

HARDEE
POWER
STATION

**SITE
CERTIFICATION
APPLICATION/
ENVIRONMENTAL
ASSESSMENT**

CHAPTER 6

**TRANSMISSION LINES
AND OTHER
LINEAR FACILITIES**

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TAMPAE ① Pebble Dale 16 miles
FPC ② Vandolah 8 mi.
③ Lee 78 mi.

6.0 TRANSMISSION LINES AND OTHER LINEAR FACILITIES

6.1 TRANSMISSION LINES

6.1.1 Project Introduction

Three transmission lines are needed to connect the proposed Hardee Power Station to the Florida transmission grid to supply projected power needs starting in 1992. The determination of need for the Hardee Power Station and associated facilities is discussed in Section 1.2 of this document.

The individual transmission lines will originate from the proposed Hardee Power Station 230 kV switchyard. One transmission line will terminate approximately 26 km (16 miles) north at Tampa Electric's existing Pebbledale Substation. A second transmission line will terminate approximately 13 km (8 miles) south of the Hardee Power Station at FPC's Vandolah Substation. The third transmission line will parallel the Vandolah line from the Hardee Power Station to the Vandolah Substation and then continue south terminating at the Lee Substation in North Ft. Myers. The transmission line between the Hardee Power Station and the Lee Substation will have a total length of approximately 126 km (78 miles). No intermediate substations are planned. All termination substations are currently existing.

The transmission line connecting the Hardee Power Station with the Pebbledale Substation will be constructed by Tampa Electric on or adjacent to existing road right-of-way (ROW), existing transmission ROW, and new transmission ROW. The width of the corridor is generally 0.8 km (0.5 mile) with variable widths ranging from 0.4 km (0.25 mile) near Bradley Junction to 1.6 km (1 mile) in the phosphate mining areas. A single 230 kV transmission line is requested between the Hardee Power Station and the Pebbledale Substation. The total number of transmission lines within the corridor will vary along the length of the route. The preferred corridor includes areas where there are existing 69 kV and 230 kV transmission lines. Along Old Highway 37 there will be areas where an existing 69 kV transmission line will coexist within the corridor with the proposed line.

Where the corridor intersects the existing ROW, the proposed line will share the corridor with the existing 230 kV transmission line. In the 3 km (2 miles) of corridor directly south of Pebbledale Substation, the proposed line may share the corridor with as many as three other transmission lines (one 230 kV and two 69 kV lines). In addition, in the phosphate area northeast of Bradley Junction, future relocation of existing power lines for mining operations may result in additional lines being placed within the corridor. The typical ROW width within the corridor between the Hardee Power Station and the Pebbledale Substation will be 30 m (100 ft) for single pole construction and 46 m (150 ft) for H-frame construction.

② The transmission line corridor between the Hardee Power Station and the Vandolah Substation will contain two 230 kV transmission lines, one terminating at the Vandolah Substation and the other continuing south to the Lee Substation. The corridor will follow existing road ROW, existing transmission line ROW, and new transmission ROW. The total number of transmission lines within the corridor will vary along the length of the route. Between the Hardee Power Station and the Vandolah Substation, the width of the corridor will be 0.8 km (0.5 mile) with the exception of a slight increase near Ft. Green Springs. The typical ROW width within the corridor between the Hardee Power Station and the Vandolah Substation will be 53 to 61 m (175 to 200 ft) for H-frame construction and 30 m (100 ft) for single pole construction.

The transmission line corridor from the Vandolah Substation south to the Lee Substation will be for a single 230 kV line. The corridor will follow existing transmission line ROW, existing road ROW, and new transmission line ROW. The total number of transmission lines within the corridor will vary along the length of the route. Between the Vandolah Substation and the Lee Substation the width of the corridor will generally be 0.8 km (0.5 mile) but will vary locally. The typical ROW to be constructed within the corridor from the Vandolah Substation and the Lee Substation will be 46 m (150 ft) for H-frame construction and 30 m (100 ft) for single pole construction.

6.1.2 Corridor Location and Layout

The routes for the preferred transmission line corridors and alternative segments from the Hardee Power Station to all three substations are presented in Figure 6.1.2-1 (see Appendix 11.10) at a scale of 1:126,720. FDOT highway maps were used as the base map for Figure 6.1.2-1. Existing transmission lines of 115 kV and above within 8 km (5 miles) of the proposed corridor are also shown. Major geographic features are depicted relative to the proposed corridor. The exact corridor locations are shown on aerial photographs in Figure 6.1.2-2 (see Appendix 11.10).

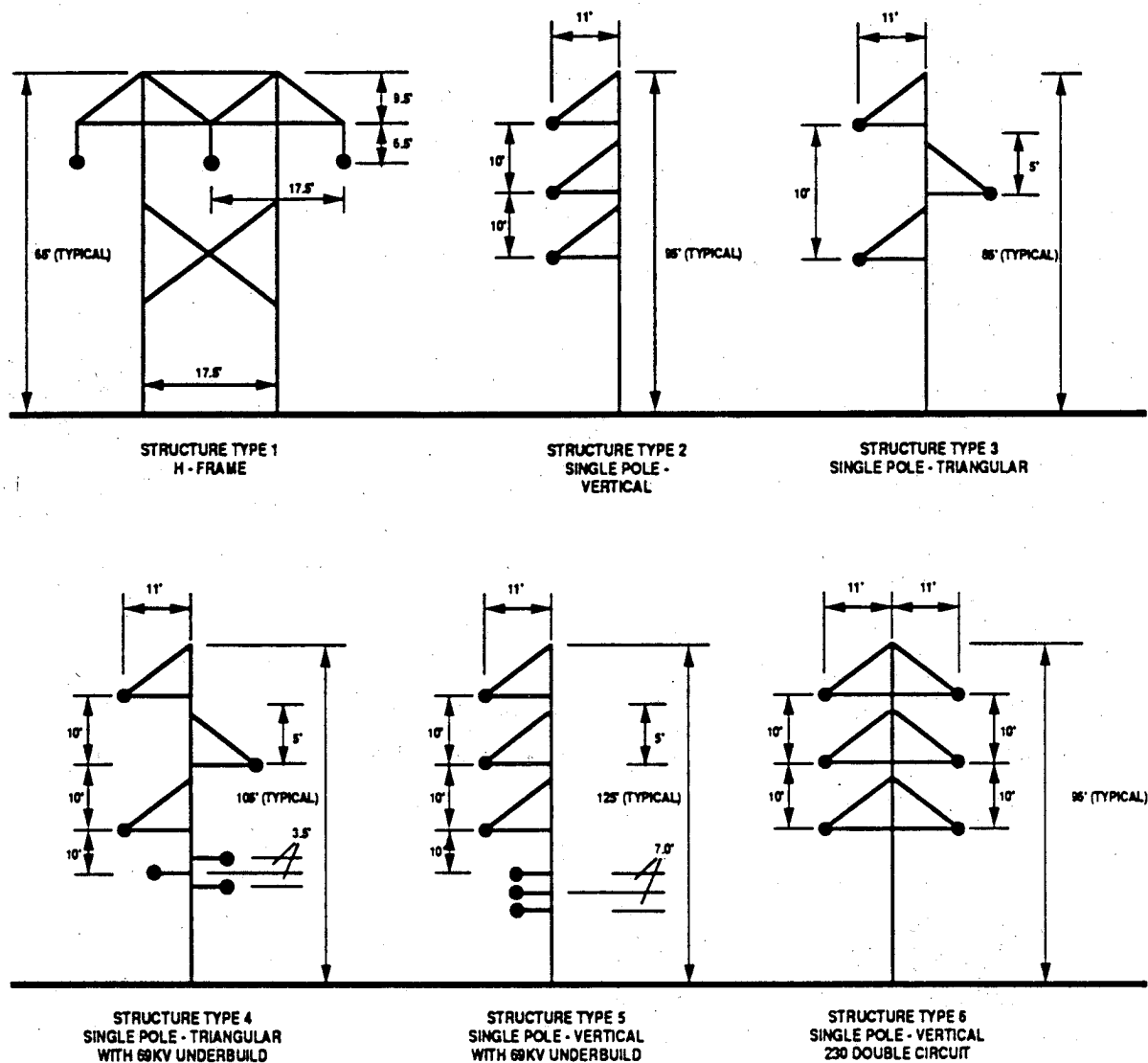
6.1.3 Transmission Line and Road Design Characteristics

The transmission line will be constructed using wood H-frame structures where the ROW width and surrounding land use features allow. Single steel or concrete poles will be utilized in urban areas with more restricted ROWs. It is anticipated that the majority of the transmission line will be constructed of wood H-frame structures based on the rural land use characteristics of much of the corridor and surrounding areas. Typical configurations to be used on H-frame and single pole structures are shown on Figure 6.1.3-1. Where the lines turn shallow angles, similar unguyed structures will be used. Where the lines turn steep angles the structures will utilize guys and anchors.

The design voltage of the proposed lines will be nominally 230 kV with a maximum current rating (MCR) of 2,040 amperes and a maximum continuous capacity of 640 to 812 megavolt-amperes (MVA). The MCR is the nominal capacity which would be expected to result in the conductor to reach its design temperature limit of 140°C (284°F).

why the
172 MVA
Range?
TEMP?

Final conductor selection has not been completed. The optimum conductor will be determined based on an analysis of economics and performance considerations. A typical conductor for this type of construction is a 1590 aluminum conductor steel reinforced (ACSR) unit with a nominal operating voltage of 230,000 volts. The overhead ground wire may contain fiber optic communications circuits or may be a stranded steel cable.



NOT TO SCALE

Figure 6.1.3-1 HARDEE POWER STATION
TRANSMISSION STRUCTURES

**Hardee
Power Station**

Conductor profiles for H-frame and single pole configurations are presented in Figures 6.1.3-2 and 6.1.3-3, respectively.

Span lengths between structures will average between 183-213 m (600 to 700 ft). Individual span lengths will be determined by the topography of the route and the width of the ROW. The entire line will meet National Electrical Safety Code Standards for clearance to ground and obstructions. Additionally, the minimum clearance from any energized conductor to ground will be 8 m (27 ft).

UNDERBUILD?

Existing roadways will be used for access to the transmission line wherever possible. If adequate access roads do not exist, new roads will be constructed which will typically be unpaved and have a maximum width of 6 m (20 ft). It is estimated that approximately 40 miles of new access road will need to be constructed. No new bridges will be required as part of the corridor construction.

Structure pads will typically be constructed adjacent to the access roads. The pads will be approximately 7 m (24 ft) in width, with the length varying as a function of the distance between the structure and the access road.

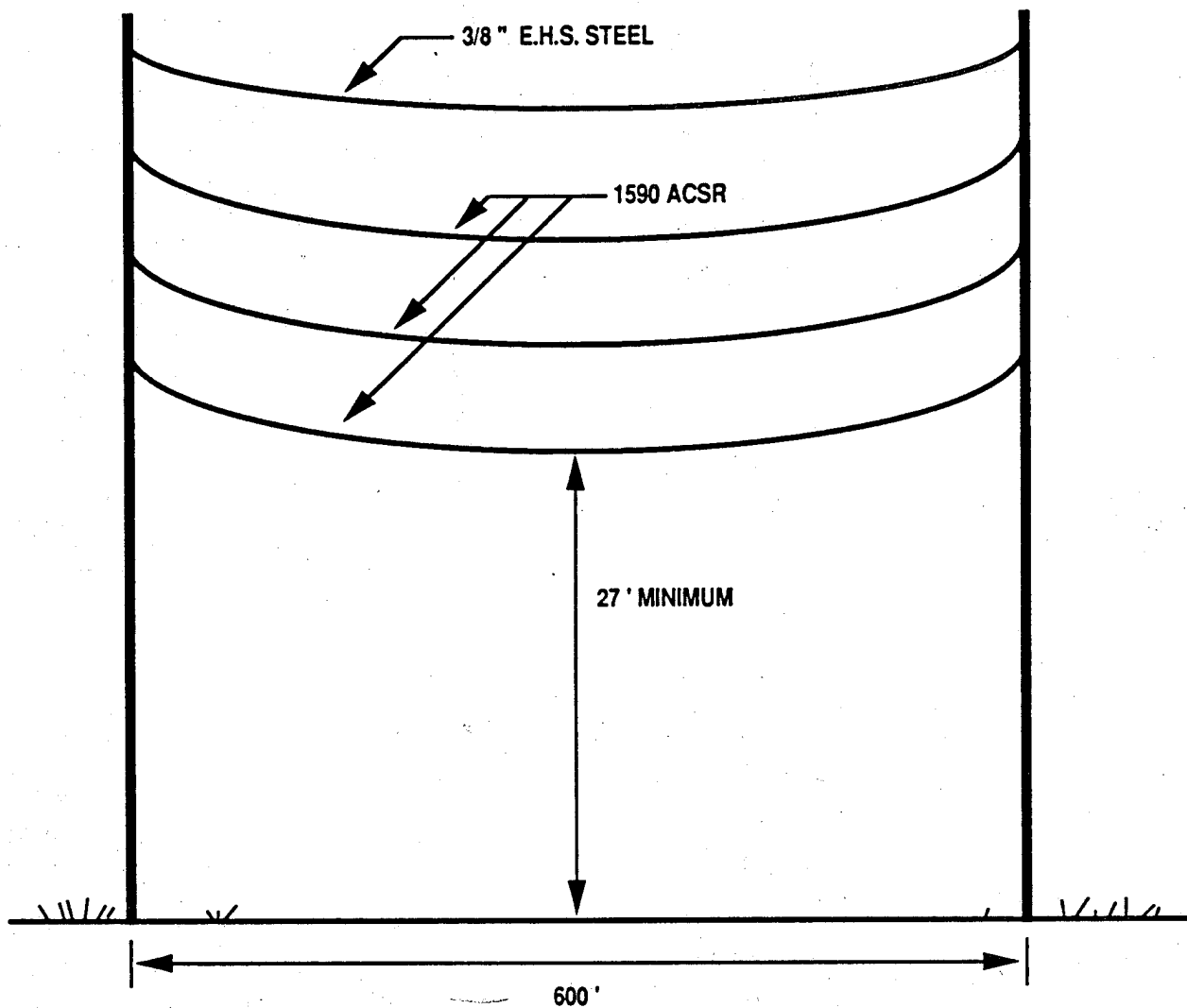
with what materials?

6.1.4 Cost Projections

Approximate costs for the transmission lines are presented in Table 6.1.4-1. The actual cost of the transmission lines may vary depending on the final ROW and structure location, cost of ROW acquisition and other site specific conditions.

6.1.5 Corridor Selection

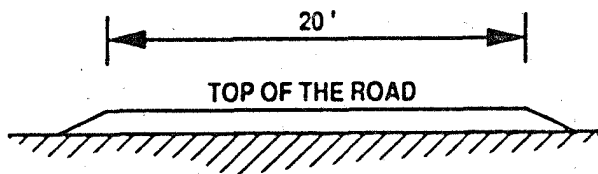
The objective of the transmission line corridor siting study was to select the most favorable corridor in the study area based on a combination of socioeconomic, environmental, engineering and economic considerations. The study area for the corridor selection study (Figure 6.1.5-1) was defined by the geographic distribution of the Hardee Power Station and the three end point substations, i.e., Pebbledale, Vandolah and Lee Substations.



1590 ACSR (LAPWING)
600' RULING SPAN

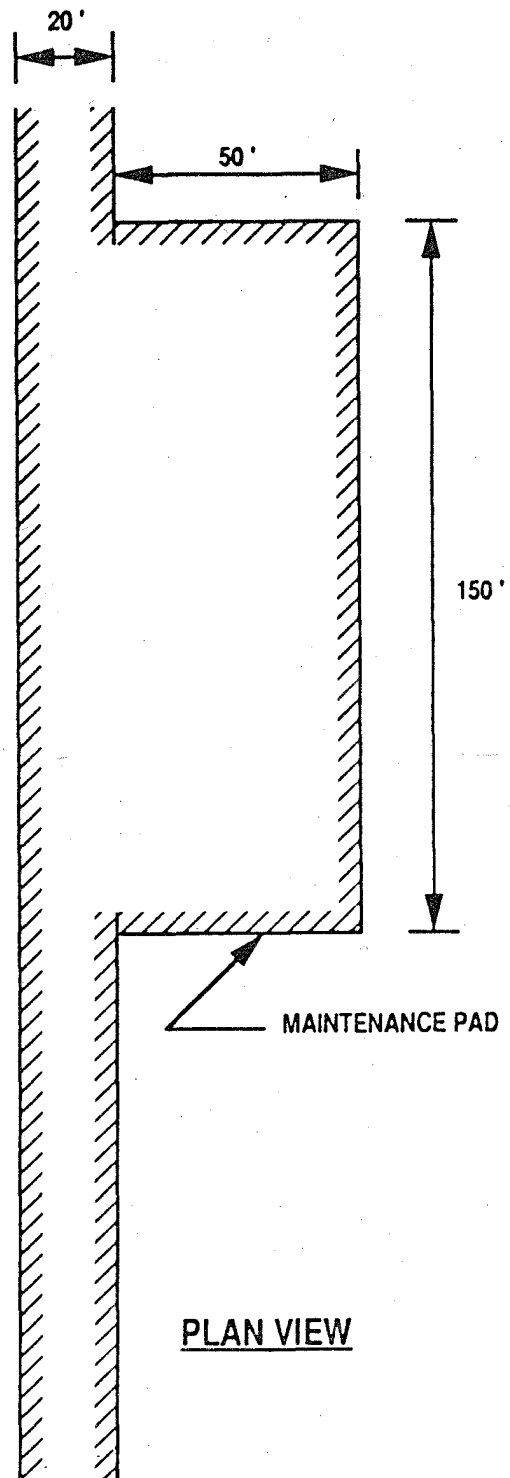
Figure 6.1.3-2 CONDUCTOR PROFILE FOR H-FRAME
CONSTRUCTION

**Hardee
Power Station**



NOTE: FILL TO BE ADDED AS REQUIRED

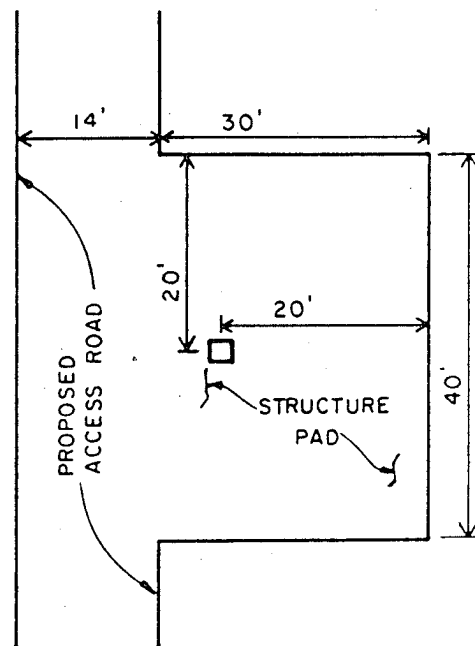
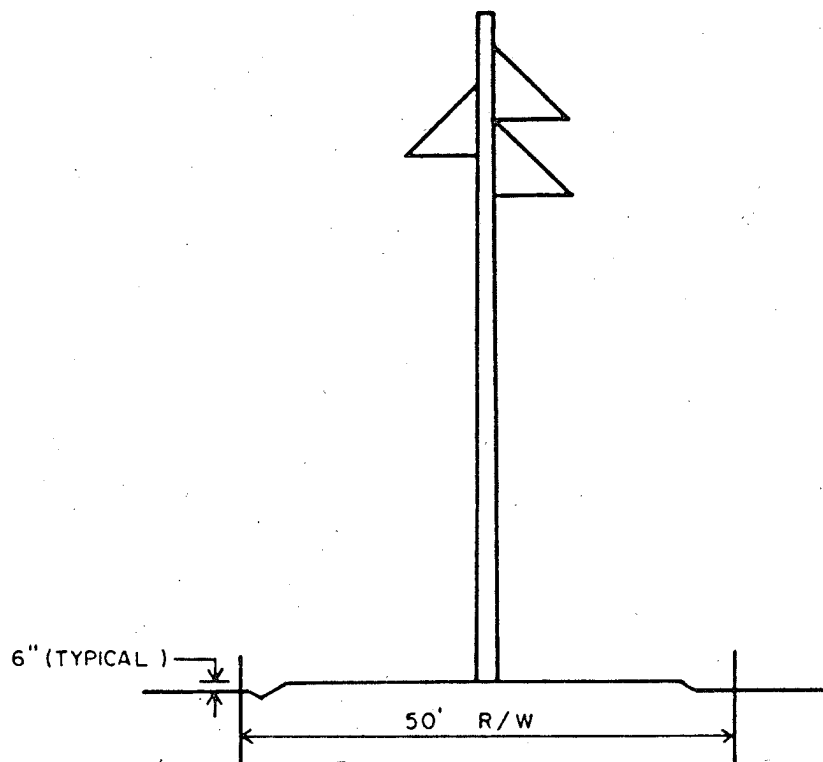
CROSS-SECTION



PLAN VIEW

Figure 6.1.6-4 HARDEE POWER STATION TO PEBBLEDAL
SUBSTATION TYPICAL ACCESS ROAD PLAN
AND CROSS-SECTION

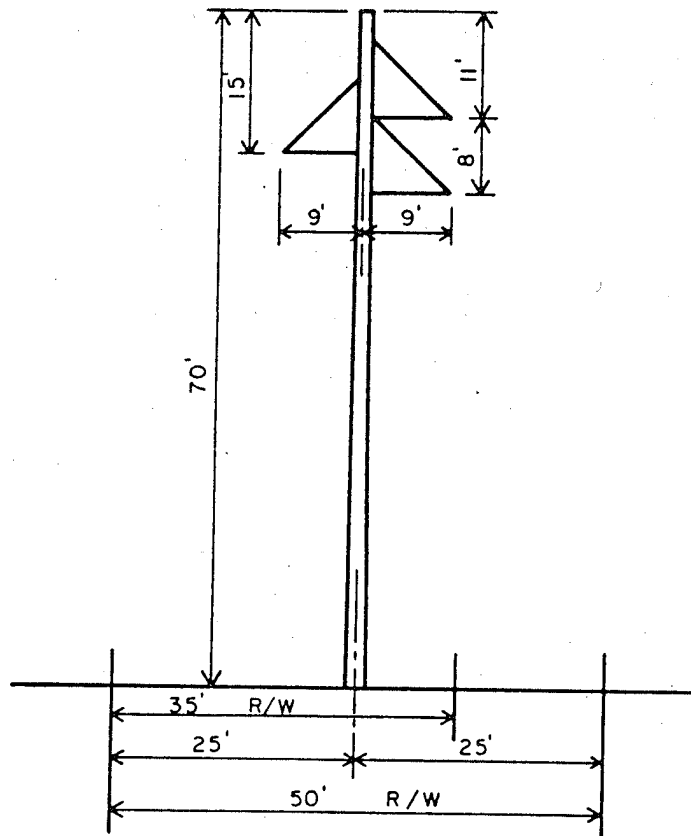
Hardee
Power Station



NOT TO SCALE

Figure 1.3-3
TYPICAL ACCESS ROAD AND STRUCTURE PAD DESIGN —
NO EXISTING ACCESS AVAILABLE

SOURCE: FPL, 1988.



NOTE: RIGHT-OF-WAY REQUIREMENTS FOR THIS STRUCTURE TYPE
WILL BE 35' WHEN ADJACENT TO OTHER RIGHTS-OF-WAY,
50' OTHERWISE.

NOT TO SCALE

Figure 1.3-2
TYPICAL CONCRETE POLE STRUCTURE —
TRIANGULAR CONFIGURATION

SOURCE: FPL, 1988.

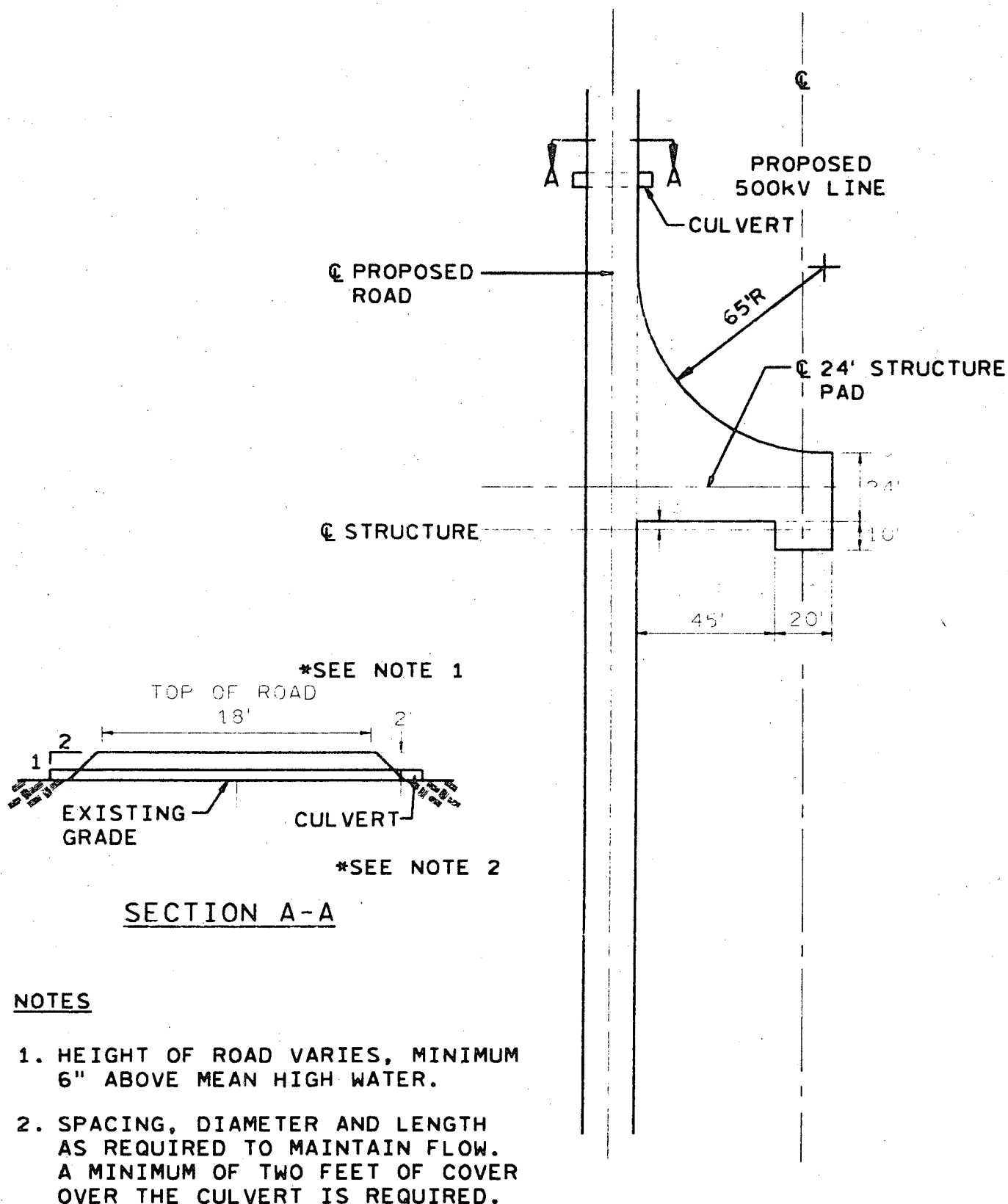


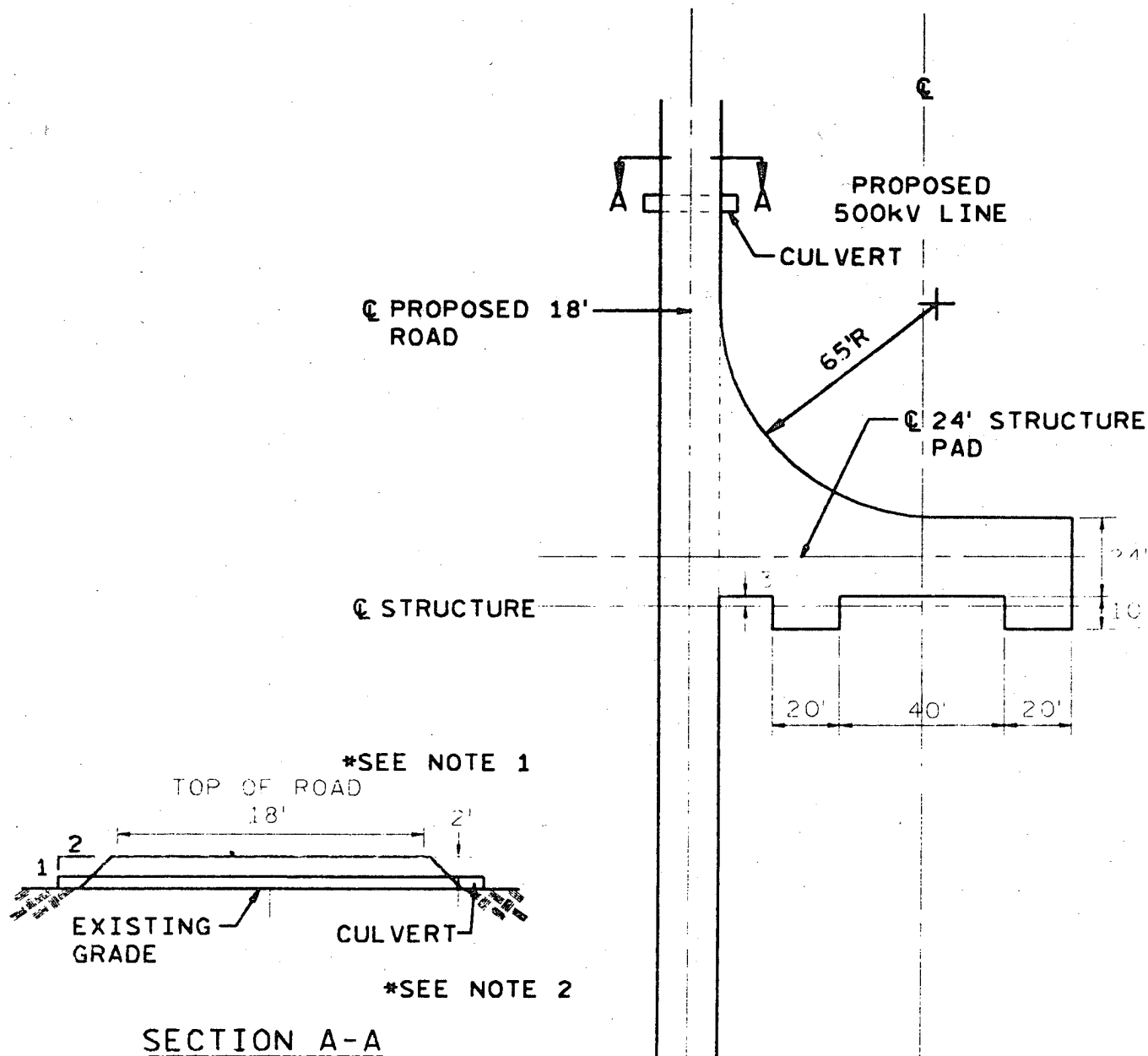
Figure 1.3-7
TYPICAL ACCESS ROAD AND STRUCTURE PAD LAYOUT
FOR SINGLE-POLE-STRUCTURE

SOURCE: FPL, 1988.



Levee-Midway
500kV
Transmission Line

FPL



NOTES

1. HEIGHT OF ROAD VARIES, MINIMUM 6" ABOVE MEAN HIGH WATER.
2. SPACING, DIAMETER AND LENGTH AS REQUIRED TO MAINTAIN FLOW. A MINIMUM OF TWO FEET OF COVER OVER THE CULVERT IS REQUIRED.

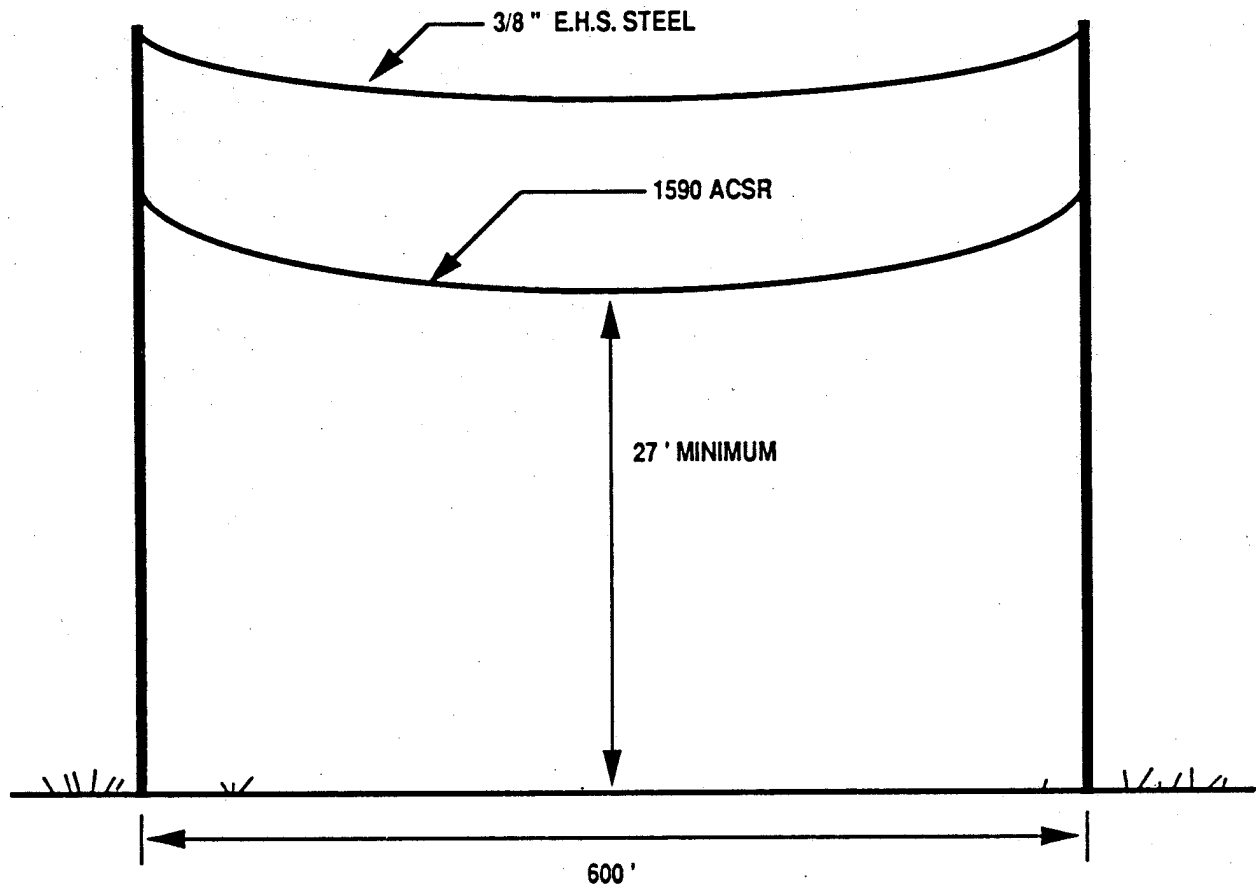
Figure 1.3-6
TYPICAL ACCESS ROAD AND STRUCTURE PAD LAYOUT
FOR H-FRAME STRUCTURE

SOURCE: FPL, 1988.



Levee-Midway
500kV
Transmission Line

FPL



1590 ACSR (LAPWING)
600' RULING SPAN

Figure 6.1.3-3 CONDUCTOR PROFILE FOR SINGLE POLE
CONSTRUCTION

**Hardee
Power Station**

Table 6.1.4-1. Cost Projections for the Preferred and Alternative Corridors for the Hardee Power Station Project in 1988 Dollars

Corridor	Section	Approximate Length (Miles)	Estimated ROW Cost (\$)	Total ROW Preparation Cost (\$)	Line Construction Cost (\$)	Estimated Cost per mile (\$)	Total Cost (\$)
Preferred	C1	16	606,000	836,000	2,560,000 to 4,000,000	250,000 to 340,000	4,002,000 to 5,442,000
	C2	8*	580,800	200,000	3,219,200	250,000	4,000,000
	C3	70	2,540,000	875,000	14,084,000	250,000	17,500,000
Alternative	C1	18	1,091,000	528,000	2,880,000 to 4,500,000	250,000 to 340,000	4,499,000 to 6,119,000

* Two parallel lines of 13 km (8 miles) each.

C1 = Hardee Power Station to Pebbledale Substation

C2 = Hardee Power Station to Vandolah Substation

C3 = Vandolah Substation to Lee Substation

The corridor selection study consisted of a sequential, iterative screening and evaluation process which was conducted in three phases:

1. Regional resources mapping and screening;
2. Selection of candidate corridors; and
3. Selection of preferred and alternative corridors.

Each of the phases in the corridor selection process was based on specific criteria and involved increasing levels of detail.

The end points for the transmission line and line voltage were selected by the Applicant based on studies of the need for power in their service area. The limits of the study area were selected to incorporate the three identified end points and to provide a broad area in which to locate the transmission line ROW.

Phase 1: Regional Resources Mapping and Screening -- The objectives of this phase were to: 1) establish criteria for classifying unfavorable areas (e.g., urban areas and critical habitats); 2) develop a regional screening map of the study area to identify potentially favorable areas; and 3) screen out areas which were unfavorable for the location of a transmission line.

The first task of Phase 1 was the compilation, accurate mapping, and rating of resources in the study area which could affect the suitability of certain areas for transmission corridor siting. Through this process, areas which were determined to be unsuitable due to specific siting constraints such as economics, environmental impacts and land use conflicts were identified and subsequently eliminated from further siting consideration. Through this process, land areas within the study area which possessed unalterable obstacles or restrictions to siting of the corridor were identified. A three-level rating scale was developed to classify various areas within the study area based on socioeconomic/land use, ecological and physical criteria. Specific criteria evaluated are presented in Table 6.1.5-1.

Sensitive areas were mapped throughout the study area using the PC ARC/INFO[®] geographic information system (GIS). PC ARC/INFO[®] is a computer-based

Table 6.1.5-1. Phase 1 Screening Criteria for Transmission Line Corridors for the Hardee Power Station

Land Use Criteria	Ecological Criteria	Physical Engineering Criteria
Residential Areas	Important Species	Major Water Bodies
Unique Use/Restricted Areas	Wetlands/Sensitive Vegetation	Flood-Prone Areas
Recreation, Parks, and Natural Resource Areas		Phosphate Reserves
Agricultural Areas		
Historic Sites		
Archaeological Sites		
Minable Phosphate Reserves		

Source: SECI, 1982.

mapping and analytical system that allows multiple thematic coverages to be digitized and plotted. The coverages mapped for Phase I of the transmission line siting study included:

- o all water bodies with a width greater than 0.4 km (0.25 mile);
- o land use features including residential, commercial and recreational areas, airports, and towns;
- o known nesting areas and habitats of threatened and endangered species;
- o major floodplain areas;
- o transportation routes including roads and railroads; and
- o phosphate mining areas.

Based on the results of the regional mapping and screening, favorable, potentially favorable, and unfavorable areas within the study area were identified. Areas identified as unfavorable were removed from further consideration and those identified as favorable or potentially favorable were assessed further in Phase 2 of the siting study.

Phase 2: Identification of Candidate Corridors -- The objective of this phase was to identify candidate corridors based on information obtained during the regional mapping and screening.

Candidate corridors were selected by using the regional screening maps developed in Phase 1 in addition to information from helicopter flyovers. Corridor segments were identified in areas rated as favorable and potentially favorable for transmission line development. Candidate corridors were then developed by using the corridor segments identified in areas rated as favorable and potentially favorable, based on the following criteria:

- o using the most direct routes between the new power plant and the transmission line end points;
- o paralleling existing ROWs;
- o minimizing crossing of other transmission lines, rivers and highways;
- o minimizing impact on residential and commercial development; and
- o minimizing impact to wetlands and other forested areas.

By applying the above criteria, candidate corridors were identified and are presented in Figure 6.1.5-2 (see Appendix 11.10). The candidate corridors were then further screened at a greater level of detail during Phase 3 of the siting study.

Phase 3: Selection of Preferred and Alternative Corridors -- The objective of Phase 3 was to select the preferred and alternative corridors based on quantitative ranking criteria (socioeconomic, land use, environmental, and physical/engineering).

During this phase of the corridor siting study, the candidate corridors identified previously were evaluated at a greater level of detail and ranked, based on criteria presented in Table 6.1.5-2. The criteria emphasized the identification of constraints within each of the candidate corridors that could affect routing of the actual ROW. A quantitative ranking was developed for each of the candidate corridors based on a scale from one to three. Appropriate maps, aerial photography, local and regional planning documents, and other data sources were used to provide the detailed information used in the ranking process. Each criterion was weighted to reflect its overall importance relative to the other criteria. A weighted composite score was developed for each of the combinations of corridor segments which was used to identify the preferred and alternative corridors.

6.1.6 Hardee Power Station to Pebbledale Substation Transmission Line

6.1.6.1 Description of Preferred and Alternative Corridors

The preferred and alternative corridors between the Hardee Power Station and Pebbledale Substation are described below. The corridor description starts at the Hardee Power Station and proceeds north to Tampa Electric's Pebbledale Substation. This section of the transmission line will be constructed and maintained by Tampa Electric.

HARDEE POWER STATION TO PEBBLEDAL E SUBSTATION

Selection of the preferred and alternative corridors in the area between the Hardee Power Station and the Pebbledale Substation was made primarily on the

Table 6.1.5-2. Candidate Corridor Ranking Criteria

Corridor Ranking Criteria

Residential Density

Land Use Planned Development

Regional Facilities

Airports

Ecology

Natural Communities

Natural Areas

Wildlife Habitats

Rare and Endangered Species

Length of Corridor

basis of economics but also in consideration of other factors. The preferred route (see Figure 6.1.6-1 in Appendix 11.10) is the most direct route between the termination point and the Hardee Power Station using existing road and transmission line ROWs. In addition, this route avoids the populated areas of Bradley Junction, Oak Terrace, and Pinedale, while making use of phosphate mining land where practical.

Due to mining setback restrictions, the siting study concentrated on routing the corridor adjacent to existing highway and railroad ROWs. In addition, wherever practical, existing transmission line ROWs were used for the routing of the transmission corridor.

Due to the uncertainty of mining plans, alternative routing was identified in this area, as shown on the corridor site map. This alternative route makes extensive use of highway and railroad ROW and is less dependent on mining activities in the area. This alternative is a viable route if the preferred route is not available.

The preferred corridor starts at the Hardee Power Station and heads north paralleling to CR 61 for approximately 16 km (10 miles), making use of existing highway ROW. The corridor in this area has a width of 0.8 km (0.5 mile). Due to mining setback restrictions in the area of public road ROWs, lands adjacent to the road ROW may also be available for siting of the transmission line ROW. By routing the corridor parallel to the existing road ROW the need for access road construction and filling is minimized. Directly south of the community of Bradley Junction, the corridor turns to the east for a distance of approximately 0.8 km (0.5 mile). In this area, the corridor maintains a width of approximately 0.4 km (0.25 mile) to avoid residential development. The corridor then increases in width to 0.8 km (0.5 mile) and heads north for approximately 1.6 km (1 mile) to Agricola Road and joins the existing ROW, while staying east of Bradley Junction. The corridor then heads toward the east along the existing ROW for a distance of approximately 2.8 km (1.7 miles). The corridor in this area has a width of 1.6 km (1 mile). Finally, the corridor turns north and follows

the existing ROW to the Pebbledale Substation. The width of the corridor for this section is 1.6 km (1 mile).

~~An alternative route is identified which continues north into Bradley Junction rather than running east as does the preferred route.~~ The alternative corridor runs north through Bradley Junction and is 610 m (2,000 ft) wide with its western edge 76 m (250 ft) west of SR 37. ~~This alignment will allow either SR 37 or the railroad ROW to be utilized in the Bradley Junction area.~~ The section of corridor through Bradley Junction is expected to have a minimum impact on the community of Bradley Junction while maintaining an alignment parallel to existing state road and railroad ROW.

The alternative corridor shifts to the west at the intersection of SR 37 and the railroad directly north of Bradley Junction. The corridor continues north with a width of 0.5 mile and is centered on SR 37. The corridor continues north but narrows to a width of 457 m (1,500 ft) to avoid the community of Oak Terrace. At the intersection of SR 37 and SR 640, the corridor turns east and follows SR 640 to a point directly north of Pebbledale Substation. Beginning at the intersection of SR 37 and SR 640, the corridor has a width of 457 m (1,500 ft). The northern edge of this section is approximately 61 m (200 ft) north of SR 640 thus avoiding the community of Pinedale. Once past the community of Pinedale, the corridor widens to approximately 0.8 km (0.5 mile) as it follows SR 640 east approximately 3.6 km (2.25 miles). The corridor then turns south and follows the existing transmission line ROW to Pebbledale Substation. The width of this section is 0.8 km (0.5 mile).

6.1.6.2 Socio-Political Environment of the Pebbledale Substation Corridor Area

6.1.6.2.1 Governmental Jurisdictions

The preferred and alternative corridors are shown in Figure 6.1.6-1 (see Appendix 11.10) at a scale of 1:126,720 relative to governmental jurisdictions within 0.8 km (0.5 mile) of the edge of the corridor. The corridor runs in a south to north orientation through the extreme northern section of Hardee County and through Polk County. No incorporated

municipalities are known to occur within 0.8 km (0.5 mile) of the Pebbledale corridor.

6.1.6.2.2 Zoning and Land Use

POLK COUNTY

The relevant provisions of the Polk County Comprehensive Plan are discussed in Section 2.2.2 of this document. Additionally, the Polk County Electric Utility Element establishes as a policy to, "Encourage the design of transmission lines and substations compatible with existing land use." For the reasons set forth elsewhere in this chapter (see discussions regarding corridor siting, land uses, ecology, etc.), the Polk County 230 kV transmission line corridor routing is compatible with existing land uses. Moreover, the 230 kV transmission line is a Class I essential service which is authorized throughout Polk County under the Zoning Ordinance. The January 24, 1989 letter from the Zoning Administrator of Polk County and January 20, 1989, memorandum written by the Chief of Current Planning for Polk County (both documents are included in Appendix 11.2) confirm that the transmission line corridor is consistent with the Polk County Comprehensive Plan and in compliance with the Polk County Zoning Ordinance. Further, land use maps showing the Hardee Power Station to Pebbledale Substation corridor are presented in Figure 6.1.6-2 (see Appendix 11.10).

HARDEE COUNTY

The relevant provisions of the Hardee County Comprehensive Plan are discussed in Section 2.2.2 of this document. No specific constraints on transmission line siting are set forth in the plan. The discussion in this section pertaining to planning approach, adjacent land uses, ecology, etc., demonstrates that the 230 kV transmission line corridors in Hardee County are consistent with the Hardee County Comprehensive Plan. Moreover, transmission lines are specifically authorized in all zoning districts in Hardee County as use exceptions pursuant to Section 2.3G of the Hardee County Zoning Ordinance.

6.1.6.2.3 Easements, Title, Agency Works

Easements will be required for the transmission line corridor to cross lands under the jurisdiction of the Board of Trustees of the Internal Improvement Trust Fund. A list of roads, and railroads within the preferred and alternative corridors between the Hardee Power Station and the Pebbledale Substation for which crossing approvals will be required is presented in Table 6.1.6-1.

6.1.6.2.4 Vicinity Scenic, Cultural, and Natural Landmarks

As identified in Section 6.1.6.2.1, no state resource areas will be crossed by the proposed transmission line corridor from the Hardee Power Station to the Pebbledale Substation.

6.1.6.2.5 Archaeological and Historical Sites

DHR was contacted to determine whether any archaeological or historic sites listed or eligible for listing in the National Register of Historic Places, or otherwise of national, state, or local significance might be affected by the proposed 230 kV transmission line corridor between the Hardee Power Station and the Pebbledale Substation. A set of USGS topographic quadrangle maps (1:24,000) and a set of 1984 Mark Hurd aerial photographs (1:24,000) showing the locations of the corridor were reviewed by the DHR personnel. Known sites and potential historical and archaeological site locations within the corridor were identified by the DHR staff.

One known site exists in the corridor between the Hardee Power Station and the Pebbledale Substation. This site is located in an area previously surveyed by archaeologists. However, this site (8-Po-90) is not considered significant. No other known archaeological or historical sites were identified within the Pebbledale corridor.

6.1.6.3 Bio-Physical Environment of the Corridor Area

6.1.6.3.1 Land Use/Vegetation

Existing land use and vegetation cover within 0.8 km (0.5 mile) and vegetation cover within 0.4 km (0.25 mile) from the edge of the corridor between the Hardee Power Station and the Pebbledale Substation

Table 6.1.6-1. Easements, Title, Crossing Approvals Normally Required for Transmission Line Construction in the Preferred and Alternative Corridors Between the Hardee Power Station and Pebbledale Substation

Facility	Corridor	Affected Agency	Previous Approval	Changes
<u>Roads</u>				
CR 663	C1	Polk County	Utility Permit	None
CR 630	C1	Polk County	Utility Permit	None
CR 640	C1	Polk County	Utility Permit	None
SR 37	Cla	FDOT	Utility Permit	None
CR 640	Cla	Polk County	Utility Permit	None
CR 663	Cla	Polk County	Utility Permit	None
<u>Railroads</u>				
Seaboard Coastline	C1	FDOT	Utility Permit	None
Seaboard Coastline	Cla	FDOT	Utility Permit	None

Note: C1 - Hardee Power Station to Pebbledale Substation
 Cla - Hardee Power Station to Pebbledale Substation Alternative Corridor

(Figure 6.1.6-3 in Appendix 11.10) were determined using USGS 1:24,000 topographic quadrangle maps alongside recent aerial photographs at the same scale. Generalized 1985 Land Use Maps prepared by the COE for SWFWMD were also examined. Helicopter flights and ground inspections were used to clarify interpretations.

The land use maps have been prepared according to the FLUCCS (FDOT, 1985).

LAND USE

Aerial photographs at a scale of 1:24,000 depicting the preferred and alternative corridors between the Hardee Power Station and the Pebbledale Substation are included in Figure 6.1.2-2 (see Appendix 11.10). Much of the preferred corridor between the Hardee Power Station and the Pebbledale Substation runs through land which has been strip mined for phosphate ore. This corridor also passes along the southern and eastern sides of the unincorporated community of Bradley Junction.

The alternative corridor segment starts at the southern boundary of Bradley Junction and proceeds north including both SR 37 and the Seaboard Coastline Railroad. Land use within the alternative corridor includes areas of residential development and mined phosphate lands.

VEGETATION

The preferred and alternative corridors pass through heavily mined phosphate lands, which were formerly scrub and sandhill rangeland with marshes, ponds, and cypress domes in depressions and floodplain swamps and forests along the creeks. Farming, phosphate mining, and other land clearing activities have eliminated most of the original vegetation. Practically all remaining forested communities have been cut over to some extent.

The major natural communities are pine flatwoods and prairies, with a full range of hydric, mesic, and xeric types represented. Smaller tracts of hammock also range from hydric to xeric in character. The primary wetland type is marsh with floodplain forest communities along streams.

Hammocks are relatively fire-intolerant hardwood forests. In the study area they are usually dominated by live oak (Quercus virginiana), sand live oak (Q. geminata), laurel oak (Q. hemisphaerica), and cabbage palm (Sabal palmetto). Water oak (Q. nigra), sweetgum (Liquidambar styraciflua), and sugarberry (Celtis laevigata) are also common.

Scrub communities are shrubby thickets and/or sand pine (Pinus clausa) forests adapted to catastrophic fires at less frequent intervals. The typical shrubs include sand live oak (Q. geminata), scrub oak (Q. inopina), Chapman's oak (Q. chapmanii), myrtle oak (Q. myrtifolia), rosemary (Ceratiola ericoides), fetterbush (Lyonia ferruginea), and other leathery-leaved species. The forest floor is usually white sand with patches of deer moss (Cladonia spp.), prickly pear (Opuntia humifusa), and occasional grasses and forbs. There are no clearly defined areas of scrub in the corridor, but some areas of xeric flatwoods or oak hammock may have admixtures of scrub species.

Flatwoods usually occur on low-lying, level lands with a high water table and, consequently, a hardpan layer within a few feet of the soil surface. Slash pine (Pinus elliottii) is usually the dominant species in these stands of scattered pines, but longleaf may occur on some sites in the corridor. Natural flatwoods have a very diverse grassy understory dominated by wiregrass, but places subjected to repeated winter burning may have a dense thicket of saw palmetto (Serenoa repens) beneath the pines.

Red maple (Acer rubrum), sweetbay Magnolia virginiana), loblolly bay (Gordonia lasianthus), swamp bay (Persea palustris), dahoon holly (Ilex cassine), and sweetgum (Liquidambar styraciflua) are the most common. Wax myrtle (Myrica cerifera), carolina willow (Salix caroliniana), and buttonbush (Ceophalanthus occidentalis) are abundant in disturbed wetlands along the Pebbledale corridor.

Where fires occur too often for trees to become established, marshes are the wetland vegetation. These are typically composed of herbaceous emergents like maidencane (Panicum hemitomon), bulltongue sagittaria (Sagittaria

lancifolia), and pickerel weed (Pontederia cordata). These communities may grow on either organic or mineral soils, though the latter are usually termed wet prairies.

6.1.6.3.2 Affected Water and Wetlands

The area between the Hardee Power Station and the Pebbledale Substation contains various scattered water bodies and wetland areas. Any corridor located in this area of Florida is likely to traverse through some water bodies and wetlands.

Water bodies crossed by this corridor are listed in Table 6.1.6-2. All water bodies encountered within the corridor can be spanned without the need for placing supporting structures within the water bodies. No major bridge construction will be required for the associated access road. The potential impact of the transmission line on water bodies will be minimal, since the width of the final ROW selected within the corridor will be considerably less than the 0.8 km (0.5 mile) to 1.6 km (1 mile) corridor width. Most of the wetlands located in the corridor are small and isolated and efforts will be made to avoid wetland areas during selection of the ROW.

The section of corridor between the Hardee Power Station and the Pebbledale Substation includes numerous phosphate mining areas. Some of these areas have been reclaimed. Many of the mining areas in this section of the corridor contain isolated water bodies. The mining areas and associated water bodies will be avoided during final siting of the transmission line ROW. The preferred corridor crosses the South Prong Alafia River at a point 3.2 km (2 miles) north of Brewster. The South Prong Alafia River is classified as a Class III Surface Water (for recreation an propagation of aquatic life) in Chapter 17-3 F.A.C. The alternative corridor crosses the North Prong Alafia River at a point approximately 0.4 km (0.25 mile) east of the Pinedale Subdivision. This river is a Class III Surface Water (Chapter 17-3 F.A.C.).

Table 6.1.6-2. Water Bodies Within Preferred and Alternative Corridors
Between the Hardee Power Station and the Pebbledale
Substation

Water Body	Receiving Water	Corridor	Comments
Phosphate Mine	Isolated	C1, Cla	Numerous Phosphate Mines Between Hardee Power Station and Pebbledale Substation
South Prong Alafia River	Alafia River	Cla	Two Miles North of Brewster
North Prong Alafia River	Alafia River	Cla	West of Pinedale Subdivision

Note: C1 - Hardee Power Station to Pebbledale Substation
Cla - Hardee Power Station to Pebbledale Substation Alternative Corridor

6.1.6.3.3 Ecology

This section discusses species which are designated as endangered, threatened, or species of special concern by the USFWS or the FGFWFC and which, based on a literature survey and consultations with state, regional, and local agencies, are known or expected to occur in or near the proposed transmission corridor between the Hardee Power Station and the Pebbledale Substation. The species addressed may occur as residents, migrants, or transients. Lists of plant and animal species (Tables 6.1.6-3 and 6.1.6-4) discussed in the following sections were prepared in consultation with FGFWFC and the FNAI.

The probability of occurrence for threatened, endangered, and species of special concern within the corridor was based on known locations (e.g., eagle nests, wading bird colonies), recent and historical reports, and information in the scientific literature, and discussions with biologists familiar with the region. Locations of known occurrences of these species and habitat features critical to their survival within 457 m (1,500 ft) of the corridor are depicted in Figure 6.1.6-3 (see Appendix 11.10).

PLANT SPECIES

No genuinely rare plant species have been reported within the proposed transmission corridor and very few have been documented nearby. There have not been many botanical surveys of the region, however. The list of potentially present protected plants presented in Table 6.1.6-3 was derived from FNAI element occurrence records for a 58 km (36 miles) swath centered on the corridor study area. This list was edited to remove species restricted to Lake Wales Ridge and coastal habitats and supplemented with species documented during Agrico and CFI DRI studies.

There are several rare species that might possibly be found in open xeric habitats in the general area of the corridor. These include scrub holly, scrub buckwheat, Curtiss' milkweed, Ashe's savory, scrub milkwort, nodding pinweed, Florida beargrass, wild coco, and sand butterfly pea. Scientific names and federal and state statuses of these species are given in

Table 6.1.6-3. Protected Rare Plant Species Potentially Present within Five Miles of Proposed Transmission Line Corridor Between the Hardee Power Station and the Pebbledale Substation

Common Name	Scientific Name	Status	
		USFWS*	FDA**
Curtiss' milkweed	<u>Asclepias curtissii</u>		T
Ashe's savory	<u>Calamintha ashei</u>	UR1	T
Spoon-leaved sundew	<u>Drosera intermedia</u>		T
Florida beardgrass	<u>Gymnopogon floridanus</u>	UR2	
Water spider orchid	<u>Habernaria repens</u>		T
Hartwrightia	<u>Hartwrightia floridana</u>	UR2	T
Edison's ascyrum	<u>Hypericum edsonianum</u>	UR1	T
Scrub holly	<u>Ilex opaca</u> var. <u>arenicola</u>	UR5	
Thick-leaved water-willow	<u>Justicia crassifolia</u>	UR2	
Nodding pinweed	<u>Lechea cernua</u>	UR2	
Serpent fern	<u>Phlebodium aureum</u>		T
Scrub milkwort	<u>Polygala lewtonii</u>	UR1	E
Wild coco	<u>Pteroglossapis ecristata</u>	UR2	T
Banded wild-pine	<u>Tillandsia flexuosa</u>		T
Red needleleaf airplant	<u>Tillandsia setacea</u>		T
Shoestring fern	<u>Vittaria lineata</u>		T
Rain lily	<u>Zephyranthes simpsonii</u>	UR5	E
Scrub buckwheat	<u>Eriogonum floridanum</u>		T
Sand butterfly pea	<u>Centrosema arenicola</u>	UR5	

Note: E - Endangered

T - Threatened

UR1 - Under review for listing, with substantial evidence indicating some degree of biological vulnerability and/or threat

UR2 - Under review for listing, but substantial evidence of biological vulnerability and/or threat is lacking

UR5 - Still formally under review, but no longer considered a likely candidate for listing because recent information indicates species is more widespread or abundant than previously believed

* USFWS = U.S. Fish and Wildlife Service

** FDA = Florida Department of Agriculture

Table 6.1.6-4. Protected Animal Species Potentially Present within Five Miles of Proposed Transmission Line Corridor Between the Hardee Power Station and the Pebbledale Substation

Common Name	Scientific Name	Status	
		FGFWFC*	USFWS**
<u>MAMMALS</u>			
Sherman's fox squirrel	<u>Sciurus niger shermani</u>	SSC	UR2
Round-tailed muskrat	<u>Neofiber alleni</u>		UR2
<u>BIRDS</u>			
Bald eagle	<u>Haliaeetus leucocephalus</u>	T	E
Red-cockaded woodpecker	<u>Picoides borealis</u>	T	E
Little blue heron	<u>Egretta caerulea</u>	SSC	
Crested caracara	<u>Polyborus plancus audubonii</u>	T	
Southeastern American kestrel	<u>Falco sparverius paulus</u>	T	UR2
Swallow-tailed kite	<u>Elanoides forficatus</u>		UR2
Sandhill crane	<u>Grus canadensis pratensis</u>	T	
Florida scrub jay	<u>Aphelocoma coerulescens</u> <u>coerulescens</u>	T	T
Snowy egret	<u>Egretta thula</u>	SSC	
Tricolored heron	<u>Egretta tricolor</u>	SSC	
Wood stork	<u>Mycteria americana</u>	E	E
Florida burrowing owl	<u>Athene cunicularia floridana</u>	SSC	
<u>REPTILES</u>			
Gopher tortoise	<u>Gopherus polyphemus</u>	SSC	UR2
Eastern indigo snake	<u>Drymarchon corais couperi</u>	T	T
Blue-tailed mole skink	<u>Eumeces egregius lividus</u>	T	T
Florida pine snake	<u>Pituophis melanoleucus mugitus</u>	SSC	UR2
American alligator	<u>Alligator mississippiensis</u>	SSC	T(S/A)

Note: E - Endangered

T - Threatened

T(S/A) - Threatened due to similarity of appearance

SSC - Species of special concern

UR2 - Under review for listing, but substantial evidence of biological vulnerability and/or threat is lacking.

* Florida Game and Fresh Water Fish Commission

** U.S. Fish and Wildlife Service

Table 6.1.6-3. Scrub milkwort is the only one of these plants that is more than moderately rare. Serpent fern, red needleleaf airplant, and shoestring fern might be encountered growing as epiphytes on trees in swamp or hammock habitats.

Edison's ascyrum, hartwrightia, rain lily, water spider orchid, thick-leaved water willow, and/or spoon-leaved sundew may be found in wet depressions or seepage areas.

WILDLIFE SPECIES

The presence or potential for occurrence of the wildlife species listed in Table 6.1.6-4 within a given area is primarily related to the presence of suitable habitat for cover, feeding, and reproduction. In general, the type and quality of wildlife habitat depends upon vegetation, surrounding land use, and hydrology. Wildlife habitat types, therefore, frequently correspond to vegetation types.

The natural communities which serve as the principal wildlife habitats in the corridor include flatwoods, hammocks, and marshes. Most of these are present only as degraded remnants with limited habitat value.

A number of vertebrate species, including reptiles and amphibians, birds, and mammals were identified as important species occurring or possibly occurring within 8 km (5 miles) of the proposed corridor between the Hardee Power Station and the Pebbledale Substation (Table 6.1.6-4). The status and potential for occurrence of each of these species is discussed below.

REPTILES

Most of the rare xeric habitat reptiles of conservation concern to the north and east of the study area have not been documented west of the Lake Wales Ridge. The few known to occur in the Pebbledale corridor vicinity are as follows:

Gopher Tortoise (Gopherus polyphemus)

The gopher tortoise is listed as a species of special concern by FGFWFC and UR2 by USFWS. Gopher tortoise populations have declined due to collection as food and to habitat losses associated with urban growth and conversion of land to commercial pine plantations. Gopher tortoises occur in xeric habitats such as sandhills, xeric hammocks, pine flatwoods, scrubs, and old fields. The burrow excavated by the gopher tortoise is also used by a variety of other organisms, including gopher frogs and indigo snakes. The gopher frog, however, does not occur in the corridor area. Areas of suitable habitat along the corridor could be expected to support gopher tortoises.

Eastern Indigo Snake (Drymarchon corais couperi)

The eastern indigo snake is listed as threatened by both USFWS and FGFWFC. Reasons for its decline include habitat destruction, capture by snake collectors, and mortality from rattlesnake roundups. Eastern indigo snakes are found in dry, sandy areas such as pine flatwoods as well as in hardwood hammocks. Indigo snakes may be expected to occur in appropriate habitats in the corridor area.

Florida Pine Snake (Pituophis melanoleucus mugitus)

The pine snake is listed as a species of special concern by FGFWFC and UR2 by USFWS. It uses sandhills and other open, xeric habitats where pocket gophers, mice, and similar prey are abundant. Although pine snakes have been recorded as far south as Charlotte County, the bulk of the species' range is north of the corridor. It is thus not likely to be found within the affected area.

American Alligator (Alligator mississippiensis)

The alligator is listed as a species of special concern by FGFWFC and threatened due to similarity of appearance with the endangered American crocodile by USFWS. The alligator is found in wetland communities including lakes, ponds, rivers, and marshes. Alligators adapt fairly well to the presence of humans and can be found in urban areas if not molested. Populations have recovered to the point where USFWS has retained their

status as threatened only in order to protect the similar endangered American Crocodile. Alligators probably occur in almost all suitable habitats in the study area.

Blue-tailed Mole Skink (Eumeces egregius lividus)

This lizard is listed as threatened by FGFWFC and USFWS. It is known from only a small area of south-central Florida and is confined to scrub and sometimes shrubby sandhill habitats. The blue-tailed mole skink has been observed approximately 6.4 km (4 miles) east of the Pebbledale corridor, 13 km (8 miles) south of Vandolah. It might be found in scrub communities within the corridor.

MAMMALS

Few mammals of concern occur in the corridor area. Although several uncommon bat species have extensive ranges that encompass the corridor area, no breeding localities or other evidence that they are likely to be found here has been documented.

Sherman's Fox Squirrel (Sciurus niger shermani)

Sherman's fox squirrel is listed as a species of special concern by FGFWFC and UR2 by USFWS. Fox squirrels may occur in sandhill xeric flatwoods and open remnants in the Pebbledale corridor area. They require open, frequently burned sandhills with scattered pines and oaks as habitat.

Round-tailed Muskrat (Neofiber alleni)

The round-tailed muskrat is listed UR2 by USFWS. It utilizes marshes with dense stands of maidencane, pickerel weed, and sagittaria. This species has an irregular spotty distribution encompassing most of the Florida peninsula, including the study area. It may occur in appropriate habitats within the corridor.

BIRDS

Bald Eagle (Haliaeetus leucocephalus)

The bald eagle is listed as threatened by FGFWFC and endangered by USFWS. Eagles in peninsular Florida include permanent residents and seasonal

migrants. Migrants occasionally occur along rivers or lakes. Eagle nests are generally located in tall pines or cypress. Two active nests have been recorded in the vicinity of the Pebbledale corridor. One is approximately 8.0 km (5 miles) south of Bradley Junction and 0.8 km (0.5 mile) west of the corridor centerline. The other is near the center of Section 25 about 3.2 km (2 miles) west of Pebbledale and 0.8 km (0.5 mile) east of the centerline of the nearest corridor segment.

Southeastern Kestrel (Falco sparverius paulus)

The southeastern kestrel is listed as threatened by FGFWFC and UR2 by USFWS. The practically indistinguishable unlisted eastern kestrel also winters in Florida. These small hawks utilize sandhills and similar open upland habitats where they hunt from perches and nest in cavities such as old woodpecker holes in pine trees. They may occur in appropriate habitats in the corridor area.

Burrowing Owl (Athene cunicularia)

Due to habitat loss, the burrowing owl is listed as a species of special concern by FGFWFC. This owl requires well drained sandy soil in areas of sparse growth such as prairies, sandhills, and pastures. Burrowing owls might be found in open upland habitats.

Crested Caracara (Polyborus plancus audubonni)

The caracara is considered threatened by both FGFWFC and USFWS. This is a large hawk whose Florida range is restricted to the open prairie region of the south-central portion of the peninsula. It forages in pastures and sparse pinelands, feeding on both carrion and live prey, and nests in cabbage palm trees. The species range is generally southeast of the study area, but the birds do occasionally travel through the region and could potentially be seen in the corridor.

Swallow-tailed Kite (Elanoides forficatus)

The swallow-tailed kite is listed as UR2 by USFWS. These birds range throughout Florida, but prefer habitat that is a mosaic of forested and open wetlands. They feed on insects and reptiles in wet prairies or marshes and

nest in large cypress or pine trees. Swallow-tailed kites may occasionally be seen in the corridor.

WADING BIRDS

Three species of protected wading birds are known or expected to occur in the vicinity of the corridor. These species are the snowy egret (Egretta thula), little blue heron (Egretta caerulea), and tricolored heron (Hydranassa tricolor). All three species are designated as species of special concern by FGFWFC. These birds utilize similar habitats, requiring wetlands for feeding and shrub swamp or cypress swamp for roosting and nesting. They can be expected to forage in suitable wetlands along the corridor. Although there are several historical records of wading birds nesting within a few miles of the corridor, no active rookeries have been observed within 8.0 km (5 miles) during recent surveys.

Wood Stork (Mycteria americana)

Wood storks are listed as endangered by FGFWFC and USFWS. Reasons for their decline include loss of feeding and nesting areas. Wood storks nest primarily in cypress or mangrove swamps, and forage where fish populations concentrate in freshwater marshes, ditches, and flooded pastures. Wood storks are expected to occasionally forage throughout the corridor in areas of suitable habitat. Storks have nested near the corridor in the past, but no active rookeries have been documented nearby recently.

Florida Sandhill Crane (Grus canadensis pratensis)

The resident Florida subspecies of the sandhill crane is listed as threatened by FGFWFC. Unlisted migratory birds join these flocks in the winter. The sandhill crane uses large open pastures and dry prairies as foraging habitat and breeds in associated wet prairies and marshes. Cranes may occasionally be seen in the corridor area.

Red-cockaded Woodpecker (Picoides borealis)

The red-cockaded woodpecker is listed as threatened by FGFWFC and endangered by USFWS. The bird nests in "overmature" pines affected by a fungus disease that softens the heartwood. Timber management practices have

greatly reduced the numbers of these trees. No red-cockaded woodpecker colonies have been documented along the corridor and the limited area of pine forest remaining is probably insufficient to maintain populations.

Florida Scrub Jay (Aphelocoma coerulescens coerulescens)

The scrub jay is listed as threatened by both FGFWFC and USFWS. This species is very restricted in its habitat requirements, utilizing brushy early successional scrub habitats virtually exclusively. It has been observed near the corridor and may occur in suitable habitats along the route.

6.1.6.3.4 Other Environmental Features

All relevant environmental features associated with the transmission line corridor between the Hardee Power Station and the Pebbledale Substation have been presented in the preceding subsections. No additional information is deemed necessary to describe environmental characteristics of the transmission line corridor.

6.1.6.4 Effects of Right-of-Way Preparation and Transmission Line Construction

6.1.6.4.1 Construction Techniques

RIGHT-OF-WAY CLEARING

All trees, brush, and scrub growth in the ROW will be cleared. Trees beyond the boundary of the ROW may be trimmed or cut with the owners consent if it is determined that the trees present a danger to the transmission line. Equipment used to cut these may include bulldozers, shearing machines, or chainsaws.

