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DOE/EIS - 0138
Volume IV, Appendix 11

FINAL
ENVIRONMENTAL IMPACT STATEMENT

SUPERCONDUCTING SUPER COLLIDER

Volume IV
Appendix 11

December 1988

U.S. Department of Energy

UNITED STATES
DEPARTMENT OF ENERGY
WASHINGTON, D.C. 20545
ER-65/GTN

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11.1 ORGANIZATION

This ecological resources assessment focuses on identifying impacts (of construction and operations of the SSC) on the unique, unusual, or sensitive ecological systems at each of the proposed sites. Potential mitigations, where appropriate at the site selection phase of the SSC project, are also addressed. More detailed planning of mitigations will be required after selection of a site and preparation of a site specific engineering design. Evaluation of detailed information will be included in the Supplemental EIS prepared for the selected site.

This assessment addresses ecological impacts in the following areas:

- Sensitive terrestrial and aquatic communities
- Threatened, endangered, and state-protected species
- Wetlands
- Commercially, recreationally, and culturally important species.

This appendix contains impact assessment only. Description of the existing environment, lists of species, and habitat/association descriptions are contained in Volume IV, Appendix 5.

11.1.1 Sensitive Terrestrial/Aquatic Communities

Ecosystem structure and function can be temporarily or permanently altered by construction and/or operation of a major facility. Each system has differing sensitivities to disturbance. It is these sensitivities that are assessed in this appendix.

In almost any area of the country there are unique associations of plant and animal species. This assessment examines the unique or unusual ecological characteristics of the systems occupying the sites as compared to similar adjacent or nearby ecological systems. The impact assessment focuses on the relative sensitivity of these associations to development and operations of the SSC and the potential for mitigation of unavoidable impacts.

11.1.2 Threatened, Endangered, and State-Protected Species

Assessment of impacts to threatened, endangered, and state-protected species from SSC construction and operations are based on the following information: 1) Federal and state-protected plant and animal species lists (including candidate or proposed species), 2) identification of any designated critical habitats proximal to the SSC site for the species of concern, 3) recovery plans, and 4) other management plans and open literature research data.

For completeness, the impact assessment presented in this appendix includes state-listed species as well as Federal-listed, proposed, and candidate species. State agencies have been contacted regarding the presence or absence and the sensitivity of any state-protected, threatened, or endangered species.

Consultation with the U.S. Fish and Wildlife Service (USFWS) has been initiated in accordance with the requirements of the Endangered Species Act of 1973 (for listing of Federal species and their critical habitats). Documentation of the consultations for each state is presented in Attachment A to this appendix. This appendix contains an assessment of potential impacts of the project on threatened and endangered species and provides a basis for a determination by the DOE of the probable effect of construction and operation of the SSC at each of the site alternatives.

11.1.3 Wetlands

Under Executive Order 11990, "Protection of Wetlands," Federal agencies must consider the protection of wetlands in decision-making processes. Under Section 404 of the Clean Water Act, the U.S. Army Corps of Engineers (COE) has authority to issue permits to dredge or fill wetlands. The COE coordinates with the USFWS in assessing wetlands impacts and developing or approving plans to mitigate wetlands impacts. The U.S. Environmental Protection Agency (EPA) also coordinates with the COE in this permitting process and has veto power over COE decisions. DOE regulation 10 CFR 1022 (Compliance with Floodplain/Wetlands Environmental Review Requirements) provides the procedures which the DOE follows to assure adequate consideration of floodplains and wetlands. (See Volume I, Chapter 5, Section 5.1.2.2 and Volume IV, Appendix 7 for the floodplains assessment.) A permit under Section 404 of the Clean Water Act would be required prior to construction of the SSC if it would entail discharge of dredge or fill material into waters of the United States, including wetlands.

Accordingly, this EIS - including the Ecological Resources Assessment (Volume IV, Appendix 11), the Engineering Description (Volume IV, Appendix 1), and other sections (such as Volume I) - forms the basis for a wetlands assessment including the project description, location, analysis of impacts, and suggested mitigations.

For each site, the wetlands impact assessment: 1) identifies the location, extent, and quality of potentially affected wetlands (Volume IV, Appendix 11); 2) describes the existing settings wherein these wetlands occur (Volume IV, Appendix 5); 3) identifies the type and magnitude of expected impacts (Volume IV, Appendix 11); 4) assesses the significance of such impacts (Volume IV, Appendix 11); and 5) discusses mitigation measures that could be taken to reduce the magnitude of the anticipated adverse impacts associated with wetlands (Volume IV, Appendix 11).

11.1.4 Commercially, Recreationally, or Culturally Important Species

Individual species may be economically, recreationally, or culturally important to humans. Information required to assess impacts to these species from SSC construction and operations includes: 1) occurrence and abundance of wildlife and fish species harvested for economic gain, food, sport, or used as the basis of other recreational activities, or of special cultural significance to Native American or other cultural groups; 2) location, abundance, and description of habitat support requirements of these populations; and 3) current management and harvest practices for these species. Additional consideration of recreational values is given in Volume IV, Appendix 13. A baseline discussion of commercially, recreationally, and culturally important species is presented in Volume IV, Appendix 5, and assessment of impacts is addressed in this appendix.

11.2 TECHNICAL APPROACH

11.2.1 Purpose and Scope

The purpose of the ecological resources assessments is not only to satisfy the National Environmental Policy Act (NEPA), but also to meet the requirements of the Endangered Species Act, Executive Order 11990 and 10 CFR 1022. These assessments identify and evaluate the potential impacts on ecological (e.g., population, community, and species) resources at the site alternatives with respect to preconstruction, construction, and operations of the SSC. The underlying purpose of all these requirements is to consider the ecological consequences of these impacts. The scope of the ecological resource assessments includes: the terrestrial and aquatic ecosystems (including special populations such as threatened and endangered species), and wetlands.

The seven site alternatives encompass different ecological biomes: the desert site in Arizona, the western Great Plains short-grass prairie site in Colorado, the Illinois and Michigan sites in the northern deciduous forest/prairie border zone, the North Carolina site in the southeastern Piedmont mixed deciduous forest, the Tennessee site in the eastern deciduous forest, and the Texas prairie site. Since direct comparison of these vastly divergent ecosystems is not appropriate, the assessment of ecological impacts considers the unique or unusual characteristics of the ecosystems at the site when compared to adjacent or nearby ecological systems. The relative abundance of the sites' habitats and their relative sensitivity to construction and operations of the SSC are evaluated. Consideration is also given to headwaters of off-site river or wetland communities, migration corridors, breeding and nursery habitats, wintering areas, and other similar areas which may be affected by construction and operations of the SSC.

The consequences of the proposed action from an ecological resource perspective are examined with respect to SSC project requirements that are both site independent and site dependent. Ecological consequences are evaluated as to their magnitude and duration. Ecosystem processes

that are impacted on a short-term basis, but re-establish and stabilize (although perhaps on a different basis) shortly following construction and project implementation, are identified. Regardless of the site selected for the SSC and the degree to which mitigative measures are applied, some ecological impacts are anticipated. In general, unavoidable impacts include alternation or loss of habitat, decrease in habitat quality, some displacement of wildlife and vegetation, and the potential for replacement of native with managed species, either directly or by indirect effects such as increased noise or other pollutants.

11.2.2 Assumptions

11.2.2.1 Areas Disturbed

In the assessment of ecological resources, the DOE used the alignments as proposed by the states. Estimates of the amounts of land that would be disturbed either directly or indirectly by construction, and the amounts that would be permanently lost because of structures (roads, buildings, etc.), are derived from preliminary engineering design data. The total number of acres estimated to be disturbed permanently and temporarily by the project are presented in Volume I, Chapter 3, Table 3-2. While there are different amounts of land which would be affected by the SSC at the site alternatives, the differences in acreages are due primarily to the magnitude of ancillary development required. For example, in Colorado the acreage includes the right-of-way for the east-west access road which is necessary to qualify the site under ISP requirements. The basis for assessment of effects directly due to on-site development is assumed constant for all sites, e.g., construction activity at a service area irrespective of site is assumed to disturb the same acreage. The exception to this assumption is Arizona where cut-and-cover construction is proposed for portions of the tunnel.

11.2.2.2 Habitat Disturbed

While there clearly are different habitats and animal associations present at the sites alternatives, no attempt is made to compare numbers of plants or animals displaced or to assign relative values to "common" species associated with each site alternative. No attempt is made to estimate existing habitat areas for the entire project area, since the actual locations of the project facilities within areas are flexible (as are the placement of all areas except A, B and C) and will be determined on a site-specific basis once a site is selected. Acres of habitat within Areas A and B are subdivided into three categories based upon planimetric measurements from aerial photographs. The categories are: agricultural, natural systems (which includes wetlands), and urban/developed (Volume I, Chapter 4, Table 4-15A).

11.2.2.3 Threatened and Endangered Species

Based on information contained in Volume IV, Appendix 5, species lists, habitat availability, and presence or absence of threatened and endangered species were identified based on information from the USFWS and from the open literature. Lists of species of state-protected rare,

threatened, or endangered plants and animals, or species so acknowledged by the states, are presented because these species may inhabit rare, unique, or unusual habitats. When information was inconclusive or conflicting, the bias in this process was toward including a species on the lists rather than not including it.

11.2.2.4 Wetlands

The assessment of wetland impacts was based on estimates of the acreage of habitat that could be disturbed by construction of surface facilities. Estimates were conservative because it was assumed that no mitigation measures would be used. This approach was used because mitigation plans await final design and consultation with Federal and state agencies. The wetland assessment focused on the impact of those surface facilities proposed for immediate development. These facilities included Areas A, B, and all E, F, and K facilities except for K3 and K4. The acreage of affected wetland habitat was determined from the amount of wetland associated with each facility, up to the maximum amount of surface disturbance expected. Acreages of these disturbances varied somewhat between states.

The impacts to wetlands of facilities designated for future expansion were also assessed. Future expansion areas included Area C, all of the J facilities, K3, and K4. The acreage of wetlands that could be disturbed was estimated in a similar fashion to that described above. Construction of Area C was assumed to impact 279 acres (similar to Area B disturbance). It was assumed that a J facility would impact 20 acres. It was also assumed that only two J facilities at any site would be constructed: one among J1, J2, and J5, and another among J3, J4, and J6. The acreage disturbed by construction of the K3 and K4 facilities was assumed to be the same as the K5 and K6 facilities for each state.

The wetland assessment included the impacts of proposed spoils disposal sites, sediment retention ponds, and ancillary facilities. In most cases, locations for all ancillary facilities (e.g., pipelines, railroad spurs, and access roads) were not provided in the state proposals. A general assessment of the impacts of these ancillary facilities on wetlands, therefore, is provided in this document and is based on an estimate of the total acreage of disturbance expected (see Volume I, Chapter 3, Table 3-2).

The locations of surface facilities were determined from the original proposals submitted by the states as modified by supplemental data submitted on March 15 and 31, 1988. However, for each site selected mitigation measures may include realignment or relocation of surface facilities to avoid wetlands. Thus, the EIS places an upper bound on impacts.

National Wetland Inventory maps developed by the USFWS were used to locate wetlands and identify wetland types within and adjacent to proposed surface facilities (Areas A, B, C, E, F, J, and K) at each SSC site. Acres of wetlands associated with each proposed facility were determined by planimetry of wetland inventory maps. The entire area of

wetlands within the boundaries of surface facilities, including the area of any portion that extended beyond these boundaries, was used in this estimate of wetland acreage. The only exception was the treatment of linear wetlands (riverine or riparian wetlands) and large lacustrine wetlands; for these only the portion within the facility boundary and that extending 100 feet outside was considered.

Since the wetland assessment is based on the acreage of wetlands within and adjacent to surface facilities, the wetland acreages presented in the final EIS differ (often significantly) from those presented in the DEIS. The DEIS wetland totals were either for the entire study area or for all of the fee simple areas, depending upon how wetland information was presented within the individual state's data submissions. Therefore, wetland acreage comparisons among site alternatives were sometimes misleading and did not consistently address the potential for impact or degree of mitigation that may be required. The final EIS wetland totals are only for fee simple areas associated with surface facilities.

The quality of wetlands within proposed surface facilities was evaluated and the land cover type immediately adjacent to wetlands was determined because of its influence on wetland quality. Wetland quality and surrounding land cover type were determined in most cases by air and ground surveys of the sites, as supplemented by aerial photographs and maps. Determinations of quality were based on the apparent degree of degradation of each wetland. Categories utilized for determining the degree of degradation were:

- None/slight - no apparent observation of human induced disturbance (including that caused by livestock); wetland plant species predominate at the site.

- Moderate - wetland disturbed by human activity but natural wetland plant community established; less than 25 percent of the wetland edge or shoreline disturbed.

- Severe - wetland disturbed by human activity and natural wetland plant community not present or greatly reduced in extent; 25 percent or more of the wetland edge or shoreline disturbed and devoid of most wetland vegetation.

The potential for indirect impacts (e.g., from erosion and water discharges) to wetlands located adjacent to proposed surface facility sites was also determined. This was done by superimposing proposed surface facility locations on USFWS wetland maps. Wetlands were considered adjacent to a site if they were located within 250 feet of the site boundary.

11.2.2.5 Commercially, Recreationally, or Culturally Important Species

Commercially important species are those non-agricultural species that are managed or harvested by man for economic gain. Examples would include commercial fisheries, furbearing animals, red cedar and other specialty tree species, and herbs.

Culturally important are those species that are held in some special religious, historical, or celebratory significance by some group of people. Examples include wild horses, feral burros, some fungi, and certain bird species. Federally-listed threatened and endangered species, such as the bald eagle, which are culturally significant are assessed elsewhere in this appendix and are excluded from this analysis.

Recreationally important species are those that people seek out to observe, photograph, collect, or fish. Birding, fishing, hunting, nature study and nature photography, outdoor recreation, hiking, and off-road vehicle use are among the activities associated with the use of this resource. Impacts of the construction and operation of the SSC are based on estimation of the potential for changes in the existing resource balance or use of the site area. Likewise, potential for changes in access to the resource are assessed.

11.2.2.6 Noise

The following assumptions are drawn from Volume IV, Appendix 9, and form the basis for the consideration of noise impacts to ecological resources for all sites. The assessments are based on estimates of noise levels that would be produced during construction activities at the service areas and access areas (E and F). Daytime noise levels would be 75 dBA at 250 ft from the source and nighttime levels would be 75 dBA at 500 ft from the source. The noise impacts on wildlife are also based on the distance from the construction noise source to the point at which the preconstruction noise level of L_{dn} (40 dBA) is not increased by the construction activity. This value differs between day and night because the construction schedule prevents operation of the louder noise sources during nighttime hours. The daytime distance referenced above for construction is estimated to be 6600 ft, while the nighttime distance is estimated to be 5800 ft.

Blasting may be used in construction of shafts at the access areas and service areas. While this sudden, intense noise could create a startle or panic response depending on the location of wildlife at the time of the incident, this source would be considered short term. By avoiding blasting during times when species exhibit critical behaviors, the effects of noise from blasting could be mitigated. Wildlife may be temporarily displaced from areas adjacent to the noise sources but would not necessarily be inhibited from returning once they become acclimated to the noise.

During operations, noise levels generated (compressors, etc.) would be considered "permanent sources." The noise levels expected at a service area during operations are 60 dBA at 750 ft. The distance from the service facility to the point at which the preconstruction noise level L_{dn} (40 dBA) is not increased by the sound of SSC operation is 3400 ft. Depending upon the degree of acclimation of wildlife to the constant noise, impacts could range from no effect to adve
areas adjacent to the noise source.

11.3 RESOURCE ASSESSMENTS

11.3.1 Arizona

Construction of all parts of the SSC would permanently disturb approximately 933 acres of Sonoran desert scrub communities, and temporarily disturb approximately 1,222 additional acres, for a total disturbance of 2,155 acres. These figures assume that no land would be disturbed by spoils disposal. If the spoils were disposed of on-site, an additional 640 acres would be disturbed. The perimeter of the A and B areas encompasses approximately 2,050 acres, which in Arizona are virtually all naturally vegetated. Construction activities in Areas A and B would require 476 acres of land, 283 of which would be permanently disturbed with buildings and support facilities. No wetlands are located within these areas. Mitigation activities could be expected to reduce the overall impact of the temporary and permanent acreage losses.

11.3.1.1 Sensitive Terrestrial/Aquatic Communities

The two types of upland communities, Arizona Upland and Lower Colorado, and the Sonoran riparian woodlands associated with the edges of dry washes are neither rare nor unusual in this area. The loss of this habitat is not expected to be significant. Nevertheless, these habitats are very sensitive to the disturbance of surface soil. Recolonization can take many decades following a disturbance such as land clearing, mesquite harvesting, or off-road vehicle passage. The natural, unassisted return to a predisturbance plant and animal community can require more than 100 years. Because of this sensitivity, careful design and continuing surveillance of construction practices would be required to minimize disruption of the natural plant and animal communities. Plans to minimize surface disturbance during construction, and designation of prohibited areas for vehicles, would be developed as part of final project design and addressed in the Supplemental EIS should the Arizona site be selected.

There are no wildlife refuges or sanctuaries in the vicinity of the proposed site. However, a portion of the area is a Wilderness Study Area.

Especially sensitive areas along the proposed SSC ring in Arizona relate to the ranges of the desert bighorn sheep, Gila monster, and the desert tortoise, which are discussed below in Section 11.3.1.2 on threatened and endangered species.

The site proposed by Arizona for the SSC contains no aquatic ecosystems and thus no impacts on aquatic communities are expected. Creation of temporary or permanent bodies of water may result if ponds are used for cooling tower blowdown and sewage effluent. This could have a positive impact on some wildlife species in the area and a negative impact on others. The availability of water is a principal limiting factor for the population density of many of these species. Small mammals of the area are desert adapted and do not need or flourish with water. Predator population increases and decreases would follow changes in the prey

population. Should the small mammal and bird populations increase as the result of SSC-related features (e.g., ponds), predator populations would be expected to increase as well.

11.3.1.2 Threatened, Endangered, and State-Protected Species

The DOE has initiated consultation with the USFWS under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543), regarding the presence or absence of threatened or endangered species at the proposed SSC site (Volume IV, Appendix 11, Attachment A). It has been determined that there are no designated critical habitats in the vicinity of the site (50 CFR 17).

One Federally listed endangered plant species, the Tumamoc globeberry (Tumamoca macdougallii), is a small, thin perennial vine typically found growing in association with desert shrubs, and is generally noticeable only when it flowers (Attachment A). It has been collected from nearby Pima and Pinal counties, and 15 plants have been identified in the Vekol Valley south of Interstate 8 in Maricopa County (Bisson 1988). This area is in the vicinity of the southern extension of the collider ring. This evidence somewhat increases the small potential for discovery of this species in other portions of the collider ring and associated facilities, particularly toward the southern end of the ring and the water well field. The water pipeline and service roads could be relocated to avoid any plants found within proposed rights-of-way. If Tumamoca were located on the collider right-of-way, it would be feasible to tunnel in that area without creating negative impacts to the plants. The probability of locating Tumamoca on the campus sites (which contains only marginally suitable habitat for Tumamoca), on one of the facility access points into the ring, or on some small features which cannot be relocated is extremely low.

Although the Tumamoc globeberry has not been reported throughout the Arizona site, it occurs in habitats similar to those found on the site and, therefore, should the Arizona site be selected more detailed surveys in areas subject to surface disturbance would be necessary prior to actual construction activities, to confirm the presence or absence of this species. If the plant is located in an area likely to be disturbed, the DOE would consult with the USFWS to determine the degree of avoidance necessary and any acceptable mitigative measures.

The Federally-listed endangered American peregrine falcon (Falco peregrinus anatum) occurs statewide during migration and may also nest in Arizona in areas of tall cliffs near water. Peregrines may hunt throughout the Maricopa Mountains and their adjacent valleys, but are currently not known to nest in the vicinity of the site. Another wide ranging species, the Federally-listed endangered southern bald eagle (Haliaeetus leucocephalus leucocephalus), has been recorded along the Gila River west of the site. It could be present at the site only as a rare visitor. Because of their scarcity in the region and lack of rivers and other large water bodies in the area, neither of these species would be adversely affected by the project.

The Arizona Native Plant Law (Chapter 7, Arizona Revised Statutes) restricts the collection of many plant species in Arizona, including all cacti. Major construction projects, such as the SSC, are allowed to remove included species, but require coordination with State officials. This process can provide an opportunity to mitigate unnecessary impacts to the cacti and other included native species by plant salvage and relocation to other sites.

Several plant species which are candidates for listing as either threatened or endangered by the USFWS are present in the area, and one has been observed on the site. While these candidates for listing do not have protection under the Endangered Species Act of 1973, they are considered during Section 7 consultation and are listed under the Arizona Native Plant Law. Under the State law mitigation of impacts to these species could include transplanting to areas not scheduled for site disturbance or to the campus area for landscaping purposes. A Category 1 species known to occur in Maricopa County, Neolloydia erectocentra var. acunensis, is a creosote-bursage shrub found on well-drained knolls and ridges. The night-blooming cereus (Peniocereus greggii var. transmontanus; Category 2) has been observed throughout the site at densities of up to 0.5 plants per acre or 320 plants per mi^2 (Bisson 1988).

Desert tortoises (Gopherus agassizii), a Category 2 species, are found in areas such as those occurring in several areas around the ring, particularly the washes northeast of the Maricopa Mountains (Ross 1986). Sensitive areas for the desert tortoise include the toes of slopes around the upper bajadas and incised washes running out of the mountains that contain the mixed cacti/palo verde associations having the perennial grasses and preferred forbs. Thus, especially sensitive areas for SSC construction may be around sites E2, K6, E7, F7, E9, and possibly Area B. The proposed location of E7 is within a one-square-mile study plot established by the Bureau of Land Management (BLM) to observe the effect of grazing on the desert tortoise (Palmer 1987). From preliminary data, a high density of approximately 57 tortoises/mi^2 occurs at this site (Palmer 1987). This density is probably representative of high rocky areas and is expected to be dramatically less in lower bajadas and lower, less rocky areas. These numbers also suggest that the Maricopa Mountains may support the highest known population densities in Arizona.

Tortoises and other reptiles may be stirred to activity during normally inactive periods by noise from construction and/or operations of the SSC. Such activity, if inappropriate to their physiological status at the time of disturbance, may result in potential hearing loss and death to individuals due to desiccation and heat stress.

The degree of impacts to the desert tortoise can be dependent on the time of year. The breeding season for the desert tortoise extends from June through October, mating occurs from June to August, and eggs are laid in a shallow nest in the soft soil at the entrances to burrows from August to October (Burge 1979). The eggs hatch in approximately three months.

The tortoise has an extremely slow rate of sexual maturation, with estimates of up to 30 years of age before reaching maturity. The maximum lifespan of a desert tortoise is approximately 100 years. Tortoises are dormant (a period called brumation) generally from October to between February and April. Tortoises burrow in the ground during brumation alone and in pairs.

Mitigation of impacts to desert tortoises should include: 1) presence of an experienced tortoise biologist to monitor new road construction and all land clearing, and to monitor the effectiveness of all mitigative measures; 2) location, flagging, and avoidance of tortoise burrows prior to initiation of surface disturbing activities; 3) proper handling and moving (if alternate habitat is available) of any tortoise encountered during construction; 4) avoidance of construction during critical times of the year, including the the periods of March to May and July to October; 5) construction of barriers to movement in high risk areas, while providing safe corridors around such areas; 6) revegetation of all disturbed sites with native Sonoran Desert plant species, particularly those of value to the desert tortoise; 7) required briefings of construction personnel in regard to status of laws pertaining to the tortoise, and all the preceding stipulations; and 8) adequate habitat compensation, such as replacement and protection of prime habitat in another area, for loss due to project development. Since desert tortoises are likely to be found in a number of areas throughout the SSC site, loss of habitat and potential loss of individuals could be expected without these mitigative measures.

The Gila monster (Heloderma suspecta), another USFWS Category 2 species, is likely to occur on rocky slopes and in washes of the desert scrub associations common to the proposed site. However, very little is known of the status of this species in Arizona or in the site area (Werner 1987). Measures taken to mitigate impacts to the desert tortoise, other than physical removal, would tend to mitigate impacts to the Gila monster because these two species occur in similar habitats and both are ground dwelling. Mitigation may include avoidance of disturbance to Gila monster habitat during the species' activity periods.

Another Category 2 species, Swainson's hawk (Buteo swainsoni), may be present as a migrant in and around the agricultural areas in the vicinity of the Arizona site. Because Swainson's hawks do not breed in the site area and are not likely to be attracted to the majority of habitats present, the proposed SSC project is not expected to adversely affect this species.

Arizona Upland Desert Scrub communities of the Maricopa Mountains presently support a small population (one to five sheep per square mile) of the desert bighorn sheep (Ovis canadensis mexicana). This species is listed as threatened by the Arizona Game and Fish Commission; it is also a game species in Arizona. While desert bighorn sheep are not migratory in the classic sense, they do undergo significant seasonal movement and occupy a large range (estimates indicate up to 100 square kilometers for a mature ram; Dummer and Patten 1985). The area containing the SSC site has been proposed as a location for future transplant programs.

Principal habitat disturbance activities associated with construction and operation of the SSC in Arizona which might adversely affect the bighorn sheep include any construction, road building, fencing, or other intensive human activities in the northern half of the far cluster, particularly areas K6, E6, F6, E7, and F7. Although permanent loss of habitat is not expected, bighorn sheep may be adversely affected by construction noise, operations noise, and the presence of humans. While noise may temporarily displace bighorn sheep from areas adjacent to the noise source, it would not necessarily inhibit their return if they acclimate to the noise. Stress caused by increased noise could also affect bighorn sheep during breeding and lambing seasons.

Blasting may be used in construction of shafts at the access areas and service areas. While this sudden, intense noise could create a startle or panic response depending on where the bighorn sheep were at the time of the incident, this noise source would be short term. By avoiding blasting during rutting and lambing seasons (fall and spring months), the effects of noise from blasting would be expected to be similar to those described above, i.e., the bighorn sheep may be temporarily displaced from areas adjacent to the noise sources but not necessarily inhibited from returning once they become acclimated to the noise.

The desert bighorn sheep range includes areas on the desert floor close to mountain ridges. Consequently, some attenuation of noise would be expected. The extent of the range available to the bighorn sheep, together with the fact that this range is currently below carrying capacity, suggests that there is only a small probability that construction noise will have a measurable long-term effect on the desert bighorn sheep. Moreover, the bighorn sheep are also subjected to the presence of people, hunting pressure, and the noises of off-road vehicles associated with multiple use of BLM lands.

During operations, noise levels generated by the SSC (compressors, etc.) are considered "permanent sources." The noise levels expected at a service area during operations are 60 dBA at 750 ft. Noise would be indistinguishable from background (40 dBA) at a distance of 3,400 ft from the source (refer to Volume IV, Appendix 9 for additional information on noise sources). Depending upon the degree of acclimation of individual bighorn sheep to the constant noise, effects could range from no effect to total bighorn sheep avoidance of areas adjacent to the noise source. If Arizona is selected as the location of the SSC, a detailed study of construction noise impacts on the desert bighorn sheep would be included in the design study.

11.3.1.3 Wetlands

Based on USFWS classification criteria there are no wetlands in the project area at the proposed Arizona site. Xeroriparian habitats associated with larger ephemeral drainages and stock ponds are found in the vicinity of the project area, but none are close enough to surface facilities to be impacted by construction activities or operations of the SSC facility (Volume IV, Appendix 5).

A. Construction Impacts

No impacts to wetlands are expected, because of the absence of wetlands in the project area.

B. Operations Impacts

A 135-acre evaporation pond (or a number of smaller such ponds totalling 135 acres) would be created. This pond could be considered a wetland by the USFWS. Depending upon design characteristics and the physical and chemical conditions that develop, the evaporation pond could provide habitat for a number of plant and animal species.

11.3.1.4 Commercially, Recreationally, or Culturally Important Species

Although prohibited by State law, harvesting mesquite and collecting reptiles and cacti are likely to continue throughout this region because of increased access and human presence in the area provided by the project. It is difficult to predict exactly how poaching will be affected following SSC project activities in the area; while improved access, including off-road vehicle routes, may allow more poachers to enter the area, it may simultaneously inhibit poaching, due to greater habitation and population density, and perhaps more security controls in the area. Increased access to the SSC areas could be balanced somewhat by institutional controls on access, as has been suggested informally by the BLM. One potential point of conflict could occur if extensive fencing is used for control of public access. In some areas this would conflict with recommended desert bighorn sheep and desert tortoise mitigation efforts, which prohibit fencing in key habitats and migratory areas. The impact of fencing on the desert tortoise, however, depends on the type of fence used. Four- to five-strand barbed wire would have virtually no impact on the species; a chain-link fence to the ground, on the other hand, would severely curtail tortoise movements. Fencing and other controls would be instituted in consultation with the BLM and the Arizona Game and Fish Department.

Hunting as a recreational activity would be restricted during construction, and would continue to be tightly controlled within fenced fee simple areas for the operational life of the SSC. Should the Arizona site be selected, the exact locations of these areas would be determined during final design of the project. No information is available on hunting frequency or success in the area. Arizona Game and Fish Department management of hunting and fishing should not change substantially as a result of SSC presence beyond the construction period.

Feral burros, considered culturally important under the Wild Free-Roaming Horses and Burros Act of 1971 (16 USC 1331-1340), occur primarily in the northwestern portions of the site, in association with the mountains and maintained water catchments.

11.3.2 Colorado

The predominant vegetation type in the area of the proposed SSC site in Colorado is nonirrigated farmland, primarily dryland wheat, followed by intensively-grazed rangeland. Natural plant communities in the area are very limited but include short-grass prairie, mixed-grass prairie, alkali range, and riparian lands. Most of these natural areas are found in drainage areas and along fencerows that have not been disturbed by agricultural practices. There is very little overlap between the planned facilities and the distribution of these surviving natural environments. The area of terrestrial habitats permanently disturbed or removed by the proposed project would be approximately 1,327 acres, and the area temporarily disturbed would be approximately 2,068 additional acres. Approximately 140 acres would be used for spoils disposal. Almost all of this acreage is agricultural land. The perimeter of Areas A and B encompasses approximately 2,050 acres. This includes approximately 1,260 acres of agricultural land and 790 acres of natural systems not in agriculture. Construction activities in Areas A and B would require 476 acres of land, 283 of which would be permanently disturbed with buildings and support facilities. Approximately three acres of wetlands are located within Area B. Should the Colorado site be selected, consideration would be given to avoiding wetlands and placing the SSC facilities in habitats with lesser value during final design. Mitigation activities could be expected to reduce the overall impact of the temporary and permanent acreage losses.

The State of Colorado recommended methods to mitigate or avoid unnecessary impacts to sensitive communities. Perhaps most sensitive are the riparian woodlands. Riparian woodland does not occur within the immediate areas where surface facilities for the proposed collider are designated. Some riparian vegetation is associated with the proposed access roads.

11.3.2.1 Sensitive Terrestrial/Aquatic Communities

There are no wildlife refuges or sanctuaries in the vicinity of the proposed site. Riparian vegetation associated with floodplains is uncommon and consequently of major importance to wildlife populations in northeastern Colorado. Among other important roles, trees along stream courses serve as habitat for raptors, including Swainson's and ferruginous hawks, both Federal candidate species. However, only a part of each of these areas would be developed. If this site is selected, during final design attention would be paid to minimizing or preventing impact to riparian communities. Tree growth patterns under Colorado plains conditions are so slow and unpredictable that maintenance of existing trees is far superior to attempting restoration or revegetation (Volume IV, Appendix 7 identifies those locations where fee simple land acquisitions intrude upon floodplains).

Pronghorn antelope on the plains of Colorado are sensitive to the loss of winter range or barriers across migration routes. The Colorado Division of Wildlife (1987) has identified wintering and migration areas for pronghorn antelope in the short-grass prairie areas in the northwest quadrant of the ring. The Badger Creek area adjacent to Area C, J5, K2, and E1 is the area of greatest overlap of pronghorn habitat and SSC construction activity. Some of this habitat might be disturbed or destroyed. In response to the sensitivity of the antelope to loss of winter range and barriers, the State has proposed to minimize construction of new roadways by primarily utilizing improvements in existing corridors. Should the Colorado site be selected, placement of any necessary fences or roads should be evaluated during final design to minimize disruption to pronghorn migration.

Natural prairie environments, though limited in extent, may also contain plants and animals other than the pronghorn antelope that could be sensitive to disruptions caused by the construction or operations of the SSC. For example, prairie habitat may support prairie dogs and their predator, the endangered black-footed ferret. Much of eastern Colorado was originally dominated by short-grass prairie; however, it is being converted to grazing land or nonirrigated cropland in many areas (U.S. DOI, 1985). Mixed-grass prairies are often the result of overgrazing effects on short-grass prairies. Development of the SSC project in Colorado could continue the transition from prairie to more developed lands. If Colorado is selected as the site, the potentially sensitive species associated with the prairie type of ecosystem would be identified by surveys of the site as part of the Supplemental EIS.

The SSC project area lies within the Central Flyway, used each spring and fall by a large number of migrating waterfowl and shorebirds. The South Platte River and its floodplain, along with the adjacent reservoirs that lie several miles north of the proposed site, are the most heavily used. The SSC would not disturb habitats in these areas during either construction or operations.

The South Platte River is the major aquatic resource in the region. The stream exhibits a highly braided channel and concomitantly silty bottom at this point. The river is of sufficient distance from the ring alignment to prevent direct impacts. However, should final design of water withdrawal include the South Platte River, it could lead to habitat disturbance despite extensive mitigation (see Section 11.3.2.2 below for habitat disturbance and Volume IV, Appendix 7, Section 7.1.3.2.G for additional discussion regarding water withdrawals).

Other aquatic resources in the area are small ponds, mostly used for agricultural purposes. The impact on this resource is presumed to be low, but cannot be quantified until final layout is selected.

Wintering bald eagles at Barr Lake State Park and the Rocky Mountain Arsenal and a nesting pair of eagles at Barr Lake could be exposed to disturbance by construction of the new access highway from Interstate 76 (I-76) and the new Denver airport proposed by the State. In the event

the highway was sited along the proposed corridor, the extent of the impact of this disturbance would be the focus of consultation with the USFWS under Section 7 of the Endangered Species Act of 1973.

Final placement and mitigation planning for ancillary facilities (such as access roads in the SSC area, utilities, waste disposal plants, and water supplies) would determine the extent and magnitude of impacts from these activities. Maps and discussion of the location of these facilities are presented in Volume IV, Appendices 1 and 10, and impacts to prime farmlands are discussed in Appendix 13. Should the Colorado site be selected, further analysis of ancillary facilities would be conducted, and presented in the Supplemental EIS.

11.3.2.2 Threatened, Endangered, and State-Protected Species

The DOE has begun consultation with the USFWS in accordance with the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543), regarding the presence or absence of listed and candidate species in the vicinity of the proposed Colorado SSC site (Attachment A). If the Colorado site is selected, this process would continue throughout all project phases.

It has been determined that there are no designated critical habitats for Federally-listed threatened or endangered species potentially present at the proposed SSC site (50 CFR 17).

Three Federally-listed species would be considered only if there would be water level fluctuations in the South Platte River due to SSC water requirements. These species - the Federally-listed endangered interior least tern (Sterna antillarum anthalassos), the endangered whooping crane (Grus americana), and the threatened piping plover (Charadrium melodus) - have been observed in the Platte River floodplains in Nebraska. Three other Federally listed species would be considered if there were water depletions from the Colorado River: these are the Colorado squawfish (Ptychocheilus lucius), humpback chub (Gila cypha), and bonytail chub (Gila elegans). These three Federally-listed endangered fish are subject to a recovery plan resulting from an agreement between states using Colorado River water, the Western Power Administration, and the Department of the Interior. In addition, a major concentration of Federally-listed endangered bald eagles (Haliaeetus leucocephalus) occurs along the South Platte River in the general area of Fort Morgan and Brush, north of the proposed SSC site. These eagles would be adversely affected only if water depletions reduced their prey base of fish and waterfowl.

Present projected water needs for the SSC would be met by obtaining water from Morgan County wells, augmented, if necessary, by previously allocated water from the Colorado Big Thompson system. The use of the Morgan County wells within the South Platte River could result in slight water level fluctuations adjacent to the points of withdrawal. This would not affect downstream locations in Nebraska used by the endangered whooping crane, piping plover, and least tern. Nor are these slight

fluctuations likely to affect the prey base of fish and waterfowl utilized by the winter concentrations of endangered bald eagles in the vicinity of Fort Morgan and Brush. Moreover, these water level fluctuations would not normally require flow augmentation from other water allocations; thus the Colorado squawfish, humpback chub, and bonytail chub found in the Colorado River basin are not expected to be adversely affected.

Although prairie dog towns are presently scattered throughout the region containing the SSC site and access routes, there is no evidence that the Federally-listed endangered black-footed ferret (Mustela nigripes), exclusively associated with this habitat, is present. The last probable sighting of the ferret in Colorado was more than 15 years ago, and the last sight records for the region containing the site were from the 1950s (Leachman 1988). In general, the dry land farming and grazing practices common to this area are historically linked with prairie dog elimination which, in turn, may have contributed to the elimination of ferrets.

Preliminary surveys of the SSC site and proposed access route have located several prairie dog populations. These are scattered areas of fewer than 100 acres each, surrounded by cropland and rangeland and likely to have limited populations of prairie dogs. Two populations occur east of Barr Lake near the proposed highway access. Two additional populations are present outside of the ring in the vicinity of the F9 service area and the E10 intermediate access. It is unlikely that these areas contain populations of black-footed ferrets. Should the Colorado site be selected, however, before any site disturbance more detailed field surveys would be performed, to determine if there was the possibility that a population at black footed ferrets was present. If so, formal consultation with the USFWS would occur.

The Federally-listed endangered American peregrine falcon (Falco peregrinus anatum) is a wide-ranging migrant throughout Colorado. It is rarely observed, but may occasionally be present in the region in areas such as the South Platte River and at reservoirs. Because it is typically associated with the larger bodies of water having cliffs and other roosts, it would not be expected to be adversely affected by proposed project activities.

Two Federal candidate species (Category 2) are known to occur within the SSC ring area, although details of their numbers and specific habitat requirements on site are not known. These are the ferruginous hawk (Buteo regalis) and Swainson's hawk (Buteo swainsoni). At present, these species are not afforded Federal protection under the Endangered Species Act of 1973 until they are proposed for listing as threatened or endangered. However, because their status could change at any time during development of the SSC project, both birds would be taken into consideration in the SSC development plans should the Colorado site be chosen. In addition, the ferruginous and Swainson's hawks are protected under the Migratory Bird Treaty Act. Impacts to these species could

include loss of habitat, direct mortality, and behavioral disturbance due to noise and the presence of humans. Mitigation of these impacts typically include avoidance of natural habitat during project development as much as practicable.

