	Water
10	15	16261	121472083000	Huisinga, H. B.	34		50	Water
10	15	16262	121472082900	Huisinga, H. B.*		19470801	98	Water
10	15	16263	121472083100	Hurst, L. B.	46		85	Water
10	15	16264	121472083200	Stoddard, Minnie	45		100	Water
10	15	16265	121472083400	Borton, B.	44		90	Water
10	15	16266	121472083500	Dillon, Bob	37		70	Water
10	15	16267	121472123900	Gantz, William		19950621	77	Water
10	15	16268	121472085600	Kingsboro, Fern Est.		19541231	83	Water
10	15	16269	121472083300	Rudisill, B. M.		19390101	84	Water
10	15	16270	121472124800	Brewer, Mike		19990903	76	Water
10	15	16271	121470007700	Deland City Test #5	5	19350101	110	WTST
10	15	16272	121472083600	Gantz, I.W.	36		100	Water
10	15	16275	121472119000	Reed, Lola	1	19970516	84	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
10	15	16276	121472083800	McNitt, Hattie	39	19170101	90	Water
10	15	16277	121472056700	Ahlrich, Ray	1	19860411	165	Water
10	15	16278	121472095300	Strohl, Dick #1	1	19920515	163	Water
10	15	16279	121472084000	Trenchard, W. B.*		19470801	81	Water
10	15	16280	121472084100	Equitable Life Ins. Co. #47	47		76	Water
10	15	16281	121472034100	Kirby, John Trust* #1	1	19750417	178	Water
10	15	16282	121472039100	Kirby Farm Estate		19771028	164	Water
10	15	16283	121470001400	Whiteside, Hazel		19480101	71	Water
10	15	16286	121472111700	Brennan, Mike #1		19931028	210	Water
10	15	16287	121472120500	Dalton, Charles	1	19980713	170	Water
10	15	16288	121472122000	Frank, Brad	1	19981216	102	Water
10	15	16289	121472084200	Doss, W. J.		19410101	84	Water
10	15	16290	121472089000	Harris, Michael		19890508	158	Water
10	15	16291	121472042400	Huesinga, Don		19770525	99	Water
10	15	16292	121472047400	Marquis, Mrs. J. R.	1	19780821	178	Water
10	15	16293	121472084300	Strohl, J. F.	43	19160101	90	Water
10	15	16294	121470018500	Leischner			212	Water
10	15	16295	121470018600	Leischner			146	Water
10	15	16296	121472084400	Moore, C. H. Estate	42		76	Water
10	15	16297	121472084500	Remmers, John	40	19160101	217	Water
10	15	16298	121472089100	Richards, Mike		19900515	68	Water
10	15	16299	121472042500	Robinson, Richard		19770102	102	Water
10	15	16300	121472122400	Stoddard, Bruce	1	19941115	82	Water
10	15	16301	121472084700	Welsh, W. W.		19450601	77	Water
10	15	16302	121472095500	Hardy, Gerald	1	19930526	89	Water
10	15	16303	121472069500	Kirkland, Dale		19841016	220	Water
10	15	16304	121472065400	Norse Farms #2	2	19880706	86	Water
10	15	16334	121470023400	Hardimon, Larry	1-69	19690701	165	Water
10	15	16335	121472095800	Hiser, Lynn #1	1	19930730	208	Water
10	15	16337	121472101400	Gessford Farm				WTST
10	15	16338	121472452200	Incobrasa, Il., Ltd. Corp.			80	Water
10	15	16339	121472071800	Kirkland, Chester		19450901	66	Water
10	15	16340	121472066400	Madden, Arthur #1	1	19880823	111	Water
10	15	16462	121472089900	Kelley, J.B.	1	19891023	112	Water
10	15	16464	121472031500	Maden, Gaylord		19630101	100	Water
10	15	16465	121472072200	Perkins, Jim		19450101	71	Water
10	15	19123	120392121100	Lubbers, Jackie	2	19950828	123	Water
10	15	19124	120392146700	Christianson, Richard	1	20000913	215	Water
10	15	19127	120392143500	Klemm, Robert		20000519	155	Water
10	15	19128	120392061900	Klemm, Walter		19100101	160	Water
10	15	19129	120392062000	Klemm, Walter et al		19100101	130	Water
10	15	19130	120392129500	Ball, Fred			126	Water
10	15	19131	120390049500	Cline Est.			100	Water
10	15	19132	120390018100	McCool, Bert		19410101	119	Water
10	15	19133	120392128700	Central School		19060101	152	Water
10	15	19134	120390018200	Harpenau, Leo		19470301	154	Water
10	15	19135	120390053700	Harpennu, Lloyd		19691110	138	Water
10	15	19136	120392134300	Lecouris, Vera	2	19980716	220	Water
10	15	19137	120392133100	Turney, Josh	2	19980129	304	Water
10	15	19143	120392134400	Sequel Land Co.	3	19980708	188	Water
10	15	19144	120392125400	Sequel Land Co. #1		19960917	265	Water
10	15	19145	120392125500	Sequel Land Co. #2		19960918	200	Water
10	15	19146	120390018600	Shiveley, Nathan #1	1	19400101	118	Water
10	15	19147	120392112600	Bolton, Terry	1	19940225	255	Water
10	15	19148	120392117000	Inter-D-Pork #2		19941013	135	Water
10	15	19149	120392075700	Baker, Wilbur		19791221	200	Water
10	15	19150	120390018700	Crang, C. E.		19390101	148	Water
10	15	19151	120390018800	Fosnaugh, George		19400101	180	Water
10	15	19152	120392128800	Pollarck Estates J.			14	Water
10	15	19153	120392078200	Austin, Greg		19831130	84	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
10	15	19154	120392113500	Larkin, John	1	19940718	85	Water
10	15	19155	120392129600	McMath, Robert	1	19970524	325	Water
10	15	19156	120392139600	Yeomans, Dan & Kim	2	19990528	325	Water
10	15	19157	120390024400	Fink, Henry #1	1	19400101	127	Water
10	15	19158	120390018900	McClimans, Dave		19440801	151	Water
10	15	19159	120390019000	Fink, Henry		19400101	138	Water
10	15	19160	120392111100	DeWitt Co. Nursing Home	3	19900418	326	Water
10	15	19161	120390055300	DeWitt County Nursing Home #1	1	19500301	336	Water
10	15	19162	120392138900	Mix, Dave & Renee		19981012	230	Water
10	15	19163	120392147700	Thomas, Brad	3	20010507	159	Water
10	15	19165	120390019100	Johnston, Tom L.		19430101	151	Water
10	15	19166	120392139700	Paddock, Steve	1	19990420	155	Water
10	15	19167	120392110000	West, Raymond	1	19940317	293	Water
10	15	19178	120392078100	DeMent, Ray	7	19821216	135	Water
10	15	19179	120392128400	Deerwester, Rick	1	19961223	138	Water
10	15	19180	120390019800	Dement, Ray W.		19440101	139	Water
10	15	19181	120392139000	Followell, Robert		19981205	135	Water
10	15	19182	120392078300	Foster, Robert		19811006	270	Water
10	15	19183	120392075800	Hallsville Christian Church		19801028	129	Water
10	15	19184	120390019600	Irwin, Mae		19470601	341	Water
10	15	19185	120392075900	Overbey, Thomas	4	19800828	137	Water
10	15	19186	120392121500	Overbey, Tom #2		19951122	140	Water
10	15	19187	120392061400	Presswood, Robt.		19730806	192	Water
10	15	19188	120392065800	Robinson, Helen		19750625	142	Water
10	15	19189	120392065900	Smith, Willard		19750701	142	Water
10	15	19190	120392151900	Thoms, Rebecca		20010918	124	Water
10	15	19191	120390059900	Williamson, Richard	1	19730718	173	Water
10	15	19192	120392071700	Williamson, Richard	18	19771110	136	Water
10	15	19193	120392062700	Smith, Mary		19741010	145	Water
10	15	19194	120392139800	Sprague, Jay	1	19990511	306	Water
10	15	19195	120392130100	Allen, Gene	1	19970522	285	Water
10	15	19196	120392071800	Hammer, Barbara	12	19781219	131	Water
10	15	19197	120392118700	Hoke, Larry		19950513	72	Water
10	15	19198	120392129700	Korneman, Darren		19970512	325	Water
10	15	19199	120392128500	Scogin, Merle		19520108	300	Water
10	15	19200	120392117100	Wallace, Scott & Carolyn #2		19941130	214	Water
10	15	19201	120392114200	Clayton, Bill		19940906	83	Water
10	15	19202	120392120900	Harris, Merle		19951003	79	Water
10	15	19203	120392150800	Hoke, Chad	1	20010823	260	Water
10	15	19214	120390054100	Greene, Leo		19700526	86	Water
10	15	19266	120392124400	Arnold, Raymond & Donna		19960612	84	Water
10	15	19267	120392143700	Comfort, Pat		20000517	255	Water
10	15	19268	120392091300	Sickles, Darrell	1	19880731	67	Water
10	15	19269	120392141800	Chapman, Mike	1	19990421	90	Water
10	15	19270	120392063400	Griffin, L. D.		19730101	306	Water
10	15	19272	120390021800	Mooney, Ross		19460101	65	Water
10	15	19273	120392100400	Shaffer, Gary #1	1	19910529	75	Water
10	15	19500	121472075700	Troxel, Kenneth		19450101	106	Water
10	15	19501	121472055100	Eubank, Barbara		19800421	153	Water
10	15	19502	120392067100	Roberson, Roy	2	19761125	174	Water
10	15	19503	120392064600	Farmer City	2-65	19651228	200	WTST
10	15	19504	120392064900	Farmer City	3-65	19651229	180	WTST
10	15	19505	120392107600	Farmer City, City of	2-65-A		200	WTST
10	15	19506	120392125100	Frichtl, Darrel F.		19961004	53	Water
10	15	19514	120390050100	Farmer City	2-65	19651228	200	WTST
10	15	19515	120392107700	Farmer City,City of	3-65-A		185	WTST
10	15	19516	120390029000	Moister, J.		19410101	58	Water
10	15	19517	120390029100	Shubert, Bert		19440901	77	Water
10	15	19518	121472045700	Holoch, Lynn			200	Water
10	15	19519	121472045500	Vistron Corp.	1	19780412	98	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
10	15	19520	121472117500	Weidner, Kevin	1	19980327	207	Water
10	15	19521	121472107200	Miller, Gary #1		19941110	65	Water
10	15	19522	121472075800	Parr, Ruben (at Mansfield)		19250101	66	Water
10	15	19523	121472109600	Weidner, Lyle #1		19950818	80	Water
10	15	19524	121470102900	Shubert	4-57	19570101	95	WTST
10	15	19525	121472102600	Shubert	1-57	19570101	177	WTST
10	15	19526	121472102700	Shubert	2-57	19570101	175	WTST
10	15	19527	121472102800	Shubert #3-57		19570101		WTST
10	15	19528	121472030700	Shubert, Kenneth	1		100	WTST
10	15	19529	121472030800	Shubert, Kenneth	2		178	WTST
10	15	19530	121472035100	Shubert, Rose	1	19750618	70	Water
10	15	19531	121472035900	Shubert, Rose	1	19740101	18	Water
10	15	19538	121472090400	Bateman, Arthur		19890831	62	Water
10	15	19539	121472035200	Swartz, Cappy		19740523	141	Water
10	15	19540	121472111600	Voss, Alvin #1		19950919	157	Water
10	15	19541	121470029800	Moore, Harlan E.		19720504	135	Water
10	15	19542	121472097700	Sosamon, Doug	1	19921112	140	Water
10	15	19543	121470008400	Swartz, Ross		19430101	95	Water
10	15	19544	121472090500	Huisinga, Stephen		19900618	50	Water
10	15	19545	121472104800	Huisinga, Stephen	TH 1-90	19900117	165	Water
10	15	19550	121472107600	Barton, J. L.	41		100	Water
10	15	19551	121472084600	Barton, J.L.	41	19160101	90	Water