ROAD AND PAD CONSTRUCTION

Access roads will be required in areas where the final transmission line ROW between the Hardee Power Station and the Pebbledale Substation does not follow existing roads. The overall objective of the access roads will be to provide efficient and safe ingress and egress to the transmission line structures while minimizing environmental impact and cost. Access roads

will be required for construction and maintenance of the transmission line facilities.

The use of fill will be minimized in the construction of access roads, and wherever possible, roads will be constructed by blading natural soil from both sides of the intended road. Where fill is required, it will be trucked in and spread, compacted, and shaped to the desired elevation. Access roads will be constructed to have a maximum surface width of 6.1 m (20 ft). Dump trucks may be used for hauling, and bulldozers and graders may be used for spreading and compacting. A typical cross section for the access road is presented in Figure 6.1.6-4.

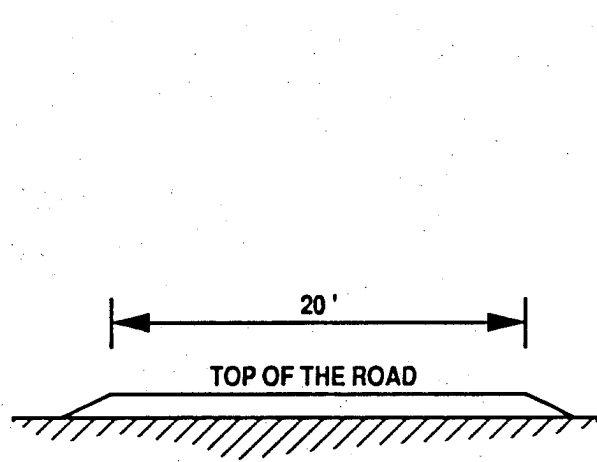
LINE CONSTRUCTION

Multiple structure configurations and construction materials will be used throughout the length of the transmission line from the Hardee Power Station to the Pebbledale Substation. The type of structure used in any particular area will be a function of the characteristics of the ROW and surrounding areas.

For the majority of the ROW which crosses open land, the preferred structure will be wooden H-frame construction (see Figure 6.1.3-1). H-frame construction involves directly imbedding the poles into native soil and attaching cross bracing after imbedment. Suspension insulators are then attached to the cross bracing to allow the phase conductors to be pulled. H-frame construction is used for tangent (straight line) construction.

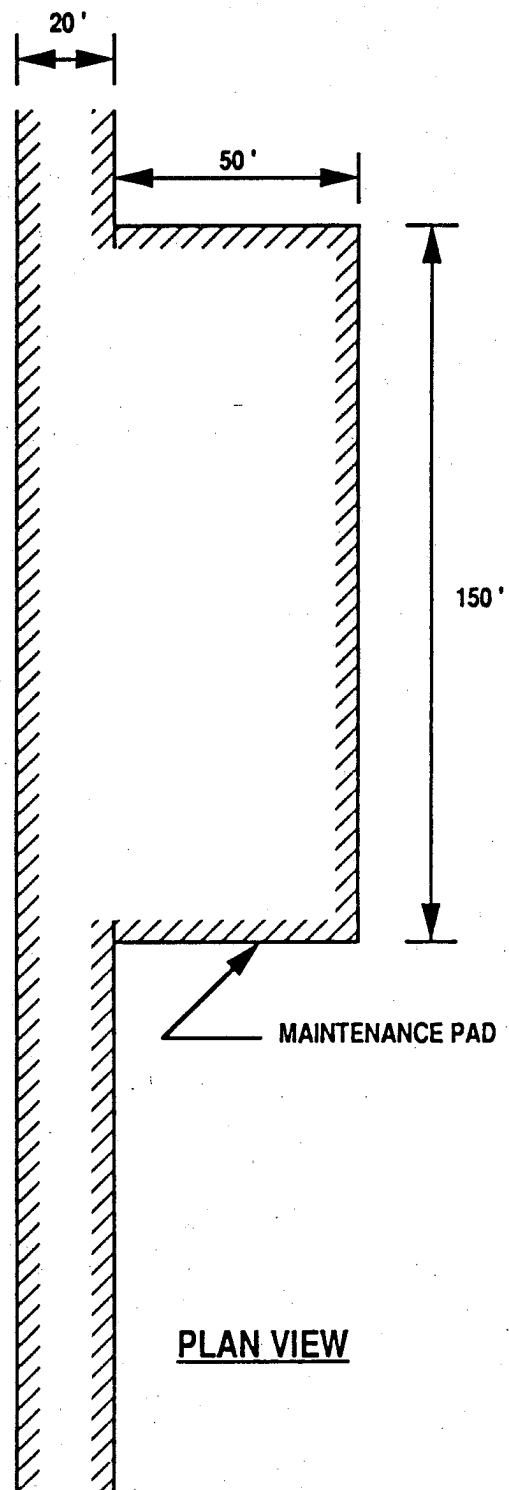
Where the ROW allows, three pole structures will be used for line angle construction. This type of construction involves directly imbedding the structures and guying to meet strength requirements. Once the poles and guy wires are installed, suspension insulators are attached to the structures to allow the conductor to be pulled.

Single pole construction will be used where ROW or other constraints limit the use of H-frame construction. Single pole structures are anticipated to be used in areas where the width of the ROW prohibits the use of H-frame



NOTE: FILL TO BE ADDED AS REQUIRED

CROSS-SECTION



PLAN VIEW

Figure 6.1.6-4 HARDEE POWER STATION TO PEBBLEDAL
SUBSTATION TYPICAL ACCESS ROAD PLAN
AND CROSS-SECTION

**Hardee
Power Station**

structures, and in areas where visual impacts are significant. Single pole structures may be directly imbedded with native soil, crushed rock or concrete backfill. Single pole structures can be used for line angles and can be designed to be self supporting.

Structures will be framed and erected using cranes and other support vehicles. Overhead ground wires and conductors will be installed by various wire-pulling equipment. Vehicles used to support line construction may include bulldozers, tractors, and other light vehicles.

Foundations for structures may be either native soil, crushed rock or concrete backfill. In addition, poured concrete foundations may be used where an extra strong foundation is required. With native soil or crushed rock backfill, a hole is augered and the pole is inserted into the hole. The backfill material is then compacted around the pole up to the surrounding ground level. In the case of poured concrete foundations, the required concrete foundation is poured and anchor bolts are installed. Once the foundation has set, the base of the pole is bolted onto the anchor bolts of the foundation.

EROSION

Disturbance to natural vegetation will be kept to a minimum to reduce the potential for erosion. Where necessary, erosion control measures will be utilized to eliminate erosion during construction. Routine maintenance of the ROW will be designed to minimize ground cover disturbance, and therefore reduce the potential for erosion during operation of the transmission line.

6.1.6.4.2 Impacts on Water bodies and Uses

Exact routing of the ROW within the corridor between the Hardee Power Station and the Pebbledale Substation has not been determined at present. All efforts will be made to avoid waters of the State, including jurisdictional wetlands, during the final routing of the Pebbledale transmission line ROW.

Construction of the Pebbledale transmission line and associated access road is expected to have minimal impact on waters of the State. During the siting process, corridor segments were identified which contained relatively few water bodies or wetlands greater than 0.4 km (0.25 mile) in length. This selection criteria was identified to screen out areas with water bodies or wetlands that could not be spanned by the transmission line. Several small drainage areas and the South Prong Alafia River will be crossed by the corridor but the line construction is not expected to have an impact on these water bodies. Based on the selected type of construction for the support structures, the transmission line will be able to span a maximum distance of approximately 0.4 km (0.25 mile) and still retain adequate ground clearance. Therefore, few, if any, support structures will be constructed within waters of the State. It is also anticipated that the Pebbledale transmission line will be able to span or be diverted around most wetlands. However, some filling in wetland areas may be required for the access road. Most of the wetlands crossed by this corridor are relatively small. Therefore, keyhole filling will be utilized where possible in lieu of continuous filling. The total area that will require filling is not known at the present time, but is expected to represent only a small fraction of the overall corridor length. Where road construction or structure placement must occur in wetlands, the following procedures will be followed. To control runoff of project site sediments, appropriate sediment control methods will be used. Methods to be used include staked silt fences with haybales in upland areas and transitional to shallow wetlands, and floating turbidity barriers in water bodies. Silt screens will be placed downstream of construction abutting all open water. In addition, in areas requiring minor excavation for culvert placement, appropriate stabilization of the banks will be provided.

No bridges are expected to be constructed in association with the transmission line or access road. Therefore, no restrictions to navigation will occur on any water body crossed by the corridor. Adequate clearance

between the surface of the water and the transmission line will be maintained, and no impedance to boat traffic or other water related activity will result.

6.1.6.4.3 Solid Wastes

Solid waste generated from ROW preparation and line construction generally consists of cleared vegetation and construction related debris. All cleared vegetation and combustible debris will be burned on-site. Applicable state and local regulations regarding on-site burning will be followed. Non-combustible material will be collected and disposal will occur at existing landfills.

Approximately three yards of native soil is expected to be removed for each pole installation. The majority of this soil will be used for backfill in cases where native soil backfill is acceptable for foundation. In cases where crushed rock backfill or concrete foundations are used, the soil will be spread over the ROW in a manner to minimize the impact on the surrounding area.

6.1.6.4.4 Changes to Vegetation, Wildlife, and Aquatic Life

ROW preparation and line construction for the Pebbledale transmission line will have minimal adverse impact on terrestrial or aquatic systems because the corridor has been chosen to avoid major areas of ecological importance and the ROW will be routed to avoid smaller areas of significant habitat within the corridor. Critical habitats, substantial areas of forest or wetland, concentrations of rare species, breeding locations of sensitive species, and important examples of rare or threatened natural communities were all screened out during the corridor selection process.

Tampa Electric plans to avoid construction of raised roads wherever possible, so disruption of hydrological patterns should be minimal. Culverts and similar engineering solutions will be applied to correct any disturbance to drainage caused by essential road improvements.

Trees must be cut out of the area beneath and immediately adjacent to the lines.

Construction activities will inevitably have some direct impact on wildlife. Some animals will be displaced from the ROW by disturbance. Plants will be impacted by essential cutting and clearing activities. The cumulative effect of these impacts will be minimal, however, since care has been and will continue to be taken to avoid important habitats.

6.1.6.4.5 Impact on Human Populations

Specialized crews will work to clear easements, clear access roads, prepare foundations, assemble and erect support structures, string conductors, and clean up, with overlap of activities as required. Construction of the Pebbledale line is anticipated to take approximately 18 months. It is expected that construction of the Pebbledale line will not restrict traffic flow on roads adjacent to or crossed by the line. Short-term impacts to area residents from the noise of saws and other equipment which will be required to clear the corridor and construct the support structures will be of short duration.

A construction work crew of approximately 15-20 will be required, with work generally taking place between the hours of 7:00 a.m. and 7:00 p.m. The relatively small number of workers and minimal amount of equipment required for this effort are not expected to cause any significant impact on traffic conditions on area roads either during morning and evening peak traffic periods, or during the day.

6.1.6.4.6 Impact on Regional Scenic, Cultural and Natural Landmarks

As noted in Section 6.1.6.2.4, no state resources areas are crossed by the Pebbledale transmission line.

6.1.6.4.7 Impact on Archaeological and Historical Sites

Upon selection of a final ROW, a professional archaeological survey will be conducted for any areas within the ROW previously identified by DHR as

having potentially significant archaeological sites (see Appendix 11.3) and which will be disturbed by land clearing and construction activities.

These sites will be avoided during construction of the transmission line and subsequently during the maintenance of those properties to assure in-place site preservation. If avoidance is not feasible, impacts will be mitigated through archaeological salvage excavation conducted by a professional archaeologist. The DHR will be consulted regarding appropriate procedures for either preservation or excavation of any significant site(s).

If unforeseen artifacts or archaeological sites are discovered during construction, the DHR will be notified. Following a determination of the importance of these artifacts or sites, the Applicant will work with the DHR to assess mitigation measures necessary to minimize adverse impacts.

6.1.6.5 Post-Construction Impacts and Effects of Maintenance

6.1.6.5.1 Maintenance Techniques

TRANSMISSION LINE MAINTENANCE

The Pebbledale transmission line ROW will be patrolled and inspected regularly to identify structures in need of repair. Occasional maintenance will be required on the transmission structures. Insulators will be replaced when damaged as will supporting clamps and braces. Wood transmission poles are expected to be replaced on the average of every 15 years. Where steel or concrete poles are used, there will be minimum pole maintenance needed. The expected life of these poles is in excess of 30 years. The maintenance of the transmission line is expected to have a minimum impact on the surrounding area.

RIGHT-OF-WAY MAINTENANCE

Mechanical mowing and herbicides will be used to keep the ROW clear of unwanted vegetation. These chemicals will be used as needed. All herbicide application will be conducted in a manner consistent with all state and local regulations and will be carried out by trained personnel.

No burning is anticipated to be needed for the maintenance of the ROW.

6.1.6.5.2 Multiple Uses

Various activities including citrus farming, grazing, and agriculture are typically allowed within the ROW as long as these activities do not interfere with full use of the ROW. An easement will be obtained for the construction and operating of the Pebbledale transmission line, including ingress and egress to the transmission line. Specific uses within the ROW will be addressed individually with affected parties. Multiple use of the ROW may be restricted in certain areas, but in general, compatible multiple uses will be allowed.

6.1.6.5.3 Changes in Species Populations

WILDLIFE AND AQUATIC LIFE

Potential post-construction impacts along the Pebbledale transmission line fall into four major categories: 1) impacts related to the actual transmission lines and supporting poles; 2) impacts of ROW maintenance procedures; 3) disturbances associated with access roads; and 4) effects of electromagnetic fields (EMFs).

The primary concern associated with the actual transmission line is the potential increase in bird mortality due to collisions with the wires. The impacts of collisions with power lines on avian mortality are difficult to quantify. It is generally agreed, however, that collisions are a potentially significant cause of mortality among birds. It is also agreed that a large percentage of avian mortality from collisions with power lines can be avoided through careful planning (Anderson, 1978; Lee, 1978; Faanes, 1987). For this reason, the corridor was routed to minimize the potential for collisions by avoiding areas of known bird concentrations and areas used for foraging, roosting, or nesting by sensitive species. Special attention has been given to habitats used by bald eagles, wood storks and other wading birds and sandhill cranes.

The ROW must be maintained so that trees cannot grow into the overhead wires. This implies maintenance of a permanent gap in the canopy through any forested areas. In hydric or mesic habitats this may have a slight deleterious effect in drying and heating the microclimate of the adjacent

forest. Generally, however, in the habitat types prevalent in the corridor, creation of desirable edge habitat and maintenance of early successional vegetation could have a positive effect on sensitive species. Gopher tortoises, and several other species of concern in this region prefer relatively open habitats.

Herbicide use will be implemented in such a manner so as to minimize impact to wildlife or aquatic organisms.

Access roads can act as barriers to animals reluctant to cross openings, and can displace (or subject to routine trampling) a certain amount of vegetation. These impacts should be minimal, however, because Tampa Electric intends to use existing roads wherever feasible and minimize the lengths of any essential new roads.

6.1.6.5.4 Effects of Public Access

It is Tampa Electric's policy to install locked gates at all points where the transmission line access road intersects previously fenced property. Therefore, with the exception of Tampa Electric's personnel performing routine maintenance, no increased vehicle access is anticipated. Since no significant increase in human traffic into formerly inaccessible habitats will result, there will be no subsequent increased disturbance to wildlife.

6.1.6.5.5 Other Post Construction Effects

The transmission line will meet EMF limits set forth in Chapter 17-274, F.A.C. Maximum electric and magnetic field strengths at the edge of the ROW for the transmission line were calculated using the Bonneville Power Administration Corona and Fields Effects program. Input data used in the program were based on the generating capacity of the Hardee Power Station and included the following parameters:

1. A maximum current rating of 2,040 amperes;
2. A minimum conductor clearance of 27 ft from the earth;
3. Currents were assumed to be balanced in phase and in magnitude with no zero sequence current;
4. A maximum operating voltage of 242 kV; and
5. Voltages were assumed to be balanced in phase and in magnitude.

Where are calculations results?

Electromagnetic fields strengths will vary depending on the ROW width and structure type. The maximum field strengths at the edge of the transmission ROW will be below the field strength standards listed in Chapter 17-274.450, F.A.C. (i.e., 2.00 kV/m for electric field, and 150 milliGauss for magnetic field). The entire transmission line facility will meet the applicable sections of the National Electrical Safety Code. Due to the design and routing of the proposed transmission line and its location relative to residential areas, EMF and acoustic and electric noise will not be a problem.

6.1.7 Hardee Power Station to Vandolah and Lee Substations Transmission Line

6.1.7.1 Description of Preferred and Alternative Corridors

The preferred corridors from the Hardee Power Station to both the Vandolah and Lee Substations are described below. The corridor description starts at the Hardee Power Station and proceeds south to Vandolah Substation and from Vandolah Substation south to Lee Substation. These transmission lines will be constructed and maintained by SECI.

HARDEE POWER STATION TO VANDOLAH SUBSTATION

This section of the corridor starts at the Hardee Power Station and proceeds south, approximately 13 km (8 miles) to the Vandolah Substation located on Vandolah Road (see Figure 6.1.7-1 in Appendix 11.10). Much of the land between the Hardee Power Station and the Vandolah Substation is owned by various phosphate mining companies and may be mined in the future. Due to the potential for mining activities in this area, the siting study concentrated on routing the corridor adjacent to existing highway and railroad ROWs.

The Hardee Power Station to Vandolah corridor is approximately 13 km (8 miles) and starts at the switchyard of the Hardee Power Station and proceeds south along CR 663. The width of this section of corridor is 0.8 km (0.5 mile) with the exception of a 1.6-km (1-mile) section where it increases to 1.2 km (0.75 mile) near the town of Ft. Green Springs. The expanded corridor width near Ft. Green Springs is designed to allow additional flexibility in siting the ROW in this area to minimize potential impacts to developed areas.

Two parallel 230 kV transmission lines are planned for the Hardee Power Station to Vandolah section of the corridor. Separate ROWs and structures are needed for each of the two transmission lines in this area. Both lines

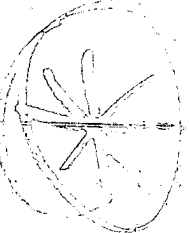
will start at the Hardee Power Station and one line will terminate at the Vandolah Substation while the other line continues south to the Lee Substation in North Ft. Myers. Both ROWs will be located within the 0.8 km (0.5 mile) corridor.

VANDOLAH SUBSTATION TO LEE SUBSTATION

The Vandolah to Lee corridor is approximately 113 km (70 miles) and starts at the Vandolah Substation and continues south parallel to CR 663, CR 661 and the CSX Railroad for a distance of approximately 26 km (16 miles). The width of the corridor decreases from its standard width of 0.8 km (0.5 mile) to a width of 0.4 km (0.25 mile) for a distance of approximately 0.8 km (0.5 mile) near Ona, and then increases to one mile for a short distance near the Town of Limestone. These changes in corridor width were incorporated to minimize impacts to populated areas. At the end of this section, the corridor turns slightly to the west and decreases in width to 0.4 km (0.25 miles) and continues for a distance of approximately 2.6 km (1.6 miles) to Lansing. The decrease in width to 0.4 km (0.25 mile) and the location of the corridor immediately west of the railroad was designed to avoid residential development to the east of the railroad.

At Lansing, the corridor turns to the west, away from the railroad for a distance of approximately 0.4 km (0.25 mile) and then heads south continuing along CR 661 to the intersection with SR 70. The corridor maintains a width of 0.8 km (0.5 mile) from Lansing to the intersection with SR 70. At SR 70 the corridor turns to the east for 2.4 km (1.5 miles) and follows the highway, maintaining a width of approximately 0.5 km (0.3 mile) (to avoid the Peace River to the north). The corridor then crosses the Peace River near the existing SR 70 crossing, west of the town of Arcadia. After the corridor crosses the Peace River near Arcadia, it turns to the south and follows the CSX Railroad just west of Arcadia for a distance of approximately 1.9 km (1.2 miles), maintaining a width of 0.4 km (0.25 mile). The corridor then increases in width to 0.8 km (0.5 mile), turns to the southwest and parallels an old railroad grade east of the Peace River and south of Arcadia for a distance of approximately 3 km (2 miles). The corridor then turns to the southeast for a distance of approximately 3.7 km

(2.3 miles), crossing the CSX Railroad, U.S. Highway 17, and SR 760. Approximately 0.4 km (0.25 mile) south of SR 760, the corridor decreases in width to 0.4 km (0.25 mile) and heads due south for approximately 15.7 km (9.8 miles). The corridor in this area crosses predominantly open land with scattered residential and agricultural uses. The corridor angles east for approximately 0.53 km (0.33 mile) to avoid a residential development to the west. The corridor then turns due south for 2.6 km (1.6 miles) to a point approximately 1.2 km (0.75 mile) north of Shell Creek. The corridor then angles southwest for about 5 km (3 miles), crossing Shell Creek.



The corridor turns due west paralleling SR 74 for 5 km (3 miles) and maintains a width of 0.8 km (0.5 mile). The center line of the corridor in this section follows along the northern boundary of the Cecil M. Webb Wildlife Management Area. At the western boundary of the management area, the corridor angles across the extreme northwest corner of the wildlife management area and proceeds due south for 15.8 km (9.85 miles). The width of the corridor in this section extends from 0.20 km (0.13 mile) west of the wildlife management area boundary to 0.60 km (0.38 mile) east of the wildlife management area boundary.

The corridor then turns southwest for about 0.8 km (0.5 mile), leaves the Cecil M. Webb Wildlife Management Area and crosses U.S. Highway 41. This section of the corridor was selected to minimize impacts to developed areas near U.S. Highway 41 and to align the corridor to proceed directly south through areas without residential development. The corridor then proceeds south for approximately 12 km (7.5 miles) to Gator Slough Canal in Lee County. The corridor width decreases to 0.4 km (0.25 mile) for 1.6 km (1 mile) immediately west of the Charlotte County Sanitary Landfill. This section of the corridor was selected due to the absence of any residential or commercial development in the immediate area. Just north of Gator Slough Canal, the corridor turns east for 1.6 km (1 mile). The corridor then turns due south for 1.6 km (1 mile) just west of the City of Cape Coral city limits and maintains with a width of 0.4 km (0.25 mile). The corridor then enters the City of Cape Coral, decreases in width to 61 m (200 ft), and angles toward the east for approximately 0.3 km (0.2 mile). The corridor

then heads south for 0.8 km (0.5 mile), at which point the corridor turns east and continues for 2.9 km (1.8 mile). The corridor then turns north for 0.5 km (0.3 mile) to avoid some residential development. At this point, the corridor then turns back toward the east and continues for 0.3 km (0.2 mile). The corridor then increases in width to 0.4 km (0.25 mile) and continues east for 1.0 km (0.6 mile), at which point the corridor turns south for 1.6 km (1.0 mile), terminating at the Lee Substation.

6.1.7.2 Socio-Political Environment of the Vandolah and Lee Substations Corridor Area

6.1.7.2.1 Governmental Jurisdictions

The preferred corridor is shown in Figure 6.1.7-1 (see Appendix 11.10) at a scale of 1:126,720 relative to governmental jurisdictions within 0.8 km (0.5 mile) of the edge of the corridor. The corridor runs in a north to south orientation through the counties of Hardee, DeSoto, Charlotte and Lee. The corridor crosses through a small section of the city of Cape Coral in northern Lee County and passes adjacent to the city of Arcadia in DeSoto County. No other incorporated municipalities are known to occur within 0.8 km (0.5 mile) of the corridor. The Cecil M. Webb Wildlife Management Area (located in Charlotte County) and the Peace River (canoe trail) which is crossed by the corridor near the city of Arcadia in DeSoto County are the only areas under governmental jurisdiction which are located within 0.8 km (0.5 mile) of the corridor.

6.1.7.2.2 Zoning and Land Use

HARDEE COUNTY

The relevant provisions of the Hardee County Comprehensive Plan are discussed in Section 2.2.2 of this document. No specific constraints on transmission line siting are set forth in the plan. The discussion in this section pertaining to planning approach, adjacent land uses, ecology, etc., demonstrates that the 230 kV transmission line corridors in Hardee County are consistent with the Hardee County Comprehensive Plan. Moreover, transmission lines are specifically authorized in all zoning districts in Hardee County as use exceptions pursuant to Section 2.3G of the Hardee County Zoning Ordinance.

Future land use maps showing the areas crossed by the Hardee Power Station to Vandolah and Lee Substation corridors are presented in Figure 6.1.7-2 (see Appendix 11.10).

DESOTO COUNTY

The DeSoto County Comprehensive Plan, including the Land Use Element, places no specific restrictions or preclusions on transmission line location. The Land Use Element, like those for Polk and Hardee Counties, essentially sets forth a series of narrative guidelines. The sections in this application addressing the ecological and land use features along the DeSoto County portion of the transmission line corridor demonstrate that the proposed corridor reflects requisite sensitivity to land use and environmental concerns. Moreover, Section 8-8 of the DeSoto County Zoning Ordinance provides that "electric cables" are "permitted uses" and "allowed as a matter of right" in all zoning districts.

CHARLOTTE COUNTY

The transmission line corridor in Charlotte County will avoid the majority of areas designated as residential on the Land Use Element of Charlotte County's Comprehensive Plan. The corridor will pass through some areas designated as agricultural and significant expanses of vacant or undeveloped land. Also, as shown on Figure 6.1.7-1 (see Appendix 11.10), the corridor will pass along the northwest border of the 26,440 ha (65,334 acres) Cecil M. Webb Wildlife Management Area, a "natural reserve" managed by the Florida Game and Fresh Water Fish Commission. It is designated as a "preservation area" in the Land Use Element. This designation requires that the county must stringently review any development plans for the Webb area for consistency with management goals and cooperate with wildlife management area managers. In practice, it means that county officials will generally voice support for FGFWFC's position on issues concerning transmission line routing in the vicinity of Webb.

The Charlotte County Comprehensive Plan contains no specific restriction on transmission lines. As shown elsewhere in this section of this application,

EMF

HARDEE POWER STATION TO PEBBLEDALE

SUBSTATION TRANSMISSION LINE

 * CORONA AND FIELD *
 * EFFECTS PROGRAM *
 * Source: Bonneville Power Administration *

*** INPUT DATA LIST ***

+HFRAME
 +PEBBLEDALE SUB. TO HARDEE SUB.
 + 1 0 3 5 242.0 2.00 1.00 .00

(ENGLISH UNITS OPTION)

LINE GRADIENTS COMPUTED BY PROGRAM

PHYSICAL SYSTEM CONSISTS OF 5 CONDUCTORS, OF WHICH 3 ARE ENERGIZED PHASES

+COMB	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
+ 5.000	5.000	30.000	5.000	1.000	75.000	3.280	4.000	3.280												
+PH.A-1	A	-17.50	27.00	1	1.502	.00	242.00	.0	2040.	.00										
+PH.B-1	A	.00	27.00	1	1.502	.00	242.00	120.0	2040.	.00										
+PH.C-1	A	17.50	27.00	1	1.502	.00	242.00	240.0	2040.	.00										
+OHG1-1	A	-8.75	43.00	1	.375	.00	.00	.0	0.	.00										
+OHG2-1	A	8.75	43.00	1	.375	.00	.00	.0	0.	.00										
+ 200	-100.0	1.0																		
+ 0	.0	.0																		

STRUCTURE TYPE 1
 H FRAME

COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, ELECTRIC AND MAGNETIC FIELD

HFRAME

BLEDALE SUB. TO HARDEE SUB.

	DIST. FROM ZERO REFERENCE (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON DIAM. (IN)	NO. OF SUBCON	SUBCON SPACING (IN)	VOLTAGE L-L (KV)	PHASE ANGLE (DEGREES)	CURRENT (AMPS)	CORONA LOSSES (KW/MI)
PH.A-1	-17.50	27.00	12.53	1.502	1.00	.00	242.00	.00	2040.0	2.948
PH.B-1	.00	27.00	13.37	1.502	1.00	.00	242.00	120.00	2040.0	4.514
PH.C-1	17.50	27.00	12.53	1.502	1.00	.00	242.00	240.00	2040.0	2.948
OHG1-1	-8.75	43.00	2.90	.375	1.00	.00	.00	.00	.0	.000
OHG2-1	8.75	43.00	2.90	.375	1.00	.00	.00	.00	.0	.000

AN MICROPHONE HT.= 5.0 FT, RI ANT. HT.= 5.0 FT, TV ANT. HT.= 30.0 M, ALTITUDE= .0 FT

RI FREQ= 1.000 MHZ, TV FREQ= 75.000 MHZ, WIND VEL.(OZ) = 2.000 MPH, GROUND CONDUCTIVITY = 4.0 MMHOS/M

E-FIELD TRANSDUCER HT.= 3.3FT, B-FIELD TRANSDUCER HT. = 3.3FT

STRUCTURE TYPE 1
H FRAME

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE		TVI TOTAL RAIN	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN) L50 DBA	(FAIR) L50 DBA	(RAIN) L50 DBUV/M	(FAIR) L50 DBUV/M			
-100.0	37.6	12.6	41.1	24.1	9.7	.23	39.60
-99.0	37.6	12.6	41.2	24.2	9.7	.23	40.38
-98.0	37.7	12.7	41.4	24.4	9.8	.24	41.19
-97.0	37.7	12.7	41.5	24.5	9.9	.25	42.02
-96.0	37.8	12.8	41.7	24.7	10.0	.26	42.87
-95.0	37.8	12.8	41.8	24.8	10.1	.26	43.75
-94.0	37.9	12.9	42.0	25.0	10.2	.27	44.65
-93.0	37.9	12.9	42.1	25.1	10.3	.28	45.59
-92.0	38.0	13.0	42.3	25.3	10.4	.29	46.55
-91.0	38.0	13.0	42.4	25.4	10.5	.30	47.54
-90.0	38.1	13.1	42.6	25.6	10.6	.31	48.57
-89.0	38.1	13.1	42.8	25.8	10.7	.32	49.63
-88.0	38.2	13.2	42.9	25.9	10.8	.33	50.72
-87.0	38.3	13.3	43.1	26.1	10.9	.34	51.85
-86.0	38.3	13.3	43.2	26.2	11.0	.35	53.01
-85.0	38.4	13.4	43.4	26.4	11.1	.36	54.22
-84.0	38.4	13.4	43.6	26.6	11.2	.37	55.46
-83.0	38.5	13.5	43.8	26.8	11.3	.38	56.75
-82.0	38.5	13.5	44.0	27.0	11.4	.39	58.08
-81.0	38.6	13.6	44.2	27.2	11.5	.41	59.45
-80.0	38.7	13.7	44.4	27.4	11.6	.42	60.88
-79.0	38.7	13.7	44.6	27.6	11.7	.44	62.35
-78.0	38.8	13.8	44.9	27.9	11.8	.45	63.88
-77.0	38.8	13.8	45.1	28.1	11.9	.47	65.46
-76.0	38.9	13.9	45.4	28.4	12.0	.48	67.10
-75.0	39.0	14.0	45.6	28.6	12.2	.50	68.80
-74.0	39.0	14.0	45.9	28.9	12.3	.52	70.57
-73.0	39.1	14.1	46.1	29.1	12.4	.54	72.40
-72.0	39.2	14.2	46.4	29.4	12.5	.56	74.30
-71.0	39.2	14.2	46.6	29.6	12.6	.58	76.27
-70.0	39.3	14.3	46.9	29.9	12.8	.60	78.32
-69.0	39.4	14.4	47.1	30.1	12.9	.62	80.44
-68.0	39.4	14.4	47.4	30.4	13.0	.65	82.65
-67.0	39.5	14.5	47.7	30.7	13.1	.67	84.95
-66.0	39.6	14.6	48.0	31.0	13.3	.70	87.35
-65.0	39.6	14.6	48.3	31.3	13.4	.73	89.84
-64.0	39.7	14.7	48.5	31.5	13.5	.75	92.43
-63.0	39.8	14.8	48.8	31.8	13.7	.78	95.13
-62.0	39.9	14.9	49.1	32.1	13.8	.82	97.94
-61.0	39.9	14.9	49.4	32.4	13.9	.85	100.86
-60.0	40.0	15.0	49.7	32.7	14.1	.88	103.92
-59.0	40.1	15.1	50.1	33.1	14.2	.92	107.10
-58.0	40.2	15.2	50.4	33.4	14.4	.96	110.42
-57.0	40.2	15.2	50.7	33.7	14.5	1.00	113.88
-56.0	40.3	15.3	51.0	34.0	14.7	1.04	117.50
-55.0	40.4	15.4	51.3	34.3	14.8	1.08	121.28
-54.0	40.5	15.5	51.7	34.7	15.0	1.13	125.22
-53.0	40.6	15.6	52.0	35.0	15.2	1.18	129.33
-52.0	40.7	15.7	52.4	35.4	15.5	1.23	133.63
-51.0	40.7	15.7	52.7	35.7	15.7	1.28	138.13
-50.0	40.8	15.8	53.1	36.1	16.0	1.34	142.82
-49.0	40.9	15.9	53.4	36.4	16.2	1.40	147.73
-48.0	41.0	16.0	53.8	36.8	16.5	1.46	152.86
-47.0	41.1	16.1	54.2	37.2	16.8	1.52	158.22
-46.0	41.2	16.2	54.5	37.5	17.1	1.59	163.81

STRUCTURE TYPE 1
H FRAME

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE ¹		TVI	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN) L50 DBA	(FAIR) L50 DBA	(RAIN) L50 DBUV/M	(FAIR) L50 DBUV/M	TOTAL RAIN DBUV/M		
-45.0	41.3	16.3	54.9	37.9	17.4	1.65	169.66
-44.0	41.4	16.4	55.3	38.3	17.7	1.73	175.77
-43.0	41.5	16.5	55.7	38.7	18.1	1.80	182.15
-42.0	41.6	16.6	56.0	39.0	18.4	1.88	188.80
-41.0	41.7	16.7	56.4	39.4	18.8	1.96	195.73
-40.0	41.8	16.8	56.8	39.8	19.1	2.04	202.96
-39.0	41.9	16.9	57.2	40.2	19.5	2.12	210.49
-38.0	42.0	17.0	57.6	40.6	19.9	2.20	218.31
-37.0	42.1	17.1	58.0	41.0	20.3	2.29	226.43
-36.0	42.2	17.2	58.4	41.4	20.8	2.38	234.86
-35.0	42.3	17.3	58.7	41.7	21.3	2.47	243.58
-34.0	42.4	17.4	59.1	42.1	21.8	2.55	252.58
-33.0	42.5	17.5	59.5	42.5	22.3	2.64	261.86
-32.0	42.6	17.6	59.8	42.8	22.8	2.72	271.40
-31.0	42.7	17.7	60.2	43.2	23.4	2.81	281.18
-30.0	42.8	17.8	60.5	43.5	24.1	2.88	291.16
-29.0	42.9	17.9	60.9	43.9	24.7	2.96	301.32
-28.0	43.0	18.0	61.2	44.2	25.5	3.02	311.61
-27.0	43.1	18.1	61.5	44.5	26.3	3.08	321.99
-26.0	43.1	18.1	61.7	44.7	27.1	3.14	332.41
-25.0	43.2	18.2	62.0	45.0	28.1	3.18	342.80
-24.0	43.3	18.3	62.2	45.2	29.1	3.21	353.11
-23.0	43.4	18.4	62.4	45.4	30.3	3.23	363.27
-22.0	43.5	18.5	62.6	45.6	31.6	3.23	373.21
-21.0	43.6	18.6	62.7	45.7	33.0	3.22	382.86
-20.0	43.7	18.7	62.8	45.8	34.4	3.20	392.15
-19.0	43.8	18.8	62.9	45.9	35.7	3.16	401.01
-18.0	43.8	18.8	62.9	45.9	36.6	3.10	409.40
-17.0	43.9	18.9	62.9	45.9	36.6	3.04	417.25
-16.0	44.0	19.0	62.9	45.9	35.7	2.96	424.52
-15.0	44.1	19.1	63.1	46.1	34.4	2.86	431.18
-14.0	44.1	19.1	63.4	46.4	33.0	2.76	437.21
-13.0	44.2	19.2	63.8	46.8	31.6	2.65	442.58
-12.0	44.2	19.2	64.1	47.1	30.3	2.53	447.32
-11.0	44.3	19.3	64.4	47.4	29.1	2.41	451.42
-10.0	44.3	19.3	64.7	47.7	29.3	2.29	454.92
-9.0	44.4	19.4	65.0	48.0	30.1	2.17	457.84
-8.0	44.4	19.4	65.3	48.3	31.0	2.05	460.24
-7.0	44.5	19.5	65.5	48.5	32.0	1.95	462.15
-6.0	44.5	19.5	65.7	48.7	33.1	1.85	463.65
-5.0	44.5	19.5	65.9	48.9	34.3	1.77	464.78
-4.0	44.5	19.5	66.1	49.1	35.7	1.70	465.61
-3.0	44.6	19.6	66.2	49.2	37.1	1.65	466.19
-2.0	44.6	19.6	66.3	49.3	38.5	1.61	466.56
-1.0	44.6	19.6	66.3	49.3	39.7	1.59	466.77
.0	44.6	19.6	66.4	49.4	40.1	1.58	466.84
1.0	44.6	19.6	66.3	49.3	39.7	1.59	466.77
2.0	44.6	19.6	66.3	49.3	38.5	1.61	466.56
3.0	44.6	19.6	66.2	49.2	37.1	1.65	466.19
4.0	44.5	19.5	66.1	49.1	35.7	1.70	465.61
5.0	44.5	19.5	65.9	48.9	34.3	1.77	464.78
6.0	44.5	19.5	65.7	48.7	33.1	1.85	463.65
7.0	44.5	19.5	65.5	48.5	32.0	1.95	462.15
8.0	44.4	19.4	65.3	48.3	31.0	2.05	460.24
9.0	44.4	19.4	65.0	48.0	30.1	2.17	457.84

STRUCTURE TYPE 1
H FRAME

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE		TVI	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN)	(FAIR)	(RAIN)	(FAIR)	TOTAL		
	L50 DBA	L50 DBA	L50 DBUV/M	L50 DBUV/M	RAIN DBUV/M		
10.0	44.3	19.3	64.7	47.7	29.3	2.29	454.92
11.0	44.3	19.3	64.4	47.4	29.1	2.41	451.42
12.0	44.2	19.2	64.1	47.1	30.3	2.53	447.32
13.0	44.2	19.2	63.8	46.8	31.6	2.65	442.58
14.0	44.1	19.1	63.4	46.4	33.0	2.76	437.21
15.0	44.1	19.1	63.1	46.1	34.4	2.86	431.18
16.0	44.0	19.0	62.9	45.9	35.7	2.96	424.52
17.0	43.9	18.9	62.9	45.9	36.6	3.04	417.25
18.0	43.8	18.8	62.9	45.9	36.6	3.10	409.40
19.0	43.8	18.8	62.9	45.9	35.7	3.16	401.01
20.0	43.7	18.7	62.8	45.8	34.4	3.20	392.15
21.0	43.6	18.6	62.7	45.7	33.0	3.22	382.86
22.0	43.5	18.5	62.6	45.6	31.6	3.23	373.21
23.0	43.4	18.4	62.4	45.4	30.3	3.23	363.27
24.0	43.3	18.3	62.2	45.2	29.1	3.21	353.11
25.0	43.2	18.2	62.0	45.0	28.1	3.18	342.80
26.0	43.1	18.1	61.7	44.7	27.1	3.14	332.41
27.0	43.1	18.1	61.5	44.5	26.3	3.08	321.99
28.0	43.0	18.0	61.2	44.2	25.5	3.02	311.61
29.0	42.9	17.9	60.9	43.9	24.7	2.96	301.32
30.0	42.8	17.8	60.5	43.5	24.1	2.88	291.16
31.0	42.7	17.7	60.2	43.2	23.4	2.81	281.18
32.0	42.6	17.6	59.8	42.8	22.8	2.72	271.40
33.0	42.5	17.5	59.5	42.5	22.3	2.64	261.86
34.0	42.4	17.4	59.1	42.1	21.8	2.55	252.58
35.0	42.3	17.3	58.7	41.7	21.3	2.47	243.58
36.0	42.2	17.2	58.4	41.4	20.8	2.38	234.86
37.0	42.1	17.1	58.0	41.0	20.3	2.29	226.43
38.0	42.0	17.0	57.6	40.6	19.9	2.20	218.31
39.0	41.9	16.9	57.2	40.2	19.5	2.12	210.49
40.0	41.8	16.8	56.8	39.8	19.1	2.04	202.96
41.0	41.7	16.7	56.4	39.4	18.8	1.96	195.73
42.0	41.6	16.6	56.0	39.0	18.4	1.88	188.80
43.0	41.5	16.5	55.7	38.7	18.1	1.80	182.15
44.0	41.4	16.4	55.3	38.3	17.7	1.73	175.77
45.0	41.3	16.3	54.9	37.9	17.4	1.65	169.66
46.0	41.2	16.2	54.5	37.5	17.1	1.59	163.81
47.0	41.1	16.1	54.2	37.2	16.8	1.52	158.22
48.0	41.0	16.0	53.8	36.8	16.5	1.46	152.86
49.0	40.9	15.9	53.4	36.4	16.2	1.40	147.73
50.0	40.8	15.8	53.1	36.1	16.0	1.34	142.82
51.0	40.7	15.7	52.7	35.7	15.7	1.28	138.13
52.0	40.7	15.7	52.4	35.4	15.5	1.23	133.63
53.0	40.6	15.6	52.0	35.0	15.2	1.18	129.33
54.0	40.5	15.5	51.7	34.7	15.0	1.13	125.22
55.0	40.4	15.4	51.3	34.3	14.8	1.08	121.28
56.0	40.3	15.3	51.0	34.0	14.7	1.04	117.50
57.0	40.2	15.2	50.7	33.7	14.5	1.00	113.88
58.0	40.2	15.2	50.4	33.4	14.4	.96	110.42
59.0	40.1	15.1	50.1	33.1	14.2	.92	107.10
60.0	40.0	15.0	49.7	32.7	14.1	.88	103.92
61.0	39.9	14.9	49.4	32.4	13.9	.85	100.86
62.0	39.9	14.9	49.1	32.1	13.8	.82	97.94
63.0	39.8	14.8	48.8	31.8	13.7	.78	95.13
64.0	39.7	14.7	48.5	31.5	13.5	.75	92.43

STRUCTURE TYPE 1
H FRAME

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE		TVI TOTAL RAIN	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN) L50 DBA	(FAIR) L50 DBA	(RAIN) L50 DBUV/M	(FAIR) L50 DBUV/M	DBUV/M		
65.0	39.6	14.6	48.3	31.3	13.4	.73	89.84
66.0	39.6	14.6	48.0	31.0	13.3	.70	87.35
67.0	39.5	14.5	47.7	30.7	13.1	.67	84.95
68.0	39.4	14.4	47.4	30.4	13.0	.65	82.65
69.0	39.4	14.4	47.1	30.1	12.9	.62	80.44
70.0	39.3	14.3	46.9	29.9	12.8	.60	78.32
71.0	39.2	14.2	46.6	29.6	12.6	.58	76.27
72.0	39.2	14.2	46.4	29.4	12.5	.56	74.30
73.0	39.1	14.1	46.1	29.1	12.4	.54	72.40
74.0	39.0	14.0	45.9	28.9	12.3	.52	70.57
75.0	39.0	14.0	45.6	28.6	12.2	.50	68.80
76.0	38.9	13.9	45.4	28.4	12.0	.48	67.10
77.0	38.8	13.8	45.1	28.1	11.9	.47	65.46
78.0	38.8	13.8	44.9	27.9	11.8	.45	63.88
79.0	38.7	13.7	44.6	27.6	11.7	.44	62.35
80.0	38.7	13.7	44.4	27.4	11.6	.42	60.88
81.0	38.6	13.6	44.2	27.2	11.5	.41	59.45
82.0	38.5	13.5	44.0	27.0	11.4	.39	58.08
83.0	38.5	13.5	43.8	26.8	11.3	.38	56.75
84.0	38.4	13.4	43.6	26.6	11.2	.37	55.46
85.0	38.4	13.4	43.4	26.4	11.1	.36	54.22
86.0	38.3	13.3	43.2	26.2	11.0	.35	53.01
87.0	38.3	13.3	43.1	26.1	10.9	.34	51.85
88.0	38.2	13.2	42.9	25.9	10.8	.33	50.72
89.0	38.1	13.1	42.8	25.8	10.7	.32	49.63
90.0	38.1	13.1	42.6	25.6	10.6	.31	48.57
91.0	38.0	13.0	42.4	25.4	10.5	.30	47.54
92.0	38.0	13.0	42.3	25.3	10.4	.29	46.55
93.0	37.9	12.9	42.1	25.1	10.3	.28	45.59
94.0	37.9	12.9	42.0	25.0	10.2	.27	44.65
95.0	37.8	12.8	41.8	24.8	10.1	.26	43.75
96.0	37.8	12.8	41.7	24.7	10.0	.26	42.87
97.0	37.7	12.7	41.5	24.5	9.9	.25	42.02
98.0	37.7	12.7	41.4	24.4	9.8	.24	41.19
99.0	37.6	12.6	41.2	24.2	9.7	.23	40.38

STRUCTURE TYPE 1
H FRAME

 * CORONA AND FIELD *
 * EFFECTS PROGRAM *
 * Source: Bonneville Power Administration *

*** INPUT DATA LIST ***

+VERTICAL
 +PEBBLEDALE SUB. TO HARDEE SUB.
 + 1 0 3 4 242.0 2.00 1.00 .00

(ENGLISH UNITS OPTION)

LINE GRADIENTS COMPUTED BY PROGRAM

PHYSICAL SYSTEM CONSISTS OF 4 CONDUCTORS, OF WHICH 3 ARE ENERGIZED PHASES

+COMB	XX	XX	XX	XX	XX	XX	XX							
+ 5.000	5.000	30.000	5.000	1.000	75.000	3.280	4.000	3.280						
+PH.A-1	A	11.00	47.00	1	1.502	.00	242.00	.0	2040.	.00				
+PH.B-1	A	11.00	37.00	1	1.502	.00	242.00	120.0	2040.	.00				
+PH.C-1	A	11.00	27.00	1	1.502	.00	242.00	240.0	2040.	.00				
+OHG1-1	A	5.00	57.00	1	.375	.00	.00	.0	0.	.00				
+ 200	-100.0	1.0												
+ 0	.0	.0												

STRUCTURE TYPE 2
 VERTICAL

COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, ELECTRIC AND MAGNETIC FIELD

VERTICAL

WOBLEDALE SUB. TO HARDEE SUB.

	DIST. FROM ZERO REFERENCE (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON DIAM. (IN)	NO. OF SUBCON	SUBCON SPACING (IN)	VOLTAGE L-L (KV)	PHASE ANGLE (DEGREES)	CURRENT (AMPS)	CORONA LOSSES (KW/MI)
PH.A-1	11.00	47.00	13.72	1.502	1.00	.00	242.00	.00	2040.0	5.316
PH.B-1	11.00	37.00	14.77	1.502	1.00	.00	242.00	120.00	2040.0	8.602
PH.C-1	11.00	27.00	13.84	1.502	1.00	.00	242.00	240.00	2040.0	5.629
OHG1-1	5.00	57.00	5.98	.375	1.00	.00	.00	.00	.0	.000

AM MICROPHONE HT.= 5.0 FT, RI ANT. HT.= 5.0 FT, TV ANT. HT.= 30.0 M, ALTITUDE= .0 FT

RI FREQ= 1.000 MHZ, TV FREQ= 75.000 MHZ, WIND VEL.(OZ) = 2.000 MPH, GROUND CONDUCTIVITY = 4.0 MMHOS/M

E-FIELD TRANSDUCER HT.= 3.3FT, B-FIELD TRANSDUCER HT. = 3.3FT

STRUCTURE TYPE 2
VERTICAL

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE		TVI	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN)	(FAIR)	(RAIN)	(FAIR)	TOTAL		
	L50 DBA	L50 DBA	L50 DBUV/M	L50 DBUV/M	RAIN DBUV/M		
-100.0	42.0	17.0	47.2	30.2	13.9	.08	17.12
-99.0	42.0	17.0	47.4	30.4	14.0	.09	17.40
-98.0	42.1	17.1	47.5	30.5	14.1	.09	17.69
-97.0	42.1	17.1	47.6	30.6	14.1	.09	17.99
-96.0	42.2	17.2	47.7	30.7	14.2	.09	18.30
-95.0	42.2	17.2	47.9	30.9	14.3	.09	18.61
-94.0	42.2	17.2	48.0	31.0	14.4	.09	18.93
-93.0	42.3	17.3	48.1	31.1	14.5	.09	19.26
-92.0	42.3	17.3	48.2	31.2	14.6	.09	19.60
-91.0	42.4	17.4	48.4	31.4	14.6	.09	19.95
-90.0	42.4	17.4	48.5	31.5	14.7	.09	20.30
-89.0	42.5	17.5	48.6	31.6	14.8	.09	20.67
-88.0	42.5	17.5	48.8	31.8	14.9	.09	21.04
-87.0	42.5	17.5	48.9	31.9	15.0	.10	21.43
-86.0	42.6	17.6	49.0	32.0	15.1	.10	21.82
-85.0	42.6	17.6	49.2	32.2	15.2	.10	22.22
-84.0	42.7	17.7	49.3	32.3	15.3	.10	22.64
-83.0	42.7	17.7	49.5	32.5	15.3	.10	23.07
-82.0	42.8	17.8	49.6	32.6	15.4	.10	23.51
-81.0	42.8	17.8	49.7	32.7	15.5	.10	23.96
-80.0	42.9	17.9	49.9	32.9	15.6	.10	24.42
-79.0	42.9	17.9	50.0	33.0	15.7	.10	24.90
-78.0	43.0	18.0	50.2	33.2	15.8	.10	25.38
-77.0	43.0	18.0	50.3	33.3	15.9	.10	25.89
-76.0	43.1	18.1	50.5	33.5	16.0	.10	26.41
-75.0	43.1	18.1	50.6	33.6	16.1	.10	26.94
-74.0	43.2	18.2	50.8	33.8	16.2	.10	27.49
-73.0	43.2	18.2	51.0	34.0	16.3	.10	28.05
-72.0	43.3	18.3	51.1	34.1	16.4	.10	28.63
-71.0	43.3	18.3	51.3	34.3	16.5	.10	29.23
-70.0	43.4	18.4	51.4	34.4	16.6	.10	29.85
-69.0	43.4	18.4	51.6	34.6	16.7	.10	30.48
-68.0	43.5	18.5	51.8	34.8	16.8	.10	31.13
-67.0	43.5	18.5	51.9	34.9	17.0	.10	31.81
-66.0	43.6	18.6	52.1	35.1	17.1	.10	32.50
-65.0	43.7	18.7	52.3	35.3	17.2	.10	33.22
-64.0	43.7	18.7	52.5	35.5	17.3	.10	33.96
-63.0	43.8	18.8	52.6	35.6	17.4	.10	34.72
-62.0	43.8	18.8	52.8	35.8	17.5	.10	35.51
-61.0	43.9	18.9	53.0	36.0	17.6	.10	36.32
-60.0	43.9	18.9	53.2	36.2	17.8	.10	37.15
-59.0	44.0	19.0	53.4	36.4	17.9	.10	38.02
-58.0	44.1	19.1	53.5	36.5	18.0	.10	38.91
-57.0	44.1	19.1	53.7	36.7	18.1	.10	39.83
-56.0	44.2	19.2	53.9	36.9	18.3	.10	40.79
-55.0	44.2	19.2	54.1	37.1	18.4	.09	41.77
-54.0	44.3	19.3	54.3	37.3	18.5	.09	42.79
-53.0	44.4	19.4	54.5	37.5	18.7	.09	43.85
-52.0	44.4	19.4	54.7	37.7	18.8	.09	44.93
-51.0	44.5	19.5	54.9	37.9	18.9	.08	46.06
-50.0	44.5	19.5	55.1	38.1	19.1	.08	47.23
-49.0	44.6	19.6	55.3	38.3	19.2	.08	48.43
-48.0	44.7	19.7	55.5	38.5	19.4	.07	49.68
-47.0	44.7	19.7	55.7	38.7	19.5	.07	50.98
-46.0	44.8	19.8	56.0	39.0	19.6	.06	52.31

STRUCTURE TYPE 2
VERTICAL

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE ¹		TVI TOTAL	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN) L50 DBA	(FAIR) L50 DBA	(RAIN) L50 DBUV/M	(FAIR) L50 DBUV/M	RAIN DBUV/M		
-45.0	44.9	19.9	56.2	39.2	19.8	.06	53.70
-44.0	44.9	19.9	56.4	39.4	20.0	.05	55.14
-43.0	45.0	20.0	56.6	39.6	20.1	.05	56.63
-42.0	45.1	20.1	56.8	39.8	20.3	.04	58.17
-41.0	45.2	20.2	57.1	40.1	20.4	.04	59.77
-40.0	45.2	20.2	57.3	40.3	20.6	.04	61.43
-39.0	45.3	20.3	57.5	40.5	20.8	.04	63.15
-38.0	45.4	20.4	57.7	40.7	20.9	.04	64.94
-37.0	45.4	20.4	58.0	41.0	21.1	.04	66.79
-36.0	45.5	20.5	58.2	41.2	21.3	.05	68.71
-35.0	45.6	20.6	58.5	41.5	21.5	.07	70.70
-34.0	45.7	20.7	58.7	41.7	21.7	.08	72.76
-33.0	45.7	20.7	58.9	41.9	21.9	.10	74.91
-32.0	45.8	20.8	59.2	42.2	22.0	.11	77.13
-31.0	45.9	20.9	59.4	42.4	22.2	.13	79.44
-30.0	46.0	21.0	59.7	42.7	22.5	.15	81.84
-29.0	46.0	21.0	59.9	42.9	22.7	.18	84.33
-28.0	46.1	21.1	60.2	43.2	22.9	.20	86.91
-27.0	46.2	21.2	60.4	43.4	23.1	.23	89.58
-26.0	46.3	21.3	60.7	43.7	23.3	.26	92.36
-25.0	46.4	21.4	61.0	44.0	23.5	.29	95.24
-24.0	46.4	21.4	61.2	44.2	23.8	.32	98.22
-23.0	46.5	21.5	61.5	44.5	24.0	.36	101.32
-22.0	46.6	21.6	61.7	44.7	24.3	.40	104.52
-21.0	46.7	21.7	62.0	45.0	24.5	.44	107.84
-20.0	46.8	21.8	62.3	45.3	24.8	.49	111.28
-19.0	46.8	21.8	62.5	45.5	25.1	.54	114.83
-18.0	46.9	21.9	62.8	45.8	25.3	.59	118.50
-17.0	47.0	22.0	63.0	46.0	25.6	.64	122.29
-16.0	47.1	22.1	63.3	46.3	25.9	.70	126.20
-15.0	47.2	22.2	63.6	46.6	26.2	.77	130.22
-14.0	47.3	22.3	63.8	46.8	26.5	.83	134.37
-13.0	47.3	22.3	64.1	47.1	26.9	.91	138.62
-12.0	47.4	22.4	64.3	47.3	27.2	.98	142.98
-11.0	47.5	22.5	64.6	47.6	27.6	1.06	147.45
-10.0	47.6	22.6	64.8	47.8	27.9	1.14	152.00
-9.0	47.7	22.7	65.0	48.0	28.3	1.23	156.64
-8.0	47.7	22.7	65.3	48.3	28.7	1.32	161.34
-7.0	47.8	22.8	65.5	48.5	29.1	1.41	166.10
-6.0	47.9	22.9	65.7	48.7	29.5	1.51	170.90
-5.0	48.0	23.0	66.0	49.0	30.0	1.61	175.71
-4.0	48.0	23.0	66.2	49.2	30.5	1.71	180.51
-3.0	48.1	23.1	66.4	49.4	30.9	1.82	185.27
-2.0	48.2	23.2	66.5	49.5	31.4	1.92	189.96
-1.0	48.2	23.2	66.7	49.7	32.0	2.02	194.54
.0	48.3	23.3	66.9	49.9	32.5	2.12	198.99
1.0	48.3	23.3	67.1	50.1	33.1	2.22	203.25
2.0	48.4	23.4	67.2	50.2	33.7	2.32	207.29
3.0	48.4	23.4	67.3	50.3	34.3	2.41	211.05
4.0	48.5	23.5	67.4	50.4	34.9	2.49	214.51
5.0	48.5	23.5	67.6	50.6	35.5	2.56	217.61
6.0	48.6	23.6	67.7	50.7	36.1	2.63	220.32
7.0	48.6	23.6	67.8	50.8	37.5	2.69	222.59
8.0	48.6	23.6	68.0	51.0	38.9	2.73	224.39
9.0	48.6	23.6	68.1	51.1	40.3	2.76	225.70

STRUCTURE TYPE 2
VERTICAL

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE		TVI	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN)	(FAIR)	(RAIN)	(FAIR)	TOTAL		
	L50 DBA	L50 DBA	L50 DBUV/M	L50 DBUV/M	RAIN DBUV/M		
10.0	48.6	23.6	68.1	51.1	41.4	2.78	226.50
11.0	48.6	23.6	68.1	51.1	41.9	2.79	226.76
12.0	48.6	23.6	68.1	51.1	41.4	2.78	226.50
13.0	48.6	23.6	68.1	51.1	40.3	2.76	225.70
14.0	48.6	23.6	68.0	51.0	38.9	2.72	224.39
15.0	48.6	23.6	67.8	50.8	37.5	2.68	222.59
16.0	48.6	23.6	67.7	50.7	36.1	2.62	220.32
17.0	48.5	23.5	67.6	50.6	35.5	2.55	217.61
18.0	48.5	23.5	67.4	50.4	34.9	2.48	214.51
19.0	48.4	23.4	67.3	50.3	34.3	2.39	211.05
20.0	48.4	23.4	67.2	50.2	33.7	2.30	207.29
21.0	48.3	23.3	67.1	50.1	33.1	2.20	203.25
22.0	48.3	23.3	66.9	49.9	32.5	2.10	198.99
23.0	48.2	23.2	66.7	49.7	32.0	2.00	194.54
24.0	48.2	23.2	66.5	49.5	31.4	1.90	189.96
25.0	48.1	23.1	66.4	49.4	30.9	1.79	185.27
26.0	48.0	23.0	66.2	49.2	30.5	1.69	180.51
27.0	48.0	23.0	66.0	49.0	30.0	1.58	175.71
28.0	47.9	22.9	65.7	48.7	29.5	1.48	170.90
29.0	47.8	22.8	65.5	48.5	29.1	1.38	166.10
30.0	47.7	22.7	65.3	48.3	28.7	1.29	161.34
31.0	47.7	22.7	65.0	48.0	28.3	1.20	156.64
32.0	47.6	22.6	64.8	47.8	27.9	1.11	152.00
33.0	47.5	22.5	64.6	47.6	27.6	1.03	147.45
34.0	47.4	22.4	64.3	47.3	27.2	.95	142.98
35.0	47.3	22.3	64.1	47.1	26.9	.87	138.62
36.0	47.3	22.3	63.8	46.8	26.5	.80	134.37
37.0	47.2	22.2	63.6	46.6	26.2	.73	130.22
38.0	47.1	22.1	63.3	46.3	25.9	.67	126.20
39.0	47.0	22.0	63.0	46.0	25.6	.61	122.29
40.0	46.9	21.9	62.8	45.8	25.3	.55	118.50
41.0	46.8	21.8	62.5	45.5	25.1	.50	114.83
42.0	46.8	21.8	62.3	45.3	24.8	.45	111.28
43.0	46.7	21.7	62.0	45.0	24.5	.40	107.84
44.0	46.6	21.6	61.7	44.7	24.3	.36	104.52
45.0	46.5	21.5	61.5	44.5	24.0	.32	101.32
46.0	46.4	21.4	61.2	44.2	23.8	.28	98.22
47.0	46.4	21.4	61.0	44.0	23.5	.25	95.24
48.0	46.3	21.3	60.7	43.7	23.3	.22	92.36
49.0	46.2	21.2	60.4	43.4	23.1	.19	89.58
50.0	46.1	21.1	60.2	43.2	22.9	.16	86.91
51.0	46.0	21.0	59.9	42.9	22.7	.14	84.33
52.0	46.0	21.0	59.7	42.7	22.5	.12	81.84
53.0	45.9	20.9	59.4	42.4	22.2	.10	79.44
54.0	45.8	20.8	59.2	42.2	22.0	.08	77.13
55.0	45.7	20.7	58.9	41.9	21.9	.07	74.91
56.0	45.7	20.7	58.7	41.7	21.7	.06	72.76
57.0	45.6	20.6	58.5	41.5	21.5	.05	70.70
58.0	45.5	20.5	58.2	41.2	21.3	.04	68.71
59.0	45.4	20.4	58.0	41.0	21.1	.05	66.79
60.0	45.4	20.4	57.7	40.7	20.9	.05	64.94
61.0	45.3	20.3	57.5	40.5	20.8	.06	63.15
62.0	45.2	20.2	57.3	40.3	20.6	.06	61.43
63.0	45.2	20.2	57.1	40.1	20.4	.07	59.77
64.0	45.1	20.1	56.8	39.8	20.3	.08	58.17

STRUCTURE TYPE 2
VERTICAL

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE		TVI	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN)	(FAIR)	(RAIN)	(FAIR)	TOTAL		
	L50 DBA	L50 DBA	L50 DBUV/M	L50 DBUV/M	RAIN DBUV/M		
65.0	45.0	20.0	56.6	39.6	20.1	.08	56.63
66.0	44.9	19.9	56.4	39.4	20.0	.09	55.14
67.0	44.9	19.9	56.2	39.2	19.8	.09	53.70
68.0	44.8	19.8	56.0	39.0	19.6	.10	52.31
69.0	44.7	19.7	55.7	38.7	19.5	.10	50.98
70.0	44.7	19.7	55.5	38.5	19.4	.11	49.68
71.0	44.6	19.6	55.3	38.3	19.2	.11	48.43
72.0	44.5	19.5	55.1	38.1	19.1	.11	47.23
73.0	44.5	19.5	54.9	37.9	18.9	.11	46.06
74.0	44.4	19.4	54.7	37.7	18.8	.12	44.93
75.0	44.4	19.4	54.5	37.5	18.7	.12	43.85
76.0	44.3	19.3	54.3	37.3	18.5	.12	42.79
77.0	44.2	19.2	54.1	37.1	18.4	.12	41.77
78.0	44.2	19.2	53.9	36.9	18.3	.12	40.79
79.0	44.1	19.1	53.7	36.7	18.1	.12	39.83
80.0	44.1	19.1	53.5	36.5	18.0	.13	38.91
81.0	44.0	19.0	53.4	36.4	17.9	.13	38.02
82.0	43.9	18.9	53.2	36.2	17.8	.13	37.15
83.0	43.9	18.9	53.0	36.0	17.6	.13	36.32
84.0	43.8	18.8	52.8	35.8	17.5	.13	35.51
85.0	43.8	18.8	52.6	35.6	17.4	.13	34.72
86.0	43.7	18.7	52.5	35.5	17.3	.13	33.96
87.0	43.7	18.7	52.3	35.3	17.2	.13	33.22
88.0	43.6	18.6	52.1	35.1	17.1	.13	32.50
89.0	43.5	18.5	51.9	34.9	17.0	.13	31.81
90.0	43.5	18.5	51.8	34.8	16.8	.13	31.13
91.0	43.4	18.4	51.6	34.6	16.7	.13	30.48
92.0	43.4	18.4	51.4	34.4	16.6	.13	29.85
93.0	43.3	18.3	51.3	34.3	16.5	.13	29.23
94.0	43.3	18.3	51.1	34.1	16.4	.12	28.63
95.0	43.2	18.2	51.0	34.0	16.3	.12	28.05
96.0	43.2	18.2	50.8	33.8	16.2	.12	27.49
97.0	43.1	18.1	50.6	33.6	16.1	.12	26.94
98.0	43.1	18.1	50.5	33.5	16.0	.12	26.41
99.0	43.0	18.0	50.3	33.3	15.9	.12	25.89

STRUCTURE TYPE 2
VERTICAL

 * CORONA AND FIELD *
 * EFFECTS PROGRAM *
 * Source: Bonneville Power Administration *

*** INPUT DATA LIST ***

+TRIANGULAR
 +PEBBLEDALE SUB. TO HARDEE SUB.
 + 1 0 3 4 242.0 2.00 1.00 .00

(ENGLISH UNITS OPTION)

LINE GRADIENTS COMPUTED BY PROGRAM

PHYSICAL SYSTEM CONSISTS OF 4 CONDUCTORS, OF WHICH 3 ARE ENERGIZED PHASES

+COMB	XX	XX	XX	XX	XX	XX	XX					
+	5.000	5.000	30.000	5.000	1.000	75.000	3.280	4.000	3.280			
+PH.A-1		A	11.00	37.00	1	1.502	.00	242.00	.0	2040.	.00	
+PH.B-1		A	-11.00	32.00	1	1.502	.00	242.00	120.0	2040.	.00	
+PH.C-1		A	11.00	27.00	1	1.502	.00	242.00	240.0	2040.	.00	
+OHG1-1		A	5.00	57.00	1	.375	.00	.00	.0	0.	.00	
+	200	-100.0	1.0									
+	0	.0	.0									

STRUCTURE TYPE 3
 SINGLE POLE TRIANGULAR

COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, ELECTRIC AND MAGNETIC FIELD

TRIANGULAR

BLEDALÉ SUB. TO HARDEE SUB.