Other candidate wildlife species that may occur, but have not been observed, include the swift fox (Vulpes velox; C2), Preble's jumping mouse (Zapus hudsonius preblei; C2), long-billed curlew (Numenius americanus; C2), western snowy plover (Charadrius alexandrinus nivosus; C2), and mountain plover (Charadrius montanus; C1). These species are primarily associated with relatively natural short-grass prairies and would be considered rare to nonexistent in areas containing intensive agricultural development. Therefore, these species would not be expected to be adversely affected by the project.

While definitive surveys have not been conducted, it appears that none of the candidate plant species associated with the native short-grass prairie community type are likely to be present in areas of the ring where surface disturbance would occur during construction. This is due primarily to the intensive agriculture and grazing that have occurred in recent history. Plant species include the Colorado butterfly plant (Guara neomexicana var. coloradoensis; C1) and streaked ragweed (Ambrosia linearis; C2). If the Colorado site is selected, additional consideration would be given to these species during project design, until such time as their presence or absence in areas of construction could be confirmed.

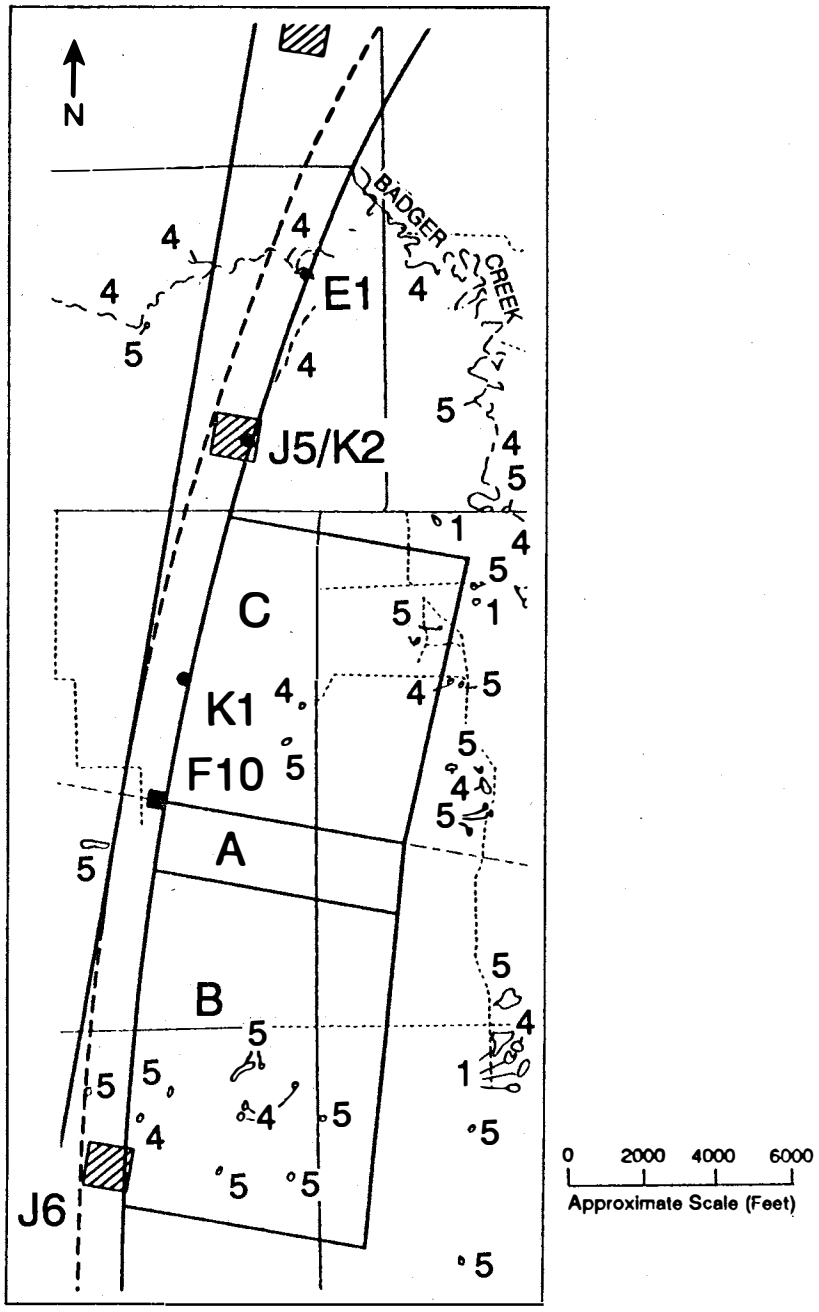
The Colorado Department of Natural Resources has also been contacted regarding the presence or absence and sensitivity of State-protected, threatened, or endangered species. State-protected species include the bald eagle, peregrine falcon, and whooping crane (addressed previously), the plains sharp-tailed grouse (Pediocetes phasianellus jamesi), and the sandhill crane (Grus canadensis). One other species of special interest, the greater prairie chicken (Tympanuchus cupido), is monitored in areas north of the proposed site. These species may occur in the region, but present knowledge of the proposed site suggests that there is limited or no preferred habitat. There are no listed State-protected plants in the region.

11.3.2.3 Wetlands

The proposed SSC project site in Colorado contains areas classified as wetlands by the USFWS, however, such areas are not common. Small palustrine wetlands located in swales in the rolling topography are the most common type, although lacustrine and riverine wetlands are also present in the region. Surface facilities encroach upon 4.7 acres (16 individual wetlands) of wetlands (Figure 11-1 and Table 11.3.2.3-1).

Figure 11-1

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED COLORADO SITE: AREAS B, C, E1



LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Table 11.3.2.3-1

WETLANDS WITHIN PROPOSED SURFACE FACILITY AREAS IN COLORADO[1]

Facility	Number of Wetlands[2]	Area of Wetlands (ac)[3]	Area Disturbed (ac)	Area of Wetlands Impacted (ac)[4]
Proposed				
B	10	3.2	279	3.2
E1	1	0.5	1	0.5
Total	11	3.7	280	3.7
Future Expansion				
C	4	0.7	279	0.7
J6	1	0.3	20	0.3
Total	5	1.0	279-299[5]	0.7-1.0[5]

1 Source: USFWS National Wetland Inventory maps.

2 Includes all wetlands located completely or partially within surface facilities.

3 Includes entire area of wetlands including that extending beyond facility.

4 Area of wetlands within facility boundary up to a maximum of area to be disturbed.

5 Upper and lower bounds are placed on totals for future expansion areas because only two of the J areas (one of either J1, J2, or J5, and one of either J3, J4, or J6) would be developed if needed

All of the wetlands located within surface facility boundaries are moderately degraded from agricultural activities. However, these areas provide topographic relief and are among the only natural areas occurring within the study area.

Additional areas that are classified as wetlands are located along the proposed railroad spur, north/south access road, and the east/west access road. Both the north/south access road and rail spur would cross palustrine emergent wetlands and flats associated with Badger Creek and its tributaries and a riverine wetland associated with the Fort Morgan Canal. Each wetland that would be crossed is about 0.2 acres or less in size; these total approximately 1.6 acres for both the access road and

rail spur. Those wetlands associated with Badger Creek and its tributaries are moderately degraded from agricultural activities and some portions are severely degraded from overgrazing. The wetlands associated with the Fort Morgan Canal are severely degraded due to a combination of excavation, water level modifications, and agriculture.

The planned alignment of the east/west access road crosses at least 41 wetlands, although the Colorado Department of Highways estimates this number at 300 (see Volume I, Chapter 5, Section 5.2.9.7). This discrepancy could be an artifact of splitting larger wetlands into smaller units and/or including wetlands that may be adjacent to, but not actually within, the proposed road alignment. Total acreage involved would be about 200 acres. Most of the wetlands are associated with small order, intermittent streams and are 0.5 acres or less in size. As with other wetlands in the area, most (26 of 41 observed) are moderately degraded from agricultural activities. Another 11 wetlands are severely degraded either from excavation and water level modification (e.g., canals along the western portion of the corridor) or from agricultural activities (e.g., farm ponds). However, four wetlands exhibited slight to no degradation, and are among the most extensive wetlands in size that would be encroached on by collider and ancillary surface facilities. The wetlands associated with Beebe Seep and Neres Canal contain habitats extensively utilized by waterfowl. Other streams (such as Bijou Creek) have large floodplains with stands of cottonwood. These areas provide much of the natural vertical topographic relief in the area.

A. Construction Impacts

Two of the surface facilities (Area B and E1) to be initially developed at the proposed Colorado site could impact wetlands. Construction at these sites could result in the destruction or modification of about 3.7 acres of palustrine wetlands. From practical engineering and construction standpoints, wetland habitats would be avoided wherever feasible and the amount of wetland habitat actually impacted would likely be lower (see also Mitigation below).

Approximately 1 acre of wetland habitat is located within future expansion areas and could be impacted if construction occurred at these sites (Table 11.3.2.3-1 and Figure 11-1).

Spoils disposal would occur on upland sites away from wetlands. Consequently no impacts to wetlands from spoils disposal are anticipated.

Direct impacts to wetlands within construction areas could result from 1) the filling, draining, or elimination of portions of the wetlands; 2) vegetation clearing; 3) the use of heavy machinery within wetlands; and 4) the installation of structures within or adjacent to the wetlands. The potential impacts resulting from these activities could include disruption of drainage patterns, erosion and siltation, changes in water temperature and chemistry, habitat destruction, wildlife displacement, water-level modification, and the inadvertent release of

chemicals (e.g., fuel). Some of these impacts could be temporary and, with adequate revegetation and erosion control measures, would cease soon after construction was complete. Dewatering of wetlands would not be expected to occur because low rates of groundwater seepage into the tunnel are anticipated (see Volume IV, Appendix 10, Section 10.2.3.2).

There are wetlands adjacent (within 250 feet of facility boundaries) to E4, F1, J2, and K6. The erosion control measures planned for the construction of surface facilities (described in Volume IV, Appendix 7) should minimize indirect impacts to these wetlands. Any impacts that did occur are expected to be temporary, and would cease soon after construction and site restoration were complete.

Wetland impacts could also result from the construction of the various ancillary facilities (e.g., the railroad spur, east/west access road, upgrade of the north/south access road, and the installation of the gas and water pipelines). These facilities could disrupt approximately 1,770 acres (Volume I, Chapter 3, Table 3-2). The acreage of wetlands included in this total, particularly for the 541 acres related to pipeline construction, has not been determined as final routing alignments have not been established. However, the wetlands acreage disturbed should be minimal as flexibility in placement could allow for the avoidance of wetlands during construction.

B. Operations Impacts

Operations of the SSC facility would not significantly impact existing wetlands. Minor impacts could be expected as a result of maintenance, particularly of access roads, and from increased public access.

A 255-acre evaporation pond (or a number of smaller ponds totalling 255 acres) would be created to store wastewater from cooling towers. Depending upon design characteristics and the physical and chemical conditions that develop, the evaporation pond could provide habitat for a variety of plant and animal species and thus serve as mitigation for wetland impacts. A detailed assessment of the impacts of the evaporation pond would be provided in the EIS supplement should the Colorado site be selected.

C. Mitigation

It is DOE policy to avoid impacts to wetlands to the maximum extent practicable, in compliance with Section 404 of the Clean Water Act and Executive Order 11990 - Protection of Wetlands. This could be accomplished by relocation of surface facilities that are located within or adjacent to wetlands. Prior to construction, wetland locations should be reviewed to determine preferred facility locations that would minimize wetland impacts. Facility E1 could be relocated up to 200 ft from its proposed location. This would place the facility away from wetland habitat. Also, J3 or J4 could be constructed rather than J6. This would avoid wetland impacts associated with development of the buried

beam access zone areas. Access roads, pipelines, and other ancillary facilities could be adjusted during final design to minimize their encroachment with wetlands. Bridging wetlands may also be possible in some instances, and would be recommended for the more extensive and least degraded wetlands that occur along the proposed east/west corridor. Standard erosion control practices (described in Volume IV, Appendix 7) would be used to minimize surface runoff to adjacent wetlands.

To further mitigate any wetlands loss where avoidance or other mitigation is not effective, replacement in kind could be used as mitigation. Additional mitigation could be proposed as a result of consultation during final design with appropriate Federal and/or State agencies (e.g., the USFWS, under the Fish and Wildlife Coordination Act, and with the COE, under Section 404 of the Clean Water Act). All work within wetlands would be conducted in accordance with conditions of the COE permits (if they are required) as well as those of applicable State and local regulations. More detailed information relative to wetland mitigation would be included within the Supplement to the EIS should Colorado be selected as the SSC site.

Some future protection of wetlands on fee simple estate lands controlled by the DOE is a potential benefit of the project. The fee simple status effectively precludes future development of wetlands in these areas. As discussed above, the proposed evaporation pond could also serve as mitigation for wetland impacts if it was designed to provide natural wetland habitat.

11.3.2.4 Commercially, Recreationally, or Culturally Important Species

There are no commercially or culturally important species along the SSC ring in Colorado; however, many species of recreational potential are present. Hunting, trapping, and fishing as recreational activities would be restricted locally during construction, and would continue to be tightly controlled within fenced fee simple areas for the operational life of the SSC. The exact locations of these areas will be determined later during final design of the project.

Due to the limited amount of rainfall received in the area, most streams in and near the project site are intermittent (seasonal). No large water bodies capable of supporting recreational fisheries exist. Sport fishing in the reservoirs northwest of the site would be unaffected by the SSC project.

Recreational hunting does occur in the area. Colorado Small Game Management Unit 36, which includes the project area and the surrounding South Platte River bottomlands, ranks first in the state for mourning dove harvest (Colorado Division of Wildlife 1987). Both pronghorn antelope and mule deer are hunted in the area, and badger, beaver, coyote, and red fox are trapped. Beyond the localized restrictions on hunting and trapping mentioned above, the SSC should not alter these activities.

Both the terrestrial and aquatic resources of this area of Colorado are under extensive management. This includes agricultural production management, water supply management, and management of migratory birds, small mammals, and big game species. To some extent, the growth in population due to the project would alter management strategies and place increased pressure on some resources.

11.3.3 Illinois

The Illinois site contains a mixture of high-quality farmlands, wetlands, other natural areas, and a 6,800-acre Federal research facility at Fermi National Accelerator Laboratory (Fermilab). Little or no unmanaged land is present. Therefore, construction of any new facility would generally replace some other intensively managed land use. Approximately 227 acres of land would be permanently disturbed or destroyed by construction of the SSC at the Illinois site. Approximately 267 additional acres would be temporarily disturbed. The injector facilities would not need to be constructed because the Fermilab accelerators would be used for this purpose, shared with ongoing Fermilab experiments. No land would be disturbed by spoils disposal. The proposed ring alignment would remove some farmlands from production (Volume IV, Appendix 13).

The A,B, and C areas consist of approximately 2,630 acres which are within Fermilab property. These areas include approximately 1,000 acres of agricultural land, and 940 acres of natural systems (which include wetlands, and other lands not in agriculture), and approximately 690 acres with other land uses. Construction activities at Fermilab (the equivalent of portions of Areas A, B, and C at other states) would disturb 192 acres of land, 87 of which would be permanently occupied by building and support facilities.

The major difference in acreage between Illinois and the other states is that Fermilab injector construction (Area B) would only require minimal additional acreage (five acres during construction). Approximately 900 acres of wetlands are located within Fermilab, 280 of which are within the perimeter of the existing Fermilab accelerator ring. During final design, consideration would be given to avoiding wetlands and placing the SSC facilities in habitats with lesser value; mitigation activities are expected to reduce the overall impact of the temporary and permanent acreage losses.

11.3.3.1 Sensitive Terrestrial/Aquatic Communities

These are no wildlife refuges or sanctuaries in the vicinity of the proposed site. However, there are a number of different natural areas present in the general vicinity of the Illinois site. These include wetlands, woodlands, prairies, savannas, bogs, fens, and other unusual or rare habitats. The State reports that most of these areas are along rivers, primarily the Fox River, or along railroads, in cemeteries, or on property owned and managed by educational institutions. Much of the forest land in northeastern Illinois lies along river margins or in forest preserves and other public lands. These areas are highly valued for recreation and provide important habitats for many species. Some hardwood forested lands are located within the proposed fee simple boundaries (Fermilab). These forests, if removed, represent approximately 1 to 2 percent of the available forest in the region.

Approximately seven prairie remnants are listed in the 16-township study area reviewed by the State. Most of these areas are within nature preserves, and most are sufficiently far from anticipated construction sites along the ring to preclude direct impact. Several are, however, sufficiently close that attention must be taken to prevent or minimize unnecessary indirect impacts. The largest "natural" area is the 675-acre prairie reconstruction project within the existing accelerator ring at Fermilab. This continuing effort at recreating prairie and savanna habitats on previously heavily cultivated lands is beginning its second decade.

The Fox River bisects the proposed collider ring. This river is an important local warm-water fishing and recreational resource in an area where most streams are polluted. Present plans do not call for surface facilities in areas that would have a high probability of impacting the river. The underground ring passes under the Fox River at two locations. No surface hydrological effects are likely to accompany these crossings.

11.3.3.2 Threatened, Endangered, and State-Protected Species

The Department of Energy has begun consultation with the USFWS under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543), regarding the presence or absence of threatened or endangered species at the proposed Illinois SSC site (Attachment A). It has been determined that there are no designated critical habitats for these or any other listed species at the proposed site (50 CFR 17).

Three Federally-listed endangered animal species (the bald eagle (Haliaeetus leucocephalus and H. alascanus), peregrine falcon (Falco peregrinus anatum and F. p. tundrius), and the Indiana bat (Myotis sodalis) may be very rare seasonal visitors. These species have large ranges and, though individuals may be observed in the region, none of the species is known to breed in the vicinity of the proposed SSC site. The bald eagle and the peregrine falcon are typically associated with the larger lakes and rivers; peregrine falcons may occasionally be present during migration around inland wetlands if waterfowl and shorebirds are abundant. Impacts to the bald eagle and peregrine falcon are not expected because the lack of preferred habitat will not attract them to the region containing the proposed Illinois SSC site.

Although the Indiana bat does not winter and is not known to breed in the region, the species may be present during the summer months (the last specimen was collected in Cook County in 1928; Becker 1988). Preliminary surveys have been conducted by the DOE at the proposed Illinois SSC site to determine if habitat suitable to support summer populations of the Indiana bat was present. The Indiana bat typically forages along small- to moderate-sized streams that retain some flow or pools throughout the summer. Streams preferred by bats are bordered by mature trees that overhang the stream. Indiana bats form small nursery

colonies consisting of 20 to 30 females and their young in large mature deciduous trees, either in cavities or under loose bark. Individual bats use similar trees for roosting. Although nursery colonies and roosts are usually found in wooded riparian areas, the use of other woodland habitats has been documented.

Potential foraging habitat may be present at J6, located near Kress Creek; nesting and roosting habitat may be available at Area B, J6, E8, and E9. Campus Area B may be the only area that cannot be avoided by relocating surface facilities; however, the amount of potential habitat removed represents only a small percentage of available habitat in northeastern Illinois. More detailed surveys would be conducted within preferred habitat to determine the presence or absence of the Indiana bat. If populations are found that could be adversely affected by project development, the DOE would consult with the USFWS and the State to determine appropriate avoidance or mitigative measures. Avoidance measures, which include limitations of vegetation clearance within riparian woodlands, are outlined in Volume I, Chapter 5, Section 5.1.5.2.C.

The Federally-listed threatened prairie bush clover (Lespedeza leptostachya) and lakeside daisy (Hymenoxis acaulis var. glabra), and the candidate (C1) forked aster (Aster furcatus) are potentially present in the region. The prairie bush clover is restricted to northern Illinois where seven protected populations are known from five counties: Lee, Ogle, McHenry, Cook, and DuPage. These populations are not within the SSC project area. The preferred habitat of the prairie bush clover consists of dry-mesic or dry gravel prairie on steep slopes of bluffs and moraines. Field work conducted by the Illinois Natural History Survey (1988) located one prairie remnant on the proposed SSC site. This area occurs along a railroad right-of-way and is a wet-mesic prairie that does not contain suitable habitat for the species. Lakeside daisy is also associated with dry-mesic prairie, but there are no known populations within the region of influence. If suitable habitat is found in the site area or in areas proposed for ancillary facilities, these areas would be surveyed during preconstruction for the presence of the species. Disturbance of soils and drainage would be the principal cause of adverse impact. Therefore, all proposed sites would be carefully surveyed before disturbance. The use of the Fermilab prairie restoration project for mitigation would be considered if the proper conditions for establishing populations of prairie bush clover and lakeside daisy are present. Surveys would also be conducted for the forked aster.

In addition, there are five animal species which are candidate species (all C2) and thought to be present in the region. These are the salamander mussel (Simsonichonca ambiqua), Illinois mud turtle (Osternon flavescens spooneri), Kirtland's water snake (Clonophis kirtlandi), eastern massasauga (rattlesnake) (Sistrurus catenatus), and Swainson's hawk (Buteo swainsoni). These species are not known to occur on the proposed site due to habitat limitations, thus impacts to these species are unlikely.

State agencies have been contacted regarding the presence or absence and sensitivity of State-protected, threatened, or endangered species. A number of plant and animal species listed as threatened or endangered by the State of Illinois are known to be associated with habitats in the vicinity of the SSC. This list includes 55 threatened or endangered plants, 34 birds, and three mammals (Volume 1, Chapter 4, Table 4-18). The majority of these species are unlikely to be present due to habitat loss from current land use which includes increasing urbanization and intensive agriculture. Remaining natural habitats attractive to these species are primarily limited to scattered woodlots, wooded floodplains, fencerows, and remnant prairies along right-of-ways. Many water resources, including lakes, ponds, and streams, have also been degraded by past and present land uses. Much of the higher quality habitat is protected in regional parks and refuges.

Known areas occupied by State-protected species which are expected to be impacted by SSC construction include:

Areas A, B, C: American bittern (Botaurus lentiginosus),
Upland sandpiper (Bartramia longicauda)

Area E7: Yellow-headed blackbird (Xanthocephalus xanthocephalus)

Areas I, F9: Sedge (Carex crawei),
White lady's slipper (Cypripedium candidum)

Area F2: Slender sandwort (Arenaria patula)

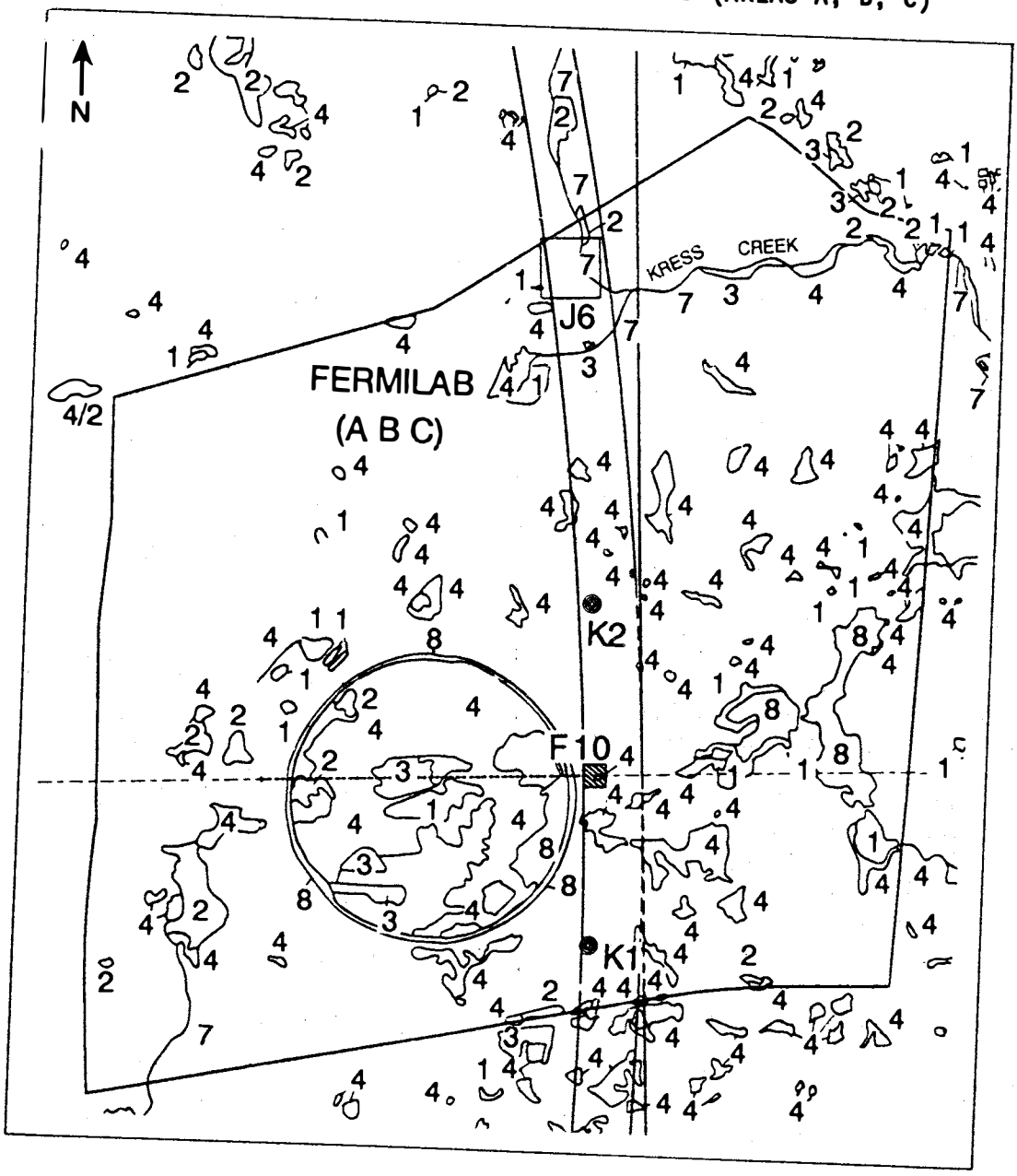
Potential impacts to these species could include loss of habitat, direct mortality, or disturbance by noises or human presence. The potential for impacts from the SSC, as presently designed, would require special studies in continued consultation with the State of Illinois to determine the abundance and distribution of the listed species on site and to determine the abundance and distribution of the listed species on site and to develop measures to mitigate adverse effects.

11.3.3.3 Wetlands

Wetlands are abundant in the Illinois project area and comprise about 921 acres (115 wetlands) of the fee simple areas where surface facilities could be located (Figures 11-2 through 11-8; Table 11.3.3.3-1). Palustrine wetlands are the most common wetland type in the area but lacustrine and riverine wetlands are also found. A large percentage of the wetland habitat (900 acres) within fee simple areas lies within the Fermilab property. Some of these wetlands are part of the Fermilab Prairie Restoration Natural Area located in the middle of the existing accelerator ring (approximately 265 acres - excluding the cooling canal) where no construction is planned. Much of the remaining wetland habitat could be protected from construction impacts since the State proposes to utilize the existing Tevatron ring at Fermilab as the injector for the SSC, rather than construct a new injector facility.

Figure 11-2

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES
AT THE PROPOSED ILLINOIS SITE: FERMILAB (AREAS A, B, C)



LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

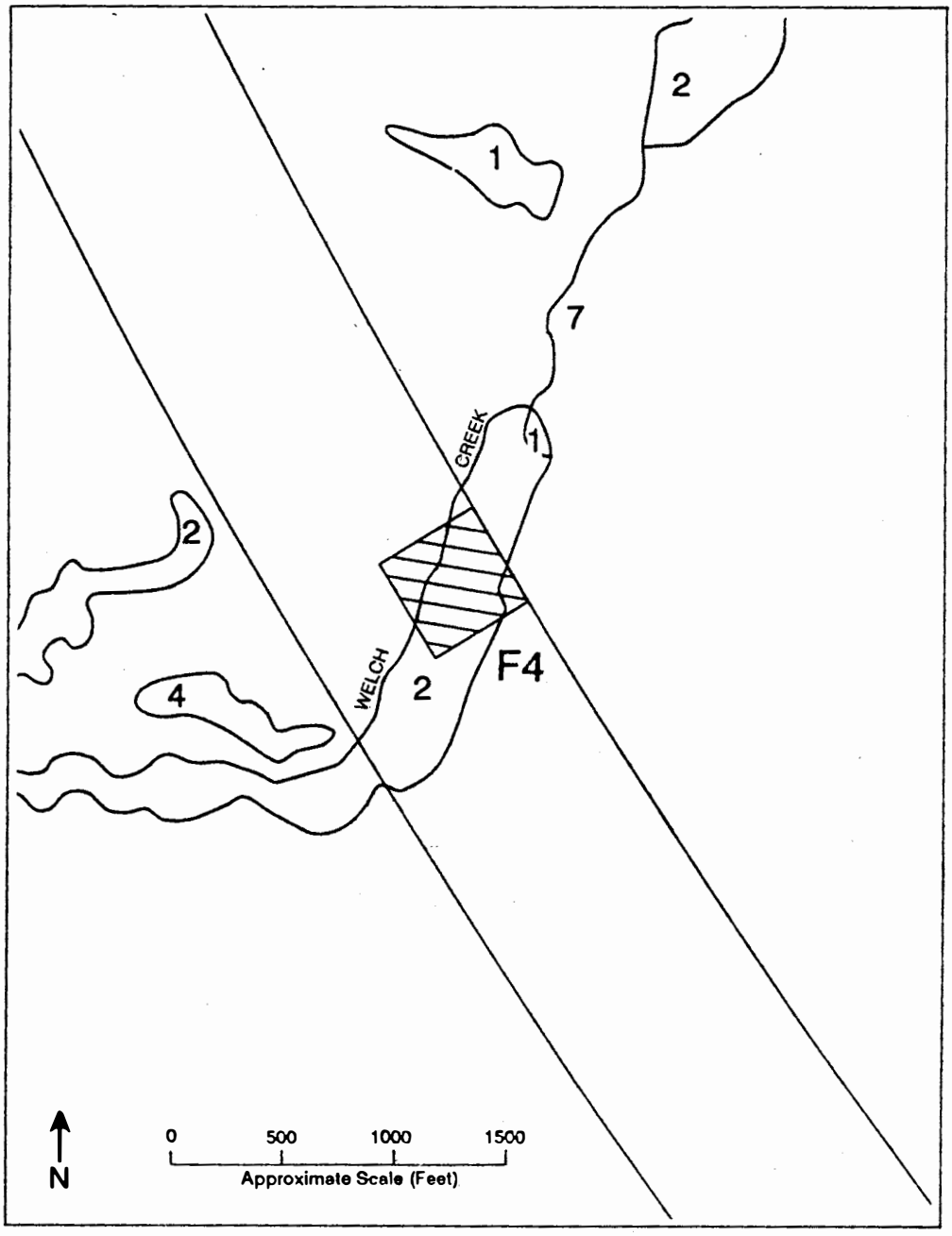
Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

0 2000 4000 6000
Approximate Scale (Feet)

SSCAP11A3278838

Figure 11-3

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED ILLINOIS SITE: AREA F4



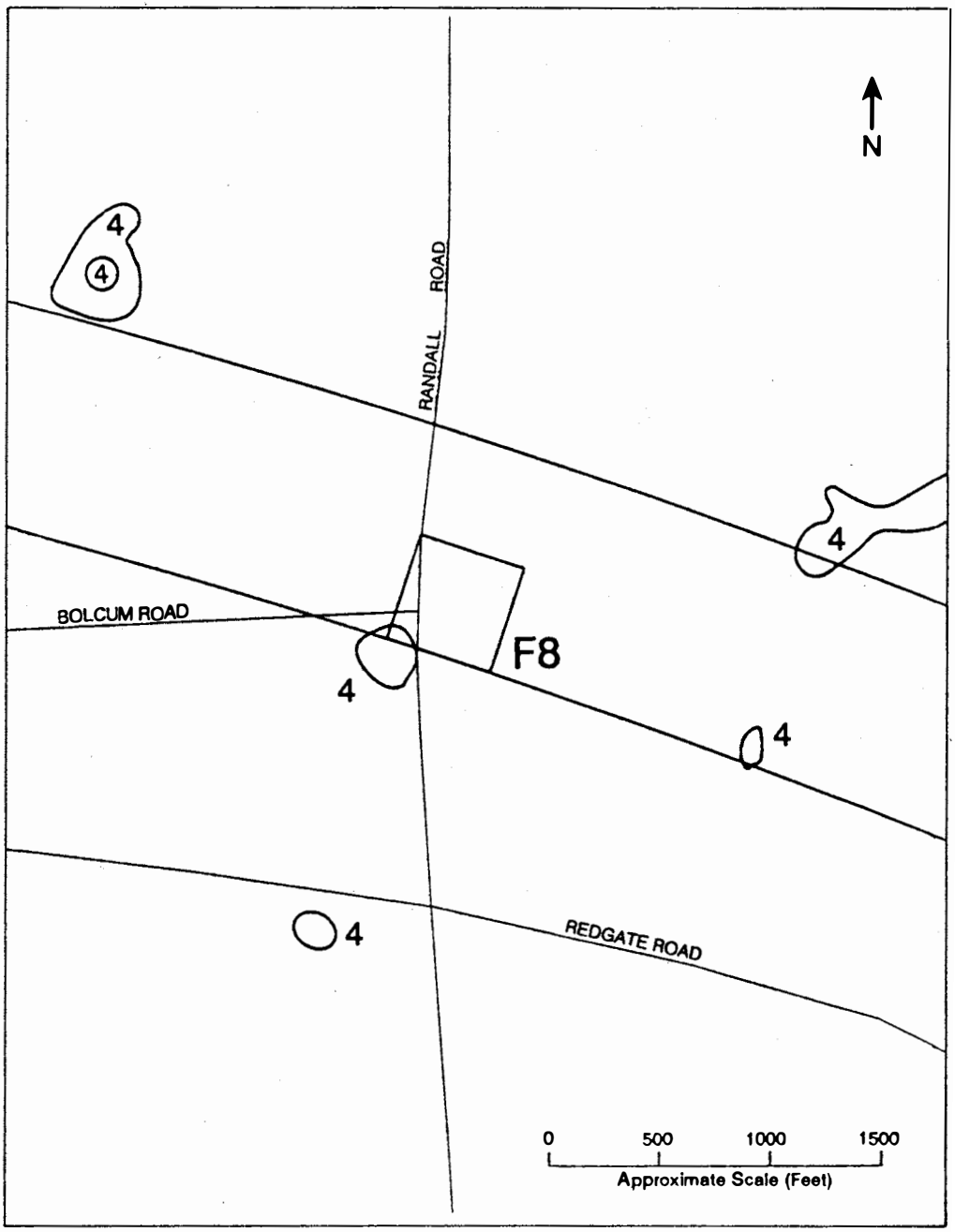
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-4

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED ILLINOIS SITE: AREA F8



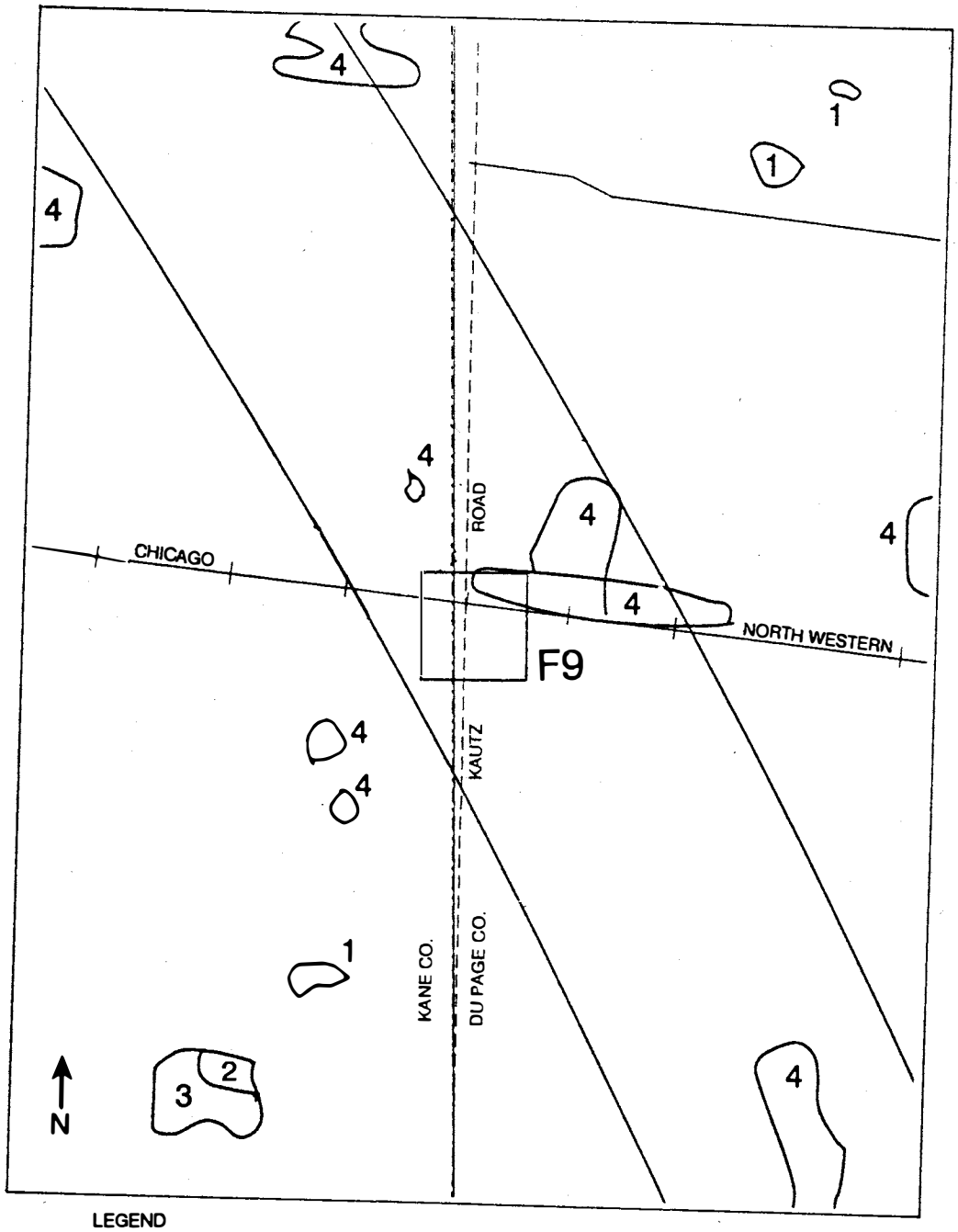
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-5

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED ILLINOIS SITE: AREA F9



LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

0 500 1000 1500
Approximate Scale (Feet)