10	15	19552	121472103000	Borton, L.	1-69	19690101	237	WTST
10	15	19553	121472064200	Wallace, Mark	2	19880413	135	Water
10	15	19565	121472058000	Kemplin, Kevin		19860507	146	Water
10	15	19589	121472090600	Bragg, Earl M. Jr.	1	19890508	63	Water
10	15	19592	121472103100	James, C. E.	1-61	19610101	65	WTST
10	15	19593	121472103200	James, J. Wilbur	1-56	19560101	248	WTST
10	15	19594	121472103300	James, W.	1-57	19570101	90	WTST
10	15	19595	121472035400	Zeiders, Verne		19720612	61	Water
10	15	19596	121472050500	Zeiders, Verne		19791120	62	Water
10	15	19597	121472057300	Bragg, Robert	1	19851030	177	Water
10	15	19598	121472117700	Burk, Claude & Mildred		19970422	90	Water
10	15	19625	121470022500	Dalton, George	1	19681216	100	Water
10	15	19626	121472077600	Randall			100	Water
10	15	19627	121472097900	Swartz, Lorainne	2	19920328	85	Water
10	15	19628	121472114000	Burton, Charles #2		19960501	183	Water
10	15	19629	121472077700	Copenhaver, W. E.	1-64	19640101	220	Water
10	15	19630	121470017400	Copenhaver, W.E.		19450901	181	Water
10	15	19631	121472115500	Gullion, Dave		19960503	210	Water
10	15	19632	121472055300	Harris, B.B. Estate		19820415	213	Water
10	15	19633	121472091100	McConkey, Mike	2	19900809	172	Water
10	15	19634	121470021900	Royster, F.S.	1	19680223	220	Water
10	15	19635	121472098000	Stanley Elev. %Am. Reinsurance		19920818	220	Water
10	15	22493	121132143800	Hanlin, Wayne		19830921	50	Water
10	15	22495	120390029600	Graff Ina Co.	1	19340101	124	Water
10	15	22496	120390029700	Ball, T. D.	2	19400101	58	Water
10	15	22497	120392129800	Runge, Art		19970423	90	Water
10	15	22505	120390030400	Ball, T. D. #1	1	19400101	168	Water
10	15	22506	120392129000	Starkey, John		19430920	134	Water
10	15	22507	120392152500	Davis, Chris	1	20011219	332	Water
10	15	22508	120392146600	Combs, Don & Dorothea	1	20000918	107	Water
10	15	22509	120392119900	Klecha, Paul		19950814	220	Water
10	15	22510	120392115500	Peasley, Melvin	2	19940901	340	Water
10	15	22511	120392148600	Williamson, Robert		20010814	342	Water
10	15	22512	120392062800	Hohnias, Gus Est.		19741101	115	Water
10	15	22513	120392113000	Schmid, Phillip	1	19940614	91	Water
10	15	22514	120392142400	Followell, Shelly	1	19990730	149	Water
10	15	22515	120392152400	Hartley, Patrick & Gail	1	20011120	170	Water
10	15	22516	120392133300	Taylor, Raymond		19971022	63	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
10	15	22520	120392080800	Martins, Roger	1	19860523	125	Water
10	15	22537	120392129400	Stark, John		19370101	165	Water
10	15	22538	120390052200	Ball, Mrs. Fred		19370101	120	Water
10	15	22539	120392143200	Smith, Ken	1	20000414	60	Water
10	15	22540	120392072900	Kerley, Ray	13	19781219	132	Water
10	15	22541	120390031000	Lane, Harold		19360101	214	Water
10	15	22542	120392147800	Short, Kent & Karen	1	20010404	64	Water
10	15	22543	121130011000	Texas Empire Pipe Line #1	1	19290101	270	Water
10	15	22544	121132357700	Williams Pipeline	2	19990923	280	Water
10	15	22545	121130011100	Arnold, Joseph			197	Water
10	15	22546	121130011400	Heyworth Test #4	4	19350101	300	WTST
10	15	22547	121130011300	Heyworth Test #A		19350101	106	WTST
10	15	22548	121132202500	Rutledge, Dr.			70	Water
10	15	22549	121132201900	High School				Water
10	15	22550	121132188100	Schmidt, Gary	1	19880628	170	Water
10	15	22551	121132202000	Willis, J. W.				Water
10	15	22552	121132202100	Brown, Arther		19450201	85	Water
10	15	22553	121132378700	Heyworth, Village o	3		48	Water
10	15	22554	121130094100	Heyworth, Village of	1	19350101	62	Water
10	15	22555	121132327500	Meade, Norman		19951122	295	Water
10	15	22556	121130086300	Truckenbrad, J. C.		19711120	74	Water
10	15	22557	121132202800	Darrah, D. D. Estate Test	4	19670101	44	WTST
10	15	22558	121132203900	Darrah, D. D. Estate Test # 15		19670101	55	WTST
10	15	22559	121132204300	Darrah, D. D. Estate Test # 19		19670101	66	WTST
10	15	22560	121132204400	Darrah, D. D. Estate Test # 20		19670101	72	WTST
10	15	22561	121132204500	Darrah, D. D. Estate Test # 21		19670101	47	WTST
10	15	22562	121132204600	Darrah, D. D. Estate Test # 22		19670101	39	WTST
10	15	22563	121132204700	Darrah, D. D. Estate Test # 23		19670101	27	WTST
10	15	22564	121132204800	Darrah, D. D. Estate Test # 24		19670101	31	WTST
10	15	22565	121132204900	Darrah, D. D. Estate Test # 25		19670101	47	WTST
10	15	22566	121132205000	Darrah, D. D. Estate Test # 26		19670101	61	WTST
10	15	22567	121132205100	Darrah, D. D. Estate Test # 27		19670101	33	WTST
10	15	22568	121132205200	Darrah, D. D. Estate Test # 28		19670101	54	WTST
10	15	22569	121132203000	Darrah, D. D. Estate Test # 6		19670101	22	WTST
10	15	22570	121132203300	Darrah, D. D. Estate Test # 9		19670101	27	WTST
10	15	22571	121132202300	Darrah, D. D. Estate Test #1		19670101	22	WTST
10	15	22572	121132202200	Darrah, D.D. Estate Test	3	19670101	23	WTST
10	15	22573	121132203400	Darrah, D.D. Estate Test # 10		19670101	52	WTST
10	15	22574	121132203500	Darrah, D.D. Estate Test # 11		19670101	61	WTST
10	15	22575	121132203600	Darrah, D.D. Estate Test # 12		19670101	33	WTST
10	15	22576	121132203700	Darrah, D.D. Estate Test # 13		19670101	43	WTST
10	15	22577	121132203800	Darrah, D.D. Estate Test # 14		19670101	56	WTST
10	15	22578	121132204000	Darrah, D.D. Estate Test # 16		19670101	22	WTST
10	15	22579	121132204100	Darrah, D.D. Estate Test # 17		19670101	22	WTST
10	15	22580	121132204200	Darrah, D.D. Estate Test # 18		19670101	59	WTST
10	15	22581	121132202700	Darrah, D.D. Estate Test # 2		19670101	33	WTST
10	15	22582	121132202900	Darrah, D.D. Estate Test # 5		19670101	29	WTST
10	15	22583	121132203100	Darrah, D.D. Estate Test # 7		19670101	29	WTST
10	15	22584	121132203200	Darrah, D.D. Estate Test # 8		19670101	15	WTST
10	15	22585	121131220280	Darrah,D.D.Estate Test hole #4		19670101	44	WTST
10	15	22586	121132289000	Carmichael Agri-Service	2	19921105	120	Water
10	15	22587	121132260700	Baldwin, Randall #1	1	19910619	180	Water
10	15	22588	121132312600	Dawson, Dan & Mary #1		19941222	64	Water
10	15	22589	121132258200	L.B. Clark			40	Water
10	15	22590	121132257200	Thomas, Floyd		19540507	73	Water
10	15	22591	121132350100	Oyer, Clarence & Jeanne		19970813	59	Water
10	15	22592	121130011600	Quinton, Ralph	1	19400401	184	Water
10	15	22593	121132368700	Wakefield Est. Lloyd M.	2	20000717	80	Water
10	15	22596	120392099600	Lane, Albion C.		19660228	75	Water
10	15	22597	120392099800	Venard, J.		19460717	171	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
10	15	22598	120392099900	Harrison Farm		19530207	272	Water
10	15	22599	120390031100	Lierman, E. J.	1	19400801	281	Water
10	15	22600	120390031200	Lierman, E. J.	2		103	Water
10	15	22601	120392150300	Turner, Mercer	2	20010831	347	Water
10	15	22602	120392110100	Waters, John R.	1	19940405	310	Water
10	15	22603	121132257100	Weitag		19630919	45	Water
10	15	22604	120392100900	Westfall, Steve	1	19911219	334	Water
10	15	22605	120392134800	McBurney, Marvin	1	19980801	372	Water
10	15	22606	120392140600	Moran, John	1	19990611	355	Water
10	15	22607	120392131200	Theobald, John	1	19971103	360	Water
10	15	22608	120390059400	Barnett, Earl		19720817	80	Water
10	15	22609	120392150600	Bellis, Grant	1	20010828	325	Water
10	15	22610	120390056500	Durbin, James		19710710	191	Water
10	15	22611	120392138200	Ewen, Gary		19981016	340	Water
10	15	22612	120392134900	Glass, Darrin & Stephanie	1	19980401	398	Water
10	15	22613	120392098600	Kinder, James	1	19890824	48	Water
10	15	22614	120392092600	Toohill, Kenneth	1	19880907	37	Water
10	15	22615	120392104800	Weinheimer, Jim	2	19921204	84	Water
10	15	22619	120392131300	Filken, Mike		19971105	345	Water
10	15	22620	120390059500	Mearda, J. L.		19721013	81	Water
10	15	22636	120392073000	Deatrick, Paul	6	19770101	70	Water
10	15	22638	120392080900	Abbott, Carl	1	19860604	381	Water
10	15	22639	120392138300	Harper, Lana	1	19980717	82	Water
10	15	22640	120392105100	Whitted, Gene	2	19930427	340	Water
10	15	22641	120392130700	Whitted, Gene	2	19970924	366	Water
10	15	22644	120390031500	Burke, A. B.		19440101	75	Water
10	15	22645	120392098700	Lippert, Robert		19891129	62	Water
10	15	22698	121132230300	Beals # 2-61				WTST
10	15	22699	121132230400	Beals # 3-61				WTST
10	15	22700	121132230500	Beals # 4-61				WTST
10	15	22701	121132213600	Beals #1-61				WTST
10	15	22702	121130011800	Zeigler, Dr.		19440901	82	Water
10	15	22703	121130011900	Empire School		19451101	68	Water
10	15	22704	121132124000	Peterson Seed		19780718	64	Water
10	15	22705	121132135900	Peterson Seed		19790702	62	Water
10	15	22706	121132143900	Vance, Don			165	Water
10	15	22707	121132374700	Chastain, Brian	1	20000620	172	Water
10	15	22709	121132389200	Phillips, Paul	1	20011205	170	Water
10	15	22719	121130025600	Dewitt, W. C.		19440901	80	Water
10	15	22721	120390033100	Forbes, Wilbur		19451001	200	Water
10	15	22770	121132243500	Swigart, Karl	1	19900827	138	Water
10	15	22771	121132230600	Amdor, L.B.	1			WTST
10	15	22772	121130079500	Franklin, Paul	2	19700831	67	Water
10	15	22773	121132114300	Giles, Claude M. #2	2	19760330	173	Water
10	15	22774	121132132500	Jiles, Claude # 1		19790301	66	Water
10	15	22775	121132230700	Franklin, Okley #1-60				WTST
10	15	22776	121132230800	Saxton, L. B. #2				WTST
10	15	22777	121130101800	Farmer City Packers	1	19731001	202	Water
10	15	22778	121132111800	Lane, K. R.		19720908	203	Water
10	15	22779	121132157500	Schumacher, Pete	1	19870416	203	Water
10	15	22780	121132111100	Farmer City, Village of #3-75	3-75	19750918	200	WTST
10	15	22781	121132120100	Ruch, Kenneth E. #1	1	19770508	73	Water