	DIST. FROM ZERO REFERENCE (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON DIAM. (IN)	NO. OF SUBCON	SUBCON SPACING (IN)	VOLTAGE L-L (KV)	PHASE ANGLE (DEGREES)	CURRENT (AMPS)	CORONA LOSSES (KW/MI)
PH.A-1	11.00	37.00	13.70	1.502	1.00	.00	242.00	.00	2040.0	5.287
PH.B-1	-11.00	32.00	12.37	1.502	1.00	.00	242.00	120.00	2040.0	2.718
PH.C-1	11.00	27.00	13.92	1.502	1.00	.00	242.00	240.00	2040.0	5.860
OHG1-1	5.00	57.00	2.62	.375	1.00	.00	.00	.00	.0	.000

AN MICROPHONE HT.= 5.0 FT, RI ANT. HT.= 5.0 FT, TV ANT. HT.= 30.0 M, ALTITUDE= .0 FT

RI FREQ= 1.000 MHZ, TV FREQ= 75.000 MHZ, WIND VEL.(OZ) = 2.000 MPH, GROUND CONDUCTIVITY = 4.0 MMHOS/M

E-FIELD TRANSDUCER HT.= 3.3FT, B-FIELD TRANSDUCER HT. = 3.3FT

STRUCTURE TYPE 3
SINGLE POLE TRIANGULAR

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE ¹		TVI TOTAL RAIN	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN) L50 DBA	(FAIR) L50 DBA	(RAIN) L50 DBUV/M	(FAIR) L50 DBUV/M			
-100.0	39.5	14.5	43.3	26.3	10.8	.22	27.68
-99.0	39.6	14.6	43.5	26.5	10.9	.23	28.21
-98.0	39.6	14.6	43.6	26.6	11.0	.23	28.74
-97.0	39.7	14.7	43.7	26.7	11.1	.24	29.30
-96.0	39.7	14.7	43.8	26.8	11.2	.25	29.87
-95.0	39.8	14.8	44.0	27.0	11.2	.25	30.45
-94.0	39.8	14.8	44.1	27.1	11.3	.26	31.06
-93.0	39.9	14.9	44.2	27.2	11.4	.26	31.68
-92.0	39.9	14.9	44.3	27.3	11.5	.27	32.31
-91.0	39.9	14.9	44.5	27.5	11.6	.28	32.97
-90.0	40.0	15.0	44.6	27.6	11.7	.29	33.65
-89.0	40.0	15.0	44.7	27.7	11.7	.29	34.35
-88.0	40.1	15.1	44.9	27.9	11.8	.30	35.06
-87.0	40.1	15.1	45.0	28.0	11.9	.31	35.80
-86.0	40.2	15.2	45.1	28.1	12.0	.32	36.57
-85.0	40.2	15.2	45.3	28.3	12.1	.33	37.35
-84.0	40.3	15.3	45.4	28.4	12.2	.34	38.16
-83.0	40.3	15.3	45.6	28.6	12.3	.35	39.00
-82.0	40.4	15.4	45.7	28.7	12.4	.36	39.86
-81.0	40.4	15.4	45.8	28.8	12.5	.37	40.75
-80.0	40.5	15.5	46.0	29.0	12.6	.38	41.67
-79.0	40.5	15.5	46.1	29.1	12.7	.39	42.62
-78.0	40.6	15.6	46.3	29.3	12.8	.40	43.61
-77.0	40.6	15.6	46.4	29.4	12.9	.41	44.62
-76.0	40.7	15.7	46.6	29.6	13.0	.42	45.67
-75.0	40.8	15.8	46.7	29.7	13.1	.44	46.75
-74.0	40.8	15.8	46.9	29.9	13.2	.45	47.87
-73.0	40.9	15.9	47.1	30.1	13.3	.47	49.03
-72.0	40.9	15.9	47.2	30.2	13.4	.48	50.23
-71.0	41.0	16.0	47.4	30.4	13.5	.49	51.47
-70.0	41.0	16.0	47.5	30.5	13.6	.51	52.75
-69.0	41.1	16.1	47.7	30.7	13.7	.53	54.08
-68.0	41.2	16.2	47.9	30.9	13.8	.54	55.46
-67.0	41.2	16.2	48.0	31.0	13.9	.56	56.89
-66.0	41.3	16.3	48.2	31.2	14.0	.58	58.37
-65.0	41.3	16.3	48.4	31.4	14.1	.60	59.90
-64.0	41.4	16.4	48.6	31.6	14.2	.62	61.49
-63.0	41.5	16.5	48.7	31.7	14.4	.64	63.14
-62.0	41.5	16.5	48.9	31.9	14.5	.66	64.85
-61.0	41.6	16.6	49.1	32.1	14.6	.68	66.63
-60.0	41.6	16.6	49.3	32.3	14.7	.71	68.47
-59.0	41.7	16.7	49.5	32.5	14.8	.73	70.39
-58.0	41.8	16.8	49.6	32.6	15.0	.76	72.38
-57.0	41.8	16.8	49.8	32.8	15.1	.78	74.44
-56.0	41.9	16.9	50.0	33.0	15.2	.81	76.59
-55.0	42.0	17.0	50.2	33.2	15.4	.84	78.82
-54.0	42.0	17.0	50.4	33.4	15.5	.87	81.14
-53.0	42.1	17.1	50.6	33.6	15.6	.90	83.55
-52.0	42.2	17.2	50.8	33.8	15.8	.93	86.05
-51.0	42.2	17.2	51.0	34.0	15.9	.97	88.66
-50.0	42.3	17.3	51.2	34.2	16.0	1.00	91.37
-49.0	42.4	17.4	51.4	34.4	16.2	1.04	94.19
-48.0	42.5	17.5	51.6	34.6	16.3	1.07	97.12
-47.0	42.5	17.5	51.8	34.8	16.5	1.11	100.17
-46.0	42.6	17.6	52.1	35.1	16.6	1.15	103.34

STRUCTURE TYPE 3
SINGLE POLE TRIANGULAR

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE ¹		TVI	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN)	(FAIR)	(RAIN)	(FAIR)	TOTAL		
	L50 DBA	L50 DBA	L50 DBUV/M	L50 DBUV/M	RAIN DBUV/M		
-45.0	42.7	17.7	52.3	35.3	16.8	1.19	106.64
-44.0	42.8	17.8	52.5	35.5	16.9	1.24	110.07
-43.0	42.8	17.8	52.8	35.8	17.1	1.28	113.64
-42.0	42.9	17.9	53.1	36.1	17.3	1.33	117.35
-41.0	43.0	18.0	53.4	36.4	17.4	1.37	121.21
-40.0	43.1	18.1	53.7	36.7	17.6	1.42	125.22
-39.0	43.1	18.1	54.0	37.0	17.8	1.47	129.39
-38.0	43.2	18.2	54.4	37.4	17.9	1.52	133.71
-37.0	43.3	18.3	54.7	37.7	18.1	1.57	138.19
-36.0	43.4	18.4	55.0	38.0	18.3	1.62	142.84
-35.0	43.5	18.5	55.3	38.3	18.5	1.67	147.66
-34.0	43.6	18.6	55.6	38.6	18.7	1.72	152.65
-33.0	43.6	18.6	55.9	38.9	18.9	1.78	157.81
-32.0	43.7	18.7	56.2	39.2	19.1	1.83	163.15
-31.0	43.8	18.8	56.5	39.5	19.5	1.88	168.65
-30.0	43.9	18.9	56.8	39.8	20.0	1.93	174.31
-29.0	44.0	19.0	57.1	40.1	20.4	1.98	180.14
-28.0	44.1	19.1	57.4	40.4	20.9	2.03	186.13
-27.0	44.2	19.2	57.7	40.7	21.4	2.07	192.26
-26.0	44.2	19.2	58.0	41.0	22.0	2.11	198.54
-25.0	44.3	19.3	58.2	41.2	22.6	2.15	204.94
-24.0	44.4	19.4	58.5	41.5	23.2	2.18	211.45
-23.0	44.5	19.5	58.7	41.7	23.9	2.21	218.06
-22.0	44.6	19.6	58.9	41.9	24.6	2.24	224.75
-21.0	44.7	19.7	59.1	42.1	25.4	2.25	231.49
-20.0	44.8	19.8	59.3	42.3	26.3	2.27	238.27
-19.0	44.9	19.9	59.5	42.5	27.3	2.27	245.05
-18.0	44.9	19.9	59.8	42.8	28.3	2.26	251.81
-17.0	45.0	20.0	60.2	43.2	29.6	2.25	258.51
-16.0	45.1	20.1	60.6	43.6	31.0	2.23	265.14
-15.0	45.2	20.2	61.0	44.0	32.6	2.20	271.65
-14.0	45.3	20.3	61.4	44.4	34.5	2.16	278.01
-13.0	45.4	20.4	61.7	44.7	36.6	2.11	284.19
-12.0	45.5	20.5	62.1	45.1	38.6	2.05	290.15
-11.0	45.5	20.5	62.5	45.5	39.6	1.99	295.87
-10.0	45.6	20.6	62.9	45.9	38.6	1.91	301.31
-9.0	45.7	20.7	63.3	46.3	36.6	1.84	306.44
-8.0	45.8	20.8	63.7	46.7	34.5	1.75	311.23
-7.0	45.9	20.9	64.1	47.1	32.6	1.67	315.65
-6.0	45.9	20.9	64.4	47.4	31.0	1.59	319.67
-5.0	46.0	21.0	64.8	47.8	29.6	1.51	323.28
-4.0	46.1	21.1	65.2	48.2	28.3	1.44	326.44
-3.0	46.2	21.2	65.5	48.5	28.6	1.39	329.13
-2.0	46.2	21.2	65.9	48.9	29.2	1.36	331.33
-1.0	46.3	21.3	66.2	49.2	29.9	1.37	333.02
.0	46.3	21.3	66.5	49.5	30.6	1.40	334.18
1.0	46.4	21.4	66.8	49.8	31.4	1.46	334.78
2.0	46.5	21.5	67.1	50.1	32.2	1.54	334.83
3.0	46.5	21.5	67.4	50.4	33.1	1.63	334.29
4.0	46.5	21.5	67.6	50.6	34.1	1.73	333.16
5.0	46.6	21.6	67.8	50.8	35.2	1.84	331.44
6.0	46.6	21.6	68.0	51.0	36.4	1.94	329.11
7.0	46.6	21.6	68.2	51.2	37.8	2.04	326.19
8.0	46.7	21.7	68.3	51.3	39.2	2.13	322.69
9.0	46.7	21.7	68.4	51.4	40.6	2.21	318.61

STRUCTURE TYPE 3
SINGLE POLE TRIANGULAR

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE ¹		TVI	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN)	(FAIR)	(RAIN)	(FAIR)	TOTAL		
	L50 DBA	L50 DBA	L50 DBUV/M	L50 DBUV/M	RAIN DBUV/M		
10.0	46.7	21.7	68.4	51.4	41.8	2.28	313.98
11.0	46.7	21.7	68.4	51.4	42.2	2.34	308.83
12.0	46.7	21.7	68.4	51.4	41.8	2.38	303.20
13.0	46.6	21.6	68.4	51.4	40.6	2.42	297.14
14.0	46.6	21.6	68.3	51.3	39.2	2.43	290.68
15.0	46.6	21.6	68.2	51.2	37.8	2.44	283.88
16.0	46.5	21.5	68.0	51.0	36.4	2.43	276.80
17.0	46.5	21.5	67.8	50.8	35.2	2.42	269.49
18.0	46.4	21.4	67.6	50.6	34.1	2.39	262.01
19.0	46.4	21.4	67.4	50.4	33.1	2.35	254.42
20.0	46.3	21.3	67.1	50.1	32.2	2.31	246.76
21.0	46.2	21.2	66.8	49.8	31.4	2.25	239.08
22.0	46.2	21.2	66.5	49.5	30.6	2.20	231.43
23.0	46.1	21.1	66.2	49.2	29.9	2.13	223.85
24.0	46.0	21.0	65.9	48.9	29.2	2.07	216.38
25.0	45.9	20.9	65.5	48.5	28.6	2.00	209.04
26.0	45.8	20.8	65.2	48.2	28.1	1.93	201.85
27.0	45.8	20.8	64.8	47.8	27.5	1.86	194.85
28.0	45.7	20.7	64.4	47.4	27.0	1.79	188.04
29.0	45.6	20.6	64.1	47.1	26.5	1.72	181.44
30.0	45.5	20.5	63.7	46.7	26.1	1.65	175.05
31.0	45.4	20.4	63.3	46.3	25.6	1.59	168.88
32.0	45.3	20.3	62.9	45.9	25.2	1.52	162.93
33.0	45.2	20.2	62.5	45.5	24.8	1.46	157.20
34.0	45.1	20.1	62.1	45.1	24.4	1.40	151.70
35.0	45.0	20.0	61.7	44.7	24.1	1.34	146.41
36.0	44.9	19.9	61.4	44.4	23.7	1.28	141.34
37.0	44.8	19.8	61.0	44.0	23.4	1.23	136.47
38.0	44.7	19.7	60.6	43.6	23.1	1.18	131.81
39.0	44.6	19.6	60.2	43.2	22.8	1.13	127.34
40.0	44.5	19.5	59.8	42.8	22.5	1.08	123.06
41.0	44.4	19.4	59.5	42.5	22.2	1.04	118.96
42.0	44.3	19.3	59.1	42.1	21.9	1.00	115.03
43.0	44.2	19.2	58.8	41.8	21.6	.96	111.27
44.0	44.2	19.2	58.4	41.4	21.3	.92	107.67
45.0	44.1	19.1	58.0	41.0	21.1	.88	104.22
46.0	44.0	19.0	57.7	40.7	20.8	.85	100.91
47.0	43.9	18.9	57.4	40.4	20.6	.81	97.74
48.0	43.8	18.8	57.0	40.0	20.4	.78	94.71
49.0	43.7	18.7	56.7	39.7	20.1	.75	91.80
50.0	43.6	18.6	56.4	39.4	19.9	.72	89.01
51.0	43.5	18.5	56.0	39.0	19.7	.70	86.34
52.0	43.4	18.4	55.8	38.8	19.5	.67	83.77
53.0	43.4	18.4	55.5	38.5	19.3	.65	81.31
54.0	43.3	18.3	55.3	38.3	19.1	.62	78.95
55.0	43.2	18.2	55.0	38.0	18.9	.60	76.68
56.0	43.1	18.1	54.8	37.8	18.7	.58	74.50
57.0	43.0	18.0	54.6	37.6	18.5	.56	72.40
58.0	43.0	18.0	54.3	37.3	18.3	.54	70.39
59.0	42.9	17.9	54.1	37.1	18.1	.52	68.45
60.0	42.8	17.8	53.8	36.8	17.9	.50	66.59
61.0	42.7	17.7	53.6	36.6	17.8	.49	64.80
62.0	42.7	17.7	53.4	36.4	17.6	.47	63.07
63.0	42.6	17.6	53.2	36.2	17.4	.45	61.41
64.0	42.5	17.5	52.9	35.9	17.3	.44	59.81

STRUCTURE TYPE 3
SINGLE POLE TRIANGULAR

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE ¹		TVI	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN) L50 DBA	(FAIR) L50 DBA	(RAIN) L50 DBUV/M	(FAIR) L50 DBUV/M	TOTAL RAIN DBUV/M		
65.0	42.4	17.4	52.7	35.7	17.1	.42	58.27
66.0	42.4	17.4	52.5	35.5	16.9	.41	56.78
67.0	42.3	17.3	52.3	35.3	16.8	.40	55.35
68.0	42.2	17.2	52.1	35.1	16.6	.39	53.97
69.0	42.1	17.1	51.8	34.8	16.5	.37	52.64
70.0	42.1	17.1	51.6	34.6	16.3	.36	51.35
71.0	42.0	17.0	51.4	34.4	16.2	.35	50.11
72.0	41.9	16.9	51.2	34.2	16.0	.34	48.91
73.0	41.9	16.9	51.0	34.0	15.9	.33	47.75
74.0	41.8	16.8	50.8	33.8	15.8	.32	46.63
75.0	41.7	16.7	50.6	33.6	15.6	.31	45.54
76.0	41.7	16.7	50.4	33.4	15.5	.30	44.50
77.0	41.6	16.6	50.2	33.2	15.4	.29	43.48
78.0	41.6	16.6	50.0	33.0	15.2	.28	42.50
79.0	41.5	16.5	49.8	32.8	15.1	.28	41.56
80.0	41.4	16.4	49.6	32.6	15.0	.27	40.64
81.0	41.4	16.4	49.5	32.5	14.8	.26	39.75
82.0	41.3	16.3	49.3	32.3	14.7	.25	38.89
83.0	41.2	16.2	49.1	32.1	14.6	.25	38.05
84.0	41.2	16.2	48.9	31.9	14.5	.24	37.24
85.0	41.1	16.1	48.7	31.7	14.4	.23	36.46
86.0	41.1	16.1	48.6	31.6	14.2	.23	35.70
87.0	41.0	16.0	48.4	31.4	14.1	.22	34.96
88.0	41.0	16.0	48.2	31.2	14.0	.21	34.24
89.0	40.9	15.9	48.0	31.0	13.9	.21	33.55
90.0	40.8	15.8	47.9	30.9	13.8	.20	32.87
91.0	40.8	15.8	47.7	30.7	13.7	.20	32.22
92.0	40.7	15.7	47.5	30.5	13.6	.19	31.58
93.0	40.7	15.7	47.4	30.4	13.5	.19	30.97
94.0	40.6	15.6	47.2	30.2	13.4	.18	30.36
95.0	40.6	15.6	47.1	30.1	13.3	.18	29.78
96.0	40.5	15.5	46.9	29.9	13.2	.17	29.21
97.0	40.5	15.5	46.7	29.7	13.1	.17	28.66
98.0	40.4	15.4	46.6	29.6	13.0	.17	28.12
99.0	40.4	15.4	46.4	29.4	12.9	.16	27.60

STRUCTURE TYPE 3
SINGLE POLE TRIANGULAR

 * CORONA AND FIELD *
 * EFFECTS PROGRAM *
 * Source: Bonneville Power Administration *

*** INPUT DATA LIST ***

+TRIANGULAR w/ 69 kV underbuild
 +PEBBLEDALE SUB. TO HARDEE SUB.
 + 1 0 6 7 242.0 2.00 1.00 .00

(ENGLISH UNITS OPTION)

LINE GRADIENTS COMPUTED BY PROGRAM

PHYSICAL SYSTEM CONSISTS OF 7 CONDUCTORS, OF WHICH 6 ARE ENERGIZED PHASES

+COMB	XX	XX	XX	XX	XX	XX	XX						
+	5.000	5.000	30.000	5.000	1.000	75.000	3.280	4.000	3.280				
+PH.A-1		A	11.00	45.00	1	1.502	.00	242.00	.0	2040.	.00		
+PH.B-1		A	-11.00	40.00	1	1.502	.00	242.00	120.0	2040.	.00		
+PH.C-1		A	11.00	35.00	1	1.502	.00	242.00	240.0	2040.	.00		
+PH.A-2		A	3.50	26.00	1	1.124	.00	72.00	.0	1171.	.00		
+PH.B-2		A	-3.50	22.00	1	1.124	.00	72.00	120.0	1171.	.00		
+PH.C-2		A	3.50	18.00	1	1.124	.00	72.00	240.0	1171.	.00		
+OHG1-1		A	.00	65.00	1	.375	.00	.00	.0	0.	.00		
+	200	-100.0	1.0										
+	0	.0	.0										

STRUCTURE TYPE 4
 SINGLE POLE TRIANGULAR
 W/69KV UNDERBUILD

COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, ELECTRIC AND MAGNETIC FIELD

TRIANGULAR

LEDALE SUB. TO HARDEE SUB.

	DIST. FROM ZERO REFERENCE (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON DIAM. (IN)	NO. OF SUBCON	SUBCON SPACING (IN)	VOLTAGE L-L (KV)	PHASE ANGLE (DEGREES)	CURRENT (AMPS)	CORONA LOSSES (KW/MI)
PH.A-1	11.00	45.00	13.49	1.502	1.00	.00	242.00	.00	2040.0	4.766
PH.B-1	-11.00	40.00	12.23	1.502	1.00	.00	242.00	120.00	2040.0	2.527
PH.C-1	11.00	35.00	14.21	1.502	1.00	.00	242.00	240.00	2040.0	6.697
PH.A-2	3.50	26.00	6.48	1.124	1.00	.00	72.00	.00	1171.0	.013
PH.B-2	-3.50	22.00	4.98	1.124	1.00	.00	72.00	120.00	1171.0	.002
PH.C-2	3.50	18.00	5.24	1.124	1.00	.00	72.00	240.00	1171.0	.003
OHG1-1	.00	65.00	2.67	.375	1.00	.00	.00	.00	.0	.000

AN MICROPHONE HT.= 5.0 FT, RI ANT. HT.= 5.0 FT, TV ANT. HT.= 30.0 M, ALTITUDE= .0 FT

RI FREQ= 1.000 MHZ, TV FREQ= 75.000 MHZ, WIND VEL.(OZ) = 2.000 MPH, GROUND CONDUCTIVITY = 4.0 MMHOS/M

E-FIELD TRANSDUCER HT.= 3.3FT, B-FIELD TRANSDUCER HT. = 3.3FT

STRUCTURE TYPE 4
SINGLE POLE TRIANGULAR
W/69KV UNDERBUILD

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE		TVI	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN) L50 DBA	(FAIR) L50 DBA	(RAIN) L50 DBUV/M	(FAIR) L50 DBUV/M	TOTAL RAIN DBUV/M		
-100.0	39.7	14.7	44.8	27.8	11.9	.26	31.46
-99.0	39.7	14.7	44.9	27.9	12.0	.26	32.03
-98.0	39.7	14.7	45.1	28.1	12.1	.27	32.62
-97.0	39.8	14.8	45.2	28.2	12.1	.27	33.22
-96.0	39.8	14.8	45.3	28.3	12.2	.28	33.84
-95.0	39.9	14.9	45.4	28.4	12.3	.29	34.47
-94.0	39.9	14.9	45.6	28.6	12.4	.29	35.13
-93.0	40.0	15.0	45.7	28.7	12.5	.30	35.80
-92.0	40.0	15.0	45.8	28.8	12.6	.31	36.49
-91.0	40.0	15.0	46.0	29.0	12.6	.32	37.19
-90.0	40.1	15.1	46.1	29.1	12.7	.32	37.92
-89.0	40.1	15.1	46.2	29.2	12.8	.33	38.67
-88.0	40.2	15.2	46.4	29.4	12.9	.34	39.44
-87.0	40.2	15.2	46.5	29.5	13.0	.35	40.23
-86.0	40.3	15.3	46.6	29.6	13.1	.36	41.04
-85.0	40.3	15.3	46.8	29.8	13.2	.37	41.88
-84.0	40.4	15.4	46.9	29.9	13.3	.38	42.74
-83.0	40.4	15.4	47.1	30.1	13.3	.39	43.63
-82.0	40.5	15.5	47.2	30.2	13.4	.40	44.55
-81.0	40.5	15.5	47.4	30.4	13.5	.41	45.49
-80.0	40.6	15.6	47.5	30.5	13.6	.42	46.45
-79.0	40.6	15.6	47.7	30.7	13.7	.43	47.45
-78.0	40.7	15.7	47.8	30.8	13.8	.44	48.48
-77.0	40.7	15.7	48.0	31.0	13.9	.45	49.54
-76.0	40.8	15.8	48.1	31.1	14.0	.47	50.63
-75.0	40.8	15.8	48.3	31.3	14.1	.48	51.76
-74.0	40.9	15.9	48.4	31.4	14.2	.49	52.92
-73.0	40.9	15.9	48.6	31.6	14.3	.51	54.12
-72.0	41.0	16.0	48.8	31.8	14.4	.52	55.35
-71.0	41.0	16.0	48.9	31.9	14.5	.54	56.63
-70.0	41.1	16.1	49.1	32.1	14.6	.55	57.95
-69.0	41.1	16.1	49.2	32.2	14.7	.57	59.30
-68.0	41.2	16.2	49.4	32.4	14.9	.58	60.71
-67.0	41.2	16.2	49.6	32.6	15.0	.60	62.16
-66.0	41.3	16.3	49.8	32.8	15.1	.62	63.65
-65.0	41.3	16.3	49.9	32.9	15.2	.64	65.20
-64.0	41.4	16.4	50.1	33.1	15.3	.66	66.79
-63.0	41.5	16.5	50.3	33.3	15.4	.67	68.44
-62.0	41.5	16.5	50.5	33.5	15.5	.69	70.15
-61.0	41.6	16.6	50.7	33.7	15.7	.71	71.91
-60.0	41.6	16.6	50.8	33.8	15.8	.74	73.74
-59.0	41.7	16.7	51.0	34.0	15.9	.76	75.62
-58.0	41.7	16.7	51.2	34.2	16.0	.78	77.57
-57.0	41.8	16.8	51.4	34.4	16.2	.80	79.59
-56.0	41.9	16.9	51.6	34.6	16.3	.83	81.68
-55.0	41.9	16.9	51.8	34.8	16.4	.85	83.84
-54.0	42.0	17.0	52.0	35.0	16.5	.88	86.07
-53.0	42.0	17.0	52.2	35.2	16.7	.90	88.38
-52.0	42.1	17.1	52.4	35.4	16.8	.93	90.78
-51.0	42.2	17.2	52.6	35.6	16.9	.96	93.26
-50.0	42.2	17.2	52.8	35.8	17.1	.99	95.82
-49.0	42.3	17.3	53.1	36.1	17.2	1.02	98.48
-48.0	42.4	17.4	53.3	36.3	17.4	1.05	101.23
-47.0	42.4	17.4	53.5	36.5	17.5	1.08	104.08
-46.0	42.5	17.5	53.7	36.7	17.7	1.11	107.04

STRUCTURE TYPE 4
SINGLE POLE TRIANGULAR
W/69KV UNDERBUILD

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE ¹		TVI TOTAL	ELECTRIC	MAGNETIC
	(RAIN) L50 DBA	(FAIR) L50 DBA	(RAIN) L50 DBUV/M	(FAIR) L50 DBUV/M	RAIN DBUV/M	FIELD KV/M	FIELD MG
-45.0	42.6	17.6	53.9	36.9	17.8	1.14	110.09
-44.0	42.6	17.6	54.2	37.2	18.0	1.17	113.26
-43.0	42.7	17.7	54.4	37.4	18.1	1.20	116.54
-42.0	42.8	17.8	54.6	37.6	18.3	1.24	119.94
-41.0	42.8	17.8	54.8	37.8	18.5	1.27	123.46
-40.0	42.9	17.9	55.1	38.1	18.6	1.31	127.11
-39.0	43.0	18.0	55.3	38.3	18.8	1.34	130.88
-38.0	43.0	18.0	55.6	38.6	19.0	1.38	134.80
-37.0	43.1	18.1	55.8	38.8	19.2	1.41	138.85
-36.0	43.2	18.2	56.1	39.1	19.3	1.44	143.06
-35.0	43.2	18.2	56.3	39.3	19.5	1.48	147.41
-34.0	43.3	18.3	56.6	39.6	19.7	1.51	151.92
-33.0	43.4	18.4	56.8	39.8	19.9	1.55	156.60
-32.0	43.5	18.5	57.1	40.1	20.1	1.58	161.44
-31.0	43.5	18.5	57.3	40.3	20.3	1.61	166.47
-30.0	43.6	18.6	57.6	40.6	20.5	1.64	171.68
-29.0	43.7	18.7	57.8	40.8	20.7	1.67	177.08
-28.0	43.7	18.7	58.1	41.1	20.9	1.70	182.68
-27.0	43.8	18.8	58.4	41.4	21.2	1.73	188.50
-26.0	43.9	18.9	58.7	41.7	21.4	1.75	194.53
-25.0	44.0	19.0	58.9	41.9	21.6	1.77	200.80
-24.0	44.0	19.0	59.2	42.2	21.9	1.79	207.31
-23.0	44.1	19.1	59.5	42.5	22.1	1.81	214.06
-22.0	44.2	19.2	59.8	42.8	22.4	1.82	221.09
-21.0	44.2	19.2	60.0	43.0	22.6	1.83	228.38
-20.0	44.3	19.3	60.3	43.3	22.9	1.84	235.96
-19.0	44.4	19.4	60.6	43.6	23.2	1.84	243.83
-18.0	44.5	19.5	60.9	43.9	23.4	1.83	252.00
-17.0	44.5	19.5	61.1	44.1	23.7	1.82	260.46
-16.0	44.6	19.6	61.4	44.4	24.1	1.81	269.21
-15.0	44.7	19.7	61.7	44.7	24.4	1.79	278.23
-14.0	44.7	19.7	62.0	45.0	24.7	1.76	287.51
-13.0	44.8	19.8	62.3	45.3	25.0	1.73	297.00
-12.0	44.9	19.9	62.5	45.5	25.4	1.69	306.64
-11.0	44.9	19.9	62.8	45.8	25.8	1.64	316.37
-10.0	45.0	20.0	63.1	46.1	26.1	1.59	326.09
-9.0	45.0	20.0	63.3	46.3	26.5	1.53	335.68
-8.0	45.1	20.1	63.6	46.6	27.0	1.47	345.00
-7.0	45.2	20.2	63.8	46.8	27.4	1.41	353.88
-6.0	45.2	20.2	64.1	47.1	27.9	1.35	362.14
-5.0	45.3	20.3	64.3	47.3	28.3	1.30	369.58
-4.0	45.3	20.3	64.6	47.6	28.8	1.26	375.97
-3.0	45.4	20.4	64.8	47.8	29.4	1.25	381.13
-2.0	45.4	20.4	65.0	48.0	29.9	1.25	384.84
-1.0	45.5	20.5	65.2	48.2	30.5	1.29	386.95
.0	45.5	20.5	65.4	48.4	31.2	1.34	387.32
1.0	45.5	20.5	65.6	48.6	31.9	1.41	385.88
2.0	45.6	20.6	65.7	48.7	32.6	1.48	382.64
3.0	45.6	20.6	65.9	48.9	33.3	1.56	377.67
4.0	45.6	20.6	66.0	49.0	34.1	1.63	371.10
5.0	45.7	20.7	66.1	49.1	35.0	1.69	363.15
6.0	45.7	20.7	66.2	49.2	35.8	1.74	354.06
7.0	45.7	20.7	66.3	49.3	36.7	1.78	344.13
8.0	45.7	20.7	66.4	49.4	37.5	1.81	333.63
9.0	45.7	20.7	66.4	49.4	38.2	1.84	322.84

STRUCTURE TYPE 4
SINGLE POLE TRIANGULAR
W/69KV UNDERBUILD

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE		TVI	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN)	(FAIR)	(RAIN)	(FAIR)	TOTAL		
	L50 DBA	L50 DBA	L50 DBUV/M	L50 DBUV/M	RAIN DBUV/M		
10.0	45.7	20.7	66.4	49.4	38.7	1.85	311.98
11.0	45.7	20.7	66.5	49.5	38.8	1.86	301.26
12.0	45.7	20.7	66.4	49.4	38.7	1.86	290.80
13.0	45.7	20.7	66.4	49.4	38.2	1.85	280.70
14.0	45.7	20.7	66.4	49.4	37.5	1.84	271.03
15.0	45.6	20.6	66.3	49.3	36.7	1.83	261.79
16.0	45.6	20.6	66.2	49.2	35.8	1.81	253.00
17.0	45.6	20.6	66.1	49.1	35.0	1.79	244.63
18.0	45.6	20.6	66.0	49.0	34.1	1.77	236.66
19.0	45.5	20.5	65.9	48.9	33.3	1.74	229.05
20.0	45.5	20.5	65.7	48.7	32.6	1.71	221.79
21.0	45.4	20.4	65.6	48.6	31.9	1.68	214.84
22.0	45.4	20.4	65.4	48.4	31.2	1.65	208.17
23.0	45.3	20.3	65.2	48.2	30.5	1.62	201.76
24.0	45.3	20.3	65.0	48.0	29.9	1.58	195.60
25.0	45.2	20.2	64.8	47.8	29.4	1.55	189.66
26.0	45.2	20.2	64.6	47.6	28.8	1.51	183.93
27.0	45.1	20.1	64.3	47.3	28.3	1.47	178.41
28.0	45.0	20.0	64.1	47.1	27.9	1.43	173.07
29.0	45.0	20.0	63.8	46.8	27.4	1.40	167.91
30.0	44.9	19.9	63.6	46.6	27.0	1.36	162.93
31.0	44.9	19.9	63.3	46.3	26.5	1.32	158.11
32.0	44.8	19.8	63.1	46.1	26.1	1.28	153.45
33.0	44.7	19.7	62.8	45.8	25.8	1.25	148.94
34.0	44.6	19.6	62.5	45.5	25.4	1.21	144.59
35.0	44.6	19.6	62.3	45.3	25.0	1.17	140.38
36.0	44.5	19.5	62.0	45.0	24.7	1.14	136.31
37.0	44.4	19.4	61.7	44.7	24.4	1.10	132.37
38.0	44.3	19.3	61.4	44.4	24.1	1.07	128.57
39.0	44.3	19.3	61.1	44.1	23.7	1.04	124.89
40.0	44.2	19.2	60.9	43.9	23.4	1.00	121.34
41.0	44.1	19.1	60.6	43.6	23.2	.97	117.91
42.0	44.1	19.1	60.3	43.3	22.9	.94	114.60
43.0	44.0	19.0	60.0	43.0	22.6	.91	111.40
44.0	43.9	18.9	59.8	42.8	22.4	.88	108.31
45.0	43.8	18.8	59.5	42.5	22.1	.85	105.32
46.0	43.8	18.8	59.2	42.2	21.9	.83	102.44
47.0	43.7	18.7	58.9	41.9	21.6	.80	99.65
48.0	43.6	18.6	58.7	41.7	21.4	.78	96.96
49.0	43.5	18.5	58.4	41.4	21.2	.75	94.36
50.0	43.5	18.5	58.1	41.1	20.9	.73	91.85
51.0	43.4	18.4	57.8	40.8	20.7	.71	89.42
52.0	43.3	18.3	57.6	40.6	20.5	.69	87.08
53.0	43.2	18.2	57.3	40.3	20.3	.66	84.82
54.0	43.2	18.2	57.1	40.1	20.1	.64	82.63
55.0	43.1	18.1	56.8	39.8	19.9	.62	80.51
56.0	43.0	18.0	56.6	39.6	19.7	.61	78.47
57.0	43.0	18.0	56.3	39.3	19.5	.59	76.49
58.0	42.9	17.9	56.1	39.1	19.3	.57	74.58
59.0	42.8	17.8	55.8	38.8	19.2	.55	72.74
60.0	42.7	17.7	55.6	38.6	19.0	.54	70.95
61.0	42.7	17.7	55.3	38.3	18.8	.52	69.22
62.0	42.6	17.6	55.1	38.1	18.6	.51	67.55
63.0	42.5	17.5	54.8	37.8	18.5	.49	65.93
64.0	42.5	17.5	54.6	37.6	18.3	.48	64.37

STRUCTURE TYPE 4
SINGLE POLE TRIANGULAR
W/69KV UNDERBUILD

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE		TVI	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN)	(FAIR)	(RAIN)	(FAIR)	TOTAL		
	L50 DBA	L50 DBA	L50 DBUV/M	L50 DBUV/M	RAIN DBUV/M		
65.0	42.4	17.4	54.4	37.4	18.1	.46	62.85
66.0	42.3	17.3	54.2	37.2	18.0	.45	61.38
67.0	42.3	17.3	53.9	36.9	17.8	.44	59.96
68.0	42.2	17.2	53.7	36.7	17.7	.43	58.59
69.0	42.2	17.2	53.5	36.5	17.5	.41	57.25
70.0	42.1	17.1	53.3	36.3	17.4	.40	55.96
71.0	42.0	17.0	53.1	36.1	17.2	.39	54.71
72.0	42.0	17.0	52.8	35.8	17.1	.38	53.50
73.0	41.9	16.9	52.6	35.6	16.9	.37	52.32
74.0	41.8	16.8	52.4	35.4	16.8	.36	51.18
75.0	41.8	16.8	52.2	35.2	16.7	.35	50.08
76.0	41.7	16.7	52.0	35.0	16.5	.34	49.00
77.0	41.7	16.7	51.8	34.8	16.4	.33	47.96
78.0	41.6	16.6	51.6	34.6	16.3	.32	46.95
79.0	41.5	16.5	51.4	34.4	16.2	.32	45.97
80.0	41.5	16.5	51.2	34.2	16.0	.31	45.02
81.0	41.4	16.4	51.0	34.0	15.9	.30	44.09
82.0	41.4	16.4	50.8	33.8	15.8	.29	43.19
83.0	41.3	16.3	50.7	33.7	15.7	.28	42.32
84.0	41.3	16.3	50.5	33.5	15.5	.28	41.47
85.0	41.2	16.2	50.3	33.3	15.4	.27	40.65
86.0	41.2	16.2	50.1	33.1	15.3	.26	39.85
87.0	41.1	16.1	49.9	32.9	15.2	.26	39.07
88.0	41.0	16.0	49.8	32.8	15.1	.25	38.31
89.0	41.0	16.0	49.6	32.6	15.0	.25	37.57
90.0	40.9	15.9	49.4	32.4	14.9	.24	36.86
91.0	40.9	15.9	49.2	32.2	14.7	.23	36.16
92.0	40.8	15.8	49.1	32.1	14.6	.23	35.48
93.0	40.8	15.8	48.9	31.9	14.5	.22	34.82
94.0	40.7	15.7	48.8	31.8	14.4	.22	34.18
95.0	40.7	15.7	48.6	31.6	14.3	.21	33.55
96.0	40.6	15.6	48.4	31.4	14.2	.21	32.94
97.0	40.6	15.6	48.3	31.3	14.1	.20	32.35
98.0	40.5	15.5	48.1	31.1	14.0	.20	31.77
99.0	40.5	15.5	48.0	31.0	13.9	.19	31.20

STRUCTURE TYPE 4
SINGLE POLE TRIANGULAR
W/69KV UNDERBUILD

 * CORONA AND FIELD *
 * EFFECTS PROGRAM *
 * Source: Bonneville Power Administration *

*** INPUT DATA LIST ***

+VERTICAL w/ 69 kV underbuild
 +PEBBLEDALE SUB. TO HARDEE SUB.

+ 1 0 6 7 242.0 2.00 1.00 .00

(ENGLISH UNITS OPTION)

LINE GRADIENTS COMPUTED BY PROGRAM

PHYSICAL SYSTEM CONSISTS OF 7 CONDUCTORS, OF WHICH 6 ARE ENERGIZED PHASES

+COMB	XX	XX	XX	XX	XX	XX	XX						
+ 5.000	5.000	30.000	5.000	1.000	75.000	3.280	4.000	3.280					
+PH.A-1	A	11.00	59.00	1	1.502	.00	242.00	.0	2040.	.00			
+PH.B-1	A	11.00	49.00	1	1.502	.00	242.00	120.0	2040.	.00			
+PH.C-1	A	11.00	39.00	1	1.502	.00	242.00	240.0	2040.	.00			
+PH.A-2	A	4.00	32.00	1	1.124	.00	72.00	.0	1171.	.00			
+PH.B-2	A	4.00	25.00	1	1.124	.00	72.00	120.0	1171.	.00			
+PH.C-2	A	4.00	18.00	1	1.124	.00	72.00	240.0	1171.	.00			
+ONG1-1	A	.00	69.00	1	.375	.00	.00	.0	0.	.00			
+ 200	-100.0	1.0											
+ 0	.0	.0											

STRUCTURE TYPE 5
 VERTICAL W/69KV UNDERBUILD

COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, ELECTRIC AND MAGNETIC FIELD

VERTICAL

PLEDALE SUB. TO HARDEE SUB.

	DIST. FROM ZERO REFERENCE (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON DIAM. (IN)	NO. OF SUBCON	SUBCON SPACING (IN)	VOLTAGE L-L (KV)	PHASE ANGLE (DEGREES)	CURRENT (AMPS)	CORONA LOSSES (KW/MI)
PH.A-1	11.00	59.00	13.47	1.502	1.00	.00	242.00	.00	2040.0	4.722
PH.B-1	11.00	49.00	14.80	1.502	1.00	.00	242.00	120.00	2040.0	8.699
PH.C-1	11.00	39.00	14.40	1.502	1.00	.00	242.00	240.00	2040.0	7.307
PH.A-2	4.00	32.00	6.89	1.124	1.00	.00	72.00	.00	1171.0	.019
PH.B-2	4.00	25.00	6.25	1.124	1.00	.00	72.00	120.00	1171.0	.010
PH.C-2	4.00	18.00	5.13	1.124	1.00	.00	72.00	240.00	1171.0	.003
OHG1-1	.00	69.00	5.24	.375	1.00	.00	.00	.00	.0	.000

AN MICROPHONE HT.= 5.0 FT, RI ANT. HT.= 5.0 FT, TV ANT. HT.= 30.0 M, ALTITUDE= .0 FT

RI FREQ= 1.000 MHZ, TV FREQ= 75.000 MHZ, WIND VEL.(OZ) = 2.000 MPH, GROUND CONDUCTIVITY = 4.0 MMHOS/M

E-FIELD TRANSDUCER HT.= 3.3FT, B-FIELD TRANSDUCER HT. = 3.3FT

STRUCTURE TYPE 5
VERTICAL W/69KV UNDERBUILD

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE		TVI	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN)	(FAIR)	(RAIN)	(FAIR)	TOTAL		
	L50 DBA	L50 DBA	L50 DBUV/M	L50 DBUV/M	RAIN DBUV/M		
-100.0	42.3	17.3	49.3	32.3	13.9	.11	23.86
-99.0	42.4	17.4	49.4	32.4	14.0	.11	24.25
-98.0	42.4	17.4	49.5	32.5	14.0	.11	24.65
-97.0	42.5	17.5	49.6	32.6	14.1	.11	25.06
-96.0	42.5	17.5	49.8	32.8	14.2	.11	25.48
-95.0	42.5	17.5	49.9	32.9	14.3	.11	25.91
-94.0	42.6	17.6	50.0	33.0	14.4	.11	26.35
-93.0	42.6	17.6	50.1	33.1	14.4	.12	26.80
-92.0	42.7	17.7	50.2	33.2	14.5	.12	27.26
-91.0	42.7	17.7	50.3	33.3	14.6	.12	27.74
-90.0	42.7	17.7	50.5	33.5	14.7	.12	28.22
-89.0	42.8	17.8	50.6	33.6	14.8	.12	28.72
-88.0	42.8	17.8	50.7	33.7	14.9	.12	29.23
-87.0	42.9	17.9	50.8	33.8	14.9	.12	29.76
-86.0	42.9	17.9	51.0	34.0	15.0	.12	30.29
-85.0	43.0	18.0	51.1	34.1	15.1	.12	30.84
-84.0	43.0	18.0	51.2	34.2	15.2	.13	31.41
-83.0	43.0	18.0	51.3	34.3	15.3	.13	31.99
-82.0	43.1	18.1	51.5	34.5	15.4	.13	32.59
-81.0	43.1	18.1	51.6	34.6	15.5	.13	33.20
-80.0	43.2	18.2	51.7	34.7	15.6	.13	33.83
-79.0	43.2	18.2	51.9	34.9	15.6	.13	34.48
-78.0	43.3	18.3	52.0	35.0	15.7	.13	35.15
-77.0	43.3	18.3	52.1	35.1	15.8	.13	35.83
-76.0	43.4	18.4	52.3	35.3	15.9	.13	36.53
-75.0	43.4	18.4	52.4	35.4	16.0	.13	37.26
-74.0	43.4	18.4	52.5	35.5	16.1	.13	38.00
-73.0	43.5	18.5	52.7	35.7	16.2	.13	38.77
-72.0	43.5	18.5	52.8	35.8	16.3	.14	39.56
-71.0	43.6	18.6	53.0	36.0	16.4	.14	40.37
-70.0	43.6	18.6	53.1	36.1	16.5	.14	41.20
-69.0	43.7	18.7	53.3	36.3	16.6	.14	42.06
-68.0	43.7	18.7	53.4	36.4	16.7	.14	42.95
-67.0	43.8	18.8	53.5	36.5	16.8	.14	43.86
-66.0	43.8	18.8	53.7	36.7	16.9	.14	44.80
-65.0	43.9	18.9	53.8	36.8	17.0	.14	45.77
-64.0	43.9	18.9	54.0	37.0	17.1	.14	46.77
-63.0	44.0	19.0	54.2	37.2	17.3	.14	47.81
-62.0	44.0	19.0	54.3	37.3	17.4	.14	48.87
-61.0	44.1	19.1	54.5	37.5	17.5	.14	49.97
-60.0	44.1	19.1	54.6	37.6	17.6	.14	51.11
-59.0	44.2	19.2	54.8	37.8	17.7	.14	52.28
-58.0	44.2	19.2	54.9	37.9	17.8	.14	53.49
-57.0	44.3	19.3	55.1	38.1	17.9	.14	54.75
-56.0	44.4	19.4	55.3	38.3	18.1	.14	56.04
-55.0	44.4	19.4	55.4	38.4	18.2	.14	57.38
-54.0	44.5	19.5	55.6	38.6	18.3	.13	58.76
-53.0	44.5	19.5	55.7	38.7	18.4	.13	60.20
-52.0	44.6	19.6	55.9	38.9	18.6	.13	61.68
-51.0	44.6	19.6	56.1	39.1	18.7	.13	63.22
-50.0	44.7	19.7	56.3	39.3	18.8	.13	64.81
-49.0	44.7	19.7	56.4	39.4	18.9	.13	66.46
-48.0	44.8	19.8	56.6	39.6	19.1	.12	68.18
-47.0	44.8	19.8	56.8	39.8	19.2	.12	69.95
-46.0	44.9	19.9	56.9	39.9	19.3	.12	71.79

STRUCTURE TYPE 5
VERTICAL W/69KV UNDERBUILD

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE		TVI	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN) L50 DBA	(FAIR) L50 DBA	(RAIN) L50 DBUV/M	(FAIR) L50 DBUV/M	TOTAL RAIN DBUV/M		
-45.0	45.0	20.0	57.1	40.1	19.5	.11	73.71
-44.0	45.0	20.0	57.3	40.3	19.6	.11	75.70
-43.0	45.1	20.1	57.5	40.5	19.8	.11	77.76
-42.0	45.1	20.1	57.6	40.6	19.9	.10	79.91
-41.0	45.2	20.2	57.8	40.8	20.1	.10	82.14
-40.0	45.2	20.2	58.0	41.0	20.2	.09	84.47
-39.0	45.3	20.3	58.2	41.2	20.4	.09	86.89
-38.0	45.4	20.4	58.4	41.4	20.5	.08	89.41
-37.0	45.4	20.4	58.5	41.5	20.7	.07	92.04
-36.0	45.5	20.5	58.7	41.7	20.8	.07	94.78
-35.0	45.5	20.5	58.9	41.9	21.0	.06	97.64
-34.0	45.6	20.6	59.1	42.1	21.1	.05	100.62
-33.0	45.7	20.7	59.3	42.3	21.3	.05	103.74
-32.0	45.7	20.7	59.5	42.5	21.5	.05	107.00
-31.0	45.8	20.8	59.7	42.7	21.6	.05	110.41
-30.0	45.8	20.8	59.8	42.8	21.8	.05	113.98
-29.0	45.9	20.9	60.0	43.0	22.0	.06	117.72
-28.0	46.0	21.0	60.2	43.2	22.2	.07	121.63
-27.0	46.0	21.0	60.4	43.4	22.4	.09	125.74
-26.0	46.1	21.1	60.6	43.6	22.5	.11	130.04
-25.0	46.2	21.2	60.8	43.8	22.7	.13	134.56
-24.0	46.2	21.2	60.9	43.9	22.9	.15	139.30
-23.0	46.3	21.3	61.1	44.1	23.1	.18	144.27
-22.0	46.3	21.3	61.3	44.3	23.3	.21	149.50
-21.0	46.4	21.4	61.5	44.5	23.5	.24	155.00
-20.0	46.5	21.5	61.7	44.7	23.7	.27	160.77
-19.0	46.5	21.5	61.8	44.8	23.9	.31	166.84
-18.0	46.6	21.6	62.0	45.0	24.1	.35	173.22
-17.0	46.6	21.6	62.2	45.2	24.3	.40	179.91
-16.0	46.7	21.7	62.3	45.3	24.5	.44	186.93
-15.0	46.7	21.7	62.5	45.5	24.8	.50	194.29
-14.0	46.8	21.8	62.7	45.7	25.0	.55	202.00
-13.0	46.9	21.9	62.8	45.8	25.3	.61	210.04
-12.0	46.9	21.9	63.0	46.0	25.7	.68	218.43
-11.0	47.0	22.0	63.1	46.1	26.0	.75	227.13
-10.0	47.0	22.0	63.3	46.3	26.3	.82	236.14
-9.0	47.1	22.1	63.5	46.5	26.7	.90	245.39
-8.0	47.1	22.1	63.7	46.7	27.1	.98	254.85
-7.0	47.2	22.2	63.9	46.9	27.4	1.07	264.44
-6.0	47.2	22.2	64.1	47.1	27.8	1.16	274.05
-5.0	47.2	22.2	64.3	47.3	28.2	1.25	283.56
-4.0	47.3	22.3	64.5	47.5	28.7	1.34	292.82
-3.0	47.3	22.3	64.6	47.6	29.1	1.43	301.65
-2.0	47.4	22.4	64.8	47.8	29.5	1.52	309.85
-1.0	47.4	22.4	65.0	48.0	30.0	1.61	317.21
.0	47.4	22.4	65.1	48.1	30.5	1.69	323.50
1.0	47.5	22.5	65.3	48.3	30.9	1.76	328.52
2.0	47.5	22.5	65.4	48.4	31.4	1.82	332.07
3.0	47.5	22.5	65.5	48.5	31.9	1.86	334.03
4.0	47.5	22.5	65.6	48.6	32.4	1.89	334.30
5.0	47.6	22.6	65.7	48.7	32.8	1.91	332.88
6.0	47.6	22.6	65.8	48.8	33.3	1.91	329.83
7.0	47.6	22.6	65.8	48.8	33.7	1.90	325.28
8.0	47.6	22.6	65.9	48.9	34.0	1.88	319.40
9.0	47.6	22.6	65.9	48.9	34.2	1.85	312.41

STRUCTURE TYPE 5
VERTICAL W/69KV UNDERBUILD

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE (RAIN) L50 DBA	NOISE (FAIR) L50 DBA	RADIO INTERFERENCE ¹ (RAIN) L50 DBUV/M	(FAIR) L50 DBUV/M	TVI TOTAL RAIN DBUV/M	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
10.0	47.6	22.6	66.0	49.0	34.4	1.81	304.55
11.0	47.6	22.6	66.0	49.0	34.4	1.76	296.04
12.0	47.6	22.6	66.0	49.0	34.4	1.71	287.11
13.0	47.6	22.6	65.9	48.9	34.2	1.65	277.95
14.0	47.6	22.6	65.9	48.9	34.0	1.59	268.72
15.0	47.6	22.6	65.8	48.8	33.7	1.53	259.56
16.0	47.6	22.6	65.8	48.8	33.3	1.47	250.57
17.0	47.6	22.6	65.7	48.7	32.8	1.41	241.84
18.0	47.5	22.5	65.6	48.6	32.4	1.36	233.40
19.0	47.5	22.5	65.5	48.5	31.9	1.30	225.30
20.0	47.5	22.5	65.4	48.4	31.4	1.24	217.56
21.0	47.5	22.5	65.3	48.3	30.9	1.19	210.17
22.0	47.4	22.4	65.1	48.1	30.5	1.14	203.14
23.0	47.4	22.4	65.0	48.0	30.0	1.08	196.45
24.0	47.4	22.4	64.8	47.8	29.5	1.03	190.09
25.0	47.3	22.3	64.6	47.6	29.1	.98	184.05
26.0	47.3	22.3	64.5	47.5	28.7	.94	178.29
27.0	47.2	22.2	64.3	47.3	28.2	.89	172.81
28.0	47.2	22.2	64.1	47.1	27.8	.85	167.59
29.0	47.2	22.2	63.9	46.9	27.4	.80	162.60
30.0	47.1	22.1	63.7	46.7	27.1	.76	157.84
31.0	47.1	22.1	63.5	46.5	26.7	.72	153.28
32.0	47.0	22.0	63.3	46.3	26.3	.68	148.91
33.0	47.0	22.0	63.1	46.1	26.0	.64	144.72
34.0	46.9	21.9	63.0	46.0	25.7	.60	140.69
35.0	46.9	21.9	62.8	45.8	25.3	.56	136.82
36.0	46.8	21.8	62.7	45.7	25.0	.53	133.09
37.0	46.7	21.7	62.5	45.5	24.8	.49	129.50
38.0	46.7	21.7	62.3	45.3	24.5	.46	126.03
39.0	46.6	21.6	62.2	45.2	24.3	.43	122.69
40.0	46.6	21.6	62.0	45.0	24.1	.40	119.45
41.0	46.5	21.5	61.8	44.8	23.9	.37	116.33
42.0	46.5	21.5	61.7	44.7	23.7	.34	113.31
43.0	46.4	21.4	61.5	44.5	23.5	.32	110.38
44.0	46.3	21.3	61.3	44.3	23.3	.29	107.55
45.0	46.3	21.3	61.1	44.1	23.1	.27	104.81
46.0	46.2	21.2	60.9	43.9	22.9	.24	102.16
47.0	46.2	21.2	60.8	43.8	22.7	.22	99.59
48.0	46.1	21.1	60.6	43.6	22.5	.20	97.10
49.0	46.0	21.0	60.4	43.4	22.4	.18	94.68
50.0	46.0	21.0	60.2	43.2	22.2	.16	92.34
51.0	45.9	20.9	60.0	43.0	22.0	.14	90.07
52.0	45.8	20.8	59.8	42.8	21.8	.13	87.86
53.0	45.8	20.8	59.7	42.7	21.6	.11	85.73
54.0	45.7	20.7	59.5	42.5	21.5	.10	83.65
55.0	45.7	20.7	59.3	42.3	21.3	.09	81.64
56.0	45.6	20.6	59.1	42.1	21.1	.07	79.69
57.0	45.5	20.5	58.9	41.9	21.0	.06	77.80
58.0	45.5	20.5	58.7	41.7	20.8	.05	75.96
59.0	45.4	20.4	58.5	41.5	20.7	.05	74.18
60.0	45.4	20.4	58.4	41.4	20.5	.04	72.45
61.0	45.3	20.3	58.2	41.2	20.4	.04	70.77
62.0	45.2	20.2	58.0	41.0	20.2	.04	69.14
63.0	45.2	20.2	57.8	40.8	20.1	.04	67.56
64.0	45.1	20.1	57.6	40.6	19.9	.05	66.02

STRUCTURE TYPE 5
VERTICAL W/69KV UNDERBUILD

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE		RADIO INTERFERENCE		TVI	ELECTRIC FIELD KV/M	MAGNETIC FIELD MG
	(RAIN) L50 DBA	(FAIR) L50 DBA	(RAIN) L50 DBUV/M	(FAIR) L50 DBUV/M	TOTAL RAIN DBUV/M		
65.0	45.1	20.1	57.5	40.5	19.8	.05	64.53
66.0	45.0	20.0	57.3	40.3	19.6	.06	63.08
67.0	45.0	20.0	57.1	40.1	19.5	.06	61.67
68.0	44.9	19.9	56.9	39.9	19.3	.07	60.30
69.0	44.8	19.8	56.8	39.8	19.2	.07	58.97
70.0	44.8	19.8	56.6	39.6	19.1	.08	57.68
71.0	44.7	19.7	56.4	39.4	18.9	.08	56.43
72.0	44.7	19.7	56.3	39.3	18.8	.08	55.21
73.0	44.6	19.6	56.1	39.1	18.7	.09	54.03
74.0	44.6	19.6	55.9	38.9	18.6	.09	52.88
75.0	44.5	19.5	55.7	38.7	18.4	.09	51.76
76.0	44.5	19.5	55.6	38.6	18.3	.10	50.67
77.0	44.4	19.4	55.4	38.4	18.2	.10	49.61
78.0	44.4	19.4	55.3	38.3	18.1	.10	48.59
79.0	44.3	19.3	55.1	38.1	17.9	.11	47.59
80.0	44.2	19.2	54.9	37.9	17.8	.11	46.61
81.0	44.2	19.2	54.8	37.8	17.7	.11	45.67
82.0	44.1	19.1	54.6	37.6	17.6	.11	44.75
83.0	44.1	19.1	54.5	37.5	17.5	.11	43.85
84.0	44.0	19.0	54.3	37.3	17.4	.11	42.98
85.0	44.0	19.0	54.2	37.2	17.3	.11	42.13
86.0	43.9	18.9	54.0	37.0	17.1	.12	41.31
87.0	43.9	18.9	53.8	36.8	17.0	.12	40.50
88.0	43.8	18.8	53.7	36.7	16.9	.12	39.72
89.0	43.8	18.8	53.5	36.5	16.8	.12	38.96
90.0	43.7	18.7	53.4	36.4	16.7	.12	38.22
91.0	43.7	18.7	53.3	36.3	16.6	.12	37.49
92.0	43.6	18.6	53.1	36.1	16.5	.12	36.79
93.0	43.6	18.6	53.0	36.0	16.4	.12	36.10
94.0	43.5	18.5	52.8	35.8	16.3	.12	35.44
95.0	43.5	18.5	52.7	35.7	16.2	.12	34.78
96.0	43.4	18.4	52.5	35.5	16.1	.12	34.15
97.0	43.4	18.4	52.4	35.4	16.0	.12	33.53
98.0	43.4	18.4	52.3	35.3	15.9	.12	32.93
99.0	43.3	18.3	52.1	35.1	15.8	.12	32.34

STRUCTURE TYPE 5
VERTICAL W/69KV UNDERBUILD

EMF

HARDEE POWER STATION TO VANDOLAH AND

LEE SUBSTATIONS TRANSMISSION LINE

[illegible]

C **00AMP**

Image Quality

As you review the next group of images, Please note that the original documents were of poor quality.

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COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, OZONE CONCENTRATION, GROUND GRADIENT AND MAGNETIC FIELD
230KV H-FRAME SINGLE CIRCUIT COMBINED CYCLE
1-1.545 IN. HORT CONFIG, WITH TWO GROUND WIRE PER CIRCUIT
0
242. KV

	DIST. FROM CENTER OF TOWER (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON. DIAM. (IN)	NO. OF SUBCON.	SUBCON SPACING (IN)	VOLTAGE L-N (KV)	PHASE ANGLE (DEGREES)	CORONA LOSSES (KW/MI)
PH. A-1	17.50	27.00	12.20	1.55	1.	0.00	139.70	0.00	2.816
PH. B-1	0.00	27.00	13.02	1.55	1.	0.00	139.70	-120.00	4.297
PH. C-1	-17.50	27.00	12.20	1.55	1.	0.00	139.70	120.00	2.816
GND -1	8.75	45.00	2.46	0.39	1.	0.00	0.00	0.00	0.000
GND -2	-8.75	45.00	2.46	0.39	1.	0.00	0.00	0.00	0.000

AN MICROPHONE HT. = 4.9 FT. RI ANT. HT. = 6.6 FT. TV ANT. HT. = 9.8 FT. ALTITUDE = 0.0 FT
RI FREQ = 1.000 MHz HT. = 3.0 FT. B-FIELD TRANSDUCER HT. = 3.0 FT. WIND VEL. (102) = 1.500 MPH, GROUND CONDUCTIVITY = 2.0 MMHOS / M

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE (RAIN) (FAIR) L50 DBA	RADIO INTERFERENCE (RAIN) (FAIR) L50 DBU/M	TVI TOTAL RAIN DBU/M	OZONE FOR RAIN RATE OF IN/HR AT 0. FT. LEVEL PPH	ELECTRIC FIELD KV/M	MAGNETIC FIELD GAUSS/1000AMP
0.0	3.0	66.7	9.7	0.5	1.0	0.0
2.0	3.0	66.7	9.7	0.5	1.0	0.0
4.0	3.0	66.7	9.7	0.5	1.0	0.0
6.0	3.0	66.7	9.7	0.5	1.0	0.0
8.0	3.0	66.7	9.7	0.5	1.0	0.0
10.0	3.0	66.7	9.7	0.5	1.0	0.0
12.0	3.0	66.7	9.7	0.5	1.0	0.0
14.0	3.0	66.7	9.7	0.5	1.0	0.0
16.0	3.0	66.7	9.7	0.5	1.0	0.0
18.0	3.0	66.7	9.7	0.5	1.0	0.0
20.0	3.0	66.7	9.7	0.5	1.0	0.0
22.0	3.0	66.7	9.7	0.5	1.0	0.0
24.0	3.0	66.7	9.7	0.5	1.0	0.0
26.0	3.0	66.7	9.7	0.5	1.0	0.0
28.0	3.0	66.7	9.7	0.5	1.0	0.0
30.0	3.0	66.7	9.7	0.5	1.0	0.0
32.0	3.0	66.7	9.7	0.5	1.0	0.0
34.0	3.0	66.7	9.7	0.5	1.0	0.0
36.0	3.0	66.7	9.7	0.5	1.0	0.0
38.0	3.0	66.7	9.7	0.5	1.0	0.0
40.0	3.0	66.7	9.7	0.5	1.0	0.0
42.0	3.0	66.7	9.7	0.5	1.0	0.0
44.0	3.0	66.7	9.7	0.5	1.0	0.0
46.0	3.0	66.7	9.7	0.5	1.0	0.0
48.0	3.0	66.7	9.7	0.5	1.0	0.0
50.0	3.0	66.7	9.7	0.5	1.0	0.0
52.0	3.0	66.7	9.7	0.5	1.0	0.0
54.0	3.0	66.7	9.7	0.5	1.0	0.0
56.0	3.0	66.7	9.7	0.5	1.0	0.0
58.0	3.0	66.7	9.7	0.5	1.0	0.0
60.0	3.0	66.7	9.7	0.5	1.0	0.0
62.0	3.0	66.7	9.7	0.5	1.0	0.0
64.0	3.0	66.7	9.7	0.5	1.0	0.0
66.0	3.0	66.7	9.7	0.5	1.0	0.0
68.0	3.0	66.7	9.7	0.5	1.0	0.0
70.0	3.0	66.7	9.7	0.5	1.0	0.0
72.0	3.0	66.7	9.7	0.5	1.0	0.0
74.0	3.0	66.7	9.7	0.5	1.0	0.0
76.0	3.0	66.7	9.7	0.5	1.0	0.0
78.0	3.0	66.7	9.7	0.5	1.0	0.0
80.0	3.0	66.7	9.7	0.5	1.0	0.0
82.0	3.0	66.7	9.7	0.5	1.0	0.0
84.0	3.0	66.7	9.7	0.5	1.0	0.0
86.0	3.0	66.7	9.7	0.5	1.0	0.0
88.0	3.0	66.7	9.7	0.5	1.0	0.0
90.0	3.0	66.7	9.7	0.5	1.0	0.0
92.0	3.0	66.7	9.7	0.5	1.0	0.0
94.0	3.0	66.7	9.7	0.5	1.0	0.0
96.0	3.0	66.7	9.7	0.5	1.0	0.0
98.0	3.0	66.7	9.7	0.5	1.0	0.0
100.0	3.0	66.7	9.7	0.5	1.0	0.0

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COMBINED UTILITY OF AUDIBLE NOISE, RADIO NOISE, TVI, DZONE CONCENTRATION, GROUND GRADIENT AND MAGNETIC FIELD
COMBINED CYCLE 230KV DOUBLE CIRCUIT LINES
1-1.345 IN., VERT. CONFIG, WITH ONE GROUND WIRE PER CIRCUIT 0

242. KV

	DIST. FROM CENTER OF TOWER (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON. DIAM. (IN)	NO. OF SUBCON.	SUBCON. SPACING (IN)	VOLTAGE L-N (KV)	PHASE ANGLE (DEGREES)	CORONA LOSSES (KW/MI)
PH-A-1	11.00	47.00	12.96	1.55	1	0.00	139.70	0.00	4.175
PH-B-1	11.00	37.00	14.33	1.55	1	0.00	139.70	-120.00	8.017
PH-C-1	11.00	27.00	15.19	1.55	1	0.00	139.70	120.00	4.681
PH-B-2	-11.00	47.00	13.96	1.55	1	0.00	139.70	0.00	4.175
PH-A-2	-11.00	37.00	14.33	1.55	1	0.00	139.70	-120.00	8.017
PH-C-2	-11.00	27.00	15.19	1.55	1	0.00	139.70	120.00	4.681
GND	-4.00	63.00	5.95	0.39	1	0.00	0.00	0.00	0.000
GND	-4.00	63.00	5.95	0.39	1	0.00	0.00	0.00	0.000

AN MICROPHONE HT. = 4.9 FT. RI ANT. HT. = 6.6 FT. TV ANT. HT. = 9.8 FT. ALTITUDE = 0.0 FT.
RI FREQ = 1.000 MHZ. TV FREQ = 75.000 MHZ. WIND VEL. = 1.500 MPH, GROUND CONDUCTIVITY = 2.0 MMHOS / M
E-FIELD TRANSDUCER HT. = 3.0 FT, B-FIELD TRANSDUCER HT. = 3.0 FT

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE (FMIN) (FAIR) LSO DAA	RADIO INTERFERENCE (RAIN) (FAIR) LSO DAA	TVI TOTAL RAIN DBUV/M	FOR RAIN RATE OF IN/HR AT 0. FT LEVEL PPH	ELECTRIC FIELD KV/M	MAGNETIC FIELD GAUSS/1000AMP
0.0	50.0	66.6	49.0	0.0597777	4.167	0.14916
2.0	50.0	67.2	50.0	0.1052336	4.126	0.14923
4.0	50.0	67.2	50.0	0.154068	4.077	0.15002
6.0	50.0	67.2	50.0	0.201018	4.026	0.15024
8.0	50.0	67.2	50.0	0.242962	3.986	0.15055
10.0	50.0	67.2	50.0	0.278550	3.946	0.14923
12.0	50.0	67.2	50.0	0.307587	3.905	0.14762
14.0	50.0	67.2	50.0	0.330519	3.866	0.14518
16.0	50.0	67.2	50.0	0.348195	3.827	0.14177
18.0	50.0	67.2	50.0	0.360323	3.789	0.13783
20.0	50.0	67.2	50.0	0.367366	3.753	0.13307
22.0	50.0	67.2	50.0	0.369221	3.718	0.12757
24.0	50.0	67.2	50.0	0.365941	3.684	0.12126
26.0	50.0	67.2	50.0	0.357594	3.650	0.11563
28.0	50.0	67.2	50.0	0.344227	3.616	0.11001
30.0	50.0	67.2	50.0	0.325791	3.583	0.10447
32.0	50.0	67.2	50.0	0.302221	3.550	0.09896
34.0	50.0	67.2	50.0	0.274601	3.518	0.09347
36.0	50.0	67.2	50.0	0.242882	3.486	0.08799
38.0	50.0	67.2	50.0	0.207105	3.454	0.08247
40.0	50.0	67.2	50.0	0.167288	3.422	0.07696
42.0	50.0	67.2	50.0	0.123288	3.390	0.07146
44.0	50.0	67.2	50.0	0.075105	3.358	0.06596
46.0	50.0	67.2	50.0	0.022882	3.326	0.06045
48.0	50.0	67.2	50.0	0.000000	3.294	0.05495
50.0	50.0	67.2	50.0	0.000000	3.262	0.04945
52.0	50.0	67.2	50.0	0.000000	3.230	0.04395
54.0	50.0	67.2	50.0	0.000000	3.198	0.03845
56.0	50.0	67.2	50.0	0.000000	3.166	0.03295
58.0	50.0	67.2	50.0	0.000000	3.134	0.02745
60.0	50.0	67.2	50.0	0.000000	3.102	0.02195
62.0	50.0	67.2	50.0	0.000000	3.070	0.01645
64.0	50.0	67.2	50.0	0.000000	3.038	0.01095
66.0	50.0	67.2	50.0	0.000000	3.006	0.00545
68.0	50.0	67.2	50.0	0.000000	2.974	0.00000
70.0	50.0	67.2	50.0	0.000000	2.942	0.00000
72.0	50.0	67.2	50.0	0.000000	2.910	0.00000
74.0	50.0	67.2	50.0	0.000000	2.878	0.00000
76.0	50.0	67.2	50.0	0.000000	2.846	0.00000
78.0	50.0	67.2	50.0	0.000000	2.814	0.00000
80.0	50.0	67.2	50.0	0.000000	2.782	0.00000
82.0	50.0	67.2	50.0	0.000000	2.750	0.00000
84.0	50.0	67.2	50.0	0.000000	2.718	0.00000
86.0	50.0	67.2	50.0	0.000000	2.686	0.00000
88.0	50.0	67.2	50.0	0.000000	2.654	0.00000
90.0	50.0	67.2	50.0	0.000000	2.622	0.00000
92.0	50.0	67.2	50.0	0.000000	2.590	0.00000
94.0	50.0	67.2	50.0	0.000000	2.558	0.00000
96.0	50.0	67.2	50.0	0.000000	2.526	0.00000
98.0	50.0	67.2	50.0	0.000000	2.494	0.00000
100.0	50.0	67.2	50.0	0.000000	2.462	0.00000

 * U. P. A. *
 * F I E L D *
 * E F F E C T S *
 * C O R O N A *
 * A N D *
 * P R O G R A M *

+++++
 + INPUT DATA LIST +
 +++++

+++++
 + COMBINED CYCLE 230KV SINGLE CIRCUIT DELTA WIRE PER CIRCUIT 0
 + 1-1.535 IN., DELT.CONFIG, WITH ONE GROUND 1.50
 + 1 3 4 242.0 1.00
 +++++

(ENGLISH UNITS OPTION)

LINE GRADIENTS COMPUTED BY PROGRAM

PHYSICAL SYSTEM CONSISTS OF 4 CONDUCTORS, WHICH 3 ARE ENERGIZED PHASES

COND	RF	02	RI	EF	TV	AN	CL	1.000	75.000	3.000	2.000	3.0
+ 4.921	6.562	11.00	9.342	47.00	0.000	1	1.55	0.00	0.00	139.7	0.0	0.00
+ PH. A-1	11.00	-11.00	37.00	0.00	1	1.55	0.00	0.00	139.7	-120.0	0.00	
+ PH. B-1	11.00	11.00	27.00	0.00	1	1.55	0.00	0.00	139.7	120.0	0.00	
+ PH. C-1	4.00	4.00	63.00	0.00	1	6.39	0.00	0.00	0.00	0.00	0.00	
+ GND	50	0.0	0.0	2.0	0.0							

COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, OZONE CONCENTRATION, GROUND GRADIENT AND MAGNETIC FIELD
CONTAINED CYCLE 230KV SINGLE CIRCUIT DELTA
1-1.565 IN., DELT.CONFIG, WITH ONE GROUND WIRE PER CIRCUIT
0

242. KV

	DIST. FROM CENTER OF TOWER (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON. DIAM. (IN)	NO. OF SUBCON.	SUBCON SPACING (IN)	VOLTAGE L-N (KV)	PHASE ANGLE (DEGREES)	CORONA LOSSES (KW/MI)
PH. A-1	11.00	47.00	12.26	1.55	1:	0.00	139.70	0.00	2.914
PH. B-1	-11.00	37.00	12.00	1.55	1:	0.00	139.70	-120.00	2.525
PH. C-1	11.00	27.00	4.37	1.55	1:	0.00	139.70	0.00	3.411
GND	4.00	63.00	0.39	0.39	1:	0.00	0.00	0.00	0.000

AN MICROPHONE HT. = 4.9 FT. ANTI. HT. = 6.6 FT. TV ANTI. HT. = 9.3 FT. ALTITUDE = 0.0 FT
RI FREQ = 1.000 MHZ RI FREQ = 3.0 FT, B-FIELD TRANSDUCER HT. = 3.0 FT
E-FIELD TRANSDUCER HT. = 3.0 FT

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE (RAIN) (FAIR) L50 DBA	RADIO INTERFERENCE (RAIN) (FAIR) L50 DBUV/M	TVI TOTAL RAIN DBUV/M	OZONE FOR RAIN AT 1.00 IN/HR PPB	ELECTRIC FIELD KV/M	MAGNETIC FIELD GAUSS/1000AMP
0.00	16.8	62.7	45.7	20.8	0.002547	0.145774
2.00	16.9	63.0	47.0	21.6	0.002670	0.147611
4.00	17.0	64.0	47.7	21.9	0.002778	0.148561
6.00	17.0	64.7	47.7	22.0	0.002808	0.148561
8.00	17.0	64.7	47.7	22.0	0.002836	0.148561
10.00	17.0	64.7	47.7	22.0	0.002860	0.148561
12.00	17.0	64.7	47.7	22.0	0.002884	0.148561
14.00	17.0	64.7	47.7	22.0	0.002908	0.148561
16.00	17.0	64.7	47.7	22.0	0.002932	0.148561
18.00	17.0	64.7	47.7	22.0	0.002956	0.148561
20.00	17.0	64.7	47.7	22.0	0.002980	0.148561
22.00	17.0	64.7	47.7	22.0	0.003004	0.148561
24.00	17.0	64.7	47.7	22.0	0.003028	0.148561
26.00	17.0	64.7	47.7	22.0	0.003052	0.148561
28.00	17.0	64.7	47.7	22.0	0.003076	0.148561
30.00	17.0	64.7	47.7	22.0	0.003100	0.148561
32.00	17.0	64.7	47.7	22.0	0.003124	0.148561
34.00	17.0	64.7	47.7	22.0	0.003148	0.148561
36.00	17.0	64.7	47.7	22.0	0.003172	0.148561
38.00	17.0	64.7	47.7	22.0	0.003196	0.148561
40.00	17.0	64.7	47.7	22.0	0.003220	0.148561
42.00	17.0	64.7	47.7	22.0	0.003244	0.148561
44.00	17.0	64.7	47.7	22.0	0.003268	0.148561
46.00	17.0	64.7	47.7	22.0	0.003292	0.148561
48.00	17.0	64.7	47.7	22.0	0.003316	0.148561
50.00	17.0	64.7	47.7	22.0	0.003340	0.148561
52.00	17.0	64.7	47.7	22.0	0.003364	0.148561
54.00	17.0	64.7	47.7	22.0	0.003388	0.148561
56.00	17.0	64.7	47.7	22.0	0.003412	0.148561
58.00	17.0	64.7	47.7	22.0	0.003436	0.148561
60.00	17.0	64.7	47.7	22.0	0.003460	0.148561
62.00	17.0	64.7	47.7	22.0	0.003484	0.148561
64.00	17.0	64.7	47.7	22.0	0.003508	0.148561
66.00	17.0	64.7	47.7	22.0	0.003532	0.148561
68.00	17.0	64.7	47.7	22.0	0.003556	0.148561
70.00	17.0	64.7	47.7	22.0	0.003580	0.148561
72.00	17.0	64.7	47.7	22.0	0.003604	0.148561
74.00	17.0	64.7	47.7	22.0	0.003628	0.148561
76.00	17.0	64.7	47.7	22.0	0.003652	0.148561
78.00	17.0	64.7	47.7	22.0	0.003676	0.148561
80.00	17.0	64.7	47.7	22.0	0.003700	0.148561
82.00	17.0	64.7	47.7	22.0	0.003724	0.148561
84.00	17.0	64.7	47.7	22.0	0.003748	0.148561
86.00	17.0	64.7	47.7	22.0	0.003772	0.148561
88.00	17.0	64.7	47.7	22.0	0.003796	0.148561
90.00	17.0	64.7	47.7	22.0	0.003820	0.148561
92.00	17.0	64.7	47.7	22.0	0.003844	0.148561
94.00	17.0	64.7	47.7	22.0	0.003868	0.148561
96.00	17.0	64.7	47.7	22.0	0.003892	0.148561
98.00	17.0	64.7	47.7	22.0	0.003916	0.148561
100.00	17.0	64.7	47.7	22.0	0.003940	0.148561

the transmission line routing is sensitive to adjacent land uses and therefore is consistent with the Comprehensive Plan.