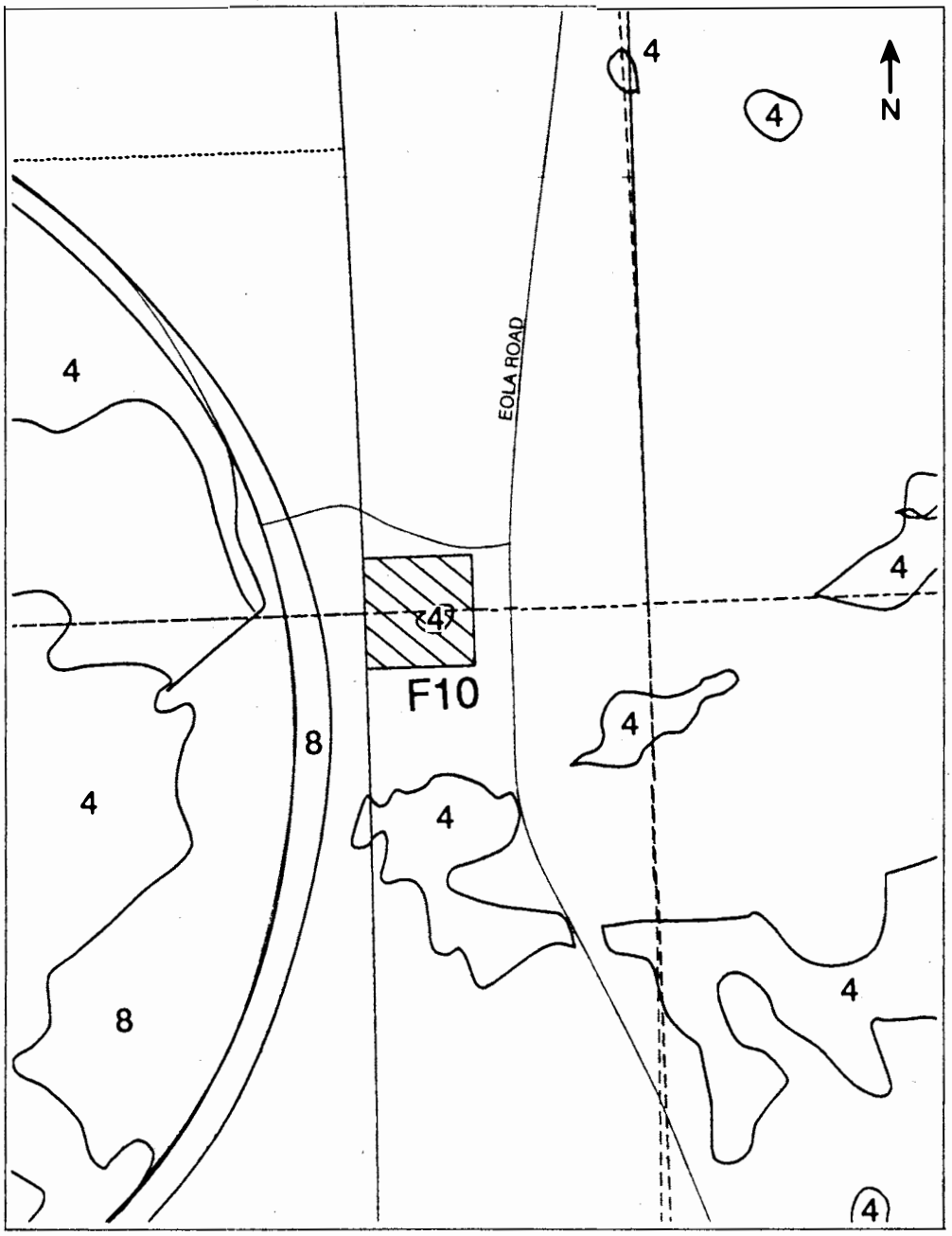
SSCAP11A3278841

EIS Volume IV Appendix 11

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-6

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES
AT THE PROPOSED ILLINOIS SITE: AREA F10



LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

0 500 1000 1500
Approximate Scale (Feet)

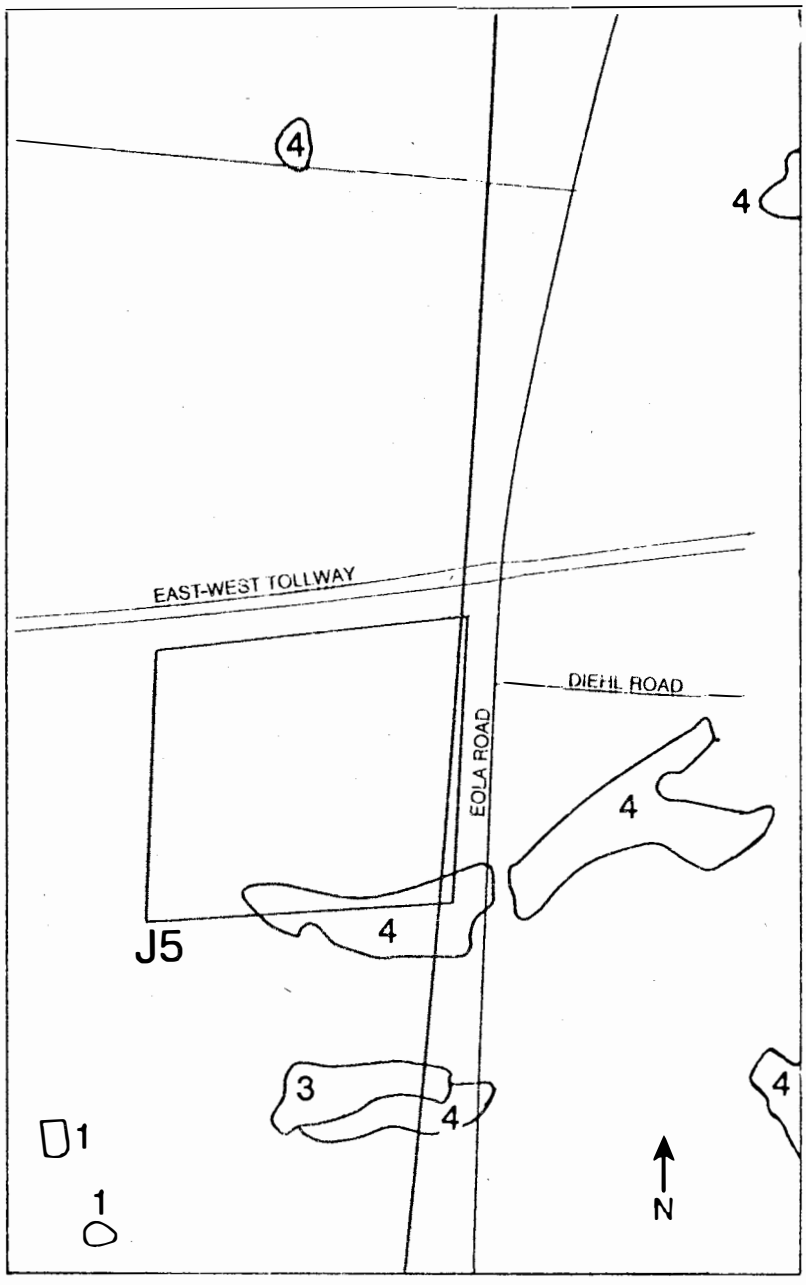
SSCAP11A3278842

EIS Volume IV Appendix 11

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-7

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED ILLINOIS SITE: AREA J5



LEGEND

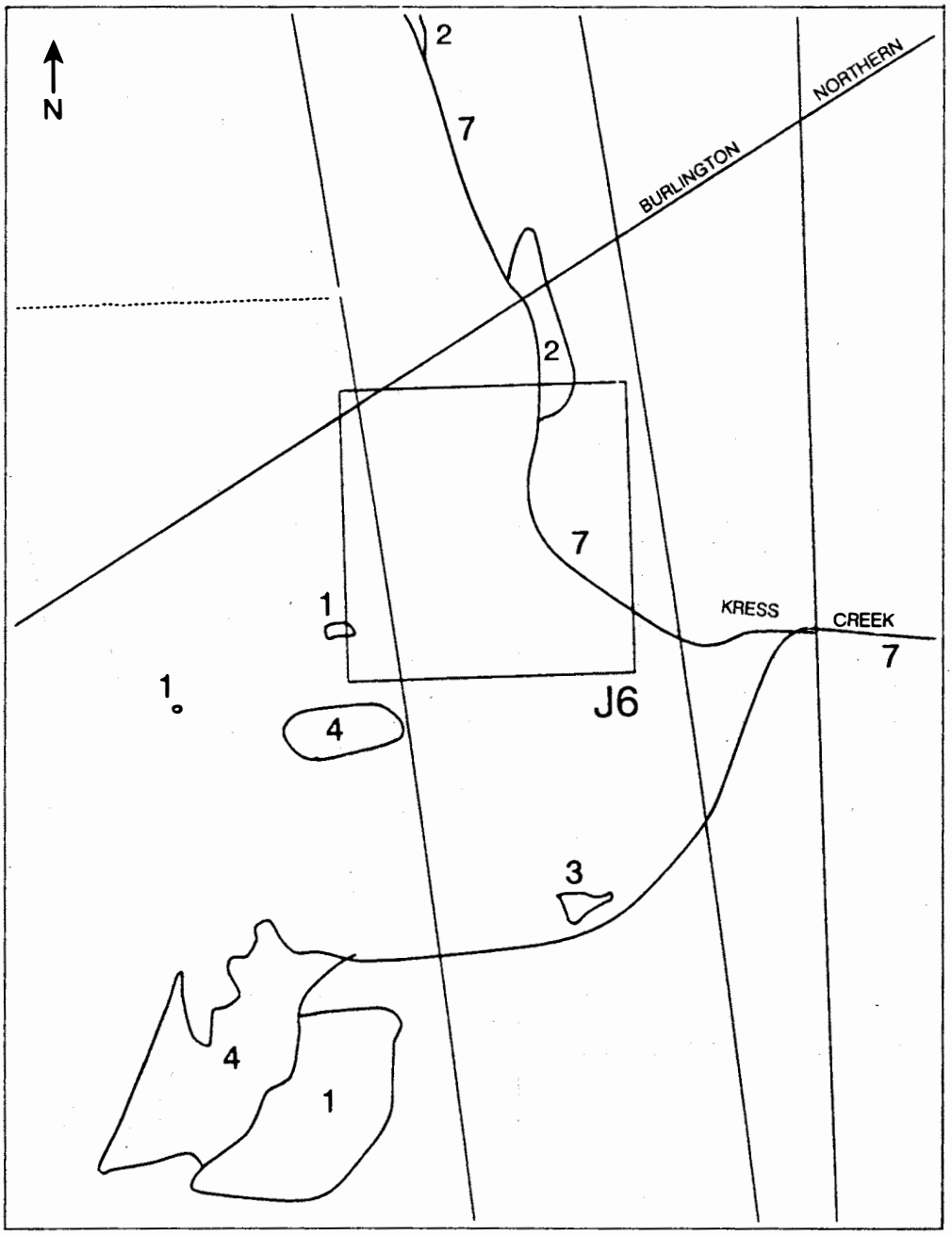
1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

0 500 000 1500
Approximate Scale (Feet)

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-8

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED ILLINOIS SITE: AREA J6



LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

0 500 1000 1500
Approximate Scale (Feet)

SSCAP11A3278844

EIS Volume IV Appendix 11

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Table 11.3.3.3-1

WETLANDS WITHIN PROPOSED SURFACE FACILITY AREAS IN ILLINOIS[1]

Facility	Number of Wetlands[2]	Area of Wetlands (ac)[3]	Area Disturbed (ac)	Area of Wetlands Impacted (ac)[4]
Proposed				
A	107[5]	895.3[5]	187	187
B	107[5]	895.3[5]	5	5
F4	1	5.8	2.5	2.5
F8	1	1.2	2.5	1.2
F9	1	3.3	2.5	2.5
F10	1	0.4	2.5	0.4
Total	111[5]	906[5]	202	198.6
Future Expansion				
C	107[5]	895.3[5]	279	279
J5	1	10.5	20	10.5
J6	3	4.6	20	4.6
Total	111[5]	910.4[5]	279-319[6]	279.0-294.1[6]

1 Source: USFWS National Wetland Inventory maps.

2 Includes wetlands located completely or partially within surface facilities.

3 Includes entire area of wetlands including that extending beyond facility.

4 Area of wetlands within facility boundary up to a maximum of area to be disturbed.

5 The Fermilab boundary would enclose facilities associated with Areas A, B, and C. No precise locations for Areas A, B, and C have been designated within Fermilab, however, and thus numbers and acres of wetlands within Fermilab are repeated for each area.

6 Upper and lower bounds are placed on totals for future expansion areas because only two of the J areas (one of either J1, J2, or J5, and one of either J3, J4, or J6) would be developed if needed.

Most of the wetlands that are located within proposed facility boundaries are degraded to some extent, as is typical for wetlands in this region. A total of 26 wetlands (about 142 acres) are severely degraded. These are mostly in areas that are actively cultivated, or have been drained. Fifty-three wetlands (about 505 acres) are moderately degraded. This degradation is a result of a variety of factors including agricultural and residential/industrial development. The wetlands within the Fermilab Prairie Restoration Natural Area also show some degree of degradation due primarily to impounding, diking, and ongoing prairie restoration work. Twenty-five wetlands (about 227 acres) show little or no evidence of degradation. These wetlands are primarily confined to the Fermilab site, including areas along Kress Creek and the large lacustrine and/or palustrine wetlands at the eastern, southern, and southwestern portions of the Fermilab site. The palustrine forested wetland in the southwestern portion of the Fermilab site contains an active great-blue heron rookery. The only wetland outside the Fermilab property that is considered to have little or no degradation is a riparian forested wetland associated with Welch Creek in the vicinity of F4 (Figure 11-3). Ten wetlands (about 46 acres) shown on the USFWS wetland maps were not observed, and quality could not be readily assessed from available aerial photographs.

A. Construction Impacts

Six of the surface facilities to be initially developed at the proposed Illinois site could impact wetland habitat (A, B, F4, F8, F9, and F10). Construction of these facilities could result in the destruction or modification of about 199 acres of wetlands (Table 11.3.3.3-1). The highest quality wetlands among these locations are located in the F4 and Fermilab areas. The greatest potential impacts to wetlands at the Illinois project area would occur in the Fermilab area. This high potential for significant impact is a result of the large number, area, and quality of wetlands that could be affected by surface construction activities in these areas. An additional 294 acres of wetlands could be affected by development of future expansion areas (Figures 11-2, 11-7, and 11-8).

The estimate of wetland impacts is conservative and is based on the assumption that no mitigation would be used. However, from practical engineering and construction standpoints, wetlands would be avoided where feasible and the amount of wetland impact would likely be lower (see also Mitigation below).

Spoils disposal would occur at various quarry sites. Approximately 24 acres of wetlands occur in these quarries, and most are severely degraded. However, one 2.1-acre wetland in quarry site S-22 contains well established wetland vegetation and is only moderately degraded. Disposal of spoils would eliminate all of these wetlands.

Direct impacts to wetlands could result from 1) filling, draining, or elimination of portions of the wetlands within construction areas; 2) vegetation clearing; 3) use of heavy machinery within wetlands; and 4) installation of structures within or adjacent to wetlands. The potential impacts resulting from these activities could include disruption of drainage patterns, erosion and siltation, changes in water temperature and chemistry, habitat destruction, wildlife displacement, water-level modification, and the inadvertent addition of chemicals (e.g., fuel). Some of these impacts could be temporary and, with adequate revegetation and erosion control measures, would cease soon after construction was complete. Dewatering of wetlands during tunnel and shaft construction is not expected to occur because low rates of groundwater seepage during tunnel construction are anticipated (see Volume IV, Appendix 10, Section 10.2.3.3).

Indirect construction impacts, such as siltation and erosion, could affect wetlands adjacent (within 250 ft of facility boundaries) to proposed surface facilities. There are wetlands adjacent to sites J2 and J4. The erosion control measures planned for the construction of surface facilities (described in Volume IV, Appendix 7) should minimize indirect impacts to these wetlands. Impacts that occurred are expected to cease as soon as construction and site restoration is completed.

Construction of ancillary facilities could also impact wetlands. Construction of access roads, rail spur, and gas and water pipelines could disturb approximately 200 acres of land (Volume I, Chapter 3, Table 3-2). The wetland acreage included in this total has not been determined because the location of these facilities has not been finalized. However, wetland impacts could be minimized if wetlands were avoided during siting of the facility. Potential impacts associated with construction of ancillary facilities would be discussed in the site-specific Supplement to the EIS should Illinois be chosen as the SSC site.

B. Operations Impacts

Operations of the SSC facility would not significantly impact existing wetlands. Minor impacts are expected as a result of maintenance, particularly of access roads, and from increased public access.

C. Mitigation

It is DOE policy to avoid impacts to wetlands to the maximum extent practicable, in compliance with Section 404 of the Clean Water Act and Executive Order 11990 - Protection of Wetlands.

This could be accomplished by relocation of surface facilities located within or adjacent to wetlands. Prior to construction, wetland locations should be reviewed in order to determine locations for facilities that would minimize wetland impacts. Facilities F4, F8, F9, and F10 could be located up to 200 ft from their proposed locations. These relocations would minimize facility locations within wetland habitats. However, relocation of these facilities would not completely eliminate the potential for wetland impacts. For F4, in particular, mitigative measures other than relocation may be required (see Figure 11-3). Other mitigations could include the development of J1 or J2 rather than J5, and J3 or J4 rather than J6. These alternative facility choices would avoid wetland impacts associated with development of the buried beam access zone areas. Access roads, pipelines, and other ancillary facilities also could be adjusted during final design to minimize their encroachment upon wetlands. Bridging wetlands may also be possible in many instances, and would be recommended for extensive or high quality wetlands that may occur along access roads. Standard erosion control practices (described in Volume IV, Appendix 7) could be used to minimize runoff to adjacent wetlands.

To further mitigate any wetlands loss where avoidance or other mitigation is not effective, replacement in kind could be used as mitigation. Additional mitigation could be proposed as a result of consultation during final design with appropriate Federal and/or State agencies (e.g., the USFWS, under the Fish and Wildlife Coordination Act, and with the COE, under Section 404 of the Clean Water Act). All work within wetlands would be conducted in accordance with conditions of the COE permits, as well as those of applicable State and local regulations. More detailed information relative to wetland mitigation would be included within the site-specific Supplement to the EIS should Illinois be selected as the site for the SSC.

Some future protection of wetlands on fee simple estate lands controlled by the DOE and at the Fermilab, might be a benefit of the project. The fee simple status effectively precludes future development of wetlands in these areas.

11.3.3.4 Commercially, Recreationally, or Culturally Important Species

Hunting, fishing, environmental education, bird watching, and other dispersed recreation dependent on ecological resources are the primary recreational uses of the area. Hunting and fishing as recreational activities would be restricted during construction, and would continue to be tightly controlled within fenced fee simple areas for the operational life of the SSC. The exact locations of these areas will be determined later during final design of the project.

The Fox River supports a major and diverse recreational fishery, which is not expected to be negatively impacted by construction of the SSC. Within the area, most hunting occurs on private land and along the Fox River. Hunting leases on agricultural land are also common, the lease

rate being variable depending on the number and types of species present. In general, most leases are for ring-necked pheasant, waterfowl, and white-tail deer hunting. Cottontail rabbit is also a frequently sought species. The populations of game species in the area have been declining over recent years due to continually increasing pressures of urbanization.

11.3.4 Michigan

The proposed SSC site in Michigan comprises a mixture of agricultural lands, small parcels of forest, wetlands, lakes, and streams. Construction of the SSC would permanently disturb or destroy habitats on approximately 402 acres of these lands, and temporarily disturb approximately 678 additional acres. No land would be disturbed by spoils disposal. The perimeter of Areas A and B encompasses approximately 2,050 acres, including approximately 1,860 acres of agricultural land and 190 acres of natural systems such as wetlands and lands not in agriculture. Construction activities in Areas A and B would require 476 acres of land, 283 of which would be permanently disturbed with buildings and support facilities. Approximately 163 acres of wetlands are located within Areas A and B. During final design, consideration would be given to avoiding wetlands and placing the SSC facilities in habitat with lesser value, should Michigan be selected for the SSC site. Mitigation activities are expected to reduce the overall impacts of the temporary and permanent acreage losses.

11.3.4.1 Sensitive Terrestrial/Aquatic Communities

Several sensitive plant and animal communities are adjacent to the fee simple area of the campus and near cluster. These are currently protected as part of the Waterloo Recreation Area and the Haehnle Wildlife Sanctuary. The latter protects sandhill crane habitat. One tract of black spruce receives special protection at the Waterloo Recreation Area. Other sensitive communities present at the Recreation Area in the vicinity of the SSC include sphagnum bogs, a dry/mesic southern forest community north of Bartig Lake, and an unusual wetland bog.

Construction of facilities in the fee simple Areas J1 and J2, and E2 and E3, is located within one mile of the Haehnle Sanctuary and the Waterloo Recreation Areas. However, construction noise is not expected to impact the adjacent Waterloo State Recreation Area and Haehnle Sanctuary. While some noise increase could be noticeable, the levels would be near ambient (50 dBA). Daytime construction noise levels (E and F areas) are expected to be 75 dBA at 250 ft from the sources, and nighttime noise levels would be 75 dBA at 500 ft from the source. During the day it would take an estimated 3,600 ft for noise levels produced by the SSC to be indistinguishable from ambient; at night this distance would decrease to 2,900 ft. Estimated noise levels at Haehnle would be near 50 dBA based on the assumed distance of at least 4,000 ft between E2 and Eagle Lake; at Waterloo Recreation Area it is likely that noise from the SSC would be indistinguishable from background (assumed distances from J1 and J2 of approximately 3,000 ft). No credit on these estimated noise levels is taken for the attenuation of noise. Noise at these levels would likely have no effect on the sandhill crane which uses the Haehnle Sanctuary as a major migratory staging area, and which is used by several breeding pairs of cranes for nesting. No other impacts to the sanctuary and recreation area are anticipated.

Birds are generally reluctant to leave their nests even when startled by loud noises. Birds tend to become habituated to repetitious noises. Unfamiliar stimuli are more likely to elicit a response when noise is coupled with other stimuli, such as low aircraft overflights, and birds may temporarily flush from nests. At such times, the adults and their nests are more susceptible to opportunistic predators. There is evidence that loss of eggs and/or young is greater among densely colonial nesting species, such as the great blue heron rookeries, than in solitary nesting species, such as the sandhill crane (Bowles 1988). Blasting may be used in construction of shafts at the access and service areas. Vibrations from the first few explosive blasts in a given vicinity (distances of 1 to 2 mi) during SSC construction would likely cause nesting birds to fly up, but they are expected to habituate quickly with no measurable reduction in nesting success.

Nearby streams and rivers, including Lower Sycamore Creek and smaller creeks that flow through the project area, support locally and regionally important recreational fisheries. Warm water fisheries prevail on the larger streams such as lower Sycamore Creek, but the small tributaries support a put-and-take trout fishery. Impacts to these fisheries could be minimized by siting facilities away from the streams and the fact that the ring should be far enough below ground to avoid affecting surface hydrology effects.

11.3.4.2 Threatened, Endangered, and State-Protected Species

The DOE has begun consultation with the USFWS in accordance with the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543), concerning threatened or endangered species that may occur in the vicinity of the proposed Michigan SSC site (Attachment A). This process may continue through site investigation and design phases should the presence of Federally protected species be determined and the Michigan site be chosen. It has been determined that there are no designated critical habitats present (50 CFR 17).

Several migratory Federally-protected animal species could pass through the area and be attracted to local habitats. These include the endangered southern bald eagle (Haliaeetus leucocephalus leucocephalus) and the threatened northern bald eagle (H. l. alascanus), the endangered American peregrine falcon (Falco peregrinus anatum) and the threatened arctic peregrine falcon (F. p. tundrius), the endangered Kirtland's warbler (Dendroica kirtlandii), and the threatened piping plover (Charadrius melodus). None of these species is known to breed in the vicinity of the SSC site. It is unlikely that any of these species would be adversely affected by development of the SSC in Michigan.

The Federally-listed endangered Indiana bat (Myotis sodalis), may occur within the project area during the summer. Suitable habitat for foraging typically occurs along small- to moderate-sized perennial streams with a mature, wooded riparian corridor. Preliminary surveys of the proposed Michigan SSC site have indicated that these corridors are

present on site along stretches of Thornapple Creek (Areas A, B, and C), and within one mile of the site along the Portage River, Orchard Creek, and Lowe Lake Drain, at locations J2, J3, E1, F1, E2, and F2. Nursery and roosting habitats are potentially present if large, mature hardwood trees (living or dead) having cavities or loose bark are within one mile of foraging habitat. Potential nursery and roosting habitat occurs on site or within one mile of the site at each of the locations listed above.

Habitat within the campus area would be lost because construction of surface facilities within these areas cannot be avoided by relocation of the facilities. Potential Indiana bat habitat in the ring areas could be relocated to a certain degree depending upon the proposed activity. Habitat in these areas would be avoided under the procedure described above for Illinois. Because the Indiana bat is known to range extensively throughout southern Michigan, the amount of potential summer habitat lost due to SSC development would represent an extremely small percentage of the overall habitat available for the species. Prior to site disturbance, all preferred habitats would be surveyed to determine the presence or absence of the species. If the species is found, the DOE would begin formal consultation with the USFWS and the Michigan Department of Natural Resources to determine appropriate measures to avoid or mitigate potentially adverse impacts. The preferred action would be to avoid preferred habitat; however, a potentially attractive mitigative measure may be the purchase and protection of habitat at a nearby location.

Kitten-tails (Besseya bullii), a Federal Category 2 plant species, have historically been reported in the area. Kitten-tails are known to exist in only ten locations in Michigan, including two in Jackson County. None of these are on the ring alignment. Preliminary surveys of the alignment have not located any individuals of this species, but have been inadequate to eliminate the possibility. Three other candidate species (all C2) - prairie fringed orchid (Platanthera leucophaca), log sedge (Carex decomposita), and bog bluegrass (Poa paludigena) - may also be present in the area, but have not been observed. More detailed surveys during site characterization could confirm the presence or absence of these species to ensure that populations are avoided in the final designs. The Category 2 animal species, loggerhead shrike (Lanius ludovicianus migrans), is a potential breeding bird in southern Michigan. It could be adversely affected if its breeding habitat were disturbed by construction activities. The population status on-site would be confirmed in the event Michigan is selected and discussed in a Supplemental EIS.

Three terrestrial animal species protected in Michigan as State-threatened are potentially present at the proposed SSC site. The king rail (Rallus elegans) has been sighted within the SSC ring at the Dansville State Game Area within the last few years. The king rail utilizes freshwater marshes similar to those widely found throughout the project area. The least shrew (Cryptotis parva), at the northern limits

of its range in southern Michigan, has not been observed in the vicinity for years. Mitchell's satyr (Neonympha mitchellii), a species of butterfly, may also be present on the site. If these species are present in the vicinity, potential impacts of SSC construction on these species may include loss of habitat, direct mortality, and disturbance due to noise and the presence of humans.

Two fish species, black redhorse (Moxostoma duquesnei) and greater redhorse (M. valenciennesi), are listed by Michigan as rare, a category which requires monitoring but provides no special legal status. The two redhorse species are known to occur in the Grand River downstream of the two river crossings by the ring. Because no construction is anticipated at surface level in these locations, no negative consequences should result. The spotted turtle (Clemmys guttata), also listed as rare by the State of Michigan, is present in both the Waterloo Recreation Area and the Haehnle Wildlife Sanctuary. However, the turtle would not experience any direct impact since construction would not occur in these areas.

There are a total of 34 plant species protected under Michigan law as endangered, threatened, or of special concern that may occur in the vicinity of the proposed site (Volume IV, Appendix 5). Species that have recent occurrence records include golden-seal (Hydrastis canadensis), ginseng (Panax quinquefolius), and edible valerian (Valeriana ciliata). These species are present at or near area F3 and in a number of locations in southern areas G and I. In the event the Michigan site is selected, plant communities likely to contain these species would be surveyed to determine their presence or absence. Results of the surveys would be reported in a Supplemental EIS and would provide input to project design in order to minimize impact. Sensitive areas could be avoided during construction of surface facilities.

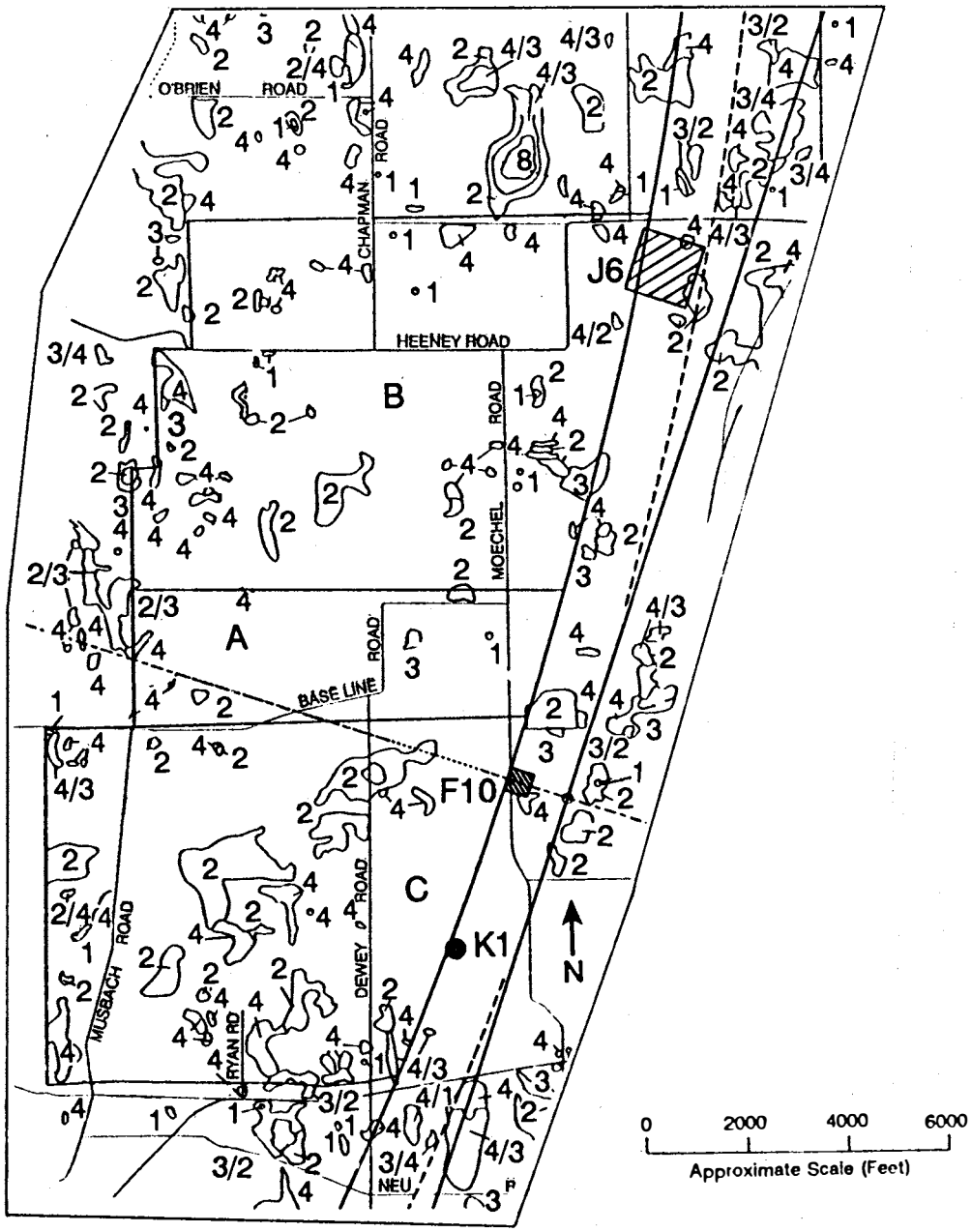
11.3.4.3 Wetlands

Wetlands are abundant in the Michigan project area. For the most part, these are classified as palustrine wetlands. Approximately 567 acres (118 individual wetlands) are in fee simple areas associated with surface facilities. These values differ from those presented in the DEIS for reasons discussed in Section 11.2.2.4 above. Facilities that are located within wetlands are shown in Figures 11-9 through 11-21 and listed in Table 11.3.4.3-1.

Most wetlands that would be affected by surface facilities have been degraded to some extent, as is typical for wetlands in this region. The cause is largely agricultural practices, but some is due to residential and industrial development. However, a large number (268 acres, 63 wetlands) show little or no physical evidence of degradation; the majority of these are smaller than 5 acres. The largest, a 30-acre palustrine wetland complex, is located in the J5/K2 area (Figure 11-19). About 215 acres (31 wetlands) show moderate degradation and about 77 acres (17 wetlands) are severely degraded. Seven wetlands shown on the USFWS wetland maps, totalling 7.3 acres, were not observed and quality could not be readily assessed from available aerial photographs.

Figure 11-9

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED MICHIGAN SITE: AREAS A, B, C



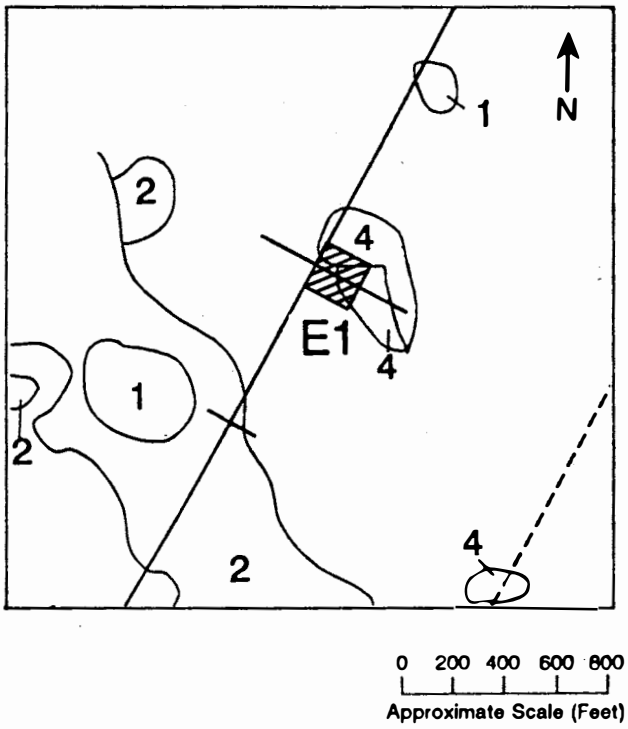
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-10

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED MICHIGAN SITE: AREA E1



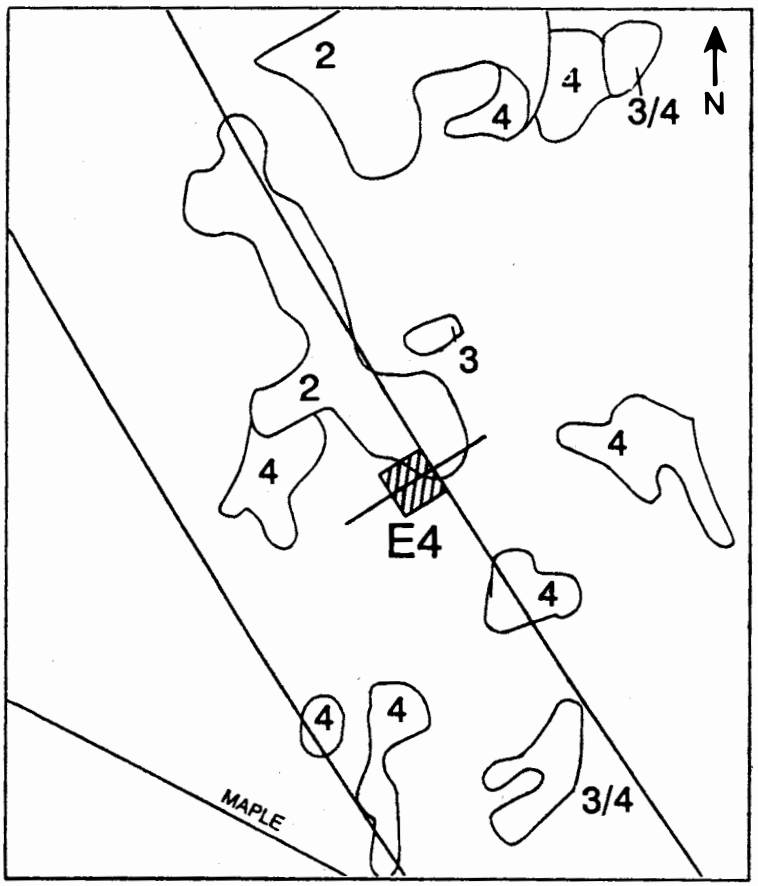
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-11

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED MICHIGAN SITE: AREA E4



LEGEND

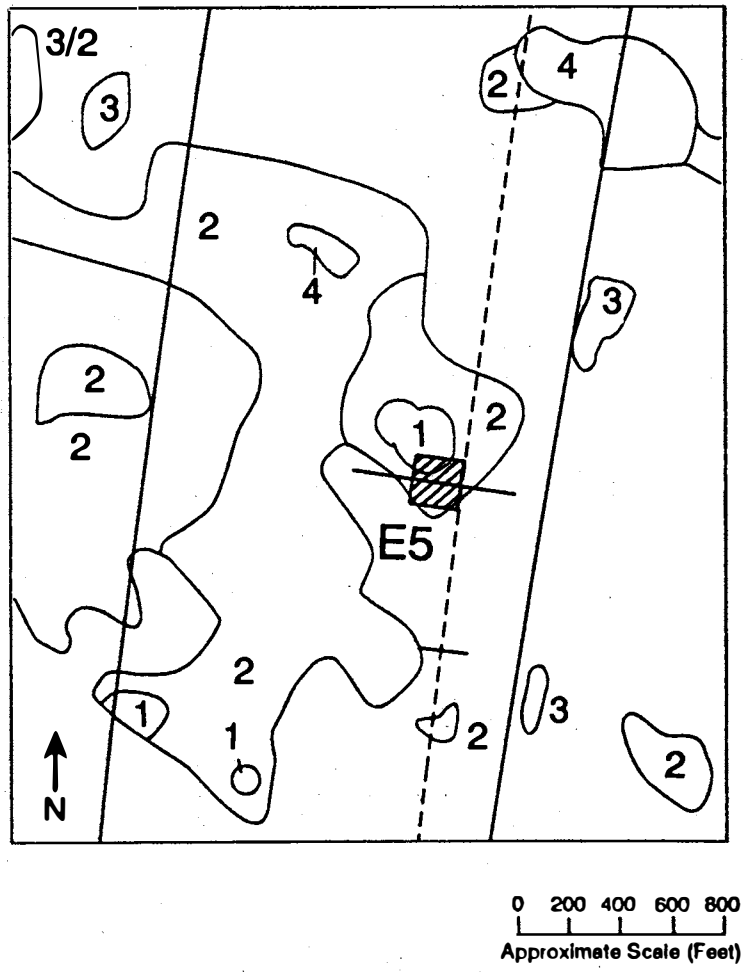
1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

0 200 400 600 800
Approximate Scale (Feet)