10	15	22782	121132144000	Gilmore, Clytus		19820518	197	Water
10	15	22783	121132304300	Schrock, Cathy & Greg		19940110	84	Water
10	15	22784	121132348000	McLean County Service Co.	2	19971118	180	Water
10	15	22785	121132108500	Perhay, William #1	1	19741118	176	Water
10	15	22786	121132111900	Weedman Grain		19730714	149	Water
10	15	22790	120392078600	First National Bank		19821130	47	Water
10	15	22791	120390050400	Rankin, W. H.			16	Water
10	15	22792	120390034500	Thomas, Helen		19400101	40	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
10	15	22793	120390034600	Thomas, J. G.		19440101	175	Water
10	15	22794	120390034700	Weedman M. E. Church		19150101	42	Water
10	15	22795	120390034800	Bracken School		19270101	175	Water
10	15	22796	120390048800	Brenneman, Miss Gertrude	2	19670711	210	Water
10	15	22797	120390034900	Murphy, Wayne		19310101	46	Water
10	15	22798	120392063800	Farmer City, Village of	1-75	19750101	210	WTST
10	15	22799	120390035000	Hurst, Emma		19440701	53	Water
10	15	22800	120392099200	Kelly, Virgel	1-65		210	WTST
10	15	22801	120392105300	Kirby, Dale	2	19930427	186	Water
10	15	22802	120390035100	Mullen, James			60	Water
10	15	22803	120390035200	Murphy, Bert		19330101	56	Water
10	15	22804	120390035300	Collins, Elmer			75	Water
10	15	22805	120392105400	Collins, George	4	19930326	151	Water
10	15	22806	120392083000	Collins, George #1	1	19870917	162	Water
10	15	22807	120392063900	Farmer City, Village of #2-75	2-75	19750901	210	WTST
10	15	22808	120392130800	Sigler, Ron		19970327	152	Water
10	15	22809	120392094300	Harlow Stensel Watkins Farm		19841031	55	Water
10	15	22810	120390035400	Smith, Lowell D.			80	Water
10	15	22811	120390035500	Kincaid, George		19250101	74	Water
10	15	22812	120392138400	Yeagle, Bill	2	19981005	186	Water
10	15	22814	120390035600	Camel, Jas. Heirs			75	Water
10	15	22815	120392137500	Foster, Jim	1	19980923	67	Water
10	15	22816	120392147100	Foster, Jim	1	20000908	66	Water
10	15	22817	120392147200	Foster, Jim	1	20000913	68	Water
10	15	22818	120392147300	Foster, Jim	1	20000912	68	Water
10	15	22819	120392066400	Hoppe, Elmer		19760701	185	Water
10	15	22820	120390035700	Rueger, Don		19451001	75	Water
10	15	22821	120392066300	Arcole Midwest Corp.		19710101	167	Water
10	15	22822	120390001900	Farmer City	55-16	19551001	188	WTST
10	15	22823	120390050500	Farmer City	TH 1-65-A	19650624	192	WTST
10	15	22824	120392065000	Farmer City	7-67	19670317	190	WTST
10	15	22825	120392073700	Farmer City	1-79	19790717	196	WTST
10	15	22826	120392073800	Farmer City #2-79	2-79	19790720	190	WTST
10	15	22827	120392124900	Farmer City T.H	2-96	19960502	211	Water
10	15	22828	120392124800	Farmer City T.H (1-96)	11	19970729	200	Water
10	15	22829	120392074900	Farmer City, City of			196	Water
10	15	22830	120392075000	Farmer City, City of	10		190	Water
10	15	22831	120392117600	Murphy, Earl		19491231	54	Water
10	15	22832	120390059200	Stagen, Carl		19730101	190	Water
10	15	22833	120390050600	Farmer City	TH 1/64	19641111	245	WTST
10	15	22834	120390050700	Farmer City	TH 2/64	19641120	185	WTST
10	15	22835	120390059600	Farmer City, City of	1-73		230	Water
10	15	22836	120390035800	Kissack Est.		19300101	51	Water
10	15	22837	120390035900	Kissack Estate		19441001	45	Water
10	15	22838	120390036000	Prudential Insurance Co.		19160101	175	Water
10	15	22839	120392108200	Schnamen, L.	1-63		185	WTST
10	15	22840	120390036100	Schneman, Frank		19000101	173	Water
10	15	22841	120390036200	Sievers, Frank		19460401	40	Water
10	15	22842	120390036300	Sievers, Frank	2	19460101	31	Water
10	15	22843	121472055600	Howe, Narteya		19830831	50	Water
10	15	22844	120390050800	Smith, A. A.			20	Water
10	15	22845	121470021400	Smith, A. A.	3	19670627	42	Water
10	15	22846	121472077900	Smith, A. A.		19450101	61	Water
10	15	22847	120392139300	Grimes, Dave	3	19990121	240	Water
10	15	22848	120390050900	Lindsay, Charles		19090101	31	Water
10	15	22849	120390001100	Farmer City	6	19550601	43	Water
10	15	22850	120390001300	Farmer City	10	19550601	40	Water
10	15	22851	120390001400	Farmer City	11	19550601	40	Water
10	15	22852	120390001500	Farmer City	12	19550601	40	Water
10	15	22853	120390001600	Farmer City	13	19550701	40	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
10	15	22854	120392108400	Farmer City	9-54		60	WTST
10	15	22855	120392108500	Farmer City	10-54		80	WTST
10	15	22856	120392108600	Farmer City	11-54		20	WTST
10	15	22857	120392108700	Farmer City	12-54		15	WTST
10	15	22858	120392108300	Farmer City #8-54	8-54		190	WTST
10	15	22859	120390025800	Hansen, Eugene #1	1	19761210	162	Water
10	15	22860	120390036400	Kissack Estate			173	Water
10	15	22861	120390001700	Farmer City	55-14	19551001	185	Water
10	15	22862	120390001800	Farmer City	55-15	19551001	183	WTST
10	15	22863	120390048900	Farmer City	7	19670911	180	Water
10	15	22864	120390053800	Farmer City	3-67	19670301	180	WTST
10	15	22865	120392065100	Farmer City	6-67	19670316	189	WTST
10	15	22866	120392065200	Farmer City	5-67	19670315	196	WTST
10	15	22867	120392065300	Farmer City	2-67	19670308	193	WTST
10	15	22868	120392065400	Farmer City	1-67	19670227	196	WTST
10	15	22869	120392065500	Farmer City	4-67	19670301	194	WTST
10	15	22870	120392109300	Farmer City	6-54			WTST
10	15	22871	120392109400	Farmer City	7-54			WTST
10	15	22872	120390051500	Farmer City Test	1		180	WTST
10	15	22873	120390051600	Farmer City Test	17		190	WTST
10	15	22874	120390051700	Farmer City Test	18		175	WTST
10	15	22875	120390051800	Farmer City Test	19		180	WTST
10	15	22876	120390051900	Farmer City Test	21		170	WTST
10	15	22877	120390036700	Farmer City Test Hole		19510101	150	WTST
10	15	22878	120392108800	Farmer City Test Hole	1	19540101		WTST
10	15	22879	120392108900	Farmer City Test Hole	2	19540101		WTST
10	15	22880	120392109000	Farmer City Test Hole	3	19540101		WTST
10	15	22881	120392109100	Farmer City Test Hole	4	19540101		WTST
10	15	22882	120392109200	Farmer City Test Hole	5	19540101		WTST
10	15	22883	120390036600	Farmer City Well	4	19310701	174	Water
10	15	22884	120390036800	Farmer City Well	3	19510901	172	Water
10	15	22885	120390000900	Farmer City, City of	1	19550101	193	Water
10	15	22886	120390001000	Farmer City, City of	5	19550501	160	Water
10	15	22887	120390001200	Farmer City, City of	9	19550601	40	Water
10	15	22888	120390036500	Farmer City, City of		19300101	164	Water
10	15	22889	120390058400	Farmer City, City of	6	19551201	172	Water
10	15	22890	120392061700	Farmer City, City of	4	19551101	167	Water
10	15	22891	120392061800	Farmer City, City of	2	19450901	167	Water
10	15	22892	120390036900	Scarbough, Alva		19450801	165	Water
10	15	22893	120390037000	Smith, A. A.		19460101	33	Water
10	15	22894	120392082600	Woodlawn Country Club	1	19870908	159	Water
10	15	22895	120390051100	Vance, J. C.			20	Water
10	15	22904	120390057400	Farmer City, City of	4-71	19711103	175	WTST
10	15	22907	120392115600	Leahy, Richard	1	19940915	67	Water
10	15	22908	120392136800	Osborne, Todd	1	19980622	174	Water
10	15	22911	120392066100	Resser, R. M.		19760630	83	Water
10	15	22913	120390037400	Waindle, Edward F.		19460101	66	Water
10	15	22915	120392150400	Ashcoft-Kopp Farms		20010821	28	Water
10	15	22916	120392150200	Emmerson, Verl L.		20010628	165	Water
10	15	22917	120390057100	Farmer City, City of	1-71	19711029	166	WTST
10	15	22918	120390057200	Farmer City, City of	2-71	19711101	173	WTST
10	15	22919	120390057300	Farmer City, City of	3-71	19711102	168	WTST
10	15	22920	120390058300	Farmer City, City of	6	19720719	153	Water
10	15	22921	120392148300	Hammer, Mike	1	20010519	155	Water
10	15	22922	120392116600	Marvin, Virgil		19631231	165	Water
10	15	22923	120390037500	Morgan		19400101	69	Water
10	15	22924	120392082200	Reynold, Fred E.	1	19870725	52	Water
10	15	22925	120392118300	Stickles, Roger#1-94		19940921	173	Water
10	15	22926	120392106200	Stickles, Roger#2-94		19940930	164	Water
10	15	22927	120392117300	Twist, Roger		19941223	165	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
10	15	22928	120392119400	Russell, Scott #1		19950727	240	Water
10	15	22929	120392110200	Simpson, Eugene		19940421	61	Water
10	15	22930	121472103600	Harris Station		19560101	75	WTST
10	15	22931	121472046500	Petry, C. A.	1	19780520	167	Water
10	15	22932	121472046600	West Fertilizer (John West)	1	19780913	192	Water
10	15	22970	121472103700	Smith, Don	1-66	19661223	210	WTST
10	15	24739	121130060700	Lovins, D. M.	1	19680501	95	Water
10	15	24740	121132354800	Shultz, Gary		19970930	115	Water
10	15	24741	121132212500	McDonald Bros.		19390101	53	Water
10	15	24742	121132224500	Thomas, John		19400401	74	Water
10	15	24743	121132307300	Thompson, Keith		19940810	265	Water
10	15	24745	121132144200	Leight, Al	2	19820421	105	Water
10	15	24759	121132319400	Breese, Todd		19950713	76	Water
10	15	24763	121130025100	Wade, Anna		19410101	117	Water
10	15	24764	121132124700	Brobst, Richard	1	19770810	190	Water
10	15	24765	121132359200	Cleinmark, Dave	1	19991203	171	Water
10	15	24766	121132240300	Cleinmark, Dave #1	1	19921014	190	Water
10	15	24767	121132378800	Country Lane MH	1		125	Water
10	15	24768	121132377000	Darrow, D. & Williams, A.	1	20001018	191	Water
10	15	24769	121132359300	Jacquin, Tammy	1	19991007	146	Water
10	15	24770	121132351000	Johnson, Rick A.	1	19980629	169	Water
10	15	24771	121132243800	Lauher, Fred	1		122	Water
10	15	24772	121132351100	Roth, Miriam	1	19980909	162	Water
10	15	24773	121132191300	Strange, Samuel P.	1	19881220	186	Water
10	15	24776	121132309900	Whitmeyer, Mark		19940912	75	Water
10	15	24777	121132206000	Bartell, Frank		19931130	105	Water