LEE COUNTY

Approximately 8 km (5 miles) of the corridor in Lee County will pass through areas designated as open land with the remaining approximately 4.8 km (3 miles) passing through central urban land as designated by the Lee County Future Land Use Plan Map. Crossing through central urban designated land was unavoidable due to urban development in the area immediately surrounding the Lee Substation. The route selected for the corridor in Lee County was designed to minimize crossing into urban designated areas to the fullest extent possible.

The electric power element of Lee County's Comprehensive Plan provides, in part, as follows:

- o GOAL VII.S

To assist the electric power utilities in achieving their objective(s) of providing "... an adequate and reliable electric power supply for its customers as economically as possible with due regard to environmental and other established guidelines and policies."

- o OBJECTIVE VII.S.1

To protect local land uses and environmental quality from the impacts of electric power facilities through reasonable standards of design and construction.

- o POLICY VII.S.1

Insofar as it lies within its regulatory authority, the county shall ensure that sufficient land is available for the erection of electric power facilities.

o POLICY VII.S.2

Where conflict or incompatibility occur between power facilities and adjacent land uses, the County shall require that compatible design criteria, landscaping and buffering be invoked to protect those adjacent land uses.

o POLICY VII.S.3

The County shall encourage that power line easements or ROWs be designed for multiple use consistent with the type of area; e.g., recreation and transportation in urban areas and wildlife management or recreation in non-urban areas, if feasible and safe.

o POLICY VII.S.4

The County shall require that in the non-urban areas, power line easements shall be designed so that:

- service trails will not impede or divert surface water flow; and
- secondary land uses, including recreation, agriculture, and wildlife management, will not be unnecessarily inhibited or prohibited.

o POLICY VII.S.5

The County shall maintain a cooperative program of information exchange with the local electric utilities.

The transmission line corridor routing in Lee County will be duly sensitive to all relevant goals, objectives, and policies of the Lee County Comprehensive Plan, and will be consistent with the Comprehensive Plan.

The transmission line qualifies as an "essential service" under Section 1001.13 of the Lee County Zoning Ordinance. As such, the transmission line and related appurtenances "are permitted by right in all zoning districts when necessary for the day-to-day operation of the service," subject to enumerated requirements pertaining to setbacks, visibility, location, and

compliance with the National Electrical Safety Code (See Lee County Zoning Ordinance, 516B).

CITY OF CAPE CORAL

Approximately 5.3 km (3.2 miles) of the transmission line corridor will pass through the northernmost portion of the City of Cape Coral. Review of the Cape Coral Future Land Use Map reflects that approximately 2 km (1.2 miles) of the corridor will pass through an area designated for single family residential usage. Approximately 1.6 km (1 mile) of corridor will traverse an area designated for mixed use, and another 1.6 km (1 mile) through an area classified for parks/recreation utilization.

The Cape Coral Comprehensive Plan contains no specific restriction on transmission lines. Because the proposed transmission line corridor planning approach is sensitive to adjacent land uses and ecological features, it is consistent and in compliance with the City of Cape Coral Comprehensive Plan.

The transmission line constitutes a "public service structure" as that term is defined under the City of Cape Coral Land Use and Development Regulations, and is listed as a "special exception use" under one or more of the zoning districts that it will traverse. Special exception uses are described in Article XI of the City of Cape Coral Zoning Ordinance as uses that are "essential to or would promote the public health, safety, or welfare in one or more districts," but require conditions in order to avoid impairment of the integrity and character of the area. The transmission line corridor is consistent with and will comply with all appropriate conditions.

6.1.7.2.3 Easements, Title, Agency Works

Easements will be required for the transmission line corridor to cross lands under the jurisdiction of the Board of Trustees of the Internal Improvement Trust Fund. A list of roads, canals, and railroads within the preferred corridor between the Hardee Power Station and the Lee Substation which will be crossed is presented in Table 6.1.7-1.

Table 6.1.7-1. Easements, Title, Crossing Approvals Normally Required for Transmission Line Construction in the Preferred Corridor Between the Hardee Power Station and Vandolah and Lee Substations

Facility	Corridor	Affected Agency	Previous Approval	Changes
<u>Roads</u>				
CR 663	C2	Hardee County	Utility Permit	None
SR 63	C2	FDOT	Utility Permit	None
SR 70	C2	FDOT	Utility Permit	None
SR 72	C2	FDOT	Utility Permit	None
CR 661	C2	Hardee County	Utility Permit	None
CR 661	C2	DeSoto County	Utility Permit	None
US Hwy 17	C3	FDOT	Utility Permit	None
SR 35	C3	FDOT	Utility Permit	None
Reynolds Street	C3	DeSoto County	Utility Permit	None
CR 760A	C3	DeSoto County	Utility Permit	None
CR 74	C3	Charlotte County	Utility Permit	None
I-75	C3	FDOT	Utility Permit	None
US Hwy 41	C3	FDOT	Utility Permit	None
(Tamiami Trail)				
Andalusia Boulevard	C3	Cape Coral	Utility Permit	None
Jacaranda Parkway	C3	Cape Coral	Utility Permit	None
<u>Canals</u>				
Gator Slough Canal	C3	South Florida Water Management District	Utility Permit	None
<u>Railroads</u>				
Seaboard Coastline	C2,C3	FDOT	Utility Permit	None

Note: C2 - Hardee Power Station to Vandolah Substation
C3 - Vandolah Substation South to Lee Substation

6.1.7.2.4 Vicinity Scenic, Cultural, and Natural Landmarks

As identified in Section 6.1.7.2.1, two state resource areas will be crossed by the proposed transmission line corridor from the Hardee Power Station to Vandolah and Lee Substations. The transmission line corridor will follow along the northwest boundary of the Cecil M. Webb Wildlife Management Area Charlotte County. This state-owned tract is managed by the FGFWFC with four goals: 1) "To manage for healthy and productive wildlife and plant communities"; 2) "To provide public hunting, fishing and other compatible outdoor activities"; 3) "To manage all natural resources in an efficient, productive manner which is compatible with wildlife management practices"; and 4) "To manage real estate in a manner that is productive but still maintains the integrity and purpose of the area" (FGFWFC, 1982). Quail hunting is the focus of the area's management program.

An existing Florida Power and Light Transmission line runs northwest to southeast across the western part of the wildlife management area. However, FGFWFC is very concerned about any potential habitat fragmentation or management complications that might arise from additional corridors across the area. DNR's Division of State Lands has prepared a policy statement on "Incompatible Use of Natural Resource Lands". This document, dated August 9, 1988 (Mallison, 1989), states that uses other than those for which an area is intended may be permitted if 1) the use is in the public interest; 2) it is not incompatible with the primary purpose for which the lands were acquired; 3) there is no practicable alternative; and 4) the project will provide a net positive benefit to the lands on which it is located.

The section of the corridor routed along the Cecil M. Webb Wildlife Management Area northwestern boundary was done so to minimize impacting developed areas to the west. The corridor was specifically routed along the boundary of the Wildlife Management Area in a region that was previously impacted. Impacts to the Wildlife Management Area as a result of the proposed Vandolah to Lee Substation corridor will be minimal based on results of a site specific habitat study in the corridor area.

The transmission line corridor will also cross the Peace River Canoe Trail west of Arcadia in DeSoto County. This state designated trail covers 67 miles from its start in Fort Meade at the U.S. Highway 98 bridge to its termination where the river ends at Charlotte Harbor. The corridor will cross the canoe trail at approximately the same location as the existing SR 70 bridge immediately west of the City of Arcadia. No additional bridges will be constructed in association with the corridor. Adequate vertical clearance will be maintained between the river and the transmission lines. The transmission line will span the river without the use of any structures within the canoe trail.

No other regional scenic, cultural and natural landmarks which could be impacted by the transmission line are known to exist within 0.8 km (0.5 mile) of the corridor.

6.1.7.2.5 Archaeological and Historical Sites

DHR was contacted to determine whether any archaeological or historic sites listed or eligible for listing in the National Register of Historic Places, or otherwise of national, state, or local significance might be affected by the proposed 230 kV transmission line corridor between the Hardee Power Station and the Vandolah and Lee Substations. A set of USGS quadrangle maps (1:24,000) and a set of 1984 Mark Hurd aerial photographs (1:24,000) showing the locations of the corridor were reviewed by the DHR personnel. Known sites and potential historical and archaeological site locations within the corridor were identified by the DHR staff.

Seven known sites exist in or partially within the Hardee Power Station to Vandolah and Lee corridors (Table 6.1.7-2). These sites are located in areas previously surveyed by archaeologists. However, only one is considered significant. The significant site is 8-Hr-17, the Ona Mound site, a mound located in the SW 1/4 of the NE 1/4 of the NW 1/4 of Section 29, Township 33 South, Range 24 East. Another site, 8-Hr-13, the Sawmill site, was not considered significant, but should be considered potentially significant if impacted by the ROW. This site is located in the NW 1/4 of the NE 1/4 of the SE 1/4 of Section 7, Township 33 South, Range 24 East.

Table 6.1.7-2. Archaeological and Historic Sites Within the Preferred Transmission Line Corridor Between the Hardee Power Station and the Vandolah and Lee Substations

Site	Name	Significance	Reference
8-Hr-6	Aboriginal Site #2	No	Milanich, J.T., R.A. Marrinan and C. Martinez. 1975
8-Hr-13	Sawmill Site	No*	Wood, L.N. 1976
8-Hr-14	Terri's Site	No*	Wood, L.N. 1976
8-Hr-17	Ona Road Mound	Yes	Wood, L.N. 1976
8-Hr-20	Green Meadow Site	No	Wood, L.N. 1976
8-Hr-55	Aboriginal Site #3	No	Willis, R.F. and Milanich, J.T. 1977
8-De-392	Fletcher Road Site	No	Ballo, G. 1988

* Should be reevaluated.

Archaeologically sensitive areas were also identified by the DHR in the corridors. Recommendations as to how these sensitive areas should be dealt with are contained in the April 4, 1989 letter from the DHR (see Appendix 11.3).

6.1.7.3 Bio-Physical Environment of the Corridor Area

6.1.7.3.1 Land Use/Vegetation

Existing land use and vegetation cover within 0.8 km (0.5 mile) and vegetation cover within 0.4 km (0.25 mile) from the edge of the Hardee Power Station to Vandolah and Lee corridors (see Figure 6.1.7-3 in Appendix 11.10) were determined using USGS 1:24,000 topographic quadrangle maps alongside recent aerial photographs at the same scale. Generalized 1985 Land Use Maps prepared by the COE for the SWFWMD were also examined. Helicopter flights and ground inspections were used to clarify interpretations. The maps have been prepared according to the FLUCCS (FDOT, 1985). Aerial photographs at a scale of 1:24,000 depicting the preferred corridors between the Hardee Power Station and Vandolah and Lee Substations are included in Appendix 11.9.

To adapt the FLUCCS codes to best reflect meaningful aerial interpretation of the actual vegetation of the corridor, the following conventions were consistently used:

Code 411, Pine Flatwoods, was used to include a wide variety of flatwoods from seasonally flooded slash pine systems to xeric longleaf communities with many scrub and sandhill species in the understory. Pines are so sparse in many of these areas that they might be considered dry prairies. Most of this land has been clearly impacted by grazing and associated cattle management activities and could be coded as 310, 320, or 320 rangeland.

Code 427, Live Oak, includes all xeric to mesic oak dominated forests, including those sometimes classified as 432, Sand Live Oak. Some of these forests are apparently recently overgrown remnants of scrub, flatwoods, or sandhill communities and include a number of species typical of these associations. Others grade into riverine forests through subtle xeric to hydric transitions not obvious from the canopy cover.

Code 643, Wet Prairie, was used for all herbaceous wetlands, many of which included some deeper areas that could be categorized as 641, Freshwater Marsh. Wet prairies grade very subtly into dry prairies in this region. The areas mapped as 643 probably include substantial areas which would not be legally delineated as wetlands.

Code 616, Cypress Ponds and Sloughs, was used for the few examples of cypress-dominated wetlands. Code 429, Wax Myrtle - Willow, was applied to all shrub swamps. Buttonbush and other shrubs are also common in some of these areas, and, especially in the phosphate region, many of these sites are tangled thickets with a number of other weedy shrubs and vines. Mesic to hydric hardwoods clearly associated with a stream were coded 615, Stream and Lake Swamp (Bottomland). The remaining wooded wetlands were coded 630, Wetland Forested Mixed. They include some ecotonal hydric to mesic hardwoods as well as a few sites that might have appropriate species composition for characterization as 611, Bay Swamp.

LAND USE

For the most part, land along the corridor is undeveloped. The segment of the corridor from the Hardee Power Station to the Vandolah Substation passes through citrus groves and the unincorporated communities of Ft. Green and Ft. Green Springs for the first 3.2 km (2 miles) south of the site. Between Ft. Green Springs and the Vandolah substation site the land is generally undeveloped with the exception of the CSX railroad corridor along which this segment is located.

Between the Vandolah and Lee Substations, the corridor follows the railroad ROW in a southeasterly direction through undeveloped land until it reaches the unincorporated community of Ona, at which point the corridor jogs to the west to avoid that residential area. South of Ona the corridor runs through about 3.2 km (2 miles) of undeveloped land and 6.4 km (4 miles) of citrus groves. A short undeveloped area is then crossed before the line leaves the railroad ROW to avoid the unincorporated community of Limestone. South of Limestone the transmission line no longer follows the railroad but passes through occasional groves till it reaches the wetlands associated

with the Peace River. The line crosses the Peace River adjacent to the CR 70 bridge and then heads south along the western border of the City of Arcadia. After Arcadia, the land is once again undeveloped until the line reaches Nocatee, about 4.8 km (3 miles) southeast of Arcadia. From Nocatee, the corridor heads south through citrus groves along the community's eastern border. Between Nocatee and the point where the corridor crosses I-75, the land is predominantly undeveloped. The corridor runs along portions of the north and west boundary of the Cecil M. Webb Wildlife Management Area. The corridor crosses I-75 and SR 41 east of Punta Gorda. After crossing SR 41, the line heads south, crossing about 9.6 km (6 miles) of undeveloped land until it reaches North Fort Myers. At this point the line passes adjacent to a sparsely developed residential area and several parcels containing streets but very few other structures in the City of Cape Coral, before arriving at the Lee Substation.

VEGETATION

Going from north to south, the proposed corridor passes from heavily mined phosphate lands into a region dominated by prairie and flatwoods rangeland with occasional small isolated marshes and ponds. Live oak hammocks and wetland forests occur in small patches and along streams. There is a substantial area of open scrublike pine-oak forest south of Arcadia.

Most of the vegetation in the proposed corridor has been disturbed. Farming, phosphate mining, and other land clearing activities have eliminated the original vegetation from many sites. Practically all the forested communities have been cut over to some extent. Open range practices have exposed the whole region to grazing in the past and most of it is still used as pasture. Roads, clearings, and customary fire management interfere with the natural burning processes essential to native ecosystem maintenance.

The major natural communities are pine flatwoods and prairies, with a full range of hydric, mesic, and xeric types represented. There are areas of flatwoods and xeric hammock with many shrubs and some scrub species, but no sizeable tracts of classic scrub. Occasional hammocks range from hydric to

xeric in character. Marshes are the primary wetland type. Floodplain communities occur along other streams.

Hammocks are relatively fire-intolerant hardwood forests. In the study area they are usually dominated by live oak (Quercus virginiana), sand live oak (Q. geminata), laurel oak (Q. hemisphaerica), and cabbage palm (Sabal palmetto). Water oak (Q. nigra), sweetgum (Liquidambar styraciflua), and sugarberry (Celtis laevigata) are also common.

Flatwoods usually occur on low-lying, level lands with a high water table and, consequently, a hardpan layer within a few feet of the soil surface. Slash pine (Pinus elliotii) is usually the dominant species in these stands of scattered pines, but longleaf (Pinus palustris) occurs on many sites in the corridor area. Natural flatwoods have a very diverse grassy understory dominated by wiregrass (Aristida stricta) but most of those in the corridor have been subjected to repeated artificial winter burning and thus have a dense thicket of saw palmetto (Serenoa repens) beneath the pines. Treeless prairies typically support the same wiregrass/palmetto groundcover community as pine flatwoods with similar hydrological conditions.

Scrub communities are shrubby thickets and/or sand pine (Pinus clausa) forests adapted to catastrophic fires at less frequent intervals. The typical shrubs include sand live oak (Q. geminata), scrub oak (Q. inopina), Chapman's oak (Q. chapmanii), myrtle oak (Q. myrtifolia), rosemary (Ceratiola ericoides), fetterbush (Lyonia ferruginea), and other leathery-leaved species. The forest floor is usually white sand with patches of deer moss (Cladonia spp.), prickly pear (Opuntia humifusa), and occasional grasses and forbs. There are only a few tiny patches of clearly defined scrub in the corridor, but there are several substantial areas of xeric flatwoods with admixtures of scrub and sandhill species including turkey oak (Q. laevis) and bluejack oak (Q. incana).

Red maple (Acer rubrum), sweetbay Magnolia virginiana), loblolly bay (Gordonia lasianthus), swamp bay (Persea palustris), dahoon holly (Ilex cassine), sweetgum (Liquidambar styraciflua), and cypress (Taxodium

distichum and T. ascendens) are the most common wetland forest species. Was myrtle (Myrica cerifera) coastal plain willow (Salix caroliniana) and button bush (Cephalanthus occidentalis) are disturbed wetlands.

Where fires occur too often for trees to become established, marshes are the wetland vegetation. These are typically composed of herbaceous emergents like maidencane (Panicum hemitomon), bulltongue sagittaria (Sagittaria lancifolia), and pickerel weed (Pontederia cordata). These communities may grow on either organic or mineral soils, though the latter are usually termed wet prairies.

6.1.7.3.2 Affected Water and Wetlands

The area between the Hardee Power Station and the Vandolah and Lee Substations contains various scattered water bodies and wetland areas. Any corridor located in this area of Florida state is likely to traverse through some water bodies and wetlands.

Water bodies crossed by these corridors are listed in Table 6.1.7-3. All water bodies encountered within the corridor can be spanned without the need for placing supporting structures within the water bodies. No bridge construction will be required for the associated access road. The potential impact of the transmission line on water bodies will be minimal, since the width of the final ROW selected within the corridor will be considerably less than the 0.8-km (0.5-mile) corridor. Most of the wetlands located in the corridor are small and isolated and efforts will be made to avoid wetland areas during selection of the ROW.

The section of corridor between the Hardee Power Station and the Vandolah Substation crosses three water bodies; Payne Creek, Little Payne Creek and Shirttail Branch. All are relatively small creeks and are classified as Class III surface water by Chapter 17-3 F.A.C. Several small unnamed drainage areas are also located in this section of the corridor.

The section of corridor between Vandolah Substation and Lee Substation crosses six creeks, Gator Slough Canal and the Peace River. The corridor

Table 6.1.7-3. Water Bodies Within Preferred and Alternative Corridors Between the Hardee Power Station and Vandolah and Lee Substations

Waterbody	Receiving Water	Corridor	Comments
Payne Creek	Peace River	C2	South of Ft. Green
Little Payne Creek	Peace River	C2	South of Ft. Green
Shirttail Branch	Payne Creek	C2	At Ft. Green Springs
Unnamed Drainages	Unknown	C2,C3	Various Small Drainages Along Corridor
Oak Creek	Peace River	C3	South of Ona
Limestone Creek	Peace River	C3	South of Limestone
Peace River	Gulf of Mexico	C3	West of Arcadia
Joshua Creek	Peace River	C3	Two Miles South of Arcadia
Prairie Creek	Peace River	C3	DeSoto/Charlotte County Line
Shell Creek		C3	One Mile North of Highway 74
South Prong Alligator Creek		C3	Near Tuckers Grade Interchange
Gator Slough Canal	Gulf of Mexico	C3	North of Cape Coral in Lee County

C2 - Hardee Power Station to Vandolah Station

C3 - Vandolah Substation to Lee Substation

crosses Oak Creek south of the community of Ona, and crosses Limestone Creek south of the community of Limestone. Both creeks are classified as Class III Surface Waters by Chapter 17-3 F.A.C. and are relatively narrow where crossed by the corridor. The corridor crosses the Peace River immediately west of Arcadia adjacent to the crossing of Highway 70. Crossing of the Peace River could not be reasonably avoided due to the location of the river relative to the substations. The corridor was designed to allow crossing of the Peace River at a location with an existing facility crossing. This will minimize potential visual impacts to the river and surrounding area and will eliminate the need for bridge and access road construction. The Peace River is classified as a Class III Surface Water by Chapter 17-3 F.A.C.

Continuing south of the Peace River, the corridor crosses Joshua Creek approximately 3.2 km (2 miles) south of Arcadia, Prairie Creek near the DeSoto-Charlotte County line and Shell Creek 1.6 km (1 mile) north of Highway 74 in Charlotte County. Joshua Creek is classified as a Class III Surface Water by Chapter 17-3 F.A.C. Shell Creek and Prairie Creek are classified as Class I Surface Waters. The corridor crosses the South Prong of Alligator Creek near the western boundary of Cecil M. Webb Wildlife Management Area. This water body is classified as a Class I Surface Water by Chapter 17-3 F.A.C. Finally, in Lee County, the corridor crosses Gator Slough Canal just north of the city of Cape Coral. This water body is primarily a man-made drainage canal which may have originated as a natural drainage area. Gator Slough Canal is classified as a Class III Surface Water by Chapter 17-3 F.A.C.

The corridor contains some isolated wetlands, many of which are less than 0.4 km (0.25 mile) in diameter and could therefore be spanned by the transmission line. The corridor location was selected to minimize impacts to wetlands.

6.1.7.3.3 Ecology

This section discusses species which are designated as endangered, threatened, or species of special concern by the USFWS or the FGFWFC and which, based on a literature survey and consultations with state, regional, and local agencies, are known or expected to occur in or near the proposed transmission corridor between the Hardee Power Station and Vandolah and Lee Substations. The species addressed may occur as residents, migrants, or transients. The lists of plant and animal species (Tables 6.1.7-4 and 6.1.7-5) which are discussed in the following sections were prepared in consultation with FGFWFC and FNAI.

The probability of occurrence for threatened, endangered, and species of special concern within the corridor was based on known locations (e.g., red-cockaded woodpecker colonies, wading bird rookeries), recent and historical reports, and information in the scientific literature, and discussions with biologists familiar with the region. Locations of known occurrences of these species and habitat features critical to their survival within 457 m (1,500 ft) of the corridor are depicted in Figure 6.1.7-4.

PLANT SPECIES

No genuinely rare plant species have been reported within the proposed transmission corridor and very few have been documented nearby. There have not been many botanical surveys of the region, however. Habitat information suggests that some moderately rare species might occur in wet pinelands, hammocks, or scrubby flatwoods in this general area.

Scrub-like open xeric habitats might possibly support scrub holly, Curtiss' milkweed, Ashe's savory, scrub milkwort, Florida beardgrass, nodding pinweed, wild coco, and/or sand butterfly pea. Scientific names and federal and state statuses of these species are given in Table 6.1.7-4. Scrub milkwort is the only one of these plant species that is more than moderately rare.

White squirrel banana and Florida beargrass have recently been found in dry flatwoods along Burnt Store Road a few miles west of the corridor. These

Table 6.1.7-4. Protected Rare Plant Species Potentially Present within Five Miles of Proposed Transmission Line Corridor Between the Hardee Power Station and the Vandolah and Lee Substations

Common Name	Scientific Name	Status	
		USFWS*	FDA**
Curtiss' milkweed	<u>Asclepias curtissii</u>		T
Ashe's savory	<u>Calamintha ashei</u>	UR1	T
Sand butterfly pea	<u>Centrosema arenicola</u>	UR5	
White squirrel banana	<u>Deeringothamnus pulchellus</u>	E	E
Spoon-leaved sundew	<u>Drosera intermedia</u>		T
Florida beardgrass	<u>Gymnopogon floridanus</u>	UR2	
Water spider orchid	<u>Habenaria repens</u>		T
Hartwrightia	<u>Hartwrightia floridana</u>	UR2	T
Edison's ascyrum	<u>Hypericum edsonianum</u>	UR1	T
Scrub holly	<u>Ilex opaca</u> var. <u>arenicola</u>	UR5	
Thick-leaved water-willow	<u>Justicia crassifolia</u>	UR2	
Nodding pinweed	<u>Lechea cernua</u>	UR2	
Florida beargrass	<u>Nolina atopocarpa</u>	UR2	E
Serpent fern	<u>Phlebodium aureum</u>		T
Scrub milkwort	<u>Polygala lewtonii</u>	UR1	E
Wild coco	<u>Pteroglossapis ecristata</u>	UR2	T
Banded wild pine	<u>Tillandsia flexuosa</u>		T
Red needleleaf airplant	<u>Tillandsia setacea</u>		T
Shoestring fern	<u>Vittaria lineata</u>		T
Rain lily	<u>Zephyranthes simpsonii</u>	UR5	E

Note: E - Endangered

T - Threatened

UR1 - Under review for listing, with substantial evidence indicating some degree of biological vulnerability and/or threat

UR2 - Under review for listing, but substantial evidence of biological vulnerability and/or threat is lacking

UR5 - Still formally under review, but no longer considered a likely candidate for listing because recent information indicates species is more widespread or abundant than previously believed

* USFWS - U.S. Fish and Wildlife Service

** FDA - Florida Department of Agriculture

Table 6.1.7-5. Protected Rare Animal Species Potentially Present within Five Miles of Proposed Transmission Line Corridor Between the Hardee Power Station and the Vandolah and Lee Substations

Common Name	Scientific Name	Status	
		FGFWFC*	USFWS**
<u>MAMMALS</u>			
Florida black bear	<u>Ursus americanus floridanus</u>	T	UR2
Sherman's fox squirrel	<u>Sciurus niger shermani</u>	SSC	UR2
Round-tailed muskrat	<u>Neofiber alleni</u>		UR2
Pine Island rice rat	<u>Oryzomys palustris planirostri</u>		UR2
Florida mastiff bat	<u>Eumops glaucinus floridanus</u>		UR2
<u>BIRDS</u>			
Bald eagle	<u>Haliaeetus leucocephalus</u>	T	E
Red-cockaded woodpecker	<u>Picoides borealis</u>	T	E
Little blue heron	<u>Egretta caerulea</u>	SSC	
Crested caracara	<u>Polyborus plancus audubonii</u>	T	
Southeastern American kestrel	<u>Falco sparverius paulus</u>	T	UR2
Swallow-tailed kite	<u>Elanoides forficatus</u>		UR2
Sandhill crane	<u>Grus canadensis pratensis</u>	T	
Florida scrub jay	<u>Aphelocoma coerulescens</u> <u>coerulescens</u>	T	T
Snowy egret	<u>Egretta thula</u>	SSC	
Tricolored heron	<u>Egretta tricolor</u>	SSC	
Wood stork	<u>Mycteria americana</u>	E	E
Florida burrowing owl	<u>Athene cunicularia floridana</u>	SSC	
<u>REPTILES</u>			
Gopher tortoise	<u>Gopherus polyphemus</u>	SSC	UR2
Eastern indigo snake	<u>Drymarchon corais couperi</u>	T	T
Blue-tailed mole skink	<u>Eumeces egregius lividus</u>	T	T
Florida pine snake	<u>Pituophis melanoleucus mugitus</u>	SSC	UR2
American alligator	<u>Alligator mississippiensis</u>	SSC	T(S/A)

Note: E - Endangered

T - Threatened

T(S/A) - Threatened due to similarity of appearance

SSC - Species of special concern

UR2 - Under review for listing, but substantial evidence of biological vulnerability and/or threat is lacking.

* Florida Game and Fresh Water Fish Commission

** U.S. Fish and Wildlife Service

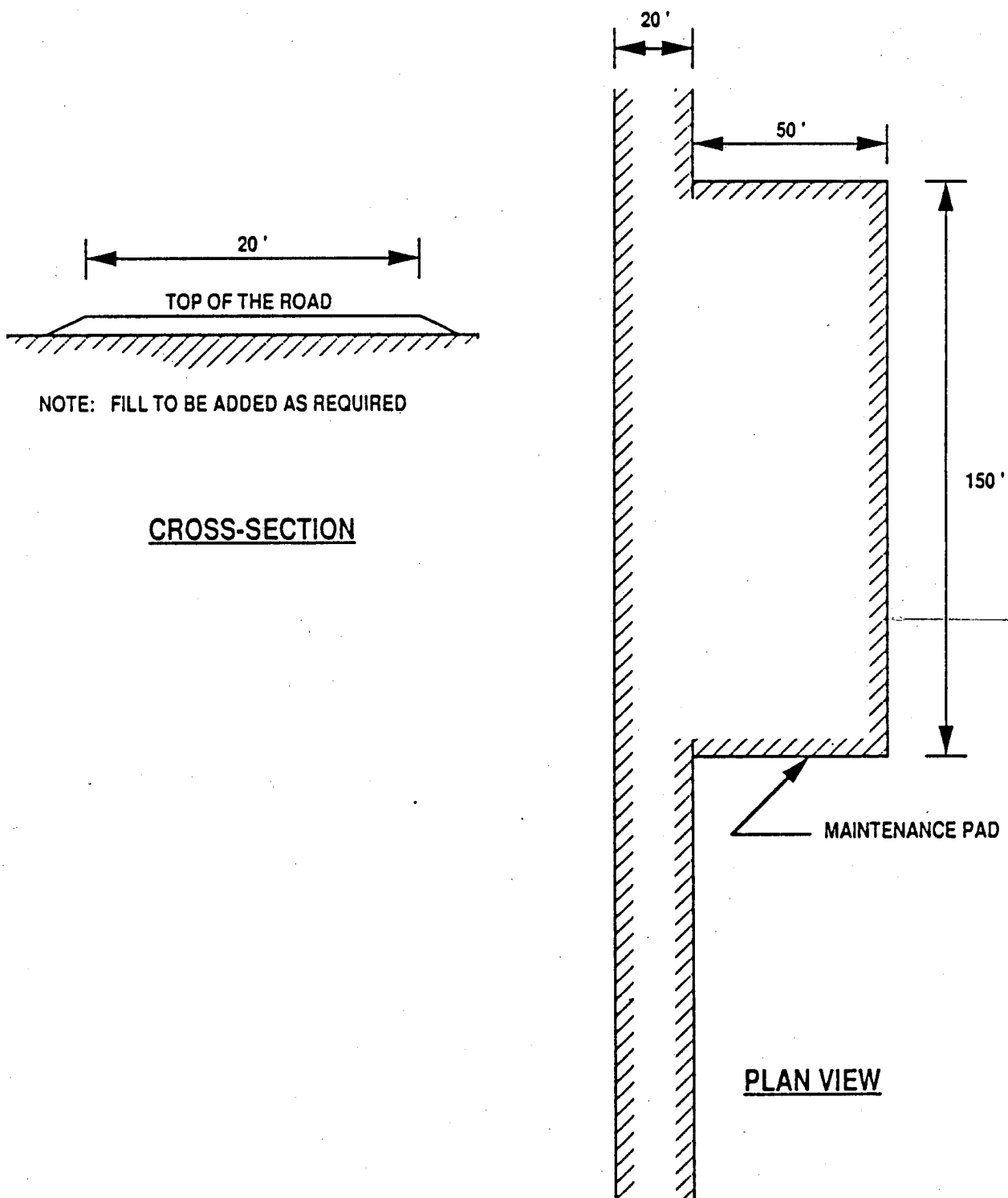


Figure 6.1.7-4 HARDEE POWER STATION TO LEE AND
VANDOLAH SUBSTATIONS TYPICAL ACCESS
ROAD PLAN AND CROSS SECTION

**Hardee
Power Station**

species are not expected to occur in the wet flatwoods typical of the southern end of corridor route, but might be found in patches of dry soil in Charlotte and Lee County flatwoods. Such areas will be identified and surveyed during ROW selection. Squirrel banana thrives in mowed habitats and would not be significantly impacted by a sensitively constructed and maintained ROW.

Edison's ascyrum, hartwrightia, rain lily, water spider orchid, thick-leaved water willow, and/or spoon-leaved sundew may be found in wet depressions or seepage areas. Rain lily, a moderately rare species, might be encountered in appropriate habitats in this region, but there is no reason to expect that the more seriously threatened wetland species occur in the corridor.

Redberry stopper, shoestring fern, red needleleaf airplant, serpent fern, and/or banded wild pine might be encountered in hammock habitats at the southern end of the corridor, but these are not very rare plants. Serpent fern, also known as golden polypody, was observed on cabbage palms in pine flatwoods just north of the Cecil M. Webb Wildlife Management Area headquarters. It is actually quite common as a cabbage palm epiphyte in southwest Florida.

WILDLIFE SPECIES

The presence or potential for occurrence of the wildlife species listed in Table 6.1.7-5 within a given area is primarily related to the presence of suitable habitat for cover, feeding, and reproduction. In general, the type and quality of wildlife habitat depends upon vegetation, surrounding land use, and hydrology. Wildlife habitat types, therefore, frequently correspond to vegetation types.

The natural communities which serve as the principal wildlife habitats in the corridor are xeric, mesic, and hydric flatwoods, prairies, and hammocks.

A total of 19 vertebrate species, including 5 reptiles and amphibians, 10 birds, and 4 mammals were identified as important species occurring or

possibly occurring within 8 km (5 miles) of the proposed corridor between the Hardee Power Station and the Vandolah and Lee Substations (Table 6.1.7-5). The status and potential for occurrence of each of these species is discussed below.

REPTILES

Most of the rare xeric habitat reptiles of conservation concern to the north and east of the study area have not been documented within the region between the Lake Wales Ridge and the southwest Florida coastal zone. The few known to occur in the vicinity are as follows:

Gopher Tortoise (Gopherus polyphemus)

The gopher tortoise is listed as a species of special concern by FGFWFC and UR2 by USFWS. Gopher tortoise populations have declined due to collection as food and to habitat losses associated with urban growth and conversion of land to commercial pine plantations. Gopher tortoises occupy open grassy areas in xeric habitats such as sandhills, xeric hammocks, pine flatwoods, scrubs, and old fields. The burrow excavated by the gopher tortoise is also used by a variety of other organisms, including gopher frogs and indigo snakes. The best known of these, the gopher frog, does not occur in the corridor area, however. Areas of suitable habitat along the corridor could be expected to support gopher tortoises.

Eastern Indigo Snake (Drymarchon corais couperi)

The eastern indigo snake is listed as threatened by USFWS and FGFWFC. Reasons for its decline include habitat destruction, capture by snake collectors, and mortality from rattlesnake roundups. Eastern indigo snakes are found in dry, sandy areas such as pine flatwoods as well as in hardwood hammocks. Indigo snakes may be expected to occur in appropriate habitats in the corridor area.

Florida Pine Snake (Pituophis melanoleucus mugitus)

The pine snake is listed as a species of special concern by FGFWFC and UR2 by USFWS. It uses sandhills and other open, xeric habitats where pocket gophers, mice, and similar prey are abundant. Although pine snakes have

been recorded from Charlotte County, the bulk of the species' range is north of the corridor. It is thus not likely to be found within the affected area.

American Alligator (Alligator mississippiensis)

The alligator is listed as a species of special concern by FGFWFC and threatened due to similarity of appearance by USFWS. The alligator is found even in most wetland communities including lakes, ponds, rivers, and marshes. Alligators adapt fairly well to the presence of humans and can be found in urban areas if not molested. Populations have recovered to the point where USFWS has retained their status as threatened only in order to protect the similar endangered American crocodile. Alligators probably occur in almost all suitable habitats in the study area.

Blue-tailed Mole Skink (Eumeces egregius lividus)

This lizard is listed as threatened by FGFWFC and USFWS. It is confined to scrub and sometimes shrubby sandhill habitats in south-central Florida. The blue-tailed mole skink has been observed approximately 4 miles east of the Vandolah and Lee corridors, 13 km (8 miles) south of Vandolah. It might be found in xeric shrub communities in the northern part of the corridor.

MAMMALS

Few mammals of concern occur in the corridor area.

Florida Black Bear (Ursus americanus floridanus)

Florida's subspecies of the black bear is listed as threatened by FGFWFC in peninsular Florida, and under review for listing by USFWS. Bears inhabit areas of dense cover, which are not abundant in the corridor. They have been documented to travel through the area, however.

Fox Squirrel (Sciurus niger)

There is a fox squirrel population in the northwest corner of the Cecil M. Webb Wildlife Management Area just southeast of the sewage treatment plant and they may occur in open pine/oak forests elsewhere in the corridor.

The Webb population has not been studied and identified as to subspecies, but it is suspected to represent the Big Cypress fox squirrel (Sciurus niger avicennia), or possibly a form intermediate between that and Sherman's fox squirrel (Sciurus niger shermani), the subspecies found to the north. As a distinct population outside the usual range of each subspecies, it has particular scientific importance and conservation significance.

Fox squirrels require open, frequently burned sandhills with scattered pines and oaks as habitat.

Round-tailed Muskrat (Neofiber alleni)

The round-tailed muskrat is listed UR2 by USFWS. It utilizes marshes with dense stands of maidencane, pickerel weed, and sagittaria. This species has an irregular spotty distribution encompassing most of the Florida peninsula, including the study area. It may occur in appropriate habitats within the corridor.

Pine Island Rice Rat (Oryzomys palustris planirostris)

The Pine Island rice rat is under review for listing by USFWS, but recent taxonomic studies by Florida Museum of Natural History scientists indicate that it may not be a valid subspecies. This rodent utilizes marshy habitats and has been historically recorded north of Fort Myers several miles south of the corridor.

Florida Mastiff Bat (Eumops glaucinus floridanus)

The Florida mastiff bat, which was previously known only from the Miami area, has recently been discovered using an abandoned red-cockaded woodpecker cavity a few miles northeast of the Cecil M. Webb Wildlife Management Area headquarters. Hollow trees potentially inhabited by these bats will be inspected and appropriately considered during the ROW selection process. Bats navigate by a very sensitive sonar system (unaffected by EMF) which enables them to avoid collisions with wires, therefore no impacts on this species are expected if potential roosting cavities are protected.

BIRDS

Bald Eagle (Haliaeetus leucocephalus)

The bald eagle is listed as threatened by FGFWFC and endangered by USFWS. Eagles in peninsular Florida include permanent residents and seasonal migrants. Migrants occasionally occur along rivers or lakes. Eagle nests are generally located in tall pines or cypress. No active nests are known to occur along the Vandolah and Lee corridors.

Crested Caracara (Polyborus plancus audubonii)

The caracara is considered threatened by both FGFWFC and USFWS. This is a large hawk whose Florida range is restricted to the open prairie region of the south-central portion of the peninsula. It forages in pastures and sparse pinelands, feeding on both carrion and live prey, and nests in cabbage palm trees. The heart of the species' territory is east of the study area, but the birds have historically ranged through the region and could potentially be found in the corridor.

Southeastern Kestrel (Falco sparverius paulus)

The southeastern kestrel is listed as threatened by FGFWFC and UR2 by USFWS. The practically indistinguishable unlisted eastern kestrel also winters in Florida. These small hawks utilize sandhills and similar open upland habitats where they hunt from perches and nest in cavities such as old woodpecker holes in pine trees. They may occur in appropriate habitats in the corridor area.

Swallow-tailed Kite (Elanoides forficatus)

The swallow-tailed kite is listed as UR2 by USFWS. These birds range throughout Florida, but prefer habitat that is a mosaic of forested and open wetlands. They feed on insects and reptiles in wet prairies or marshes and nest in large cypress or pine trees. Since the study region has areas of suitable habitat, swallow-tailed kites can be expected to occasionally be observed within the corridor.

Burrowing Owl (Athene cunicularia)

Due to habitat loss, the burrowing owl is listed as a species of special concern by FGFWFC. This owl requires well drained sandy soil in areas of sparse growth such as prairies, sandhills, and pastures. Burrowing owls are expected in open upland habitats in the southern part of corridor.

WADING BIRDS

Three species of protected wading birds are known or expected to occur in the vicinity of the corridor. These species are the snowy egret (Egretta thula), little blue heron (Egretta caerulea), and tricolored heron (Hydranassa tricolor). All three species are designated as species of special concern by FGFWFC. These birds utilize similar habitats, requiring wetlands for feeding and shrub swamp or cypress swamp for roosting and nesting. They can be expected to forage in suitable wetlands along the corridor. A nesting colony of snowy egrets, great egrets, and great blue herons is located 16 km (10 miles) south of Vandolah and 1.2 km (0.75 mile) west of the corridor centerline. Wading birds have nested at other nearby locations in the past, but this is the only currently active rookery documented by FGFWFC.

Wood Stork (Mycteria americana)

Wood storks are listed as endangered by FGFWFC and USFWS. Reasons for their decline include loss of feeding and nesting areas. Wood storks nest primarily in cypress or mangrove swamps, and forage where fish populations concentrate in freshwater marshes, ditches, and flooded pastures. Wood storks are expected to occasionally forage throughout the corridor in areas of suitable habitat. No active rookeries are known within five miles of the corridor.

Florida Sandhill Crane (Grus canadensis pratensis)

The resident Florida subspecies of the sandhill crane is listed as threatened by FGFWFC. Unlisted migratory birds join these flocks in the winter. The sandhill crane uses large open pastures and dry prairies as foraging habitat and breeds in associated wet prairies and marshes. These habitats are abundant in the study region and are heavily utilized.

Regions the Florida Natural Areas Inventory has identified as crane concentration areas are indicated on Figure 6.1.7-3 (see Appendix 11.10). The only such area crossed by the corridor is the stretch from just north of the I-75 interchange at Tuckers Grade south to Cape Coral. This habitat is not proposed for preservation and will probably be lost to residential development in the not too distant future.

Since the endangered whooping crane has similar habitat requirements, several Florida sites have been evaluated as potential reintroduction sites for the extirpated species. The Cecil M. Webb Wildlife Management Area was rated as an alternate to a preferred Kissimmee Prairie site.

Red-cockaded Woodpecker (Picoides borealis)

The red-cockaded woodpecker is listed as threatened by FGFWFC and endangered by USFWS. The bird nests in "overmature" pines affected by a fungus disease that softens the heartwood. Timber management practices have greatly reduced the numbers of these trees.

Since there were numerous old records of red-cockaded woodpeckers in the vicinity of the Cecil M. Webb Wildlife Management Area, but no current data, a careful field survey of alternative transmission line routes across the area was conducted. Colonies previously numbered 11, 2, and 18 by the Webb staff were not found at their former locations, but active colonies were located near the centers of Sections 16 and 17 and at the center of the boundary between 8 and 9 as indicated on (Figure 6.1.7-3 in Appendix 11.10). FGFWFC personnel believe that the locations of these colonies "drift" over time.

No red-cockaded woodpeckers have been documented within the proposed corridor. None have been recorded nearby north of Charlotte County, but their regional abundance and characteristics of the habitat suggest that they may be encountered in other pinelands at the south end of the region.

Florida Scrub Jay (Aphelocoma coerulescens coerulescens)

The scrub jay is listed as threatened by both FGFWFC and USFWS. This species is very restricted in its habitat requirements, utilizing brushy early successional scrub habitats virtually exclusively. Scrub jays have been historically documented a mile and a half north of the Ft. Myers substation. There are no recent data on this population, but it is doubtful that affected habitats are important to them since the corridor encompasses only small areas of suitable patchy oak thicket. Scrub jays might occur in appropriate habitats anywhere along the corridor.

6.1.7.3.4. Other Environmental Features

All relevant environmental features associated with the transmission line corridor between the Hardee Power Station and the Vandolah and Lee Substations have been presented in the preceding subsections. No additional information is deemed necessary to describe environmental characteristics of the transmission line corridor.

6.1.7.4 Effects of Right-of-Way Preparation and Transmission Line Construction

6.1.7.4.1 Construction Techniques

RIGHT-OF-WAY CLEARING

All trees, brush, and scrub growth in the ROW will be cleared. Trees beyond the boundary of the ROW may be trimmed or cut with the owners consent if it is determined that the trees present a danger to the transmission line. Equipment used to cut these may include bulldozers, shearing machines, or chainsaws.

ROAD AND PAD CONSTRUCTION

Access roads will be required in areas where the final Vandolah and Lee transmission line ROWs do not follow existing roads. The overall objective of the access roads will be to provide efficient and safe ingress and egress to the transmission line structures while minimizing environmental impact and cost. Access roads will be required for construction and maintenance of the transmission line facilities.

The use of fill will be minimized in the construction of access roads, and where possible, roads will be constructed by blading natural soil from both sides of the intended road. Where fill is required the fill will be trucked in and spread, compacted, and shaped to the desired elevation. Access roads will be constructed to have a maximum surface width of 20 feet. Dump trucks may be used for hauling, and bulldozers and graders may be used for spreading and compacting. A typical cross section for the access road is presented in Figure 6.1.7-4.

LINE CONSTRUCTION

Multiple structure configurations and construction materials will be used throughout the length of the transmission line from the Hardee Power Station to the Vandolah and Lee Substations. The type of structure used in any particular area will be a function of the characteristics of the ROW and surrounding areas.

For the majority of the ROW which crosses open land, the preferred structure will be wooden H-frame construction (see Figure 6.1.3-1). H-frame construction involves directly imbedding the poles into native soil and attaching cross bracing after imbedment. Suspension insulators are then attached to the cross bracing to allow the phase conductors to be pulled. H-frame construction is used for tangent (straight line) construction.

Where the ROW allows, three pole structures will be used for line angle construction. This type of construction involves directly imbedding the structures and guying to meet strength requirements. Once the poles and guy wires are installed, suspension insulators are attached to the structures to allow the conductor to be pulled.

Single pole construction will be used where ROW or other constraints limit the use of H-frame construction. Single pole structures are anticipated to be used in areas where the width of the ROW prohibits the use of H-frame structures, and in areas where visual impacts are significant. Single pole structures may be directly imbedded with native soil, crushed rock or

concrete backfill. Single pole structures can be used for line angles and can be designed to be self supporting.

Structures will be framed and erected using cranes and other support vehicles. Overhead ground wires and conductors will be installed by various wire-pulling equipment. Vehicles used to support line construction may include bulldozers, tractors, and other light vehicles.

Foundations for structures may be either native soil, crushed rock or concrete backfill. In addition, poured concrete foundations may be used where an extra strong foundation is required. With native soil or crushed rock backfill, a hole is augered and the pole is inserted into the hole. The backfill material is then compacted around the pole up to the surrounding ground level. In the case of poured concrete foundations, the required concrete foundation is poured and anchor bolts are installed. Once the foundation has set, the base of the pole is bolted onto the anchor bolts of the foundation.

EROSION

Disturbance to natural vegetation will be kept to a minimum to reduce the potential for erosion. Where necessary, erosion control measures will be utilized to eliminate erosion during construction. Routine maintenance of the ROW will be designed to minimize ground cover disturbance, and therefore reduce the potential for erosion during operation of the transmission line.

6.1.7.4.2 Impacts on Water Bodies and Uses

Exact routing of the ROW within the corridor from the Hardee Power Station to the Vandolah and Lee Substations has not been determined at present. All efforts will be made to avoid waters of the State, including jurisdictional wetlands, during the final routing of the Vandolah and Lee transmission line ROW.

Construction of the Vandolah and Lee transmission lines and associated access road is expected to have minimal impact on waters of the State. During the siting process, corridor segments were identified which contained

relatively few water bodies or wetlands greater than 0.4 km (0.25 mile) in length. This selection criteria was identified to screen out areas with water bodies or wetlands that could not be spanned by the transmission line. Several small creeks and the Peace River will be crossed by the corridor but the line construction is not expected to have an impact on these water bodies. Based on the selected type of construction for the support structures, the transmission line will be able to span a maximum distance of approximately 0.4 km (0.25 mile) and still retain adequate ground clearance. Therefore, few, if any, support structures will be constructed within waters of the State. It is also anticipated that the Vandolah and Lee transmission lines will be able to span or be diverted around most wetlands. However, some filling in wetland areas may be required for the access road. Most of the wetlands crossed by the corridor are relatively small. Therefore, keyhole filling will be utilized where possible in lieu of continuous filling. The total area that will require filling is not known at the present time, but is expected to represent only a small fraction of the overall corridor length. Where road construction or structure placement must occur in wetlands, the following procedures will be followed. To control runoff of project site sediments, appropriate sediment control methods will be used. Methods to be used include staked silt fences with haybales in upland areas and transitional to shallow wetlands, and floating turbidity barriers in water bodies. Silt screens will be placed downstream of construction abutting all open water. In addition, in areas requiring minor excavation for culvert placement, appropriate stabilization of the banks will be provided.

No bridges are expected to be constructed in association with the transmission line or access road. Therefore, no restrictions to navigation will occur on any water body crossed by the corridor. Adequate clearance between the surface of the water and the transmission line will be maintained, and no impedance to boat traffic or other water related activity will result.

6.1.7.4.3 Solid Wastes

Solid waste generated from ROW preparation and line construction generally consists of cleared vegetation and construction related debris. All cleared vegetation and combustible debris will be burned on-site. Applicable state and local regulations regarding on-site burning will be followed. Non-combustible material will be collected and disposal will occur at existing landfills.

Approximately three yards of native soil is expected to be removed for each pole installation. The majority of this soil will be used for backfill in cases where native soil backfill is acceptable for foundation. In cases where crushed rock backfill or concrete foundations are used, the soil will be spread over the ROW in a manner to minimize the impact on the surrounding area.

6.1.7.4.4 Changes to Vegetation, Wildlife, and Aquatic Life

ROW preparation and line construction for the Vandolah and Lee transmission lines will have minimal adverse impact on terrestrial or aquatic systems because the corridor has been chosen to avoid major areas of ecological importance and the ROW will be routed to avoid smaller areas of significant habitat within the corridor. Critical habitats, substantial areas of forest or wetland, concentrations of rare species, breeding locations of sensitive species, and important examples of rare or threatened natural communities were all screened out during the corridor selection process.

SECI plans to avoid construction of raised roads wherever possible, so disruption of hydrological patterns should be minimal. Culverts and similar engineering solutions will be applied to correct any disturbance to drainage caused by essential road improvements.

In xeric communities, opening the tree canopy may have a positive effect on habitat values. Gopher tortoises, burrowing owls, and several of the other sensitive species in the corridor region do best in such relatively sunny open habitats.

Construction activities will inevitably have some direct impact on wildlife. Some animals will be displaced from the ROW by disturbance. Plants will be impacted by essential cutting and clearing activities. Trees must be cut out of the area beneath and immediately adjacent to the lines. The cumulative effect of these impacts will be minimal, however, since care has been and will continue to be taken to avoid important habitats.

6.1.7.4.5 Impact on Human Populations

Transmission line construction to be conducted by SECI will consist of two 230 kV lines from the Hardee Power Station to Vandolah Substation, and one 230 kV line from Vandolah to Lee Substation in North Ft. Myers. Work on these segments will occur simultaneously. Within each segment, specialized crews will work in sequence to clear easement, construct access roads, prepare foundations, assemble and erect support structures, string conductors, and cleanup, with overlap of activities as required. Construction of the entire SECI line is anticipated to take approximately 18 months. It is expected that construction of the Vandolah and Lee lines will not restrict traffic flow on roads adjacent to or crossed by the line. Short-term impacts to area residents from the noise of saws and other equipment which will be required to clear the corridor and construct the support structures will be of short duration.

A construction work crew of approximately 20-30 will be required on each of the two SECI segments with work generally taking place between the hours of 7:00 a.m. and 7:00 p.m. The relatively small number of workers and minimal amount of equipment required for this effort are not expected to cause any significant impact on traffic conditions on area roads either during morning and evening peak traffic periods, or during the day.

6.1.7.4.6 Impact on Regional Scenic, Cultural and Natural Landmarks

As noted in Section 6.1.7.2.4, two state resources areas, the Peace River Canoe Trail and the Cecil M. Webb Wildlife Management Area, are crossed by the Lee transmission line corridor.

The Peace River is a designated canoe trail which traverses 108 km (67 miles) and contains numerous launching/takeout areas. One launch/takeout point is located in the vicinity of the transmission line crossing, near the intersection of SRs 70 and 72. To minimize the potential visual impact of the transmission line as it crosses the Peace River, the line will be located parallel and adjacent to SR 70 where it crosses the river. In addition, the crossing point will be located at a bend in the river so that no long distance views from either upstream or downstream will be possible. Consequently, the one contact will be brief and quickly passed with little possibility of seriously affecting the canoeing experience. Care will be taken by the construction crew to minimize the amount of vegetation cleared on the river banks. Because of its location at a bend in the river and in an area which currently contains major man-made elements (highway, bridge and rail crossings), the transmission line should have minimal impact on the recreational experience of canoeing on the river. With the exception of the point at which the transmission line crosses the river, the line will be a sufficient distance from the Peace River to insure that it is not a focal point in the canoeist's viewscape.

The proposed corridor runs along sections of the north and west boundaries of the Cecil M. Webb Wildlife Management Area to a point approximately 2.4 km (1.5 miles) south of the Tuckers Grade I-75 interchange. Efforts have been and will be made to minimize any adverse impacts to the wildlife management area.

The transmission line will be constructed and maintained without a linear raised road bed, if possible. SECI will maintain locked gates to limit trespass problems.

A general concern FGFWFC has with transmission lines involves the potential for bird collisions. The proposed route has been selected to avoid the vicinities of wading bird rookeries, and minimize corridor length in areas of heavy sandhill crane activity.

Presuming arrangements can be made to maintain native ground cover and use prescribed fire brush control techniques beneath the lines, local FGFWFC officials have four specific concerns about transmission lines in the northwest corner of the Webb area: 1) proximity to red-cockaded woodpecker colonies; 2) potential interference with drainage to Alligator Creek; and 3) potential interference with drainage to Myrtle Slough.

The transmission line corridor route across the wildlife management area has been chosen to avoid relatively undisturbed habitats, large areas of wetland or forest, and concentrations of rare species, as well as areas identified as particularly heavily used by birds. The preferred corridor crosses only a corner of the area, rather than running through the center. This corner has improved pastures of exotic bahia grass and relatively less native vegetation than the Webb area as a whole.

The corridor was rerouted after field surveys revealed red-cockaded woodpecker colonies and extensive foraging habitat in the area originally chosen. It now goes around the edge of the Webb area, crossing mostly improved pastures and open prairies and running close to I-75 where the prescribed burning program necessary for red-cockaded woodpecker habitat management is problematic. Careful ROW selection and construction should avoid impacts on this species.

Drainage into Myrtle Slough and Alligator Creek should not be affected, since a continuous raised road should not be needed.

6.1.7.4.7 Impact on Archaeological and Historical Sites

Upon selection of a final ROW, a professional archaeological survey will be conducted for any areas within the ROW previously identified by DHR as having potentially significant archaeological sites (see Appendix 11.3) and which will be disturbed by land boring and construction activities.

The Applicant will comply with the request made by the DHR (see letter of April 4, 1989 in Appendix 11.3) that if the archaeological survey of the ROW alignment discovers any sites considered to be significant, these sites will

be avoided during construction of the transmission line and subsequently during the maintenance of those properties to assure in-place site preservation. If avoidance is not feasible, impacts will be mitigated through archaeological salvage excavation conducted by a professional archaeologist. The DHR will be consulted regarding appropriate procedures for either preservation or excavation of any significant site(s).

If unforeseen artifacts or archaeological sites are discovered during construction, the DHR will be notified. Following a determination of the importance of these artifacts or sites, the Applicant will work with the DHR to assess mitigation measures necessary to minimize adverse impacts.

6.1.7.5 Post-Construction Impacts and Effects of Maintenance

6.1.7.5.1 Maintenance Techniques

TRANSMISSION LINE MAINTENANCE

The Vandolah and Lee transmission line ROWs will be patrolled and inspected regularly to identify structures in need of repair. Occasional maintenance will be required on the transmission structures. Insulators will be replaced when damaged as will supporting clamps and braces. Wood transmission poles are expected to be replaced on the average of every 15 years. Where steel or concrete poles are used, there will be minimum pole maintenance needed. The expected life of these poles is in excess of 30 years. The maintenance of the transmission line is expected to have a minimum impact on the surrounding area.

RIGHT-OF-WAY MAINTENANCE

Mechanical mowing and herbicides will be used to keep the ROW clear of unwanted vegetation. These chemicals will be used as needed. All herbicide application will be conducted in a manner consistent with all state and local regulations and will be carried out by trained personnel.

No burning is anticipated to be needed for the maintenance of the ROW.

6.1.7.5.2 Multiple Uses

Various activities including citrus farming, grazing, and agriculture are typically allowed within the ROW as long as these activities do not interfere with full use of the ROW. An easement will be obtained for the construction and operating of the Vandolah and Lee transmission lines, including ingress and egress to the transmission line. Specific uses within the ROW will be addressed individually with affected parties. Multiple use of the ROW may be restricted in certain areas, but in general, compatible multiple uses will be allowed.

6.1.7.5.3 Changes in Species Populations

WILDLIFE AND AQUATIC LIFE

Potential post-construction impacts along the Vandolah and Lee transmission lines fall into four major categories: 1) impacts related to the actual transmission lines and supporting poles; 2) impacts of ROW maintenance procedures; 3) disturbances associated with access roads; and 4) effects of electromagnetic fields.

The primary concern associated with the actual transmission line is the potential increase in bird mortality due to collisions with the wires. The impacts of collisions with power lines on avian mortality are difficult to quantify. It is generally agreed, however, that collisions are a potentially significant cause of mortality among birds. It is also agreed that a large percentage of avian mortality from collisions with power lines can be avoided through careful planning (Anderson, 1978; Lee, 1978; Faanes, 1987). For this reason, the corridor was routed to minimize the potential for collisions by avoiding areas of known bird concentrations and areas used for roosting or nesting by sensitive species.

Special attention has been given to habitats used by wood storks and other wading birds, sandhill cranes, and red-cockaded woodpeckers. Prior to ROW selection, additional field surveys will be undertaken to identify undocumented sites used by sensitive species and smaller areas of significant habitat. The ROW will be routed to minimize impact on these areas.

The ROW must be maintained so that trees cannot grow into the overhead wires. This implies maintenance of a permanent gap in the canopy through any forested areas. In hydric or mesic habitats this may have a slight deleterious effect in drying and heating the microclimate of the adjacent forest. However, creation of desirable edge habitat and maintenance of openings will probably have a positive effect on such sensitive species as gopher tortoises and burrowing owls.

Herbicide use will be implemented in a manner that will minimize impacts to wildlife or aquatic organisms.

Access roads can act as barriers to animals reluctant to cross openings, and can displace (or subject to routine trampling) a certain amount of vegetation. These impacts should be minimal, however, because SECI intends to use existing roads wherever feasible and minimize the lengths of any essential new roads.

6.1.7.5.4 Effects of Public Access

It is SECI's policy to install locked gates at all points where the transmission line access road intersects previously fenced property. Therefore, with the exception of SECI personnel performing routine maintenance, no increased vehicle access is anticipated. Since no significant increase in human traffic into formerly inaccessible habitats will result, there will be no subsequent increased disturbance to wildlife.

6.1.7.5.5 Other Post Construction Effects

The transmission line will meet EMF limits set forth in Chapter 17-274, F.A.C. Maximum electric and magnetic field strengths at the edge of the ROW for the transmission line were calculated using the Bonneville Power Administration Corona and Fields Effects program. Input data used in the program were based on the generating capacity of the Hardee Power Station and included the following parameters:

1. A maximum current rating of 2,040 amperes;
2. A minimum conductor clearance of 27 ft from the earth;
3. Currents were assumed to be balanced in phase and in magnitude with no zero sequence current;
4. A maximum operating voltage of 242 kV; and
5. Voltages were assumed to be balanced in phase and in magnitude.

Electromagnetic fields strengths will vary depending on the ROW width and structure type. The maximum field strengths at the edge of the transmission line ROW will be below the field strength standards listed in Chapter 17-274.450, F.A.C. (i.e., 2.00 kV/m for electric field, and 150 milliGauss for magnetic field). The entire transmission line facility will meet the applicable sections of the National Electrical Safety Code. Due to the design and routing of the proposed transmission line and its location relative to residential areas, EMF and acoustic and electric noise will not be a problem.

6.2 ASSOCIATED NATURAL GAS PIPELINE

6.2.1 Project Description

The proposed primary fuel for the Hardee Power Station is natural gas. It will be brought to the site by a new 48-cm (18-inch) natural gas pipeline, the Hardee Power Station Lateral, connecting with an existing gas pipeline near Polk City, Florida. The Federal Energy Regulatory Commission (FERC) issued an environmental assessment on January 31, 1989 for a series of proposed Florida Gas Transmission System (FGT) gas pipelines, which included a portion of the proposed Hardee Power Station Lateral, referred to as the Sarasota Lateral Loop. FERC determined that the construction of the proposed facilities including the Sarasota Lateral Loop would not constitute a major federal action significantly affecting the human environment (FERC, 1989).

The Hardee Power Station Lateral incorporates the proposed Sarasota Lateral Loop and continues to the plant site. The Hardee Power Station Lateral begins about 1.6 km (1 mile) north of Polk City where it interconnects with the existing FGT 18-inch St. Petersburg lateral and continues south to the Hardee Power Station (Figure 6.2.1-1).

The gas pipeline will consist of an underground pipeline along a ROW up to 22 m (75 ft) wide. There are no proposed compressor stations along the preferred pipeline corridor.

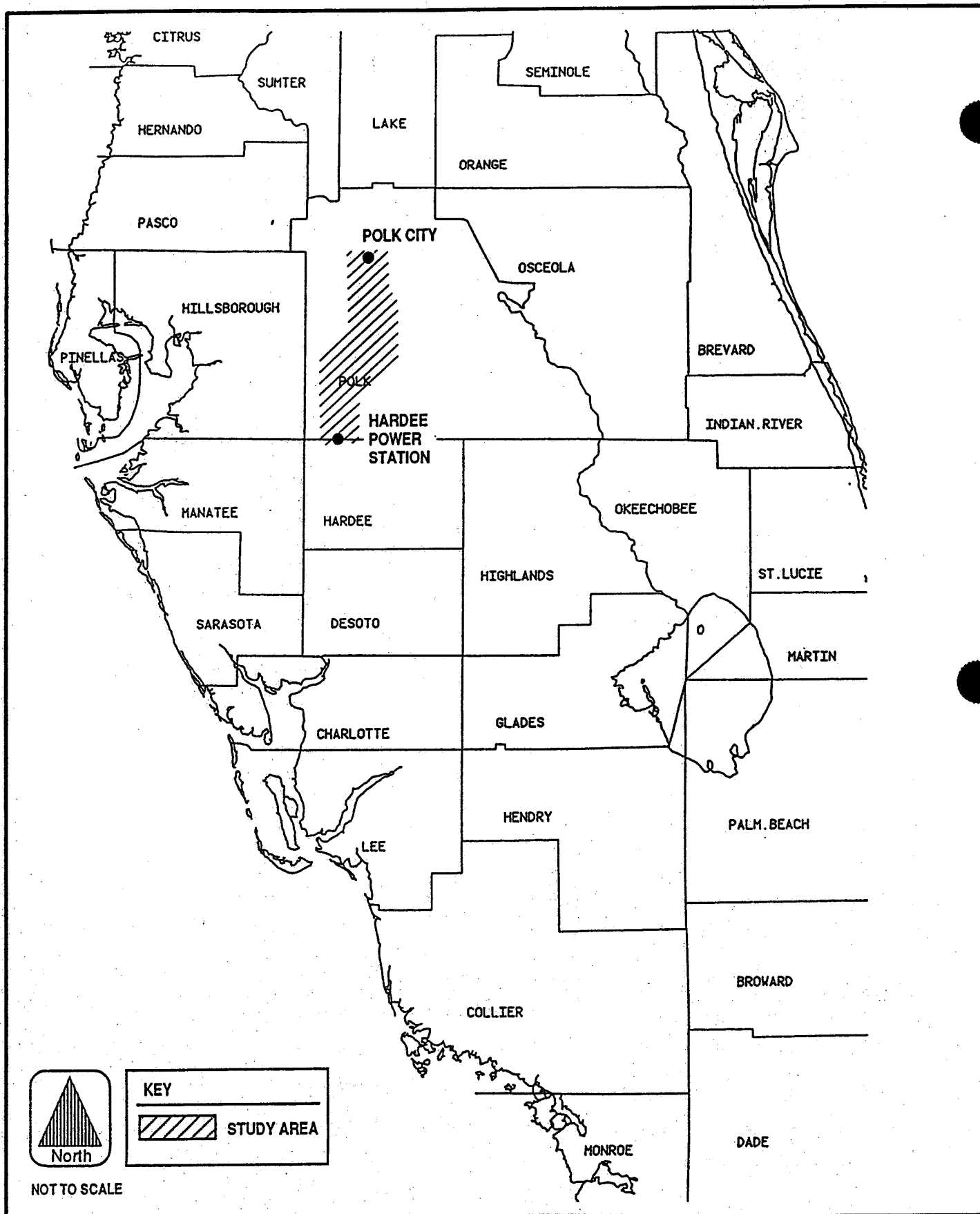


Figure 6.2.1-1 NATURAL GAS PIPELINE STUDY AREA AND INTERCONNECT POINTS

Hardee Power Station

6.2.2 Corridor Location and Layout

Figures 6.2.1-2 through 6.2.1-5 identify the full length of the proposed corridor relative to major geographic features. Existing gas pipeline are shown on these figures. Approximately 91% of the proposed gas pipeline is along existing ROWs.

Beginning at the north end of the pipeline corridor and moving south, the corridor is generally 200 ft wide where it follows the abandoned CSX Railroad. Where the corridor leaves the railroad, it narrows to 100 to 125 ft as it follows a local street. The corridor turns west, then turns south, occupying an area approximately 2,000 ft wide. At the crossing of U.S. 92, the corridor widens to a maximum of 600 ft, then, further south, narrows to 200 to 250 ft, following local streets. Where the corridor follows the existing transmission lines and gas pipeline south of Auburndale, the corridor width is generally 400 ft but varies from approximately 300 ft to 900 ft.

West of Bartow Airport, the corridor encompasses transmission line rights-of-way and is approximately 500 to 600 ft wide. Along Old Bartow/Eagle Lake Road, the corridor incorporates existing transmission line, road, and gas pipeline rights-of-way and is approximately 400 ft wide. Near Bartow, the corridor narrows to between 150 ft and 200 ft.

Along SR 60, the corridor incorporates the road right-of-way plus an existing pipeline right-of-way and is approximately 350 to 400 ft wide. Along Bonnie Mine Road, the corridor encompasses an existing pipeline right-of-way and the road right-of-way and is 300 ft wide. The corridor widens slightly next to CF Industries offices near Pierce and narrows slightly along SR 37 through Bradley. Thereafter, the corridor remains 300 ft wide until it begins following Fort Green Road south of CR 630. At that point, the corridor widens to 600 ft, encompassing the road and railroad rights-of-way down to the Hardee Power Station site.