Figure 11-12

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED MICHIGAN SITE: AREA E5



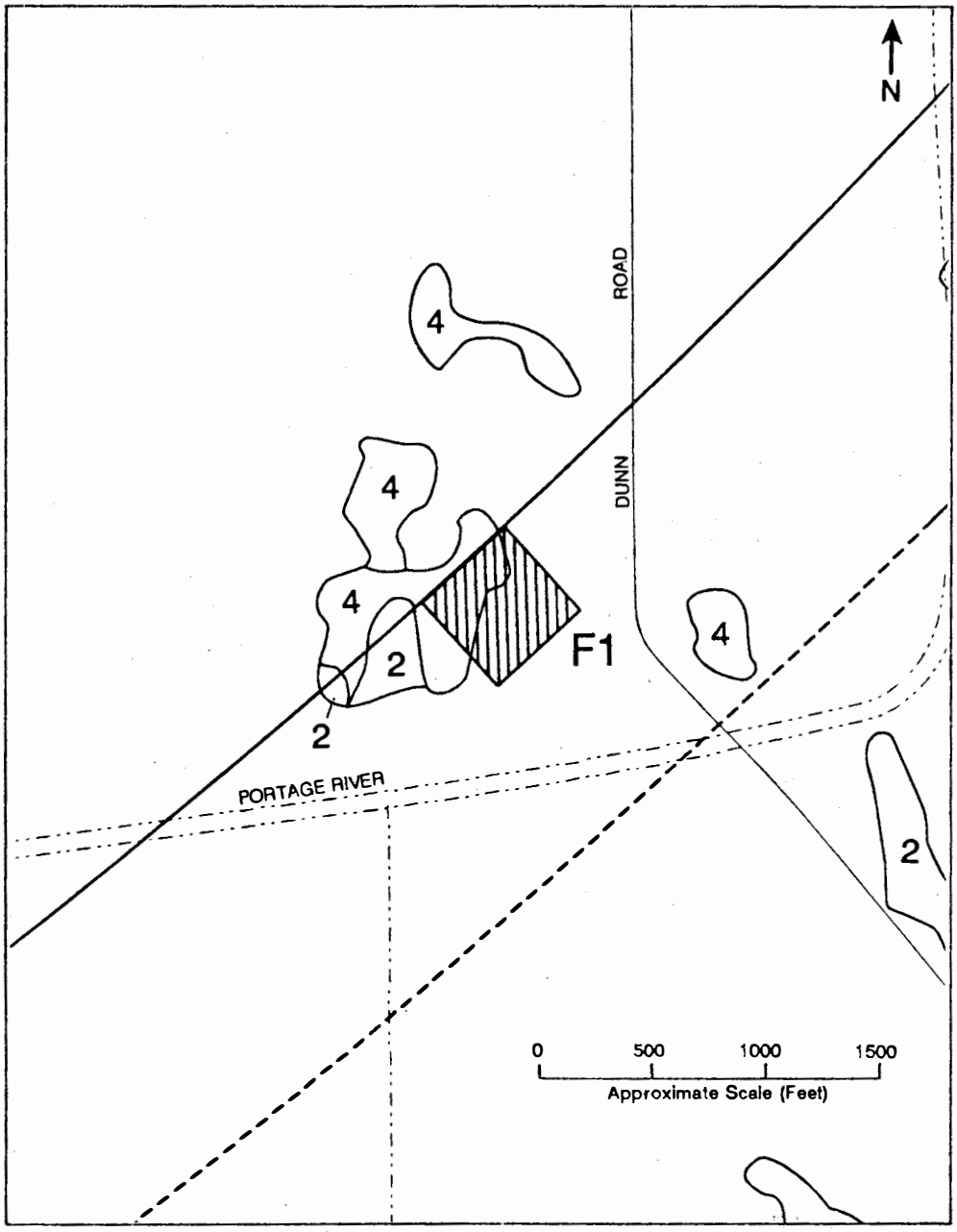
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-13

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES
AT THE PROPOSED MICHIGAN SITE: AREA F1



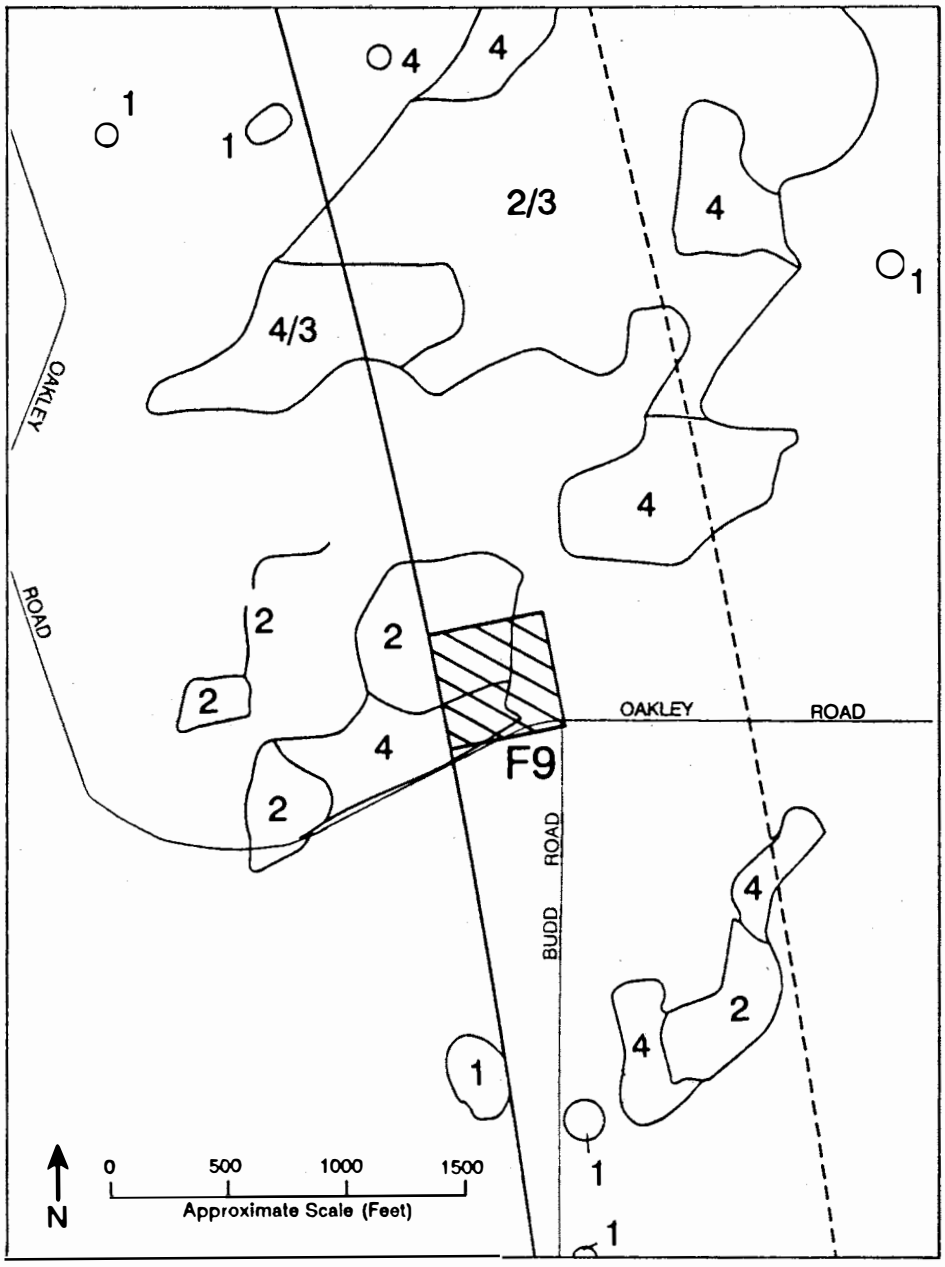
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-14

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED MICHIGAN SITE: AREA F9



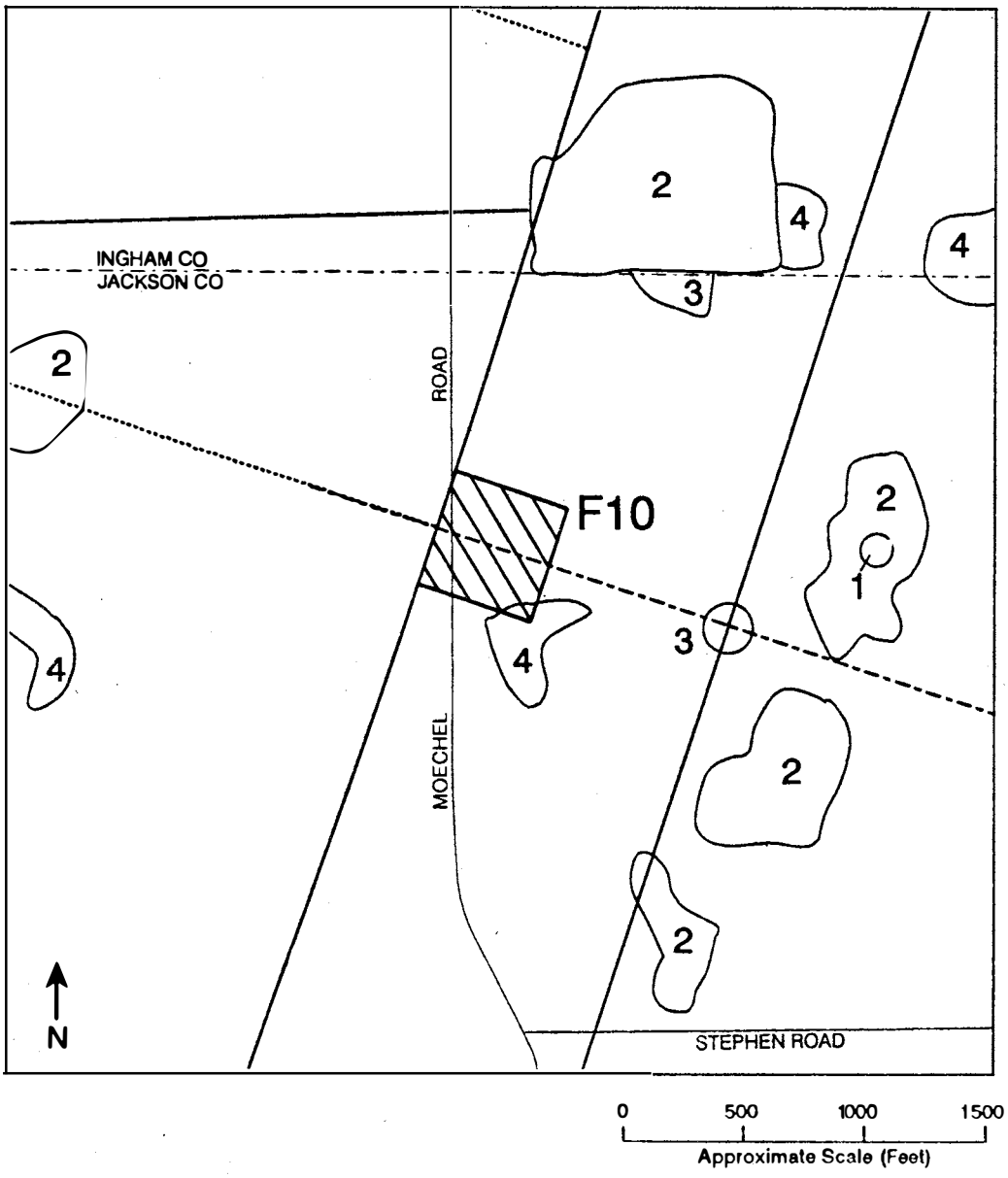
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-15

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED MICHIGAN SITE: AREA F10



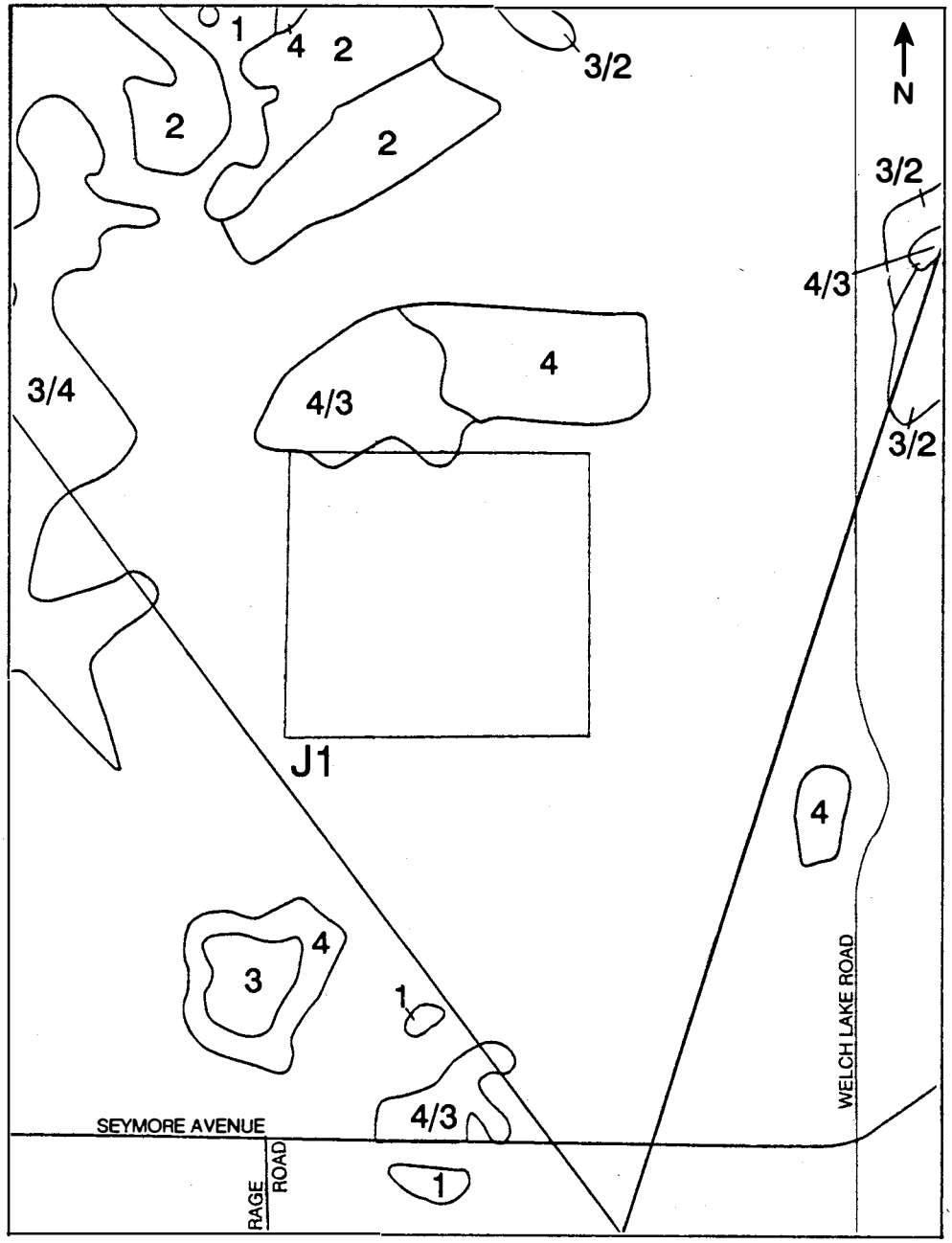
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-16

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED MICHIGAN SITE: AREA J1



LEGEND

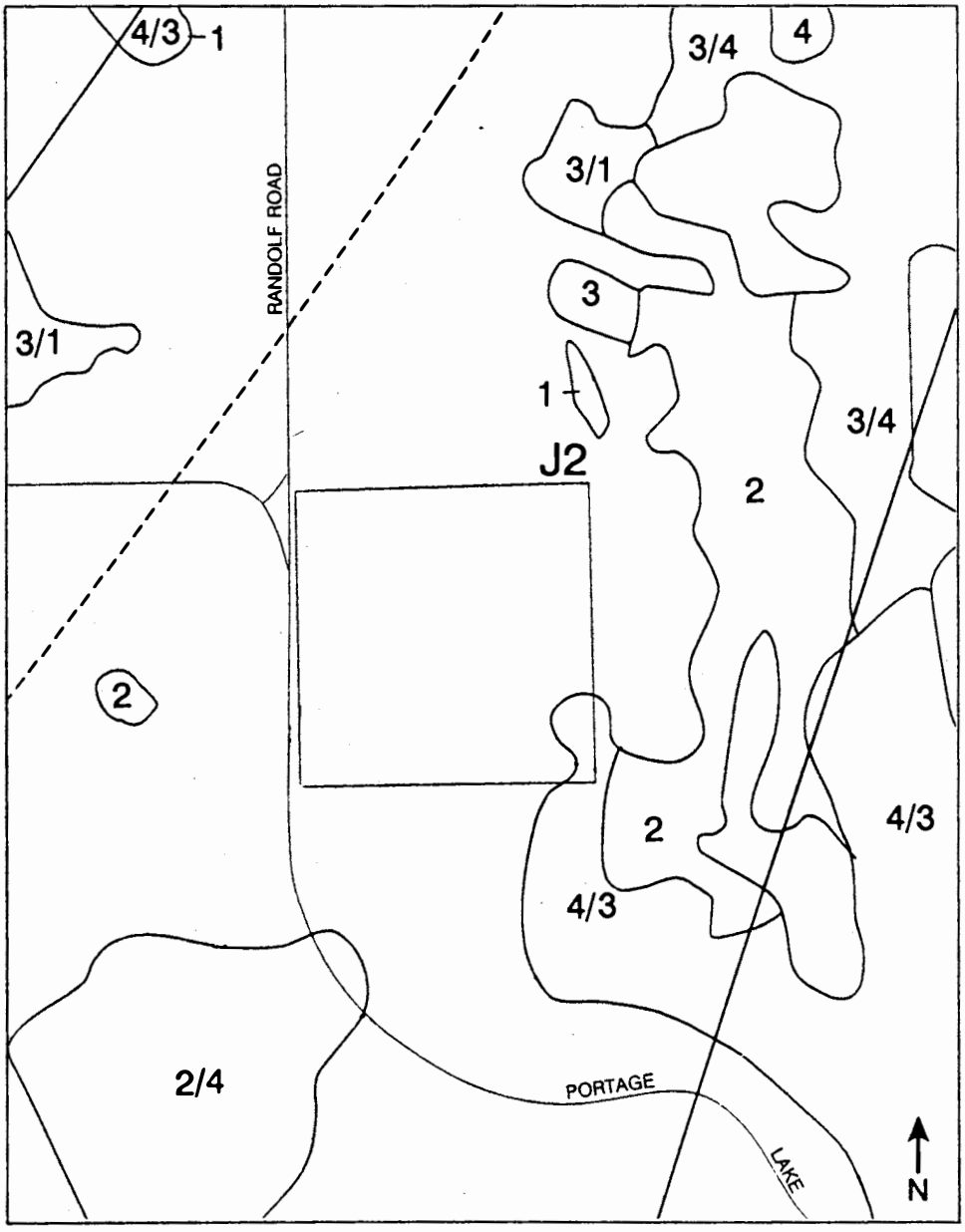
1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

0 500 1000 1500
Approximate Scale (Feet)

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-17

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED MICHIGAN SITE: AREA J2



LEGEND

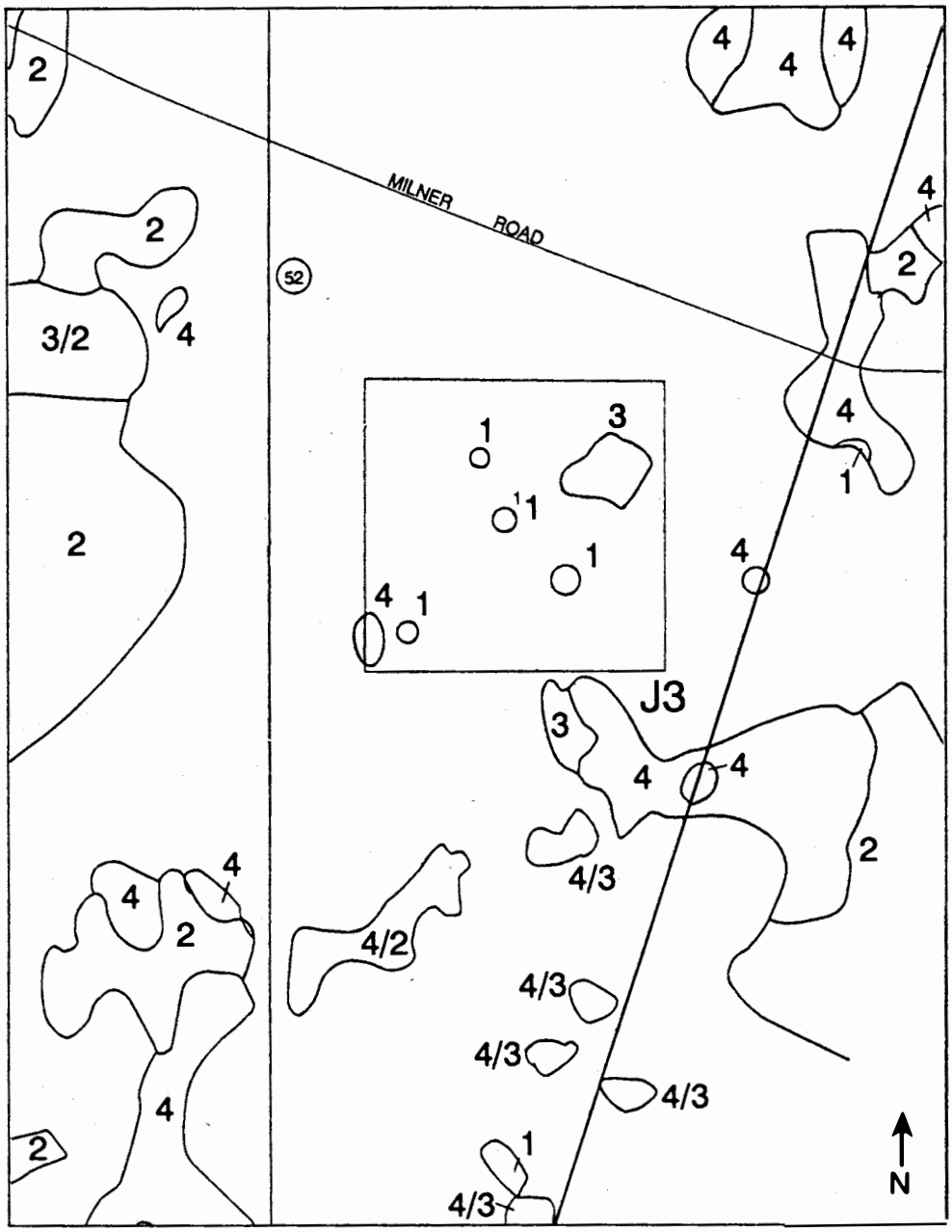
1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

0 500 1000 1500
Approximate Scale (Feet)

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-18

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES
AT THE PROPOSED MICHIGAN SITE: AREA J3



LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

0 500 1000 1500
Approximate Scale (Feet)

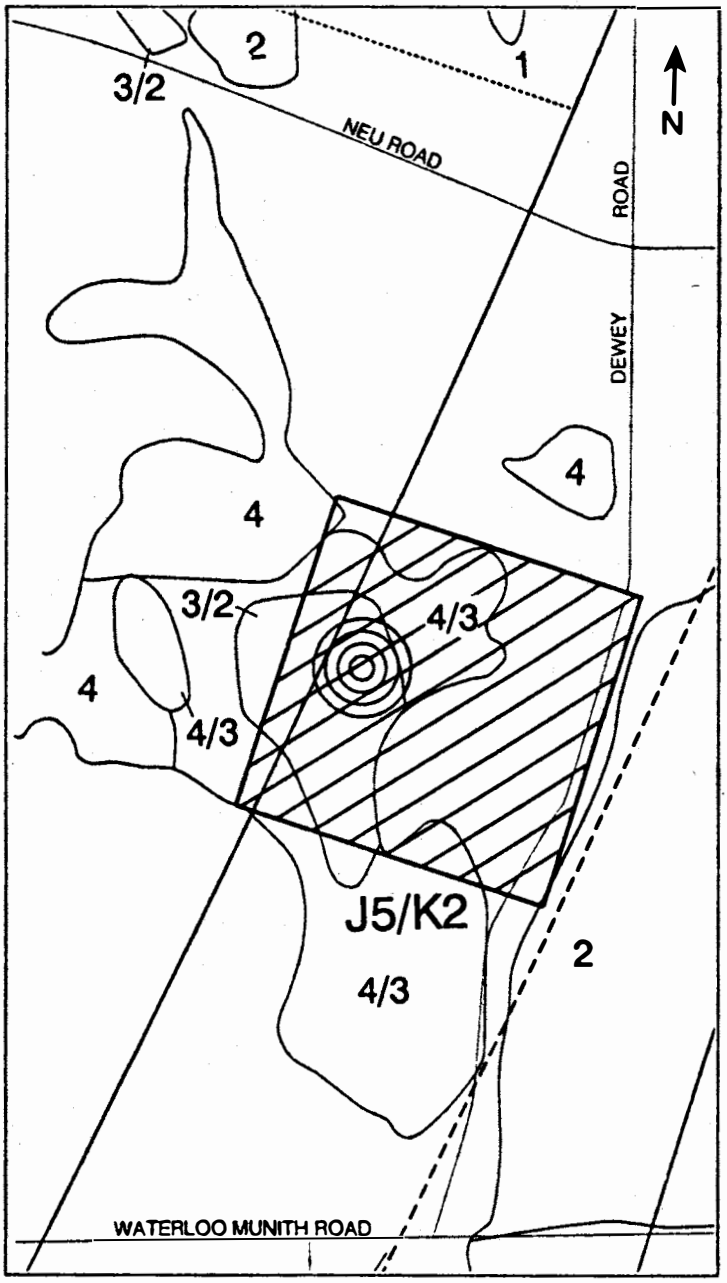
SSCAP11A3278862

EIS Volume IV Appendix 11

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-19

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED MICHIGAN SITE: AREA J5/K2



LEGEND

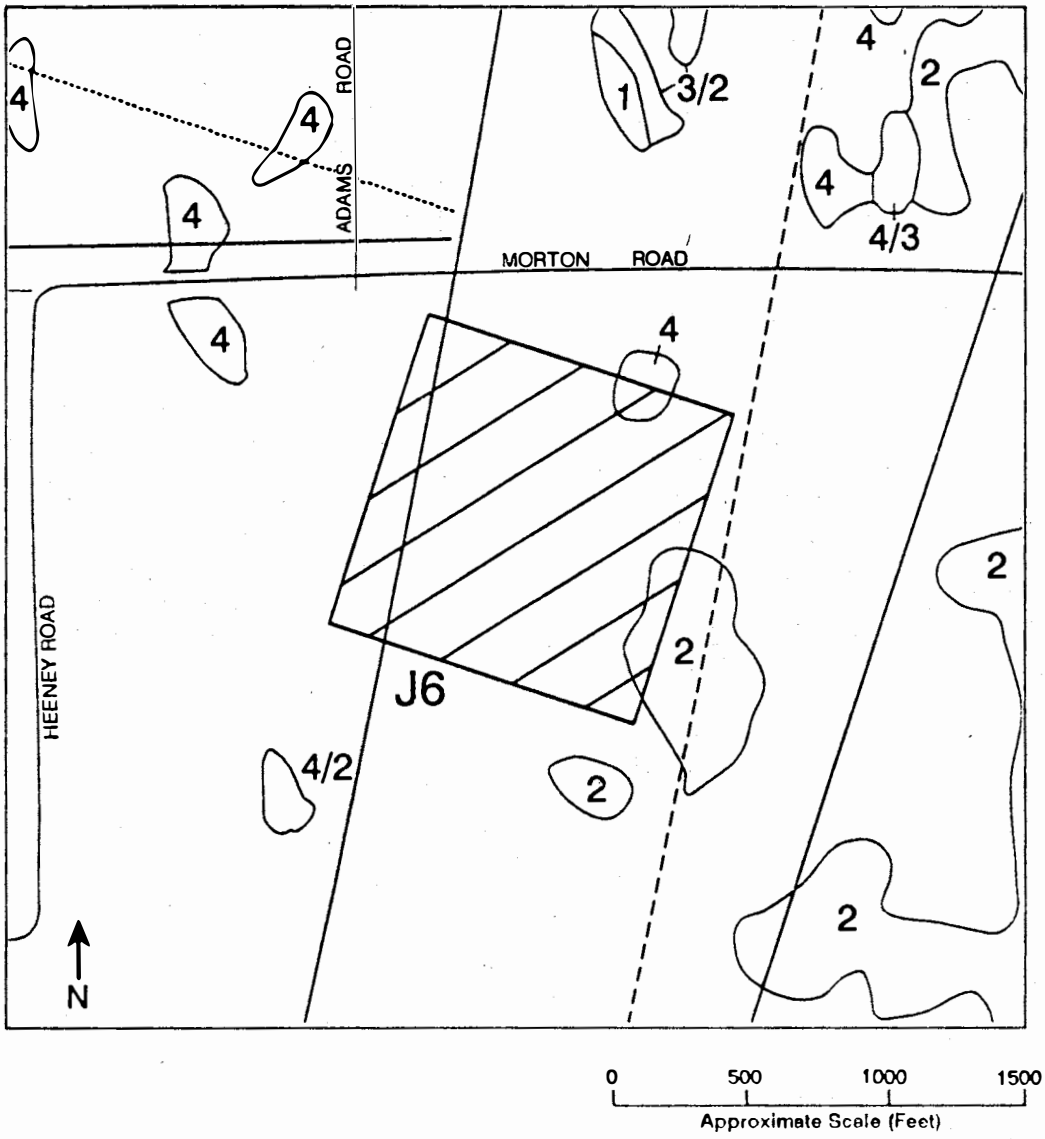
1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

0 500 1000 1500
Approximate Scale (Feet)

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-20

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED MICHIGAN SITE: AREA J6



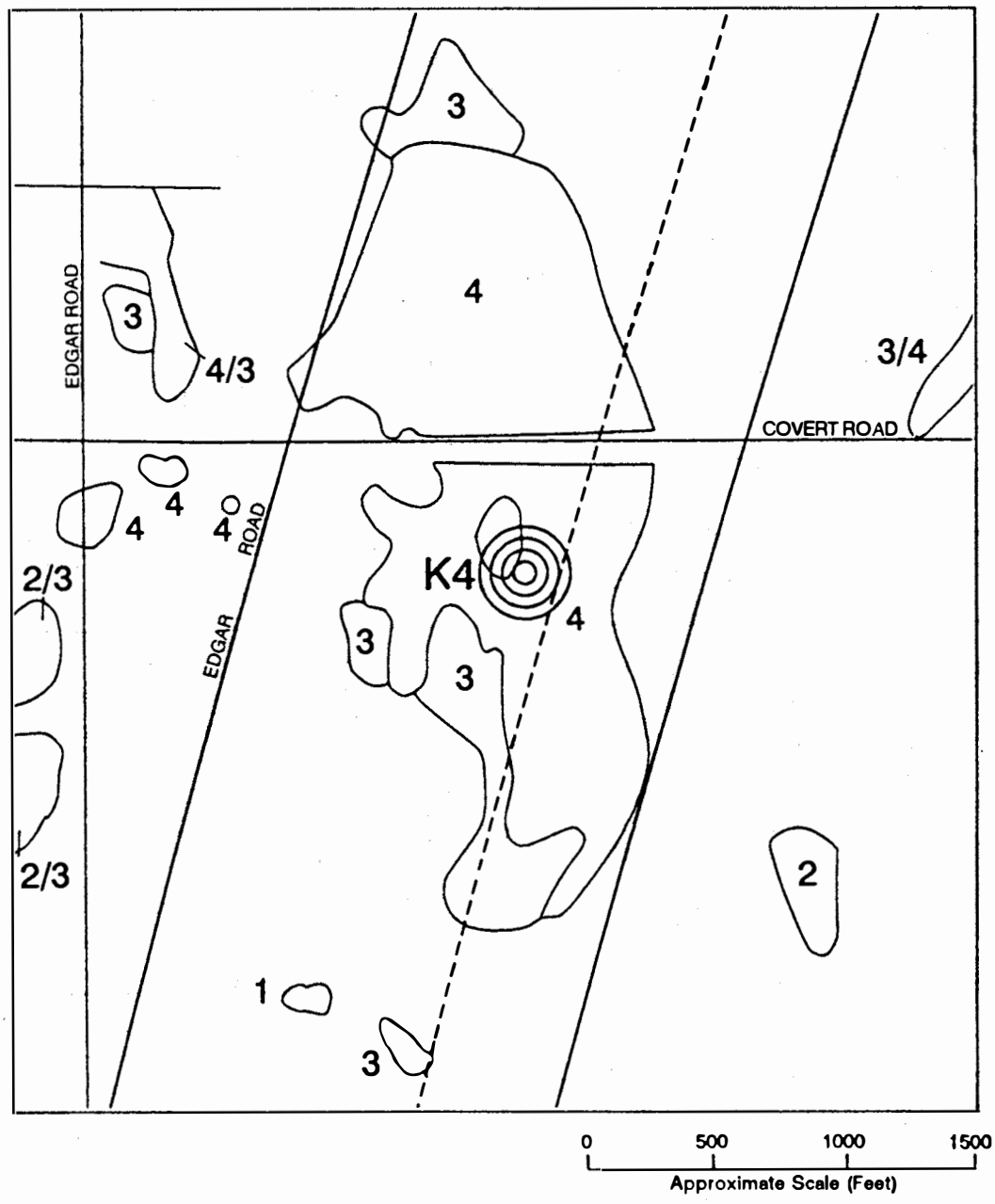
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-21

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED MICHIGAN SITE: AREA K4



LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Table 11.3.4.3-1

WETLANDS WITHIN PROPOSED SURFACE FACILITY AREAS IN MICHIGAN[1]

Facility	Number of Wetlands[2]	Area of Wetlands (ac)[3]	Area Disturbed (ac)	Area of Wetlands Impacted (ac)[4]
Proposed				
A	6	29.6	197	29.6
B	46	133.1	279	133.1
E1	2	3.4	1	3.4
E4	1	2.0	1	1.0
E5	2	10.0	1	1.0
F1	2	10.5	2.5	2.5
F9	2	15.0	2.5	2.5
F10	1	3.0	2.5	2.5
K2	2[5]	45.0[5]	14.0	14.0
Total	64	251.6	500.5	189.6
Future Expansion				
C	43	281.0	279	279
K4	1	3.0	5.0	3.0
J1	1	5.1	20.0	5.1
J2	1	3.0	20.0	3.0
J5	2[5]	45.0[5]	20.0	20.0
J3	6	5.5	20.0	5.5
J6	2	17.4	20.0	17.4
Total	56	360.0	304-324[6]	285.0-319.4[6]

1 Source: USFWS National Wetland Inventory maps.

2 Includes wetlands located completely or partially within surface facilities.

3 Includes entire area of wetlands including that extending beyond facility.

4 Area of wetlands within facility boundary up to a maximum of area to be disturbed.

5 J5 and K2 are at the same location. Therefore, the number and area of wetlands have been duplicated in this table.

6 Upper and lower bounds are placed on totals for future expansion areas because only two of the J areas (one of either J1, J2, or J5, and one of either J3, J4, or J6) would be developed if needed.

Major concentrations of wetlands occur in the Dansville State Game Area and the Waterloo Recreation Area, both located near but not immediately on the collider ring. These important wetlands are not expected to be affected by SSC construction because of their distance from surface facilities. In general, the most productive and diverse habitats have been avoided in locating the ring.

A. Construction Impacts

Nine of the surface facilities (Areas A, B, and E1, E4, E5, F1, F9, F10, and K2) to be initially developed at the proposed Michigan site could impact wetlands. Construction of these facilities could result in the destruction or modification of approximately 190 acres of wetland habitat (Table 11.3.4.3-1). All wetlands at these sites are classified as palustrine wetlands and include open water, forested, scrub-shrub, and emergent types (Figures 11-9 through 11-15 and 11-19). The highest quality wetlands are associated with Area B, E4, E5, J5/K2, and F9. Because of the amount and quality of wetlands involved, the greatest potential impacts could occur in J5/K2, and Areas A and B. An additional 319 acres of wetlands could be affected by development of future expansion areas (Figures 11-9 and 11-16 through 11-21). These estimates of wetland impacts are conservative and based on the assumption that no mitigation measures would be used. However, from engineering and construction standpoints, should the Michigan site be chosen wetlands habitats would be avoided where feasible and the amount of wetland impact would probably be lower.

Spoils disposal is to occur at several abandoned quarry sites. Little wetland habitat exists in these quarries, and most are severely degraded. Disposal of spoils would eliminate these wetlands.

Direct impacts to wetlands could result from 1) filling, draining, or elimination of portions of the wetlands; 2) vegetation clearing; 3) use of heavy machinery within wetlands; and 4) installation of structures within or adjacent to the wetlands. The potential impacts resulting from these activities could include disruption of drainage patterns, erosion and siltation, changes in water temperature and chemistry, habitat destruction, wildlife displacement, water level modification, and the inadvertent addition of chemicals (e.g., fuel). Some of these impacts could be temporary and, with adequate revegetation and erosion control measures, would cease soon after construction was complete. Dewatering of wetlands during tunnel and shaft construction are not expected to occur because of the low rates of groundwater seepage anticipated (see Volume IV, Appendix 10, Section 10.2.3.4).

Indirect construction impacts, such as siltation and erosion, could affect wetlands adjacent (within 250 ft of facility boundaries) to proposed surface facilities. E2, E7, F2, F3, F5, F6, and K3 are adjacent to wetlands. The erosion control measures planned for the construction of surface facilities (described in Volume IV, Appendix 7) should minimize indirect impacts to these wetlands. Impacts that occurred would be expected to cease as soon as construction and site restoration is complete.

Construction of ancillary facilities could also impact wetlands. Construction of access roads, the rail spur, and gas and water pipelines would disturb about 252 acres (Volume I, Chapter 3, Table 3-2). The wetland acreage included in this total has not been determined because the location of these facilities has not been finalized. However, wetland impacts could be minimized if wetlands were avoided during siting of facilities. Potential impacts associated with construction of ancillary facilities would be discussed in the Supplement to the EIS should Michigan be selected as the SSC site.

B. Operations Impacts

Operations of the SSC facility would not significantly impact existing wetlands. Minor impacts are expected as a result of maintenance, particularly of access roads, and from increased public access.

C. Mitigation

It is DOE policy to avoid impacts to wetlands to the maximum extent practicable, in compliance with Section 404 of the Clean Water Act and Executive Order 11990 - Protection of Wetlands. This could be accomplished by relocation of surface facilities that are located within or adjacent to wetlands. Prior to construction, wetland locations could be reviewed to determine locations for facilities that would minimize wetland impacts. Facilities E1, E4, E5, F1, F9, F10, and K2 could be located up to 200 ft from their proposed locations. These relocations would minimize facility locations within wetland habitats. However, relocation of these facilities may not completely eliminate the potential for wetland impacts. F1 and F9, in particular, may require mitigative measures other than relocation (see Figures 11-13 and 11-14). Other mitigations could include the development of J1 or J2 rather than J5, and the development of J4 rather than J3 or J6. These alternative facility choices, combined with relocation of either J1 or J2, could avoid wetland impacts associated with development of the buried beam access zone areas. The locations of access roads, pipelines, and other ancillary facilities could be adjusted during final design to minimize their encroachment upon wetlands. Bridging wetlands may also be possible in many instances, and would be recommended for extensive or high quality wetlands that occurred along access roads. Standard erosion control practices (described in Volume IV, Appendix 7) could be used to minimize surface runoff to adjacent wetlands.