10	15	24778	121132382800	Bartosik, Daniel	2	20010407	93	Water
10	15	24779	121132264800	Gaines, Tom	1	19910829	55	Water
10	15	24780	121132371700	Kauffman, Jack		20001003	88	Water
10	15	24781	121132369900	Kiesling, Bill	2	20000526	55	Water
10	15	24782	121130095000	Ohlendorf, Bill #1	1	19720612	95	Water
10	15	24783	121130095100	Ohlendorf, Bill #1	1	19720720	55	Water
10	15	24784	121130095200	Ohlendorf, Bill #1	1	19720614	80	Water
10	15	24785	121130086800	Ohlendorph, Bill	40	19710612	190	Water
10	15	24786	121130086700	Ohlendorph, Bill #21	21	19710610	55	Water
10	15	24787	121130095300	White, Ronald	1	19720620	95	Water
10	15	24788	121132286500	Boitnott, Tom			75	Water
10	15	24789	121132298800	Brooks, Robert	1	19940427	62	Water
10	15	24790	121132289100	Coombs, Glen		19921101	120	Water
10	15	24791	121132112600	Coombs, Glenn		19751031	59	Water
10	15	24792	121132118200	Foreman, E. H.		19761004	77	Water
10	15	24793	121132284200	Fuson, Mickey		19920520	65	Water
10	15	24794	121132312000	Hannes, Gary #3		19941201	85	Water
10	15	24795	121132383700	Iseminger, Duane & Esther	1	20010505	74	Water
10	15	24796	121132344100	Kilhoffer, Kelley	2	19970702	80	Water
10	15	24797	121132211900	Killhoffer, Kelly	1	19930630	28	Water
10	15	24798	121132378900	Longview Subdivisio	1		110	Water
10	15	24799	121132114400	Martin,Wayne Jr.	1	19760101	58	Water
10	15	24800	121132323000	Milton, Gerald #2		19940930	80	Water
10	15	24801	121132278200	Necessary, Joe	1	19920429	100	Water
10	15	24802	121132330500	Patterson, Paul #1		19960716	100	Water
10	15	24803	121132117100	Phoenix III Corp		19760622	47	Water
10	15	24804	121132311200	Smith, Lyle J.	9		43	WTST
10	15	24805	121132294500	Taylor, David		19930831	125	Water
10	15	24806	121132298900	Theobald, Keith I.		19940602	85	Water
10	15	24807	121132377500	Wood, Brad	1	20001016	240	Water
10	15	24808	121132286100	Milton, Glenn		19920615	85	Water
10	15	24809	121132342500	Milton, Kenneth		19970807	55	Water
10	15	24810	121132323100	Ashley, Vernal #2		19950908	100	Water
10	15	24811	121132187800	Clemons, Gary	1	19880520	101	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
10	15	24812	121132375900	Evans, Garry	1	20000922	102	Water
10	15	24813	121132359400	Lott, Steve	1	19991124	110	Water
10	15	24814	121132162600	McGuire, Mike	1	19871030	91	Water
10	15	24815	121132375200	Ritter, Kevin	3	20001023	72	Water
10	15	24816	121132306500	Rosenberger, Wesley		19940531	365	Water
10	15	24817	121130098600	Cooperider, David		19721201	97	Water
10	15	24819	121132371900	Corbitt, Cheryl	2	20000925	95	Water
10	15	24820	121132144700	Corbitt, Tom	1	19800420	81	Water
10	15	24821	121132382000	Cowden, John	1	20010509	61	Water
10	15	24822	121130088600	Dieter, George #1	1	19701108	157	Water
10	15	24823	121132243900	Holt, Lee	1	19900727	77	Water
10	15	24824	121132348100	Melton, Jerry A.		19980504	110	Water
10	15	24825	121132348200	Melton, Jerry A.		19980509	110	Water
10	15	24826	121132384600	Milton, Gerald (Todd Springer)		19930112	80	Water
10	15	24827	121132136200	Rust, Edward B.			81	Water
10	15	24828	121132304400	Kutemeier, Don		19940930	185	Water
10	15	24829	121132359000	Nicholas, Garth		19960906	32	Water
10	15	24830	121132244000	Shaw, Bob		19900605	94	Water
10	15	24831	121132310000	Zoerb, Jim		19941001	75	Water
10	15	24832	121132359100	Angel, Marty & Dawn		19991022	47	Water
10	15	24833	121132244100	Ensminger, Noble	1	19890809	38	Water
10	15	24834	121132337900	Zimmerman, Dan	2	19970401	85	Water
10	15	24835	121132338100	Zimmerman, Dan	1	19970321	80	Water
10	15	24836	121132342600	Zimmerman, Dan	3	19970404	85	Water
10	15	24837	121132328500	Krieg, Russell #2		19960322	130	Water
10	15	24838	121132339600	New Horizon Christian Church		19970706	80	Water
10	15	24839	121132291100	Spaulding, Les	2	19930520	87	Water
10	15	24840	121132342700	Fitzgerald, Charles		19971001	50	Water
10	15	24841	121130012800	Heyworth Test	7	19350101	114	WTST
10	15	24842	121130012900	Heyworth Test	8	19350101	66	WTST
10	15	24843	121132379000	Heyworth, Village o	2	19590101	59	Water
10	15	24844	121132213100	Brown, A. E.			56	Water
10	15	24845	121132230100	Daniel			82	Water
10	15	24846	121130013000	Heyworth Test	2	19350101	335	WTST
10	15	24847	121130013100	Heyworth Test	3	19350101	275	WTST
10	15	24848	121130013200	Heyworth Test Well	5	19350101	91	WTST
10	15	24849	121132213300	Cunningham, F.			128	Water
10	15	24850	121132328900	Geosling, Gary		19951006	325	Water
10	15	24851	121130013300	Heyworth Test	1	19340101	328	WTST
10	15	24852	121130013500	Heyworth Test	B	19350101	41	WTST
10	15	24853	121132231000	Heyworth, City of #2			52	WTST
10	15	24854	121130004700	Heyworth,City of	2	19591001	63	Water
10	15	24855	121132301200	Hinthorn, Keith & Terry	1	19940731	312	Water
10	15	24856	121132295100	Hunt, David		19930521	295	Water
10	15	24857	121132299000	Hunt, David			105	Water
10	15	24858	121132305300	Kaufman, Mike	1	19931103	180	Water
10	15	24859	121132213500	Lumber Yard			82	Water
10	15	24860	121132330600	Call, George #1		19960805	251	Water
10	15	24861	121132344200	Sinn, Chuck	2	19961230	265	Water
10	15	24879	121132374000	Schaffer, Ivan Trust	2	20000530	70	Water
10	15	24881	121132324400	Snyder Development		19951010	76	Water
10	15	24882	121132324500	Snyder Development #2		19951009	76	Water
10	15	24884	121132389300	Espinoza, Dave	1	20011017	79	Water
10	15	24885	121132344300	Prochnow, Gerald & Debbie	1	19970722	77	Water
10	15	24886	121132244300	Prochnow, Gerald R.	1	19891219	70	Water
10	15	24887	121132386600	Fish, Bob	1	20010717	140	Water
10	15	24888	121132124800	Hillary, Don #1		19770422	78	Water
10	15	24889	121132299100	Hillery, Donald	2	19940822	90	Water
10	15	24890	121132324600	Milby, Larry #2		19950929	52	Water
10	15	24891	121132278300	Griffin, Ross	2	19920413	130	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
10	15	24892	121132351300	Griffin, Ross	3	19980730	330	Water
10	15	24893	121132289200	Hamblin, Richard		19921014	125	Water
10	15	24894	121132144300	Baker, Dale	1	19831001	111	Water
10	15	24895	121132161800	Grubb, Gene	2	19870917	125	Water
10	15	24896	121132371100	Klodzinski, Tammy	2	20000726	95	Water
10	15	24897	121130025200	Rust, Adlai #1	1	19391001	80	Water
10	15	24898	121132304500	Brent, Allen	1	19940731	122	Water
10	15	24899	121132332500	Gher, Brad		19950501	140	Water
10	15	24900	121132332600	Adams-Duke Farms #1		19960821	70	Water
10	15	24901	121132234700	Prosser, D. W. #1		19390101	77	Water
10	15	24902	121132156200	Head, Charles	2	19860905	89	Water
10	15	24903	121132339700	Roberts, Jesse		19970728	93	Water
10	15	24904	121132291200	Johnson, Paul	2	19930122	95	Water
10	15	24905	121130025900	Johnson, Emery #1	1	19430101	67	Water
10	15	24906	121132389000	Stutzman, Ronald	2	20011022	103	Water
10	15	24907	121132234800	Tompkins, W. G. #1		19390101	76	Water
10	15	24908	121132301300	Hamman, Stanley	1	19931130	95	Water
10	15	24909	121132370800	Morgan, Brad	1	20000516	85	Water
10	15	24910	121130026000	Rust, Adlai H. #1	1	19401201	170	Water
10	15	24911	121132192000	Rust, Edward B.	2	19840428	86	Water
10	15	24912	121132308600	Yolton Farms #1		19941123	99	Water
10	15	24913	121132192100	Rust, Edward B.	2	19840427	95	Water
10	15	24914	121132388400	Snodgrass, Eric	1	20010406	302	Water
10	15	24915	121130026100	Franklin Estate		19400101	75	Water
10	15	24916	121130053000	Ryan, John			67	Water
10	15	24919	121132352600	Hanshew, Deb & Ken	1	19980806	81	Water
10	15	24934	121132155300	McCauley, Irvine	1	19860627	190	Water
10	15	24935	121130013700	Johnson, J. T.	1	19401201	169	Water
10	15	24936	121132235200	Whitmer, L. G.		19350501	58	Water
10	15	24937	121132359700	Starkey, Jerry	1	19990924	123	Water
10	15	24941	121130026400	Crumbaugh, Clara		19410101	84	Water
10	15	24942	121132347400	Kirby, Lonnie	1	19970605	92	Water
10	15	24943	121132359800	Myers, Steve	1	19991224	96	Water
10	15	24944	121130003100	Leroy State Bank #1	1	19570101	47	Water
10	15	24945	121132367800	Peters, Marvin	1	20000405	110	Water
10	15	24946	121130012000	Stahley Bros. #1	1	19410101	189	Water
10	15	24947	121132372400	Wolren Corp.	2	20001018	143	Water
10	15	24948	121132235400	LeRoy, City of		19670203	103	Water
10	15	24949	121130012100	Stahley, G. A. #1	1	19410501	112	Water
10	15	24950	121132235500	Whitmer, L. G. #1		19400101	65	Water
10	15	24951	121130066900	Wollrab, James C. #1	1	19690902	178	Water
10	15	24952	121132144500	City Of Leroy	8	19820809	105	Water
10	15	24953	121132235600	Kline, E.D. #1		19400101	58	Water
10	15	24954	121132313100	LeRoy, City of		19820809	105	Water
10	15	24955	121132313200	LeRoy, City of #TH1-82		19920326	200	Water
10	15	24956	121130055801	LeRoy, City of #4		19680508	80	Water
10	15	24957	121132120400	LeRoy, Village of	2-77	19771019	100	WTST
10	15	24959	121132118600	Leroy, City of	1-77	19770401	115	WTST
10	15	24960	121130055800	Leroy, City of #4	4	19400101	78	Water
10	15	24961	121132123900	Leroy, City of #7	7	19780306	76	Water
10	15	24962	121132269100	Leroy Lanes				Water
10	15	24963	121132365600	Thornton, Neil & Deb	1	19990922	74	Water
10	15	24964	121132144600	Ford, Arlo	2	19820423	124	Water
10	15	24965	121132115100	McLaughlin, James		19660101	140	Water
10	15	24966	121132244600	McLaughlin, Mike	3	19890327	123	Water
10	15	24967	121132120200	Amdor, John G.	2	19770418	86	Water
10	15	24968	121130086400	Golden, Kenneth		19720109	78	Water
10	15	24969	121132186300	Hail, Michael	1	19880918	73	Water
10	15	24970	121132260500	Hendren, Merle	1	19910630	88	Water
10	15	24971	121132299200	LeRoy Country Club	2	19940525	50	Water