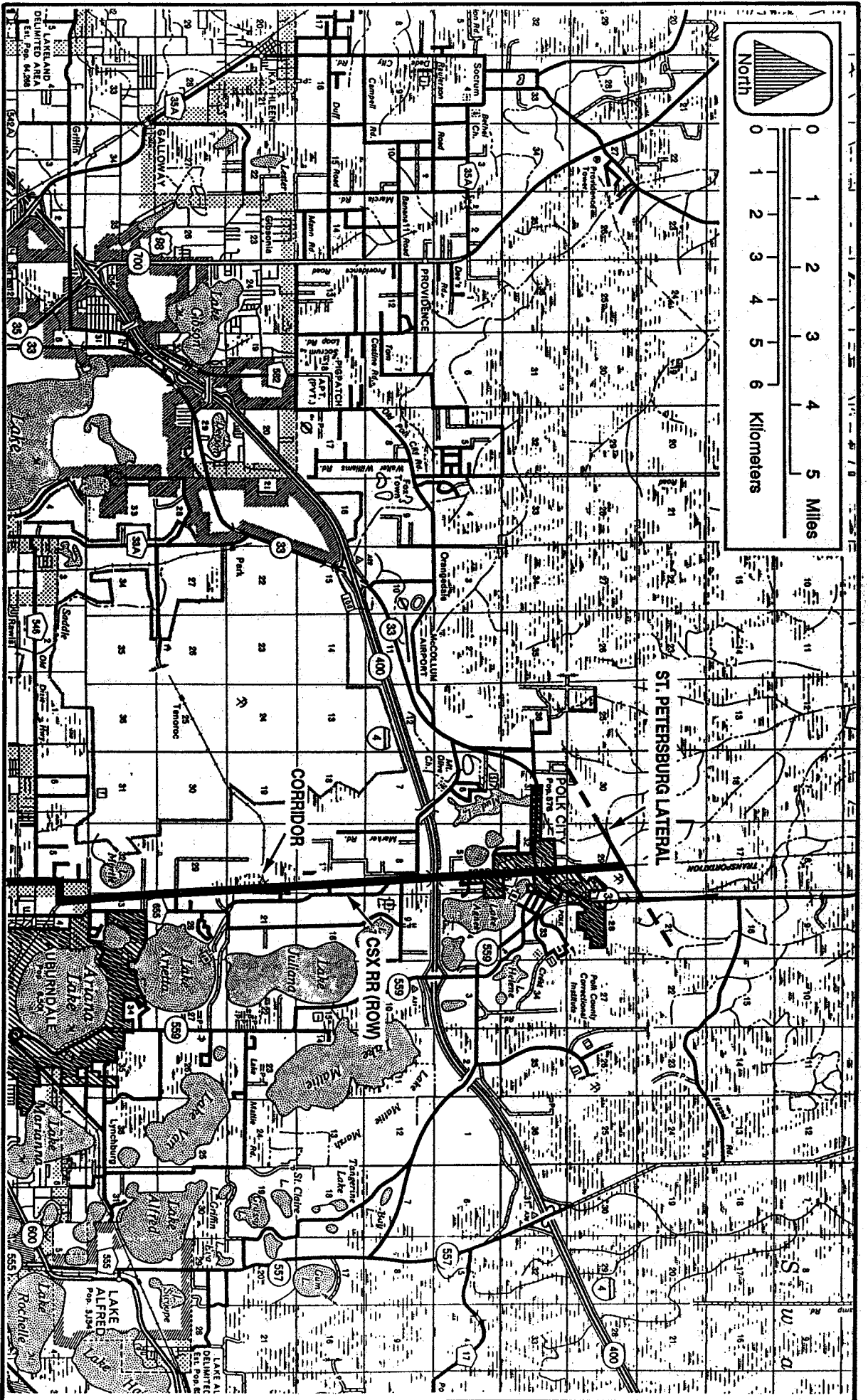
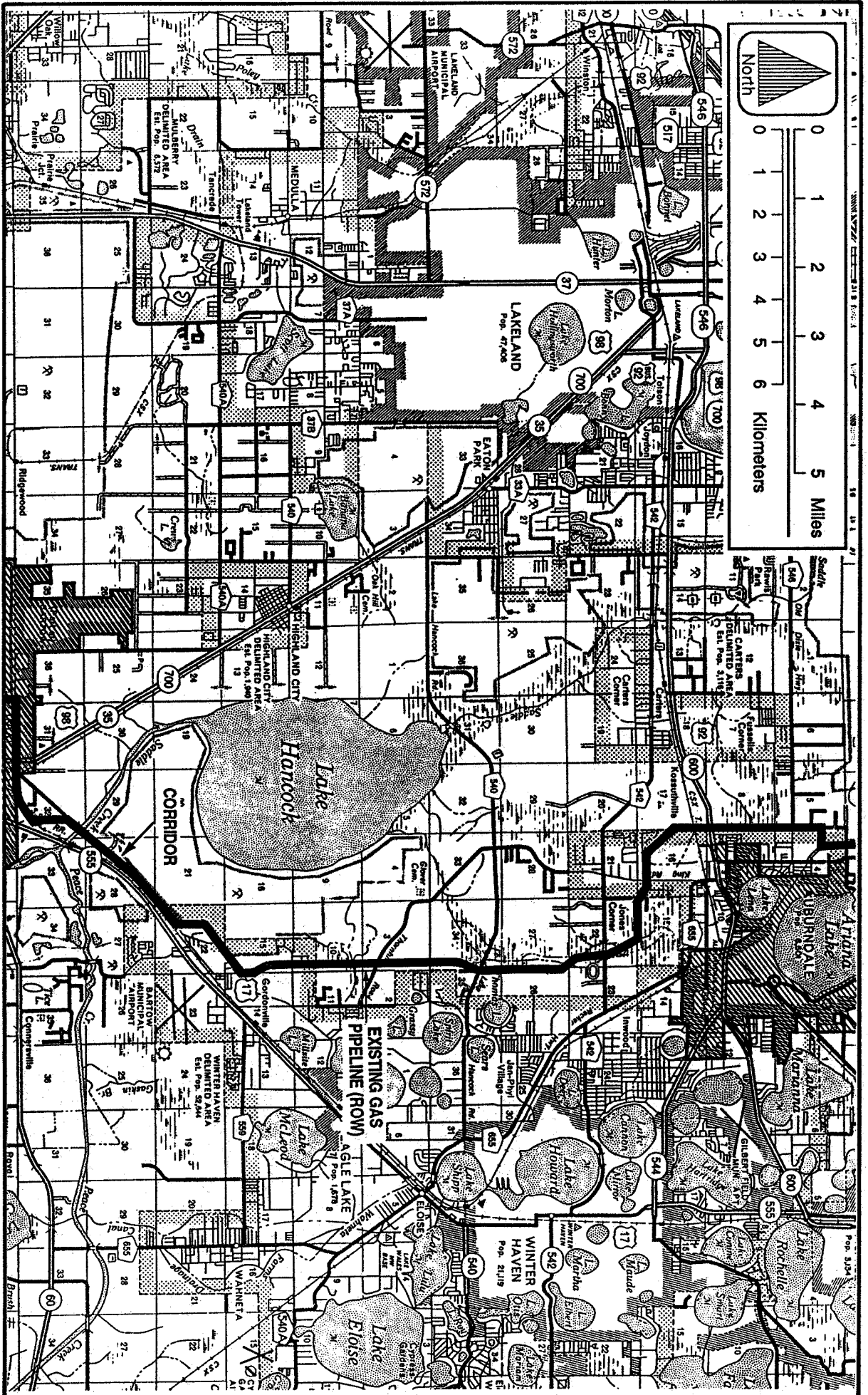


Figure 6.2.1-2 PROPOSED GAS PIPELINE CORRIDOR:
HARDEE POWER STATION LATERAL BEGINNING AT THE ST. PETERSBURG
LATERAL AND CONTINUING SOUTH TO PLANT SITE

**Hardee
Power Station**

Figure 6.2.1-3 PROPOSED GAS PIPELINE CORRIDOR:
HARDEE POWER STATION LATERAL SOUTH TO PLANT SITE



**Hardee
Power Station**

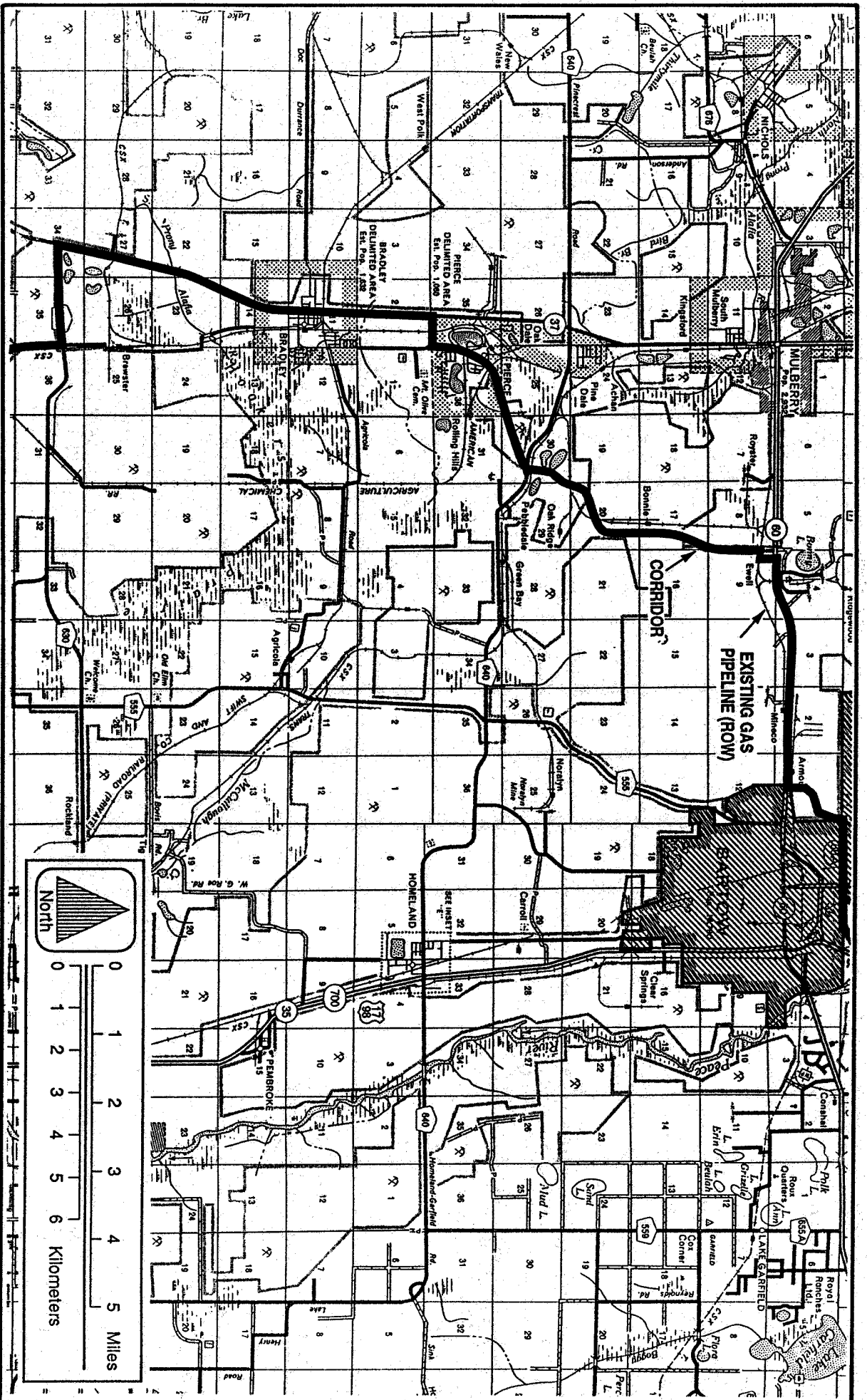


Figure 6.2.1-4 PROPOSED GAS PIPELINE CORRIDOR:
HARDEE POWER STATION LATERAL SOUTH TO PLANT SITE

**Hardee
Power Station**

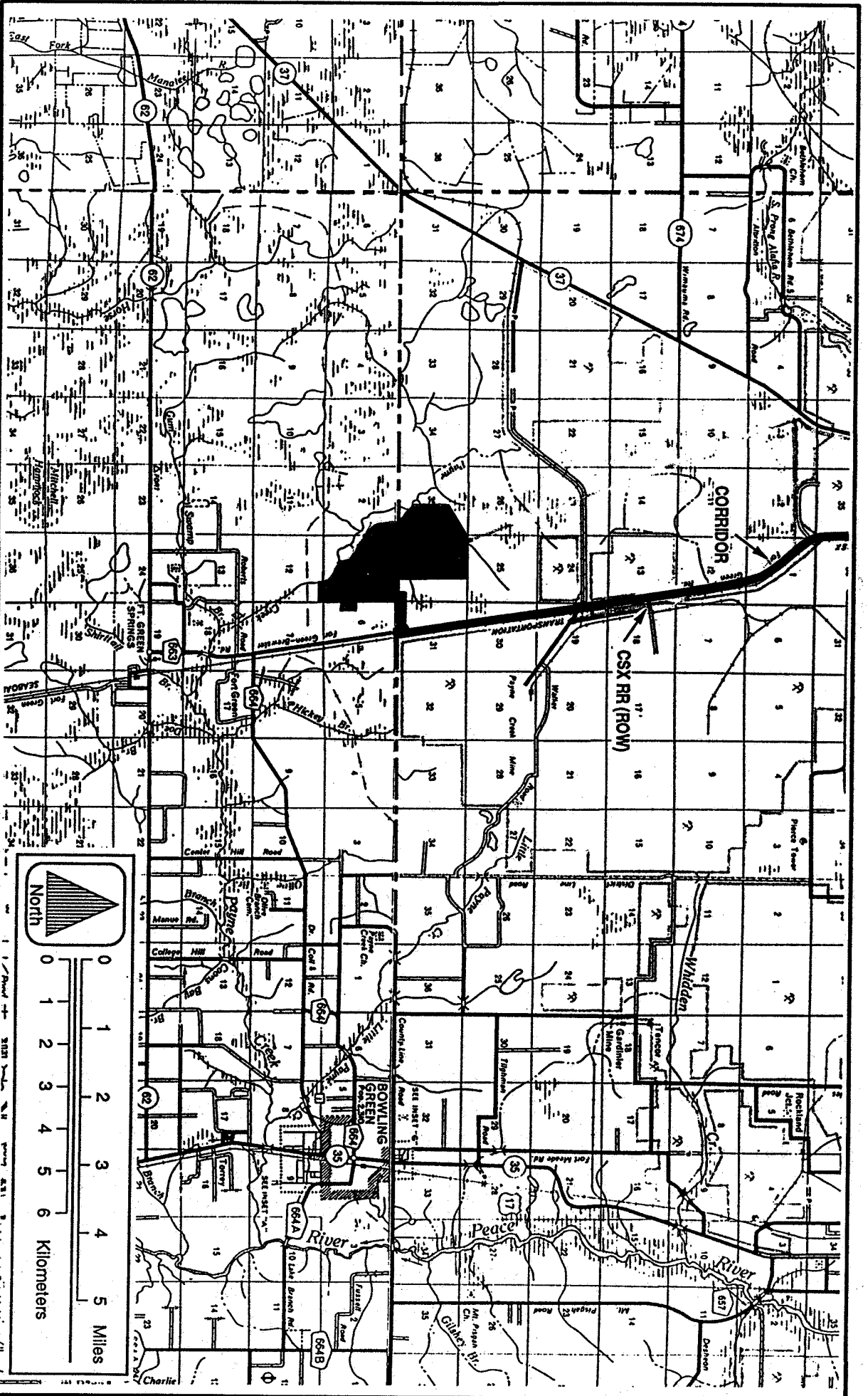


Figure 6.2.1-5 PROPOSED GAS PIPELINE CORRIDOR:
HARDEE POWER STATION LATERAL SOUTH TO PLANT SITE

**Hardee
Power Station**

Figures 6.2.1-6 and 2.6.1-7 present 1:24,000 maps showing the proposed corridor in areas requiring a new ROW.

6.2.3 Gas Pipeline Design Characteristics

The proposed gas pipeline will consist of an underground pipeline 48 cm (18 inches) in diameter. It will be approximately 79 km (49 miles) in length. Figure 6.2.3-1 presents a typical ROW design along new ROWs, and other existing ROWs.

6.2.4 Cost Projections

The estimated costs per mile are approximately \$420,000 per mile. The total cost of the pipeline will vary depending on the ultimate location of the pipe, cost of ROW acquisition and other site specific conditions.

6.2.5 Corridor Selection

FGT conducted the initial gas pipeline ROW selection study and identified preferred and alternative ROWs for the proposed Sarasota Lateral and an extension of this line to the Hardee Power Station Plant Site. These ROWs were reevaluated based on the following environmental considerations:

1. Using the most direct routes between the new power plant and the Polk City interconnect point;
2. Paralleling existing ROWs;
3. Minimizing crossing of rivers and highways;
4. Minimizing impact on residential and commercial development; and
5. Minimizing impact to wetlands and other forested areas.

Environmental conditions within and adjacent to the corridor along the proposed gas pipeline route were examined. By applying the above set of criteria, preferred and alternative corridors were identified and are presented in Figures 6.2.1-2 through 6.2.1-5.

Appropriate maps, aerial photography, ground inspection, local and regional planning documents, and other data sources were used to evaluate these

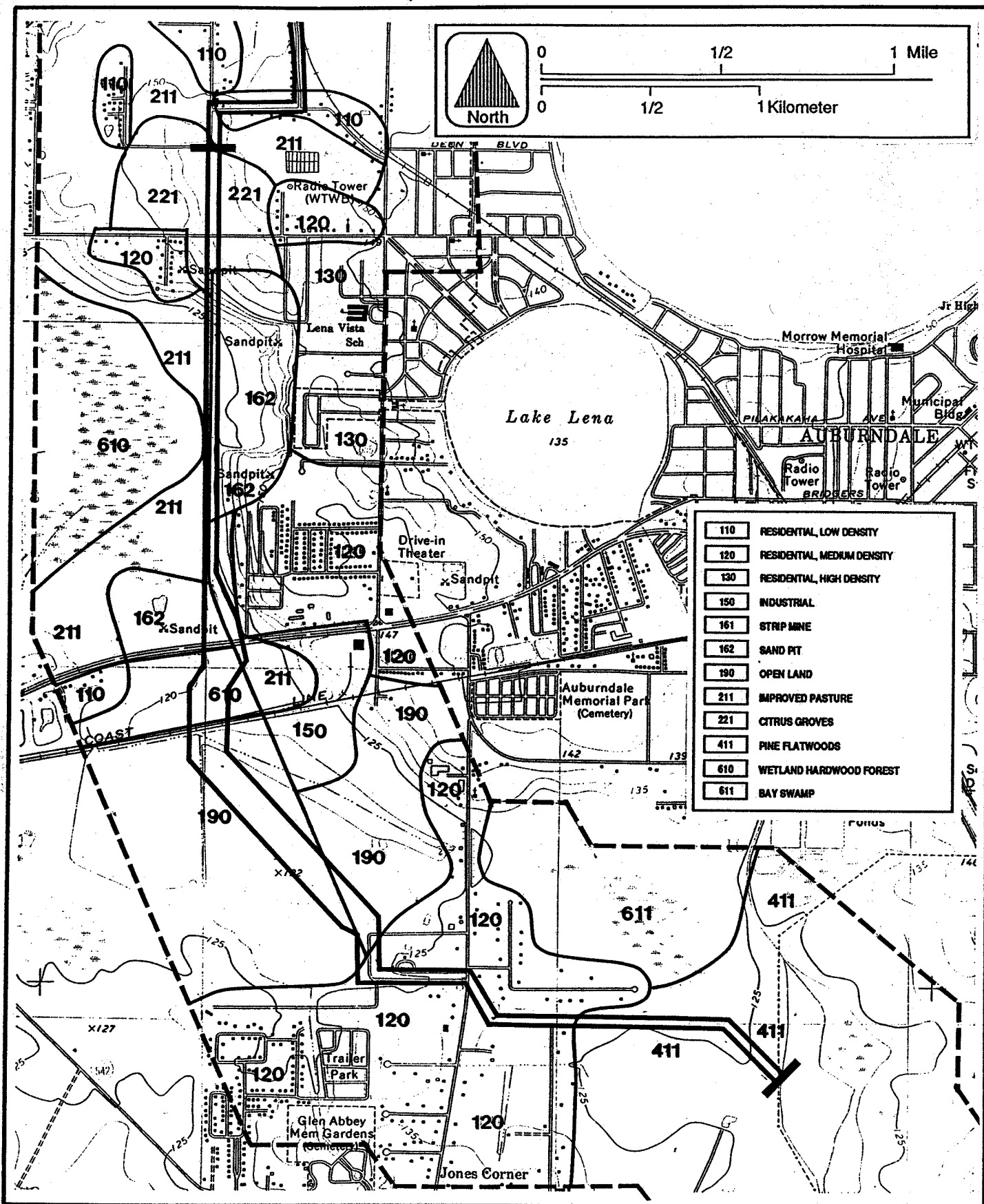


Figure 6.2.1-6 LAND USE/VEGETATION IN POTENTIAL NEW ACCESS AREAS ALONG THE PROPOSED NATURAL GAS PIPELINE CORRIDOR (BRADDOCK ROAD TO HIGHWAY 92)

**Hardee
Power Station**

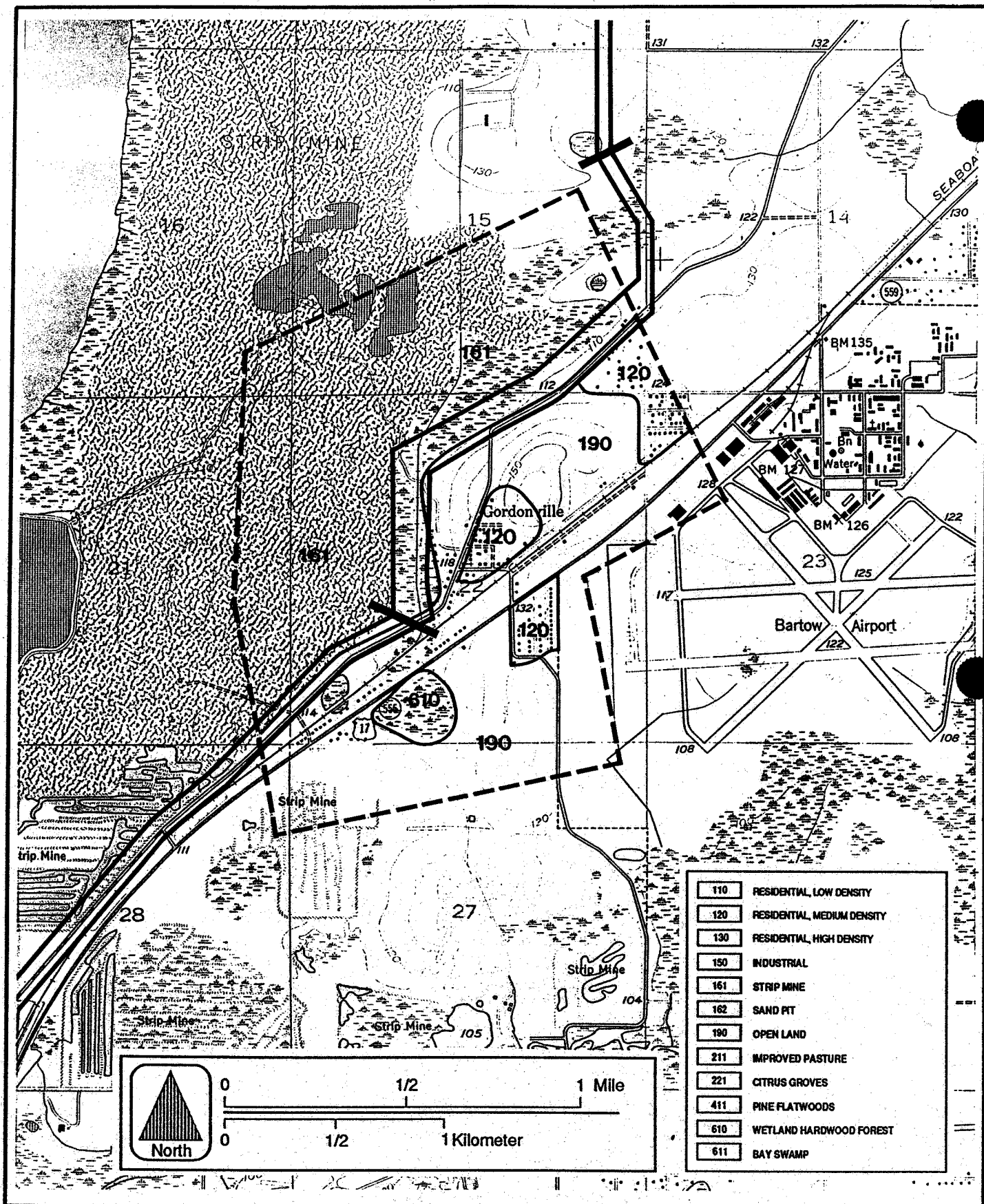
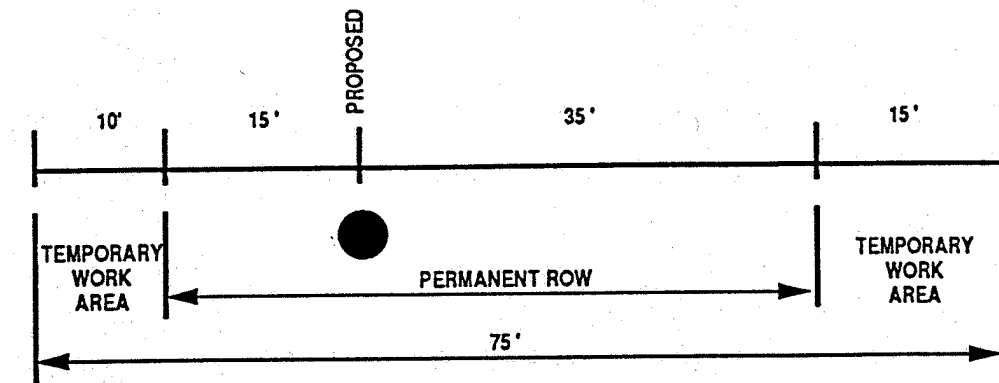
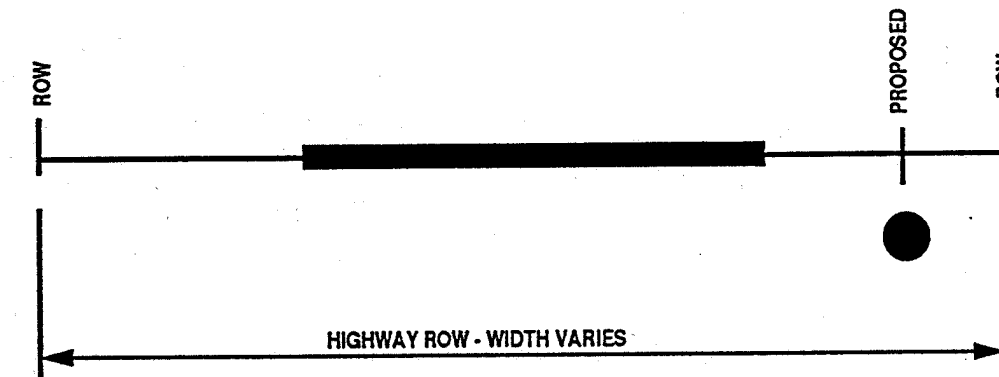


Figure 6.2.1-7 LAND USE/VEGETATION IN POTENTIAL NEW ACCESS AREAS ALONG THE PROPOSED NATURAL GAS PIPELINE CORRIDOR (OLD EAGLE LAKE TO GORDONVILLE)

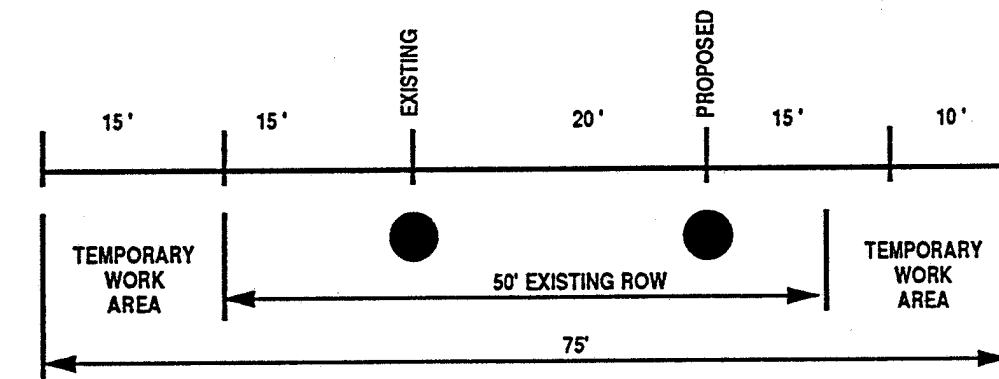
**Hardee
Power Station**



NEW RIGHT-OF-WAY



NEW RIGHT-OF-WAY
ALONG OTHER ROW (HIGHWAY)



NEW RIGHT-OF-WAY
ALONG EXISTING GAS PIPELINE ROW

NOT TO SCALE

Figure 6.2.3-1 PROPOSED RIGHT-OF-WAY (ROW)
SCHEMATIC DESIGNS

**Hardee
Power Station**

corridors. A qualitative assessment of resources contained within the preferred and alternative corridors was made through this process.

Preferred corridors were identified which minimized potential impacts to local land use and environmental features. The alternative corridors were discarded due to environmental considerations, e.g., potential wetland impacts.

6.2.6 Socio-Political Environment of the Corridor Area

6.2.6.1 Governmental Jurisdiction

The proposed natural gas pipeline corridor runs generally southward from just north of Polk City to the Polk/Hardee County line where it enters the plant just inside Hardee County. The pipeline is approximately 79 km (49 miles) long and passes through unincorporated portions of Polk County and Polk City, Auburndale and Bartow. It is also within 0.8 km (0.5 mile) of several smaller unincorporated communities including Bradley Junction and Gordonville. Figures 6.2.1-2 through 6.2.1-5 show the proposed pipeline corridor in relation to the towns and cities within 0.8 km (0.5 mile) of the corridor.

6.2.6.2 Zoning and Land Use Plans

The corridor crosses unincorporated parts of Polk County plus Polk City, the City of Auburndale, and the City of Bartow. Each of the four local government jurisdictions crossed by the corridor has adopted a comprehensive plan pursuant to Chapter 163, FS. Except for the City of Auburndale and the City of Polk City, none of these local governments has an adopted land use plan map. The location of the corridor in relation to the City of Auburndale's future land use plan map is depicted in Figure 6.2.6-1. The location of the corridor in relation to the City of Polk City's future land use plan map is presented in Figure 6.2.6-2.

The City of Auburndale's future land use map covers a planning area that includes the city limits and fringe areas outside the city limits. The future land use plan covering only the city limits does not include the area crossed by the pipeline corridor. As shown on Figure 6.2.6-1, land

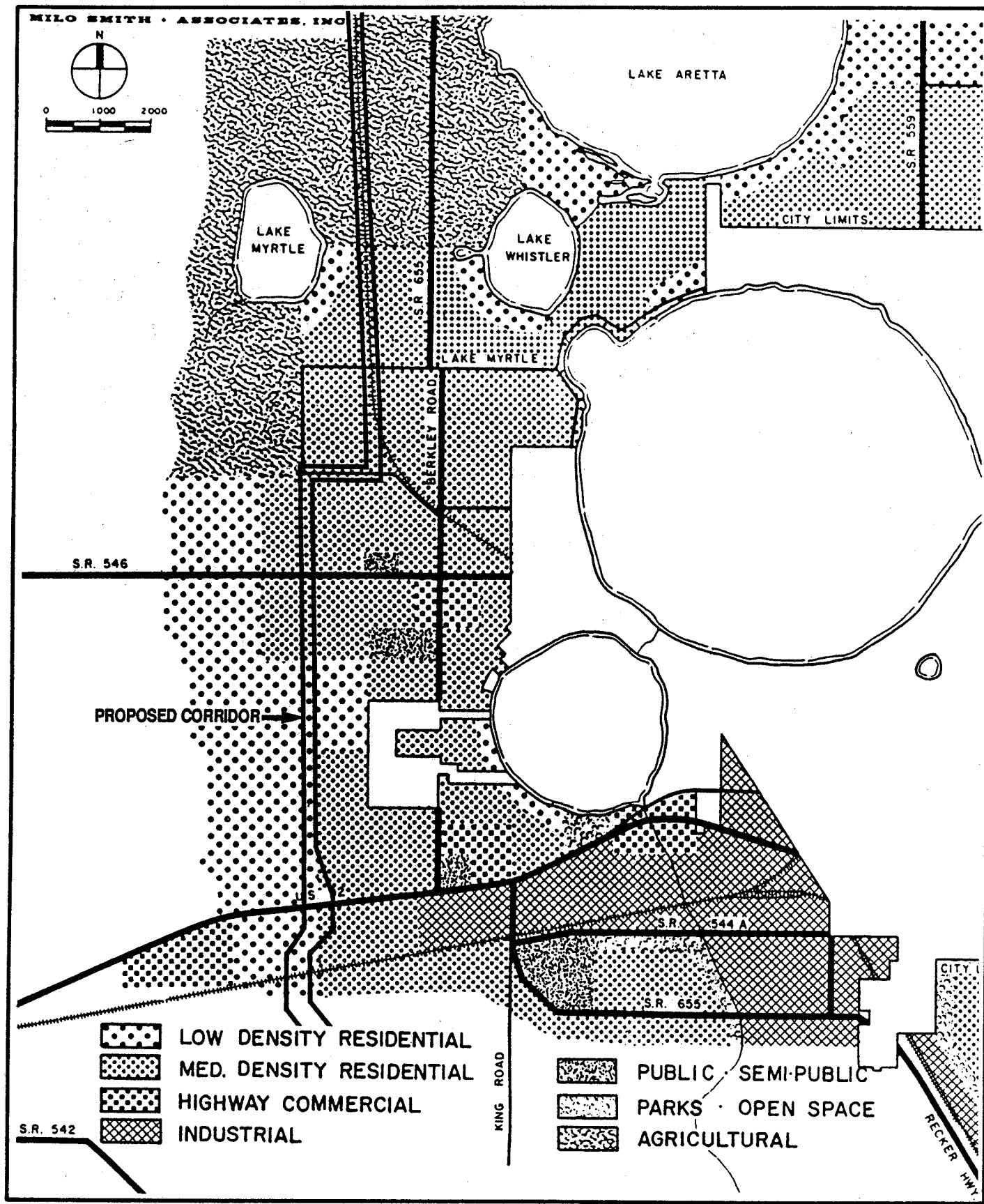


Figure 6.2.6-1 FUTURE LAND USE MAP — AUBURNDALE

**Hardee
Power Station**

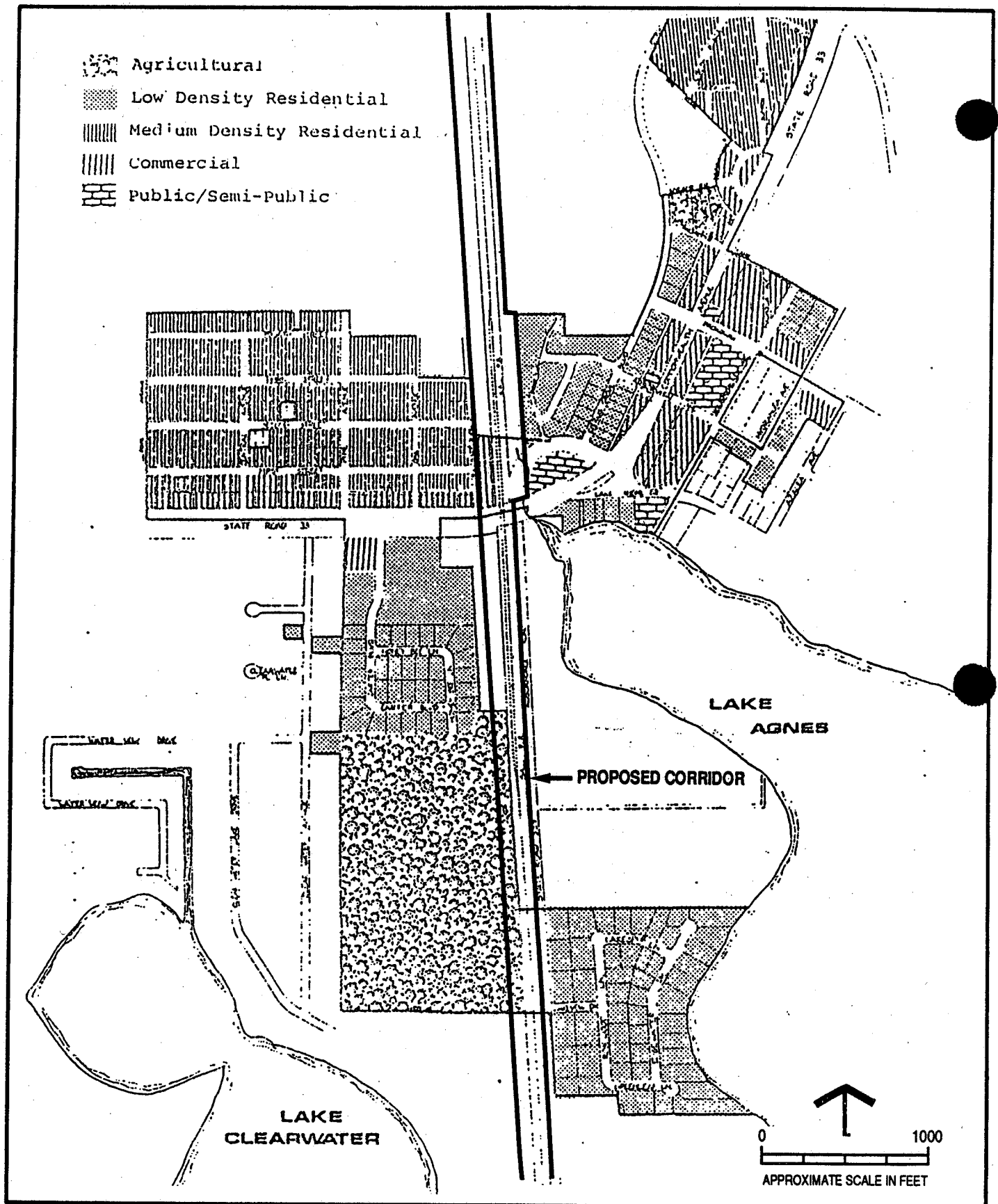


Figure 6.2.6-2 FUTURE LAND USE MAP — POLK CITY

**Hardee
Power Station**

use plan categories crossed by the pipeline corridor are Agricultural, Medium Density Residential, and Low Density Residential.

As shown in Figure 6.2.6-2, land use plan categories in Polk City's future land use plan crossed by the pipeline corridor are Agricultural and Commercial.

The following zoning districts are crossed by the pipeline corridor:

Polk City

C-1--Commercial Restricted District

City of Auburndale

CH--Commercial Highway District

City of Bartow

R-1--Residential District

R-1A--Residential District

C-3--Highway Commercial District

P-1--Professional Office District

I-1--Industrial District

I-2--Industrial District

Polk County

R-1--Residence District

R-2--Residence District

R-3--Residence District

RE-1--Rural Estates District

RE-2--Rural Estates District

SF-1--Single Family District

SF-1M--Single Family District

RC--Rural Conservation District

RC-2--Rural Conservation District

C-2--Commercial District - Multi Neighborhood Commercial

C-3--Commercial District - Regional Commercial

C-4--Commercial District - Heavy Commercial

GI--General Industrial District

PUD--Planned Unit Development District

Applicable provisions of each local government's zoning code are discussed in the following paragraphs.

Polk County--The Polk County Land Use Element of the Polk County Comprehensive Plan and the Polk County Zoning Ordinance were reviewed, and County Officials were consulted to determine the compatibility of the

proposed pipeline with existing Polk County rules and plans. In response to a request from the Applicants, a letter was received from the Polk County Administrator indicating that the Zoning Ordinance and the Comprehensive Plan consider gas pipelines to be essential services. These facilities are, therefore, permitted in the existing zoning districts of Polk County.

Hardee County--The pipeline enters Hardee County on the Hardee Power Station property. The plant and associated gas pipeline are authorized uses under present zoning (see Section 2.2.2).

Polk City--The Zoning Ordinance (Ordinance Number 89-11) does not include any reference to a gas pipeline as either a permitted or prohibited use. The location of the pipeline corridor through Polk City was approved by the City Commission on April 2, 1990.

Auburndale--Auburndale's zoning code (Chapter 25) defines essential services as clearly including "gas facilities" and provides that they "may be located within any zoning district after review and approval by the City Commission" (Section 25-20, Page 1462). That approval was granted by the City Commission on April 2, 1990.

Bartow--The City of Bartow's zoning code defines public service structures as clearly including gas pipelines (Section 15, Page 337). Section 33, general regulations for structures and uses, identifies public service structures as permitted in all zoning districts only after review by the zoning commission (Pages 358-360). Approval was granted by the Zoning Commission on March 26, 1990.

6.2.6.3 Easements, Title, Agency Works

Easements will be required for the gas pipeline corridor to cross lands under the jurisdiction of the Board of Trustees of the Internal Improvement Trust Fund. This jurisdictional determination has been requested for the proposed corridor and will be provided subsequent to ROW selection. A list of roads, railroads and transmission lines within the preferred corridor

for which crossing approvals would ordinarily be required is presented in Table 6.2.6-1.

6.2.6.4 Vicinity Scenic, Cultural and Natural Landmarks

There are no areas of the type identified in Section 2.2.5 of the Instruction Guide for Site Certification Applications within 0.8 km (0.5 mile) of the proposed pipeline.

6.2.6.5 Archaeological and Historic Sites

DHR was contacted to determine whether any archaeological or historic sites listed or eligible for listing in the National Register of Historic Places, or otherwise of national, state, or local significance might be affected by the proposed gas pipeline corridor. A set of USGS quadrangle maps (1:24,000) showing the locations of the corridor were reviewed by the DHR personnel. Both known sites and potential historical and archaeological site locations within the corridor were identified by the DHR staff. Based on DHR review it has been determined that no recorded archaeological and historic sites would be impacted by the proposed corridor (see DHR letter, Appendix 11.3). Several potentially sensitive areas were identified.

6.2.7 Bio-Physical Environment of the Corridor Areas

6.2.7.1 Land Use/Vegetation

Land use (see Section 6.2.7.3) along the corridor ranges from residential (FLUCCS 110-120) to strip mined (FLUCCS 161). The major land use along the corridor is improved pasture (FLUCCS 211). Ninety-one percent of the corridor is along existing gas pipeline, railroad, and highway ROWs. Figures 6.2.1-6 and 6.2.1-7 show land use/vegetation within 0.8 km (0.5 mile) of the proposed pipeline corridor along sections of the corridor requiring new access. Land use and vegetation were determined using USGS 1:24,000 topographic quadrangle maps, recent aerial photos and ground inspection.

6.2.7.2 Affected Waters and Wetlands

Table 6.2.7-1 lists the water bodies that will be crossed by the proposed pipeline. All water bodies are presently crossed by existing ROWs. These

Table 6.2.6-1. Easements, Title, Crossing Approvals Normally Required for Gas Pipeline Construction from Interconnect Point to Hardee Power Station (Page 1 of 2)

Facility	Location	Affected Party	Type of Previous Approvals
SR 33	Polk City	FDOT	Utility Permit
I-4/SR 400	2.3 km (1.4 miles) South of CR 33	FDOT	Utility Permit
CSX RR	4.0 km (2.5 miles) South of I-4	CSX	Use Approval
Mount Olive Road	Polk City	Polk County	Use Permit
Pace Road	4.8 km (3.0 miles) South of Polk City	Polk County	Use Permit
Bryan Lane	4.8 km (3.0 miles) South of Polk City	Polk County	Use Permit
Spring Road	4.0 km (2.5 miles) North of Auburndale	Polk County	Use Permit
Braddock Road	4.0 km (2.5 miles) North of Auburndale	Polk County	Use Permit
Lake Myrtle Road	Auburndale	Polk County	Use Permit
Jones Road	Auburndale	Polk County	Use Permit
Plymouth Road	Auburndale	Polk County	Use Permit
Moss Road East	Auburndale	Polk County	Use Permit
CR 546	Auburndale	Polk County	Use Permit
US 92	Auburndale	FDOT	Utility Permit
CSX RR	Auburndale	CSX	Use Approval
CR 542	Jones Corner	Polk County	Use Permit
CR 540 (Winter Lake Rd)	West of Winter Haven	Polk County	Use Permit
Thornhill Road	West of Eagle Lake	Polk County	Use Permit
Hurst Road	West of Eagle Lake	Polk County	Use Permit
Wilson Road	West of Eagle Lake	Polk County	Use Permit
Mays Road	West of Eagle Lake	Polk County	Use Permit
Sheffield Road	West of Eagle Lake	Polk County	Use Permit
CSX RR	Southwest of Gordonville/West of Bartow Municipal Airport	CSX	Use Approval
Old Bartow/ Eagle Lake Road	Bartow Municipal Airport	Polk County	Use Permit
Gertler Road	West of Bartow Municipal Airport	Polk County	Use Permit
Church Street	Northeast of Bartow	Polk County	Use Permit
Perch Street	Northeast of Bartow	Polk County	Use Permit
Griffen Street	Northeast of Bartow	Polk County	Use Permit
Thomas Street	Northeast of Bartow	Polk County	Use Permit
Alma Court	North of Bartow	Polk County	Use Permit
Rosa Court	North of Bartow	Polk County	Use Permit
Gate Road	North of Bartow	Polk County	Use Permit
Wall Street	North of Bartow	Polk County	Use Permit
Radford Road	North of Bartow	Polk County	Use Permit

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Table 6.2.6-1. Easements, Title, Crossing Approvals Normally Required for Gas Pipeline Construction from Interconnect Point to Hardee Power Station (Page 2 of 2)

Facility	Location	Affected Party	Type of Previous Approvals
CSX RR/U.S. 98/ SR 700/SR 35	Bartow	CSX/FDOT	Use Approval/ Utility Permit
SR 60	West of Bartow	FDOT	Utility Permit
CSX RR	East of Mulberry	CSX	Use Approval
Bonnie Mine Road	Southwest of Bartow	Polk County	Use Permit
Pebbledale Road	Southwest of Bartow	Polk County	Use Permit
Old Hwy 37	Pierce	Polk County	Use Permit
Jamison Road	Pierce	Polk County	Use Permit
CSX RR	South of Bonnie	CSX	Use Approval
CR 630/CSX RR	Pebbledale	Polk County	Use Permit
CSX RR	Pierce	CSX	Use Approval
CSX RR	Rolling Hills	CSX	Use Approval
SR 37	Rolling Hills	FDOT	Utility Permit
Patterson Road	Rolling Hills	Polk County	Use Permit
Williams Road	Rolling Hills	Polk County	Use Permit
Brewton Street	Rolling Hills	Polk County	Use Permit
Doc Durran Road	Bradley Junction	Polk County	Use Permit
Pine Street	Bradley Junction	Polk County	Use Permit
Forbes Road	Bradley Junction	Polk County	Use Permit
Main Avenue	Bradley Junction	Polk County	Use Permit
CSX RR	Bradley Junction	CSX	Use Approval
SR 37	Brewster	FDOT	Utility Permit
SR 37	Brewster	FDOT	Utility Permit
Fort Green Road	4.8 km (3.0 miles) South of CR 630	Polk County	Use Permit
Mills Road	6.4 km (4.0 miles) South of CR 630	Polk County	Use Permit
Walker Road		Polk County	Use Permit

Note: No changes resulting from the gas pipeline are expected to occur within the facilities listed.

Table 6.2.7-1 Water Bodies Crossed by Proposed Gas Pipeline Corridor for the Hardee Power Station

Water Body	Water Classification*	County/Location	Crossings
Unnamed Tributary	Class III	Polk, South of Auburndale	Existing
Saddle Creek	Class III	Polk, North of Bartow	Existing
Bear Branch	Class III	Polk, Bartow	Existing
Skinned Sappling Creek	Class III	Polk, Southwest of Bartow	Existing
South Prong Alafia River	Class III	Polk, South of Bradley Junction	Existing

* Chapter 17.3.161 F.A.C.

water bodies are Class III water bodies. A number of wetlands are crossed by the proposed corridor. The majority of these wetlands are forested wetlands (see Section 6.2.7.3). All are already crossed by existing ROWs.

6.2.7.3 Ecology

Table 6.2.7-2 lists important fauna potentially occurring along the corridor. Except for the gopher tortoise whose burrows was observed along a railroad ROW within the corridor, the probability of occurrence of the other species within the corridor is low because of the lack of good habitat.

The short-tailed snake (Stilosoma extenuatum) whose range includes the corridor could potentially occur along the corridor. This snake, endemic to Florida, is restricted chiefly to longleaf pine/turkey oak plant associations. The ecology of this species is poorly known. It is a burrower and is seldom seen above ground except in spring and fall. The short-tailed snake is threatened primarily due to timber management practices and the conversion of its habitat to citrus groves and building sites. Because of the lack of good habitat within the corridor the probability of occurrence is low.

Detailed discussion of the other species whose ranges include the corridor is presented in the previous Section 6.1.7.3.

The following is a description of the ecological (and land use conditions) observed within sections of the gas pipeline corridor starting at the interconnect point near Polk City and proceeding south to the plant site. Except for 6.9 km (4.3 miles) the corridor contains existing ROWs, i.e., gas pipeline, highways, and railroad ROWs which are ruderal in nature.

Vegetation along the corridor is a mixture of improved pastures, citrus, ruderal areas and occasional wetlands. The southern portion of the corridor passes through mined and reclaimed lands. Wildlife along most portions of the corridor consists primarily of common species that tolerate human proximity, which include songbirds, rodents, small mammals, etc. The

Table 6.2.7-2. Threatened and Endangered Animal Species that Could Potentially Occur along the Gas Pipeline Corridor for the Hardee Power Station

Common Name	Scientific Name	Status	Habitat	Source
BIRDS				
Burrowing owl	<u>Athene cunicularia</u>	SSC	Open pine-pasture	FGFWFC
Southeastern American kestrel	<u>Falco sparverius paulus</u>	T	Open pine-pasture	FGFWFC
Bald eagle	<u>Haliaeetus leucocephalus</u>	T, E	Open pine-pasture with tall trees	FGFWFC USFWS
Audubon's crested caracara	<u>Polyboros plancus audobonii</u>	T T	Prairie, open pasture	FGFWFC USFWS
Wood stork	<u>Mycteria americana</u>	E E	Wetlands	FGFWFC USFWS
REPTILES				
American Alligator	<u>Alligator mississippiensis</u>	SSC T(S/A)	Wetlands	FGFWFC USFWS
Gopher tortoise	<u>Gopherus polyphemus</u>	SSC UR2	Upland areas with abundant herbaceous ground cover	FGFWFC USFWS
Eastern indigo snake	<u>Drymarchon corais couperi</u>	T T	Wooded areas	USFWS FGFWFC
Florida pine snake	<u>Pituophis melanocephalus mugitus</u>	SSC UR2	Upland oak-palmetto open pine-pasture	FGFWFC USFWS
Short-tailed snake	<u>Stilosoma extenuatum</u>	T UR2	Upland oak-palmetto	FGFWFC USFWS

Note: E = Endangered
 SSC = Species of Special Concern
 T = Threatened
 T(S/A) = Threatened Due to Similarity of Appearance
 UR2 = Under review for listing, but substantial evidence of biological vulnerability and/or threat is lacking
 USFWS = U.S. Fish and Wildlife Service
 FGFWFC = Florida Game and Fresh Water Fish Commission

wetlands described above, especially in the southern sections, provide habitat for aquatic dependent species such as wading birds.

Interconnect Point North of Polk City to I-4

The preferred pipeline corridor is along an abandoned CSX railroad ROW. On the east side of the pipeline corridor north of Polk City is a north-south narrow bayhead of sweet bay (Magnolia virginiana), swamp bay (Persea palustris), slash pine (Pinus elliottii), pond pine (Pinus serotina), and red maple (Acer rubrum). Cover elsewhere along the remaining corridor section consists of improved pasture and citrus.

An active gopher tortoise (Gopherus polyphemus) burrow was located along the railroad ROW north of Polk City. Most of this section provides only marginal habitat for the gopher tortoise.

I-4 to Braddock Road

This section is primarily ruderal in character and continues along the CSX ROW. A number of residences exist within 0.4 km (0.25 miles) of the corridor. Pastures, abandoned fields and citrus groves are present. One and one-half to three km (1 to 2 miles) south of I-4 the corridor crosses a wetland dominated by sweet bay and red maple. One and a half to 3 km (1 to 2 miles) farther south the corridor crosses wetlands dominated by bays and slash pine.

Braddock Road to US 92

Land use in this section of the corridor is predominantly citrus grove, pasture and a sandpit operation and includes the CSX ROW for approximately half the distance. The corridor leaves the CSX ROW and continues south through pasture and citrus groves. The corridor is bordered on the west by a large bay/slash pine wetland for approximately 1.5 km (1 mile) north of US 92. The corridor itself is an upland ruderal area.

US 92 to CR 542

The corridor crosses a willow swamp, goes across an active CSX railroad, then turns southeast across a willow swamp with scattered stands of red

maple and sweet bay, and then turns east into an area with scattered mobile homes and pastures. Across Thornhill Road, the corridor passes through a ranchette neighborhood and joins an electrical transmission line ROW. The surrounding vegetation in this area is longleaf pine flatwoods and pasture. Dominant plant species in the flatwoods are longleaf pine (Pinus palustris), saw palmetto (Serenoa repens), wiregrass (Aristida stricta), staggerbush (Lyonia fruticosa), and scrubby oaks, such as sand live oak (Quercus geminata). South of the flatwoods the ROW crosses a bay swamp that adjoins CR 542.

CR 542 to CR 540

The corridor follows the transmission line ROW and is surrounded by improved pasture. The corridor crosses a stream in two locations within 0.8 km (0.5 mile) south of CR 542. The corridor joins an existing FGT pipeline ROW. The ROW is built higher than the surrounding pasture which has many low spots of marsh or clumps of bay trees. An excavated ditch borders the ROW on the southern half of this segment. There are at least two culverts to convey water across the ROW.

CR 540 to Thornhill Road

The corridor continues along an FGT gas pipeline and a transmission line ROW. It crosses an improved pasture through most of this section. Ruderal areas and residences occur at the eastern edge of the corridor. Upland areas in this section other than improved pasture include some areas of pine plantation and pine flatwoods. Wetlands in the segment consist of a cypress dome/marsh system crossed by the existing FGT pipeline ROW, but mostly to its east, and an isolated marsh north of Thornhill Road. The cypress dome/marsh consists predominantly of cypress (Taxodium sp.), sweetbay, and slash pine on the west and a large marsh that extends past the corridor area on the east. The marsh is dominated by juncus (Juncus sp.), sedges, and lizard tail (Saururus cernuus).

The isolated marsh is dominated by juncus. There are several small [less than 0.1 ha (0.25 acre)] areas on the corridor dominated by juncus and redroot (Lachnanthes caroliniana). In some areas a wetland with juncus and

elderberry (Sambucus canadensis) parallels the east side of the existing corridor that was probably created by the construction of the ROW for the existing pipeline.

Thornhill Road to Old Bartow/Eagle Lake Road

The corridor continuing along existing ROWS crosses through improved pasture. Citrus groves occur to the east of the corridor. Small areas [<0.2 ha (<0.5 acre)] of pine palmetto flatwoods and xeric oak occur along the corridor. Approximately 0.8 km (0.5 mile) south of Thornhill Road, a large wetland crosses the corridor, apparently draining toward a strip mined area 0.8 km (0.5 mile) east of the corridor. About $3/4$ km ($1/2$ mile) north of Old Bartow/Eagle Lake Road, the corridor veers to the southeast to avoid a small lake. In this area it crosses an area of xeric oak and a longleaf pine flatwoods with an understory of saw palmetto, scrub oaks, and gallberry. Just north of Old Bartow/Eagle Lake Road is another wetland, which drains into Millsite Lake, which is approximately 1.6 km (1 mile) east of the corridor. Both wetlands are mixed slash pine/bay swamp.

Old Bartow/Eagle Lake Road to South of Gordonville

The corridor leaves the existing ROWs and borders the edge of an abandoned citrus grove. This area is a planned site for wastewater irrigation. The route borders the rural, largely residential town of Gordonville and follows Old Bartow/Eagle Lake Road. Although the USGS quad shows a wetland occurring on the north and west side of the corridor, no wetland was observed. It may have been destroyed by the extensive strip mining between this area and Lake Hancock which is 3 to 4 km (2 to 3 miles) northwest of the corridor. This section, largely bordering the residential area of Gordonville, provides only marginal wildlife habitat.

South of Gordonville to Levee South of Saddle Creek

The corridor follows existing highway and pipeline ROWs. The upland area in this section is predominantly ruderal or formerly mined land. There is an area of overgrown longleaf pine-saw palmetto flatwoods occupying the narrow strip of land between Old Bartow/Eagle Lake Road and U.S. 17. The corridor crosses Saddle Creek in this section and its associated mixed

swamp hardwood floodplain. The creek is channelized and its water level is influenced by a dam to the north that controls water flow from Lake Hancock. Cypress trees in the floodplain have been stressed by the channelization as indicated by exposed roots and soil subsidence below the buttresses.

The mixed swamp hardwood floodplain along Saddle Creek provides good wildlife habitat.

South of Saddle Creek and Along SR 60

The corridor parallels existing ROWs for most of the distance. The undeveloped uplands are ruderal, pasture, or citrus orchard in this part of the corridor. The corridor passes through some residential areas. At Bear Branch the route turns southwest leaving existing ROWs until it rejoins the CSX and SR 60. The corridor includes upland hardwoods on the southern edge and part of a strip mine lake on the north in this area. Bear Branch has been channelized and vegetation on its banks is more transitional than wetland: sweetgum (Liquidambar styraciflua), live oak (Quercus virginiana), water oak (Quercus nigra), mulberry (Morus sp.), and black cherry (Prunus serotina). The strip mine lake is bordered by weedy upland vegetation: mulberry, black cherry, persimmon (Diospyros virginiana), and groundsel bush (Baccharis halimifolia).

The proposed route roughly parallels SR 60 for 5 km (3 miles). The corridor consists mostly of pasture, planted pine, and ruderal areas on previously mined lands. At 2 km (3.2 miles) from the location where it meets SR 60, a wetland occurs on the north. Willow (Salix caroliniana) and elderberry dominate the vegetation.

Most of this section is ruderal and/or suburban in character. Wildlife in the area would consist of species that tolerate human proximity and thrive in suburban environments.

South of SR 60 to Rolling Hills

This section consists of previously mined land. The corridor follows existing railroad, gas pipeline and highway ROWs. Uplands are predominantly pasture. It crosses Skinned Sapling Creek with wetland vegetation of elderberry and groundsel bush. A large strip mine lake is west of the corridor between SR 60 and Pebbledale. A small hardwood wetland occurs on the west where the route crosses the railroad at Pebbledale.

Rolling Hills to the Intersection of SR 37 and CR 630

The corridor along Jamison Road consists of unmined lands, predominantly pine/oak flatwoods with a palmetto understory. On SR 37 the corridor consists mostly of pasture on previously mined lands. The corridor following existing ROWs crosses a citrus grove, pine/oak forest and pasture south of Bradley Junction.

The corridor crosses the South Prong Alafia River. The bank of the river is predominantly pasture.

Intersection of SR 37 and CR 630 Along CR 663 to Hardee Power Station Site

This section of corridor follows existing highway, railroad and transmission line ROW. The areas next to the corridor consists mostly of previously mined and actively mined lands. However, along CR 630 there is an area of upland hardwood on the south side of the corridor with black cherry, laurel oak (Quercus laurifolia), and groundsel bush predominating. Upland areas along the corridor that are not actively being mined consist of pasture, ruderal areas and some pineland and citrus. The corridor crosses a willow-dominated hardwood wetland where this route intersects with a proposed Alternate Route. The corridor also crosses the remains of Little Payne Creek. The former creek is represented by a ditch that traverses the road and does not appear to be connected to Little Payne Creek further east. Dominant vegetation is willow.

Most of this segment provides poor wildlife habitat due to the past and present strip mining of the area. There are, however, some small wetlands

adjacent to the corridor that provide habitat for ducks, wading birds, and other wildlife. Additionally, the pastures provide habitat for small mammals and predators such as hawks and owls.

6.2.7.4 Other Environmental Features

All applicable environmental features are described in the above sections.

6.2.8 Effects of Right-of-Way Preparation and Construction

6.2.8.1 Construction Techniques

Construction of the pipeline will involve preparing the construction ROW and trenching. Preparing the construction ROW will involve clearing a path 15 to 23 m (50 to 75 ft) wide, depending on available space, to allow for passage of construction vehicles. Where the pipeline is installed in existing ROWs, less clearing will be required. After preparation of the ROW, a linear trench 30 cm (12 inches) wider and 91 cm (36 inches) deeper than the pipeline diameter will be excavated to install the pipeline. Section 6.2.8.2 discusses erosion potential and proposed mitigation measures.

6.2.8.2 Impact on Water Bodies and Uses

The proposed pipeline will use existing ROW crossings of water bodies. Dredge and fill operations to lay the new pipeline across streams will take place. This type of construction can temporarily increase sedimentation and turbidity levels in the immediate vicinity and downstream of the proposed crossing. In order to reduce these impacts, sediment controls will be used.

Several already altered forested wetlands as well as one new isolated wetland (i.e., red maple swamp) may be affected by construction of the ROW. Potential wetland impacts include soil compaction, sedimentation, alteration of hydrology, and removal of vegetation. These impacts will be minimized by appropriate controls.

No significant adverse effects to wetlands along the proposed corridor are expected since most of the wetlands along the corridor are already impacted

by existing ROWs and the area to be disturbed along the ROW will be small. A new wetland crossing will be required for a small isolated wetland (see US 92 to CR 542 description). This wetland is already modified by a CSX ROW. No significant impacts will occur.

6.2.8.3 Solid Wastes

The major solid wastes generated will be vegetative wastes resulting from clearing activities. These may be used as mulch for the ROW or be transported to a nearby landfill. No hazardous wastes will be generated during construction operations.

6.2.8.4 Changes to Vegetation, Wildlife and Aquatic Life

Most of the corridor follows highway, railroad or transmission line ROWs which are not important vegetative or wildlife habitats. Sections of the proposed corridor that are not located along transmission lines roads or existing pipeline ROWs are on pasture lands. The potential for occurrence of threatened and endangered species in the ROW is extremely low because of the lack of habitat.

Short-term impacts of construction in these or adjoining habitats may include wind erosion and fugitive dust transport due to removal of vegetation and soil disturbance. These impacts will be minimize by appropriate erosion controls. No long-term impacts to these habitats are anticipated.

The effects of the gas pipeline on wildlife will be practically nonexistent except during the construction phase of the project. During construction, some wildlife activities in the vicinity of the pipeline may be temporarily disrupted. These activities (e.g., foraging, nesting, travel, etc.) will resume after construction.

6.2.8.5 Impact on Human Population

Construction of the proposed pipeline will result in short-term impacts to area residents whose property is traversed by the pipeline. For the most

part, the proposed pipeline corridor will be within or adjacent to existing utility ROW thus minimizing the amount of area required for this facility.

During the construction period, trees and brush will be cleared from the construction ROW. Along new ROW sections agricultural uses of the ROW will be temporarily restricted. Since approximately 3 km (1.5 miles) of pipeline can be constructed each day, it is not anticipated that any one specific location will be affected for more than a few days.

Construction through citrus groves or cultivated areas may result in temporary crop or pasture loss for the growing season in which it occurs.

In residential locations, site specific plans will be developed to minimize impacts. Impacts to residential properties could include the temporary disruption of lawns; removal of fences, mailboxes and other structures; removal of ornamental shrubs; the loss of shade trees; the cutting of streets, driveways and sidewalks; and the disruption of household utilities. In residential areas, efforts will be made to minimize dust through watering, and residents will be advised to avoid the immediate construction area.

Construction through streets is likely to have a temporary impact on traffic flow. Area officials will be consulted for each street crossing to insure that there is either adequate clearance or a suitable detour for the passage of emergency vehicles during construction. Other through traffic will be detoured or allowed to pass through the area on a restricted flow basis (one lane or with traffic control personnel). On particularly busy streets, mitigation measures, such as construction during off-peak hours, will be investigated and implemented as practicable.

Upon completion of construction, lawns, sidewalks, parking lots, and roads will be restored. In cleared areas beyond the permanent ROW, ornamental shrubs and fences will be replaced. Trees will be permanently restricted from the permanent ROW.

The impact of noise on the local environment would occur only during construction which progresses fairly rapidly. Although individuals in the immediate vicinity of the work may experience temporary annoyance, the duration of the impact at any specific location would be short-term. No nighttime impacts would occur.

6.2.8.6 Impact on Regional Scenic, Cultural, and Natural Landmarks

There will be no impacts to these resources since there are no regional scenic, cultural or natural landmarks along the proposed corridor.

6.2.8.7 Impact on Archaeological and Historic Sites

There are no recorded archaeological or historic sites along the corridor, therefore, no impacts to these resources are likely. Several potentially sensitive areas occur along the corridor. If the ROW goes through these areas and they have not been previously disturbed then additional surveys will be conducted to determine the significance of these areas and appropriate mitigation measures will be implemented.

6.2.9 Post-Construction Impacts and Effects of Maintenance

6.2.9.1 Maintenance Techniques

When construction is completed, a cleared corridor will be maintained by mechanical means to permit access to the pipeline for inspection and maintenance, and to prevent tree roots from damaging the protective coating on the pipeline. Herbaceous ground cover will be allowed to reestablish in upland and wetland areas. Turf and ornamental shrubs will be restored in residential areas.

Where the pipeline parallels an existing FGT pipeline, up to 4.5 m (15 ft) of additional new permanent ROW may be required, depending on the width of the existing ROW distance to nearby structures, and diameter of the existing pipeline. Up to 15 m (50 ft) of new ROW will be maintained for the pipelines that will not follow existing FGT pipelines. Where the pipeline follows road ROWs, the Applicant will seek permission from the highway authorities to use the existing ROW for maintenance, thereby minimizing the need to acquire additional ROWS from private landowners.

6.2.9.2 Multiple Uses

Upon completion of pipeline construction, land uses within the pipeline ROW will be allowed to revert to preconstruction conditions and most land uses previously active in the area will be allowed to return. Restrictions to land use include the planting of trees and the placement of structures (including swimming pools) within the permanent ROW.

6.2.9.3 Changes In Species Population

Most of the proposed gas pipeline ROW is located along roads, suburban areas, existing ROWs, or mined land. These areas are rarely utilized by threatened or endangered species. Thus, the maintenance of the gas pipeline ROW is not expected to affect any threatened or endangered species. The maintenance of the ROW in wooded areas will preserve edge habitats that are often heavily utilized by white-tailed deer (Odocoileus virginianus). Populations of important wildlife or plant species are not expected to be affected by maintenance of the ROW.

6.2.9.4 Effects of Public Access

The ROW will not expose previously undisturbed natural areas to the public and will not result in any effects to wildlife.

6.2.10 Other Post-Construction Effects

6.2.10.1 Pipeline Safety

The transportation of natural gas by pipeline involves some degree of risk to the public in the event of an accident and subsequent release of gas. The greatest hazard is a fire or explosion following a major pipeline rupture.

Methane, the primary component of natural gas, is colorless, odorless, and tasteless. It is not toxic, but is classified as a simple asphyxiant, possessing only a slight inhalation hazard. If breathed in high concentration, oxygen deficiency can result in serious injury or death.

Methane has an ignition temperature of 538°C (1,000°F) and is flammable at concentrations between 5% and 15% in air. Unconfined mixtures of methane

in air are not explosive. However, a flammable concentration within an enclosed space in the presence of an ignition source can explode. The specific gravity of methane is 0.55 and, therefore, it is buoyant at atmospheric temperatures.

The proposed pipeline would be designed, constructed, operated, and maintained in accordance with the U.S. Department of Transportation (DOT) Minimum Federal Safety Standards in 49 CFR Part 192. The regulations are intended to insure adequate protection for the public from natural gas pipeline failures. Part 192 specifies material selection and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion.

Part 192 also defines area classifications, based on population density in the vicinity of the pipeline, which determine more rigorous safety requirements for populated areas. The class location unit is an area that extends 201 m (220 yards) on either side of the centerline of any continuous 1.6-km (1-mile) length of pipeline. The four area classifications are defined as follows:

Class 1 Location with 10 or fewer buildings intended for human occupancy.

Class 2 Location with more than 10 but less than 46 buildings intended for human occupancy.

Class 3 Location with 46 or more buildings intended for human occupancy or where the pipeline lies within 91 m (100 yards) of any building, or small, well-defined outside area occupied by 20 or more people during normal use.

Class 4 Location where buildings with four or more stories above ground are prevalent.

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. Pipelines constructed in Class 1 locations must be installed with a minimum depth of cover of 76 cm (30 inches) in normal soil, and 46 cm (18 inches) in consolidated rock. Class 2, 3, and 4 locations, as well as drainage ditches of public roads and railroad crossings, require 91 cm (36 inches) in normal soil and 61 cm (24 inches) in consolidated rock. Class locations also specify the maximum distance to a sectionalizing block value--16 km (10 miles) in Class 1, 12 km (7.5 miles) in Class 2, 6.4 km (4 miles) in Class 3, and 4 km (2.5 miles) in Class 4. Pipeline design pressures, hydrostatic test pressures, maximum allowable operating pressure, inspection and testing of welds, and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas.

Part 192 prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Under Section 192.615, each pipeline operator must also establish an Emergency Plan which provides written procedures to minimize the hazards from a gas pipeline emergency. Key elements of the plan include procedures for:

- (1) receiving, identifying, and classifying emergency events--gas leakage, fires, explosions, and natural disasters;
- (2) establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- (3) making personnel, equipment, tools, and materials available at the scene of an emergency;
- (4) protecting people first and then property, and making safe from actual or potential hazards; and
- (5) emergency shutdown of system and safely restoring service.

Each operator will establish and maintain a liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a gas pipeline emergency, and coordinate mutual assistance in responding to emergencies. The operator will also establish a continuing education program to enable customers, the

public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials.

The primary casual factor for pipeline accidents is outside forces, which constitute 53.5% of all service incidents. This is followed by corrosion, material and construction defects. Outside forces incidents result from the encroachment of mechanical equipment such as bulldozers and backhoes; from earth movements due to soil settlement, washouts, or geological hazards; from weather effects such as winds, storms and thermal strains; and from willful damage. Operators are required to participate in "one call" public utility programs in populated areas to minimize unauthorized excavation activities in the vicinity of pipelines (FERC, 1989).

An average annual service incident frequency of 1.30 failures per 1,600 km (1,000 miles) per year has been estimated for all natural gas transmission and gathering lines. The service incident frequency on the FGT system is lower than the industry-wide average. The FGT reported 20 service incidents on its 7,100 km (4,400-mile) system since 1980 -- equivalent to a service incident frequency of 0.57 failures per 1,600 km (1,000 miles) per year (FERC, 1989).

The frequency of service incidents is strongly dependent on pipeline age. Older pipelines have a higher frequency of corrosion incidents, since corrosion is a time dependent process. Newer pipelines generally have more advanced coatings and cathodic protection to reduce corrosion potential. Older pipelines also have a higher frequency of outside forces incidents partly because the location of older pipelines may be less well known and less well marked than newer lines.