To further mitigate wetlands loss where avoidance or other mitigation is not effective, wetlands replacement could be used as a mitigation. Additional mitigation could be proposed as a result of consultation during final design with appropriate Federal and/or State agencies (e.g., the USFWS, under the Fish and Wildlife Coordination Act, and with the Michigan Department of Natural Resources (MDNR), the delegated State authority, under Section 404 of the Clean Water Act). All work within wetlands would be conducted in accordance with conditions of the MDNR

permits, as well as those of other applicable State and local regulations. More detailed information relative to wetland mitigation would be included within the Supplement to the EIS should Michigan be selected as the SSC site.

Some future protection of wetlands on fee simple estate lands controlled by the DOE might be a benefit of the project. The fee simple status effectively precludes future development of wetlands in these areas.

11.3.4.4 Commercially, Recreationally, or Culturally Important Species

Numerous recreationally important species, particularly sport fish, are found within the proposed SSC ring alignment. The Grand River and Sycamore Creek are the major sites of recreational fishing in this area. Michigan regulations requiring remediation of wetland habitats, coupled with regulations protecting and enhancing opportunities for anadromous fish populations, would serve to minimize any significant negative impacts to the fisheries along the SSC alignment, if the Michigan site is selected.

Small game mammals hunted throughout the area include cottontail rabbits, white-tailed deer, and fox squirrels; waterfowl hunting is also common. Furbearing mammals trapped and hunted include muskrat, mink, and raccoon. Hunting, trapping, and fishing would be restricted, and therefore probably reduced, during construction, and would continue to be tightly controlled within fenced fee simple areas for the operational life of the SSC. If Michigan is selected as the SSC site, the exact locations of these areas would be determined later during final design of the project.

Passive recreational activities, such as bird watching and nature photography, are a part of the Haehnle Wildlife Sanctuary and Waterloo State Game Area usage. Significant rookeries and large populations of bird species, such as the sandhill crane and great blue heron, are present. These sites would not be affected by SSC operation. However, blasting noise and/or vibration during construction of the ring tunnel could temporarily affect these areas. While sudden, intense blasting noise could create a startle or panic response depending on the location of wildlife at the time of the incident, this noise source would be short term. The effects of noise from blasting could be mitigated by avoiding blasting during times when protected species exhibit critical behaviors.

11.3.5 North Carolina

The site proposed for the SSC in North Carolina is biologically diverse and occupied by natural and agricultural systems common to the Piedmont of North Carolina. The headwaters of several small streams and rivers cross the area. Approximately 65 percent of the site is forested, with the remainder primarily in agricultural use. Approximately 1,107 acres of habitat would be permanently disturbed or destroyed by SSC construction, and another 807 acres temporarily disturbed. Approximately 315 acres would be required for disposal of spoils. The perimeter of Areas A and B encompasses approximately 2,050 acres, which includes approximately 310 acres of agricultural land and 1,730 acres of natural systems such as wetlands and lands not in agriculture. Construction activities in Areas A and B would require 476 acres of land, 283 of which would be permanently disturbed with buildings and support facilities. Approximately 38 acres of wetlands are located within Areas A and B. Should North Carolina be selected for the site, during final design consideration would be given to avoiding wetlands and placing the SSC facilities in habitats with lesser value; mitigation activities would be expected to reduce the overall impacts of both temporary and permanent acreage losses.

11.3.5.1 Sensitive Terrestrial/Aquatic Communities

There are no wildlife refuges or sanctuaries in the vicinity of the proposed SSC site in North Carolina. However, several significant botanical resources and natural areas occur on or near the proposed site. Three areas have been identified by the North Carolina Natural Heritage Program as being of statewide significance, nine of regional (within the state) significance, and ten of local significance. The existence of these sites is due to the presence of species of plants which are either rare or uncommon in that part of North Carolina because of locally unusual basic soil types which have formed on intrusive igneous rocks. The largest such area straddles the Granville-Person county line just north of the communities of Denny's Store and Goshen. Of these areas identified by the State, eight of the sites occur within one mile of the proposed ring alignment:

Area 1: Goshen Gabbro Forest

The Goshen Gabbro Forest is a biological area of statewide significance located approximately one-half mile within the ring in the vicinity of Area H (the far cluster). In general, the Goshen Gabbro Forest should not be directly impacted by construction or operations of the SSC. However, construction might require some mitigation planning to reduce the risks of indirect impacts. Some outlying populations or individuals of the unusual plant species associated with this assemblage could be lost to construction in Area H or to secondary development in that vicinity. The species that appear to be at greatest risk are Indian physic, Lewis's heartleaf, and prairie dock, each listed either as a Primary Proposed or Significantly Rare species by the North Carolina Plant Conservation and Natural Heritage Programs.

Area 2: Vernon Hill Church Road Dry Forest

This site is a xeric oak-hickory forest that has developed on acidic soils. It is considered to be of regional significance to North Carolina because of the presence of several uncommon herbaceous plants. The forest is located just inside the proposed ring adjacent to the far cluster between E5 and F5. This plant community should not be impacted by the SSC.

Area 3: Tar River - Aquatic Habitat

The Tar River is a somewhat rocky river with numerous meanders. A significant feature is the biota, which include the endemic Neuse River waterdog (an amphibian), the Atlantic pigtoe and dwarf wedge mussel (mollusks), and the Roanoke bass (fish). Approximately 11 mi of the river are considered of regional significance to North Carolina. The proposed SSC ring tunnels under the river northeast of E9. Present plans do not call for surface facilities in areas that would have a high probability of impacting the river. Potential downstream impacts from siltation that may result from ancillary facility construction will require planning for minimization and mitigation during final design.

Area 4: Flat River Slopes Above Lake Michie

The Flat River is a regionally significant biological resource. The river in this area is rocky and scenic. Steeper bluffs and rocky slopes along the river are covered by a moist hardwood forest harboring dense thickets of mountain laurel. Other unusual or rare plant species for this portion of North Carolina are also present. An approximately 6-mile reach of the river bisects the proposed ring within Area G between E1 and F1. While some negative impacts of construction are inevitable on this biological community, the area is already segmented by several county roads. If North Carolina is selected as the site, this habitat would be investigated during preconstruction planning to minimize and/or mitigate negative impacts. With proper attention to construction mitigation, resource management plans for the fee simple area have the potential to assure protection of these resources. Additional discussion of the potential impacts to this resource is presented in Section 11.3.5.3 below.

Areas 5 to 8: Locally Significant Natural Areas

Four locally significant natural areas have been identified by the State as occurring within 1 mi of the proposed ring. These sites and their location with respect to the ring are: 1) Mayo Creek Slopes, outside of ring near the northwest end of H1; 2) Timberlake Poorly-Drained Upland Forest, outside the ring approximately 1 mi from F2; 3) South Flat River Rock Outcrops, outside the ring approximately 1 mi upstream of E2; 4) Flat River Slopes at Red Mountain, inside the ring crossing approximately 2 mi downstream of E2 and 1 mi from F1. None of these four natural areas should be directly impacted by either construction or operations of the SSC. Additional discussion of the impacts of the SSC crossing the Flat River is presented in Section 11.3.5.3 below.

Final siting and mitigation planning for ancillary facilities such as access roads, utilities, waste disposal plants, and water supplies would determine the extent and magnitude of impacts to the ecological resources. Maps and discussion of the location of these facilities are presented in Volume IV, Appendices 1 and 10, and would be addressed in greater detail in the Supplemental EIS should the North Carolina site be selected.

11.3.5.2 Threatened, Endangered, and State-Protected Species

The DOE has begun consultation with the USFWS in accordance with the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543), to determine the presence or absence of listed or candidate species in the vicinity of the proposed site. Should North Carolina be chosen as the site for the SSC, this process would continue throughout all site investigation, design, construction, and operations phases.

Although the USFWS has indicated that there are no known Federally listed animal species or designated critical habitats present in the site area, two listed animal species - the endangered southern bald eagle (Haliaeetus leucocephalus leucocephalus) and the endangered American peregrine falcon (Falco peregrinus anatum) - are occasionally present in the region. Bald eagles are present for a large part of the year on two nearby COE lakes, Falls of the Neuse Lake and Jordan Lake. However, no lakes on the SSC site are large enough to provide attractive foraging habitat for eagles. Peregrines are also attracted to larger bodies of water. Neither species is known to breed in the region. Thus, it is unlikely that either of these species would be adversely affected by development of the SSC in North Carolina.

Harperella (Ptilimnium nodosum) is a Federally-listed endangered wetland plant whose status has recently been changed (Moser 1988). Harperella has been observed in North Carolina at only two locations (Moser 1988; LaGrand 1988). One of these is in Granville County along the Tar River approximately 2 mi downstream of the southeast portion of the ring. The plant is typically found along the margins of streams and pools, in rocky shoals or shallow gravel. Although no surveys for harperella have been conducted at the site, preferred habitats in areas likely to be disturbed by surface activities would be surveyed for the presence or absence of the plant. Any populations found would not be adversely affected because no construction is planned within riparian areas, and populations of harperella would be avoided during project development.

A candidate species which will be proposed for Federal listing is the dwarf wedge mussel (Alasmidonta heterodon), found in the Tar River. Species under review (C2) by the USFWS include the Carolina madtom (Noturus furiosus) - which has been observed in the South Flat River (North Carolina Wildlife Resources Commission 1988) - smooth coneflower (Echinacea laevigata), Barbara's buttons (Marshallia grandiflora), nestronia (Nestronia umbellula), and Lewis' heartleaf (Hexastylis lewisii). The loggerhead shrike (Lanius ludovicianus migrans) is known to breed in the site vicinity and could be adversely affected if its

breeding habitat is disturbed by construction activities. Although no detailed population data are available for these species in the vicinity of the SSC site, if North Carolina is chosen as the site, surveys conducted during site investigations would determine their status on the site and evaluate potential impacts of site development. This information would be reported in a Supplemental EIS.

North Carolina agencies have also been consulted regarding the presence or absence and sensitivity of State protected, threatened, or endangered species. Plant and animal species that are given special status by the State may be present. This list includes 11 plants, up to seven mollusks, one fish (Roanoke bass, Ambloplites cacifrons), one amphibian (Neuse River waterdog, Necturus lewisi), and the loggerhead shrike. Recent surveys of the headwaters of the Neuse River and Tar River drainages and the tributary creeks of the Roanoke Drainage Basin located populations of proposed or State status fresh-water mussels (North Carolina Wildlife Resources Commission 1988). The dwarf wedge mussel was found in the Tar River near the center of the ring, but is not expected to be adversely affected by project activities in this area. However, it may be present in other streams in the area as well. Other species of mussel located during the survey include Fusconaia masoni (Tar and South Flat rivers), Lampsilis cariosa (Tar, South Flat, and Flat rivers), Lampsilis radiata (Flat River), Villosa delumbis (South Flat River), Villosa constricta (South Flat and Flat rivers), Anodonta imbecilis (South Flat River), and one unidentified species in Mayo Creek.

Fresh-water mussels are highly susceptible to siltation and contaminants introduced to streams during construction projects, particularly road construction. If the proposed North Carolina site is selected, detailed site investigations would be conducted to determine the population status and distribution of these species on the site, and the results would be reported in a Supplemental EIS. With adequate planning and mitigation, adverse impacts could be avoided.

Although no significant SSC construction activity is planned on or in the vicinity of the Flat River where it is crossed by the ring in the near cluster, construction of an access road may affect two locations in the floodplain near the campus area. Without proper control of runoff, sedimentation, siltation, and chemical contaminants may adversely affect water quality. The South Flat River, a relatively undisturbed stream with a diverse assemblage of freshwater mussels, many of which are under review by the State of North Carolina, will not be affected by the present alignment of the SSC.

To the extent possible, care should be taken for construction of future facilities at J2. Several plant species located along the rocky cliffs above the Tar River, while neither rare nor endangered in North Carolina, are unusual for the Piedmont area and are present in this or similar nearby habitats. With adequate planning and mitigation impacts to these sensitive areas could be prevented or avoided, and it is

possible through administrative action, such as purchase of unique lands, to provide permanent protection to unusual or sensitive habitats that are potential habitats for rare or listed species.

11.3.5.3 Wetlands

Wetland habitat is relatively common in the North Carolina project area. Wetland types include palustrine wetlands (emergent and forested) associated with streams and farm ponds, riverine wetlands, and lacustrine wetlands (man-made reservoirs). Approximately 151 acres (53 wetlands) are in fee simple areas associated with surface facilities. Facilities that are located within wetlands are shown in Figures 11-22 through 11-30 and listed in Table 11.3.5.3-1.

Many of the wetlands that would be affected by surface facilities have been degraded to some extent. Degradation can be attributed to a variety of factors including agricultural practices and residential development. Nearly half of the wetlands (26, totalling approximately 71 acres) are moderately degraded and eight wetlands (12.3 acres) are severely degraded. Wetlands totaling approximately 68 acres (19 wetlands) show little or no evidence of degradation. Most of these high-quality wetlands are less than a few acres in size; the largest (12.0 acres) is located in Area C.

A. Construction Impacts

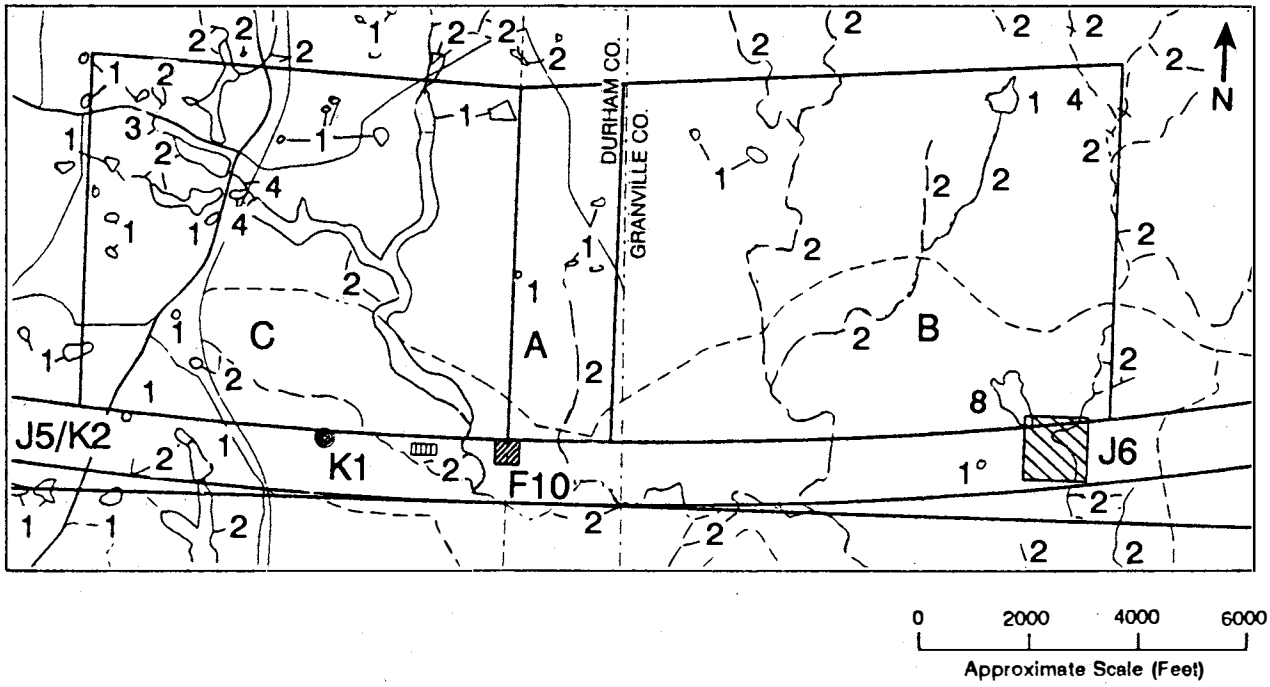
Five of the surface facilities to be initially developed at the proposed North Carolina site could impact wetland habitat (Areas A and B, and E2, E3, and F7; Table 11.3.5.3-1). Construction of the proposed surface facilities at these sites could result in the destruction or modification of about 41 acres of wetlands. The wetlands associated with these locations are all of relatively high quality. Most wetland impacts could occur within Area B. An additional 98 acres of wetlands could be affected by development of future expansion areas (Figures 11-22, and 11-26 through 11-30). These estimates of wetland impacts are conservative and are based on the assumption that no mitigation measures would be used. However, from engineering and construction standpoints, wetland habitats would be avoided where feasible and the amount of wetland impact would probably be lower.

Spoils disposal areas would occupy an estimated 320 acres in upland sites. All proposed disposal areas are at least 300 ft away from wetlands. As a result, no impacts to wetlands are expected.

Direct impacts to wetlands could result from 1) filling, draining, or elimination of portions of the wetlands; 2) vegetation clearing; 3) use of heavy machinery within wetlands; and 4) installation of structures within or adjacent to the wetlands. The potential impacts resulting from these activities could include disruption of drainage patterns, erosion and siltation, changes in water temperature and chemistry, habitat destruction, wildlife displacement, water level modification, and

Figure 11-22

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED NORTH CAROLINA SITE: AREAS A, B, C



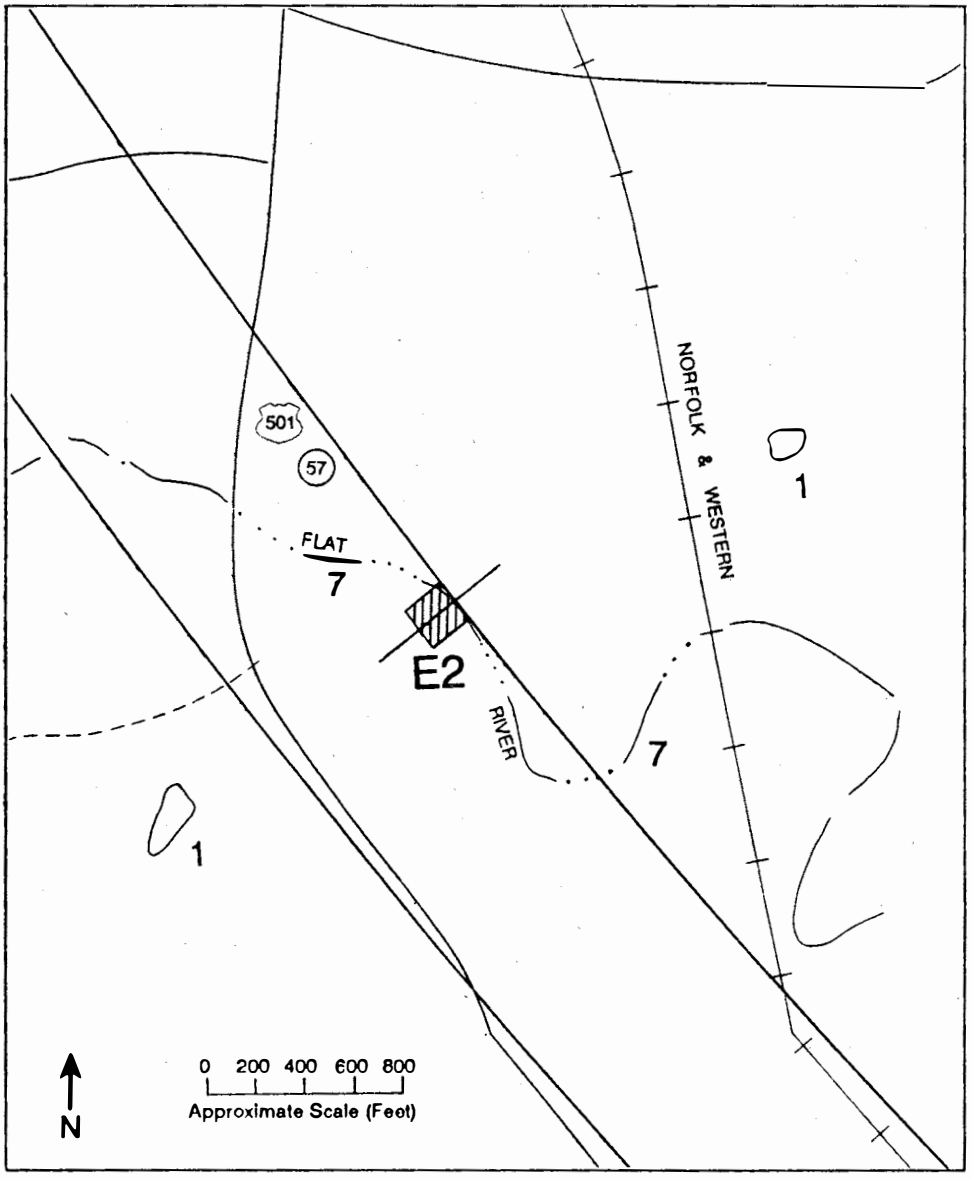
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-23

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED NORTH CAROLINA SITE: AREA E2



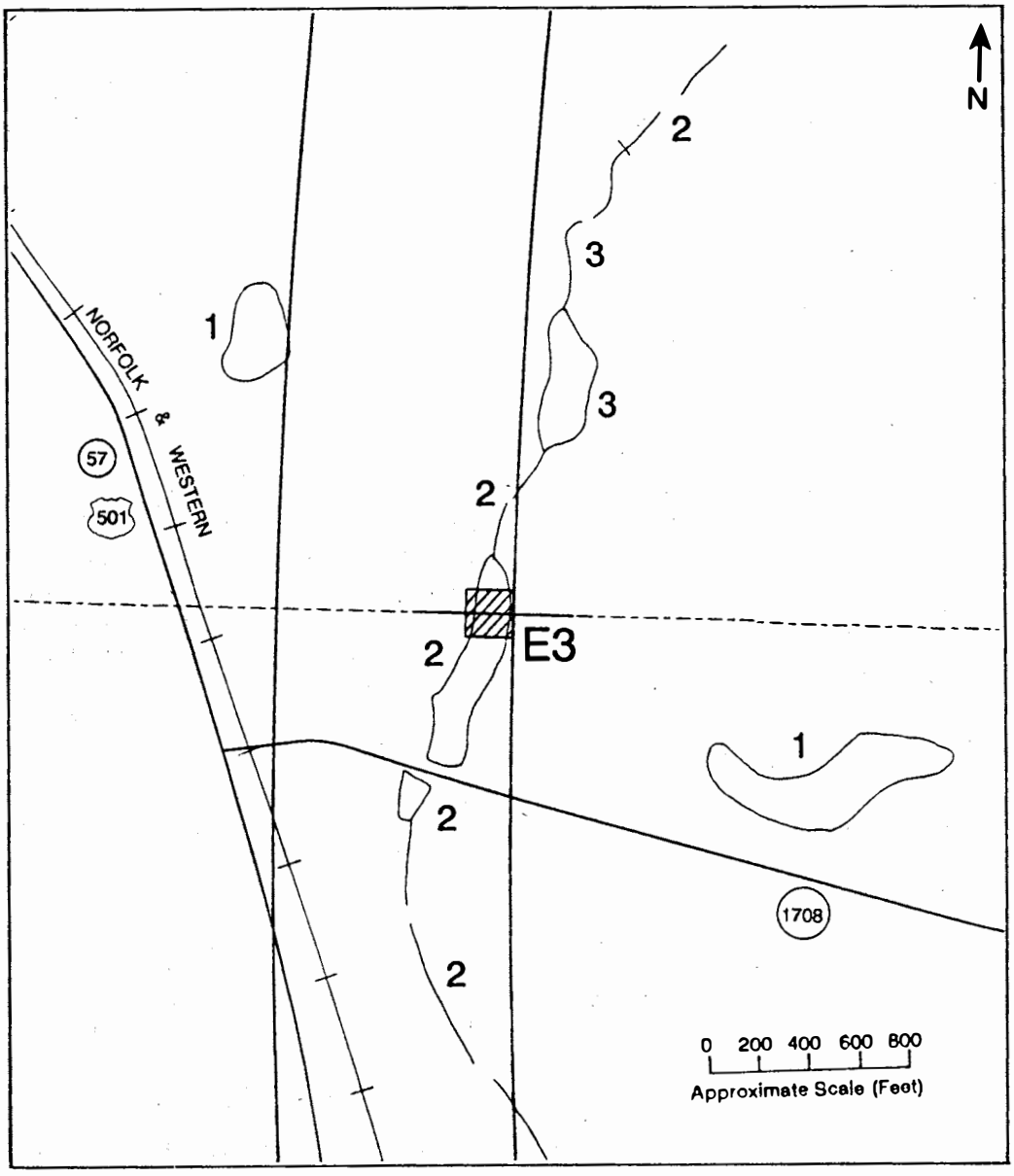
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-24

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES
AT THE PROPOSED NORTH CAROLINA SITE: AREA E3



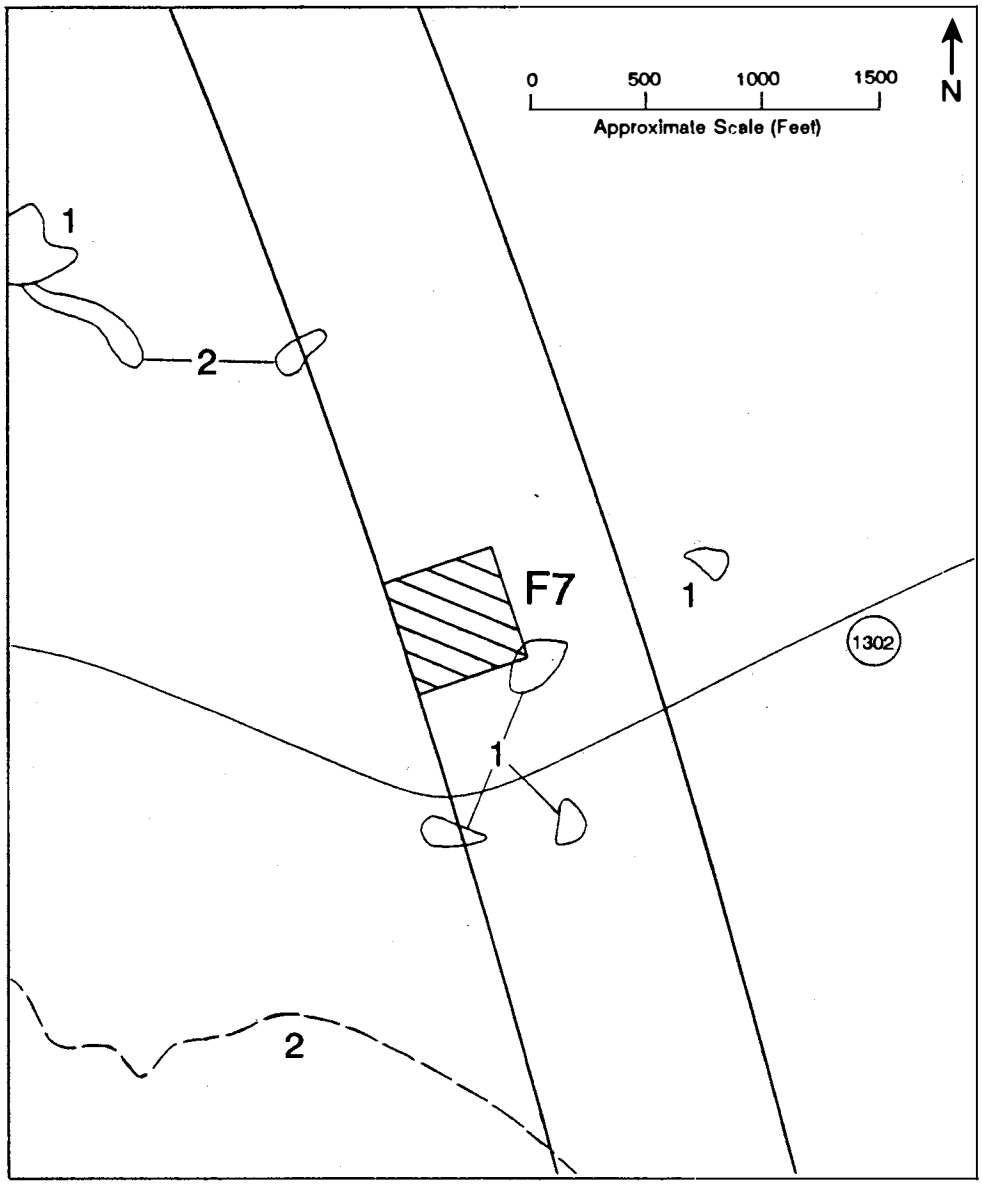
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-25

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED NORTH CAROLINA SITE: AREA F7



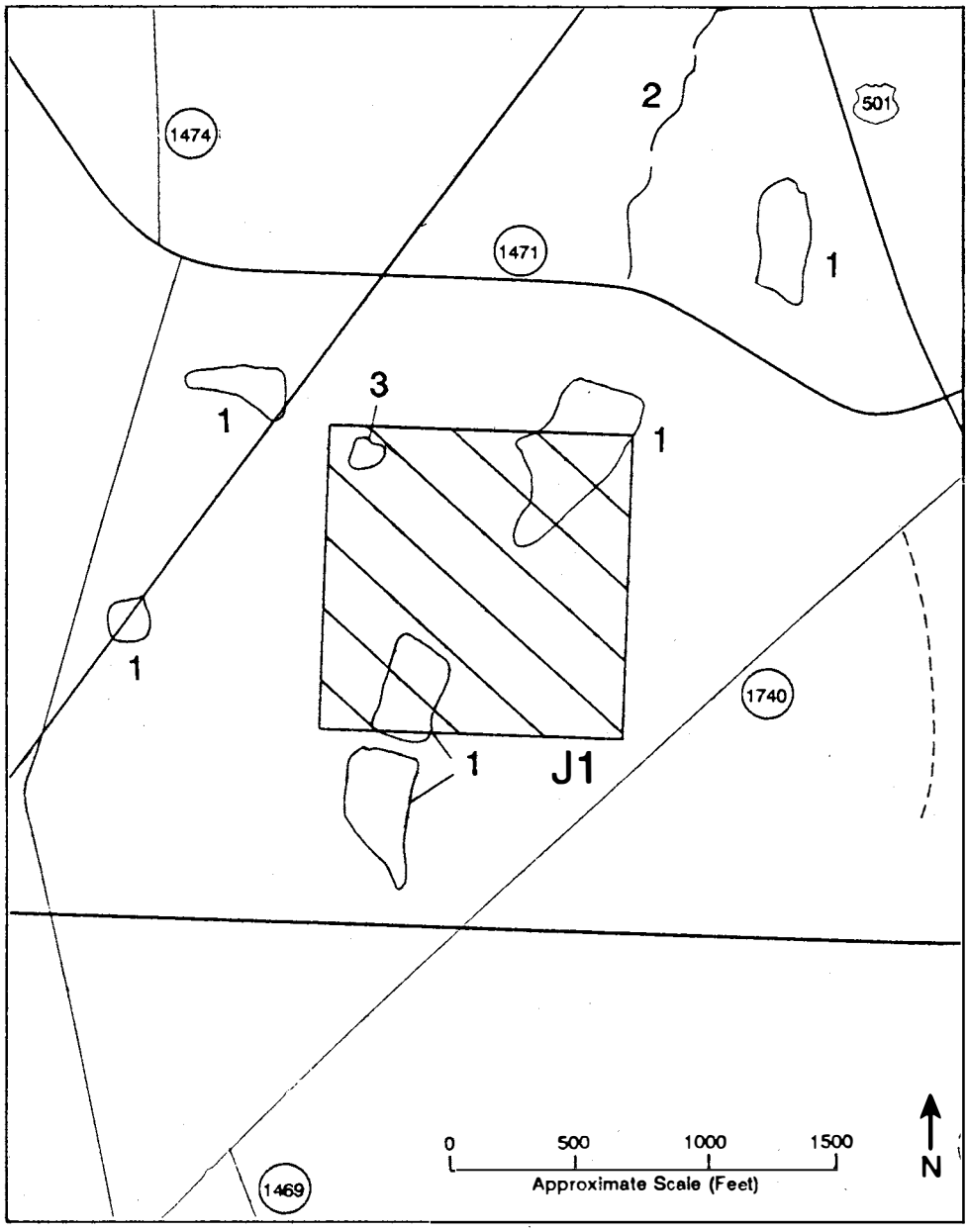
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-26

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED NORTH CAROLINA SITE: AREA J1



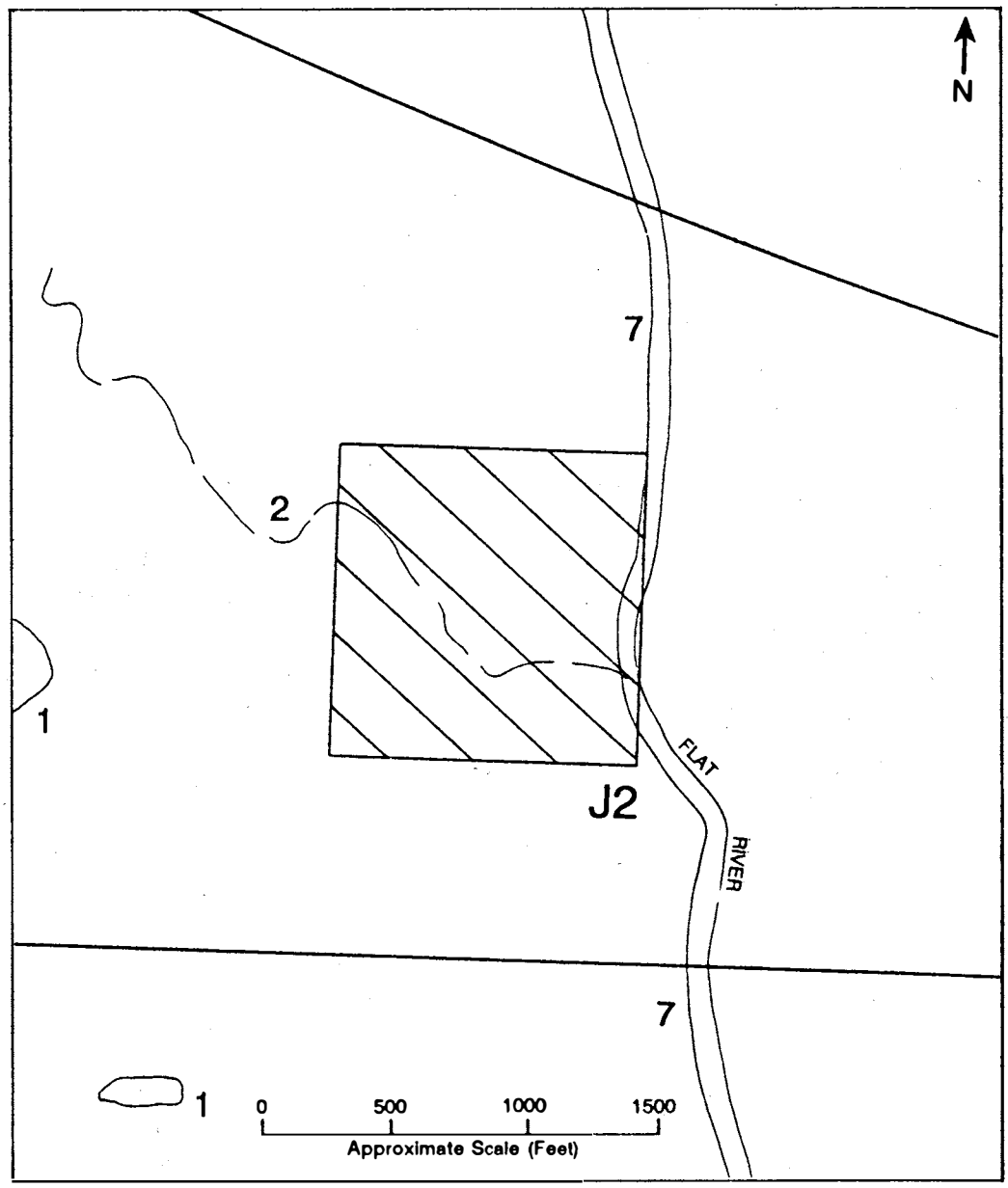
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-27

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED NORTH CAROLINA SITE: AREA J2



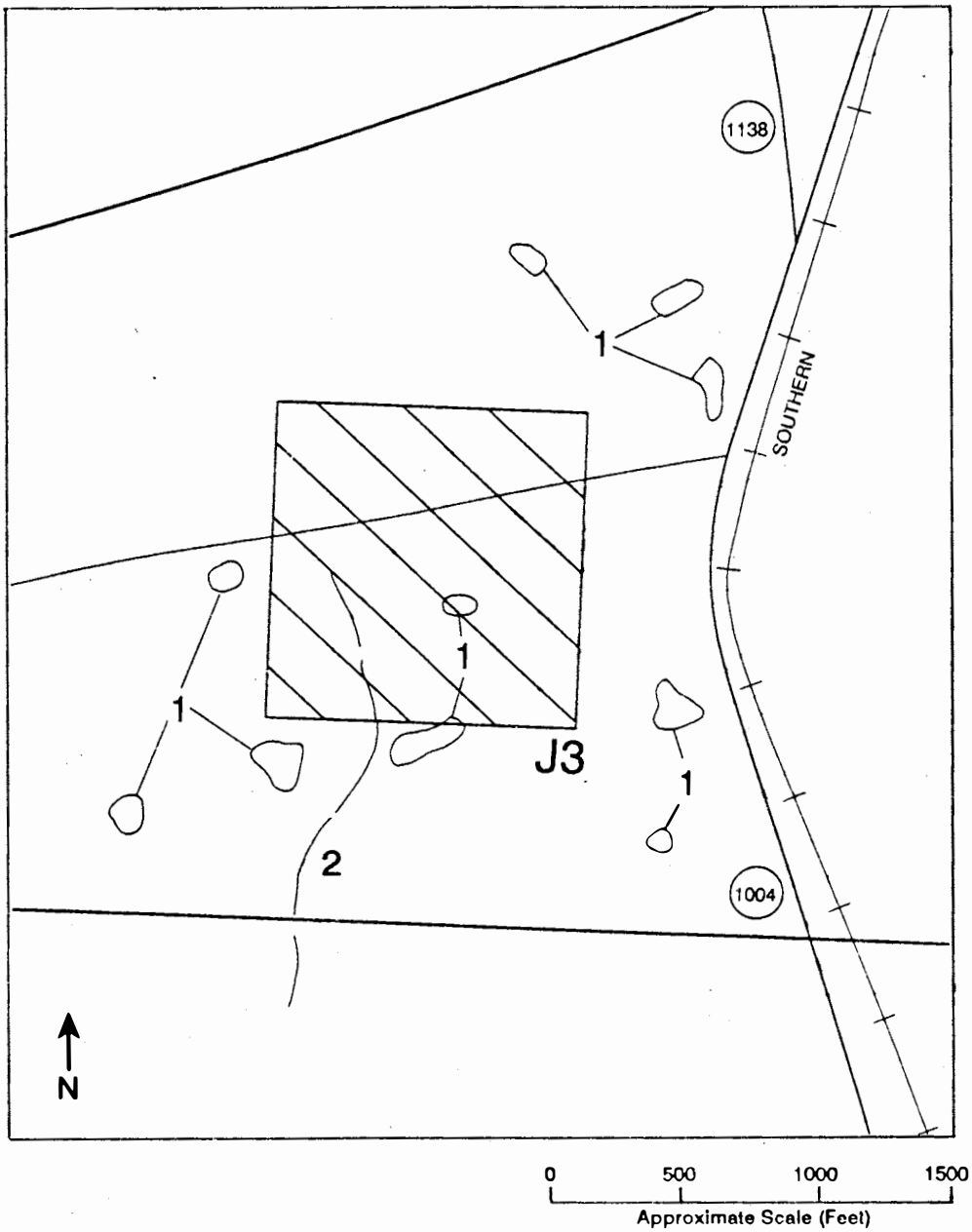
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-28