TABLE A-1
Wells within 15 mi from the Site

Distance Interval from Site (mi)		Well ID	API[a]	Owner	Well Number	Date Constructed[b]	Depth (ft)	Well Status[c]
10	15	24972	121132236400	LeRoy Damsite	1	19411201	61	Water
10	15	24973	121132236500	LeRoy Damsite	2	19411201	27	Water
10	15	24974	121132236600	LeRoy Damsite	3	19411201	30	Water
10	15	24975	121132236700	LeRoy Damsite	4		37	Water
10	15	24976	121132236800	LeRoy Damsite	5	19411201	26	Water
10	15	24977	121132236900	LeRoy Damsite	6	19411201	32	Water
10	15	24978	121132237000	LeRoy Damsite	7	19411201	36	Water
10	15	24979	121132269200	Leroy Country Club				Water
10	15	24980	121132305400	Moberly, Mark	1	19940916	71	Water
10	15	24981	121130080900	Golden,Glen	1	19700901	100	Water
10	15	24982	121132159800	Kinnison, Jerry	2	19870622	41	Water
10	15	24983	121132125000	Price, Georg	1	19770712	169	Water
10	15	24984	121132120600	Allis Chalmers		19770705	75	Water
10	15	24985	121130086900	Dardano,Pasqual	1	19710930	90	Water
10	15	24997	121132155800	Brooks, Larry	1	19860915	49	Water
10	15	24998	121132108600	Cook, George		19741125	54	Water
10	15	24999	121132237400	Crago, C.F.		19400101	47	Water
10	15	25000	121130076700	Mathews, Joe			40	Water
10	15	25001	121132331800	Mayer, Harold		19961122	260	Water
10	15	25002	121132373300	Mayer, Harold	2	20000811	184	Water
10	15	25003	121130088700	Gibson, Mack Leon		19720401	43	Water
10	15	25024	121132339900	Collins, Dean R	2		149	Water
10	15	25025	121132340000	Collins, Dean R	3		227	Water
10	15	25026	121132339800	Collins, Dean R.	1		240	Water
10	15	25027	121132244700	Hendren, Ken	2	19900709	90	Water
10	15	25037	121132136600	Althouse, Delmar		19801022	194	Water

Source: Illinois State Geological Survey (ISGS). GIS Layer of Well Locations. 2002.
[a]ISGS well number that consists of a State code (12), a 3-digit County code, and a 5-digit unique number, and a 2-digit re-drill code
[b]Date completed 'YYYYMMDD'
[c]Well Status: Water = water well, WATRS = Water Supply Well, WTST = Water Well Test Hole

APPENDIX B

Schools Within the Region

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
Douglas Elementary School	Clinton	4.8	16	253	NCES
Webster Elementary School	Clinton	4.8	19	255	NCES
Clinton Cu School District 15	Clinton	5.2	NA	NA	NA
Clinton Junior High School	Clinton	5.2	41	467	NCES
Lincoln Elementary School	Clinton	5.4	15	245	NCES
Washington Elementary School	Clinton	5.4	18	301	NCES
Clinton Christian Academy	Clinton	5.7	NA	NA	NA
Clinton Alternative Education	Clinton	5.9	NA	NA	NA
Clinton High School	Clinton	6	53	738	NCES
Richland Community College	Clinton	6	65	3,100	IDCCA
De Land Elementary School	Weldon	7.3	9	121	NCES
Deland Weldon Middle School	Weldon	7.3	2	26	NCES
Maroa Grade School	Maroa	10.6	17	288	NCES
Heyworth High School	Heyworth	11	24	342	NCES
Maroa Forsyth School District 2	Maroa	11	NA	NA	NA
Maroa-Forsyth High School	Maroa	11	21	279	NCES
Maroa-Forsyth Junior High School	Maroa	11	4	156	NCES
Heyworth Elementary School	Heyworth	11.2	37	508	NCES
Heyworth Community Unit School District	Heyworth	11.3	NA	NA	NA
Argenta Early Learning Center	Argenta	12.4	3	131	NCES
Argenta High School	Argenta	12.4	24	318	NCES
Argenta Junior High School	Argenta	12.4	NA	NA	NA
Argenta Oreana Junior High School	Argenta	12.4	13	163	NCES
Argenta-Oreana Community Unit School 1	Argenta	12.4	NA	NA	NA
Argenta-Oreana School Supt	Argenta	12.4	NA	NA	NA
Blue Ridge High School	Farmer City	12.5	24	299	NCES

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
Ruth M Schneider Elementary School	Farmer City	12.5	19	348	NCES
Le Roy Superintendent's Office	Le Roy	13	NA	NA	NA
Le Roy High School	Le Roy	13.1	25	243	NCES
Le Roy Junior High School	Le Roy	13.1	9	128	NCES
Blue Ridge Community Unit School District	Farmer City	13.2	NA	NA	NA
Tri Valley Cu School District	Downs	13.4	NA	NA	NA
Tri-Valley Elementary School	Downs	13.4	23	320	NCES
Le Roy Elementary School	Le Roy	13.5	37	463	NCES
Deland-Weldon Community Unit	De Land	14.5	NA	NA	NA
Deland-Weldon High School	De Land	14.5	11	48	NCES
Tri Valley Middle School	Downs	15.1	29	378	NCES
Tri-Valley High School	Downs	15.1	23	294	NCES
Argenta-Oreana Elementary School	Oreana	16.5	33	472	NCES
Forsyth Grade School	Forsyth	18.1	19	299	NCES
Metamorphosis Montessori School	Monticello	18.4	NA	NA	NA
H&R Block Tax Service	Monticello	18.6	NA	NA	NA
Mc Lean Elementary School	McLean	18.8	12	211	NCES
Faith Christian School	Monticello	18.9	NA	NA	NA
Monticello Community School District	Monticello	18.9	NA	NA	NA
Mansfield Elementary School	Mansfield	19.3	15	205	NCES
Blue Ridge Junior High School	Mansfield	19.4	9	138	NCES
Brigham Elementary School	Bloomington	19.4	38	516	NCES
Richland Community College	Decatur	19.4	250	5,012	IDCCA
Warrensburg Community High School	Warrensburg	19.4	22	358	NCES
Warrensburg-Latham School District 11	Warrensburg	19.4	NA	NA	NA
Warrensburg Jr High School	Warrensburg	19.7	NA	NA	NA
Warrensburg-Latham Elementary/ Middle School	Warrensburg	19.7	44	807	NCES
Lutheran School Association	Decatur	20	29	515	NCES

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
Ridgeview Arrowsmith Elementary	Arrowsmith	20	7	115	NCES
Stevenson Accelerated School	Decatur	20	11	214	NCES
Atlanta Elementary School	Atlanta	20.3	17	226	NCES
Decatur Christian School	Decatur	20.3	NA	NA	NA
Mound Middle School	Decatur	20.3	26	501	NCES
Roosevelt Middle School	Decatur	20.3	27	543	NCES
Stephen Decatur High School	Decatur	20.3	33	730	NCES
Sunnyside Center School	Decatur	20.3	11	142	NCES
Holy Trininty School	Bloomington	20.6	NA	NA	NA
Macon Resources Inc	Decatur	20.6	NA	NA	NA
Parsons Accelerated School	Decatur	20.7	21	366	NCES
Pepper Ridge School	Bloomington	20.7	40	640	NCES
Cerro Gordo Grade School	Cerro Gordo	20.9	20	279	NCES
Decatur Christian Elementary	Decatur	21	NA	NA	NA
Cerro Gordo High School	Cerro Gordo	21.1	17	230	NCES
Cerro Gordo Middle School	Cerro Gordo	21.1	6	145	NCES
Cerro Gordo Superintendent Office	Cerro Gordo	21.1	NA	NA	NA
Oakland Elementary School	Bloomington	21.1	31	513	NCES
Village Travel	Decatur	21.2	NA	NA	NA
Cornerston Christian Academy	Bloomington	21.3	NA	NA	NA
Hairmasters Institute	Bloomington	21.4	NA	NA	NA
Suzi Davis Travel	Bloomington	21.4	NA	NA	NA
Chesterbrook Academy	Bloomington	21.5	NA	NA	NA
Trinity Lutheran School	Bloomington	21.5	NA	NA	NA
St Teresa High School	Decatur	21.6	NA	NA	NA
Chesterbrook Academy	Bloomington	21.7	NA	NA	NA
Irving Elementary School	Bloomington	21.7	33	436	NCES
St Mary's School	Bloomington	21.7	NA	NA	NA
Washington Elementary School	Bloomington	21.7	21	429	NCES
Grove Elementary School	Bloomington	21.8	NA	NA	NA
Bloomington Grove Academy	Bloomington	21.9	NA	NA	NA