6.2.10.2 Impact on Public Safety

Approximately two-thirds of the incidents are classified as a leak, and the remaining one-third classified as a rupture, implying a more serious failure. From 1970 to 1986 fatalities among the public averaged 2.5 per year nationwide. Nevertheless, the average number of fatalities among the

public--2.5 per year--is relatively small considering the more than 483,000 km (300,000 miles) of transmission and gathering lines in service nationwide. Furthermore, the fatality rate is approximately two orders of magnitude lower than the fatalities from natural hazards--lightening, tornados, floods, earthquakes, etc. (FERC, 1989).

Based on approximately 483,000 km (300,000 miles) of transmission line in service, the rate of public fatalities for the nationwide mix of transmission and gathering lines is 0.008 per 1,600 km (1,000 miles) per year. Applying the industry-wide average to the proposed new pipeline segments totalling 78.6 km (48.8 miles) yields a recurrence interval of approximately one fatality per 2,000 years. FGT's service incident rate is about half of the industry average, which may lead to an even lower fatality rate. The proposed pipeline consisting of a second pipeline adjacent to an existing pipeline, would cause only a slight increase in risk to the nearby public (FERC, 1989).

REFERENCES - Section 6.1

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REFERENCES - Section 6.2

- Federal Energy Regulatory Commission. 1989. Phase II Project Assessment. Federal Energy Regulatory Commission, Washington, D.C. Docket No. CP86-704-900.

6.3 ASSOCIATED LIQUID FUEL PIPELINE

6.3.1 Project Description

A liquid fuel pipeline will be constructed extending from Port Manatee on Tampa Bay to the proposed Hardee Power Station. This proposed pipeline corridor will be approximately 69 kilometers (43.0 miles) long and would traverse portions of Manatee, Hardee, and Polk Counties.

The pipeline will transport distillate fuel oil through a 20-centimeter (8-inch) diameter steel pipe. The pipeline will be constructed so as not to preclude the transport of butane, propane, or liquified natural gas should those fuels prove more economical. This pipeline will be buried to a minimum depth of 0.9 meters (3 feet) within a ROW 22.5 meters (75 feet) wide. It is anticipated that there will be no pumping stations along the length of the corridor.

6.3.2 Corridor Location and Layout

Figure 6.3.2-1 identifies the full length of both the preferred and alternative liquid fuel pipeline corridors relative to major geographic features. Aerial photographs depicting the preferred and alternative corridors are provided in Figure 6.3.2-2 located in Appendix 11.10. Approximately 95 percent of the preferred pipeline corridor will be located within, or adjacent to, existing ROWs.

6.3.2.1 Preferred Corridor

The preferred corridor was chosen after review and evaluation of both quantitative and qualitative data. The final selection was based upon the preferred corridor's comparatively fewer effects on ecology and wetlands, existing or planned development, and overall disruption.

The preferred pipeline corridor is shown on Figure 6.3.2-1. The western terminus will be located at Port Manatee on Tampa Bay. From that point to U.S. 41, the corridor will be in excess of 750 meters (2,500 feet) to allow for the most efficient alignment from the port's unloading facilities. At U.S. 41, the corridor will be reduced to approximately 480 meters

(1,600 feet) and will run southward adjacent to and within the CSX railroad and U.S. 41 ROWs to Buckeye Road. The corridor then narrows to approximately 240 meters (800 feet) and turns east. It will proceed along or adjacent to an existing Florida Power and Light (FPL) pipeline corridor south of Buckeye Road passing under I-75 to the intersection of the existing FPL north-south transmission line ROW. At that point, the preferred corridor will turn 90° south with a width of 219 meters (730 feet) [60 meters (200 feet) wider on either side of the transmission line ROW]. The corridor follows the existing FPL pipeline ROW, making another 90° turn, proceeding east for approximately 11.1 kilometers (6.9 miles) to the FPL/Manatee power plant site. It makes another 90° turn to the south, and extends to State Road (SR) 62. In that section, the preferred corridor will be 0.9 kilometers (2,900 feet) wide.

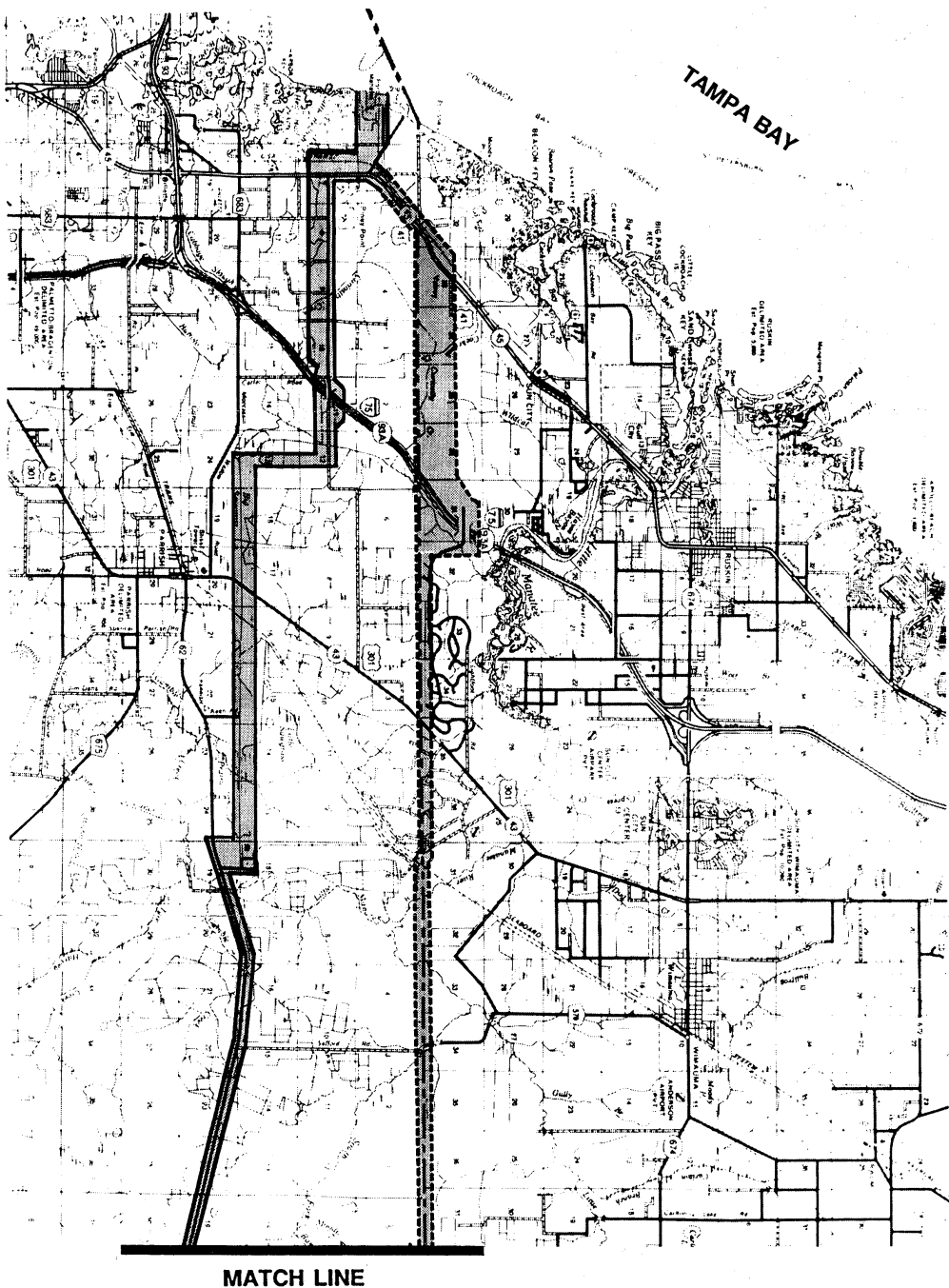
At that point, the preferred corridor turns eastward and parallels SR 62 with a 120-meter (400-foot) width centered on the highway center line. The corridor's alignment along SR 62 proceeds east beyond Safford Road, SR 39, and SR 37 for approximately 31.2 kilometers (19.5 miles), entering into Hardee County.

At John Gill Road, just west of the community of Ft. Green Springs, the preferred corridor turns 90° north and parallels that road for approximately 2.0 kilometers (6,500 feet). The corridor then turns 90° east, paralleling Roberts Road running 2.4 kilometers (8,000 feet) and crosses Payne's Creek until it intersects CR 663. In that section, the preferred corridor will be approximately 120 meters (400 feet wide) expanding to 330 meters (1,100 feet) wide where the corridor crosses Payne Creek to provide flexibility in ROW location to reduce wetland impacts.

The preferred corridor makes a turn to the north at CR 663 and proceeds [150 meters (500 feet) wide] northwesterly for 2.1 kilometers (7,000 feet) where it turns west with a width of 1.4 kilometers (4,700 feet) to allow the best, most feasible access to the proposed plant site. This will be the eastern terminus of the proposed pipeline.

Image Quality

As you review the next group of images, Please note that the original documents were of poor quality.



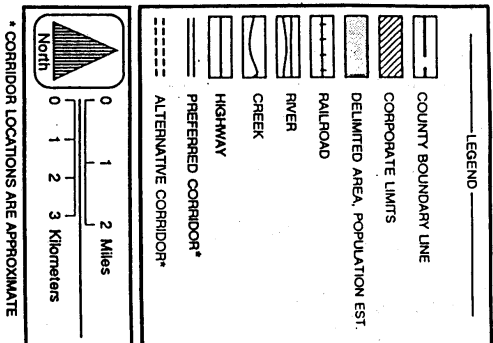
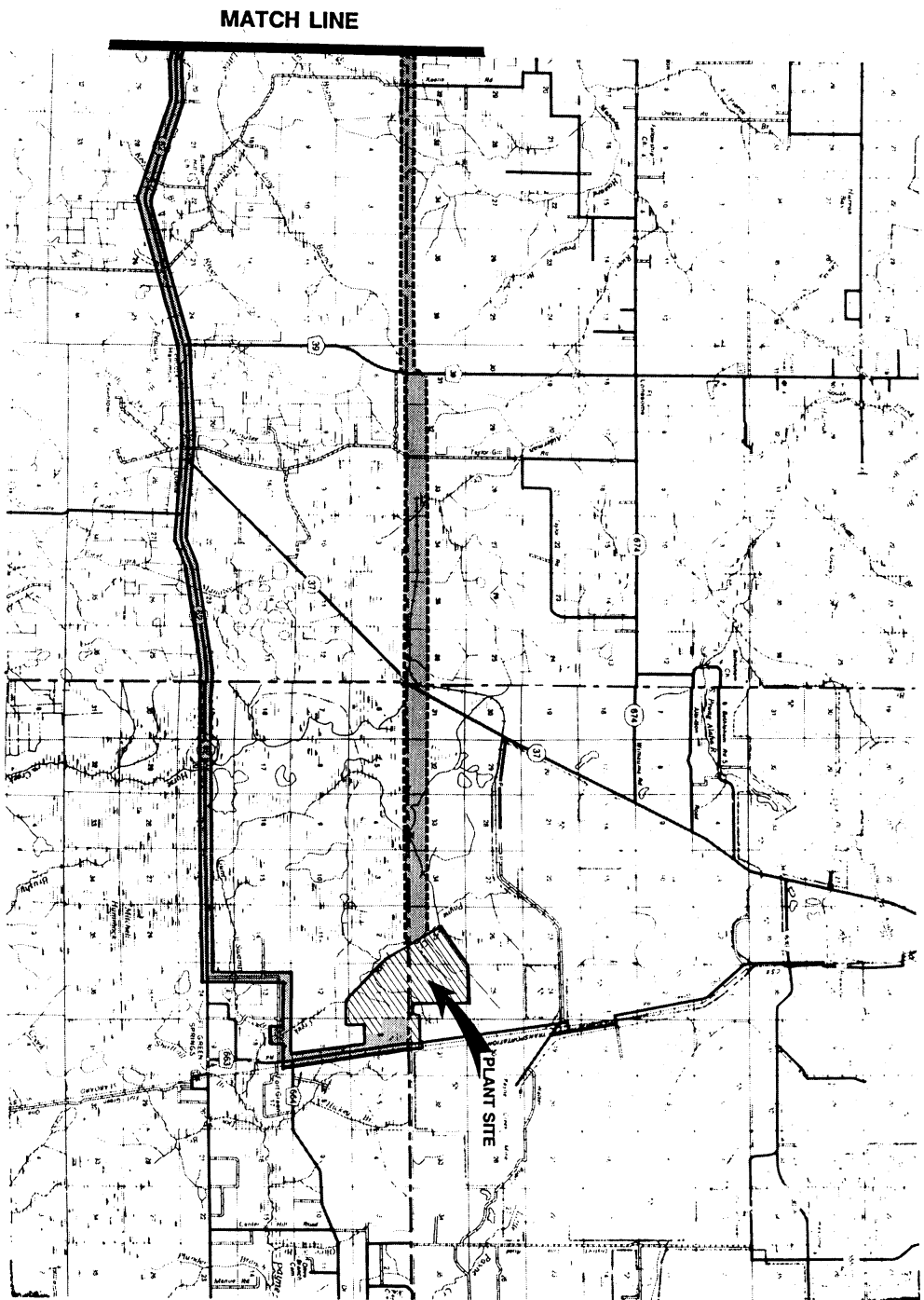


Figure 6.3.2-1 PROPOSED LIQUID FUEL PIPELINE CORRIDOR
(PAGE 2 OF 2)

**Hardee
Power Station**

The preferred corridor will lie adjacent to, or within, existing ROWs for highways and/or a transmission line/pipeline for virtually its entire length, minimizing the disturbance of isolated, relatively ecologically sensitive acreage. In addition, the preferred corridor is located in areas containing limited development, minimizing the disruption of residents as well as commercial enterprises. Finally, the location of the preferred corridor makes it less subject to the effects of future phosphate mining activity.

6.3.2.2 Alternative Corridor

An alternative corridor was identified but was not selected as preferred primarily because of the relatively greater amount of previously undeveloped land that would be subject to impact. In addition, there is uncertainty of the effects of future phosphate mining and reclamation schedules on the proposed pipeline and its required construction schedule. Virtually the entire alternative corridor length traverses open land, crossing only seven roads from U.S. 41 to the proposed plant site (eastern pipeline terminus).

The alternative corridor (Figure 6.3.2-1) begins at the Port Manatee docks (western terminus) and proceeds east to U.S. 41, having a width of 750 meters (2,500 feet) to allow the most efficient exit from the port area. At U.S. 41, the alternative corridor, with a width of 180 meters (600 feet), turns northeasterly and parallels U.S. 41 to the Hillsborough County line. At that point, the alternative corridor turns east, its width increasing to approximately 1.0 kilometer (3,200 feet) from the Hillsborough County line to north of the Valroy Road ROW.

The alternative corridor runs eastward, with the county line serving as the southern limit. This corridor, however, narrows to 96 meters (320 feet), adjoining the Hillsborough County line, to avoid the Sundance Subdivision. At the recently abandoned seaboard coastline railroad ROW, the alternative corridor expands to 120 meters (400 feet) and straddles the Hillsborough/Manatee County line as it continues east. At CR 39, the alternative corridor again widens to 300 meters (1,000 feet) immediately

north of the county line, and continues across Payne Creek where it enters the proposed plant site.

6.3.3 Liquid Fuel Pipeline Design Characteristics

The proposed pipeline will consist of 12-meter (40-foot) sections of 20-centimeters (8-inch) diameter steel pipe (Grade X-42, X-52, X-60, depending on yield strength) with a protective cover. Joints will be welded, and the top of the pipe will be buried to a minimum depth of 0.9 meters (3 feet). Under major highways, railroads and streambeds, the pipeline would be buried at least 1.2 meters (4 feet) deep. The pipeline will be contained within a 22.5-meter (75-foot) ROW. Circumstances may require a ROW width reduction; however, the minimum ROW would be no less than 9 meters (30 feet) in congested areas (for construction, operation, and maintenance).

No part of the pipeline may be located within 15 meters (50 feet) of any private dwelling, industrial building, or place of public assembly without special precautions, such as providing at least 0.3 meters (12 inches) of cover in addition to being below the level of cultivation. The proposed pipeline would be buried at least 0.9 meters (3 feet) deep, exceeding these federal requirements. Figure 6.3.3-1 presents a typical ROW design along new ROW and other existing ROWs.

6.3.4 Cost Projections

Preliminary cost projections for the preferred liquid fuel pipeline are shown in Table 6.3.4-1. The approximate cost is estimated to be \$10,000,000. The total cost of the pipeline will vary due to the final location of the ROW, which will affect the various cost components. Costs for ROW acquisition and other site-specific conditions are highly dependent upon final ROW approval.

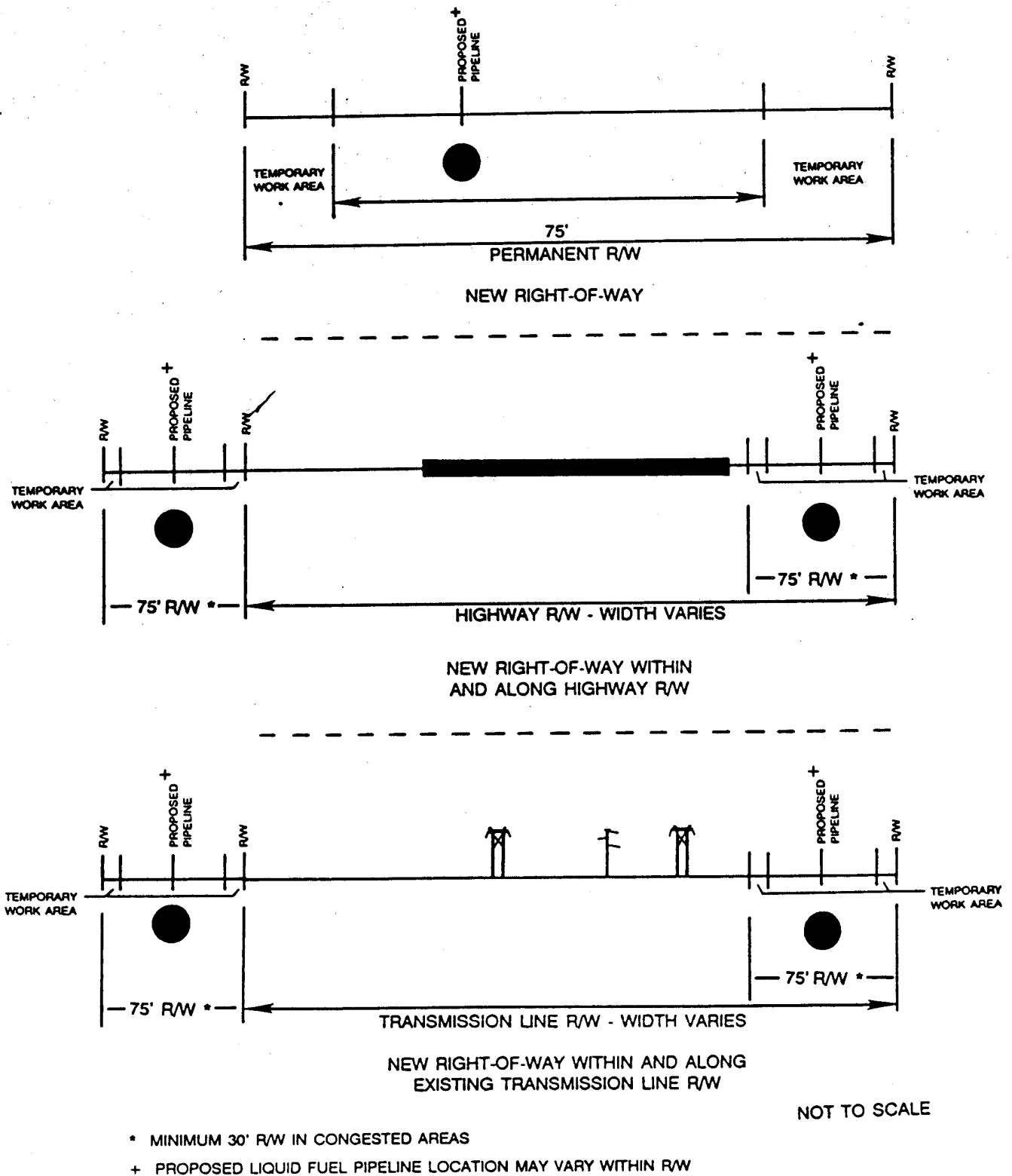


Figure 6.3.3-1 PROPOSED RIGHT-OF-WAY SCHEMATIC DESIGNS

**Hardee
Power Station**

Table 6.3.4-1. Preliminary Cost Analysis for the Hardee Power Station
Liquid Fuel Pipeline

Item	Cost
Land	\$ 725,000
Pipeline	8,740,000
Road Crossings	35,000
Rail Crossing	5,000
Water Crossings	55,000
Wetland Crossings	<u>272,000</u>
TOTAL	\$9,832,000

6.3.5 Corridor Selection

The pipeline corridor selection was based on a 3-stage process:

- Stage I: Regional screening of the Port Manatee/Hardee Power Station study area, followed by preliminary pipeline segment and corridor identification,
- Stage II: Selection of most feasible alternative corridor pathways, and
- Stage III: Selection of preferred and alternative pipeline corridors.

During Stage I, the study area (depicted in Figure 6.3.5-1) was screened to eliminate potential corridor pathways which would contain significant environmental, social, or regulatory constraints. In addition, preliminary corridor pathways and segments were selected.

During Stage II, analytical criteria were identified; incidence and acreages were quantified for each criteria; corridor segments were subjected to a computer model for segment analysis; and leading candidate alternatives were selected. Based on the preliminary screening and corridor/segment identification, the following criteria (constraints) were selected for use in the analysis of each segment and corridor:

- o Existing development;
- o Parks and recreation sites/areas;
- o Historic and archaeological sites/areas;
- o Wetland areas;
- o Water crossings (i.e., bridges, culverts); and
- o Pipeline length.

Various data and sources were used to quantify the selection criteria during this stage:

- o Latest available aerial photography (1"=400', 1"=600', 1"=900', 1"=1,800');
- o U.S. Geological Survey quadrangle sheets (1:24,000);

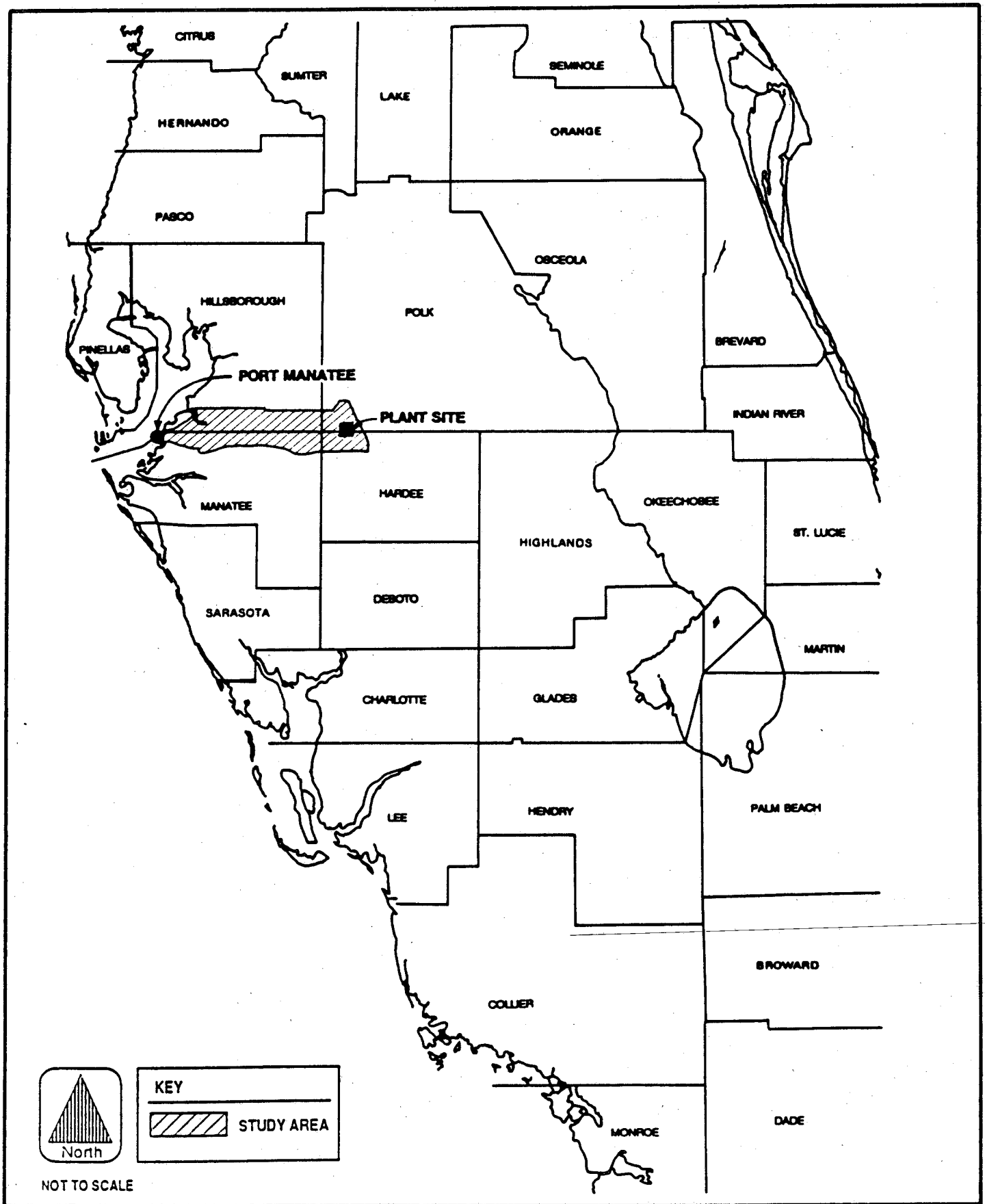


Figure 6.3.5-1 LIQUID FUEL PIPELINE CORRIDOR
SELECTION STUDY AREA

Hardee Power Station

- o Florida Department of State, Division of Historical Resource's identification of known historic and archaeological sites and archaeologically sensitive areas;
- o Contacts with county parks and recreation offices;
- o National Wetlands Inventory maps (1:24,000);
- o Review of available phosphate mine plans in approved DRI Applications and Environmental Impact Statements;
- o Three helicopter flights over the study area or corridors by multidisciplinary technical teams; and
- o Project description information supplied by Tampa Electric.

Each criterion was evaluated on a segment-by-segment basis.

The resulting data were evaluated in a computer modeling program to identify potential corridors that balanced the least incidence and/or acreage of environmentally constraining features with the least number of water crossings and shortest construction length. Relative importance weights were assigned to each criteria to ensure a meaningful analysis. Pairwise comparison evaluations were made within each technical discipline and compiled for a ranking of potential corridor pathways.

Certain broad assumptions were used in the analysis:

- o Location within, or adjacent to, an existing ROW was preferable in terms of both environmental considerations and cost;
- o Alignment would be permissible through unmined areas containing known phosphate reserves; and
- o Areas containing significant development were to be avoided wherever possible.

During Stage III, qualitative and quantitative data such as environmentally sensitive features and costs were refined and evaluated. The preferred and alternative corridors were identified.

6.3.6 Socio-Political Environment of the Corridor Area

6.3.6.1 Governmental Jurisdiction

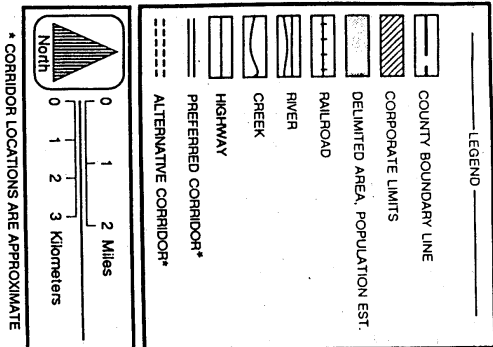
Figure 6.3.6-1 identifies the governmental jurisdictions within and adjacent to the preferred and alternative liquid fuel pipeline corridors. The preferred liquid fuel pipeline corridor will originate at Port Manatee which is located in unincorporated portions of Manatee County. The preferred corridor will extend eastward along various ROW to east of SR 37, where it will enter unincorporated Hardee County. In the vicinity of the unincorporated community of Ft. Green Springs, the preferred corridor is situated adjacent to the periphery of the community. The preferred corridor then continues to the plant site. If the plant entrance road ROW is used for the liquid fuel pipeline, an approximately 0.8-kilometer (0.5-mile) segment of the pipeline will be located in unincorporated Polk County.

The alternative liquid fuel pipeline corridor originates where the preferred corridor intersects U.S. 41 in unincorporated Manatee County. The alternative corridor extends from the Port Manatee vicinity into unincorporated Hillsborough County until it bisects an abandoned Seaboard Coastline Railroad line. From this location, the alternative corridor staddles the Manatee/Hillsborough County line until its intersection with CR 39. From CR 39 to SR 37, the alternative corridor is located in unincorporated Hillsborough County. East of SR 37, the alternative corridor enters unincorporated Polk County where it extends until the corridor terminates at the plant site boundary.

The Little Manatee River is an Outstanding Florida Water. The alternative corridor crosses the river at two locations (see Figure 6.3.6-1). No other local, regional, state, or federal areas identified in Section 2.2.1 of the Instruction Guide for Certification Applications are present within 0.8 kilometer (0.5 miles) of the preferred or alternative corridors.

6.3.6.2 Zoning and Land Use Plans

The preferred and alternative corridors are located in the unincorporated portions of Hillsborough, Polk, Manatee, and Hardee Counties. Each county



① OUTSTANDING FLORIDA WATERS

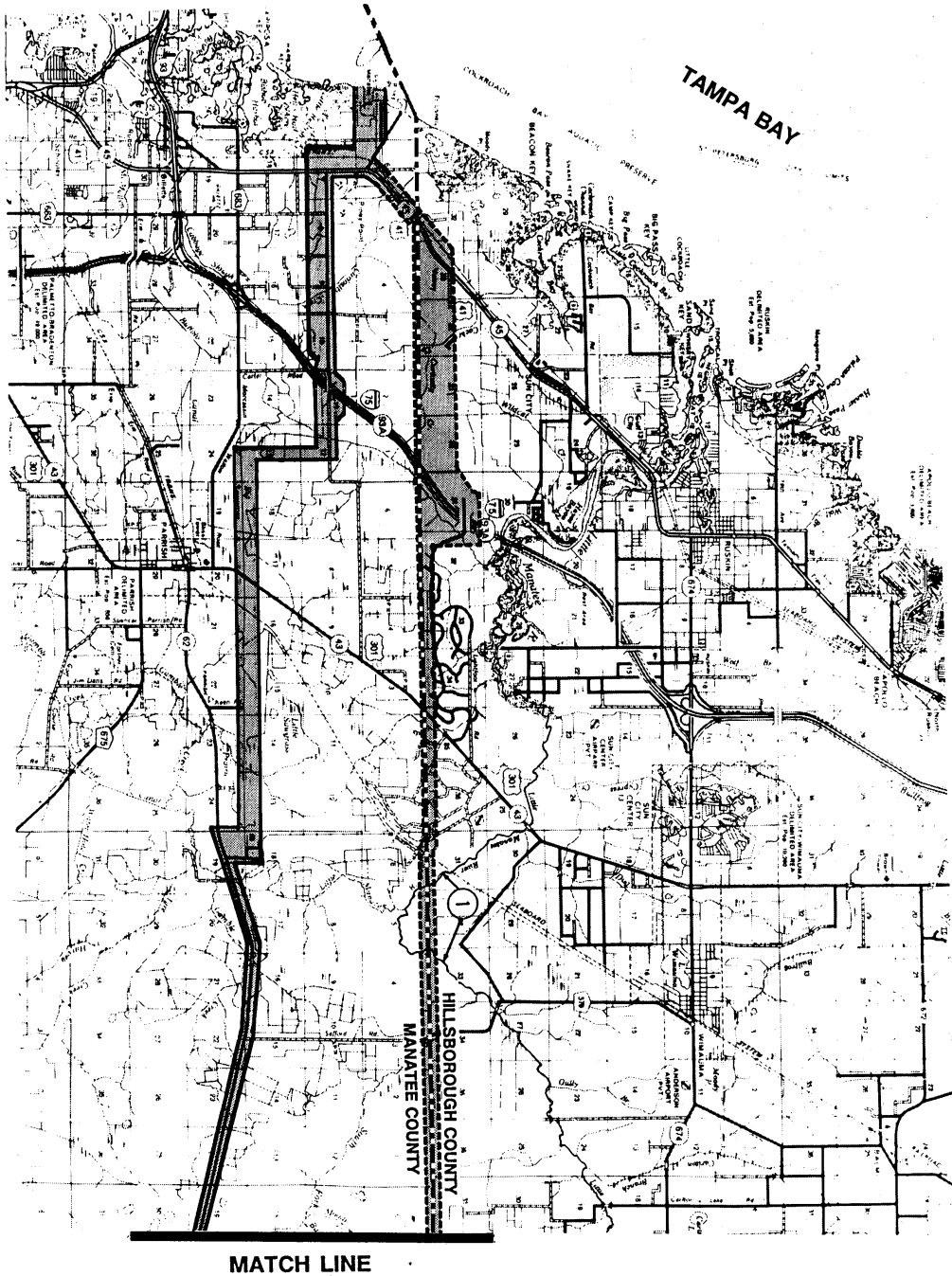


Figure 6.3.6-1 GOVERNMENTAL JURISDICTIONS - LIQUID FUEL PIPELINE CORRIDOR
(PAGE 1 OF 2)

Hardee
Power Station

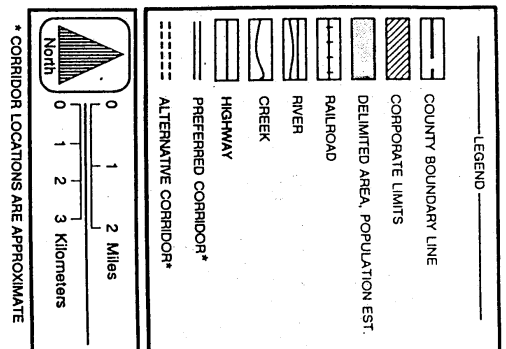
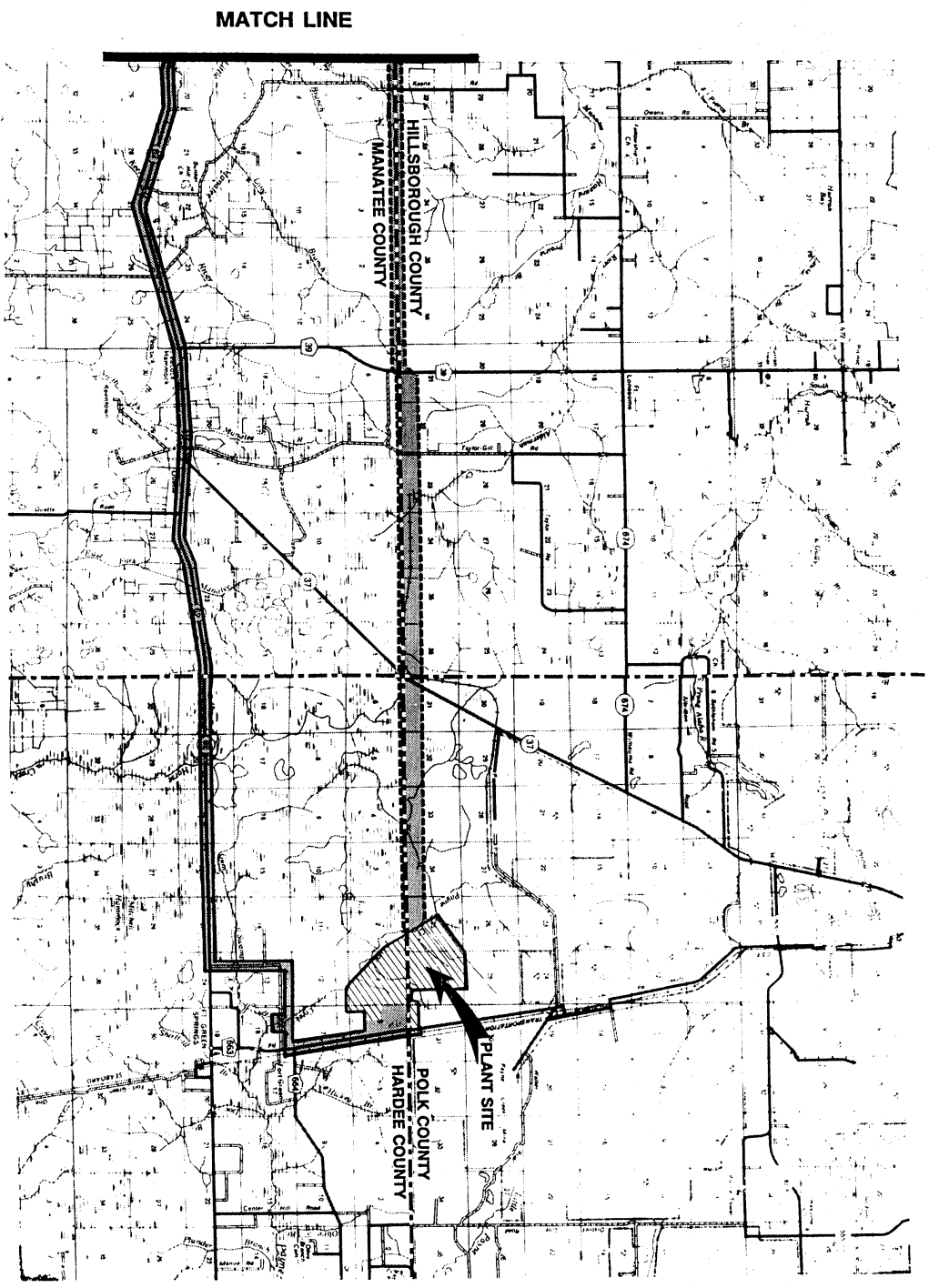


Figure 6.3-6-1 GOVERNMENTAL JURISDICTIONS - LIQUID FUEL PIPELINE CORRIDOR
(PAGE 2 OF 2)

**Hardee
Power Station**

has a Comprehensive Plan as mandated by Chapter 163, Florida Statutes. The current status of each plan is described below:

HILLSBOROUGH COUNTY

The Comprehensive Plan was prepared in accordance with the Comprehensive Planning and Land Development Regulations Act and adopted by the Board of County Commissioners in February 1989 for transmittal to the Department of Community Affairs (DCA) for approval.

POLK COUNTY

The Comprehensive Plan was adopted in July 1979.

MANATEE COUNTY

The Comprehensive Plan was prepared in accordance with the Comprehensive Planning and Land Development Regulation Act, adopted by the Board of County Commissioners and approved by DCA in 1989.

HARDEE COUNTY

The Comprehensive Plan was adopted in 1979.

Figure 6.3.6-2, located in Appendix 11.10, depicts the future land use designations identified in Hillsborough and Manatee County's Comprehensive plan. Polk and Hardee County's Comprehensive Plans do not contain future land use plan maps.

None of the comprehensive plans specifically address liquid fuel pipelines. The concept of locating a pipeline in industrial areas and areas of relatively low residential density (including Hillsborough County's R and RR designations and Manatee's IH, IL, and AG-R designations) is consistent with basic land use compatibility principles.

Each county also regulates land use and development by zoning code. Hillsborough County's zoning maps depict three zoning districts along the alternative corridor, A--Agricultural, AA--Agricultural, Single-Family

Residential, and CU--Community Unit. Hillsborough County permits public service facilities as a Class A special use.

Polk County's zoning maps depict those portions of the preferred and alternative corridor in Polk County as RC--Rural Conservation. The RC district addresses subterranean utility lines and Classes I and II Essential Services and is a permitted use.

The preferred corridor in Manatee County located in the following zoning districts:

A	General Agriculture
A-1	Suburban Agriculture
A1/AF	Suburban Agriculture/Agricultural Fringe
AF/A1	Agricultural Fringe/Suburban Agriculture
AF/R 1B	Agricultural Fringe/Residential
R-10	Residential
R-4B	Residential/Mobile Home Park
R-5	Residential/Recreational Vehicle Park
PDR	Planned Development Residential
C	Neighborhood Commercial
C-1	General Commercial
C-1A/AF	Resort Commercial/Agricultural Fringe
M-1	Light Industrial
M-2	Heavy Industrial

Heavy and light utility uses are permitted in A, A-1, M-1, and M-2 districts as a special permit use. Light utility uses are permitted in the remaining districts as a special permit use.

The Hardee County portion of the preferred corridor is located in the following districts:

A-1	Agricultural
M-1	Mining District (Overlay A-1)
I-1	Light Industrial

C-2 General Commercial
F-R Farm Residential

The Hardee County Zoning Ordinance does not specifically address subterranean pipelines or utility uses. The corridor should qualify as an accessory use incidental and subordinate to permitted principal uses.

6.3.6.3 Easements, Title, Agency Works

Approvals for crossings of federal highways such as I-75 are typically obtained from FDOT and the Federal Highway Administration (FHWA). Approvals for crossings of state roads would normally be required from FDOT, and each county grants approval for crossings of county-maintained roads. All crossings of state roads will conform to specifications contained in FDOT's Utility Accommodation Guide (July 1979). Permits are also normally required to cross waterways or other facilities under the jurisdiction of a designated water control district and "works of the district," defined as projects or works such as structures, impoundments, wells, streams, and other watercourses officially adopted by the Southwest Florida Water Management District (SWFWMD) governing board.

Easements will also be required for the liquid fuel pipeline corridor to cross lands under the jurisdiction of the Board of Trustees of the Internal Improvement Trust Fund. A jurisdictional determination has been requested for the proposed preferred and alternative corridors. This jurisdictional determination is part of the permitting activities for the pipeline ROW. Table 6.3.6-1 lists roadways, waterways, and railroads within the preferred and alternative pipeline corridors for which crossing approvals would normally be required. Notification is usually sufficient when crossing facilities owned by another utility.

6.3.6.4 Vicinity Scenic, Cultural, and Natural Landmarks

There are no scenic, cultural, or natural areas of the type identified in Section 2.2.5 of the Instruction Guide for Site Certification Applications within 0.8 kilometers (0.5 miles) of the proposed liquid fuel pipeline corridors.

Table 6.3.6-1. Easements, Title, Crossing Approvals Normally Required for Liquid Fuel Pipeline Construction in the Preferred (P) and Alternative (A) Corridors

Facility	Corridor	Affected Agency	Type of Approval	Potential Changes
<u>Roadways</u>				
U.S. 41	P,A	FDOT & FHWA*	Utility Permit	None
I-75	P,A	FDOT & FHWA*	Utility Permit	None
U.S. 301	P,A	FDOT & FHWA*	Utility Permit	None
SR 62	P	FDOT	Utility Permit	None
SR 37	P,A	FDOT	Utility Permit	None
Valroy Rd.	P	Hillsborough Co.	Utility Permit	None
Safford Rd/CR 579	P,A	Hillsborough/Manatee Co.	Utility Permit	None
CR 39	P,A	Hillsborough/Manatee Co.	Utility Permit	None
Buckeye Rd.	P	Manatee Co.	Utility Permit	None
Carter Rd.	P	Manatee Co.	Utility Permit	None
Keen Rd.	P	Manatee Co.	Utility Permit	None
Keene Rd.	P	Manatee Co.	Utility Permit	None
Taylor-Gill Rd.	P	Manatee Co.	Utility Permit	None
Duette Rd.	P	Manatee Co.	Utility Permit	None
John Gill Rd.	P	Hardee Co.	Utility Permit	None
Roberts Rd.	P	Hardee Co.	Utility Permit	None
CR 663	P	Hardee Co.	Utility Permit	None
CR 664	P	Hardee Co.	Utility Permit	None

Table 6.3.6-1. Easements, Title, Crossing Approvals Normally Required for Liquid Fuel Pipeline Construction in the Preferred (P) and Alternative (A) Corridors (Continued, Page 2 of 2)

Facility	Corridor	Affected Agency	Type of Approval	Potential Changes
<u>Railroads</u>				
Seaboard Coastline	P,A	FDOT	Encroachment Permit	None
<u>Waterways**</u>				
Gamble Creek	P	SWFWMD	Utility Permit	None
Keen Branch	P	SWFWMD	Utility Permit	None
Graveyard Creek	P	SWFWMD	Utility Permit	None
Peacock Branch	P	SWFWMD	Utility Permit	None
Horse Creek	P	SWFWMD	Utility Permit	None
Curiosity Creek	P,A	SWFWMD	Utility Permit	None
Little Manatee River	P,A	SWFWMD	Utility Permit	None
Gum Swamp Branch	P,A	SWFWMD	Utility Permit	None
Payne Creek	P,A	SWFWMD	Utility Permit	None
Cockroach Creek	A	SWFWMD	Utility Permit	None
Moody Branch	A	SWFWMD	Utility Permit	None
Little Long Branch	A	SWFWMD	Utility Permit	None
Alderman Creek	A	SWFWMD	Utility Permit	None

* FHWA approval for crossings of federal highways is obtained indirectly as part of the utility permit obtained from FDOT.

** DNR may also be an affected agency for waterways due to submerged sovereign lands under the jurisdiction of the Board of Trustees of the Internal Improvement Trust Fund.

6.3.6.5 Archaeological and Historic Sites

The Florida Master Site File at the DHR was reviewed to determine whether any known archaeological or historical sites were recorded within the preferred and alternative corridors. One site (Hr 13) was found to be located approximately 3.2 kilometers (2.0 miles) north of the SR 62/CR 663 intersection, and it is the only known site located within the preferred corridor. An additional site (Hi 414) is located on the west bank of Curiosity Creek and is the only known site located in the alternative corridor.

In addition to reviewing the Florida Master Site File for known sites, the DHR reviewed the proposed corridors to determine any areas that appear to be archaeologically sensitive. Although the agency indicated that the majority of both corridors have a low likelihood of containing significant archaeological or historical sites, DHR did identify the portions of the corridors that appear to be archaeologically sensitive by marking aerial photographs.

DHR recommends that those portions of the corridors designated archaeologically sensitive be subjected to a professional archaeological and historic survey (see Appendix 11.3). The methodology used for the survey, as well as the survey results, will be provided to DHR during permitting activities before construction for review and acceptance.

6.3.7 Bio-Physical Environment of the Corridor Area

6.3.7.1 Land Use/Vegetation

Figure 6.3.7-1, located in Appendix 11.10, depicts a series of maps identifying the preferred and alternative corridors and the area extending 0.4 kilometers (0.25 mile) from each edge of these corridors in relation to existing land use and land cover. These maps depict land uses and land covers at 1:24,000 scale. Land uses and land cover is depicted at Levels II and III of the Florida Land Use and Cover Classification System (FLUCCS), respectively. Existing land use for both the preferred and alternative corridors and their vicinities are predominantly open land and agricultural areas. Land cover or vegetation types in the undeveloped and

agricultural areas of the preferred and alternative corridors include agricultural land, forested uplands, and wetlands.

Concentrations of industrial activity occur at Port Manatee and in the vicinity of the plant site. The industrial activity in the vicinity of the port is related to shipping and rail activities and manufacturing. The industrial activity in the vicinity of the plant site is associated with phosphate mining and processing.

Various utilities and transportation uses also parallel or bisect the preferred and alternative corridors. Utilities include electrical transmission and distribution lines and associated substations, water, and natural gas transmission distribution lines, telephone, and cable. Transportation uses include state and county highways, local road, I-75, and railroads.

VEGETATION

The preferred corridor follows existing roads and/or linear utilities throughout the majority of its length. Agricultural lands predominate along the preferred corridor and include cropland, citrus groves, improved pasture, palmetto prairie, and planted pine. Small tracts of pine flatwoods occur along the preferred corridor, with smaller areas of oak hammock and oak scrub. Small areas of isolated and contiguous wetlands occasionally occur along the preferred corridor, including freshwater marsh and hardwood swamp. Unlike the preferred corridor, the majority of the alternative corridor traverses the Manatee/Hillsborough County line which is not paralleled by roads and highways or other linear facilities. Although the majority of the alternative corridor consists of agriculture, such as improved pasture, row crops, palmetto prairie, and citrus groves, there is a greater amount of undeveloped land along the alternative corridor than the preferred corridor. This undeveloped land consists of forested uplands, including pine flatwoods, oak scrub, and oak hammock. Small areas of sand pine scrub occur near the junction of Safford Road and the county line and near the county line and the abandoned railroad alignment west of the Little Manatee River.

Seven major land cover types and five major agricultural land uses were identified within the corridors as vegetation communities. The agricultural land use types were included because these lands are dominated by vegetation. The community types within the preferred and alternative corridors are described below in terms of vegetation, physical structure, and ecology. The community abbreviations given reflect the corresponding FLUCCS mapping codes.

UPLANDS

Agricultural Lands--The majority of the preferred and alternative corridors support agricultural lands used for cattle or citrus/crop production. The major agricultural land use types within the corridors are row crops (211), improved pasture (213), citrus groves (230), palmetto prairie (321), and planted pine (441). Row crops, mostly tomatoes, improved pasture, and citrus groves are an intensive form of agriculture, which results in the complete alteration of the original vegetation. A non-intensive agricultural use, palmetto rangeland or prairie, typically consists of pine flatwoods which have been altered slightly by the removal of the pine overstory and the enhancement of forage grasses through fire management for cattle grazing. Palmetto prairie can be characterized as an open, treeless rangeland dominated by saw palmetto (Serenoa repens) in the shrub layer and a mixture of grasses and forbs in the herbaceous stratum. Another non-intensive agricultural use is planted pines. Planted pine areas along the corridor consist of strips of slash pines (Pinus elliottii) planted in rows along highways within the preferred corridor.

Pine Flatwoods (411)--Pine flatwoods are characterized by a nearly flat topography with relatively poorly-drained soils. Generally, an organic or clay hardpan is situated a few feet beneath the soil layer. During the rainy season, pine flatwoods may have water on or near the soil surface. Pine flatwoods are open forest associations dominated by an overstory of pines. Longleaf pines (Pinus palustris) occur on well drained soils; slash pine is more commonly found along poorly drained, wetter areas. The shrub layer is typically dominated by saw palmetto with gallberry (Ilex glabra),

wax myrtle (Myrica cerifera), sand live oak (Quercus geminata), fetterbush (Lyonia lucida), and tarflower (Befaria racemosa). The herbaceous cover contains a variety of fire-tolerant species, including blazing star (Liatris spp.), paw paw (Asimina reticulata), and a predominance of wiregrass (Aristida spp.).

Pine flatwoods depend upon periodic fires to restrict the encroachment of hardwood trees and perpetuate fire-adapted flatwoods vegetation, which maintains the pine/saw palmetto character. Since pine flatwoods lose this structural and functional integrity when periodic burning is excluded, pine flatwoods are referred to as a fire or subclimax community. With the exclusion of fire, oaks typically become established and ultimately form a hardwood forest or oak hammock (422). Small tracts of pine flatwoods are present along the corridors; however, the majority of this historically dominant community type has been logged and impacted by agricultural activities such as cattle production and farming.

Sand Pine Scrub (413)--Sand pine scrub is a xeric, endemic association characterized by an overstory of sand pines (Pinus clausa) and an open evergreen understory, with sandy areas devoid of vegetation. Sand pine scrub occurs on excessively drained white sandy soils at higher elevations than surrounding plant communities. The understory typically contains aggregations of scrub oaks (Quercus geminata, Q. myrtifolia, and Q. chapmanii) and saw palmetto. The herbaceous complement of the sand pine scrub community is very depauperate.

Oak Scrub (421)--Oak scrub is a xeric community type that possesses an evergreen shrubby understory situated upon well-drained, deep white sandy soils on high ground. Scrubby flatwoods typically contain widely scattered slash or longleaf pine in the overstory. However, when characterized by an association of scrub oaks interspersed with areas of barren white sand without a pine canopy, the community is considered to be an oak scrub. Understory shrubs include sand live oak, dwarf live oak (Quercus minima), gopher apple (Licania michauxii) and saw palmetto. Herbaceous plants and vines within this xeric association include wiregrass, black root

(Pterocaulon virgatum), deer moss (Cladonia spp.), greenbriar (Smilax spp.), and pinweeds (Lechea spp.)

Oak Hammock (422)--In the State of Florida, the term "hammock" refers to any hardwood or broad-leaved evergreen forest which is not regularly inundated and occurs on well-drained to wet, highly organic soils. Vegetation composition within hammocks varies depending upon the type of soils, hydroperiod, and location. The primary hammock association found along the preferred and alternate corridors is mesic oak hammock.

These mesic hammocks are typically dominated by live oaks (Q. virginiana) or laurel oaks (Q. laurifolia) within the canopy layer. Generally, the wetter the system, the greater the occurrence of laurel oaks. Oak hammocks have well developed canopy layers and, therefore, rather depauperate understory layers. Since these hammocks mostly occur in pasture, this condition is further maintained through the influence of cattle trampling and foraging. Common herbaceous, vining, and shrubby plants found in the oak hammocks include wax myrtle, saw palmetto, beauty berry (Callicarpa americana), greenbriar, poison ivy (Toxicodendron radicans), Virginia creeper (Parthenocissus quinquefolia), pepper vine (Ampelopsis arborea), and grape (Vitis munsoniana). Epiphytes, such as spanish moss (Tillandsia usneoides), ball moss (T. recurvata), and wild pine (T. utriculata) are common on the limbs of the oak trees.

WETLANDS

Cypress Swamp (611)--Cypress swamp is a forested freshwater wetland dominated by pond cypress (Taxodium ascendens), bald cypress (Taxodium distichum), or a combination of both species. Within the corridors, only cypress strands and riverine cypress swamp were observed. Riverine cypress swamp consists of bald cypress that are situated along river or creek floodplains. Associated species present in the canopy and understory include red maple (Acer rubrum), wax myrtle, willow (Salix caroliniana), buttonbush (Cephalanthus occidentalis), cinnamon fern (Osmunda cinnamomea), and various bromeliads (Tillandsia spp.). Cypress strands are dominated by an overstory of bald and/or pond cypress. Cypress strands are generally

elongated or irregularly shaped systems located at the headwaters of inland tributaries. Water levels in cypress strands are influenced by precipitation and runoff from surrounding areas. Plant diversity in cypress strands is similar to that of riverine cypress systems.

Hardwood Swamp (621)--Hardwood swamps are seasonally inundated, freshwater, forested wetlands, which are dominated by water-tolerant hardwoods. The arboreal species composition varies according to swamp origin, hydroperiod, and soil structure. Hardwood associations typically support a dominance of one or a mixture of the following trees: laurel oak, red maple, sweet bay (Magnolia virginiana), swamp red bay (Persea palustris), and pop ash (Fraxinus carolinianus). The degree of canopy closure and seasonal water levels typically dictate the species cover and density at the understory and ground levels. Hardwood swamps which support a moderate to low percentage of cypress trees within the overstory are considered mixed cypress hardwood swamps. Such mixed cypress hardwoods usually occur along drainage corridors or along streams within the corridors. The specific species composition within respective strata varies according to swamp origin and hydroperiod. Typically this community may be characterized as a red maple-cypress or a laurel oak-cabbage palm-cypress association.

Another category of hardwood swamp is the swamp thicket also known as heads or shrub swamp. Swamp thickets are dense stands of aquatic shrubs or small trees that occupy standing water or periodically flooded sites. Swamp thickets that may be found along the corridors are dominated by almost pure monocultures of willow. These associations typically become established within freshwater marshes or wet prairies that have not been burned or experienced a significant reduction in water levels.

Freshwater Marsh (641)--A marsh is a treeless association dominated by emergent herbaceous and shrub aquatic vegetation which is seasonally wet, or flooded, for most of the year. The vegetative association appears as an open expanse of grasses, sedges, rushes, and other herbaceous plants. Freshwater marsh can be characterized as seasonally inundated, shallow, round, or elliptical depressions within terrestrial habitats (typically

pine flatwoods, palmetto prairie, and improved pasture in the corridors). These inland marshes are further characterized by concentric zones of emergent vegetation with floating-leaved and/or free floating plants at the center. The center may contain permanent to semipermanent standing water and, depending upon the size of the system, may be devoid of vegetation and resemble a pond. The variation in species composition among marshes is a function of water fluctuations and soil conditions. Dominant emergents associated with freshwater marsh include maidencane (Panicum hemitomon), arrowhead (Sagittaria spp.), pickerelweed (Pontedaria cordata), soft rush (Juncus effusus), and club rush (Eleocharis spp.). Common shrub species which occur sporadically throughout include willow, wax myrtle, and buttonbush.

Although not considered a true marsh, another herbaceous wetland type under the FLUCCS category of 641 is wet prairie. Large to small shallow water areas primarily within pine flatwoods and palmetto prairies that are dominated by St. Johns wort (Hypericum fasciculatum) or inland cordgrass (Spartina bakeri) are called wet prairie. Wet prairie differs from freshwater marsh by the occurrence of sandy soils with thin organic layers rather than the deep mucks/peats and the diversity of aquatic plants associated with true marshes.

6.3.7.2 Affected Waters and Wetlands

The physiography of the area where the proposed liquid fuel pipeline will be located is such that any corridor of similar dimensions to the preferred and alternative corridors will contain some wetlands and waterbodies.

From west to east, both the preferred and the alternative corridors traverse the physiographic regions called the Gulf Coastal Lowlands in the west and the Central Highlands in the east, which are broad marine terraces. The Gulf Coastal Lowlands are sharply delineated to the east by a prominent scarp with an elevation of approximately 12 meters (40-feet) MSL. They are characterized by a gently sloping topography, and are typically poorly drained. Most of the surface water in this area is tidal in nature. East of the scarp, the preferred and alternative corridors

traverse a small portion of the DeSoto Plain, which is a unit of the Central Highlands. The DeSoto Plain is gently sloping, and as a result of this feature and the areal lithology, it is poorly drained. The Plain rises to elevations of about 27 meters (90 feet) MSL in the corridor area. The Polk Upland, another unit of the Central Highlands, is located at the eastern edge of the DeSoto Plain. The Polk Upland rises to approximately 39 meters (130 feet) MSL at the terminus of the corridor area and is characterized by areas of relatively flat, poorly drained topography.

The waterbodies crossed by the preferred and alternative corridors are shown in Table 6.3.7-1. The major receiving waters for the waterbodies crossed by the preferred corridor are (from west to east): Tampa Bay, Gamble Creek, the North Fork Manatee River, the East Fork Manatee River, the Manatee River, Payne Creek, and the Peace River. The major receiving waters for the waterbodies crossed by the alternative corridor are (from west to east): Tampa Bay, Cockroach Bay, the Little Manatee River, the South Fork Little Manatee River, and Alderman Creek. All waterbodies crossed by the preferred corridor are designated as Class III (for recreation and for the propagation and maintenance of a healthy, well-balanced population of fish and wildlife) by Chapter 17-3, Florida Administrative Code (FAC), except for the following: 1) the North Fork Manatee River, which is designated as Class I (potable water supplies), and 2) the East Fork Manatee River, which is also designated as Class I. In the alternative corridor, all waterbodies crossed are designated as Class III except for the Little Manatee River, which is designated as an Outstanding Florida Water.

Both of the corridors contain marshy depressions which drain to numerous intermittent streams. In some places, the streams have been channelized and canals have been dug to augment poor natural drainage. A large cooling pond [approximately 16.9 square kilometers (6.5 square miles)] for the FPL/Manatee power plant is located just south of the Hillsborough/Manatee County line at a point where the Little Manatee River dips into Manatee County. This pond has reduced the natural drainage area to creeks in this area. East of SR 39, and adjacent to SR 37, extensive mining activities

Table 6.3.7-1. Waterbodies Within the Preferred (P) and Alternative (A) Liquid Fuel Pipeline Corridors

Waterbody	Receiving Water	Corridor(s)	Comments
Unnamed Canal	Tampa Bay	P,A	Adjacent to Port Manatee
Unnamed Pond	Isolated	P,A	Adjacent to Port Manatee
Unnamed Ponds	Isolated	A	Adjacent to U.S. 41
Mine Pit	Isolated	P	Adjacent to U.S. 41
Unnamed Creek	Piney Point Creek	A	Perpendicular to corridor
Unnamed Creek	Little Redfish Creek	P	Intermittent; adjacent to U.S. 41
Unnamed Ponds	Isolated	P	At edges of corridor
Curiosity Creek	Little Manatee River	P	Perpendicular to corridor
Cockroach Creek	Cockroach Bay	A	Intermittent
Curiosity Creek	Little Manatee River	A	Channelized
Wildcat Creek	Little Manatee River	A	Headwater at north edge of corridor
Unnamed Ponds	Isolated	A	Adjacent to I-75
Curiosity Creek	Little Manatee River	A	East of I-75
Unnamed Creek	Curiosity Creek	A	Intermittent
Unnamed Creek	Curiosity Creek	A	Intermittent
2 Unnamed Creeks	Unnamed tributary of Little Manatee River	A	East of I-75
Unnamed Creek	Unnamed tributary of Little Manatee River	A	Adjacent to U.S. 301

Table 6.3.7-1. Waterbodies Within the Preferred (P) and Alternative (A) Liquied Fuel Pipeline Corridors (Continued, Page 2 of 3)

Waterbody	Receiving Water	Corridor(s)	Comments
Unnamed Canal	Unnamed tributary of Little Manatee River	A	East of U.S. 301
Unnamed Canal	Curiosity Creek	P	At Buckeye Road
Unnamed Ponds	Isolated	P	Crossed by FPL transmission lines
Unnamed Creek	Gamble Creek	P	Intermittent
Little Manatee River	Tampa Bay	A	2 Crossings; Outstanding Florida Water
South Fork Little Manatee River	Little Manatee River	A	Crosses at confluence of unnamed tributary and South Fork, Little Manatee River
6 Unnamed Creeks	Gamble Creek	P	Intermittent
Unnamed Creek	South Fork Little Manatee River	P	Intermittent
Unnamed Creek	Gamble Creek	P	Intermittent
7 Unnamed Creeks	Howard Prairie Branch	A	Intermittent
Unnamed Creek	South Fork Little Manatee River	P	Intermittent
Keen Branch	South Fork Little Manatee River	P	About 3 miles west of SR 39
Graveyard Creek	South Fork Little Manatee River	P	About 2 miles west of SR 39

Table 6.3.7-1. Waterbodies Within the Preferred (P) and Alternative (A) Liquefied Fuel Pipeline Corridors (Continued, Page 3 of 3)

Waterbody	Receiving Water	Corridor(s)	Comments
Unnamed Creek	North Fork Manatee River	P	Intermittent
North Fork Manatee River	Manatee River	P	Class I Water
Mine Pit	Isolated	A	West of SR 37
Unnamed Creek	Alderman Creek	A	Intermittent; drainage area decreased by mining
Unnamed Tributaries	Payne Creek	A	3 miles east of Hillsborough County line
East Fork Manatee River	Manatee River	P	Class I Water; about 3 miles East of SR 37
Unnamed Creek	Horse Creek	P	Intermittent
Horse Creek	Peace River	P	1.5 miles east of Manatee County line
Mine Pit	Isolated	A	South side of corridor
Gum Swamp Branch	Payne Creek	P	Culverted at road crossing
Payne Creek	Peace River	P	Corridor widens at Roberts Road Crossing
Mine Pit	Isolated	P	West of CR 663
Payne Creek	Peace River	A	Crosses at proposed plant site boundary

Source: USGS Quadrangle Maps, 1972-1987
REDI Maps, 1979-1989
Hardee County, 1988,

are underway. This mining activity has generally resulted in a reduction in the size of natural drainage areas.

The preferred corridor proceeds east out of Port Manatee and turns due south parallel to U.S. 41. It then turns due east along Buckeye Road. It crosses several intermittent, unnamed creeks and an unnamed, isolated pond (at its southern edge). It then crosses Curiosity Creek. It crosses an unnamed stream at I-75 and then crosses a culverted canal.

The preferred corridor then turns south, paralleling an existing FPL transmission line. It crosses three unnamed intermittent creeks, and then turns east, paralleling another existing transmission line corridor. It crosses two intermittent creeks, two isolated ponds, and then crosses U.S. 301. It then crosses an abandoned Seaboard Railroad ROW, and three intermittent unnamed creeks. It turns south, and then turns east to parallel SR 62. To the north of this area is the FPL/Manatee plant cooling pond.

The preferred corridor then crosses three intermittent tributaries of Gamble Creek, passes the junction of SR 62 and Safford Road, and crosses three unnamed intermittent streams which flow to South Fork Little Manatee River. It then crosses Keen Branch and Graveyard Creek, both of which flow to South Fork Little Manatee River.

East of SR 39, the preferred corridor crosses the North Fork Little Manatee River, which is designated as Class I by Chapter 17-3, FAC. It passes SR 37, and then crosses the headwaters of the East Fork Manatee River, also designated as Class I by Chapter 17-3, FAC. As the corridor continues east, it crosses Horse Creek.

It turns north and crosses Gum Swamp Branch. It then turns east near Roberts Road, crosses Payne Creek, and turns north along CR 663. Here it is bordered on the west by a settling pond and on the east by phosphate mining activity. As it turns west, it is widened to about 1,350 meters (4,500 feet) to provide flexibility in routing around mining activities.

The alternative corridor heads east from Port Manatee. It then proceeds northwest, parallel to U.S. 41. It turns due east immediately north of the Hillsborough-Manatee County line. It crosses Cockroach Creek, the headwaters of Wildcat Creek, and a channelized portion of Curiosity Creek. It crosses a few small, isolated ponds, and then it crosses I-75.

The alternative corridor then crosses another branch of Curiosity Creek and several intermittent streams that flow into the Little Manatee River, which is designated as an Outstanding Florida Water by Chapter 17-3, FAC. It crosses the Little Manatee River twice east of the recently abandoned Seaboard Railroad ROW. It then crosses the South Fork Little Manatee River at SR 579.

The alternative corridor then crosses several intermittent streams which flow to the Little Manatee River. At SR 39, the corridor widens to 300 meters (1,000 feet) and passes through extensive mining activity to SR 37. It also crosses Alderman Creek in this area.

Past SR 37 and the Hillsborough-Polk County line, the alternative corridor crosses a wetland and associated streams, which all drain into Payne Creek. More phosphate mining activity also exists in this area. The corridor then crosses Payne Creek at the proposed plant site.

6.3.7.3 Ecology

Based on a literature survey, field inspections, and consultations with federal and state agencies, certain species officially designated as endangered, threatened, or species of special or regional concern by the USFWS or FGFWFC may reasonably be expected to occur in the liquid fuel pipeline project study area. For purposes of this discussion, this area includes sections of Hillsborough, Manatee, Polk, and Hardee Counties bounded by Tampa Bay (Port Manatee) on the west, SR 674 on the north, CR 663 on the east, and SR 62 on the south. Also considered were certain species (fish, wading birds) which are not federally- or state-listed but which are of recreational or ecological importance. The criteria which

determined the specific species to be addressed in this application included their known or expected occurrence in the project area as residents, migrants, or transients; potential for impact due to ROW preparation and construction and maintenance of the liquid fuel pipeline; or other agency concerns such as the presence of preferred or suitable habitat. The list of animal species potentially occurring within 450 meters (1,500 feet) of the proposed pipeline corridor and listed by FGFWFC or USFWS is given in Table 6.3.7-2. Non-listed, but recreationally important species occurring within waters of the proposed pipeline project area are listed in Table 6.3.7-3.

The following sections include discussions for endangered, threatened, and species of special concern which occur or may occur in the pipeline project study area. Discussions are also provided for other important species which share specific habitats (fish, wading birds). The probability of occurrence for threatened and endangered species within the proposed pipeline project area was based on known locations for such species (e.g., eagle nests, wading bird rookeries, gopher tortoise colonies), on direct observations of species or their signs of occurrence, on recent and historical reports of occurrence in scientific literature, and on the presence of suitable habitat as determined by helicopter flyovers and follow-up ground truthing.

WILDLIFE SPECIES

The occurrence of wildlife species within a given area is mainly related to the presence of suitable habitat for nesting, foraging, and reproduction. Wildlife habitat type and quality vary with vegetation type and structure, surrounding land uses and hydrologic factors. For these reasons, wildlife habitat types can frequently be categorized and equated with the land use/land cover types which are present in a region. Vegetation communities present within the pipeline project area were determined by helicopter flyovers and ground truthing and mapped on aerial photography. The land use/land cover identified in the preferred and alternative corridors which provide the principle wildlife habitat types include agricultural lands (row and field crops, citrus groves, palmetto rangeland, improved pasture)

Table 6.3.7-2. Listed Animal Species Potentially Occurring Within 1,500 Feet of the Proposed Pipeline Corridor

Common Name	Scientific Name	Designated Status ¹ FCFWFC ² USFWS ³	Probability of Occurrence ⁴
<u>Fish</u>			
Common snook	<u>Centropomus undecimalis</u>	SSC	VL
Rivulus	<u>Rivulus marmoratus</u>	SSC	VL
<u>Amphibians and Reptiles</u>			
American alligator	<u>Alligator mississippiensis</u>	SSC	L
Eastern indigo snake	<u>Drymarchon corais couperi</u>	T	M
Gopher tortoise	<u>Gopherus polyphemus</u>	SSC	P
Florida pine snake	<u>Pituophis melanoleucus mugitus</u>	SSC	L
Florida gopher frog	<u>Rana areolata aesopus</u>	SSC	L
Short-tailed snake	<u>Stilosoma extenuatum</u>	T	VL
<u>Mammals</u>			
Florida panther	<u>Felis concolor coryi</u>	E	VL
Florida mouse	<u>Peromyscus floridanus</u>	SSC	L
West Indian manatee	<u>Trichechus manatus latirostris</u>	E	VL
Sherman's fox squirrel	<u>Sciurus niger shermani</u>	SSC	VL
<u>Birds</u>			
Roseate spoonbill	<u>Alala alala</u>	SSC	VL
Florida scrub jay	<u>Aphelocoma coerulescens coerulescens</u>	T	VL
Limpkin	<u>Aramus guarana</u>	SSC	M
Florida burrowing owl	<u>Athene cucularia florida</u>	SSC	L
Kirtland's warbler	<u>Dendroica kirtlandi</u>	E	VL

Table 6.3.7-2. Listed Animal Species Potentially Occurring Within 1,500 Feet of the Proposed Pipeline Corridor
(Continued, Page 2 of 2)

Common Name	Scientific Name	Designated Status ¹ FGFWFC ²	USFWS ³	Probability of Occurrence ⁴
Little blue heron	<u>Egretta caerulea</u>	SSC	---	P
Snowy egret	<u>Egretta thula</u>	SSC	---	P
Tricolored heron	<u>Egretta tricolor</u>	SSC	---	P
Arctic peregrine falcon	<u>Falco peregrinus tundrius</u>	E	T	L
Southeastern American kestrel	<u>Falco sparverius paulus</u>	T	UR2	H
Florida sandhill crane	<u>Grus canadensis pratensis</u>	T	---	P
Southern bald eagle	<u>Haliaeetus leucocephalus</u>	T	E	P
Wood stork	<u>Mycteria americana</u>	E	E	M
Red-cockaded woodpecker	<u>Picoides borealis</u>	T	E	VL
Audubon's crested caracara	<u>Polyborus plancus auduboni</u>	T	T	L

NOTES:

- 1: E - Endangered
T - Threatened
T(S/A) - Threatened Due to Similarity of Appearance
SSC - Species of Special Concern
UR2 - Under review for listing, but substantial evidence of biological vulnerability and/or threat is lacking
- 2: Florida Game and Fresh Water Fish Commission (list published in Section 39-27.003-005, FAC)
- 3: United States Fish and Wildlife Service (list published in List of Endangered and Threatened Wildlife and Plants, 50 CFR 17.11-12)
- 4: Probability of Occurrence
VL - very low; L - low; M - moderate
H - high; P - present

Sources: FGFWFC, 1988.