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED NORTH CAROLINA SITE: AREA J3



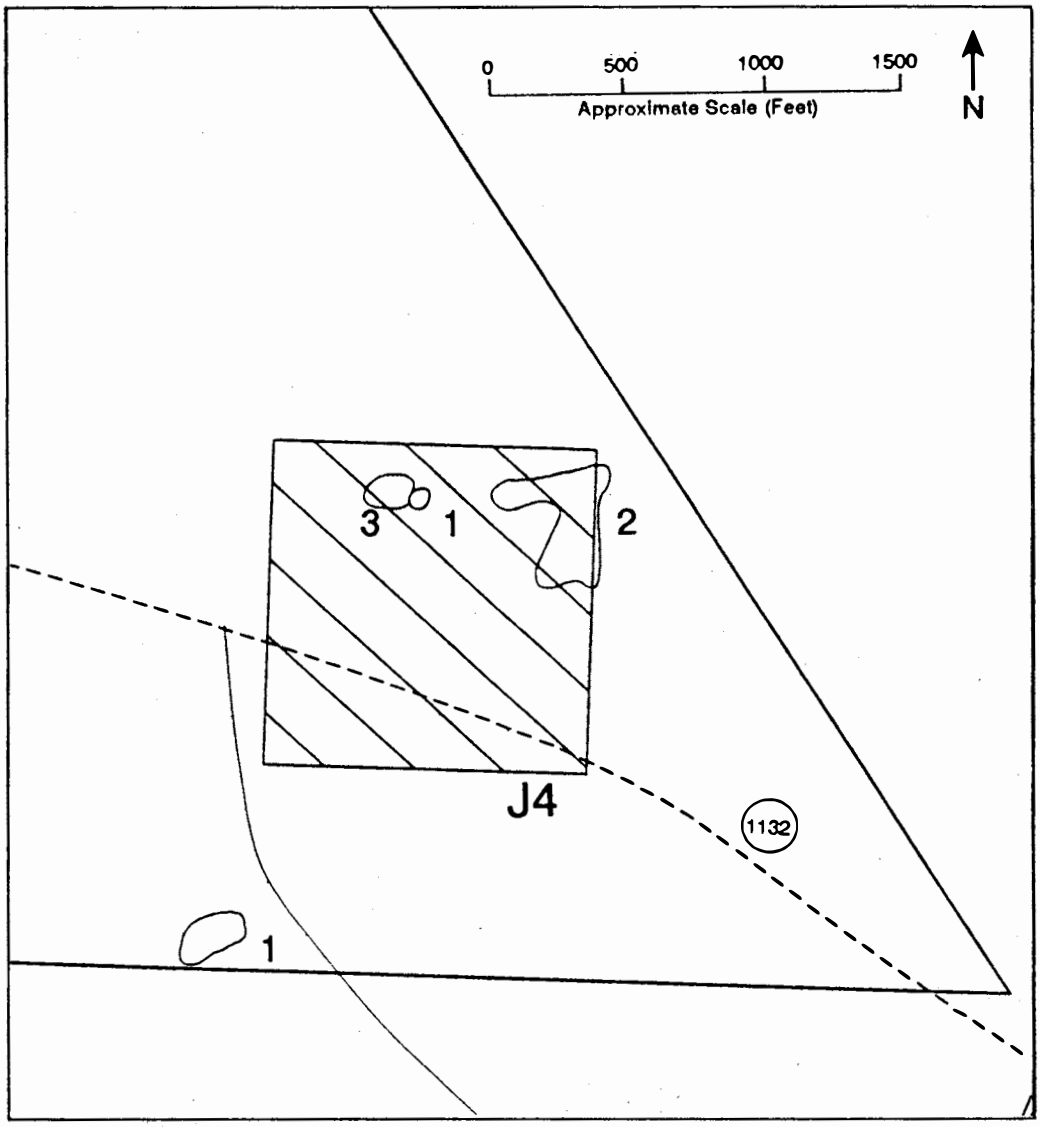
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-29

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED NORTH CAROLINA SITE: AREA J4



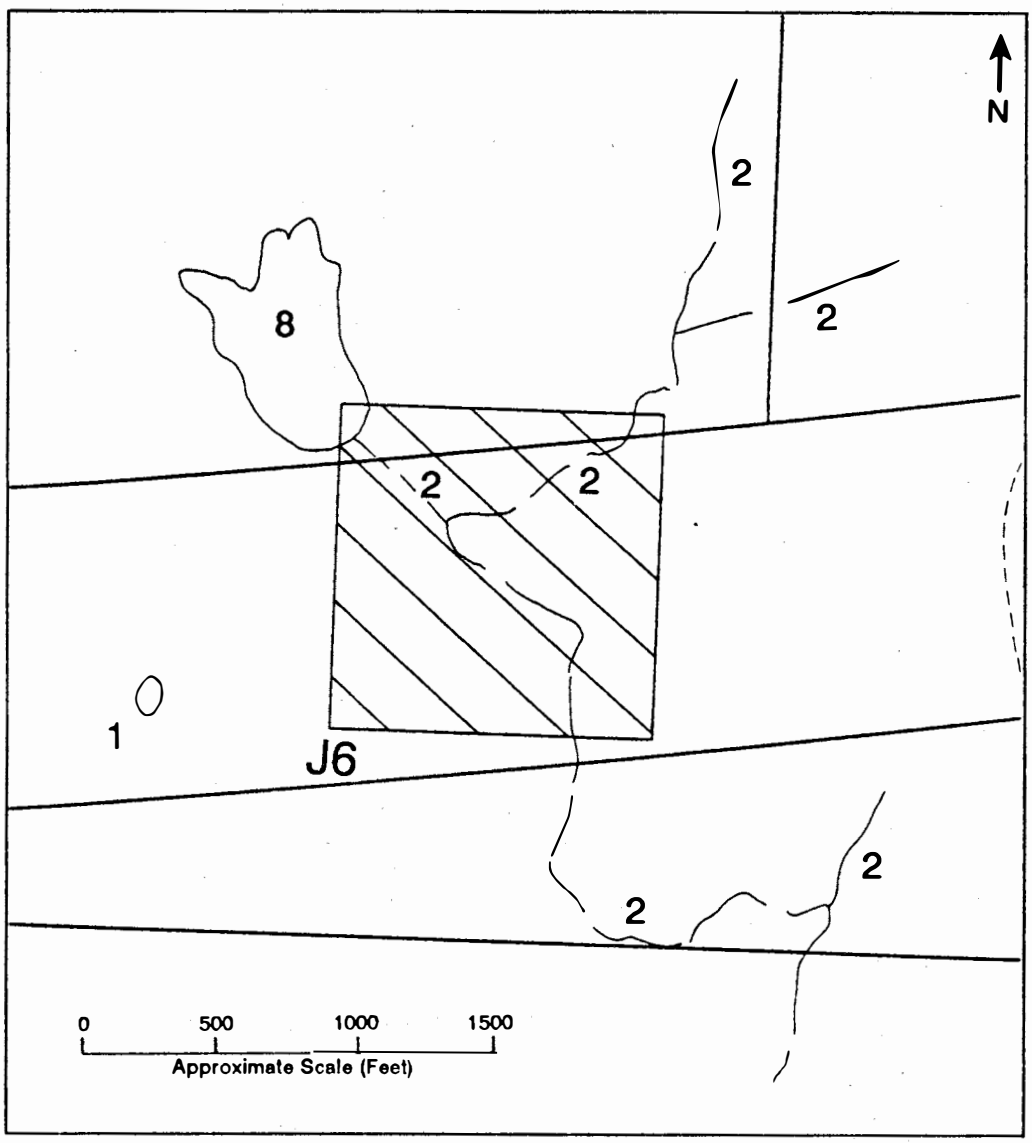
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-30

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED NORTH CAROLINA SITE: AREA J6



LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Table 11.3.5.3-1

WETLANDS WITHIN PROPOSED FACILITY AREAS IN NORTH CAROLINA[1]

Facility	Number of Wetlands[2]	Area of Wetlands (ac)[3]	Area Disturbed (ac)	Area of Wetlands Impacted (ac)[4]
Proposed				
A	5	7.2	197	7.2
B	7	31.1	279	31.1
E2	1	0.2	1	0.2
E3	1	4.6	1	1.0
F7	1	1.3	2.5	1.3
Total	15	44.4	480.5	40.8
Future Expansion				
C	26	73.2	279	73.2
J1	3	10.9	20	10.9
J2	2	1.1	20	1.1
J4	3	6.1	20	6.1
J6	2	14.3	20	14.3
Total	36	105.6	279-319[5]	73.2-98.4[5]

1 Source: USFWS National Wetland Inventory maps.

2 Includes wetlands located completely or partially within surface facilities.

3 Includes entire area of wetlands including that extending beyond facility.

4 Area of wetlands within facility boundary up to a maximum of area to be disturbed.

5 Upper and lower bounds are placed on totals for future expansion areas because only two of the J areas (one of either J1, J2, or J5, and one of either J3, J4, or J6) would be developed if needed.

the addition of chemicals (e.g., fuel). Some of these impacts would be temporary and, with adequate revegetation and erosion control measures, would cease soon after construction was complete. Dewatering of wetlands during tunnel and shaft construction is not expected to occur because of the low rate of groundwater seepage anticipated (see Volume IV, Appendix 10, Section 10.2.3.5).

Indirect construction impacts, such as siltation and erosion, could affect wetlands adjacent (within 250 ft of facility boundaries) to proposed surface facilities. E5, F9, and K6 are adjacent to several relatively small wetlands. The erosion control measures planned for the construction of surface facilities (described in Volume IV, Appendix 7) should minimize indirect impacts to these wetlands. Impacts that could occur would be expected to cease soon after construction and site restoration is complete.

Construction of ancillary facilities could impact additional wetland habitat. The proposed cluster connector road would impact several farm ponds, and also several palustrine forested wetlands associated with the many tributary streams within the collider ring. Proposed improvements to the four-lane divided road would likely impact two areas on the Flat River floodplain above and below Lake Michie, and wetlands associated with a tributary of Knap of Reeds Creek. Access road construction could impact wetlands in two areas of the Flat River floodplain. Overall, construction of access roads and gas and water pipelines would disturb about 840 acres (Volume I, Chapter 3, Table 3-2). The wetland acreage included in this total has not been determined. However, wetland impacts could be minimized if wetlands were avoided during siting of the facilities. Potential impacts associated with construction of ancillary facilities would be discussed in the Supplement to the EIS, should North Carolina be selected as the SSC site.

B. Operations Impacts

Operations of the SSC facility would not significantly impact existing wetlands. Minor impacts are expected as a result of maintenance, particularly of access roads, and from increased public access.

C. Mitigation

It is DOE policy to avoid impacts to wetlands to the maximum extent practicable, in compliance with Section 404 of the Clean Water Act and Executive Order 11990 - Protection of Wetlands. This could be accomplished by relocation of surface facilities that are located within or adjacent to wetlands. Should the North Carolina site be selected, prior to construction wetland locations could be reviewed to determine locations for facilities that would minimize wetland impacts. Facilities E2, E3, and F7 could be located up to 200 ft from their proposed locations. These relocations would minimize facility locations within wetland habitats. However, relocation of these facilities may not completely eliminate the potential for wetland impacts. E3, in particular,

may require mitigative measures other than relocation (see Figure 11-24). Other mitigations could include the development of J5 rather than J1 or J2 and development of J3 rather than J4 or J6. These alternative facility choices would avoid wetland impacts associated with development of the buried beam access zone areas. Access roads, pipelines, and other ancillary facilities could be adjusted during final design to minimize their encroachment upon wetlands. Bridging wetlands may also be possible in many instances, and could be recommended for extensive or high quality wetlands that may occur along access roads. Standard erosion control practices (described in Volume IV, Appendix 7) would be used to minimize surface runoff to adjacent wetlands.

To further mitigate wetlands impacts where avoidance or other mitigation is not effective, replacement in kind could be used as a form of mitigation. Should North Carolina be selected as the SSC site, additional mitigation could be proposed as a result of consultation during final design with appropriate Federal and/or State agencies (e.g., the USFWS, under the Fish and Wildlife Coordination Act, and with the COE under Section 404 of the Clean Water Act). All work within wetlands would be conducted in accordance with conditions of the COE permits, as well as those of other applicable State and local regulations. More detailed information relative to wetland mitigation would be included within the Supplement to the EIS should North Carolina be selected as the SSC site.

Some future protection of wetlands on fee simple estate lands controlled by the DOE might be a benefit of the project. The fee simple status effectively precludes future development of wetlands in these areas.

11.3.5.4 Commercially, Recreationally, or Culturally Important Species

Numerous species of recreational significance occur in the predominantly rural and natural areas of the proposed SSC site in North Carolina. Hunting, fishing, birding, and hiking are all pursued in the area. Fishing is popular, with species such as black bass, pickerel, crappie, perch, and sunfish found in ponds, reservoirs, streams, and rivers throughout the region. Recreational fishing is not expected to be adversely impacted, due to the presence of numerous water bodies and habitat for sport fish in the area.

Hunting, trapping, and fishing within Federal fee simple areas would be restricted during construction, and would continue to be tightly controlled within fenced fee simple areas for the operational life of the SSC. Should North Carolina be selected as the site, the exact locations of these areas would be determined later during final design of the project, although current estimates indicate that approximately 10 percent of the public hunting area of the State-owned Butner Game Lands would be within fee simple areas. Wild turkey and white-tailed deer harvests are high; other frequently hunted and/or trapped species include raccoon, mink, river otter, red and gray fox, bobcat, beaver, and migratory waterfowl. The limitations on hunting within the SSC vicinity mentioned above would only slightly affect hunting activities, because of extensive game lands occurring in many other parts of the region, including areas surrounding Mayo Reservoir and Mayo Creek.

11.3.6 Tennessee

The proposed SSC alignment in Tennessee is in an area of karst topography, a unique area containing limestone sinkholes and caves. Unusual plant communities, particularly the cedar glades with their complement of endemic and remnant species, are present as well as agricultural lands and forests. Construction of the SSC would permanently disturb or destroy 817 acres of these habitats and temporarily disturb approximately 672 additional acres. Approximately 364 acres would be required for spoils disposal. The perimeter of Areas A and B encompasses approximately 2,050 acres, which in Tennessee includes approximately 1,510 acres of agricultural land and 540 acres of natural systems such as wetlands and lands not in agriculture. Construction activities in Areas A and B would require 476 acres of land, 283 of which would be permanently disturbed with buildings and support facilities. Approximately 35 acres of wetlands are located within Areas A and B. Should the Tennessee site be selected, during the final design consideration would be given to avoiding wetlands and placing the SSC facilities in habitats with lesser value. Mitigation activities could be expected to reduce the overall impacts of the temporary and permanent losses.

11.3.6.1 Sensitive Terrestrial/Aquatic Communities

A. Cedar Glades

Cedar glades are an unusual plant community of the Cumberland River and Tennessee River basins. Many examples of this community exist in the general region and some are present in protected areas such as Cedar of Lebanon State Park and Henry Horton State Park. One significant glade and many other similar or smaller areas are present within the SSC ring area. Cedar Cove is the significant example mentioned in the State proposal, but its location is not known. Direct harvesting of red cedar trees is an agricultural practice in this part of Tennessee. Approximately 22 percent of the forested land in the area is red cedar canopied forest. Therefore, the red cedar itself is not a unique resource, and removal of small woodlands of this type in construction of the SSC would result only in normal developmental impacts to the area. However, some of the cedar glades are a significant resource for a number of co-occurring rare and threatened species. A detailed survey of their existence in areas of surface construction for the SSC might be necessary in order to support final design and to enhance mitigation of loss of the cedar glades. Should the Tennessee site be selected, the Supplement to the EIS would address this issue.

B. Snail Shell Cave

The Snail Shell Cave system, with 12.7 miles of mapped passages, is the longest continuous cave in the Central Basin of Tennessee. The cave system is a braided network of parallel streams with lateral passages with small wet-weather streams and residual pools and upper levels that act as water conduits only during flood stage (Barr 1988). There are two major streams in the system; one originates in the Windrow Creek

sinkhole, and the second originates west of the principal entrances in a large sink known as The Gulf. This second stream flows through the Nanna Cave, and has been dye-traced to Echo Cave. The system is developed in the highly cavernous Ridley limestone formation and may extend down into the underlying Pierce formation in a few places. Within the Ridley formation the roof of most passages is an especially thick and dense bed of limestone (Crawford 1982).

Because of the confining nature of the Snail Shell Cave system, the many populations of cave organisms are physically and genetically separated from other cave systems. This separation has created a unique natural community. The known fauna of the system include several endemics, as well as certain small, more widely distributed subterranean species. The troglobitic fauna (animals unique to caves and other subterranean microhabitatas and unable to survive in surface environments) contain three, possibly four, endemic troglobites: the blind cave salamander (Gyrinophilus sp.), the cave snail (Goniobasis sp.), the Trechine cave beetle (Pseudanophthalmus acherontis), and possibly the cave millipede (Trichopetalum sp.) (Barr 1988).

Should Tennessee be selected as the site for the SSC, it is highly probable that extensive surface and subsurface exploration activities would be done in order for the final siting of the SSC facilities. These geotechnical activities should identify both surface and subsurface karst features. Final placement of critical surface and subsurface facilities would take into consideration the potential for both construction and operational impacts to cave systems. As the collider ring would be well below the confining layer of the Snail Shell System at an average depth of 400 ft below the surface (i.e., below the Pierce Confining Layer), impacts to the cave system would be the result of construction of access shafts and borings and possibly surface activities.

Standard construction mitigation activities would be augmented by additional mitigation techniques specific to karst topography, in order to reduce or eliminate the potential for subsurface contamination of cave systems by suspended particulates, sewage, petroleum products, trash, and additional volumes of water. The DOE is aware of the Tennessee Cave Law. The potential for downstream impacts to cave-confined waterways and their biota must be considered in design of mitigation measures.

Physiological impacts from suspended particulates can be received by those aquatic organisms which retrieve small particles of food from the water and those organisms with gills. Those organisms which rely upon entrained food particles (directly or indirectly originating from the surface) could be affected by a reduction or increase in food sources, quantities, and contaminants. Some cave organisms have substrate specific habitat requirements which would be changed by an increase or decrease in particulates moving through their particular cave system. All these considerations would be taken into account by the Supplemental EIS should Tennessee be chosen as the site for the SSC.

C. Scales Mountain

The Tennessee site proposal mentions Scales Mountain as an ecologically significant, large (more than 1,000 acres) forested area located in proximity to fee simple Areas G and I. Because no information on the complement of natural habitats at this site has been provided to support impact analysis, contact with the State would continue should the Tennessee site be selected, and this area would be addressed in the Supplemental EIS.

D. Aquatic Resources

While some of the streams in the project area are ephemeral and therefore do not support significant aquatic populations, the headwaters of two permanent streams, Harpeth and West Fork Stones rivers, are within the ring and both cross the ring alignment. The West Fork Stones River is crossed by the ring near E1 within the near cluster where the level of impact depends upon final project design requirements. The Harpeth River is crossed by the ring between E8 and F8 and is not expected to be affected by surface construction. Likewise, the headwaters for many small tributaries of the Duck River are found within the ring, and a number are crossed by the ring in the far cluster area. The Duck River is a significant regional aquatic environment. The West Fork of Spring Creek at E6, Plum Branch at K6, and Clem Creek and North Fork at E5 are Duck River tributaries that appear to be the most likely to be impacted by current placements. These impacts might be reduced or avoided by the design and placement of facilities at these locations after the site has been selected. Tunneling should be sufficiently deep to eliminate hydrologic effects. These impacts would be addressed in the Supplemental EIS should the Tennessee site be selected.

Many small ponds and flooded sinkholes are found throughout the site area and represent good habitat for some aquatic and terrestrial species, particularly migrating waterfowl and wading birds. The number or proportion of these habitats which would be impacted by the SSC construction can only be determined by final design and mitigative measure plans. If the Tennessee site is selected, final design studies could be expected to avoid placement of facilities at sinkhole locations, reducing the potential for habitat loss due to construction activities. The effects of any incremental loss to habitat could be expected to be minimal.

E. Raptors

The Cumberland Plateau escarpment east of the proposed ring is a significant raptor migration corridor. The sandhill crane also uses this route. The range of their migration and distance from the site to the corridor are sufficiently large so that the SSC construction and operation should not negatively impact the use of this route by these species.

F. Refuges

There are no wildlife refuges or sanctuaries in the vicinity of the proposed site.

11.3.6.2 Threatened, Endangered, and State-Protected Species

The DOE has begun consultation with the USFWS in accordance with the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543), regarding the presence or absence of listed or candidate species (Attachment A). The Tennessee Wildlife Resources Agency and the Heritage Program of the Tennessee Department of Conservation would also be consulted regarding the presence or absence and sensitivity of State-protected, threatened, or endangered species where they occur. This consultation process would continue throughout project development. Although it has been determined that no designated critical habitats are present at or in the vicinity of the proposed site (50 CFR 17), habitat may be present in the region for several Federally-listed species.

Preliminary surveys for threatened or endangered species listed either by the USFWS or the Tennessee Department of Conservation have been conducted for the proposed SSC ring. Based on the habitats observed to date, the Federally-listed endangered Tennessee purple coneflower (Echinacea tennesseensis) may not be present in areas potentially affected by site disturbances because the local plant associations are not known to contain this species. The Federally-listed endangered gray bat (Myotis grisescens is not known to use local caves because the caves in the Snail Shell system are periodically flooded (Barr 1988). Unless detailed site investigations, conducted on site in the event the proposed Tennessee site is selected, confirm the presence of these species, no adverse effects are expected.

It has been determined that the Federally-listed endangered tan riffle shell mussel (Epioblasma walker;) may be present in local streams potentially affected by construction. These streams include the West Fork Stones River at E1, West Fork Spring Creek at E6, Plum Branch at K6, and Clem Creek and North Fork at E5. Construction near these streams could result in siltation or introduction of chemical pollutants, potentially affecting habitat for the mussel. If detailed surveys confirm the presence of the mussel in affected areas, the DOE would enter into consultation with the USFWS under Section 7 of the Endangered Species Act. Modifications to project design would result in the placement of surface facilities to avoid streams; construction would also employ the best engineering practices to avoid stream degradation. These would be discussed in a Supplemental EIS should the Tennessee site be selected.

Two other Federally-listed endangered mussels, the birdwing pearly mussel (Contadilla caelata) and the Cumberland monkeyface pearly mussel (Quadrula intermedia), are known to occur in the Duck River 5 mi upstream and 30 mi downstream of the ring alignment, respectively. Although no construction is planned in the area of the Duck River, if either species is present in one of the tributaries of the Duck River

they could be adversely affected if their populations were close to a construction area. Should Tennessee be selected as the SSC site, pre-construction surveys would be conducted to determine the presence or absence of and the potential impacts on these species.

The Federally-listed endangered Indiana bat (Myotis sodalis), which uses caves only for hibernation, is not known to winter in the region containing the proposed site. Site surveys have determined, however, that there is potential summer habitat. Foraging habitat is generally found along small- to moderate-sized streams that retain some flow or pools throughout the summer, and which are bordered by mature, overhanging trees. Although none of these areas are on the site, several potential areas are within one mile of the following proposed SSC surface facility sites: Overall Creek (Area B, J6), Stones River (J2, J5, K2), Fall Creek (E4), Clem Creek (E5), Spring Creek (E6), and Harpeth River (E8). Each of these areas would also contain nesting and roosting habitats, which consist of large, mature deciduous trees with cavities or loose bark, usually in riparian areas as well. Nesting and roosting habitats may be present at Area B, and J2, J5/K2, J6, E4, E5, E6, and E8. Although the Indiana bat is not expected to be present, project design could be modified to avoid potential nesting and roosting habitats. With the exception of Area B, habitats at each of the other sites can be avoided to a certain extent by relocation of the proposed surface facilities. At Area B habitat would be lost, but this habitat is only a small percentage of the total available to the species within the region. Potential habitat for the Indiana bat would be surveyed prior to site disturbance, and the DOE would begin formal consultation with the USFWS and State of Tennessee to determine appropriate avoidance or impact mitigation, which may include compensation for habitat lost.

In addition, two migratory Federally-listed endangered species, the southern bald eagle (Haliaeetus leucocephalus leucocephalus) and the American peregrine falcon (Falco peregrinus anatum), may occasionally be present in the region. These two wide ranging species are typically associated with large bodies of water and neither is known to nest in the region. Because development of the SSC in Tennessee would not affect habitat important to either species, it has been determined that the project would not result in adverse impacts.

The USFWS has also indicated that there are 11 candidate species (all C2 plants) for listing as threatened or endangered that may be present (Volume I, Chapter 4). Many of these are associated with cedar glades, thus it will be important to avoid these unique habitats during project development. In addition, recent surveys of the Snail Shell cave system have resulted in the discovery of a rich fauna which may include several endemic species that have not been described and may be new species (Barr 1988). These species, listed above in Section 11.3.6.1, include a blind salamander, stream snail, trechine beetle, and millipede. Although these species are not afforded legal protection under the Endangered Species Act of 1973, they may be listed in the future. Therefore, should Tennessee be selected as the SSC site, potential habitats for

each of the species would be extensively surveyed during site investigations to determine their presence or absence and if they would be adversely affected by site development. Candidate species would be considered during the planning phase and discussed in the Supplemental EIS. Project design would be modified as practicable to avoid any adverse impacts.

Tennessee lists 40 threatened or endangered species that may be present in the SSC vicinity (Volume I, Chapter 4, Section 4.7.4.2, Table 4-18). Preliminary surveys indicate that habitat may be present for 12 plants, two mussels, one fish, two amphibians, four birds (two are Federally-listed endangered), and two mammals (both Federally-listed endangered). Plants associated with Cedar Glades include glade cress (Leavenworthia exiqua var. exiqua), necklace glade cress (Leavenworthia torulosa), limestone fameflower (Talinum calcaricum), and leafy prairie clover (Dalea foliosa). The Tennessee cave salamander (Gyrinophilus palleucus), which is a candidate for Federal listing, is found in the Snail Shell cave system, and the hellbender (Cryptobranchus alleganiensis) and coppercheek darter (Ethiostoma aquali), both Federal candidates, have been reported in the Duck River Basin, which drains the far cluster and adjacent areas at F4 and E4. Two threatened species, Bewick's wren (Thryomones bewickii) and grasshopper sparrow (Ammodramus savannarum), are known to breed in the region, but are considered rare in the project area. Should Tennessee be selected as the SSC site, the presence or absence of these species would be confirmed during site investigations. Potential impacts to these species would be evaluated and discussed in the Supplement EIS and, if possible, avoided during the project design phase.

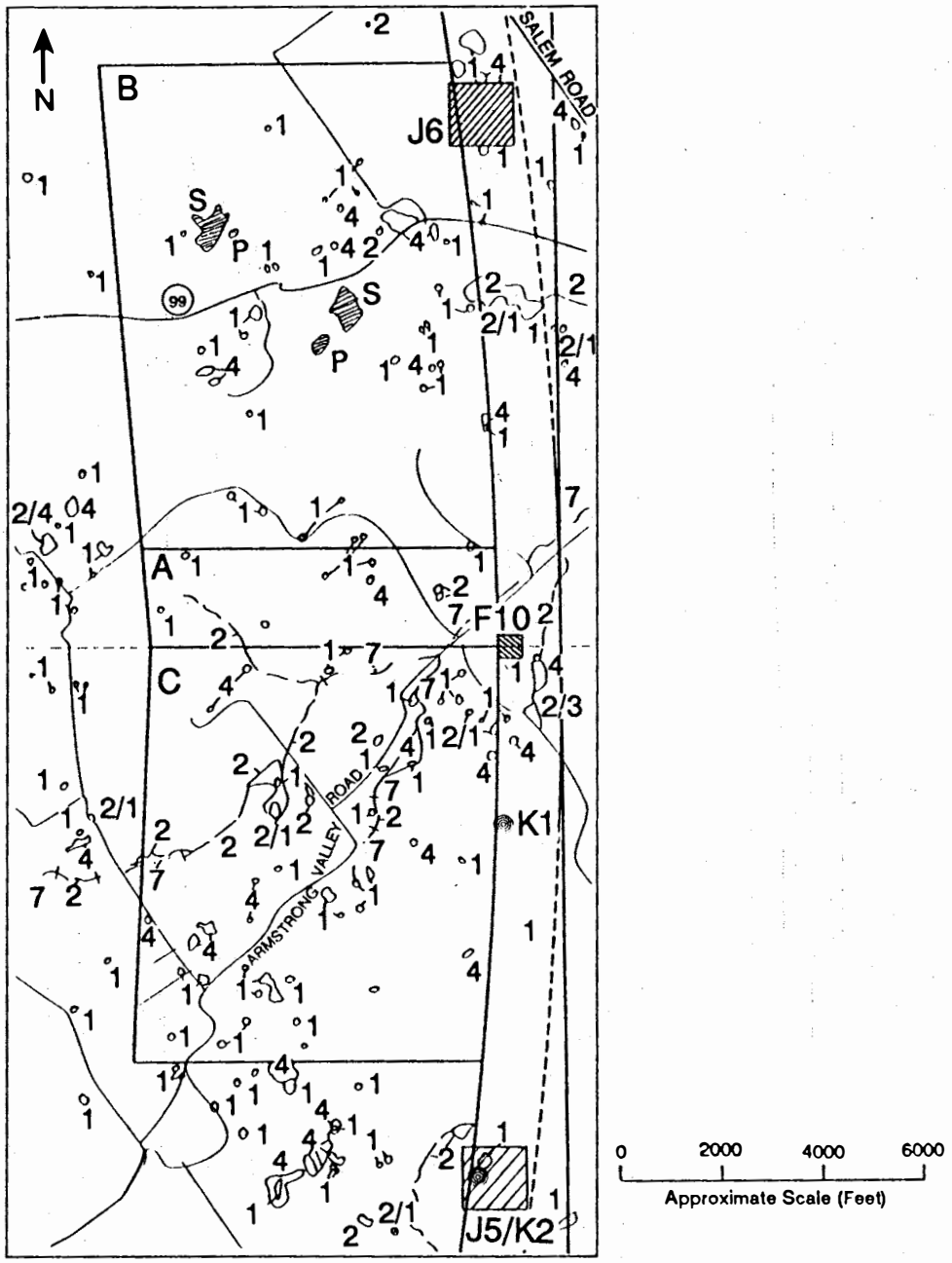
11.3.6.3 Wetlands

Wetlands are relatively common in the Tennessee project area. There are approximately 105 acres (113 wetlands) associated with planned surface facilities (Figures 11-31 through 11-34; Table 11.3.6.3-1). Most of these wetlands are farm ponds less than an acre in size. Palustrine emergent, palustrine forested, and riverine wetlands also occur within the proposed facility sites.

Most of the wetlands that are located within surface facility boundaries have been degraded, primarily as a result of agricultural practices and livestock use. Most are moderately degraded (71 wetlands, 61 acres), while approximately 25 percent (27 wetlands, 23.3 acres) are severely degraded. Few (four wetlands, 15.7 acres) show little or no degradation; three of these are forested palustrine wetlands located in area C and one is a riverine wetland that passes through F1. Eleven of the wetlands (4.8 acres) identified on USFWS maps and located in Areas B and C were not observed and quality could not be readily assessed from available aerial photographs.

Figure 11-31

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED TENNESSEE SITE: AREAS A, B, C, J5/K2, J6



LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

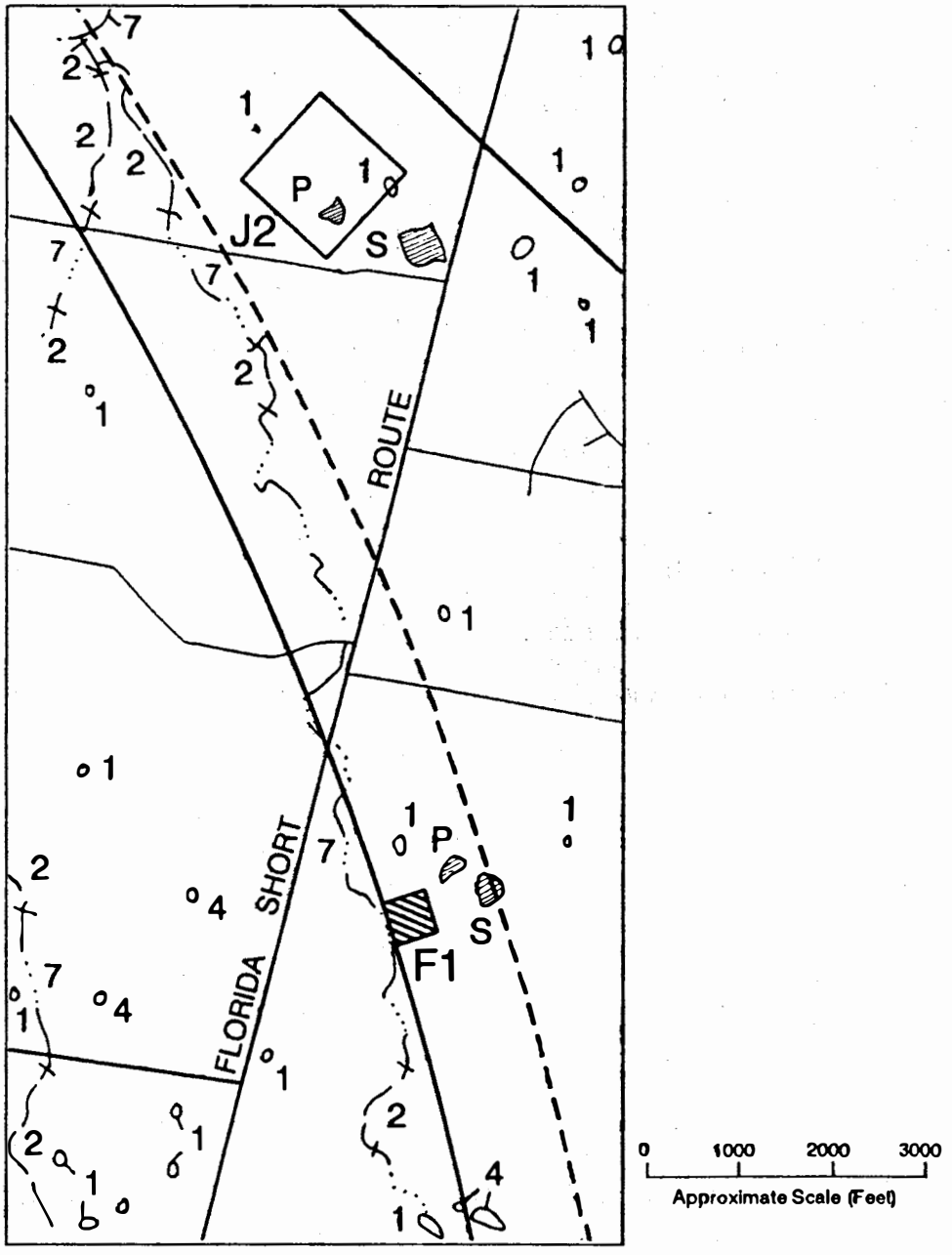
P SEDIMENTATION POND (PROPOSED)

S SPOIL PILE (PROPOSED)

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-32

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED TENNESSEE SITE: AREAS F1, J2



LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

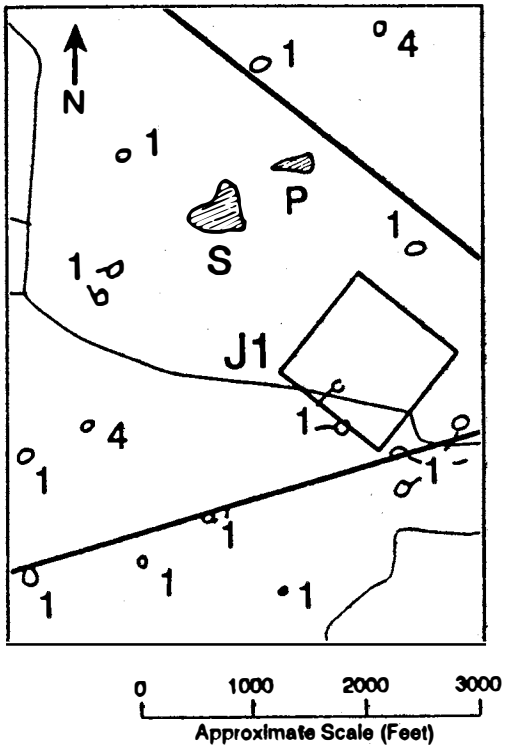
P SEDIMENTATION POND (PROPOSED)

S SPOIL PILE (PROPOSED)

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-33

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES
AT THE PROPOSED TENNESSEE SITE: AREA J1



LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

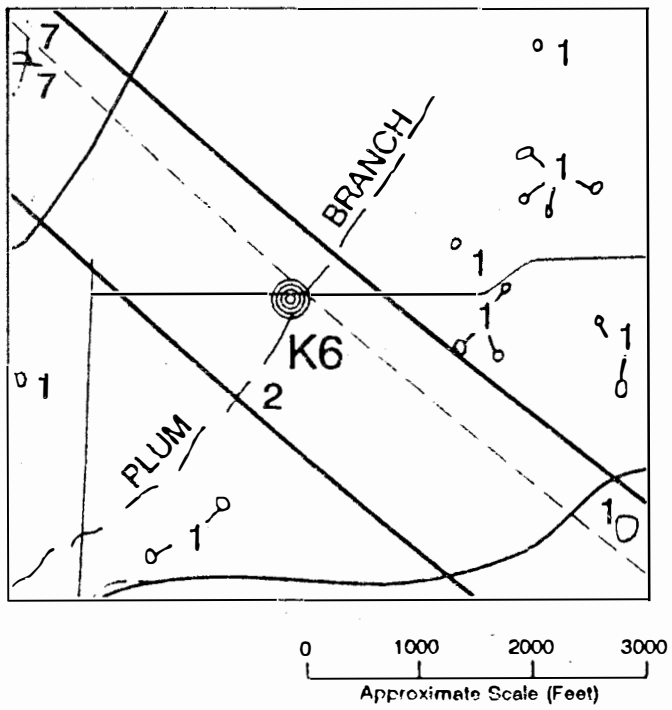
P SEDIMENTATION POND (PROPOSED)

S SPOIL PILE (PROPOSED)

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-34

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES
AT THE PROPOSED TENNESSEE SITE: AREAS K6



LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Table 11.3.6.3-1

WETLANDS WITHIN PROPOSED SURFACE FACILITY AREAS IN TENNESSEE[1]

Facility	Number of Wetlands[2]	Area of Wetlands (ac)[3]	Area Disturbed (ac)	Area of Wetlands Impacted (ac)[4]
Proposed				
A	10	5.1	197	5.1
B	37	29.7	279	29.7
F1	1	0.7	2.5	0.7
K2	1[5]	2.1[5]	5.0	2.1
K6	1	0.5	5.0	0.5
Total	50	38.1	488.5	38.1
Future Expansion				
C	57	60.5	279	60.5
J1	2	0.5	20	0.5
J2	1	0.6	20	0.6
J5	1[5]	2.1[5]	20	--[5]
J6	3	5.1	20	5.1
Total	64	68.8	279-319[6]	60.5-66.2[6]

1 Source: USFWS National Wetland Inventory maps.

2 Includes all wetlands located completely or partially within surface facilities.

3 Includes entire area of wetlands including that extending beyond facility.

4 Area of wetlands within facility boundary up to a maximum of area to be disturbed.

5 K2 and J5 are located in the same area. The wetland within the J5 facility is assumed to have been impacted by therefore is not listed under impacts of future expansion.