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
McLean County Christian School	Bloomington	21.9	NA	NA	NA
Bloomington School District 87	Bloomington	22	NA	NA	NA
Decatur Memorial Hospital	Decatur	22	NA	NA	NA
Bloomington Area Vocational Center	Bloomington	22.1	11	NA	NCES
Bloomington Computer Center	Bloomington	22.1	NA	NA	NA
Bloomington High School	Bloomington	22.1	85	1,487	NCES
Sarah NCES Raymond School of Early Education	Bloomington	22.1	8	144	NCES
Bloomington Junior High School	Bloomington	22.2	77	1,309	NCES
Stevenson Elementary School	Bloomington	22.2	32	516	NCES
William Harris Elementary School	Decatur	22.2	18	355	NCES
Benjamin Franklin Elementary School	Decatur	22.3	18	308	NCES
Central Catholic High School	Bloomington	22.3	18	578	IDCCA
La Petite Academy	Bloomington	22.3	NA	NA	NA
Bent Elementary School	Bloomington	22.5	27	337	NCES
Brush College Elementary School	Decatur	22.5	15	298	NCES
Illinois Wesleyan University	Bloomington	22.5	132	1,014	IDCCA
Midwest Christian Academy	Bloomington	22.5	NA	NA	NA
Sheridan Elementary School	Bloomington	22.6	42	560	NCES
Chesterbrook Academy	Bloomington	22.7	NA	NA	NA
Illinois Wesleyan University	Bloomington	22.7	132	1,014	IDCCA
Durfee Elementary School	Decatur	22.9	24	460	NCES
Mr John's School of Esthetics	Decatur	23.1	NA	NA	NA
Oak Grove Elementary School	Decatur	23.1	14	339	NCES
Douglas Mac Arthur High School	Decatur	23.2	49	1,069	NCES
Glenn Elementary School	Normal	23.2	19	305	NCES
Area Technical Academy	Decatur	23.3	NA	NA	NA
Colene Hoose Elementary School	Normal	23.3	39	704	NCES
Decatur Area Vocational Center	Decatur	23.3	14	NA	NCES
Decatur School-Practical Nursing	Decatur	23.3	NA	NA	NA
Northpoint Elementary School	Bloomington	23.3	38	646	NCES

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
Bloomington Normal School	Normal	23.4	NA	NA	NA
Northwest Christian School	Decatur	23.4	NA	NA	NA
St Patrick School	Decatur	23.4	NA	NA	NA
Thomas Jefferson Middle School	Decatur	23.5	28	518	NCES
Bemenet Elementary School	Bement	23.6	15	233	NCES
Bement Community School District 5	Bement	23.6	NA	NA	NA
Bement High School	Bement	23.6	13	132	NCES
Bement Middle School	Bement	23.6	6	95	NCES
Bement School	Bement	23.6	NA	NA	NA
Chiddix Junior High School	Normal	23.6	56	783	NCES
Epiphany Catholic Grade School	Normal	23.7	NA	NA	NA
Johns Hill Magnet School	Decatur	23.7	29	561	NCES
Michael E Baum Elementary School	Decatur	23.7	20	395	NCES
St James Catholic School	Decatur	23.7	NA	NA	NA
Sugar Creek Elementary School	Normal	23.7	17	313	NCES
Washington Elementary School	Decatur	23.7	27	570	NCES
Oakdale Elementary School	Normal	23.8	40	586	NCES
Sangamon Elementary School	Mahomet	23.8	31	374	NCES
Millikin University	Decatur	23.9	214	2,079	IDCCA
Normal Community High School	Normal	23.9	88	1,346	NCES
Smiley Jim	Decatur	23.9	NA	NA	NA
Dennis Elementary School	Decatur	24	16	291	NCES
Eugene Field Elementary School	Normal	24.1	9	138	NCES
Mahomet-Seymour High School	Mahomet	24.1	42	620	NCES
Southeast Elementary School	Decatur	24.1	17	339	NCES
Lincoln Trail Elementary School	Mahomet	24.2	34	635	NCES
Mahomet Junior High School	Mahomet	24.2	53	809	NCES
Middletown Early Childhood Center	Mahomet	24.2	12	244	NCES
Dwight D Eisenhower High School	Decatur	24.3	49	999	NCES
Heartland Community College	Normal	24.3	50	2,151	IDCCA

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
Prairieland Elementary School	Normal	24.3	35	692	NCES
Parkside Elementary School	Normal	24.4	22	295	NCES
University High School	Normal	24.4	47	617	NCES
Mennonite College of Nursing	Normal	24.5	6	200	IDCCA
Muffley Elementary School	Decatur	24.5	16	370	NCES
Parkside Junior High School	Normal	24.6	52	767	NCES
East Park Baptist Church	Decatur	24.7	NA	NA	NA
Illinois State University	Normal	24.7	1,126	20,504	IDCCA
Thomas Metcalf School	Normal	24.7	45	468	NCES
Calvary Baptist Academy	Normal	24.8	NA	NA	NA
College of Fine Arts Dean	Normal	24.8	NA	NA	NA
Mt Pulaski Community Unit School District	Mount Pulaski	24.8	NA	NA	NA
Mt Pulaski Grade School	Mount Pulaski	24.8	26	340	NCES
Fairview Elementary School	Normal	24.9	22	398	NCES
Zion Lutheran Grade School	Mount Pulaski	24.9	NA	NA	NA
Lincoln Correctional Center	Lincoln	25	7	33	NCES
Logan Correctional Center	Lincoln	25	12	557	NCES
Harristown Elementary School	Harristown	25.1	15	243	NCES
Mount Pulaski High School	Mount Pulaski	25.1	22	206	NCES
Olympia High School	Stanford	25.1	45	708	NCES
Olympia Middle School	Stanford	25.3	27	374	NCES
Stanford Grade School	Stanford	25.3	15	153	NCES
Salem Elementary School	Decatur	25.4	6	125	NCES
Chester-East Lincoln School	Lincoln	25.5	27	325	NCES
Garfield Elementary School	Decatur	25.5	NA	NA	NA
John Adams Elementary School	Decatur	25.5	12	263	NCES
Lincoln Christian College	Lincoln	25.5	28	312	IDCCA
Lincoln College	Normal	25.5	NA	NA	NA
Midwest School of Welding	Lincoln	25.6	6	0	IDCCA
Enterprise Elementary School	Decatur	25.7	23	388	NCES
Holy Family Parish School	Decatur	25.7	NA	NA	NA

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
Normal West High School	Normal	25.7	83	1,358	NCES
South Shores Elementary School	Decatur	25.8	17	300	NCES
Towanda Elementary School	Towanda	25.8	9	167	NCES
Adams Elementary School	Lincoln	26	6	133	NCES
Lincoln High School	Lincoln	26.1	65	980	NCES
Washington-Monroe Elementary School	Lincoln	26.1	19	293	NCES
Lincoln College	Lincoln	26.3	55	850	IDCCA
Central Elementary School	Lincoln	26.5	16	257	NCES
Lincoln Junior High School	Lincoln	26.5	20	288	NCES
Carroll Catholic School	Lincoln	26.6	NA	NA	NA
Garfield Montessori School	Decatur	26.8	16	301	NCES
Lincoln Christian College	Lincoln	26.8	28	312	IDCCA
Northwest Elementary School	Lincoln	26.9	16	229	NCES
Jefferson Elementary School	Lincoln	27.2	10	95	NCES
Niantic-Harristown High School	Niantic	27.5	14	141	NCES
Niantic-Harristown Junior High School	Niantic	27.5	6	122	NCES
Niantic-Harristown School District	Niantic	27.5	NA	NA	NA
McGaughey Elementary School	Mount Zion	27.7	23	403	NCES
Zion Lutheran School	Lincoln	27.7	NA	NA	NA
Mt Zion Elementary School	Mount Zion	28	12	235	NCES
Title I Curriculum Center at Wood	Decatur	28	10	255	NCES
Christian Academy	Lincoln	28.1	NA	NA	NA
Mt Zion Intermediate School	Mount Zion	28.1	23	444	NCES
Mt Zion Junior High School	Mount Zion	28.1	18	418	NCES
Mt Zion Senior High School	Mount Zion	28.1	39	778	NCES
West Lincoln-Broadwel Elementary School	Lincoln	28.6	15	194	NCES
Fisher Junior/Senior High School	Fisher	28.8	20	257	NCES
Fisher Grade School	Fisher	29	24	335	NCES
Mary W French Academy	Decatur	29	18	379	NCES
Danvers Elementary School	Danvers	29.2	18	307	NCES

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
Minier/Armington Elementary School	Minier	29.2	20	264	NCES
Ridgeview Colfax Elementary School	Colfax	29.9	24	300	NCES
Ridgeview Community Junior High School	Colfax	29.9	3	134	NCES
Ridgeview High School	Colfax	29.9	20	232	NCES
Seventh-Day Adventist School	Champaign	30	NA	NA	NA
Illiopolis Community School	Illiopolis	30.1	15	253	NCES
Illiopolis High School	Illiopolis	30.1	9	92	NCES
Countryside School	Champaign	30.2	NA	NA	NA
St Thomas Moore High School	Champaign	30.4	NA	NA	NA
Vernon L Barkstall Elementary School	Champaign	30.4	28	451	NCES
Kenwood Elementary School	Champaign	30.7	32	428	NCES
Parkland College	Champaign	30.7	243	4,640	IDCCA
Robeson Elementary School	Champaign	31.1	33	498	NCES
Sheet Metal Workers Training	Champaign	31.2	NA	NA	NA
Centennial High School	Champaign	31.3	95	1,508	NCES
Jefferson Middle School	Champaign	31.3	56	766	NCES
Montessori Elementary School	Champaign	31.3	NA	NA	NA
Sadorus Grade School	Sadorus	31.3	4	63	NCES
Garden Hills Elementary School	Champaign	31.4	34	453	NCES
St John's Lutheran School	Champaign	31.5	NA	NA	NA
Hudson Elementary School	Hudson	31.7	18	256	NCES
Carrie Busey Elementary School	Champaign	31.8	31	400	NCES
Westview Elementary School	Champaign	32	27	361	NCES
Dr Howard Elementary School	Champaign	32.1	33	468	NCES
Lexington Elementary School	Lexington	32.1	23	320	NCES
Lexington High School	Lexington	32.1	15	185	NCES
Lexington Junior High School	Lexington	32.1	4	67	NCES
St Matthew Catholic School	Champaign	32.2	NA	NA	NA
Judah Christian Schools	Champaign	32.3	NA	NA	NA