Table 6.3.7-3. Common (Nonlisted) Fish* Expected to Occur in the Waters of the Corridor Study Area

Common Name	Scientific Name
Black crappie	<u>Pomoxis nigromaculatus</u>
Bluegill	<u>Lepomis macrochirus</u>
Bowfin	<u>Amia calva</u>
Brown bullhead	<u>Ictalurus nebulosus</u>
Channel catfish	<u>Ictalurus punctatus</u>
Florida gar	<u>Lepistosteus platyrhinchus</u>
Largemouth bass	<u>Micropterus salmoides</u>
Mosquitofish	<u>Gambusia affinis</u>
Redbreast sunfish	<u>Lepomis auritus</u>
Redear sunfish	<u>Lepomis microlophus</u>
Spotted sunfish	<u>Lepomis punctatus</u>
Tilapia	<u>Tilapia sp.</u>
White catfish	<u>Ictalurus catus</u>

* Species not rare, threatened, or endangered but included due to recreational (game fish) or ecological importance.

Source: FGFWFC, 1989.

pine flatwoods, oak hammocks, freshwater marsh, cypress swamp, hardwood swamp, disturbed lands (e.g., grasslands, cleared areas along ROWs, areas dominated by Australian pines or Brazilian pepper, mined lands), and, to a small extent, xeric scrub areas dominated by scrub oak or sand pine.

The majority of the pipeline project area has been disturbed, primarily by agricultural uses such as citrus culture and cattle production. Grasslands, rangeland, improved pasture and other agricultural lands, such as truck crop land and citrus groves, and transportation ROWs are generally of lower value to wildlife than are more natural, less disturbed, vegetative community types. Marshes, swamps, and to a lesser extent pine flatwoods are of greater habitat value, providing larger diversity of ecological niches. They can be expected to support a greater variety of wildlife species. The xeric scrub communities, although not ordinarily of high species diversity, are relatively rare and as such can support rare, threatened or endangered species which are often restricted to these habitat types.

Habitat quality was assessed during helicopter flyovers and during ground truthing. Both the type and quality of surface waters were also examined to determine their potential habitat suitability for the aquatic- and wetland-dependent species under consideration. The status and potential for occurrence of species included for review were determined by habitat inventory, literature surveys, agency contacts and aerial surveys. Agencies or organizations contacted included the USFWS, FGFWFC, and FNAI. Twenty-seven listed vertebrate species, including 2 fish, 6 reptiles and amphibians, 15 birds, and 4 mammals were identified as species occurring or potentially occurring in the pipeline project area. The status and potential occurrence of these species in and along the preferred and alternative corridors are discussed in the following paragraphs.

AMPHIBIANS

Florida gopher frog (Rana areolata aesopus)--The gopher frog is designated as a species of special concern by FGFWFC and is currently under review by USFWS. Suitable gopher frog habitat consists of xeric uplands such as

sandhill and sand pine scrub communities. The gopher frog is often associated with gopher tortoise burrows. The occurrence of gopher frogs within the study area is limited to suitable xeric habitat. The preferred and alternative corridors traverse primarily mesic and hydric communities with relatively high water table conditions and do not contain large areas of xeric habitat preferred by this species. At three separate localities along the alternative corridor, areas of sand pine scrub with limited populations of gopher tortoise were identified. Gopher tortoise populations were sparse, and the number of burrows within the corridor is estimated to be extremely small. Therefore, no substantial or significant populations of gopher frogs are expected to occur within or adjacent to either the preferred or alternative corridors.

REPTILES

American alligator (Alligator mississippiensis)--The American alligator is listed as a species of special concern by the FGFWFC and FCREPA and as threatened (due to similarity of appearance) by the USFWS. The latter classification (threatened due to similarity of appearance) is not due to the alligator's biological vulnerability, but is due to its close similarity of appearance with other listed species such as the American crocodile (i.e., it is classified as threatened to protect these other species). This species inhabits most wetland communities where sufficient permanent open water, and aquatic prey, are present. Currently, the State of Florida permits regulated harvest of alligators to control population levels, especially where alligators are incompatible with current land uses. Within the pipeline project area, alligators can be expected to occur within isolated open water bodies, within freshwater marshes with permanent open water, and within natural and manmade drainages which are sufficiently large and otherwise suitable for alligators. This species was not observed in such areas within the preferred and alternative corridors. Because the water bodies and creeks within and adjacent to the corridors are not large, only low levels of occurrence and habitat utilization by alligators are expected.

Eastern indigo snake (Drymarchon corais couperi)--Eastern indigo snakes are listed as threatened by FGFWFC and USFWS. Indigo snakes occur in a variety of habitat types, including xeric habitats, pine flatwoods, hardwood hammocks and hardwood swamps. The Eastern Indigo snake is only expected to occur in the more rural areas of the corridors, especially in certain areas of the alternative corridor where relatively larger tracts of natural lands, with limited disturbance, occur.

Gopher tortoise (Gopherus polyphemus)--Florida gopher tortoises are listed as a species of special concern by FGFWFC and under review by the USFWS. Gopher tortoises generally occur on well-drained uplands. Gopher tortoises prefer xeric habitat such as sand pine scrub and oak scrub as well as relatively well-drained pine flatwoods and old field associations. The preferred and alternative corridors do not traverse significant portions of such habitats. However, three small areas of sand pine scrub are crossed by the alternative corridor. Gopher tortoise burrows were observed in these areas, but the population levels were assessed to be at low densities. Along the preferred corridor, several small areas of oak scrub were observed and investigated. No gopher tortoises occur in these xeric habitats.

Florida pine snake (Pituophis melanoleucus mugitus)--The Florida pine snake is listed as a species of special concern by the FGFWFC and is under review for listing by the USFWS. This species occupies habitat similar to that of the gopher tortoise. It is found in xeric upland habitats including oak scrub and sand pine scrub. This upland species is known to inhabit gopher tortoise burrows and may occur along the alternative corridor where sandhill and oak scrub areas are traversed.

Short-tailed snake (Stilosoma extenuatum)--The short-tailed snake, endemic to Florida, is largely restricted to the longleaf pine/turkey oak association, which is absent from the study region. It is occasionally found in upland hammock and sand pine scrub, but usually where such scrub is adjacent to longleaf pine/turkey oak. This species is threatened according to FGFWFC. Owing to the scarcity of suitable habitat along the

alternative corridor and a virtual absence of habitat along the preferred corridor, the species has only very low probability of occurrence in the area.

MAMMALS

Florida panther (Felis concolor coryi)--The Florida panther is classified as an endangered species, and it is likely that fewer than 50 individuals remain, mostly in the southern one-third of the state. It is not restricted to any particular habitat type but requires larger, natural areas in which to range, forage, and locate mates. Due to the high level of agricultural and moderate residential development in the pipeline project area, as well as the absence of recent occurrence records, this species has a very low probability of occurring within the project area.

Florida mouse (Podomys floridanus)--The Florida mouse, a state species of special concern, occurs primarily in scrub habitats with xeric conditions, open tree stands, clumped shrubs, and patches of open areas with well-drained sandy soils. It is known to utilize gopher tortoise burrows. Habitat suitable for this species rarely occurs along either the preferred or alternative corridor. Three relatively small areas of xeric scrub occur along the alternative corridor where gopher tortoise burrows were observed. These areas are probably too small to support any persistent, substantial populations of this species. This species probably does not occur elsewhere in the study area.

West Indian manatee (Trichechus manatus latirostris)--This endangered massive aquatic mammal inhabits sluggish rivers, shallow estuaries and salt-water bays. Critical habitat for this species includes reaches of the Little Manatee River upstream to its crossing of Highway U.S. 301 in Section 25, T32S, R19E, Hillsborough County, approximately 1.6 to 2.4 kilometers (1 to 1.5 miles) north of the alternative corridor. Manatee habitat is not traversed by either the preferred or alternative corridor, although small tributary creeks draining into the Little Manatee and Peace Rivers are crossed.

Sherman's fox squirrel (Sciurus niger shermani)--This large tree squirrel, a state species of special concern, primarily inhabits longleaf pine/turkey oak associations of the sandhills, where logging and development have reduced habitat quality. Fox squirrels can occur at low densities in some ecotonal situations involving pine flatwoods and margins of bayheads or cypress ponds. The study area is at or outside the southwest limits of this species' geographic range, and the ecotonal habitats present are rare, suboptimal and would be unlikely to support substantial numbers of fox squirrels. No records or signs of fox squirrels were discovered during field investigations. It is doubtful that this species occurs along either corridor.

WADING BIRDS

Twelve species of wading birds probably occur in the vicinity of the preferred and alternative corridors. The wood stork is listed by USFWS as endangered and by FGFWFC as threatened. The limpkin is listed as a species of special concern by FGFWFC. The roseate spoonbill, little blue heron, snowy egret and tricolored heron are considered species of special concern by FGFWFC. The great blue heron, great egret, black- and yellow-crowned night herons, eastern least bittern, glossy ibis and white ibis are not listed by either USFWS or FGFWFC, but they are protected species. All of these species require marshes or shallow open water for feeding and swamp forest habitats for nesting and roosting. Wading bird habitat is present along both the preferred and alternative corridors, but crossings were minimized during the regional screening phase of the pipeline corridor selection process.

With the exception of the roseate spoonbill, all of these species may utilize wetlands within the proposed pipeline corridors. The roseate spoonbill prefers coastal wetlands and occurs at inland freshwater wetlands only infrequently. The wading birds observed repeatedly in the study area were the great egret, little blue heron, tricolored heron, and great blue heron.

A review of agency records of wading birds rookeries for the region identified four previously recorded rookeries, all of which are at least one-mile distant from either the proposed preferred corridor or the alternative corridor. Three possible, unconfirmed rookery sites were also suggested by FGFWFC, all of which were outside the corridors. These sites were inspected during helicopter flyovers, but no evidence of rookery use was detected. No additional, new rookery sites were identified during the corridor selection process. Thus, although wading birds are likely to utilize some of the wetlands along both corridors, no involvement with nesting sites is expected.

OTHER BIRDS

Wood stork (Mycteria americana)--Wood storks are listed as endangered by USFWS and FGFWFC due to their population decline. Their populations, colony locations, and reproductive success are monitored by USFWS and FGFWFC. Wood storks typically nest in cypress swamps, will often fly long distances to forage, and require shallow water in which fish become concentrated to feed and reproduce successfully. Shallow marshes, ditches, and small ponds or flooded depressions in swamp forests are all used for foraging. A wood stork colony site was reported by FGFWFC to occur in Section 35, T32S, R23E, north of the Polk County line. This colony site was not observed during the aerial flyovers, despite a deliberate search. The colony site probably has been abandoned. No new, previously unreported colony sites were encountered, and no wood storks were observed along either corridor.

Limpkin (Aramus guarana)--This medium-sized water bird inhabits riparian habitats, feeding on snails and a variety of small invertebrate and vertebrate food items. It is likely to occur along the larger creeks and slow-flowing drainages of the study area, but not in substantial numbers.

Florida scrub jay (Aphelocoma coerulescens coerulescens)--The Florida scrub jay is a highly social jay which occupies xeric scrub habitats along the central Florida and coastal ridges. Florida scrub jays have specific habitat requirements and are largely restricted to open oak scrub with an

open scattered canopy (usually sand pine), and a low (usually < 2 meter high) discontinuous shrub layer dominated by scrub oak species, rosemary, and other ericaceous species. They avoid wetlands, flatwoods (xeric, scrubby flatwoods are suboptimal habitat and occasionally used) and other forested habitats. The closest substantial populations are located in Highlands County. According to the scientific literature and FNAI records, scrub jays reportedly occur in Hillsborough County north of the Little Manatee River near I-75 at two localities and at the Little Manatee River State Recreation Area. All of these sites are approximately two or more miles from the alternative corridor. No scrub jays were detected during field inspections. The xeric sand pine and oak scrub habitat which does occur along the alternative corridor (described previously for several species) is of unsuitable quality and too small in size to support any permanent scrub jay population. Thus, scrub jays are unlikely to occur along either corridor.

Florida burrowing owl (Athene cunicularia floridana)--This owl, a ground dwelling species which inhabits sandy ground with sparse growth including sandhill communities, pastures, and maintained grasslands, is a state species of special concern. As has been noted previously, the study corridors traverse limited areas of xeric habitat. Consequently, the probability of occurrence of burrowing owls is low, and substantial populations are unlikely to occur in the study area. No records of burrowing owls were reported by FGFWFC or FNAI, and no owls were observed during habitat surveys.

Kirtland's warbler, (Dendrioca kirtlandii)--An endangered warbler, this species migrates through Florida and other states from the northern portion of Michigan to its winter habitat in the Bahamas. It is present in Florida, in a variety of habitats, for only a few days each year. Because this species migrates primarily along the east coast, it is unlikely to travel through the study area during migration.

Arctic peregrine falcon, (Falco peregrinus tundrius)--This species migrates from the arctic to winter in Florida. It is listed as threatened by FGFWFC

and endangered by USFWS. Wintering falcons require an area with an abundant food supply of birds and numerous perches on which to roost, sun, and feed. Coastal areas usually provide optimum conditions for survival, but peregrin falcons will opportunistically exploit concentrations of birds attracted to urban areas, dump sites, and agricultural areas. This species has a moderate probability of occurring as a rare transient along either corridor during winter, but more frequent occurrence of this endangered species is not likely in the suboptimal habitat that is present. Past clearing of large segments along the corridors has probably caused reduced prey abundance, as well as fewer snags and other roosts required for optimal habitat, in contrast with coastal habitats.

Southeastern American kestrel (Falco sparverius paulus)--This species, listed as threatened by FGFWFC, usually occurs in open pine forests and clearings, uses exposed perches, and preys upon insects as well as small vertebrates. This species probably occurs along both corridors where open pine forests occur, but substantial numbers are not likely. No kestrels were observed during field surveys.

Florida sandhill crane (Grus canadensis pratensis)--Listed as threatened by FGFWFC, sandhill cranes feed and nest in shallow freshwater marshes throughout central and south Florida. Feeding also occurs in wet pastures and unimproved rangeland. This species was observed foraging in pastureland in Manatee County and probably occurs occasionally throughout the study area. No known nesting sites are within either of the two corridors.

Southern bald eagle (Haliaeetus leucocephalus lelucocephalus)--Bald eagles occur throughout Florida, becoming more numerous toward south Florida. Second only to Alaska in eagle population size, Florida's populations are considered threatened by FGFWFC. Bald eagles are listed as endangered by USFWS. Eagles require large bodies of open water in which to fish. Nests are typically in large, live pine trees (mangroves in south Florida), often in pine flatwoods at some distance (several miles) from their preferred foraging area. This species, and its nests are thoroughly protected by

federal and state laws and nest use and productivity are closely monitored by FGFWFC and USFWS.

Ten documented eagle nests were reported to occur in the general vicinity of the pipeline project area. Corridor involvement with all but one of these was avoided during the regional screening phase of study. The remaining nest site was discovered in 1988 and is an active nest. The nest is located in slash pine stand between U.S. 41 and the CSX rail line in Section 32, T32S, R18E. No other eagle nests are within 450 meters (1,500 feet) of either corridor.

Red-cockaded woodpecker (Picoides borealis)--This species is designated as endangered by USFWS and as threatened by FGFWFC. It is usually restricted to overmature stands of longleaf (and to a lesser extent slash pine) pine with an open, parkland understory maintained by fire. Large (≥ 12 " dbh), often diseased (red-heart fungal disease) live pine trees are required for cavity nests, which are excavated by this species. A good supply of pine stems within its territory also is required for foraging. Large, relatively undisturbed tracts of pine forests, with suitable colony sites (i.e., very large pines), are required to constitute suitable habitat.

The limited pine flatwoods habitat present along either corridor is unsuitable for either cavity tree nests or foraging, as trees are relatively small and stem densities are quite low due to prior logging and clearing activities. There are no records of this species within the project area, and the nearest published record is in eastern Hardee County. Due to absence of suitable habitat, this species is not expected to occur within or adjacent to either corridor.

Audubon's crested caracara (Polyborus plancus audubonii)--This threatened hawk species occurs mainly in dry prairies and palmetto rangelands. It is very opportunistic in its feeding and will consume carrion as well as live prey. Its geographic range is centered northwest of Lake Okeechobee. Records in central Hardee County and south central Manatee County indicate the western limit of its range. Some apparently suitable habitat occurs

along the preferred corridor. This species may occur, probably as a rare transient, along the preferred corridor.

FISH

Common snook (Centropomus undecimalis)--The common snook is listed by FGFWFC as a species of special concern. The Florida range of the common snook includes warm coastal estuaries of the Atlantic Ocean and Gulf of Mexico, southward from the Indian River and Tampa. Common snook have specific habitat needs and prefer saline and estuarine mangrove shorelines and swamps. However, aquatic communities in the study area do not include mangrove swamp systems or estuarine areas which may serve as important spawning and nursery areas for snook. As such, the occurrence of snook within the preferred and alternative corridor is very unlikely.

Rivulus (Rivulus marmoratus)--The rivulus is a killifish found in Caribbean waters from the Venezuelan coast to the southern third of peninsular Florida. This specific concern species is extremely rare in Florida and has not been collected in the Port Manatee area. Within the vicinity of the project study area, the rivulus could inhabit mosquito ditches and bays with estuarine mangrove or saltmarsh shorelines at Port Manatee. Given the rarity of this species in the region and the fact that the pipeline will not cross suitable rivulus habitat, this species is not expected to occur along either proposed corridor.

Other (Non-Listed) Fish

Potentially suitable habitat in the pipeline study area consists of lakes, rivers, and streams. These may contain all of the common (non-listed) fish included in Table 6.3.7-3. Natural areas considered suitable habitat within the preferred corridor may include the Little Manatee River, Horse Creek, and Payne Creek. According to FGFWFC, the bluegill and redear sunfish occur in almost any waters, and the redbreast sunfish may occur in the Little Manatee River.

Emergent weed-choked areas of any streams within the preferred and alternative corridor are expected to contain channel catfish, white catfish, and brown bullhead.

Ponds within a phosphate reservoir adjacent to the eastern portion of the alternative corridor may support catfish, tilapia, redear sunfish, spotted sunfish, redbreast sunfish, largemouth bass, and bluegill.

6.3.7.4 Other Environmental Features

All relevant environmental features associated with the liquid fuel pipeline corridors from Port Manatee to the Hardee County Power Plant have been considered and discussed in the preceding sections. No additional information is necessary to describe the environs of the corridors.

6.3.8 Effects of Right-of-Way Preparation and Construction

6.3.8.1 Construction Techniques

Construction will essentially involve clearing the construction ROW of brush and timber, trenching, laying the pipe, backfilling, and seeding disturbed areas. In all cases, the pipeline will not be located within 15 meters (50 feet) of any private dwelling, industrial building, or place of assembly without special precautions. During clearing, marketable timber which are to be removed will be sold. In residential areas, ditches will be compacted while being backfilled. Lawns will be seeded or sodded, as required by owner, and compensation will be made for watering costs.

The construction trench will be sufficiently deep so that the top of pipe will be at least 0.9 meters (3 feet) below ground surface level. At major highways and rail crossings, the pipeline pathway will be bored to minimize disruption of service. Local governments will be contacted, when necessary, to avoid traffic interference. At minor crossings, including unpaved roads, the trench will be open cut. Pipe will be placed along the ditch in 12-meter (40-foot) segments, welded, covered with a protective coating, and lowered into the trench. The trench will be filled, with the ground stabilized and seeded.

In flowing streams, excavation will be done by either dragline or clamshell dredge. Standard trenching equipment such as a backhoe will be used to cross dry or intermittent stream beds. Trenches will be sufficiently deep so that the top of the pipe will be 1.2 meters (4 feet) below the stream bed. The pipe will be welded on the upland ROW and push/pulled or floated into place.

Excavated material from flowing streams will be stored temporarily on an upland site. From dry stream beds, excavated material will be placed adjacent to the trench. It will later be returned to the trench. If rain results in a stream flow, the flow will be maintained to avoid upstream ponding.

The pipeline will be hydrostatically tested. Test water will be discharged and filtered so that erosion and turbidity are kept to a minimum.

Stream bottoms and banks, as well as upland areas, will be restored to original contours after construction to minimize drainage impacts. If necessary, banks will be stabilized using acceptable techniques.

In cases of directional drilling, there will be no local or stream disturbance. A drill rig will be set on one shore, and a pilot hole will be drilled that passes below the stream bed and surfaces on the other side. Prewelded pipe, attached to the pilot drill pipe, will be pulled back through the hole with the use of special equipment that expands the hole to the size of the pipe.

A trenching machine (backhoe or dragline/clamshell dredge) will be used in wetlands containing little or no surface water, depending on the water content of the subsoil. However, rainfall during construction could require adjustments to the use of a backhoe and the push/pull method to lay pipe.

Excavated materials will be stored along one side of the trench (within the wetland) and then used as the source material for backfill. Water flow

between wetlands on both sides of the pipeline, as well as in streams crossed within the wetlands, will be maintained during construction, and the area will be returned to preconstruction contours.

Finally, with the exception of trees that will be cleared from the ROW (for the life of the pipeline), wetland areas will be allowed to revegetate naturally or be restored by supplemental planting.

6.3.8.2 Impacts to Water Bodies and Uses

The Applicant will provide detailed information on dredging and filling (locations and volumes) to FDER and SWFWMD after the corridor is certified, when the ROW is determined and the engineering is completed.

The proposed east-west liquid fuel pipeline will pass through some wetlands and waterbodies. When crossing them, it may be necessary to trench using mats and flotation platforms. The pipe could also be floated over the water after it is welded together and then sunk to the bottom of the trench. In most cases, however, the trench will be excavated by a dragline. At least 1.2 meters (4 feet) of cover will be provided for the pipeline under the stream bed. Pipeline segments will be bent to match ground contours, welded together on the upland ROW into 12-meter (40-foot) lengths, coated with a protective coating, and hydrostatically tested. The test water will be discharged so as to not cause erosion. The pipeline will be lowered into the trench. The trench will then be backfilled.

Excavated material will be stored temporarily in an upland area for flowing streams. For dry, intermittent streams, spoil will be stored adjacent to the ditch. Should rain cause water to flow into the intermittent stream, the flow will be maintained to prevent ponding upstream of the construction site. All stream bottoms, streams banks, and uplands will be returned to the original contours.

For streams and rivers that are to be directionally drilled, no disturbance to the shoreline or stream will be necessary. A drill rig will be set up on one side of the stream crossing, and a pilot hole will be drilled at an

angle so that the drill pipe passes under the stream and surfaces on the other side. A pre-welded length of pipeline will be attached to the pilot drill pipe, and pulled back through the hole using special equipment that enlarges the hole to the diameter of the pipeline. The advantage of this method is that there is no disturbance to the stream. The disadvantages are that it costs more than conventional methods and may not be feasible under certain geological conditions.

Along the preferred corridor the major waterbodies to be crossed are the North Fork Manatee River, the East Fork Manatee River, and Payne Creek. The crossing of the forks of the Manatee River will be parallel to SR 62, where impacts have already occurred as a result of clearing for the roadway. The corridor at the crossing of Payne Creek has been widened to provide flexibility to be adjacent to Roberts Road. Along the alternative corridor, the major waterbodies crossed are the Little Manatee River (twice), and Payne Creek at the proposed site boundary. The three crossings of these waterbodies do not parallel any existing linear facility, such as a road.

Additional mitigative measures may include the use of staked silt fences with haybales in upland areas transitional to shallow wetlands, floating turbidity barriers in open waterbodies, silt screens downstream of construction or other acceptable sediment controls. As a result of these measures, only short term impacts to water quantity and quality are expected.

The construction of the pipeline should not require any ground water withdrawals, dewatering, or relocation of any waterbodies. The construction will not create any new connections to waters-of-the-state. Since no bridges are required, and since the pipeline will be constructed beneath stream beds no effects on navigation are expected.

6.3.8.3 Solid Wastes

Solid waste generated from ROW preparation, trench excavation, and pipeline installation will consist of cleared vegetation, dry excavated material,

and construction debris. Cleared brush and debris will be disposed by onsite burning. Applicable state and local regulations regarding onsite burning will be followed. Marketable timber will be cut into saleable lengths and stacked to the side of the ROW.

Excavated material will be returned to the trench. It is anticipated that only minor amounts of fill material will be brought to the site, or be removed.

6.3.8.4 Changes to Vegetation, Wildlife, and Aquatic Life

Impacts on terrestrial and aquatic systems and species resulting from ROW preparation and construction will depend primarily on the location of the selected ROW and, to a lesser degree, on clearing and excavation techniques. The ROW location determines which type of vegetative community will be altered or cleared due to access road construction. The type of vegetative community, in turn, determines which wildlife species are likely to occur in the vicinity of the area impacted by the ROW preparation and construction.

In general, higher diversities of plant and wildlife species are associated with more mature and structurally diverse vegetative communities. As such, the areas along the preferred and alternative corridors exhibiting the highest species diversities are expected to occur at the major stream crossings and within the large tracts of undeveloped land. However, the ROW preparation and construction will minimize or avoid potentially adverse impacts to terrestrial and aquatic systems and species populations for the following reasons. The potential for impacts has already been minimized or avoided through a systematic, environmentally responsive corridor selection study using biological and ecological screening criteria. Biological and ecological siting constraints such as the presence of threatened and endangered species, critical or sensitive habitats, major wetlands or woodlands, and known locations of significant resources such as eagle nests or wading bird rookeries were identified and evaluated. A detailed consideration of potential impacts to vegetation and wildlife is presented in the following sections.

VEGETATION

Impacts to the existing vegetative communities crossed by the preferred and alternative corridors (see Section 6.3.7.1) are associated with ROW preparation and construction excavation practices as addressed in Section 6.3.8.1, Construction Techniques. Such impacts to the vegetative communities will occur principally along the limited sections of ROW that are forested. ROW preparation and construction will require the cutting of trees and the subsequent maintenance of the ROW in a low-growing, early successional system. Adjoining tracts of woodlands will remain intact and provide habitat for forest species. Forested communities such as hardwood swamps, pine flatwoods, oak hammock, and oak scrub occur along short sections of the preferred corridor, and hardwood and cypress swamps, pine flatwoods, sand pine and oak scrub, and oak hammocks, occur primarily along the alternative corridor.

Along most of their lengths, both the preferred and alternative corridors traverse nonforested communities. In such open areas of low-growing vegetation (e.g., improved pasture, cropland, rangeland, wet prairie, freshwater marsh) the ROW preparation and pipeline excavation should not prematurely alter the vegetative communities. Only the construction of access roads will result in a permanent loss of the existing vegetation in these areas. Ground vegetation will also be temporarily destroyed in certain areas by the equipment that will be used in the ROW preparation and construction. Adjacent communities should not be affected by access road construction since erosion control measures and proper culverting will be maintained.

Clearing practices in nonforested wetlands will retain the vegetative root mat in the ROW, thereby minimizing impacts to wetland areas due to siltation and sedimentation. Impacts to wetlands will vary depending on the wetland system through which the pipeline is routed. The resulting shift in wetland vegetation composition will vary with the type of the original overstory and soil and drainage alterations resulting from excavation activities. Outside of areas where filling is necessary for

access road construction, freshwater marsh, shrub swamp, and wet prairie systems crossed by the pipeline will not be significantly affected by excavation and pipeline installation since the pipeline will be deep enough to allow for adequate surface and ground water flows and proper culverting will be maintained.

WILDLIFE

Specific impacts to terrestrial and aquatic vertebrates expected due to ROW clearing and pipeline installation vary by species. Based on a thorough assessment of the status and potential for occurrence of threatened and endangered species in and along the preferred and alternative corridors (see Section 6.3.7.3), no permanent or adverse changes are expected to occur in the populations of relevant species listed in Table 6.3.7-2 as a result of ROW preparation or pipeline installation activities. This conclusion is based on an analysis of each species' probability of occurrence within the preferred and alternative corridors, on each species' tolerance of disturbance and mobility (i.e., ability to avoid active clearing and work areas), and on the degree of alteration or loss of important habitat resources required by each relevant species.

Special consideration was given to the potential for impacts to the continued regional presence of relevant species, particularly eagle, woodstork, gopher tortoise, wading birds, and scrub jay populations from ROW clearing and pipeline installation activities. No bald eagle nests are located within or in the vicinity of the preferred corridor and, therefore, eagles will not be affected or disturbed by the clearing and installation activities. Similarly, no documented scrub jay, wading bird, or woodstork nesting colonies are located within this corridor.

A single eagle nest occurs in the alternative corridor. In view of its use by eagles despite heavy railroad traffic and highway traffic on U.S. 41, the construction and operation of a pipeline within this corridor, provided it does not require clearing of trees or other vegetation immediately surrounding the nest, is not expected to affect its continued use by eagles.

Local displacement of some wildlife species is expected to occur during periods of clearing and construction activities. Such displacement is generally temporary and will not adversely impact or reduce the local or regional population status of relevant species. A review of protected species potentially occurring within the future ROW shows them to be generally adaptable to manmade disturbances, mobile, and frequently able to habituate to the ROW clearing and pipeline construction activities. A review of the relevant species list shows no particularly sensitive species or populations which can be expected to be displaced permanently. Species such as wood stork, herons and egrets, limpkin, sandhill crane, glossy ibis, and alligator, among others, are adaptable and expected to return to the ROW area following habitat disturbances. Florida sandhill cranes, wood storks, herons, and egrets are expected to use recently cleared inundated areas of the ROW for feeding immediately following such activities.

Individual small burrowing mammals or fossorial reptile and amphibian species may be lost during ROW preparation. Such individual losses, however, would be restricted to limited segments of the ROW and should not substantially affect local or regional populations. As shown in the individual species' discussions, most of the listed burrowing and fossorial species, such as Florida mouse, Florida pine snake, and gopher frog, are unlikely to occur in any substantial numbers within the preferred or alternative corridors.

The American alligator is expected to occur occasionally in wetlands throughout the preferred and alternative corridors but is highly mobile, and it is not anticipated that the presence of alligator populations will be in conflict with construction and maintenance of the transmission line. In the event that individual alligators cause nuisance problems for construction or maintenance personnel, FGFWFC will be contacted to deal with the individuals in question. Indigo snakes, gopher tortoises, or similar species encountered during construction will be temporarily displaced from the area of construction. After construction is completed, such species are expected to resume use of the habitat located within the

ROW. No significant habitat or resources will be lost, and the local and regional populations will not be adversely impacted.

No losses of medium-sized or large mammals due to direct impacts or habitat alterations are expected because of the mobility of these species.

Therefore, local populations of game species, species of commercial importance, or threatened or endangered species of mammals potentially occurring within the ROW area will not be adversely impacted. The erosion control measures and the protection of water quality previously described will eliminate the potential of adverse impacts to manatees or gamefish.

No significant impacts to the resident avifauna or migratory species are expected since the preferred and alternative corridors do not include major staging, breeding, or wintering areas for such species.

Impacts on aquatic systems and species are expected to be temporary and insignificant. During construction, disturbances of the vegetative ground cover will be kept to a minimum to reduce the erosion and sedimentation potential. ROW clearing in potentially sensitive habitats such as forested wetlands may be through restrictive clearing. Leaving the root mat of most trees in place in forested wetlands will reduce the overall impacts of clearing due to soil erosion and siltation. Although the ROW preparation will involve minor excavation and placement of fill resulting in temporary increases in turbidity and silt deposition, such impacts will be local, temporary, and are not expected to adversely affect aquatic resources. The need for fill will be minimized by using the existing roads for access where possible. Following ROW preparation and pipeline construction in wetland areas, such disturbed areas will be allowed to revegetate as each section of the pipeline is completed, which will restore its habitat value and minimize changes in species composition or distribution.

6.3.8.5 Impact on Human Populations

Construction workers and equipment will be required to clear portions of the ROW for construction laydown, excavation, pipe assembly, and placement of the pipeline in the excavated trench. Construction of the pipeline is

anticipated to take less than 6 months and will generally be limited to daylight hours.

Road crossings will be made by jack and bore method under paved road crossings. Construction activities will use the proposed ROW as much as practical. Special emphasis will be made to ensure property access where driveways intersect highway ROW. During construction, restrictions to vehicle traffic flow will be minimized by placement of traffic cones, barriers and the use of flagmen as necessary.

Construction will generate noise from construction equipment and construction worker tools. Noise impacts will be minimal due to the short duration of construction at any given point along the ROW. The few residences, along the preferred and alternative corridors, are infrequent and usually set back from the ROW by a distance of several hundred feet.

Impacts will be limited to construction activities since operational activities are generally confined to Port Manatee and the plant site except for pipeline inspections and moving of ROW.

6.3.8.6 Impact on Regional Scenic, Cultural, and Natural Landmarks

The proposed corridor will have no impact on regional scenic, cultural, and natural landmarks either during or after construction as no features of this type lie within or near the corridor.

6.3.8.7 Impact on Archaeological and Historic Sites

A cultural resource survey will be conducted in the undisturbed portions of areas that will be cleared or excavated in the pipeline ROW for those areas identified by DHR as appearing to be archaeologically sensitive, the two recorded sites identified in Section 6.3.6.5 and any other areas determined by a professional archaeologist or DHR. If land clearing and excavation will disturb the recorded sites or any significant sites identified in the cultural resource survey, mitigation may be provided as determined by DHR and the professional archaeologist.

If any site or sites are found during construction, the Applicant will implement a "chance find" procedure. A professional archaeologist will evaluate the site and in consultation with DHR will determine the significance of the find. If the site is considered significant by DHR, measures will be taken to preserve or mitigate the impact to the site.

6.3.9 Post Construction Impacts and Effects of Maintenance

6.3.9.1 Maintenance Techniques

The ROW will be mechanically mowed periodically, and environmentally safe herbicides used to keep the ROW clear of unwanted vegetation. These chemicals will be used as needed. All herbicide applications will be conducted in a manner consistent with all federal, state, and local regulations and will be carried out by trained personnel. No burning is anticipated to be needed for the maintenance of the ROW.

6.3.9.2 Multiple Uses

When construction is completed, the area within the ROW can revert to its original land use. Land uses prior to construction, with the exception of tree planting and construction (structures, swimming pools) will be allowed to resume.

6.3.9.3 Changes in Species Populations

The status and potential for occurrence of relevant species in and along the preferred alternative corridors were discussed in Section 6.3.7.3. Although a large number of species were addressed for the pipeline project study area, only a fraction of that number was determined to have a moderate or higher potential for occurrence within the preferred and alternative corridors. This is not coincidental, as efforts were made during the corridor selection study to avoid potentially sensitive habitats. The avoidance of such habitats eliminated or lowered the probability of occurrence of numerous relevant species in the preferred and alternative corridors. In addition, although it was not possible to avoid all wetland communities, care was taken to avoid or minimize the length of crossings for the most mature or ecologically valuable community types, such as forested wetlands.

The potential impacts affecting the existing vegetation communities and wildlife species occur primarily during ROW preparation and pipeline construction. After pipeline installation, the cleared ROW provides new habitats within forested associations. Together with the existing nonforested systems, the ROW will essentially be maintained as low-growing or early successional vegetation communities.

Herbaceous species and woody vegetation will reestablish within the ROW. Access roads will remain cleared. The amount and location of access roads to be constructed will vary depending on final ROW location and site-specific requirements. The length and width of these access roads (i.e., the extent of vegetation clearing) will be kept at the minimum required for maneuvering equipment during pipeline excavation and installation, and during subsequent pipeline maintenance. Wherever possible, existing roads will be used for access to further minimize the required vegetation clearing. With the exception of canopy clearing, the presence of these roads will not alter adjoining aquatic habitats or wetlands.

The existing hydrological conditions, including sheet flow, will be maintained through culverting. Culverts will be designed at wetland crossings such as freshwater marsh and swamps to maintain flows and equalize water levels from one side of the road to the other. The wetlands located at the crossings should continue to function and develop normally in response to wet and dry season rainfall. Therefore, the integrity of the habitat and the composition and population levels of local wildlife species within the wetlands will be maintained.

Maintenance of the ROW will be consistent with the original ROW preparation. This includes mechanical clearing, manual cutting, and the application of EPA- and state-approved herbicides by a licensed contractor which will be conducted in compliance with all applicable regulations. The use of herbicides will restrict the growth of nuisance trees (e.g., Australian pine, Brazilian pepper, and Melaleuca) throughout the ROW. The selective, site-specific use of agency-approved herbicides is not expected

to adversely impact nontarget vegetation or wildlife species within the ROW or in adjoining terrestrial and aquatic habitats.

The ROW will be allowed to revegetate but will be maintained without trees, whose roots could damage the pipeline. This will, in forested areas, remove a narrow belt of forest habitat and replace it with an open, edge community. At any one locality, this effect will be insignificant to any of the wildlife populations previously discussed. The cumulative impacts to habitats over the length of the corridor will be regionally negligible, and distributed over a large area, so that local effects are minimal. The creation of this edge habitat is not expected to have either an adverse or positive impact on existing wildlife communities.

Because the access roads will be relatively narrow, will not cross large wetland systems, will not be paved, and will not be traveled intensively (as opposed to a regular roadway), no significant mortality or interference with wildlife movements is expected to occur.

6.3.9.4 Effects of Public Access

The pipeline, when completed, will result in no additional public access impacts on undisturbed land. It has no features that would tend to increase public activity.

6.3.10 Other Post-Construction Effects

6.3.10.1 Pipeline Safety

The transportation of liquid fuel by pipeline involves some degree of risk to the public in the event of pipe failure and subsequent release of the liquid fuel. The greatest hazards would be a fire/explosion and/or water contamination following a major pipeline rupture. In order to minimize the possibility of such situations, the proposed pipeline would be designed, constructed, operated, and maintained in accordance with the U.S. Department of Transportation (USDOT) Minimum Federal Safety Standards in 49 CFR, Part 195. The regulations are intended to ensure adequate protection for the public from liquid fuel pipeline failures. Part 195 specifies minimum design requirements for the pipeline (including material

selection and qualification; protection from internal, external, and atmospheric corrosion; design pressures; hydrostatic test pressures; and maximum allowable operating pressures).

Part 195 also prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. This written plan, or manual, will include procedures for normal day-to-day operations as well as procedures for emergencies. These emergency procedures will include the following key elements:

1. Receiving, identifying, and classifying emergency events-- pipeline rupture, fires, explosions, and natural disasters;
2. Establishing and maintaining communications with local fire, police, and public officials and the coordination of emergency response;
3. Making personnel, equipment, tools, and materials available at the scene of the emergency;
4. Minimizing public exposure to injury by assisting with evacuation efforts or other appropriate action; and
5. Directing an emergency shutdown of the system and safely restoring service.

The applicant must establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that respond to a liquid fuel pipeline emergency and coordinate mutual assistance in responding to emergencies. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a liquid fuel pipeline emergency and report it to appropriate public officials.

Some historical data are available concerning the failure rate of liquid fuel pipelines similar to that proposed for this project. Over the period of 1979 through 1988, there were an annual average 209 failures for approximately 280,000 kilometers (175,000 miles) of liquid fuel pipeline.

For a 69-kilometer (43-mile) length of pipeline, this translates to an expected failure rate of 1 incident every 19.5 years. It should be noted that, given the advances in pipe materials technology (particularly in protective coatings) in the last ten years, this incidence rate is probably high compared to that which will be realized. The reasons for pipe failure have been corrosion (25 percent), outside damage such as backhoe operation (28 percent), defective pipe (6 percent) and undetermined causes (41 percent). Most failure incidents have proven to be minor, small leaks. Pipeline availability should be 95-98 percent, with most of the down-time for regular maintenance and testing.

6.3.10.2 Impacts on Public Safety

The transportation of liquid fuel by pipeline does involve some risk to the general public in the event of an accident. However, the use of the DOT guidelines in 49 CFR, Part 195 for the design, construction, operation, and maintenance of the proposed pipeline will minimize the chances of a hazardous condition. These guidelines also include regular testing requirements along the pipeline to ensure the immediate detection of a leak or rupture.

The preferred and alternative corridors are proposed to be constructed through areas that are primarily agricultural, with only a few residential dwellings scattered within agricultural areas. As a result, the number of people likely to be affected by an accident is relatively small.

Due to the thoroughness of federal requirements and the potential number of public likely to be affected, the impacts on public safety will be greatly minimized.

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**HARDEE
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CHAPTER 7

**ECONOMIC AND SOCIAL
EFFECTS OF
PLANT CONSTRUCTION
AND OPERATION**

CHAPTER 7

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7.0 ECONOMIC AND SOCIAL EFFECTS OF PLANT CONSTRUCTION AND OPERATION

7.1 SOCIO-ECONOMIC BENEFITS

The primary benefit to be derived from Hardee Power Station project is the provision of a new, clean and reliable energy source to the public served by the Applicant. In addition to the provision of energy, the proposed project will provide jobs, tax revenues, and a productive use for a site of limited environmental resource value.

TAX REVENUES

Both direct and indirect tax benefits will accrue as a result of the construction and operation of the Hardee Power Station. The economic benefits of the associated liquid fuel pipeline are discussed separately in Chapter 6.0. Local revenues will be derived from property taxes paid on the facility and its property as well as on the property on which the transmission lines and gas pipelines are sited. State taxes will accrue in the form of taxes levied on the materials and supplies required to construct the facility.

Assuming a 30-year life for operation, it is estimated that approximately \$36,304,800 (nominal dollars) in property taxes will be paid ad valorem over the life of the facility. [This estimate assumes full abatement (economic development ad valorem tax exemption) of county assessment for the first 10 years and also assumes 295 MW of power.] These taxes will be split between the county (about 34% of total) and tax payments to the school district and the SWFWMD.

Direct benefits of plant construction will result from the purchase of materials and equipment, land and construction contracts. Materials, equipment, and contracts for construction of the 295 MW plant will cost about \$144 million, with 9.5%, or about \$13.7 million for goods purchased regionally (Tampa/Orlando area). It is estimated that sales tax to be paid on construction materials and equipment will total about \$8,631,700 during the construction effort (nominal dollars). Table 7.1-1 lists anticipated taxes and associated payments for the Hardee Power Station.

Table 7.1-1. Projected Taxes on Hardee Power Station and Transmission Facilities Over Life of the Plant

Dollars in Millions	
Property Taxes on Plant	
To County*	\$12.3
To School Board and SWFWMD	<u>24.0</u>
Total Property Tax on Plant	\$36.3
Property Tax on Transmission Facilities	
Hardee County	\$ 2.7
Polk County	1.3
DeSoto County	2.2
Charlotte County	1.4
Lee County	<u>.3</u>
Total Property Tax on Transmission Facilities	\$ 7.9
Sales Tax on Construction and Operation of Plant	
On Plant Construction	\$ 8.6
On Transmission Line Construction	1.9
During 30-yr operation (Plant & Transmission Facilities)	<u>3.3</u>
Total Sales Tax	\$13.8
TOTAL PROJECTED TAXES	58.0

* Includes full abatement of county assessment for 10 years.

Assumptions:

1. Assume millage rate held constant for all 30 years.
2. Economic development ad valorem tax exemption applies only to the county taxes and not the school and SWFWMD for first 10 years.
3. No improvements will be made to the plant.
4. Assessed value is based on original cost less accumulated depreciation at 3.3% per year (new).
5. Taxes during the period do not reflect a present value calculation.

Indirect benefits, in the form of increased spending and sales taxes paid on goods and services purchased privately by members of both the construction and operating workforce for the facility, will also add to the state and local economy. Since workers are expected to be hired from areas within commuting distance of the site and will not require relocation for this project, their spending patterns within stores and service facilities are already established. Consequently, it is not anticipated that spending patterns in the local area will change to any noticeable extent or that this increase in local revenues will create any significant new demands on the local economy.

EMPLOYMENT

Among the primary direct benefits of the facility will be the increase in job opportunities within the region associated with both plant construction and operation. As noted in Section 2.2.7.1, Polk and Hardee counties are labor surplus areas: a situation which is reflected in unemployment rates that are among the highest in the state and the country. While the region's population is expected to grow at a slower rate over the next several years (through 1995) than employment opportunities, a larger number of women and older persons are entering the labor market, thus increasing the workforce competing for the jobs. Employment opportunities provided at the proposed facility will not solve the unemployment problem in this area; however, they will directly contribute to lowering the unemployment rates.

An average of up to 225 workers will be employed over the 26-month construction period required for the first phase of this facility. Employment is expected to peak at 400 workers. The total construction payroll for this facility is estimated at up to \$34 million.

Operation of the 295 MW facility will employ approximately 80 persons who will work in three shifts.

Equal employment opportunities for all persons has been identified as a major priority of the CFRPC Comprehensive Policy Plan (1987). The Applicant

maintains full compliance with all applicable federal, state and local regulations regarding equal employment opportunity and affirmative action.

ENHANCEMENT OF RECREATIONAL OR ENVIRONMENTAL VALUES

Construction and operation of this facility will reclaim land previously mined for phosphate ore and will also create a new cooling reservoir. The use of mined lands for the Hardee Power Station enhances land conservation by combining multiple industrial uses of the same land area. The site property will not be available for public use.

CREATION OR IMPROVEMENT OF LOCAL TRANSPORTATION FACILITIES

Off-site improvements to local roads, waterways or other transportation facilities are not anticipated at this time. Discussions with county officials indicate that improvements to roads, through the use of Economic Development Funds, may be considered in the future.

7.2 SOCIO-ECONOMIC COSTS

7.2.1 Temporary External Costs

According to the Florida Department of Labor and Employment Security, over 75,000 construction workers reside within 97 km (60 miles) of the proposed site. Since a more than adequate labor supply exists within commuting distance, and since a labor surplus exists within Hardee and Polk counties, it is anticipated that workers will be hired from within the region, with minimal relocation required. Consequently, construction should have no effect on permanent housing within the region.

As is typical with longer construction projects, some workers commuting from the longer distances may choose to drive recreational vehicles (RV) to the area and camp near the site on a weekly basis, returning to their permanent homes and families on weekends. Several campgrounds providing various amenities and over 1,000 full hook-ups for RVs are located within the region which could serve these weekly commuters. Since commuting is not anticipated to be a problem, the number of workers who utilize the

campground facilities is not expected cause a change in usage patterns of normal users of these facilities.

Traffic congestion may occur at certain intersections during the morning and evening hours when construction workers are arriving at or departing from the site (see Section 4.6.2 for discussion of traffic access and impacts). Any congestion will, however, be of short-term duration and will be mitigated, to the extent possible, with the use of traffic control personnel on an as needed basis.

Since workers will be commuting and not relocating into the site region, it is not anticipated that construction workers will create any new or unusual impacts or demands on public facilities or services.

On-site construction activities should have no impact on area residents. The site is surrounded by mining operations on the north, east, southeast and west [(see Figure 2.2.3-2 for existing land use within 8 km (5 miles) of the site)]. That portion of the site boundary to the south and southwest not adjacent to the mines abuts Payne Creek and its associated wooded wetlands. Given the extensive buffers surrounding the site and the distance of over one mile to the nearest residences, on-site construction activities will not be visible and noises will be unmeasurable at the property boundary (see Section 5.7.1).

7.2.2 Long-term External Costs

The facility impacts are minimal and localized. It is not on or near any public or private facilities utilized for recreational purposes.

Consequently, the Hardee Power station will not cause any impairment to recreational values, result in any deterioration of aesthetic and scenic values, restrict access to areas of scenic or other values, have any impacts, displace persons from the land, cause loss of income, or result in significant costs to local government.

AESTHETICS

The project site is located 0.6 km (1 mile) west of CR 663 in Hardee County, just south of the Polk County border. The combustion turbines, steam turbine, and heat recovery steam generators will be located outside (see Figure 3.2-2). The tallest project structures at the site, the HRSG exhaust stacks, will be 27 m (90 ft) high. The Control Building will be 11 m (36 ft) tall. The Service and Water Treatment Buildings will be 6 m (20 ft) high. An 18 m (60-ft) high bay will extend from the Service Building to provide a covered laydown area. Support steel will be provided for a gantry crane; the top of the crane trolley will be 17 m (57 ft) above grade. The demineralized water storage tank will be the tallest tank onsite at 15 m (50 ft) above grade. Fuel oil and raw water tanks will be 13 m (43 ft) high. Transmission lines will exit the plant on the east side and will be routed both north and south along CR 663. A cooling reservoir will be constructed and used as the source of cooling water. A plant access road will be constructed off CR 663, but traffic signals at the intersection are not anticipated. Site grade elevation will be approximately 36 m (118 ft) above MSL. The top of the stacks will, therefore, be at elevation 63 m (206 ft) MSL. CR 663 elevation east of the site is 38 m (123 ft) MSL.

The exterior of the main plant buildings will be neutral colored panel siding to absorb, and not reflect, sunlight. The stacks will also be a neutral or dark color.

As discussed in Section 2.2.3 the Hardee Power Station is located in an area which has been in industrial (mining) activity for a considerable amount of time and is located well away from areas of any potential visual sensitivity. To determine the potential visibility of the facility and the consequent visual impact, a series of "sight lines" were drawn from the center point of the stacks to locations of human habitation or visitation (roads). Because of the minimal area accessible to the general population in the vicinity of the Hardee Power Station Site, site lines were drawn out to reasonably accessible locations within an approximate 8 km (5 mile) radius.

The visual analysis found that from almost all accessible locations to the south, southwest, southeast and east towards the facility (with the exception of Ft. Green), area topography and vegetation will effectively block or screen views of the Hardee Power Station. The site is partially screened from traffic by dense stands of trees. Tree stands are present west, south and east of the proposed site. Highway plantings also cover a one-half mile stretch on the west side of CR 663 east of the site. Mining operations are in progress north and northeast of the site. The project facilities will be visible to persons in vehicles traveling south on CR 663, north of the site, through a southwesterly viewing corridor. Vegetation in this corridor consists only of brush and scattered trees. Mining operations in this area north of the facility may occasionally screen the site, but mining and reclamation efforts will be concluded in the next few years. Persons traveling north on CR 663, south of the site, will only see the upper portion of the stacks, and possibly some structural steel, due to a dense tree screen to the south and east, and phosphate pond containment berms east of the site.

In the small community of Ft. Green a portion of the stacks will be visible. The stacks will be viewed from a distance of about 3.2 km (2 miles). In addition, they will be viewed through a mix of mining activities in the middleground of the view. The effect of the inclusion of the mined areas in the view will minimize the importance of the stacks and they should appear as just one more industrial structure on the horizon. Once mining is completed the stacks will be a more dominant feature of the viewscape. However, while some views of the tops of the stacks may be possible from Ft. Green, the new structures will be in conformance with the previously established industrial character.

No views of the facility should be possible from the unincorporated community of Ft. Green Springs which is located among citrus groves and on the back side of gently sloping ground leading to the Shirttail Branch of Payne Creek. Between the site and Ft. Green Springs is Payne Creek and its associated wooded wetlands. Ft. Green Springs' location on the "back" of a

slope, the location of its residences among groves, and the location of a considerable area of wooded wetlands in the middleground of the view will serve to effectively block views.

The only other areas likely to contain people on a regular basis are the county roads. With minor exceptions, the Hardee Power Station will be either blocked or screened from view by area vegetation and natural and man-made (berms around tailing ponds) topography. In addition, from those few location where views of the facility will be possible, the distance between the stacks and the viewer will minimize its importance and will also allow for the inclusion of numerous mining areas which will play a more dominant role in the view. In conclusion, the Hardee Power Station is ideally located from a visual perspective. It is in conformance with the already dominant use of the area, and will be screened or blocked from a large majority of the areas within 8 km (5 miles) which are accessible to the public.

The facility is not on or near any areas of noted scenic, historic, cultural, natural or archaeological value. Consequently the Hardee Power Station will have no visual effect on such properties.

The use of the proposed site for power generation will cause no hardship based on conversion of land use. The site is currently a phosphate mining area with no future plans for public or recreational use. The use of the property for the Hardee Power Station will reclaim a no longer productive parcel of land into a productive use without displacing any persons or loss of value to the region.

Since the site is not in or near any area used for tourism or commercial fishing, the proposed Hardee Power Station will not affect these resources.

As previously noted, the proposed site is about 1.6 km (1 mile) away from the nearest residence with substantial buffers in between. In addition, the site area has been actively used for industrial purposes (mining) for many

years with the mining activities projected to expand to the west and south during the next decade. Given the historic industrial use of the area and the distance between the site and the nearest residences, it is highly unlikely that the proposed project will have any detrimental effect on real estate values within the region.

REFERENCES - Chapter 7

Central Florida Regional Planning Council Comprehensive Policy Plan.
1987.

**HARDEE
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CHAPTER 8

**SITE AND DESIGN
ALTERNATIVES**

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8.0 SITE AND DESIGN ALTERNATIVES

8.1 ALTERNATIVE SITES

8.1.1 Introduction

As required by Chapter 186 FS and implementing regulations codified in Chapter 22E-2, FAC, SECI identified the need for new electric generating capacity in their 1987-1998 Ten Year Power Plant Site Plan. In April 1987, SECI initiated a site selection study to locate, evaluate, and recommend areas which were suitable for the construction and operation of an electric-generating facility. The study was referred to as the Combined Cycle Plant Site Selection Study (ESE, 1988). This section summarizes the procedures and results of that study.

The geographic area of the study included all or part of 46 counties in Florida, roughly corresponding to the applicant's member service area (Figure 8.1.1-1).

Potential areas were located and evaluated to determine their capability to accommodate a 660 MW combined-cycle (CC) plant utilizing natural gas, No. 2 fuel oil, or treated No. 6 residual fuel oil (no longer under consideration) with the potential for conversion to synthetic gas from a coal gasification plant at an unspecified future date.

The site selection study was conducted to comply with the regulatory provisions of NEPA, REA requirements and guidelines for the siting and assessment of environmental impacts of power-generating facilities, and the FEPPSA.

8.1.2 Siting Study Objectives

The overall objective of the site selection study was to locate, evaluate, and recommend areas within the study area suitable for construction of the proposed facilities.

The site selection study was designed to accomplish this objective through the following five major tasks:

KEY

 **STUDY AREA**

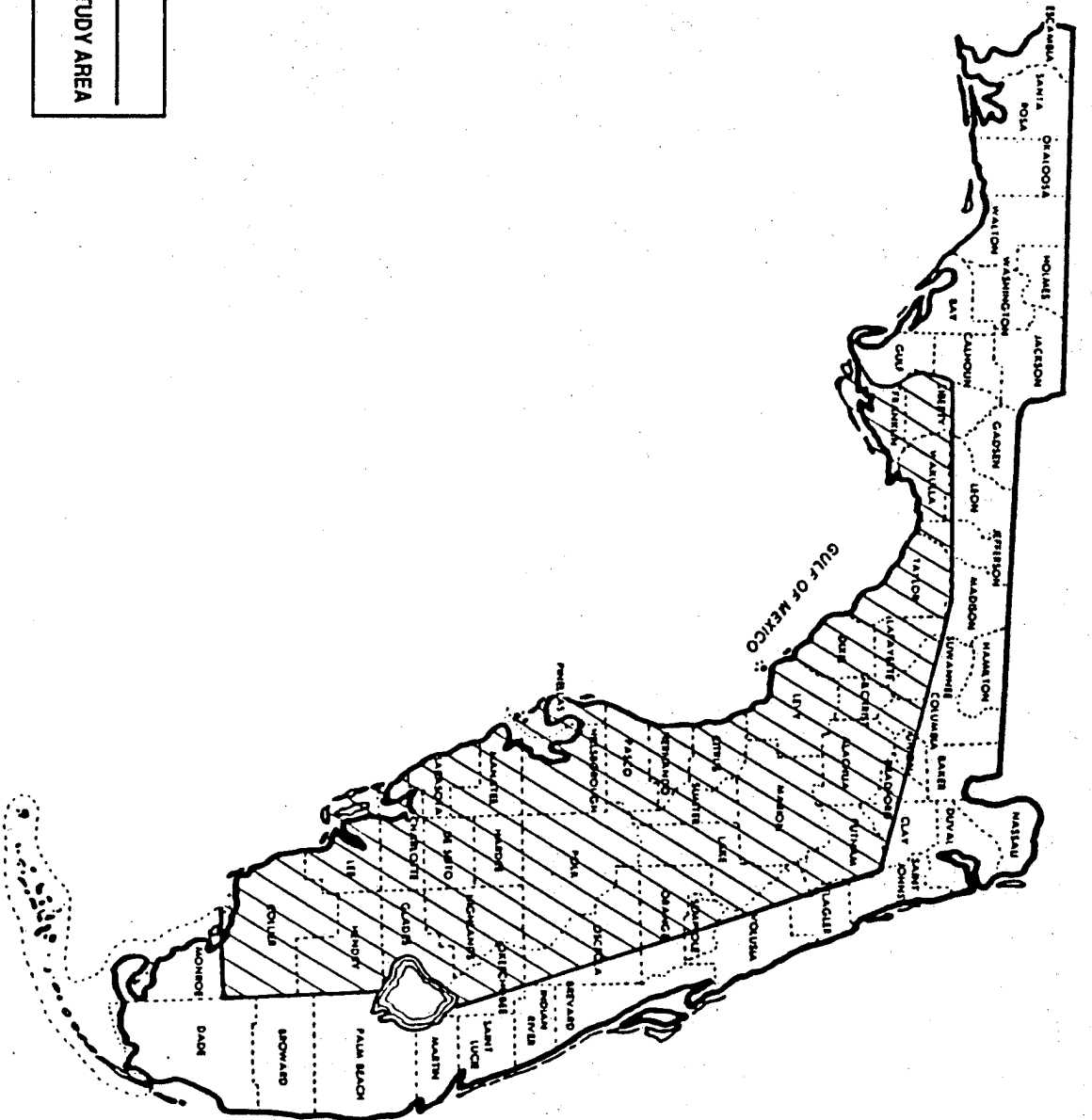


Figure 8.1.1-1 POWER PLANT SITING STUDY AREA

Hardee Power Station

1. Identify areas within the project study area where it would not be feasible to locate the proposed CC facility because of existing environmental, land use, or other constraining factors.
2. Identify locations within the project study area which could be capable of accommodating the proposed facility based solely on environmental considerations.
3. Identify Candidate Study Areas by evaluating locations identified as favorable based on fuel delivery, transmission, construction, and environmental permitting considerations.
4. Evaluate the Candidate Study Areas based on specific environmental and engineering criteria, and identify Prime Study Areas which are the most suitable for the development of the proposed facility.
5. Develop engineering and cost information on the Prime Study Areas, select a Preferred Study Area and an Alternative Study Area, and initiate a search within the Preferred Study Area to locate a specific site for the proposed CC plant.

8.1.3 Siting Study Approach

The siting study was structured into three major phases (Figure 8.1.3-1). Each phase had specific objectives and outputs, all aimed to fulfill the overall study objective. The three phases and objectives within each phase were:

1. Phase I--Regional Study Area Screening
 - a. Evaluate the entire study area based on multidisciplinary environmental constraints to determine the relative suitability (i.e., potentially favorable or restricted) of areas for the plant development; and

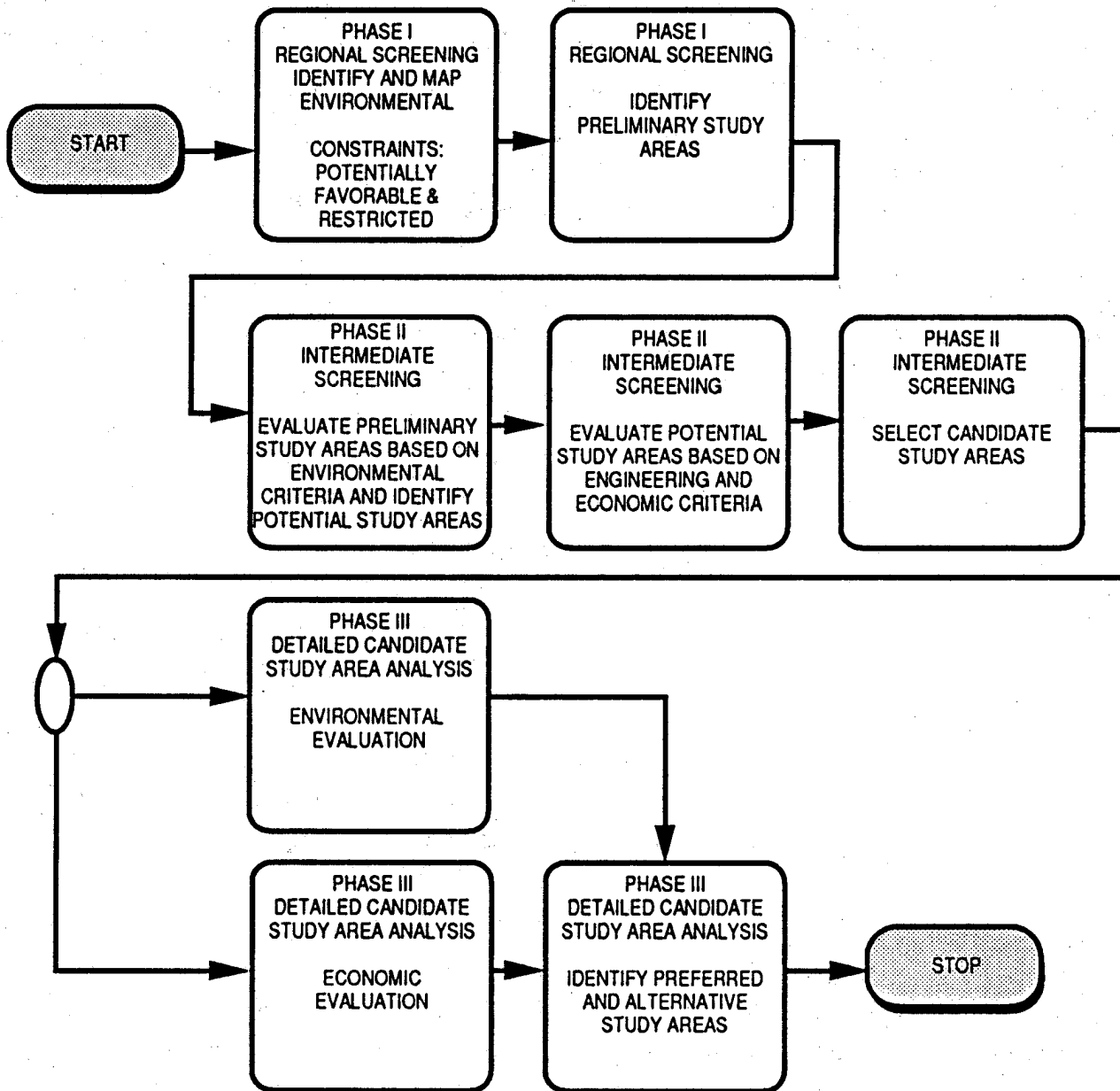


Figure 8.1.3-1 SITING STUDY PHASES

**Hardee
Power Station**

- b. Identify Preliminary Study Areas within those areas rated potentially favorable based on the overall composite rating of all environmental constraints.
2. Phase II--Intermediate Screening and Ranking
- a. Evaluate and rate the Preliminary Study Areas based on specific environmental criteria to identify Potential Study Areas;
 - b. Evaluate the Potential Study Areas based on proximity or accessibility criteria for existing transportation, fuel delivery, and transmission systems as well as water sources for each plant type; and
 - c. Select Candidate Study Areas which are ranked most suitable for plant development.
3. Phase III--Detailed Study Area Analyses
- a. Rank the Candidate Study Areas based on numerical comparison rating and weighing system using specific environmental and engineering criteria;
 - b. Select Prime Study Areas which ranked most suitable for plant development;
 - c. Develop detailed engineering and cost information on the Prime Study Areas; and
 - d. With the Applicant's staff, recommend a Preferred Study Area and Alternate Study Area for plant development.

Each phase had a specific output or result which was documented, reviewed, and approved prior to initiation of the next phase. This procedure ensured consistency and focused on achieving overall study objectives.

8.1.4 Phase I--Regional Screening

In the Regional Screening phase the general environmental suitability of areas within the study area for siting either the CC or a gasification combined cycle (GCC) plant was determined. Areas favorable to development, and of approximately 13 km² (5 square miles) in size, were identified for further investigation.

The methodology involved screening and mapping the entire project study area according to two ratings--potentially favorable and restricted. The screening methodology involved examination of the study area based on environmental criteria or constraints. These criteria were grouped into major environmental categories and included:

1. Land Use Constraints,
2. Ecological Constraints,
3. Air Quality Constraints, and
4. Water Availability Constraints.

The regional screening process identified 38 Preliminary Study Areas for further investigation (Figure 8.1.4-1). These Preliminary Study Areas varied in size and shape, depending on both the configuration of the potentially favorable areas and the location of the infrastructure (existing systems and facilities) and transportation corridors. The configuration of these Preliminary Study Areas observed, wherever possible, the political, regulatory, and management boundaries that existed within the local area. The configuration process avoided crossing natural or manmade physical barriers. These Preliminary Study Areas were at least 13 km² (5 square miles) in size.

8.1.5 Phase II--Intermediate Screening

Intermediate screening evaluated the Preliminary Study Areas based on environmental and engineering/economic criteria and selected Potential Study Areas for detailed, site-specific analysis. This objective was accomplished in two steps. In the first step, the 38 Preliminary Study Areas from the regional screening results were evaluated based on specific environmental

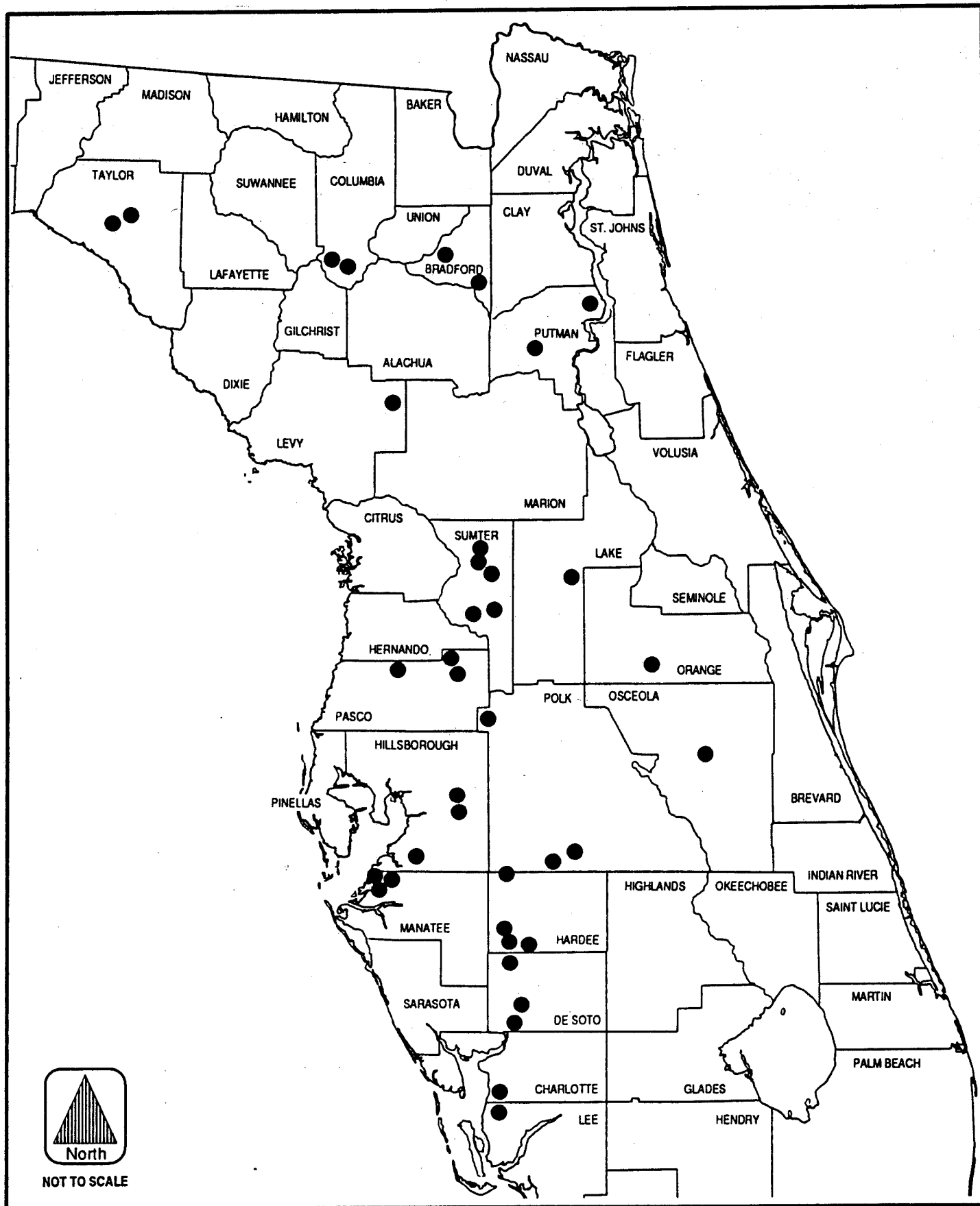


Figure 8.1.4-1 GENERAL LOCATION MAP OF PRELIMINARY STUDY AREAS - PHASE I REGIONAL SCREENING

Hardee Power Station

criteria. The criteria considered the specific differences in site and facility requirements for power plant development. The Preliminary Study Areas were screened and ranked in the following environmental categories:

1. Land use,
2. Water availability,
3. Geotechnical suitability,
4. Ecological considerations, and
5. Air quality.

The discipline rankings were composited into an overall environmental ranking of the Preliminary Study Areas, and the resulting 27 Potential Study Areas were then considered for further engineering/economic evaluation (Figure 8.1.5-1).