6 Upper and lower bounds are placed on totals for future expansion areas because only two of the the J areas (one of either J1, J2, or J5, and one of either J3, J4, or J6) would be developed if needed.

A. Construction Impacts

Five of the surface facility sites that would be initially developed at the proposed Tennessee site could impact wetland habitat (Areas A and B, and F1, K2, and K6). Construction of the proposed surface facilities at these sites could result in the destruction or modification of about 38 acres of wetlands. The least degraded wetland occurs at the F1 location. However, the greatest potential impact would occur at Area B due to the number of wetlands contained within its boundary. An additional 66 acres of wetlands could be affected by development of future expansion areas (Table 11.3.6.3-1 and Figures 11-31 through 11-33). These estimates of wetland impacts are conservative and based on the assumption that no mitigation measures would be used. However, from practical engineering and construction standpoints, wetland habitats would be avoided where feasible and the amount of wetland impact would probably be lower.

Spoils disposal areas would be located in close proximity to each surface facility. Approximately 3.1 acres of wetlands are associated with the 388 acres to be disturbed for spoils disposal sites. Those wetlands identified were a moderately degraded 0.5-acre pond near E8, a moderately degraded 2.1-acre pond in the vicinity of K2, and a moderately degraded 0.5-acre palustrine forested wetland associated with K6. These wetlands would be destroyed or modified by spoils disposal.

Direct impacts to wetlands could result from 1) filling, draining, or elimination of portions of the wetlands; 2) vegetation clearing; 3) use of heavy machinery within wetlands; and 4) installation of structures within or adjacent to wetlands. The potential impacts resulting from these activities could include disruption of drainage patterns, erosion and siltation, changes in water temperature and chemistry, habitat destruction, wildlife displacement, water level modification, and the inadvertent addition of chemicals (e.g., fuel). Some of these impacts would be temporary and, with adequate revegetation and erosion control measures, would cease soon after construction was complete. Dewatering of wetlands during tunnel and shaft construction would not be expected because of the low rate of groundwater seepage anticipated during tunnel construction (see Volume IV, Appendix 10, Section 10.2.3.6).

Indirect construction impacts, such as siltation and erosion, could affect wetlands adjacent (within 250 ft of facility boundaries) to proposed surface facilities. E5, E6, E10, F4, and K6 are adjacent to several small wetlands. The erosion control measures planned for the construction of surface facilities (described in Volume IV, Appendix 7) should minimize indirect impacts to these wetlands. Impacts that occurred would be expected to cease soon after construction and site restoration is complete.

Construction of ancillary facilities could impact additional wetland habitat. Overall, construction of access roads and gas and water pipelines could disturb close to 340 acres (Volume I, Chapter 3, Table 3-2).

The wetland acreage included in this total has not been determined. However, impacts could be minimized if wetlands were avoided during siting of facilities. Potential impacts associated with construction of ancillary facilities would be discussed in the Supplement to the EIS should Tennessee be selected as the SSC site.

B. Operations Impacts

Operations of the SSC facility would not significantly impact existing wetlands. Minor impacts are expected as a result of maintenance, particularly of access roads, and from increased public access.

C. Mitigation

It is DOE policy to avoid impacts to wetlands to the maximum extent practicable, in compliance with Section 404 of the Clean Water Act and Executive Order 11990 - Protection of Wetlands. This could be accomplished by relocation of surface facilities that are located within or adjacent to wetlands. Prior to construction, wetland locations should be reviewed to determine facility locations that would minimize wetland impacts. Facilities F1, K2, and K6 could be located up to 200 ft from their proposed locations. These relocations could eliminate facility locations within wetland habitats. Other mitigations could include the development of J1 or J2 (coupled with relocation of either of these facilities) rather than J5, and development of J3 or J4 rather than J6. These alternative facility choices could avoid wetland impacts associated with development of the buried beam access zone areas. Access roads, pipelines, and other ancillary facilities could be adjusted during final design to minimize their encroachment upon wetlands. Bridging wetlands might also be possible in many instances, and could be recommended for extensive or high quality wetlands that occurred along access roads. Standard erosion control practices (described in Volume IV, Appendix 7) would be used to minimize surface runoff to adjacent wetlands.

To further mitigate wetland loss where avoidance or other mitigation is not effective, replacement in kind could be used as a form of mitigation. Should the Tennessee site be chosen, additional mitigation could be proposed as a result of consultation during final design with appropriate Federal and/or State agencies (e.g., the USFWS, under the Fish and Wildlife Coordination Act, and with the COE under Section 404 of the Clean Water Act). All work within wetlands would be conducted in accordance with conditions of the COE permits, as well as those of other applicable State and local regulations. More detailed information relative to wetland mitigation would be included within the Supplement to the EIS should Tennessee be selected as the SSC site.

Some future protection of wetlands on fee simple estate lands controlled by the DOE might be a benefit of the project. The fee simple status effectively precludes future development of wetlands in these areas.

11.3.6.4 Commercially, Recreationally, or Culturally Important Species

No public hunting areas or State Wildlife Management Areas are located within the project area. The closest such area is about 15 mi north of the proposed ring alignment. Hunting, trapping, and fishing do occur on private property and along rivers and streams throughout the area. These recreational activities would be restricted during construction, and would continue to be tightly controlled within fenced fee simple areas for the operational life of the SSC. The exact locations of the restricted areas would be determined later during final design of the project should Tennessee be selected as the site.

Several streams in the area support sport fisheries, such as the smallmouth bass in Stones River, among many others. These sport fisheries would remain unaffected by the SSC project. The four-county area which is host to this ring alignment is part of the Middle Tennessee Wildlife Management Region, which has the highest percentage of deer harvest for the state. Comparatively little habitat would be eliminated by construction of the SSC. The wildlife populations are expected to suffer no measurable impact from SSC construction other than localized displacement. In fact, they could be expected to benefit from the additional acres placed in long-term, Government-protected management.

Wild turkeys, which have been reestablished within recent years in this portion of Tennessee, are experiencing increasing populations. Local flocks might experience loss of range during construction of individual dispersed SSC facilities, but these short-term impacts would be compensated in the long term by the areas of permanently managed Government lands resulting once construction impacts are resolved.

Several ranches which raise and train Tennessee Walking Horses are present near anticipated SSC construction at intermediate access area E4. The potential impact from noise and vibration from construction and operation of compressor units has been considered in a special review (Bowles, Awbrey and Jehl 1988). According to this report, horses initially react to sudden loud noises by startling and running away, as do most animals. They consequently habituate to repeated noises, particularly when noise frequency is predictable and when there is no visible intruder. There are reports in the literature of rare instances when tethered or confined horses hurt themselves after startling in response to loud noises (Milligan et al. 1978), although the sound levels in the reported cases were far higher than those expected from SSC activities. Kruger (1982) and Erath (1984) conducted studies of the effect of low flying aircraft on pregnant mares: changes in heart rate and adrenal hormone levels immediately following exposure were observed in both studies, but no injuries or abortions. They found that horses did kick, run, and bite in response to extreme stimuli. Such low flying aircraft are not only loud (90 to 100 dB), but also act as visual and perhaps tactilely disturbing stimuli. These studies are the best available for estimating the response of Tennessee Walking Horses in close proximity to construction and operations of the SSC. To summarize,

noise would be expected to cause minor immediate behavior changes in the horses, but to have no long-term adverse effects. No additional culturally important species, other than raptors, are known to be present in this area of Tennessee.

11.3.7 Texas

Most of the proposed SSC Texas site is occupied by cultivated grasslands and croplands. Construction of the SSC would permanently disturb approximately 997 acres of these habitats and temporarily disturb 690 additional acres. Approximately 65 acres would be required for disposal of spoils. No remnants of the native blackland prairie grasslands are known to occur in the immediate vicinity of the proposed SSC, although extensive ground surveys have not occurred to date. The perimeter of Areas A and B encompasses approximately 2,050 acres, which in Texas includes approximately 1,880 acres of agricultural land and 110 acres of natural systems such as wetlands and other land uses. Construction activities in Areas A and B would require 476 acres of land, 283 of which would be permanently disturbed with buildings and support facilities. Approximately 2 acres of wetlands are located within Areas A and B. Should Texas be selected as the SSC site, during final design consideration would be given to avoiding wetlands and placing the SSC facilities in habitats with lesser value. Mitigation activities could be expected to reduce the overall impact of the temporary and permanent acreage losses.

11.3.7.1 Sensitive Terrestrial/Aquatic Communities

Most of the proposed SSC site, which is occupied by grasslands and croplands, is an area of low species diversity. Many plant and animal species are dependent upon the riparian forest lands, occurring as strips along the floodplains of area rivers and creeks that are not heavily grazed. The riparian lands supply food, cover, and protection during all or a large part of the life cycles of many species. Therefore, disturbance to these strips of riparian forest habitat would have relatively greater significance to ecological resources than similar disturbances to other less valuable resources. The greatest diversity of plant and animal species in the vicinity of the SSC ring is associated with Red Oak, Grove, Mustang, Waxahachie, South Prong, and Onion creeks.

There are no wildlife refuges or sanctuaries in the vicinity of the proposed site.

Native blackland prairie grasslands are rare due to decades of disturbance by man from agricultural practices and urbanization. No prairie remnants have been found in the immediate area of the ring, although no extensive surveys of the area are known. Therefore, should Texas be chosen as the SSC site, surveys would be necessary prior to construction to determine the presence of any relict native blackland prairie grasslands. Mitigation to avoid impacts to these systems would be addressed in the Supplemental EIS.

Livestock watering tanks, flood-retention impoundments, water supply reservoirs, and the Trinity River floodplain (about 12 mi east of the proposed ring alignment) serve as important migratory bird resting and feeding areas. Ducks are attracted primarily to the larger reservoirs,

while the shallow water areas are important feeding habitats for birds such as herons, egrets, and dabbling ducks. Deeper waters are important to such species as grebes, pelicans, diving ducks, bald eagles, and ospreys. Because such environments are man-made, mitigation would be possible if such areas were disturbed by construction of the SSC. These areas are particularly important to canvasback ducks, which have undergone serious population declines in recent years.

Although numerous man-made ponds and lakes exist within the proposed area for the SSC, preliminary siting studies indicate these could largely be avoided by careful siting of surface facilities. Lake Waxahachie, Lake Bardwell, and other, smaller lakes in the vicinity support aquatic communities that include bass, sunfishes, crappies, and catfishes as predators, gamefishes, and waterfowl. As such, these water bodies represent an important local resource.

Several stream drainages cross the proposed SSC site. Most are ephemeral. The perennial streams support an aquatic community of native and introduced species. They do not provide as important a recreational resource as the nearby lakes and ponds.

Construction of facilities in the J4 area could have significant impact on Chambers Creek. These impacts could be avoided by developing one of the other J areas in lieu of J4. Red Oak Creek, North Prong Creek and Waxahachie Creek would all be crossed by the SSC ring. However, there would be no surface construction near any of these riparian areas. The headwaters of Baker Branch are present in Area B and could be directly impacted by construction. While some mitigation would in all likelihood be possible, the amount of impact on the affected aquatic communities would be dependent upon final design and mitigative measures planning. The impacts of construction and operation of the project on riparian areas are described in detail in the wetlands section, Section 11.3.7.3 below.

11.3.7.2 Threatened, Endangered, and State-Protected Species

The DOE has begun consultation with the USFWS in accordance with provisions of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543), regarding the presence or absence of listed or candidate species at the proposed Texas SSC site (Attachment A). While it has been determined that no designated critical habitats for threatened or endangered species are present, other habitats occur that may attract several listed species that are potentially present in the region (50 CFR 17). The Federally-listed endangered whooping crane (Grus americana), endangered southern bald eagle (Haliaeetus leucocephalus leucocephalus), threatened arctic peregrine falcon (Falco peregrinus tundrius), endangered interior least term (Sterna antillarum anthalassos), threatened piping plover (Charadrius melodus), and endangered black-capped vireo (Vireo atricapillus) all may be present in the site area at various times of the year.

All of these species except the vireo are migrants in Texas, and are not believed to have resident populations (Curtis 1988). These species are unlikely to be affected by construction and operations of the SSC.

The black-capped vireo is known to nest in adjacent counties and may occur if appropriate habitat exists in the project area. The USFWS reports that black-capped vireo habitat consists of a few small trees (typically oak or juniper) scattered among several clumps of many bushes (usually oak or sumac). These bushes are typically in the open with branching structure that reaches the ground (Curtis 1988). Breeding populations have not been reported recently in Ellis County, although recent surveys are reported to be inadequate. The nearest potential nesting habitat occurs along the White Rock Escarpment, 2 to 3 mi west of a line parallel to the outer edge of Area I; the nearest confirmed nesting is in Dallas County 10 to 15 mi north of the SSC site. A recent survey of the SSC site conducted by the Texas Parks and Wildlife Department failed to locate appropriate nesting habitat for the black-capped vireo (Wahl 1988). Should Texas be selected as the SSC site, additional confirmatory studies of the site would be conducted during site investigations and discussed in a Supplemental EIS. However, it is unlikely that the species would be adversely affected by project development.

Candidate species, listed as Category 2 by the USFWS, that may have preferred habitat in the site area include Swainson's hawk (Buteo swainsoni), western snowy plover (Charadrius alexandrius nivosis), mountain plover (Charadrius montanus), long-billed curlew (Numenius americanus), migrant loggerhead shrike (Lanius ludovicianus migrans), and golden-cheeked warbler (Dendroica chrysoparia). Most of these species are likely to be present only during migration, and none are known to breed in areas potentially disturbed by facility construction. However, should Texas be selected as the SSC site, preconstruction surveys would confirm the presence or absence of these species, and potential habitats could be avoided during site development. A recent survey conducted by the Texas Parks and Wildlife Department has determined that there is no habitat present for the golden-cheeked warbler, which nests in relatively undisturbed stands of scattered juniper (Wahl 1988).

The Texas Parks and Wildlife Department has been contacted regarding the presence or absence and sensitivity of State-protected, threatened, or endangered species where they exist. In addition to the Federally listed species identified above, Texas lists six other State-threatened species: the wood stork (Federally-listed as endangered but not considered present by the USFWS; See Attachment A), white-faced ibis (Plegadis chihi), American swallow-tailed kite (Elanoides forficatus), golden-cheeked warbler, timber rattlesnake (Crotalus horridus), and Texas horned lizard (Phrynosoma cornutum). Three of these species (the ibis, kite, and warbler) are under USFWS review as Category 2 candidate species. Although the USFWS does not list the white-faced ibis or the swallow-tailed kite as present in the site area, the State of Texas

indicates that both species are probable visitors to Ellis County (TPWD 1988). The timber rattlesnake and Texas horned lizard have confirmed populations in Ellis County, although population levels and county distributions are unknown. Thus, both species are likely to be present in one or more habitats impacted by the SSC. Currently, protection of State-listed species is oriented toward protection from physical harm, capture, domestication, or commercial exploitation.

11.3.7.3 Wetlands

Wetlands are not common in the Texas project area. Approximately 41 acres of wetland habitat (14 wetlands) are associated with surface facilities (Figures 11-35 through 11-39; Table 11.3.7.3-1). Most of the wetlands are stock ponds each less than an acre in size, although a few palustrine forested wetlands also occur. Most of these forested wetlands are confined to riparian areas associated with ephemeral streams.

Many wetlands in the area are subjected to grazing pressures or agricultural use and show signs of degradation. The palustrine forested wetlands (34.8 acres, six wetlands) that occur at J2, J3, J4, and J6, however, show little or no evidence of degradation. The large (31.7 acres) wetland at J4 that is associated with Chambers Creek (Figure 11-38), a permanent stream, is of relatively high quality. Because of the importance of wetland and aquatic habitats in an area of relatively dry climate, Chambers Creek represents an extremely valuable habitat for fish and wildlife. Wetlands in Areas A, B, C, and K6 (6.6 acres, eight wetlands) are moderately degraded from grazing and soil erosion.

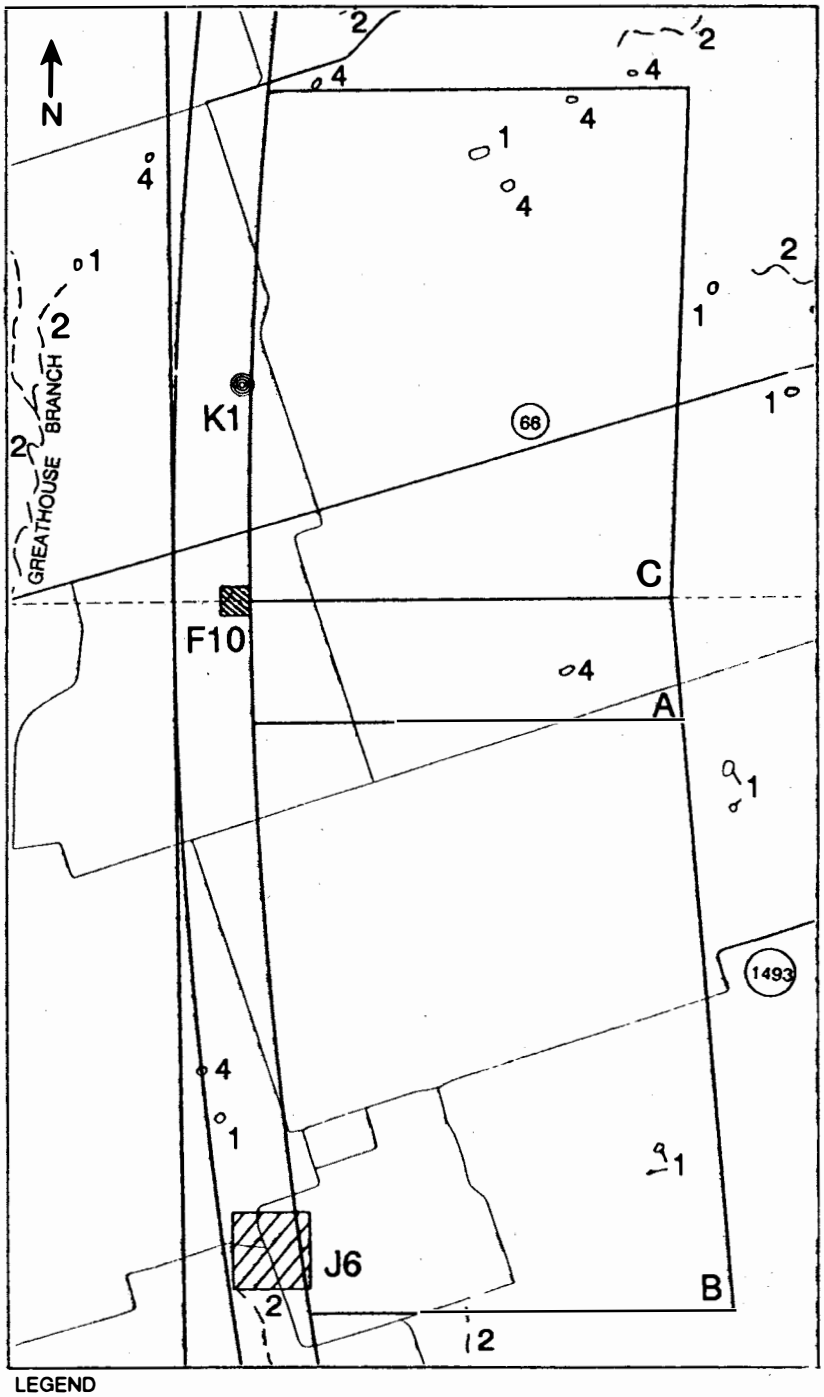
A. Construction Impacts

Three of the surface facility sites that would be initially developed at the proposed Texas site could impact wetland habitats (Areas A and B, and K6; Table 11.3.7.3-1; Figures 11-35 and 11-39). Construction of the proposed surface facilities at these sites could impact a maximum of about 2.8 acres of moderately degraded wetlands. An additional 37 acres of wetlands could be affected by development of future expansion areas (Figures 11-35 through 11-38). These estimates of wetland impacts are conservative and based on the assumption that no mitigation measures would be used. However, from practical engineering and construction standpoints, wetland habitats would be avoided where feasible and the amount of wetland impact would probably be lower.

The State has considered several alternatives for spoils disposal which include locations near areas of generation, as well as the filling of old quarries. Spoils disposal could impact about 114 acres of land. Impacts to wetlands associated with spoils disposal cannot be assessed at this time because the locations of these areas have not been identified.

Figure 11-35

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED TEXAS SITE: AREAS A, B, C, J6



LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

0 1000 2000 6000
Approximate Scale (Feet)

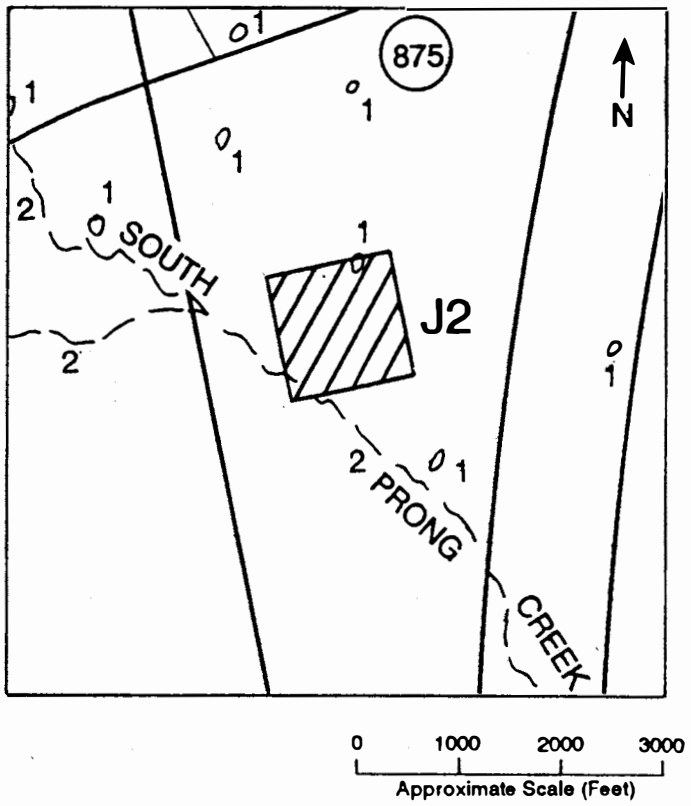
SSCAP11A32788106

FEIS Volume IV Appendix 11

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-36

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED TEXAS SITE: AREA J2



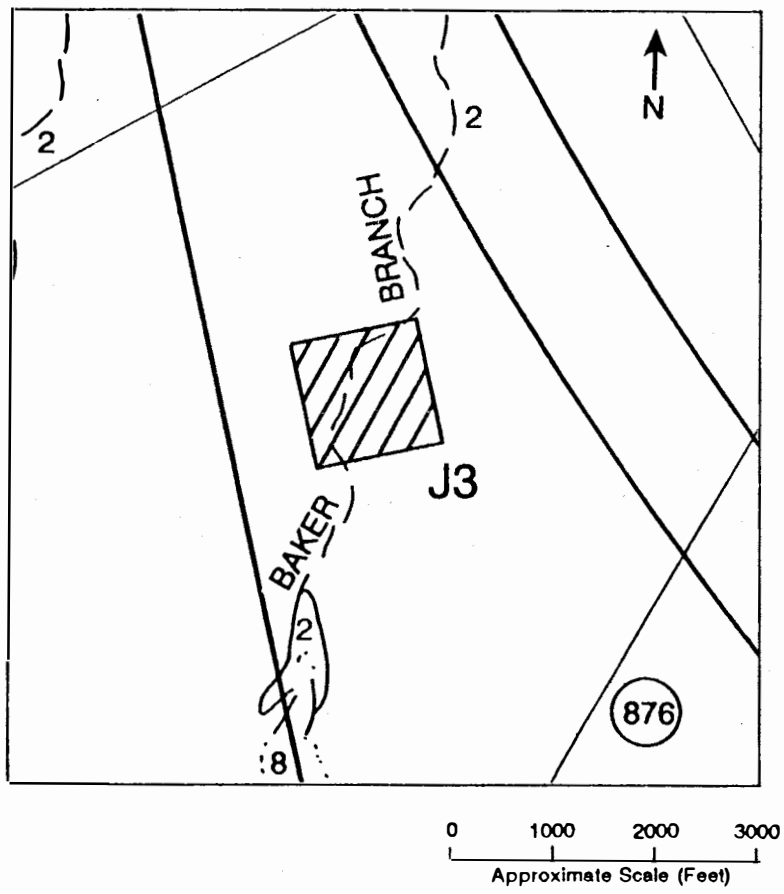
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-37

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED TEXAS SITE: AREA J3



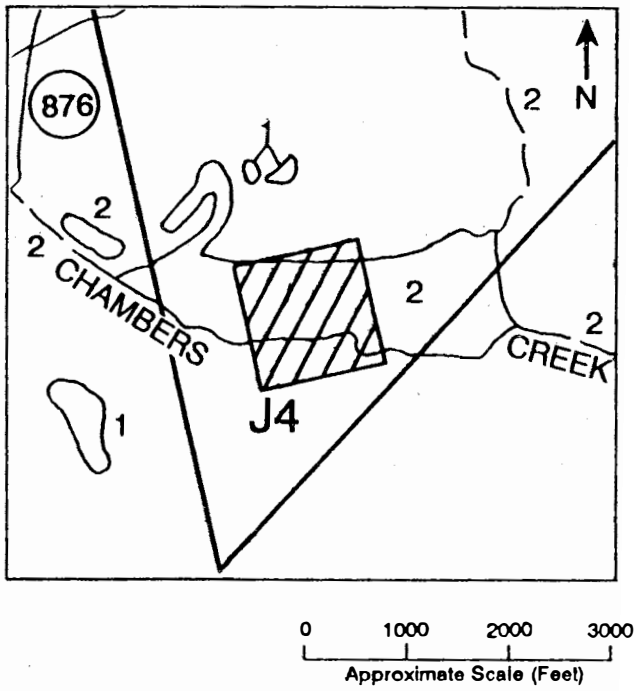
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-38

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED TEXAS SITE: AREA J4



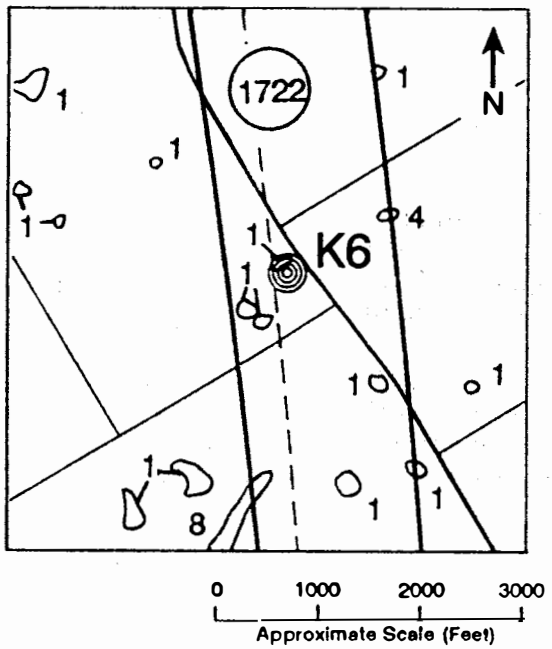
LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Figure 11-39

WETLANDS ENCROACHMENT BY SPECIFIC SURFACE FACILITIES AT THE PROPOSED TEXAS SITE: AREA K6



LEGEND

1. PALUSTRINE OPEN WATER, UNCONSOLIDATED BOTTOM AND/OR ALGAE BED
2. PALUSTRINE FORESTED
3. PALUSTRINE SCRUB-SHRUB
4. PALUSTRINE EMERGENT
5. PALUSTRINE FLATS
6. PALUSTRINE FARMED
7. RIVERINE
8. LACUSTRINE

Source: U.S. Fish and Wildlife Service National Wetland Inventory Maps

Table 11.3.7.3-1

WETLANDS WITHIN PROPOSED FACILITY AREAS IN TEXAS[1]

Facility	Number of Wetlands[2]	Area of Wetlands (ac)[3]	Area Disturbed (ac)	Area of Wetlands Impacted (ac)[4]
Proposed				
A	1	1.0	197	1.0
B	3	1.3	279	1.3
K6	1	0.5	23	0.5
Total	5	2.8	499	2.8
Future Expansion				
C	3	3.8	279	3.8
J2	2	1.2	20	1.2
J3	1	1.7	20	1.7
J4	2	31.7	20	20.0
J6	1	0.2	20	0.2
Total	9	38.6	299-319[5]	4.0-36.7[5]

1 Source: USFWS National Wetland Inventory maps.

2 Includes wetlands completely or partially within surface facilities.

3 Includes entire area of wetlands including that extending beyond facility.

4 Area of wetlands within facility boundary up to a maximum of area to be disturbed.

5 Upper and lower bounds are placed on totals for future expansion areas because only two of the J areas (one of either J1, J2, or J5, and one of either J3, J4, of J6) would be developed if needed.

Direct impacts to wetlands could result from 1) filling, draining, or elimination of portions of the wetlands; 2) vegetation clearing; 3) use of heavy machinery within wetlands; and 4) installation of structures within or adjacent to the wetlands. The potential impacts resulting from these activities could include disruption of drainage patterns, erosion and siltation, changes in water temperature and chemistry, habitat destruction, wildlife displacement, water level modification, and the inadvertent addition of chemicals (e.g., fuel). Some of these impacts could be temporary and, with adequate revegetation and erosion control measures, would cease soon after construction was complete. Dewatering of wetlands during tunnel and access shaft construction are not expected to occur because of the low rate of groundwater seepage anticipated (see Volume IV, Appendix 10, Section 10.2.3.7).

Indirect construction impacts, such as siltation and erosion, could affect wetlands adjacent (within 250 ft of facility boundaries) to proposed surface facilities. E1, E6, E9, and F6 are adjacent to several small wetlands. The erosion control measures planned for the construction of surface facilities (described in Volume IV, Appendix 7) should minimize indirect impacts to these wetlands. Impacts that could occur would be expected to cease soon after construction and site restoration are complete.

Construction of ancillary facilities could impact additional wetland habitat. Overall, construction of access roads and gas and water pipelines would disturb about 550 acres of land (Volume I, Chapter 3, Table 3-2). The wetland acreage included in this total has not been determined. However, wetland impacts could be minimized if wetlands were avoided during siting of the facilities. Potential impacts associated with construction of ancillary facilities would be discussed in the Supplement to the EIS should Texas be selected as the SSC site.

B. Operations Impacts

Operations of the SSC facility would not significantly impact existing wetlands. Minor impacts are expected as a result of maintenance, particularly of access roads, and from increased public access.

A 396-acre evaporation pond (or a number of smaller ponds totalling 396 acres) would be created for the storage of cooling tower wastewater. Depending upon design characteristics and the physical and chemical conditions that develop, the evaporation pond could provide habitat for a variety of plant and animal species.

C. Mitigation

It is DOE policy to avoid impacts to wetlands to the maximum extent practicable, in compliance with Section 404 of the Clean Water Act and Executive Order 11990 - Protection of Wetlands.

This could be accomplished by relocation of surface facilities that are located within or adjacent to wetlands. Facility K6 could be located up to 200 ft from its proposed location. This relocation could eliminate facility location within wetland habitat. Other mitigations could include the development of J1 rather than J2 or J5, and development of J6 (coupled with relocation) rather than J3 or J4. These alternative facility choices could avoid wetland impacts associated with development of the buried beam access zone areas. The latter is of particular importance as it could avoid potential impacts to high quality wetlands associated with Chambers Creek. Prior to construction, wetland locations would be reviewed to determine facility locations that would minimize wetland impacts. Access roads, pipelines, and other ancillary facilities could be adjusted during final design to minimize their encroachment upon wetlands. Bridging wetlands might also be possible in many instances, and would be recommended for extensive or high quality wetlands that may occur along access roads. Standard erosion control practices (described in Volume IV, Appendix 7) could be used to minimize surface runoff to adjacent wetlands.

To further mitigate wetland loss where avoidance or other mitigation is not effective, replacement in kind could be used. Additional mitigation could be proposed as a result of consultation during final design with appropriate Federal and/or State agencies (e.g., the USFWS, under the Fish and Wildlife Coordination Act, and with the COE, under Section 404 of the Clean Water Act). All work within wetlands would be conducted in accordance with conditions of the COE permits, as well as those of other applicable State and local regulations. More detailed information relative to wetland mitigation would be included within the Supplement to the EIS should Texas be chosen as the SSC site.

Some future protection of wetlands on fee simple estate lands controlled by the DOE might be a benefit of the project. The fee simple status effectively precludes future development of wetlands in these areas. As discussed above, the proposed evaporation pond could also serve as mitigation for wetland impacts if it was designed to provide natural wetland habitat.

11.3.7.4 Commercially, Recreationally, or Culturally Important Species

Recreational hunting, trapping, and fishing occur in this largely rural/suburban area. These recreational activities would be restricted during construction, and would continue to be tightly controlled within fenced fee simple areas for the operational life of the SSC. The exact locations of these areas would be determined later during final design of the project.

Sport fish at Lake Waxahachie and Lake Bardwell include catfish, bass, crappie, and sunfish. Principal game species include eastern cottontail, white-tailed deer, fox squirrel, northern bobwhite, mourning dove, and waterfowl species such as green-winged teal, gadwall, and mallard.

Mammals such as raccoon, opossum, skunk, and gray fox are trapped and/or hunted. Hunting and fishing would not be affected significantly by the SSC. As recreational activities, they would continue to be under pressure due to urbanization/suburbanization in this area. However, localized restrictions (as mentioned above) could balance any possible increase in the rates of sport fishing and game hunting in the immediate SSC area.

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ATTACHMENT A

DEPARTMENT OF THE INTERIOR U.S. FISH AND WILDLIFE SERVICE THREATENED AND ENDANGERED SPECIES ACT CORRESPONDENCE

APR 11 1988

CONCURRENCES	
RTG. SYMBOL	
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Mr. Sam Spiller
Phoenix Field Office
U. S. Fish and Wildlife Service
3616 W. Thomas Avenue, Suite 6
Phoenix, Arizona 85019

Dear Mr. Spiller:

On January 22, 1988, the U. S. Department of Energy (DOE) issued a Notice of Intent to prepare an environmental impact statement (EIS) for the proposed Superconducting Super Collider (SSC) project (Attachment 1). As indicated in that Notice, the Department intends to comparatively evaluate as siting alternatives the seven sites which through a detailed evaluation process have been identified as the "best qualified." One of these sites is in Arizona, approximately 30 miles southwest of Phoenix.

In accordance with our responsibilities under Section 7 of the Endangered Species Act of 1973, as amended, we are requesting that you provide a list of any listed or proposed species or designated or proposed critical habitat that may be present at the Arizona proposed site, or which may be affected by the project. To assist you, we have enclosed a map of the project area (Attachment 2) which shows the alignment of the SSC as proposed by the State of Arizona including proposed locations of surface facilities.

In order to fulfill our responsibilities under the Fish and Wildlife Coordination Act, we also would appreciate information on important wildlife and wildlife use areas which may be in the project area and vicinity.

The SSC will encompass approximately 16,000 acres and will have five basic components: an injector complex of four cascaded accelerators in which protons will be accelerated to an energy level of about 1 TeV; the collider ring (a race-track shaped underground tunnel 53 miles in circumference, ten feet in cross-section diameter), wherein dual beams of protons will be accelerated to an energy level of 20 TeV and then stored; the experimental areas containing the particle detectors; the campus/laboratory areas serving 3000 scientists and support staff; and, the site infrastructure consisting of roads and utilities.

Surface field activities would be located at the occasional clusters of buildings above the 53 mile ring (areas marked F and E), the complex of buildings at the campus area and injector area (A & B), and the separate interaction regions (K). Most of the construction occurs below ground and

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during operation the landscape will show negligible signs of the working accelerator below. Additional land made available for future expansion is designated as Area C. Area I is designated for subsurface work only with the exception of Areas J-1 through J-4 which are provided for surface facilities and below ground access.

Additional information is provided in Attachment 3 which will help to clarify questions on the project, land utilization, and the siting characteristics required by DOE. This information was taken from the Invitation For Site Proposals which DOE issued in April of 1987 to prospective proposers.

Under our current schedule, we expect to have the draft EIS for release for public and other agency review in August 1988. Your assistance in this matter is greatly appreciated, and we look forward to working with you in completing our compliance requirements.

Should you have any questions regarding the proposed project or require additional information concerning our request, please contact Dr. Jerry J. Nelsen, at 312-972-2256.

Sincerely,

Robert Selby, Director
Project Management and
Engineering Division

Enclosures:
As Stated

cc: R. Strickler, HQ, EH-25/FORSTL, w/o encls.
G. M. Riddle, RTK, w/o encls.

CONCURRENCE!	
RTG. SYMBOL	ESHD
INITIALS/SIG.	Nelsen/d
DATE	4/11/88
RTG. SYMBOL	PMED
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UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
3616 W. Thomas, Suite 6
Phoenix, Arizona 85019

2-21-85-I-56

April 26, 1988

Robert Selby
Department of Energy
Chicago Operations Office
9800 South Cass Avenue
Argonne, Illinois 60439

Dear Mr. Selby:

This responds to your request of April 11, 1988 for information on species listed or proposed to be listed as threatened or endangered that may be in the vicinity of the proposed Arizona site for the Superconducting Super Collider in Maricopa County, Arizona.

Our data indicate the following listed, proposed and candidate species may be within the proposed project area:

Listed Species:

Tumamoc globeberry (Tumamoca macdougalii) - perennial vine that grows under shrubs and small trees in desert habitats. Winter dormant with no live growth visible above ground. Plants respond to summer rains.