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
Bottenfield Elementary School	Champaign	32.6	25	380	NCES
Carlock Elementary School	Carlock	32.6	7	151	NCES
Franklin Middle School	Champaign	32.6	39	556	NCES
South Side Elementary School	Champaign	32.6	19	254	NCES
Central High School	Champaign	32.7	79	1,261	NCES
First Christian Church	Gibson City	32.8	1	12	NCES
Holy Cross School	Champaign	32.9	NA	NA	NA
Chesterbrook Academy	Champaign	33	NA	NA	NA
Columbia Center	Champaign	33	14	49	NCES
Columbia Elementary School	Champaign	33	NA	NA	NCES
Edison Middle School	Champaign	33	46	670	NCES
Stratton Elementary School	Champaign	33	29	365	S
GCMS Elementary School	Gibson City	33.1	30	478	NCES
Gibson City High School	Gibson City	33.1	25	325	NCES
Parkland College	Champaign	33.1	243	4,640	IDCCA
Atwood Hammond High School	Atwood	33.3	10	146	NCES
Mr John's School - Cosmetology	Champaign	33.3	NA	NA	NA
Meridian High School	Macon	33.4	22	320	NCES
University of Illinois	Champaign	33.4	1,402	18,198	IDCCA
Atwood-Hammond Grade School	Atwood	33.5	23	342	NCES
Lovington Elementary School	Lovington	33.6	22	268	NCES
University of Illinois	Champaign	33.6	1,402	18,198	IDCCA
Emden Elementary School	Emden	33.7	9	110	NCES
Hopedale Elementary School	Hopedale	33.7	10	157	NCES
Marquette School	Champaign	33.7	9	211	NCES
Washington Elementary School	Champaign	33.8	24	276	NCES
University of Illinois-Urbana	Urbana	33.9	2,848	36,936	IDCCA
Illinois Mining Institute	Champaign	34	NA	NA	NA
Hartsburg-Emden Junior-Senior High School	Hartsburg	34.2	17	172	NCES
ML King Jr Elementary School	Urbana	34.2	27	396	NCES
University Lab High School	Urbana	34.2	12	297	NCES

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
Elkhart Elementary School	Elkhart	34.3	10	111	NCES
Lovington High School	Lovington	34.3	11	106	NCES
Mount Auburn Elementary School	Mount Auburn	34.4	7	89	NCES
Tolono Primary School	Tolono	34.8	12	155	NCES
Unity Junior High School	Tolono	34.8	13	186	NCES
Leal Elementary School	Urbana	34.9	18	315	NCES
Unity High School	Tolono	34.9	31	445	NCES
Concept College of Cosmetology	Urbana	35	NA	NA	NA
Tri-City Elementary School	Buffalo	35	22	274	NCES
Tri-City High School	Buffalo	35	17	204	NCES
Tri-City Junior High School	Buffalo	35	8	161	NCES
Urbana High School	Urbana	35	88	1,308	NCES
Washington Early Childhood Center	Urbana	35	14	221	NCES
Congerville Elementary School	Congerville	35.1	6	94	NCES
Christ Theological Seminary	Urbana	35.2	NA	NA	NA
Urbana Middle School	Urbana	35.3	79	1,068	NCES
Deer Creek Mackinaw High School	Mackinaw	35.6	24	297	NCES
Meridian Middle School	Blue Mound	35.6	18	269	NCES
Wiley Elementary School	Urbana	35.6	24	346	NCES
Yankee Ridge Elementary School	Urbana	35.7	24	350	NCES
Dee-Mack Primary & Junior High School	Mackinaw	35.9	30	476	NCES
Ironworker Apprenticeship School	Urbana	36	NA	NA	NA
Pesotum Grade School	Pesotum	36.1	9	171	NCES
Thomasboro Grade School	Thomasboro	36.1	20	238	NCES
Frasca Air Service Inc	Urbana	36.2	NA	NA	NA
Thomas Paine Elementary School	Urbana	36.3	35	357	NCES
Prairie Elementary School	Urbana	36.5	28	411	NCES
Bethany Elementary School	Bethany	37.2	15	188	NCES
Broadmeadow Elementary School	Rantoul	37.8	17	295	NCES
Goodfield Elementary School	Goodfield	37.9	5	79	NCES

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
De Vry Institute of Technology	Rantoul	38.1	NA	NA	NA
Arthur Grade School	Arthur	38.2	23	341	NCES
Delavan Elementary School	Delavan	38.2	19	311	NCES
Delavan High School	Delavan	38.2	15	153	NCES
Delavan Junior High School	Delavan	38.2	5	83	NCES
Parkland College - Tractor	Rantoul	38.2	NA	NA	NA
Arthur High School	Arthur	38.5	17	161	NCES
Arthur Junior High School	Arthur	38.5	8	92	NCES
N Hollad-Midtown Middle School	Middletown	38.5	8	98	NCES
New Holland-Middletown Elementary School	Middletown	38.5	6	66	NCES
Central NCES&M Community High School	Moweaqua	38.6	25	304	NCES
Champaign-Ford Education	Rantoul	38.6	NA	NA	NA
JW Eater Junior High School	Rantoul	38.6	32	520	NCES
Moweaqua Elementary School	Moweaqua	38.6	16	268	NCES
Parkland College	Rantoul	38.7	NA	NA	NA
Rantoul Township High School	Rantoul	38.7	59	849	NCES
Northview Elementary School	Rantoul	38.8	19	265	NCES
Arthur Mennonite School	Arthur	39	NA	NA	NA
Bethany Junior/Senior High School	Bethany	39	17	169	NCES
Gridley Elementary School	Gridley	39.1	16	187	NCES
Gridley Junior High School	Gridley	39.1	5	88	NCES
Gridley High School	Gridley	39.2	12	117	NCES
Philo Grade School	Philo	39.2	14	170	NCES
Williamsville High School	Williamsville	39.4	28	363	NCES
Williamsville Junior High School	Williamsville	39.4	20	288	NCES
Chenoa High School	Chenoa	39.5	16	123	NCES
Eastlawn Elementary School	Rantoul	39.6	23	307	NCES
Dee-Mack Middle School	Deer Creek	39.8	12	193	NCES
Jefferson Park Elementary School	El Paso	39.8	24	317	NCES
Centennial Elementary School	El Paso	39.9	24	330	NCES

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
Chenoa Elementary School	Chenoa	39.9	29	361	NCES
Pleasant Acres Elementary School	Rantoul	39.9	21	302	NCES
El Paso High School	El Paso	40	21	295	NCES
North Ward Elementary School	Tuscola	40.4	27	390	NCES
Stonington Elementary School	Stonington	40.7	8	141	NCES
Taylorville Community School	Stonington	40.7	NA	NA	NA
Tremont Elementary School	Tremont	40.9	26	432	NCES
Tuscola High School	Tuscola	40.9	25	334	NCES
East Prairie Junior High School	Tuscola	41	22	315	NCES
Morton High School	Morton	41	63	1,020	NCES
Tremont High School	Tremont	41	25	316	NCES
Tremont Junior High School	Tremont	41	12	244	NCES
Sullivan Elementary School	Sullivan	41.6	31	504	NCES
Ludlow Elementary School	Ludlow	41.7	12	115	NCES
Sullivan High School	Sullivan	41.7	24	358	NCES
Sullivan Middle School	Sullivan	41.7	15	261	NCES
Eureka Middle School	Eureka	42	29	523	NCES
Gibson City Melvin Sibley Middle School	Melvin	42.4	13	250	NCES
Lincoln Elementary School	Morton	42.4	22	381	NCES
Riverton Elementary School	Riverton	42.5	34	639	NCES
Riverton Middle School	Riverton	42.5	23	449	NCES
Grundy Elementary School	Morton	42.7	20	314	NCES
Eureka College	Eureka	42.8	76	525	IDCCA
Prairieview Junior High School	Thomasboro	42.8	5	60	NCES
Villa Grove Elementary School	Villa Grove	42.9	27	374	NCES
Villa Grove High School	Villa Grove	42.9	21	266	NCES
Villa Grove Junior High School	Villa Grove	42.9	7	140	NCES
Blessed Sacrament School	Morton	43	NA	NA	NA
Jefferson Elementary School	Morton	43	24	355	NCES
Davenport Elementary School	Eureka	43.1	27	457	NCES
Sidney Grade School	Sidney	43.1	11	149	NCES

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
Westview Elementary School	Fairbury	43.1	30	462	NCES
Eureka High School	Eureka	43.2	35	512	NCES
Morton Junior High School	Morton	43.2	29	435	NCES
Sherman Elementary School	Sherman	43.5	27	483	NCES
Saint Joseph Ogden High School	Saint Joseph	43.7	30	462	NCES
Prairie Central High School	Fairbury	43.9	47	667	NCES
Illini Central Grade School	Mason City	44.4	37	493	NCES
Illini Central High School	Mason City	44.4	22	309	NCES
Paxton-Buckley-Loda High School	Paxton	44.5	32	479	NCES
Arcola Elementary School	Arcola	44.7	28	393	NCES
Arcola Junior/Senior High School	Arcola	44.7	25	334	NCES
West Lawn School	Paxton	44.7	1	13	NCES
Lettie Brown Elementary School	Morton	45	17	310	NCES
Clara Peterson Elementary School	Paxton	45.1	20	391	NCES
Paxton-Buckley-Loda Junior High School	Paxton	45.1	20	350	NCES
Edinburg Elementary School	Edinburg	45.3	11	193	NCES
Edinburg High School	Edinburg	45.3	12	98	NCES
Edinburg Junior HIgh School	Edinburg	45.3	5	82	NCES
Gifford Elementary School	Gifford	45.6	15	197	NCES
Cantrall Elementary School	Cantrall	45.9	24	449	NCES
St Patrick's School	Washington	45.9	NA	NA	NA
Washington Middle School	Washington	45.9	20	290	NCES
Flanagan Elementary School	Flanagan	46.1	22	254	NCES
Flanagan High School	Flanagan	46.1	14	208	NCES
Meadowbrook Elementary School	Forrest	46.3	12	203	NCES
Prairie Central Elementary	Forrest	46.3	22	300	NCES
Roanoke-Benson High School	Roanoke	46.4	15	181	NCES
Rochester High School	Rochester	46.4	39	578	NCES
Rochester Junior High School	Rochester	46.4	20	448	NCES
Rochester Middle School	Rochester	46.4	17	264	NCES
Sowers Elementary School	Roanoke	46.4	13	213	NCES