Proposed Species:

None.

Candidate Category 1 (Those species for which we have sufficient information to support their listing. Proposed rules may be prepared; however, they are not protected under the the Endangered Species Act at this time):

Neolloydia erectocentra var. acunensis - a creosote-bursage shrub on well-drained knolls and ridges.

Candidate Category 2 (Those species for which information to support their listing as endangered or threatened does not exist. Also not protected under the Endangered Species Act at this time):

Desert tortoise Gopherus agassizi
Gila monster Heloderma suspectum
Swainson's hawk Buteo swainsoni
Peniocereus greggii.

If we may be of further assistance, please contact Ms. Lesley Fitzpatrick or me (Telephone: 602/261-4720 or FTS 261-4720).

Sincerely,

Sam F. Spiller
Field Supervisor

cc: Regional Director, Fish and Wildlife Service, Albuquerque, New Mexico
(Fish and Wildlife Enhancement)
Director, Arizona Game and Fish Department, Phoenix, Arizona

United States Department of the Interior

FISH AND WILDLIFE SERVICE
FISH AND WILDLIFE ENHANCEMENT
COLORADO STATE OFFICE
529 25½ Road, Suite B-113
GRAND JUNCTION, COLORADO 81505
(303) 243-2778

IN REPLY REFER TO

(FWE) May 17, 1988

Mr. Robert Selby, Director
Project Management and
Engineering Division
Department of Energy
9800 South Cass Avenue
Argonne, Illinois 60439

Dear Mr. Selby:

This is in response to your letter of April 11, 1988, requesting information on any Federally listed threatened or endangered species, species proposed for listing, and any designated or proposed critical habitat within the area of influence of the proposed Superconducting Super Collider (SSC) Colorado site. Additionally, information on other important wildlife and habitat was requested.

THREATENED, ENDANGERED, AND PROPOSED SPECIES

The following species which may occur within the area of influence of the Colorado SSC site have been listed as threatened or endangered in accordance with the Endangered Species Act (Act) of 1973, as amended.

Species	Listing
Black-footed ferret *Mustela nigripes*	E
Peregrine falcon *Falco peregrinus*	E
Bald eagle *Haliaeetus leucocephalus*	E
Least tern *Sterna antillarum*	E

Whooping crane Grus americana	E
Piping plover Charadrius melodus	T

The whooping crane, least tern, and piping plover are included here as the water supply for the Colorado SSC proposal (cooling, domestic and recreational/aesthetic uses) may entail use of water from the South Platte River. Any depletions from the South Platte River will need to be evaluated with respect to listed species habitat along the Platte River in Nebraska. The Platte River between Lexington and Shelton, Nebraska has been designated critical habitat for whooping cranes.

In addition to the above listed species the Service would like to bring to your attention the following species which are candidates for Federal listing as threatened or endangered. Although not protected under the Endangered Species Act we believe consideration of these species is within the spirit of the Act. Additionally, we wish to make you aware of the presence of these Federal candidates should any be proposed or listed prior to the time that all Federal actions related to this project are completed.

FEDERAL CANDIDATE SPECIES

Swift fox	Vulpes velox
Preble's jumping mouse	Zapus hudsonius preblei
Ferruginus hawk	Buteo regalis
Swainson's hawk	Buteo swainsoni
Long-billed curlew	Numenius americanus
Western snowy plover	Charadrius alexandrinus nivosus
Mountain plover	Charadrius montanus
Streaked ragweed	Ambrosia linearis
Colorado butterfly plant	Gaura neomexicana ssp. coloradensis

The above species list encompasses the area of influence of the State of Colorado's proposal for the SSC project. The Department should evaluate all aspects of the Colorado proposal for potential impacts to listed species. This includes not only the collider ring and campus facilities but also the new/upgraded access roads from the Denver and Ft. Morgan areas, new or upgraded transmission lines and other utilities, water supply, railroad spur, and any ancillary features such as reservoirs or other site amenities. The Department's evaluation should also include potential secondary impacts such as residential, commercial, and industrial development resulting from the construction and operation of the SSC in Colorado.

Section 7(c) of the Endangered Species Act requires that the Federal agency proposing a major Federal action significantly affecting the quality of the human environment to conduct and submit to the Service a biological assessment to determine effects of the proposal on listed species. The biological

assessment must be completed within 180 days after the date on which initiated or a time mutually agreed upon between the agency and the Service. The assessment must be completed before physical project modification/alteration begins. If the biological assessment is not begun within 90 days, the species list above should be verified prior to initiation of the assessment.

When a particular action involves more than one Federal agency, consultation responsibilities may be fulfilled through a lead agency. Factors relevant in determining an appropriate lead agency include the time sequence in which the agencies would be involved, the magnitude of their respective involvement, and their relative expertise with respect to the environmental effects of the action. All Federal agencies with permitting or approval authority for this action should agree on which will act as lead Federal agency in fulfillment of Section 7 of the Act, and so notify this office.

The lead Federal agency should evaluate the potential impacts of the proposed project and determine if the action may affect any listed species. If a determination is "may affect" for listed species, the Federal agency must request in writing formal consultation from this office and should provide this office with a biological assessment, and any other relevant information used in making impact determinations.

The Service can enter into formal Section 7 consultation only with another Federal agency. State, county, and other governmental or private organizations can participate in the consultation process, help prepare information such as the biological assessment, participate in meetings, etc.

Your attention is also directed to Section 7(d) of the Endangered Species Act, as amended, which underscores the requirement that the Federal agency or the applicant shall not make any irreversible or irretrievable commitment of resources during the consultation period which, in effect, would deny the formulation or implementation of reasonable and prudent alternatives regarding their actions on any endangered or threatened species.

In addition to threatened and endangered species the Department should also evaluate the Colorado proposal for impacts to wetland, riparian, riverine/lacustrine and native prairie habitats. These habitats represent the most valuable cover types for wildlife in eastern Colorado. The Department should review the same scope of SSC related actions as was outlined for endangered and threatened species above. Final alignment and siting project features should be adjusted to avoid impacts to these habitats to the maximum extent possible. This is particularly important along the east-west access road in the Barr Lake area where the proposed alignment transects high quality wetlands.

The Service appreciates the opportunity to provide you with this information. If there are questions or additional information is required please contact Bill Noonan of my staff at FTS 322-0351 or 303-243-2778.

Sincerely,

Jeffrey D. Opdycke
State Supervisor

cc: FWS/FWE: SLC
FWS/FWE: Grand Island
CDOW, Ft. Collins (Attn: Ann Hodgson)
CDOW, Denver (Attn: Dave Weber)
EPA, Denver
Official file
Reading file

WRNOONAN;cjharris
SSCT&E.LTR

United States Department of the Interior

FISH AND WILDLIFE SERVICE
FISH AND WILDLIFE ENHANCEMENT
COLORADO STATE OFFICE
529 25½ Road, Suite B-113
GRAND JUNCTION, COLORADO 81505
(303) 243-2778

IN REPLY REFER TO:

(FWE) July 20, 1988

Mr. Robert Selby
Project Management and
Engineering Division
Department of Energy
9800 South Cass Avenue
Argonne, Illinois 60439

Dear Mr. Selby:

This letter supplements our May 17, 1988, letter that provided information on threatened and endangered species within the area of influence of Colorado's proposed site for the Superconducting Super Collider (SSC). Since that letter was prepared, it has come to our attention that a possible source of water for the SSC and associated development may involve the trans-mountain diversion of Colorado River water. In the event that such a diversion results in additional depletions to the Colorado River system the following federally listed endangered fish may be impacted:

Colorado squawfish	Ptychocheilus lucius
humpback chub	Gila cypha
bonytail chub	Gila elegans

The razorback sucker (Xyrauchen texanus), a candidate species for listing as endangered occurs sympatrically with the above listed species. Therefore, this species should be added to the candidate list provided to you in our May 17 letter.

The Department of Energy should determine if Colorado's SSC proposal would result in an additional depletion from the Upper Colorado River Basin. It is likely that a water depletion from the Colorado River would prompt a "may affect" finding for the above listed fishes and necessitate consultation under the Endangered Species Act.

On January 21-22, 1988, the Secretary of the Interior, the Governors of Wyoming, Colorado, and Utah, and the Administrator of the Western Area Power Administration were co-signers of a Cooperative Agreement to the "Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin" (Recovery Program). This program sets forth research and management priorities for endangered fishes and identifies river reaches containing important habitats. It also presents procedures to be used to minimize conflict between water development and endangered fish requirements. The procedures identified to offset depletion impacts are outlined in the Recovery

Program, and would be used during Section 7 consultation for this project if necessary.

The Service appreciated the opportunity to meet with you, Mr. Warren Black and other representives of the Department of Energy, to tour and discuss Colorado's proposed SSC site. We believe the time was well spent and look forward to working with your staff in the future.

If we can be of further assistance, please contact Bill Noonan of my staff at FTS 322-0351.

Sincerely,

Jeffrey D. Oppycke
State Supervisor

cc: DOE (Attn: Warren Black EH-25)
U. S. Dept. of Energy
1000 Independence Ave.
Wash. D.C. 20585
Colorado DNR (Attn: Steve Norris)
FWE, Grand Island
FWE SLC
File
Reading File

United States Department of the Interior

FISH AND WILDLIFE SERVICE
ROCK ISLAND FIELD OFFICE (ES)
1830 Second Avenue, Second Floor
Rock Island, Illinois 61201

IN REPLY REFER TO:
Com: 309-793-5800
FTS: 386-5800

May 10, 1988

Robert Selby
Director, Project Management
and Engineering Division
Department of Energy
9800 South Cass Avenue
Argonne, Illinois 60439

Dear Mr. Selby:

This is in response to your letter dated April 11, 1988 requesting information regarding endangered species in the vicinity of your proposed Superconducting Super Collider (SSC), Kane, DuPage and Kendall Counties, Illinois. In addition, you requested preliminary comments in accordance with the Fish and Wildlife Coordination Act.

Two federally listed species may occur in the area. The endangered Indiana bat (Myotis sodalis) is listed as statewide in distribution. It frequents the corridors of small streams which have a well developed riparian forest with an overhanging canopy. The bat forages for food by flying over the water surface under the tree canopy. It roosts and rears its young under the loose bark of dead trees with a diameter at breast height of sixteen inches or greater. The nearest that this species has been collected to the project area is the Waterfall Glen Forest Preserve along the DesPlaines River in Will County. There is no designated critical habitat for this species in the project area.

The threatened prairie bush clover (Lespedeza leptostachya) is listed for DuPage County. It inhabits dry to mesic prairies with gravelly soil. The nearest known population of this species is in the Hinsdale Prairie (W1/2 of Sec.11,T38N, R11E) which is owned by the DuPage County Highway Department.

With regard to other fish and wildlife resources, the project encompasses such a large area that it is difficult to enumerate the areas that might be affected. Furthermore, we understand that the majority of the project features will be underground and will not affect surface areas. The project area includes many acres of wetlands, forests and remnant prairie habitats that, depending on the location of support facilities, could be affected by the project. We suggest that you consult the Service's National Wetlands Inventory Maps for the location of

wetland habitats. When your planning has proceeded to the point that sites for the support facilities can be located, and any other impacts known, we will be happy to review and comment on those impacts.

If you have any questions, please contact Mr. Gerry Bade of my staff. This letter provides comment under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.); the National Environmental Policy Act of 1969, as amended; and the Endangered Species Act of 1973, as amended.

Sincerely,

Richard C. Nelson
Field Supervisor

United States Department of the Interior

FISH AND WILDLIFE SERVICE

EAST LANSING FIELD OFFICE (ES)
1405 S. Harrison Road, Room 302
East Lansing, Michigan 48823

IN REPLY REFER TO

May 5, 1988

Robert Selby, Director
Project Management and
Engineering Division
Department of Energy
Chicago Operations Office
9800 South Cass Avenue
Argonne, Illinois 60439

Dear Mr. Selby:

This is in response to your letter of April 11, 1988 requesting our comments regarding potential impacts to federally-listed threatened or endangered species or other essential fish and wildlife habitat (wetlands) from construction of the proposed Superconducting Super Collider. These comments pertain to one of the sites under evaluation which is in Michigan, approximately 35 miles northwest of Ann Arbor.

Fish and Wildlife Coordination Act Comments

These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et. seq.) and are consistent with the intent of The National Environmental Policy Act of 1969 (P.L. 92-190; 83 Stat. 852-856) and the Fish and Wildlife Service's Mitigation Policy. These comments do not represent the review comments of the U.S. Department of the Interior on any forthcoming environmental statement.

An examination of the appropriate draft National Wetlands Inventory Maps indicates there are wetlands present within those areas proposed as locations for surface facilities. These wetlands are denoted on the enclosed maps. You should be aware that many of the wetlands identified on draft maps have not been field-checked, and therefore the information these maps contain is subject to change. Consequently, the wetland information provided in this letter is intended only to provide technical assistance in the planning of this project, and future field investigations will be necessary to determine specific wetland boundaries. Field investigations are also necessary due to the fact that the project siting information provided only allows us to determine the approximate locations of proposed surface facilities on our maps. However, based on map review, it appears wetland impacts are most likely to occur from construction of the campus and injector facilities and facilities in Areas J-1 through J-4. Although impacts are most likely in these large facility areas, you should note that wetlands are also present in several other proposed surface facility locations.

The Federal Wetlands Executive Order 11990 mandates that wetland impacts should be avoided or minimized to the extent possible. In this case, it appears that there is sufficient upland area within the proposed project site to avoid many wetlands during construction of surface facilities. Therefore, we recommend plans for construction of these facilities be designed to minimize wetland impacts. For those wetlands which are unavoidably destroyed as a result of project construction it will be necessary to provide compensation, either through the enhancement of existing low quality wetlands or by creating new wetlands, equivalent to those destroyed, in another location contiguous to an existing wetland system.

In addition, any development or use of a wetland or watercourse is subject to regulation by the State of Michigan under the Goemaere-Anderson wetland Protection Act. Therefore, we recommend you coordinate with the Michigan Department of Natural Resources, Land and Water Management Division, regarding the need for permits for this project.

According to the information received regarding this project, its major feature, the collider ring, will be constructed approximately 140 feet underground using tunnelling techniques. Therefore, we anticipate only temporary or no impacts to wetlands from construction of the collider ring portion of the proposed project.

Endangered Species Act Comments

To facilitate compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, Federal agencies are required to obtain from the Fish and Wildlife Service information concerning any species, listed or proposed to be listed, which may be present in the area of a proposed action. Therefore, we are furnishing you the following list of species which may be present in the concerned area:

Classification	Common Name	Scientific Name	Habitat
Endangered	Indiana bat	Myotis sodalis	Potential breeding

Indiana bats hibernate in mines and caves in Indiana, Kentucky, and Missouri, from October through April. During spring and summer, they may migrate to southern Michigan and form nursery colonies in riparian and floodplain forests along streams and rivers. There is no designated critical habitat within the project area at this time.

A review of the information received regarding this project indicates that potential impacts to Indiana bat populations would be limited to the loss of suitable foraging and roosting habitat through construction of surface facilities. Therefore, we conclude that the underground construction activities associated with this project will not affect the Indiana bat. However, an examination of the appropriate draft National Wetlands Inventory Maps does indicate that suitable summer habitat for the Indiana bat may be present within areas proposed for surface field activities. As denoted on Map No. 1, potential suitable habitat is located within Areas B and C. We understand Area C is not scheduled to sustain surface field activities at the initiation of this project, but since future expansion of facilities is likely to require surface development of this parcel we have included it in our review at this time.

Factors which comprise optimal summer foraging and roosting habitat for the Indiana bat include:

1. Small to medium-sized stream channels which, at a minimum, contain permanent pools of water.

2. Mature trees bordering the stream channel on one or both sides with limbs and foliage extending 10 feet or more over the water.

3. Mixed hardwood old growth stands (16+ inches DBH with heights greater than 50 feet) adjacent or near the channel.

4. A component of trees in the overstory with exfoliating (or sloughing) bark.

We recommend that a field assessment be made of the identified areas to determine if these conditions exist. If it appears suitable habitat is present, construction plans should incorporate the following guidelines to maintain habitat integrity:

1. Prohibit removal of dead, dying or injured trees with exfoliated bark within 100 feet of the potential foraging stream.

2. Prohibit timber cutting or tree trimming in the riparian zone during the Indiana bat maternity period of May 1 through August 31.

Should the above conditions be incorporated into the project, this precludes the need for further action as required under Section 7 of the Endangered Species Act of 1973, as amended. Should this project be modified, or the above conditions not be incorporated, or new information indicates listed or proposed species may be affected, consultation should be reinitiated.

We appreciate the opportunity to provide these comments. Any questions can be directed to Kara Downey at (517) 337-6650.

Sincerely yours,

Margaret T. Kolar

Margaret T. Kolar
Acting Field Supervisor

Enclosures

cc: Jim Heinzman, SSC Commission Office, Lansing, MI
Dan Tucker, Michigan Department of Natural Resources, Wildlife Division, Lansing, MI

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Raleigh Field Office
Post Office Box 25039
Raleigh, North Carolina 27611-5039

June 8, 1988

RECEIVED
JUN 14 1988

RTK

Mr. Robert Selby
Director, Project Management and
Engineering Division
Department of Energy
Chicago Operations Office
9800 South Cass Avenue
Argonne, Illinois 60439

Dear Mr. Selby:

The U.S. Fish and Wildlife Service has received your April 11, 1988 letter requesting information on important wildlife resources that may exist in the vicinity of the proposed Superconducting Super Collider (SSC) ten miles north of the City of Durham, in Granville, Person, and Durham Counties, North Carolina. In accordance with the Endangered Species Act of 1973, as amended, your letter also requested a list of species listed or proposed for listing and designated or proposed critical habitat for species present or that may be affected by the proposed project. This report is provided in accordance with provisions of Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543).

Based on our records, there are no federally listed endangered or threatened plant or animal species present in the proposed project area, which encompasses parts of Person, Granville and Durham counties. However, harperella (Ptilimnium nodosum), formerly known as stream mock bishop weed, has been proposed for listing as an endangered species and is present in Granville County.

There are species which, although not now listed or officially proposed for listing as endangered or threatened, are under status review by the Service. "Status Review" species are not legally protected under the Act, and are not subject to any of its provisions, including Section 7, until they are formally proposed or listed as threatened or endangered. We are providing the following list of status review species which may occur within the area of the North Carolina site for the purpose of giving you advance notification. These species may be listed in the future, at which time they will be protected under the Act. In the meantime, we would appreciate anything you might do for them.

Carolina madtom	Noturus furiosus
Smooth coneflower	Echinacea laevigata
Barbara's buttons	Marshallia grandiflora

Nestronia	Nestronia umbellula
Lewis' heartleaf	Hexastylis lewisii

Important plant and wildlife resources located within the vicinity of the SSC site alternative are described in Section 5.I Wetlands, Volume 5 - Environment, State of North Carolina Site Proposal for the Superconducting Super Collider, September 2, 1987 and Section 5.3 Fish and Wildlife, Volume 5 - Ecology, State of North Carolina Superconducting Super Collider Best Qualified List Information, March 15, 1988. Due to the potential effect of the anticipated action on living resources for which we have a responsibility, a full yet concise description of those resources and anticipated impacts to them should be provided in the Environmental Impact Statement (Statement). In addition, we request that the Statement specifically address the following:

1. All direct and indirect losses of high quality natural habitats, such as vegetated wetlands and uplands, which support diverse plant and animal communities should be identified and addressed.

2. All affected habitats should be identified by cover type and acreage. This includes anticipated direct, secondary and cumulative impacts associated with the project.

3. A description of the fish and wildlife resources within the project area should be provided. All direct and indirect impacts to resident and migratory fish and wildlife should be identified.

4. Where possible, fish and wildlife enhancement features should be employed. Opportunities in this regard should be identified.

5. All mitigative features of the proposed project, including adverse impact avoidance, adverse impact minimization, and compensation for unavoidable adverse impacts should be identified and described.

During your determination of wetlands potentially impacted by the proposed project, we recommend that you consult with the U.S. Army Corps of Engineers regarding the need for Department of the Army permits to perform work in wetlands for which they may have regulatory responsibility. The Corps' contact person in this regard is: Mr. Kenneth Jolly, Office Manager, Regulatory Branch, U.S. Army Corps of Engineers, 11413 Falls of the Neuse Road, Wake Forest, North Carolina 27587.

In 1981, the Service adopted a Mitigation Policy (Federal Register 46(15): 7656-7663, January 23, 1981). One of the major purposes of this policy is to provide information to action agencies and developers so they can better anticipate Service recommendations, thereby reducing costly delays or conflicts. A copy of the policy is enclosed for your use. In our view, wetland habitat losses should be avoided whenever possible, and minimized, with all unavoidable losses

replaced through the various mitigation alternatives acceptable to the Service. We recommend that a plan for mitigating unavoidable wetland losses be included in the proposed Environmental Impact Statement and in any project plans. All mitigative features of the proposed project, including adverse impact avoidance, adverse impact minimization, and compensation should be identified and described in any Environmental Impact Statement prepared.

In those areas where wetland and stream crossing cannot be avoided, we recommend that measures, such as bridging, be taken to avoid and minimize adverse environmental impacts. Techniques to minimize impacts may include silt barriers, settling basins, wetland or stream crossing alignments at narrowest points and shortest distance, seeding of post-construction sites, and preserving vegetation bordering streams or wetlands.

Several right-of-way maintenance alternatives are available. We recommend that you consider planting fruit and mast bearing shrubs in those parts of the right-of-way adjacent to wooded areas. Shrubs will provide food and cover for wildlife and will reduce or eliminate the need for periodic clearing. If you maintain rights-of-way by mowing, we recommend that mowing be accomplished after July 31 of each year to prevent undue disturbance of ground nesting birds and mammals.

We appreciate the opportunity to provide this information. Please continue to advise us of the progress of this project.

Sincerely yours,

L.K. Mike Gantt
Field Supervisor

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Raleigh Field Office
Post Office Box 25039
Raleigh, North Carolina 27611-5039

June 24, 1988

Mr. Robert Selby
Director, Project Management and
Engineering Division
Department of Energy
Chicago Operations Office
9800 South Cass Avenue
Argonne, IL 60439

Dear Mr. Selby:

This letter concerns your April 11, 1988 letter in which you requested a list of species listed or proposed for listing which may be present within the impact area of the proposed Superconducting Super Collider (SSC) to be located ten miles north of the City of Durham, in Granville, Person and Durham Counties, North Carolina. The following information is provided in accordance with provisions of Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543).

After further review of the proposed project and consultation with State and Federal biologists, we are revising the list of "Status Review" (or "candidate") species included in our June 8, 1988 letter to your agency. The dwarf-wedged mussel (Alasmidonta heterodon) should be added to the list. A population of this species occurs within the project area in the Tar River, in Granville County. This population is considered by some species' experts as one of the healthiest dwarf-wedged mussel populations in existence (A. Moser, U.S. Fish and Wildlife Service, pers comm.).

Although not now listed or offically proposed for listing, it is quite probable that this species will be formerly proposed by the U.S. Fish and Wildlife Service for listing as endangered within the near future. "Statue Review" species are not legally protected under the Act, and are not subject to any of its provisions, including Section 7, until they are formerly proposed or listed as threatened or endangered.

I am enclosing information on the dwarf-wedged mussel (ancient floater) provided by Samuel L. H. Fuller in Endangered and Threatened Plants and Animals of North Carolina (J. E. Cooper, S. S. Robinson and J. B. Funderburg [eds.]. 1977. North Carolina State Museum of Natural History, Raleigh, North Carolina p. 143-194) for you use.

If you would like further information on this species, contact Service Biologist Andy Moser in our Annapolis, Maryland Field Office (301-269-5448).

We appreciate the opportunity to provide this information. Please continue to advise us of the progress of the project.

Sincerely yours,

David H. Rackley
Acting Field Supervisor

cc: Andy Moser
Annapolis Field Office

References: Burch (1973, 1975b), Clarke (1973), Clarke and Berg (1959), Emerson and Jacobson (1976), Fuller (1974b,c), Johnson (1970), Ortmann (1919), Tedla and Fernando (1969); see list following introduction.

Athearn, H. D., and A. H. Clarke, Jr. 1962. The freshwater mussels of Nova Scotia. Nat. Mus. Canada Bull. No. 183, Contr. Zool., 1960-1961: 11-41.

Kakonge, S. A. K. 1972. The ecology of some metazoan parasites of, and their effect on, small stream fishes and fry. Unpub. Ph.D. dissert., Univ. Waterloo, Ontario, Canada. 163 pages.

Kraemer, L. R. 1970. The mantle flap in three species of *Lampsilis* (Pelecypoda: Unionidae). Malacologia 10:225-282.

Welsh, J. H. 1969. Mussels on the move. Natural History 78:56-59.

Prolasmidonta heterodon (Lea) ANCIENT FLOATER

Description: This is a small mussel, whose shell rarely achieves so much as 38 mm (1 1/2 in.) of length. The epithet *heterodon* ("different tooth") emphasizes the chief distinguishing characteristic of this species, which is the only known North American fresh-water mussel that consistently has two lateral teeth on the right valve, but only one on the left. All other laterally dentate Nearctic species have two lateral teeth on the left valve and one on the right. However, atypical lateral dentition can occur in this species, as well as in others. Accordingly, the beginning student of North Carolina mollusks should be aware of other discriminants for this species: female shells are somewhat more obese (i.e., laterally inflated) than those of males, and shells of both sexes become increasingly arcuate with advancing age. In North Carolina, the Ancient Floater can be confused only with young members of the genus *Elliptio*, from which it can be distinguished by its mottled but colorful mantle margin. Useful aids in identification include Burch (1973, 1975b), Clarke and Berg (1959), Emerson and Jacobson (1976), Johnson (1970), and Ortmann (1919).

Distribution: Range -- Atlantic drainage; North Carolina, sporadically north into Canada.

North Carolina -- Neuse (Johnson 1970, Walter 1956) and Pamlico (D. H. Stansbery, pers. comm.) river systems.

Habitat and Mode of Life: Very little is known about the natural history of the Ancient Floater. However, something may be said of its habitat, which is itself none too clear. It is usually encountered in stable stream floors of sand and/or fine gravel, but, like most other members of the subfamily Anodontinae, it has a considerable tolerance of sediment overlying formerly clean streambeds.

Reproduction: This species is known to breed in winter (Ortmann 1919). Its extensive and broken range suggests (1) that several fishes serve as glochidial hosts, but none has been implicated (Fuller 1974c); and (2) that these host species, like the mussel itself, exhibit rather strong preferences for certain habitats whose disturbance leads to elimination of host and parasite alike.

Freshwater and Terrestrial Mollusks -- Accounts Endangered

Status: *Endangered.* The Ancient Floater's relict distribution suggests that it was already failing prior to settlement by European and African man. Also, because of its small size, it was probably no more than an occasional and inadvertent item in the diet of aboriginal man and certain other mammals known to prey upon fresh-water mussels, like the raccoon and muskrat. Habitat destruction is hastening *P. heterodon* toward extinction. Although recent discoveries have expanded knowledge of its range, the number of known populations is dwindling. We are aware of a healthy population in Connecticut that was eliminated from a tiny, sandy stream by sedimentation from construction of a single house. The only thriving population known to us occurs in New Hampshire, and the last "stronghold" of the species appears to be the Connecticut River system of New England. In North Carolina this species is in great jeopardy. The only recently discovered specimens are from the Tar River, and, despite numerous attempts, Walter's (1956) 20-year-old Neuse River records have not been confirmed.

The Ancient Floater remains one of the most rare, elusive, and vulnerable mollusks in the state and the nation. Our deliberations have confirmed an earlier decision (DNER 1973) to confer endangered status upon this species, support Clarke's (1970) contention that this form (as *Alasmidonta heterodon*) is probably endangered, and verify Stansbery's (1971) contention that it is "rare and endangered." The federal Office of Endangered Species is preparing to register it in the same status nationwide. No protective measures have yet been provided for the species, but the prospect of its addition to the federal list is encouraging. It is obvious that any effort to curb any form of pollution would benefit any species, endangered or otherwise, but such efforts would be especially practicable and beneficial in the case of this species, whose known populations are so few. A program of protection of specific habitats at specific localities should be implemented at once, especially with reference to thriving populations. There is reason to believe that they might yet be effectively guarded and preserved. Coordination of federal, state, and local laws would be required. In North Carolina there must also be an effort to discourage further channel modifications of the Neuse and Tar rivers and their tributaries.

While the Ancient Floater lacks great and unequivocal value in commercial and esthetic terms, it has great significance in biological science. As one of rather few North American fresh-water mussels with a naturally relict distribution, this species still offers an opportunity to learn much about what is necessary to a mussel's survival. That sort of information is invaluable for our efforts to save other organisms. Apart from legal and physical protection, this species needs research into various aspects of its biology, especially the identity and nature of its dominant glochidial host in the wild. Protection of the latter may be the salvation of the former.

Remarks: The naturally discontiguous range and its suggestion of great antiquity are responsible for the vernacular name, Ancient Floater, newly coined for this report, and for the elevation here of the subgeneric name, *Prolasmidonta*, to generic rank. Additional support for this taxonomic adjustment is the presence of lateral teeth and of sexual dimorphism of the shell. Both characters are foreign to members of the genus *Alasmidonta*, where the Ancient Floater is us[illegible] classified. On

the other hand, both are typical of *Fegias fabula* (Lea), also often placed in *Alasmidonta*, but the shells of these two species are quite unlike (Blankenship 1971; Burch 1973, 1975b; Neel and Allen 1964). Emerson and Jacobson (1976) have offered an alternative common name, Inverted Mussel, for this species.

References: Burch (1973, 1975b), Clarke and Berg (1959), DNER (1973), Emerson and Jacobson (1976), Fuller (1974c), Ortmann (1919), Stansbery (1971), Johnson (1970); see list following introduction.

Blankenship, S. 1971. Notes on *Alasmidonta fabula* (Lea) in Kentucky. Nautilus 85:60-61.

Clarke, A. H., Jr. 1970. Papers on the rare and endangered mollusks of North America. Discussion of Dr. Stansbery's paper. Malacologia 10: 21-22.

Neel, J. K., and W. R. Allen. 1964. The mussel fauna of the upper Cumberland basin before its impoundment. Malacologia 1:427-459.

Walter, W. M. 1956. Mollusks of the upper Neuse River basin, North Carolina. J. Elisha Mitchell Sci. Soc. 72:262-274.

GASTROPODA; BASOMMATOPHORA; PLANORBIDAE
(Ramshorn Snails)

Taphius eucosmius eucosmius Bartsch — GREENFIELD RAMSHORN

Description: This snail, recorded only from Greenfield Pond, Wilmington, is readily distinguishable from other Carolinian planorbids. It is very small, about 6 mm (1/4 in.) in breadth, and has "two rather broad, bright chestnut bands" against a "yellowish horn color" background (Bartsch 1908).

Distribution: Range — North Carolina endemic; type and only known population lived (or lives) in Greenfield Pond, Wilmington, New Hanover Co.

Habitat and Mode of Life: The only account of this species ever written (Bartsch 1908) did not include a description of its habitat. We infer that it is rather like that of *Helisoma magnificum*, the Cape Fear Ramshorn, discussed later. Nothing is known about any aspect of its natural history, including reproduction.

Status: Presumed *Extinct*. All attempts by members of the Committee to find this animal in recent years have failed. This viewpoint essentially replicates that expressed earlier (DNER 1973) as "endangered" and "possibly extinct."

Remarks: In the same paper describing this form, Bartsch (1908) also described *T. e. vaughani* from Louisiana. Within recent years J. P. E. Morrison (pers. comm.) found the latter subspecies alive and, on the basis of this material, suspects that Bartsch's taxa are better referred to the

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Post Office Box 845
Cookeville, TN 38501

May 16, 1988

IN REPLY REFER TO
LOG NUMBER 4-C-88-147

Mr. Robert Selby, Director
Project Management and Engineering Division
Department of Energy
Chicago Operations Office
9800 South Cass Avenue
Argonne, Illinois 60439

Dear Mr. Selby:

This is in response to your letter of April 11, 1988, regarding the proposed Superconducting Super Collider in Bedford, Marshall, Rutherford, and Williamson Counties, Tennessee. We have reviewed the project with regard to endangered species, as requested.

According to our records, the following listed species may occur in the impact area of the project:

LISTED SPECIES
Tennessee purple coneflower - Echinacea tennesseensis
Gray bat - Myotis grisescens
Indiana bat - Myotis sodalis
Tan riffle shell mussel - Epioblasma walkeri

STATUS REVIEW SPECIES
Tennessee milk-vetch - Astragalus tennesseensis
Gattinger's lobelia - Lobelia appendiculata var. gattingeri
Tennessee glade cress - Leavenworthia exigua var. exigua
Prairie-clover - Dalea foliosa
Cumberland rosinweed - Silphium brachiatum
Limestone flameflower - Talinum calcaricum
Stone's River bladderpod - Lesquerella stonensis
Cleft phlox - Phlox bifida var. stellaria
Large rock cress - Arabis perstellata var. ampla
Eastern blue star - Amsonia tabernaemontana var. gattingeri
Water stitchwort - Arenaria stitchwort

Status Review species are not legally protected, but are being considered for listing in the future. We would appreciate anything you do to avoid impacting them.

Section 7 of the Endangered Species Act requires federal agencies to ensure that projects they authorize, fund, or carry out do not jeopardize the continued existence of endangered or threatened species. The Draft Environmental Impact Statement should contain a thorough assessment of impacts to the endangered species listed above and a determination of "may affect" or "no effect." Upon review of the assessment we will concur with your findings or recommend that you initiate formal consultation.

A project of this magnitude is likely to have significant impacts on resources other than endangered species. We are also concerned about effects to wetlands and aquatic systems which provide habitat for valuable fish and wildlife resources. Construction and operation of surface facilities and the collider ring could result in changes in quality and quantity of ground and surface waters, flooding, drainage, and low flow conditions within the Harpeth, Stones, and Duck River watersheds. An evaluation of these changes and their impact on fish and wildlife should be included in the impact statement, along with descriptions of measures to be taken to mitigate impacts.

These constitute the comments of the U. S. Fish and Wildlife Service in accordance with the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

Sincerely,

Douglas B. Winford

Douglas B. Winford
Acting Field Supervisor

IN REPLY REFER TO
2-12-88-I-235

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

Ecological Services
9A33 Fritz Lanham Building
819 Taylor Street
Fort Worth, Texas 76102

May 13, 1988

Mr. Robert Selby, Director
Project Management and Engineering Division
Department of Energy
Chicago Operations Office
9800 South Cass Avenue
Argonne, Illinois 60439

Dear Mr. Selby:

We have received your letter of April 11, 1988 which discusses the Superconducting Super Collidor being considered for Waxahachie, Ellis County, Texas. Your letter specifically requests information under the Endangered Species Act on listed or proposed species or designated or proposed critical habitat that may be present at the site or affected by the project. You also requested information on important wildlife and wildlife use areas which may be in the project area and vicinity.

Several Federally listed bird species may migrate through Ellis County. These include the whooping crane (Grus americana), bald eagle (Haliaeetus leucocephalus), Arctic peregrine falcon (Falco peregrinus tundrius), interior least tern (Sterna antillarum), and piping plover (Charadrius melodus). None of these species have resident populations in the project area. Black-capped vireos (Vireo atricapillus) are known to nest in adjacent counties and may occur in appropriate habitat within the project site.

Black-capped vireo habitat consists of a few small trees (typically oak or juniper) scattered among separated clumps of many bushes (usually oak or sumac). Bushes are in the open and their foliage reaches the ground. Nests are typically found 0.5 to 1.0 meter above the ground in areas screened by foliage.

It is the responsibility of the Federal action agency to determine if the proposed project may affect Federally listed species. If a may affect determination is made, the Federal agency shall initiate the formal Section 7 consultation process unless an exception has been granted. Exceptions may be made if there is a determination by the action agency and written concurrence by the Service that the proposed action will not adversely impact any endangered or threatened species. Requests for formal consultation or an exception can be made by writing to Field Supervisor; U.S. Fish and Wildlife Service; 819 Taylor Street, Rm 9A33; Fort Worth, TX 76102.

If no affect is evident, no further consultation is needed but we would appreciate the opportunity to review the criteria used to arrive at that determination.

A site visit was conducted by Fish and Wildlife Service and Department of Energy staff on May 4, 1988. A cursory investigation identified two potentially important/sensitive habitats. Those are identified as sites J4 and F6. Following a detailed visit of site F6, we determined that any surface disturbance would not likely cause significant terrestrial losses. Construction must, however, be carried out to insure erosion control so that water quality of Bardwell Reservoir will not be affected.

Detailed investigation of site J4 confirmed the quality of the habitat. Siting in this area will result in significant impacts to very high quality stream, riparian, and floodplain habitats. Several problems were evident at this site. The project map indicates that surface and subsurface facilities will straddle a permanent and productive stream, as well as a very diverse riparian corridor. This area represents the highest quality habitat in the region. The permanent stream, Chambers Creek, supports a diverse fishery, including largemouth bass, white bass, channel catfish, and numerous sunfish and minnows.

Although flows become low during droughty periods, there are sufficient deep pools to provide quality habitat year round. An active beaver dam was located on a tributary and provides almost continuous flow of water. Siting of the facility would disrupt the normal and required fish migration along Chambers Creek.

The riparian and adjacent floodplain woodlands are quite diverse. At least six species of overstory trees were identified. These include oaks, pecan, ash, hackberry, and American and cedar elms. Midstory species include immature hackberry, ash and elms along with redbud and mulberry. Major woody vines observed were greenbriar and poison ivy. Herbaceous species include broadleaf chasmanthium, Canada wildrye, rescuegrass, and other grasses and forbs. The floodplain is cut by numerous small drainages that provide wildlife migration corridors and add to the diversity of this area.

Siting of surface facilities in this area would require significant mitigation of fish and wildlife losses. Relocation of the J4 site out of the floodplain on either side of Chambers Creek would be preferable, and would probably alleviate the need for extensive mitigation.

We are also concerned about the draft Environmental Impact Statement (DEIS) scheduled for release in August 1988. There is no indication that environmental studies have been carried out in sufficient detail to give fish and wildlife resources equal consideration under the law. This apparent failure could result in an incomplete DEIS. Inadequate consideration of fish and wildlife resources during project analysis and planning could result in significant adverse impacts and costly mitigation requirements. We encourage more thorough environmental studies should this site continue to receive high consideration for development.

Thank you for the opportunity to provide comments. We enjoyed the field work with Mr. Bob Strickler and Mr. Warren Black. We look forward to working with you on this project, should the Texas site be selected. If you have any questions please contact Mike McCollum at Commercial (817) 334-2961 or FTS 334-2961.

Sincerely,

David A. Curtis

David A. Curtis
Acting Field Supervisor

cc: Regional Director, FWS, Albuquerque, NM (AWE)
Executive Director, TPWD, Austin, TX

DOE/EIS - 0138

Final Environmental Impact Statement
Superconducting Super Collider

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December 1988