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
Wilcox Elementary School	Springfield	46.4	20	347	NCES
Bond Elementary School	Assumption	46.5	14	193	NCES
H&R Block Tax Service	Pekin	46.5	NA	NA	NA
Greenview Elementary	Greenview	46.6	13	172	NCES
Greenview Junior High School	Greenview	46.6	4	47	NCES
Greenview Senior High School	Greenview	46.6	11	97	NCES
Lincoln Grade School	Washington	46.6	33	547	NCES
Prairie Central Junior High School	Forrest	46.6	22	325	NCES
Roanoke-Benson Junior High School	Benson	46.6	13	193	NCES
Washington Community High School	Washington	46.6	67	1,044	NCES
Central NCES&M Middles School	Assumption	46.7	17	223	NCES
Kemmerer Village School	Assumption	46.7	8	28	NCES
Athens Middle School	Athens	46.8	15	283	NCES
Athens Senior High School	Athens	46.8	21	293	NCES
South Pekin Elementary School	South Pekin	46.8	22	295	NCES
Rochester Elementary School	Rochester	46.9	30	505	NCES
Fairview Elementary School	Springfield	47	20	325	NCES
Pleasant Hill Elementary School	Springfield	47	18	240	NCES
Rankin Elementary School	Pekin	47	17	199	NCES
Central Elementary School	Washington	47.1	31	517	NCES
Prairieview Elementary School	Royal	47.1	6	87	NCES
Findlay Elementary School	Findlay	47.3	10	129	NCES
Wanless Elementary School	Springfield	47.3	18	231	NCES
Mc Clelland Aviation Co	Springfield	47.4	NA	NA	NA
Salt Creek Academy	Athens	47.4	NA	NA	NCES
Ogden Elementary School	Ogden	47.6	13	178	NCES
Schramm Education Center	Pekin	47.6	7	33	NCES
Loda Elementary School	Paxton	47.7	14	222	NCES
Pekin Community High School	Pekin	47.7	115	2,181	NCES
Ridgely Elementary School	Springfield	47.7	16	249	NCES

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
Illinois Baptist College	Washington	47.8	50	480	IDCCA
Beverly Manor Junior High School	Washington	47.9	30	432	NCES
Broadmoor Junior High School	Pekin	47.9	29	412	NCES
Lanphier High School	Springfield	47.9	71	1,356	NCES
Matheny Elementary School	Springfield	47.9	18	245	NCES
Washington Middle School	Springfield	47.9	49	673	NCES
Don D Shute Elementary School	East Peoria	48	16	228	NCES
JL Hensey Elementary School	Washington	48	25	354	NCES
University of Illinois	East Peoria	48	NA	NA	NA
CB Smith Elementary School	Pekin	48.1	26	394	NCES
Dirksen Elementary School	Pekin	48.1	14	267	NCES
Jefferson Elementary School	Pekin	48.1	28	400	NCES
Sunset Hills Elementary School	Pekin	48.1	11	189	NCES
Washington Intermediate School	Pekin	48.1	47	662	NCES
Willow Elementary School	Pekin	48.1	22	327	NCES
Wilson Intermediate School	Pekin	48.1	33	564	NCES
Springfield College-Illinois	Springfield	48.2	NA	NA	NA
Withrow Elementary School	Springfield	48.2	12	292	NCES
Woodrow Wilson Elementary School	East Peoria	48.2	15	197	NCES
University of Illinois	Taylorville	48.3	NA	NA	NA
Visionway Christian School	Taylorville	48.3	NA	NA	NA
H&R Block Tax Service	Springfield	48.4	NA	NA	NA
North Elementary School	Taylorville	48.4	14	342	NCES
Springfield Ball Charter School	Springfield	48.4	NA	NA	NCES
Taylorville High School	Taylorville	48.4	52	876	NCES
Taylorville Junior High School	Taylorville	48.4	43	712	NCES
Able Security Training School	Springfield	48.5	NA	NA	NA
McClernand Elementary School	Springfield	48.5	25	286	NCES
Springfield Southeast High School	Springfield	48.5	70	1,379	NCES
St John's College	Springfield	48.5	NA	NA	NA
St John's Hospital School - Nursing	Springfield	48.5	NA	NA	NA

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
Lincoln Elementary School	Springfield	48.6	24	360	NCES
Sased Central-Proj Ican & Pace	Springfield	48.6	10	73	NCES
Career Logics Institute	Pekin	48.7	NA	NA	NA
Feitshans Center	Springfield	48.7	33	509	NCES
Heritage Elementary School	Homer	48.7	13	193	NCES
Heritage Junior High School	Homer	48.7	8	146	NCES
LE Starke Elementary School	Pekin	48.7	19	269	NCES
Riverton High School	Riverton	48.7	20	416	NCES
Board of Governors System	Springfield	48.9	NA	NA	NA
Iles Elementary School	Springfield	48.9	31	580	NCES
Robein School	East Peoria	48.9	15	204	NCES
Southern Illinois University	Springfield	48.9	166	4,334	IDCCA
Edison Junior High School	Pekin	49	28	446	NCES
Enos Elementary School	Springfield	49	21	286	NCES
Humboldt Elementary School	Humboldt	49	17	238	NCES
Pearson Museum	Springfield	49	NA	NA	NA
Siu School of Medicine	Springfield	49	NA	NA	NA
University of Chicago Center	Springfield	49	NA	NA	NA
Memorial Elementary School	Taylorville	49.1	17	371	NCES
Douglas School	Springfield	49.2	11	111	NCES
Glendale Elementary School	East Peoria	49.2	14	219	NCES
Undergraduate School	Springfield	49.2	NA	NA	NA
Heritage Elementary-Broadlands	Broadlands	49.4	7	73	NCES
Heritage High School	Broadlands	49.4	17	158	NCES
Springfield High School	Springfield	49.4	73	1,310	NCES
East Peoria Elementary Schools	East Peoria	49.6	NA	NA	NA
Lincoln Elementary School	East Peoria	49.6	14	217	NCES
Harvard Park School	Springfield	49.7	29	408	NCES
Jefferson Elementary School	Springfield	49.7	32	528	NCES
South Elementary School	Taylorville	49.7	15	239	NCES
East Peoria Community High School	East Peoria	49.8	70	1,182	NCES

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
Hazel Dell Elementary School	Springfield	49.8	11	208	NCES
Laketown Elementary School	Springfield	49.8	13	159	NCES
Lawrence Education Center	Springfield	49.8	4	42	NCES
Lincoln Elementary School	Pontiac	49.8	18	328	NCES
Oehrlein School of Cosmetology	East Peoria	49.8	NA	NA	NA
PL Bolin Elementary School	East Peoria	49.8	15	216	NCES
Elizabeth Graham Elementary School	Springfield	49.9	26	401	NCES
Armstrong-Oakview Elementary School	East Peoria	50	12	223	NCES
Central Junior High School	East Peoria	50	43	660	NCES
Dubois Elementary School	Springfield	50	29	539	NCES
Kincaid Elementary School	Kincaid	50	17	220	NCES
Kincaid High School	Kincaid	50	12	182	NCES
New Start Inc Training Center	Kincaid	50	NA	NA	NA
Jane Addams Elementary School	Springfield	50.1	20	319	NCES
Lincoln Land Community College	Springfield	50.1	71	3,100	IDCCA
Lincoln Land Musical Arts Center	Springfield	50.1	71	3,100	IDCCA
Metamora High School	Metamora	50.1	55	860	NCES
Chatsworth Grade School	Chatsworth	50.2	9	136	NCES
Heartland Community College	Pontiac	50.2	22	234	IDCCA
Lincolnland Community College	Taylorville	50.2	32	500	IDCCA
University of Illinois	Peoria	50.2	NA	NA	NA
Black Hawk Elementary School	Springfield	50.3	21	196	NCES
Central Elementary School	Pontiac	50.3	21	333	NCES
Washington Elementary School	Pontiac	50.4	19	338	NCES
Butler Elementary School	Springfield	50.5	22	297	NCES
Dodds School	Springfield	50.5	10	243	NCES
Illinois Central College	East Peoria	50.5	678	13,930	IDCCA
Pontiac High School	Pontiac	50.5	49	811	NCES
Pontiac Junior High School	Pontiac	50.5	32	441	NCES
US Grant Middle School	Springfield	50.5	46	720	NCES

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
Illinois First Realty	Springfield	50.6	NA	NA	NA
Edwin NCES Lee Elementary School	Springfield	50.7	25	307	NCES
Southern View Elementary School	Springfield	50.7	17	222	NCES
Livingston Area Vocational Center	Pontiac	50.9	8	NA	NCES
Benjamin Franklin Middle School	Springfield	51	53	773	NCES
Germantown Hills Middle School	Metamora	51	24	333	NCES
Owen Marsh Elementary School	Springfield	51.4	16	259	NCES
NCES-1 Travel Inc	Springfield	51.6	NA	NA	NA
Peoria Regional Office	Peoria	52	NA	NA	NA
Robert Morris College	Peoria	52	NA	NA	NA
Springfield School-Court Reporting	Springfield	52	NA	NA	NA
Illinois Central College	Peoria	52.1	NA	NA	NA
University of Illinois - West	Springfield	52.1	NA	NA	NA
Insurance Brokers-Agents-Exam	Peoria	52.2	NA	NA	NA
Jdr Educational Center	Springfield	52.2	NA	NA	NA
Riverview Elementary School	East Peoria	52.2	22	322	NCES
Sandburg Elementary School	Springfield	52.2	14	216	NCES
Peoria Barber College	Peoria	52.3	NA	NA	NA
Robert Morris College	Springfield	52.3	NA	NA	NA
University of Illinois College of Medicine	Peoria	52.3	NA	NA	NA
University of Illinois College of Nursing	Peoria	52.3	NA	NA	NA
Methodist Medical Center of Illinois	Peoria	52.5	NA	NA	NA
Capitol Area School-Practical Nursing	Springfield	52.6	21	NA	NCES
Illinois Welding School	Bartonville	52.6	3	28	IDCCA
H&R Block Tax Service	Springfield	52.7	NA	NA	NA
Esmen School	Pontiac	55.7	7	26	NCES
West Elementary School	Taylorville	58	14	243	NCES
Livingston County Academy	Pontiac	70	2	9	NCES
Blue Mound Elementary School	Blue Mound	NA	16	266	NCES

TABLE B-1
Schools Within the Region

Name	City	Miles from Clinton Power Station	Number of Staff [a]	Number of Students [a]	Source
Columbia Elementary School	Washington	NA	2	62	NCES
Decatur Correctional Center	Decatur	NA	0	NA	NCES
Findlay High School	Findlay	NA	10	67	NCES
Findlay Junior High School	Findlay	NA	3	32	NCES
Hay-Edwards Elementary School	Springfield	NA	27	331	NCES
HELP Arcola	Arcola	NA	1	36	NCES
HELP Sullivan	Sullivan	NA	2	37	NCES
Lincoln Elementary School	Monticello	NA	26	448	NCES
Macon Elementary School	Macon	NA	15	261	NCES
Monticello High School	Monticello	NA	36	521	NCES
Pontiac Correctional Center	Pontiac	NA	3	110	NCES
Saint Joseph Elementary School	Saint Joseph	NA	40	529	NCES
Saint Joseph Junior High School	Saint Joseph	NA	10	155	NCES
Taylorville Correctional Center	Taylorville	NA	6	372	NCES
Teen/Lamb Program	Decatur	NA	0	20	NCES
Washington School	Monticello	NA	26	422	NCES
White Heath Elementary School	White Heath	NA	10	204	NCES
Williamsville Middle School	Williamsville	NA	7	116	NCES

[a] If the source did not have individual schools listed then the total number of staff and students was assumed to be equal between all the schools listed and were divided evenly.

Sources: National Center for Education Statistics (NCES). Available at: http://www.capitolimpact.com. June 2002.
Illinois Department of Commerce and Community Affairs (IDCCA). Community profiles. Available at: http://www.commerce.state.il.us/com/index.html. July 2002.

Note: NA – Information Not Available