The second step of the intermediate screening process involved evaluation of engineering economic criteria which reflect generic cost factors for proximity or access to existing fuel delivery pipelines, rail, barge, or highway systems, transmission systems (230 kV and above), and cooling-water sources for the power supply option. The 27 Potential Study Areas were rated and ranked according to these criteria, and nine Candidate Study Areas were selected for more detailed analysis (Figure 8.1.5-2).

8.1.6 Phase III--Detailed Candidate Study Area Analysis

The Detailed Candidate Study Area Analysis involved three tasks:

1. Evaluate and rank the nine Candidate Study Areas based on environmental criteria to select and rank Prime Study Areas for further evaluation,
2. Evaluate these Prime Study Areas based on detailed engineering and economic criteria, and
3. Determine the Prime Study Areas for applicant review.

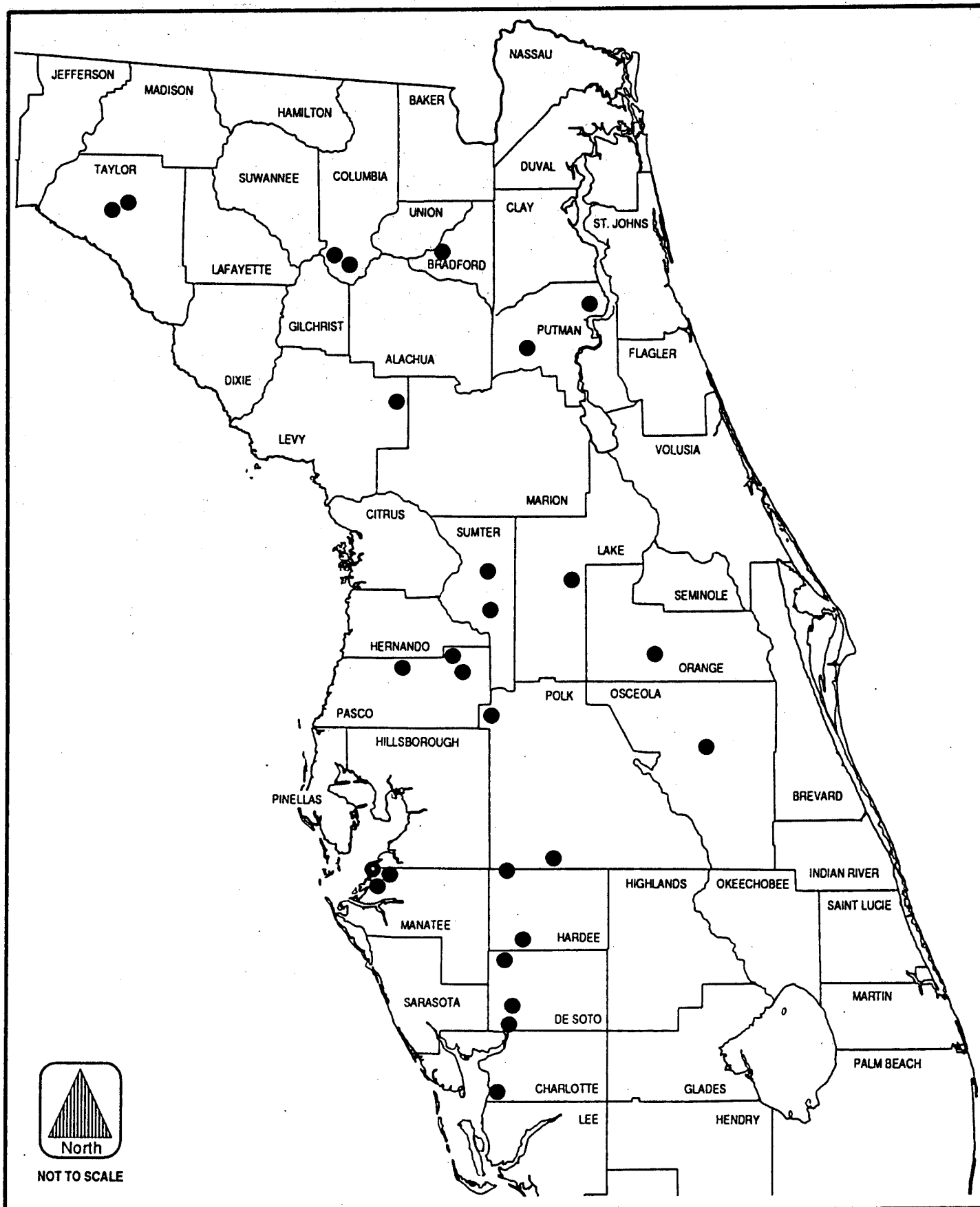


Figure 8.1.5-1 GENERAL LOCATION MAP OF POTENTIAL STUDY AREAS

Hardee Power Station

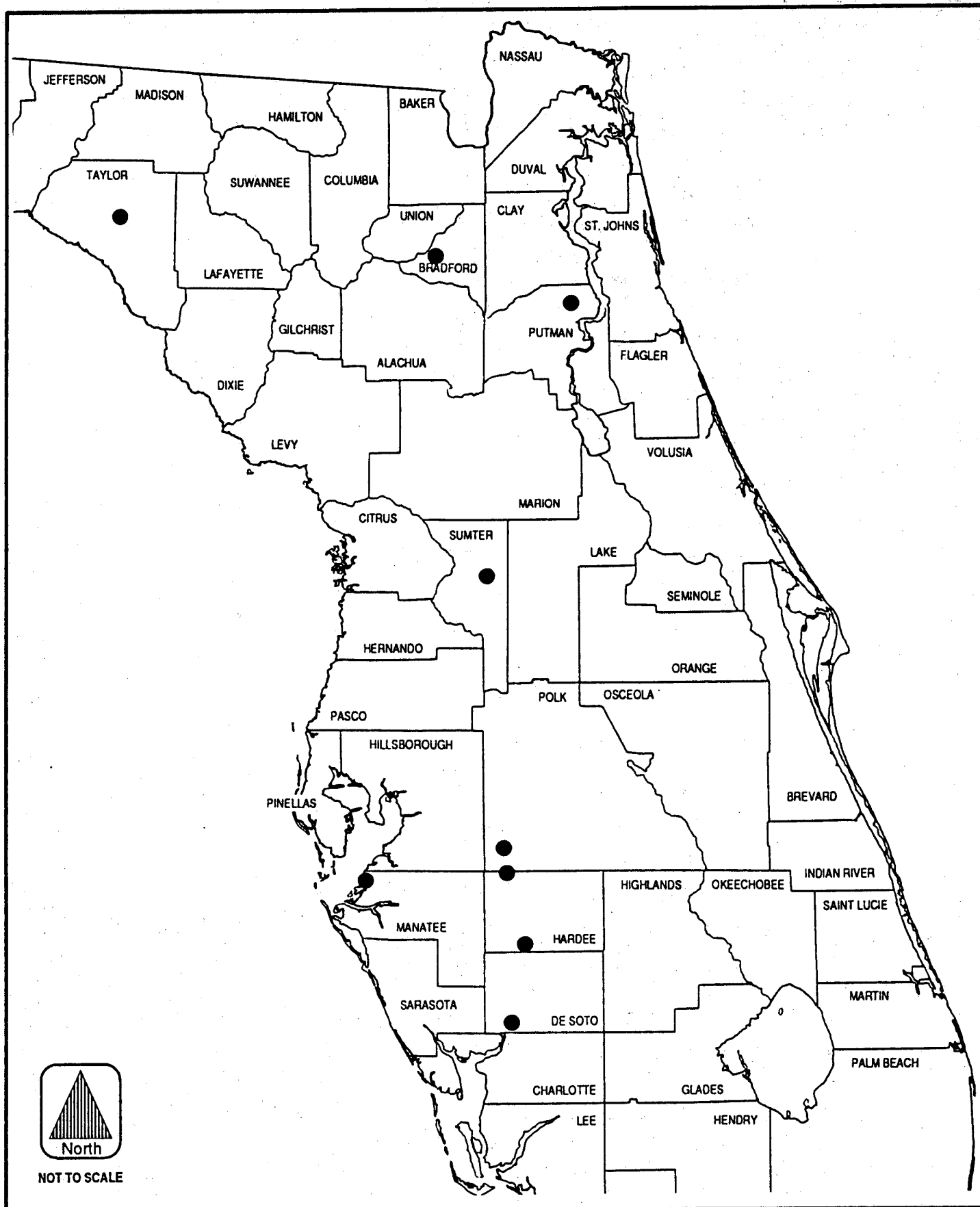


Figure 8.1.5-2 GENERAL LOCATION MAP OF CANDIDATE STUDY AREAS

Hardee Power Station

To accomplish the first task, the nine Candidate Study Areas were evaluated using an analytical technique that rates each site against four environmental disciplines: ecology, air quality, water resources, and socioeconomics and land use. These covered the range of potential environmental impacts resulting from the power plant development. To reflect the relative importance of each criterion, weights were used as a multiplier for each criterion rating.

In the second task, the nine Candidate Study Areas were subjected to a detailed cost study that evaluated natural gas delivery from the existing Florida gas transmission system, natural gas delivery from the proposed ANR Sunshine gasoline, fuel oil and coal delivery to the Candidate Study Areas, interconnecting to the Florida transmission grid system, transmission losses resulting from the preferred transmission interconnection scheme, and the benefit of the preferred transmission scheme to the applicant's long-range transmission plans.

In this evaluation, the costs for all of the criterion categories were developed or reconfirmed from the Intermediate Screening process for each of the Candidate Study Areas. A pair-wise analysis was conducted for each Candidate Study Area in each category. Numerical values obtained in the pair-wise were multiplied by weighing factors established from a pair-wise analysis conducted on each of the criteria, and a total score for each Candidate Study Area was determined.

The highest-rated areas were located in southwestern Polk County, northwestern Hardee County, and north-central Sumter County. Since the areas in Polk and Hardee Counties were similar (both areas are owned and controlled primarily by companies of the phosphate mining industry), these two general areas were combined into a single area. The Polk/Hardee area was then compared against the Sumter area to determine a preferred and alternative area. Both areas were determined to be equivalent on an economic basis.

8.1.7 Preferred and Alternative Study Areas

On March 10, 1988, the applicant's Board of Trustees selected the Polk/Hardee area as the Preferred Study Area to locate a power plant. The Sumter area was selected as the Alternative Study Area.

Properties within the Preferred Study Area were evaluated for ownership and the ability to supply contiguous land that could accommodate the following power plant requirements:

1. Power block and associated facilities on undeveloped land,
2. Cooling pond from reclaimed phosphate mining areas, or cooling towers on undeveloped land, and
3. Rail and road access.

Discussions with phosphate mining companies concerning a potential site resulted in the selection of the Agrico property located in both Polk and Hardee Counties as the preferred site. This property would allow the construction of a cooling pond from reclaimed phosphate mining areas. Also, the schedule for mining would coincide with the Applicant's requirements. The power station could be located adjacent to a cooling reservoir area and on unmined or undeveloped land.

8.2 PROPOSED SITE DESIGN ALTERNATIVES

8.2.1 Alternative Heat Rejection System

One of the most significant design alternative decisions relating to the steam portion of the proposed combined cycle unit is the selection of the preferred heat rejection system. This system is fundamental in the transfer and/or rejection to the atmosphere of waste heat from the condensation of the turbine exhaust steam. Optimization of the heat rejection system can serve to minimize plant capital and operation costs, and environmental impacts.

8.2.1.1 System Criteria

Based on the current plant design, the following engineering criteria were established for the cooling system design and evaluation:

1. The system shall be capable of continuously rejecting 1.95×10^9 Btu/hour.
2. Cooling system water quality shall be maintained at a level satisfactory for continuous condenser cooling operation.
3. The system shall be optimized for the expected ambient conditions and performance characteristics and requirements of the various heat rejection systems.
4. The system shall be capable of supplying to the condenser a daily average water temperature of 35°C (95°F) or cooler at all times under design ambient conditions and 100% load. Additionally, the condenser back pressure shall not exceed 11.4 cm (4.5 inches) Hg.

8.2.1.2 Alternative System Designs

For the proposed plant site, two conceptual heat rejection system concepts were evaluated: a cooling reservoir and cooling towers. Given the inland location of the proposed project site, once-through cooling was not considered to be a feasible alternative, due to the difficulty of obtaining permits for such large quantities of water withdrawal and the potentially adverse environmental impacts associated with these water withdrawals.

For the two available heat rejection system concepts (i.e., reservoir or towers), five specific alternative designs were identified and evaluated:

1. A recirculating cooling water reservoir with makeup from Lower Floridan Aquifer wells,

2. A cooling tower with makeup from Lower Floridan Aquifer wells and tower blowdown discharge to the Peace River.
3. A cooling tower with makeup from Lower Floridan Aquifer wells and tower blowdown discharge to a percolation pond,
4. A cooling tower with makeup from Lower Floridan Aquifer wells and tower blowdown discharge to a deep injection well, and
5. A cooling tower with makeup from Lower Floridan Aquifer wells and tower blowdown discharge to the Payne Creek.

The five alternatives are described briefly below.

RECIRCULATING COOLING WATER RESERVOIR

In a recirculating cooling water reservoir system, water from the reservoir is continuously pumped through the condenser, where it picks up heat from the turbine exhaust steam and then returns to the reservoir. The reservoir water remains at or slightly above ambient temperature primarily through evaporative cooling. The cooling reservoir provides two critical functions: (1) it serves to collect, store and supply water for use in condenser cooling; and (2) it serves to remove excess heat through evaporative, radiant and other cooling mechanisms.

The proposed cooling reservoir, previously described in detail in Chapter 3, will be constructed on reclaimed phosphate mines and lands. To satisfy the engineering criteria previously identified in Section 8.2.1.1, approximately 230 ha (570 acres) of reservoir surface will be required.

Water makeup of the reservoir will include direct rainfall, runoff and seepage from the upland watershed and, as necessary, pumped Lower Floridan Aquifer well water. To facilitate the infrequent discharges which may be necessitated by extreme (wet) meteorological conditions, a reservoir overflow to Payne Creek will be designed. Given its storage capacity, the

cooling reservoir alternative would maximize water reuse and minimize Lower Floridan Aquifer water withdrawals.

COOLING TOWER WITH BLOWDOWN DISCHARGE TO PEACE RIVER

This alternative would use a counterflow, wood frame, rectangular mechanical draft cooling tower for waste heat rejection. In this mechanical draft cooling tower system, cooling water is pumped from the cooling tower basin through the condenser to condense the turbine exhaust steam. This heated water is returned to the cooling tower where it is distributed over the tower fill and allowed to cascade down through the tower. Large fans pull air through the tower fill; heat exchange occurs by evaporation and convection.

Cooling tower water losses would be replaced by softened Lower Floridan Aquifer water. This cooling tower alternative would route tower blowdown to a percolation pond. Anticipated Lower Floridan Aquifer water quality and water softening performance would allow approximately 10 cycles of concentration. Blowdown from the towers (necessary to maintain operational water quality within the tower) would be routed to the Peace River. Given the site location, this would require construction of a 30 cm (12 inch) diameter pipe approximately 16 km (10 miles) to the Peace River.

COOLING TOWER WITH BLOWDOWN DISCHARGE TO PERCOLATION POND

This cooling tower alternative would route tower blowdown to a percolation pond. Based on a preliminary, conceptual design evaluation of the percolation pond, a 101 to 162 ha (250 to 400 acre) pond would be required to percolate the tower blowdown, depending on the pond depth and the toe drain/seepage control system used. This percolation pond would discharge tower blowdown to the surficial aquifer. During extremely wet periods, a surface discharge from the pond would have to be provided.

COOLING TOWER WITH BLOWDOWN DISCHARGE TO DEEP INJECTION WELL

This cooling tower alternative would route tower blowdown to a deep injection well. This well would be at least 61 cm (24 inches) in diameter

and at least 914 to 1,230 m (3,000 to 4,000 ft) deep. Difficulties could be encountered in delineating deep strata that are capable of receiving adequate quantities of tower blowdown water.

COOLING TOWER WITH BLOWDOWN DISCHARGE TO PAYNE CREEK

The cooling tower alternative would route tower blowdown to Payne Creek. Given the relatively small watershed upstream of the plant site [approximately 65 km² (25 square miles)], Payne Creek is subject to regular and extended periods of very low flow. During these periods, there would be virtually no stream dilution of the continuous tower blowdown discharge. In the absence of sufficient mixing and dilution, water quality criteria could be exceeded due to tower discharges. Given these regular low flow occurrences in Payne Creek at the plant site location, this design alternative was not considered feasible and was given no additional consideration or evaluation.

8.2.1.3 Alternative Systems Environmental Evaluation

The environmental impacts of the proposed cooling water reservoir alternative have been previously discussed in Chapters 4 and 5. Based on the information presented therein, the proposed cooling water reservoir system has acceptable environmental impacts.

In comparison, the cooling tower alternatives will have greater environmental impacts in the areas of groundwater withdrawal impacts and blowdown disposal alternatives.

Based on the water balance previously presented in Figure 3.5-3, the projected average annual cooling water reservoir makeup requirement is estimated to be 1.76 mgd. The reservoir serves as an effective water management facility to minimize the total withdrawal demand placed on the Lower Floridan Aquifer groundwater system when compared to the other alternatives. The cooling reservoir alternative will have no off-site surface discharge except during extreme meteorological conditions such as

major frontal systems and hurricanes. The cooling water reservoir can be constructed and operated with minimum adverse environmental impacts.

The required cooling tower makeup is estimated to be 2.40 mgd for the same station size and load factor assumed for the reservoir alternative. Therefore, the cooling tower alternatives will require 35% more groundwater compared with the reservoir alternative. In addition, under projected average annual load conditions, cooling tower blowdown discharge is estimated to be 0.4 mgd (0.6 cfs); under maximum annual load conditions, cooling tower blowdown discharge is estimated to be 1.35 mgd (2.09 cfs).

The direct discharge of the cooling tower blowdown to the Peace River would necessitate the issuance of a mixing zone. The Peace River will be subject to period low flow conditions; for example, the 7-day, 10-year low flow for the Peace River near Zolfo Springs is estimated to be 54 cfs. Given a maximum cooling tower blowdown discharge rate of 2.09 cfs, tower blowdown discharge would be approximately 3.9% of the 7-day, 10-year low flow. Therefore, the Peace River will have sufficient flow to allow adequate mixing and dilution of the tower blowdown discharge to meet Class III water quality criteria within the maximum mixing zone length of 800 meters. Given the flow, water quality and biological conditions of the Peace River, discharge of cooling tower blowdown to the Peace River would not have unacceptable adverse environmental impacts.

Discharge of the blowdown to a percolation reservoir may result in unacceptable impacts on surficial aquifer water quality. Discharge of the blowdown to deep injection well may be very difficult or infeasible at the project site due to low transmissivity rock formations at depths greater than 3,000 ft. Either type of groundwater discharge (i.e., to the surficial to deep formations) would require extensive studies to demonstrate engineering and environmental feasibility.

8.2.1.4 Preferred Heat Rejection System Alternative

Based on the information presented above, the preferred heat dissipation system alternative is a closed cycle cooling system that utilizes a cooling water reservoir constructed on reclaimed phosphate mined lands. This is the preferred alternative because the lack of any significant adverse environmental impacts associated with the proposed reservoir system; the greater potential for adverse water quality and quantity impacts associated with the cooling tower alternatives; and the decrease groundwater demand for the cooling reservoir alternative. Therefore, all planning and analysis presented in this SCA/EA have been based on the preferred alternative of a cooling water reservoir constructed on reclaimed phosphate mined lands.

Given the various environmental and engineering issues discussed above, the secondary alternative would be cooling towers with blowdown discharge to the Peace River. Environmental data collection studies of the Peace River including stream flow, water quality and aquatic ecology studies, and preliminary engineering evaluations, have been conducted in support of the cooling tower blowdown discharge alternative to the Peace River (see SECI Combined Cycle Environmental Licensing Plan of Study). Peace River flow conditions would be sufficient to allow adequate mixing and dilution within the maximum mixing zone length of 800 meters. This secondary alternative could be designed, constructed and operated without adverse environmental impacts.

8.2.2 Biological Fouling Control Alternatives

Biocide treatment of the recirculation cooling water is necessary to control biological fouling of the condensers, the associated piping, and related structures. Biocide alternatives include chlorination, bromochlorination, chlorine dioxide and ozone.

Chlorinization is the most widely used, accepted and cheapest biocide treatment currently used in the power industry. Alternative biocides (e.g., bromochlorination, chlorine dioxide and ozone) involve high

operating costs and, therefore, have not gained wide acceptance for treatment of large volumes of recirculating cooling water.

Given the large volume of the reservoir, any residual chlorine in the circulating water discharge will be "consumed" within the reservoir soon after discharge into the reservoir. By the time reservoir water reaches and seeps through the reservoir sides, there will be virtually no remaining residual chlorine. Given this factor and the infrequency of any surface discharge from the reservoir (during extreme meteorological events only), there will be no off-site impact due to chlorination. Therefore, alternative biocides do not provide any environmental advantage in this circumstance.

Chlorine is the preferred biocide for biological fouling control in the recirculation cooling water system. Chlorine use will be minimized by practicing shock chlorination, in which chlorine is periodically fed to the condenser system. The procedures for use of chlorine are discussed in Chapter 3.

8.2.3 Water Supply/Intake Alternatives

The proposed water supply for cooling water reservoir makeup and plant/potable use is groundwater from Lower Floridan Aquifer wells. Alternative water supplies potentially include withdrawals from Payne Creek or Peace River.

Both surface water supplies are subject to periodic low flow conditions. Payne Creek, near the plant site, will be subject to relatively frequent zero or near-zero flow. Therefore, Payne Creek is not an acceptable alternative.

As a continuous water supply, the Peace River will be subject to periodic low flow conditions; the 7-day, 10-year low flow for the Peace River near Zolfo Springs is estimated to be 54 cfs. Based on the water balance previously presented in Figure 3.5-1, the maximum daily plant makeup

requirement is estimated to be 7.7 mgd (or 11.9 cfs). Thus, satisfaction of this demand by withdrawal from the Peace River would require the withdrawal of approximately 22% of the 7-day, 10-year low flow. Withdrawal of the cooling reservoir makeup and plant waters has the potential for adverse flow or biological impacts during these low-flow conditions. Thus, withdrawal of water requirements from Peace River is not considered an acceptable alternative.

8.2.4 Chemical Waste and Wastewater Treatment Alternatives

Each waste stream was evaluated to determine the type of treatment needed and the waste stream's suitability for reuse. The major wastewater streams and the treatment, disposal or reuse alternatives are discussed individually below.

8.2.4.1 Steam Cycle

The proposed method of boiler blowdown disposal is discharge to the cooling reservoir and reuse in the cooling system. Alternatives for boiler blowdown wastewater disposal include discharge to a percolation pond or Payne Creek. However, since boiler blowdown will have a relatively low dissolved solids content, it can be reused in the cooling water system with no adverse engineering or environmental impacts. This reuse will both reduce or minimize total potential plant discharge and will reduce plant makeup requirements. Therefore, the preferred alternative is discharge to the cooling reservoir for reuse.

8.2.4.2 Makeup Water Demineralization

After pH adjustment, demineralized regenerant wastewater will be routed to the cooling water reservoir. Again, alternative disposal scenarios (i.e., discharge to Payne Creek) may have potential environmental impacts and offer no significant engineering or economic advantages. Therefore, the preferred alternative is discharge to the cooling reservoir for reuse.

8.2.4.3 Plant Drains

Plant drains are intermittent and may have a high oil and grease or dissolved solids content. However, water from the drain system will be routed through an oil-water separator and it is anticipated that plant drain wastewaters will then be of acceptable quality for reuse; therefore, these wastewaters will be routed to the cooling reservoir. Again, alternative disposal scenarios (i.e., discharge to Payne Creek) have potential for environmental impacts and offer no significant engineering or economic advantages. Therefore, the preferred alternative is to discharge to the cooling reservoir for reuse.

8.2.5 Plant and Sanitary Wastewater Discharge Alternatives

Plant and sanitary wastewater will be discharged to the cooling reservoir for reuse.

Disposal alternatives include discharge to Payne Creek, discharge to the Peace River, discharge to a deep injection well, or discharge to a percolation pond. All alternatives involve significant capital and operational expenses and may have significant environmental impacts. Given the lack of any significant environmental impacts associated with wastewater discharge to the proposed reservoir, the preferred alternative is discharge of plant and treated sanitary wastes to the cooling reservoir for reuse.

8.2.6 Solid Waste Disposal

Solid wastes will consist of general trash, sanitary waste treatment sludge, pretreatment and demineralizer regeneration sludges. Quantities will be small and could be disposed off site in an approved landfill. No solid combustion waste will be produced by the generation of power at the Hardee Power Station. Combustible construction wastes (e.g., paper, wood, etc.) will be burned on-site in accordance with applicable regulations.

8.2.7 Multiple Uses of the Plant

The Hardee Power Station will utilize reclaimed phosphate mining land for the cooling system. This multiple use will have the advantage of reducing overall environmental impacts that would otherwise have occurred due to reservoir construction (see Chapters 7 and 10).

8.3 **ALTERNATIVE FUELS**

The primary fuel for the combustion turbines will be natural gas with No. 2 fuel oil being used as a secondary fuel when natural gas is unavailable. If these fuels become either uneconomical or unavailable, alternative fuels such as butane or synthetic gas may serve as fuel sources. The Hardee Power Station will also have the ability to utilize medium-Btu gas derived from advanced coal gasification technologies. The plant layout has been designed to allow the potential construction of a coal gasification plant. If fuel supplies or prices made this type of facility economical a gasification plant would be separately permitted and constructed as an associated facility of the Hardee Power Station. Recent design enhancements of coal gasification processes allow the environmentally acceptable use of medium-Btu synthetic gas in combustion turbines.

This section briefly describes gasification technologies available to the project and potential environmental impacts of these technologies. Where possible, the environmental impacts were performed using quantitative assessment techniques; however, qualitative techniques were used as necessary. In addition, a discussion of butane as a potential alternative fuel source has been provided.

8.3.1 Gasification Overview

8.3.1.1 General Statement

Several gasification technologies exist at various levels of development and demonstration to convert coal to medium-Btu synthetic gas (syngas). Three basic designs exist; fixed-bed, fluidized-bed, and entrained-flow gasifiers. Coal gasification is, basically, a process of combining the carbon in coal with steam and oxygen to produce a product gas composed primarily of

hydrogen and carbon monoxide. Although the gasification process affects the overall plant design, the gasification step is only one relatively small part of the overall plant.

The gasifier most widely used throughout the world is a fixed-bed design. Most recent research and development of gasifiers for electrical power generation, however, has focused on the entrained-flow designs (i.e., those by Texaco, Shell, Dow Chemical). The following section briefly describes features, advantages, and disadvantages of each of the three basic designs (fixed-bed, fluidized-bed, entrained-flow). Following the description of the basic designs, the processes of coal gasification are defined and potential impacts are discussed.

8.3.1.2 Types of Gasifiers

FIXED-BED GASIFIERS

Fixed-bed pressure gasification is typically represented by Lurgi's gasifier, first successfully operated over 40 years ago and widely proven commercially. Coal is fed into the top of the gasifier while air or oxygen plus steam are added from the bottom. Fixed-bed gasifiers have several advantages:

- o High thermal efficiency by counter current mode of operation;
- o High direct methane yield for high-Btu syngas production; and
- o Low oxygen requirement.

Disadvantages of fixed-bed gasifiers include:

- o Strict feed coal requirements in size and caking tendency;
- o Excessive steam requirement for control of ash clinkering;
- o Extensive wastewater treatment required by formation of coal tar and other hydrocarbons; and
- o Relatively low throughput per gasifier.

FLUIDIZED-BED GASIFIERS

In a fluidized-bed gasifier, a stationary bed of coal is suspended by oxygen and steam moving through the bed at a rate sufficient to lift the coal particles. This fluidizing action allows the coal, oxidant, and combustion gases to mix thoroughly. Temperature control is important in a fluidized-bed gasifier to prevent bed slumping due to ash fusion. This type of gasifier is best suited to highly reactive coals (lignites or brown coals).

Advantages of fluidized-bed gasification are:

- o Wide range of coal quality and fines can be used;
- o Throughput is high;
- o Operation is flexible;
- o Reliability and safety is good because of simplicity and high solid inventory;
- o Mixing of bed material alleviates local overheating;
- o Gasifier configuration and operation is simple;
- o Introduction and withdrawal of solids from gasifier is easy; and
- o Raw gas contains no tars.

Disadvantages of fluidized-bed gasification are:

- o High sensible heat loss due to high exit gas temperature;
- o High fines carry over;
- o High carbon content in ash;
- o Large volume of fluidizing media is required; and
- o Caking coal must be pretreated.

ENTRAINED-FLOW GASIFIERS

Coal particles fed into an entrained-flow gasifier are suspended or entrained by the reacting gases. Partial oxidation occurs faster and at higher temperatures and pressures than in the other two major types of gasifiers. Combustion efficiency in terms of carbon conversion can be substantially increased when pure oxygen is used as the oxidant instead of

air. The high operating temperature in an entrained-flow gasifier yields good carbon conversion. As a result, heavy tars, oils, and phenols are not produced, reducing concern for by-product storage and wastewater treatment. The ash material melts to form a glass-like slag which is collected and removed from the bottom of the gasifier. Gasification is followed by heat recovery to increase efficiency of the process.

Raw syngas exits the gasifier and is cooled and water-cleaned of particulate matter and condensate. The particulate-laden water is sent to a clarifier for solids removal. The separated clarifier solids are sent to disposal along with the slag, while the clarifier effluent is generally treated and recycled to the gas cleaning system. Following cooling, the gas passes to a desulfurization unit where gaseous sulfur compounds, primarily hydrogen sulfide, are absorbed from the syngas by a solvent. The sulfur compounds pass to a Claus unit, which converts them to elemental sulfur to be stored or sold as a by-product. Tail gas from the Claus unit is incinerated. The clean syngas is transferred to gas turbine combustors.

Entrained flow coal gasifiers have been demonstrated to be the most technologically advanced method of coal gasification applicable to the power industry for electrical generation. This type of gasifier design has also been proven to be the most environmentally sound with the least amount of by-product generation during pilot and developmental projects.

8.3.1.3 Process Description--Entrained Flow

This subsection discusses processes associated with coal gasification which are applicable to entrained flow coal gasifiers. Figure 8.3.1-1 presents a simplified block diagram of a typical entrained flow coal gasification plant coupled with a combined cycle power plant.

Coal is delivered to the gasifier by the coal-water slurry or as dry pulverized coal through a pneumatic feed system. The gasifier design and operation varies between the Texaco, Shell, and Dow Chemical Company processes. Basically, the gasifier is a relatively small vessel with

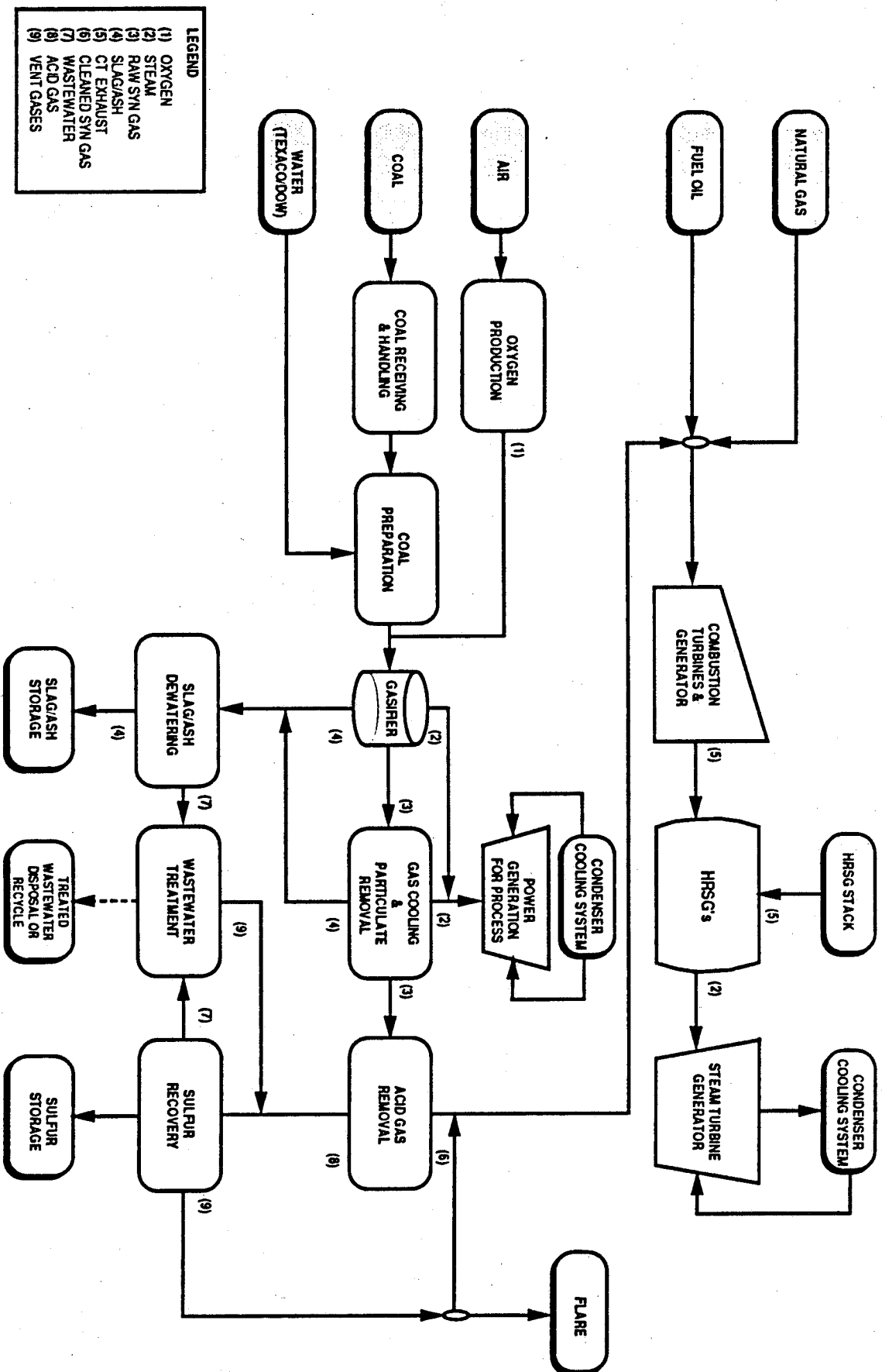


Figure 8.3.1-1 BLOCK DIAGRAM OF ENTRAINED FLOW COAL GASIFICATION PLANT AND COMBINED CYCLE POWER PLANT

Hardee
Power Station

combustion burners where coal, oxygen, and steam are injected in controlled proportions. Partial combustion with oxygen occurs at pressures of 35 to 42 kg/cm² (500 to 600 pounds per square inch) gauge and high temperatures [1,260 to 1,540°C (2,300 to 2,800°F)] to produce a medium-Btu raw syngas consisting mainly of CO, H₂, CH₄, and some CO₂. The generalized formula for coal gasification is as follows:



Oxygen must be supplied to the gasifier in relatively pure form. For purposes of reliable purity of product, as well as economics, a cryogenic air separation plant is utilized for oxygen production. This facility would be capable of producing 99% pure oxygen, which would allow the oxygen plant to produce argon as a marketable by-product.

Raw syngas produced during coal gasification is cooled to facilitate gas cleaning prior to combustion and to recover heat that can be used to generate steam for the gasification process. Several methods and devices are available to recover heat and partially cool raw syngas, including Quench Syngas Coolers, Radiant Syngas Coolers, Convection Syngas Coolers. The actual mode of cooling is determined by the type of downstream processing and by the end use of the synthetic gas. The quench mode is usually selected for the production of hydrogen, where the carbon monoxide in the raw syngas is reacted with steam to produce additional hydrogen. The radiant or convective cooler mode of operation is selected for applications which do not require adjustment of hydrogen to carbon monoxide ratios in the gas.

The effluent water from the gasification process consists of purge streams removed from the process to limit the buildup of dissolved minerals and gases (particularly ammonia) in the gasifier circulating water system. Major sources of wastewater from coal gasification include the gray waste stream and ammonia-laden condensate produced during hot syngas cooling. However, the cooling system effluent can be recycled back upstream to the

gasifier. Minor sources of process wastewater are the acid-gas removal system and the Shell-Claus Offgas Treatment (SCOT) system.

Gaseous compounds present as various acid or sour gases (H_2S , COS, CO_2 , HCN) are removed from the raw syngas prior to combustion using readily available commercial processes. These processes rely on chemical or physical absorption to remove these gases from the raw syngas. The acid gases are directed to a sulfur recovery unit, which converts SO_2 and COS to liquid elemental sulfur that can be stored or sold as a by-product. Remaining unconverted sulfur compounds in the tail gas from the sulfur recovery unit are further cleaned in a tail gas treatment system. Vent gas from the SCOT unit can be routed to the combustion turbine or to an incinerator and burned. Overall sulfur removal rates from raw syngas by the desulfurization process generally range from 95 to 99%.

8.3.2 Design and Environmental Characteristics

8.3.2.1 Design Basis

Several coal gasification technologies could be utilized for the project. As discussed previously, recent research and development, as well as demonstration projects, for electric power production using combustion turbines has focused on entrained flow designs, which are offered by Texaco, Shell and Dow Chemical. Such designs provide quality combustion turbine fuel, flexibility in using a wide variety of coals, high thermal efficiency, and acceptable environmental discharge. For the purpose of this characterization, it was assumed that an entrained flow gasification process would be constructed.

Preliminary design and environmental parameters are presented in Table 8.3.2-1 and are based on data published by the Electric Power Research Institute (EPRI) and the Cool Water Coal Gasification Program (CWCGP). The data sources are the most currently available and represent the approximate characteristics of a gasification plant that would be constructed. Details of actual design analysis will be presented at the time of submission of the permit application to construct and operate the coal gasification facility.

Table 8.3.2-1. Typical Design Data for Gasification Plant Potentially Constructed at the Hardee Power Station (Page 1 of 2)

Design Category	Design Data	Basis for Estimate
UNIT SIZE & FUEL USE		
Net Generation (Kw)	594,340	See Note 1
Heat Input (mm Btu/hr)	6,300	Reference 1
Coal Utilization (tons/day)	6,873	See Note 2
Coal Delivery (rail cars/week)	458	See Note 3
COAL CHARACTERISTICS		
Heat Content HHV (Btu/lb)	11,000.00	Reference 1
Ash Content (%)	10.00	Reference 1
Sulfur Content (%)	4.50	Reference 1
PERFORMANCE		
Net Heat Rate (Btu/Kw)	10,600.00	Reference 1
AIR EMISSIONS		
1. FLARE STACK		
NOx (lb/hr)	0.15	Reference 2
CO (lb/hr)	1.39	Reference 2
SO2 (lb/hr)	1.39	Reference 2
H2SO4 Mist (lb/hr)	0.04	Reference 2
Hg (lb/hr)	4.65E-07	Reference 2
Be (lb/hr)	9.29E-07	Reference 2
F (lb/hr)	1.55E-04	Reference 2
Pb (lb/hr)	6.20E-06	Reference 2
PM (lb/hr)	1.08	Reference 2
2. Process Fugitive Emissions		
CO (lb/day)	28.81	References 3 and 4
H2S (lb/day)	10.16	References 3 and 4
COS (lb/day)	0.26	References 3 and 4
NH3 (lb/day)	11.17	References 3 and 4
HCN (lb/day)	1.67E-03	References 3 and 4
HC (lb/day)	1.67E-04	References 3 and 4
3. Fugitive Dust		
Coal Handling - & Storage - TSP (lb/day)	274	See Note 4
Coal Handling Storage - PM10 (lb/day)	205	See Note 4
Slag/Ash Handling & Storage - TSP (lb/day)	178	See Note 4
Slag/Ash Handling & Storage - PM10 (lb/day)	153	See Note 4

Table 8.3.2-1. Typical Design Data for Gasification Plant Potentially Constructed at the Hardee Power Station (Page 2 of 2)

Design Category	Design Data	Basis for Estimate
WATER MAKEUP REQUIREMENTS		
Cooling System (gal/day)	715,700	See Note 5
Process (gal/min)	2,004	References 3 and 4
WASTEWATER DISCHARGE		
Treated Effluent (gal/min)	389	Reference 2
Demineralizer Regenerant (gal/min)	48	Reference 2
Misc. (gal/min)	15	Reference 2
BY-PRODUCTS		
Slag/Ash (tons/day)	1,375	See Note 6
Sulfur (tons/day)	294	See Note 7
Water Treatment Sludges (tons/day)	2	Reference 2

References: 1. ESE, 1988
 2. EPRI, 1989
 3. EPRI, 1984
 4. Fluor, 1986

Notes:

1. Calculated from heat rate and heat input.
2. Calculated based on heat input and coal heat content.
3. Calculated based on 105 tons/rail car.
4. Calculated from maximum coal utilization and site layout.
5. Calculated based on gasification plant size and cooling reservoir use.
6. Calculated based on ash content and 50% moisture in slag/ash.
7. Calculated based on 95% sulfur removal.

Figure 8.3.2-1 presents a conceptual layout of the coal gasification facility at the site.

8.3.2.2 Air Emissions

Sources of air emissions for a coal gasification plant would include tail gas flare or incinerator, process fugitive emissions and fugitive dust emissions. The emission estimates from these sources have been quantified in Table 8.3.2-1.

The tail gas flare would be used to incinerate vent gas released during slag/ash removal and gas leaks collected across relief valve seats. Vent gas from sulfur recovery could be routed to the combustion turbines and subsequently oxidized. The flare would also be used during start-up, shutdown, emergency relief, and upset conditions. During start-up and shutdown, experience at CWCGP indicate that flare operation is intermittent and of short duration, i.e., 1 to 4 hours about 8 to 12 times a month. If a process upset or emergency condition arises the flare would incinerate any gas remaining in the process trains; meanwhile, the gasifier would be shut down under such conditions.

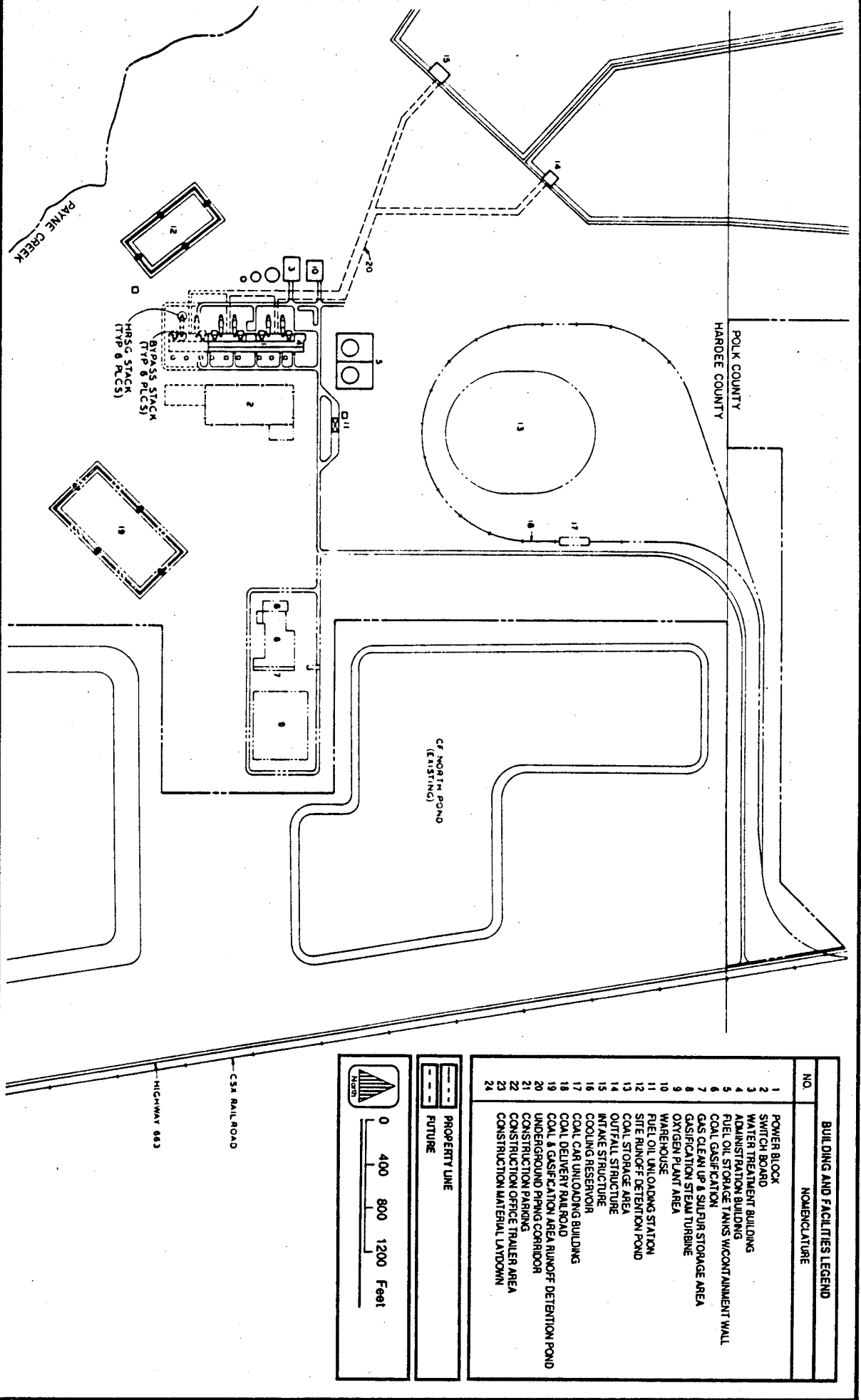
Process fugitive emissions would result from small albeit numerous leaks from equipment, i.e., valves, pumps, compressors, and connections. Fugitive particulate emissions would result from coal unloading, storage and preparation, and from slag/ash handling and storage.

Air emissions would continue to be emitted from the combustion turbines when firing clean synthetic gas. SO_2 emissions would be about the same or less than when firing No. 2 fuel oil. The sulfur removal efficiencies of the unit process typically range from 95 to 98%. Other emissions would be typical of natural gas firing.

8.3.2.3 Wastewater

The wastewater streams of a gasification plant primarily consist of grey water from slag/ash quenching and particulate removal, and condensates from

Figure 8.3.2-1 CONCEPTUAL LAYOUT OF A COAL GASIFICATION FACILITY AT THE SITE



Hardee
Power Station

the gasification process, raw gas cleaning process and sulfur recovery processes. Typical contaminants reported in wastewaters include ammonia, sulfide, chloride, fluoride, formate (high oxygen demand), cyanide and trace metals. A summary of the raw wastewater characteristics observed at CWCGP are presented in Table 8.3.2-2.

8.3.2.4 By-products

The physical and chemical characteristics of the gasifier slag will be a function of the type of coal selected and the gasification process. Insight into the physical and chemical characteristics of these by-products can be acquired from the results obtained CWCGP existing data.

The physical characteristics of the slag suggest that the slag can be used for various road and building applications (EPRI, 1986). EPRI is currently looking at artificial reefs as suitable disposal sites for slag materials. The general chemical characteristics of CWCGP slag from trace element and leachate analyses show that the slag and the leachate are non-hazardous.

The Hardee Power Station would require a by-product storage facility of approximately 60 ha (150 acres) based on a capacity factor of 72% over 30 years. Ideally, the applicant would attempt to sell the by-product. By-product material would be placed in a storage area using the best management practices for utility solid by-products storage sites.

8.3.3 Potential Environmental Impacts

The potential environmental impacts associated with a gasification plant are related to the air emissions, cooling water requirements, wastewater generated and by-products storage. The subsections that follow discuss the potential impacts of these factors, as well as control technologies that would likely be installed. These subsections present potential impacts in general terms since a specific coal and gasification process has not been made.

Table 8.3.2-2. Summary of Raw Wastewater Characteristics from CWCGP

Chemical Parameter	Concentration by Wastewater Stream (mg/L)			
	Grey Water	Gasification Condensate	SCOT Condensate	Selexol Condensate
Alkalinity	990	39,000	9,545	19,900
Ammonia	721	13,630	3,325	7,815
COF	677	160	852	17,200
Cyanide	6	36	25	302
Sulfide	ND	170	644	3,254
Fluoride	9	4	3	24
Phenolics	<5	<5	<5	<5
TOC	448	447	107	2,809
Inorganic Carbon	15	6,313	1,919	3,186
Chloride	135	2	2	6
TDS	1,500	68	225	71
Calcium	150	<0.5	<0.5	<0.5
Sodium	200	7	13	1
Boron	58	<1.0	<1.0	<1.0
Arsenic	0.026	<0.02	<0.02	<0.02
Barium	0.63	<0.001	0.056	<0.02
Cadmium	<0.001	<0.001	<0.001	<0.001
Chromium	<0.005	0.038	<0.005	<0.005
Lead	0.0066	<0.005	<0.005	0.0059
Mercury	<0.001	0.001	0.008	0.008
Selenium	0.15	0.053	<0.008	0.13
Silver	<0.05	<0.05	<0.05	<0.05

Source: Zeien, et al., 1986

8.3.3.1 Air Emissions Impacts

The potential air quality impacts from a coal gasification plant are primarily associated with the tail gas flare. An intermittent source of air emissions would result from start-up and emergency conditions where raw synthetic gas would be incinerated in a flare. Air pollutant emissions from the combined cycle plant using medium Btu coal gas would be similar to using distillate fuel oil; therefore, these impacts were previously addressed in Section 5.6.

The maximum potential impacts are predicted to occur during start-up and emergency conditions. As previously discussed in Subsection 8.3.2.2 these conditions are infrequent. Availability data for the acid gas removal and sulfur recovery processes were stated by EPRI (1989) to be 99.17% and 99.13%, respectively. Thus, flaring of raw synthetic gas or acid gas having high sulfur contents would be unlikely.

The maximum predicted impacts for those sources which operate continuously are expected to be less than the PSD increments and AAQS. Indeed, the majority of the impacts are less than the promulgated significant impact levels.

8.3.3.2 Cooling Reservoir Performance with Gasifier Thermal Loading

To evaluate and predict cooling reservoir performance (e.g., temperature and evaporation) under the increased thermal loading associated with gasifier operation, a revised reservoir thermal analysis was performed using the monthly energy budget/equilibrium temperature model, previously described in Section 5.1.1.

For this analysis, the previous modeling parameters and data were used, except for the plant and gasifier thermal load to the reservoir (see Table 8.3.3-1). Based on a review of available process information, the increase in total required heat rejection to the reservoir was estimated to be approximately 37%. Thus, the total condenser circulating cooling water flow was increased by 37% to accomplish the required heat rejection, based

Table 8.3.3-1. Estimation of Evaporation from the Proposed SCL Cooling Reservoir based on Maximum Annual Load Factor and Coal Gasifier Cooling Requirements (Page 1 of 2).

Item	Units	Jan	Feb	Mar	Apr	May	Jun	Jul
Average Air Temperature	Degrees F	61.8	63.1	67.1	72.1	76.6	80.2	81.3
Average Dew Point Temperature	Degrees F	53	54	57	60	67	72	73
Relative Humidity	%	73	72	70	66	72	76	76
Daily Average Wind Speed	mph	7	8	9	8	7	6	6
Wind Speed Function	BTU/ft ² /day	104.3	114.8	126.7	114.8	104.3	95.2	95.2
Net Short Wave Radiation	BTU/ft ² /day	1,210	1,447	1,754	1,994	2,205	2,124	1,976
Cloud Cover Fraction	%	53	47	48	47	46	58	63
Net Incoming Radiation	BTU/ft ² /day	3,669	3,911	4,335	4,709	5,039	5,133	5,048
Water Vapor Pressure	mm Hg	10.2	10.6	11.8	13.2	16.8	19.9	20.6
Equilibrium Temperature	degrees F	64.2	65.7	68.5	72.2	77.8	87.1	89.0
Saturated Vapor Pressure	mm Hg	15.2	16.1	17.7	20.1	24.2	32.6	34.7
Evaporation at Equilibrium Temperature	Gal per day	1,482,870	1,795,370	2,125,580	2,252,370	2,194,650	3,437,870	3,816,850
Temperature	Inches/month	2.9	3.5	4.2	4.4	4.3	6.8	7.5
Plant Operational Load Factor	%	100	100	100	100	100	100	100
Minimum Operational Res. Temperature	degrees F	73.7	74.1	75.5	79.4	84.8	93.4	95.0
Saturated Vapor Pressure	mm Hg	24.8	25.3	26.8	30.3	36.1	47.1	49.5
Evaporation at Heated Temperature	Gal per day	4,329,990	4,798,530	5,404,020	5,581,970	5,723,880	7,363,010	7,823,190
	Inches/month	8.5	9.4	10.6	11.0	11.3	14.5	15.4

Note: Maximum delta T across condenser = 20 degrees F
Maximum Circulating Water Pump Rate = 267,150 gallons/minute
Cooling Reservoir Size = 570 acres

Table 8.3.3-1. Estimation of Evaporation from the Proposed SCL Cooling Reservoir based on Maximum Annual Load Factor and Coal Gasifier Cooling Requirements (Page 2 of 2).

Item	Units	Aug	Sep	Oct	Nov	Dec	Summary
Average Air Temperature	Degrees F	81.6	80.2	74.7	67.4	62.7	--
Average Dew Point Temperature	Degrees F	73	72	66	58	54	--
Relative Humidity	%	75	76	74	72	73	--
Daily Average Wind Speed	mph	6	6	7	7	8	--
Wind Speed Function		95.2	95.2	104.3	104.3	114.8	--
Net Short Wave Radiation	BTU/ft ² /day	1,828	1,672	1,480	1,317	1,110	--
Cloud Cover Fraction	%	61	60	47	46	52	--
Net Incoming Radiation	BTU/ft ² /day	4,896	4,694	4,267	3,896	3,589	--
Water Vapor Pressure	mm Hg	20.6	19.9	16.2	12.3	10.6	--
Equilibrium Temperature	degrees F	83.8	80.0	72.6	67.6	63.9	--
Saturated Vapor Pressure	mm Hg	29.4	26	20.3	17.1	15.1	--
Evaporation at Equilibrium Temperature	Gal per day	2,382,150	1,651,260	1,215,950	1,423,560	1,468,940	2,103,950
	Inches/month	4.7	3.2	2.4	2.8	2.9	49.6
Plant Operational Load Factor	%	100	100	100	100	100	100
Average Operational Pond Temperature	degrees F	96.1	92.8	85.8	81.5	77.7	--
Minimum Operational Pond Temperature	degrees F	90.6	87.4	80.5	76.5	72.6	--
Saturated Vapor Pressure	mm Hg	43.2	39	31.3	27.3	24.1	--
Evaporation at Heated Temperature	Gal per day	6,117,790	5,170,350	4,478,270	4,448,620	4,406,820	5,470,540
	Inches/month	12.0	10.2	8.8	8.7	8.7	129.0
							Gallons per day
							Inches per year

Note: Maximum delta T across condenser = 20 degrees F

Maximum Circulating Water Pump Rate = 267,150 gallons/minute

Cooling Reservoir Size = 570 acres

on an allowable water temperature increase of 11°C (20°F) across the plant and gasifier condensers.

During maximum operating conditions the maximum predicted average monthly discharge condition is 35°C (95.0°F) during July. Under similar maximum load conditions without the gasifier, the predicted July discharge condition is 33.7°C (92.6°F). Under these conditions daily variations of up to 1°C (2°F) can be expected. Thus, at 100% load during July, the maximum daily reservoir discharge temperature could be approximately 36.1°C (97°F).

Unless the plant and/or gasifier designs were modified to incorporate this higher temperature, some decrease in plant efficiency could be encountered during these extreme conditions. This potential decrease in plant efficiency could be avoided or mitigated by the incorporation of helper cooling towers to reduce the circulating water temperature prior to discharge to the reservoir.

Under this 100% load gasifier scenario, total annual evaporation from the pond is estimated to average 5.5 mgd. Under similar operating/load conditions without the gasifier, total annual evaporation from the reservoir is estimated to average 4.8 mgd. Thus, with the gasifier alternative, total evaporative losses and the associated reservoir makeup requirements will increase by 0.7 mgd or approximately 15%. This increased demand would have to be supplied by additional withdrawals from the Lower Floridan Aquifer wells. Any adverse groundwater impact due to the increased water withdrawal and the potential increase in the size of the cone of the depression surrounding the well field can be avoided or mitigated by increasing the number of wells or by modifying the well field geometry.

8.3.3.3 Wastewater

There would be three major sources of process wastewater from the gasification process; gray water blow down, stripped condensate, and slag/ash sump water. The combined flow from these sources would be a maximum of 390 gpm or 0.56 mgd. The quality of raw wastewater is not known.

but can be expected to be a function of both the coal source and the gasification process used.

Treatment of these wastewaters would likely be necessary. The class of parameters requiring treatment include oxygen demanding compounds (primarily formate), ammonia, inorganic suspended solids (with occasionally high concentrations of various metals), and the dissolved fraction of several metals. Examples of the alternative treatment systems which may be employed to treat the above constituents are discussed below.

Oxygen demanding compounds can be removed from wastewater streams either by biological or chemical processes. Given the probable nature of the gasifier wastewater, it is likely that a biological treatment unit (and, specifically an activated sludge unit) would be used at the Hardee Power Station site. The activated sludge process will create an excess biological mass (i.e., sludge) which must be treated prior to disposal. Typical sludge treatment includes anaerobic digestion (for the removal of organic compounds) followed by dewatering and drying. The digested sludge will be disposed of either by land application or land filling (depending on sludge quality).

Removal of ammonia from wastewater streams is usually accomplished by air stripping. Removal of inorganic suspended solids is typically achieved through a physico-chemical treatment process (e.g., coagulation, flocculation and sedimentation). Removal of dissolved metals is accomplished using a process similar to the physico-chemical treatment used for inorganic suspended solids. The difference is that for dissolved metals, the dissolved fraction must be precipitated after which it can be coagulated and settled.

Treatment of the wastewater generated would likely include a series of several treatment processes. The final sequencing of the treatment units would be dependent on the waste stream characteristics specific to the selected gasification process and coal characteristics. Such characteristics include oxygen demand, pH, and organic content of the

settleable solids. Given the high degree of treatment, the quality of the treated effluent is expected to meet state and federal water quality standards and could be recycled in the process.

8.3.3.4 By-Product Impacts

By-products produced by the coal gasification plant would include slag, ash, and sulfur. Sulfur will be produced in liquid form by the Claus sulfur removal system. Sulfur will be sold as a marketable by-product; however, it will need to be temporarily stored prior to transport from the site. Liquid sulfur will be stored in concrete-lined retention basins which will be enclosed with no potential for exposure to the environment.

Slag and ash are marketable by-products for use as road building material and for other purposes. However, it was assumed that provisions would be required to store all slag and ash generated by the gasification of coal at or near the site. The by-product storage facility will require a land area of approximately 61 ha (150 acres) over a lifetime expectancy of 30 years for the gasification facility. Roughly 1,248,000 kg (1,375 tons) per day of slag and ash would be generated, which translates to a maximum of 957 m³ (33,782 ft³) per day and an average of 689 m³ (24,323 ft³) per day. These calculations are based on anticipated plant syngas requirements and physical characteristics for maximum dry density and interconnected porosity of slag material.

USEPA (USEPA, 1986) data have demonstrated that slag by-products from entrained-flow coal gasifiers are non-hazardous based on RCRA criteria. In addition, results of leachate testing performed at CWCGP indicate that the leachate is also non-hazardous based on RCRA criteria.

8.3.4 Assessment of Technology

Currently available gasification plant designs are technically feasible as an alternative fuel source for combustion turbines and can be constructed and operated at the Hardee Power Station site in an environmental suitable manner. As gasification designs improve in the future, this technology may

become increasingly viable from economic, operational and environmental stand points. Any site specific environmental constraints could be overcome by proper design.

REFERENCES - Chapter 8

- Electric Power Research Institute (EPRI). 1984. Cost and Performance for Commercial Applications of Texaco-Based Gasification-Combined-Cycle Plants. Palo Alto, California.
- EPRI. 1986. Preliminary Environmental Monitoring Results for the Cool Water Gasification Program. Presented at EPRI's 6th Annual Conference on Coal Gasification at Palo Alto, California.
- EPRI. 1989. Baltimore Gas and Electric Company's Study of a Shell-Based GCC Power Plant. Palo Alto, California.
- Environmental Science and Engineering, Inc. (ESE). 1988. Combined Cycle Plant Site Selection Study. Gainesville, Florida.
- Fluor Technology, Inc. (Fluor). 1986. Texaco Phasing Study Final Report Station H Dickerson Site. Irvine, California.
- U.S. Environmental Protection Agency (USEPA). 1986. Coal Gasification Environmental Data Summary: Solid Wastes and By-Product Tars. Air and Energy Engineering Research Laboratory, Research Triangle Park, NC. EPA/600/57-86/015C.
- Zeien, C.T., et al. 1986. Treatment Studies on Coal Gasification Waste Waters. Presented at 6th EPRI Coal Gasification Contractors Conference, 15-16 October 1986, Palo Alto, California.

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CHAPTER 9

COORDINATION

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9.0 COORDINATION

Federal, state, regional, and local agencies as well as the general public were contacted to provide input for the Hardee Power Station Project and associated facilities. These contacts involved both formal, multiple-agency meetings and workshops, individual agency meetings and discussions, as well as meetings with public organizations. The following is a list of formal multiple-agency meetings and workshops.

- o FDER Interagency Meeting:

- September 29, 1988: Tallahassee, Florida

- Purpose: to seek comment on proposed project, in particular the Plan of Study

- o REA Interagency Meeting:

- December 20, 1988: Wauchula, Florida

- Purpose: to seek agency comment on proposed project including identification of key issues

- o REA Public and Scoping Meetings:

- December 20, and 21, 1988: Wauchula and N. Fort Myers, Florida, respectively

- Purpose: to seek input on proposed project including identification of key issues

- o Transmission Line Public Workshops:

- February 20, 21 and 23, 1989: Wauchula, Arcadia and N. Fort Myers, Florida, respectively

- Purpose: to seek input on transmission line corridor selection process and potential candidate corridors

Table 9.0-1 presents an overall list of agency and public organization contacts.

Table 9.0-1. Hardee Power Station Agency and Public Organization Contacts

DATE	AGENCY	PURPOSE	CONTACT
1988			
3/17	Sumter County Property Appraiser	Tax Assessment	R. Hawkins
3/18	Polk County Commission & Economic Development	Describe Combined Cycle Project (CCP)	L. Libertore, <u>et al.</u>
3/22	U.S. Environmental Protection Agency (EPA)	Cooling Reservoir Considerations	C. Kaplan
3/24	Florida Department of Natural Resources (FDNR)	Cooling Reservoir on Reclaimed Lands	R. Bushey, <u>et al.</u>
3/28	Florida Department of Commerce (FDOC)	Economic Development Funds	B. Merrill, <u>et al.</u>
3/28	Polk County Planning Department	Describe CCP	R. Borchers, <u>et al.</u>
3/28	Polk County Zoning Department	Power Plant and Transmission Line Zoning	M. Paules
3/28	Polk County Codes Division	Local Reclamation Ordinances	D. Robertson
3/29	DeSoto County Commissioner	Describe CCP	K. Roan
3/29	Hardee County Commissioners	Describe CCP	B. Albritton, <u>et al.</u>
3/31	Sumter County Commissioners	Describe CCP	T. Blackman, <u>et al.</u>
4/1	Lake County Planning Department	Describe CCP	G. Burhans
4/5	Rural Electrification Administrator (REA)	Describe CCP State/Federal Permitting Requirements	R. Quigel
4/12	Hardee County Industrial Development Authorities	Economic Development Funds, Taxes Assessment	J. Davis

Table 9.0-1. Hardee Power Station Agency and Public Organization Contacts
(Page 2 of 5)

DATE	AGENCY	PURPOSE	CONTACT
4/13	Lee County Commissioner	Describe CCP	B. Fussell
4/13	Charlotte County Commissioner	Describe CCP	D. Schmidt
5/17	Hardee County Commissioner	Describe CCP	J. Moye
5/17	Hardee County Commissioner	Describe CCP	M. Henderson
5/17	Hardee County Commissioner	Describe CCP	S. Rawls
5/17	CF Industries	Describe CCP	J. Holmes
5/17	Florida Public Service Commission (PSC)	Deposition for Need Hearing	S. Brownless
5/20	Hardee County	Describe CP	R. Skipper
6/15	FDER, FDNR & Florida Department of Community Affairs (FDCA)	Project Description Cooling Pond Discussion	H. Oven, <u>et al.</u>
6/30	Hardee County Industrial Development Authority	Project Description	
7/7	Hardee County Commission	Describe CCP	
7/14	Fort Green Springs	Describe CCP	
7/28	Southwest Florida Water Management District (SWFWMD)	Describe CCP	R. Viertel
7/28	Wauchula Lion's Club	Project Description	
7/28	FDER - Tampa Office	Project Description	B. Thomas
7/29	Sumter County Planning Department	Project Description	G. Nelson

Table 9.0-1. Hardee Power Station Agency and Public Organization Contacts
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DATE	AGENCY	PURPOSE	CONTACT
8/3	REA	Project Description	R. Quigel
8/10	U.S. Army Corps of Engineers (COE)	Project Description	D. Rosensweig
8/19	Central Florida Regional Planning Council (CFRPC)	Project Description	J. Duane
9/14	Florida Game and Fresh Water Fish Commission	Project Description	D. Bailey
9/20	Hardee County Kiwanis Club	Project Description	A. French
9/20	EPA	Project Description	R. Howard
9/22	Hardee County	Project Description	
9/22	Lee County Planning Department	Transmission Line	B. Spikowski
9/27	Hardee County Business and Professional Women's Association	Project Description	
9/27	Federal Energy Regulation Commission (FERC)	Gas Pipeline Permitting	R. Szekely
9/28	PSC	Coal Gasification	J. Jenkins
9/29	FDER Inter-Agency Meeting	Plan of Study (POS) Description	FDER, FDNR, EPA, FDCA
10/3	Hardee County American Legion	Project Description	
10/7	Hardee County Women's Club	Project Description	
10/10	Wauchula City Council Meeting	Project Description	

Table 9.0-1. Hardee Power Station Agency and Public Organization Contacts
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DATE	AGENCY	PURPOSE	CONTACT
10/10	Polk County Zoning Department	Plant, Transmission Line & Gas Pipeline Zoning Requirements	R. Feagel
10/11	Bowling Green City Council Meeting	Project Description	
10/12	Federal Interagency Meeting	POS, Project Review	REA, EPA
10/14	School Board of Hardee County	Project Description	
10/18	First Baptist Church Meeting - Hardee Co.	Project Description	
10/21	Hardee County AARP	Project Description	
11/18	REA	Scoping Meeting Format	R. Quigel
12/7,8	PSC	Need Determination Hearing	S. Brownless
12/8	DeSoto County Planning	CCP, Reservoir and Transmission Line	J. Lee
12/20	REA EIS Interagency Meeting	Scoping Issues	R. Quigel
12/20	REA EIS Scoping Meeting Wauchula	Scoping Issues	R. Quigel
12/21	REA EIS Scoping Meeting Ft. Myers	Scoping Issues	R. Quigel
1989			
1/4/89	Hardee County Zoning Department	Plant & Transmission Line Zoning Requirements	R. Stowers
1/9	Polk County Zoning Department	Plant & Transmission Line Zoning Requirements	R. Feagle

Table 9.0-1. Hardee Power Station Agency and Public Organization Contacts
(Page 5 of 5)

DATE	AGENCY	PURPOSE	CONTACT
2/14	Charlotte County Planning Department	Transmission Line Corridors	G. Kelly
2/14	Polk County Planning Dept.	Transmission Line Corridors	A. Kurtzman
2/20	City of Wauchula	Public Workshop	
2/21	City of Arcadia	Public Workshop	
2/23	City of N. Fort Myers	Public Workshop	
3/15	REA	Project Meeting	R. Quigel
3/21	Desoto County Planning Department	Transmission Line Corridors	J. Lee
3/23	Cape Coral City Planning	Transmission Line Corridors	
4/11	FDER - Tallahassee	Transmission Line Corridors	H. Oven
4/17	Hardee County Zoning Department	Re-Zoning Application	R. Stowers
4/18	REA	Loan Application	J. Douvlos
5/1	REA, EPA	Project Update	R. Quigel
5/2	FDER - Tallahassee	Project Update	H. Oven
5/2	FERC	Natural Gas Pipeline	R. Szekely
5/2	FDNR	Cooling Reservoir	R. Bushey
5/4	Hardee County Zoning Board	Plant Site Rezoning	R. Stowers
5/11	Hardee County Commission	Plant Site Rezoning	B. Albritton
5/11	EPA	Flyover of Plant Site & Transmission Line Corridors	C. Berish
6/22	FDNR - Tallahassee	Cooling Reservoir	R. Bushey

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CHAPTER 10

**HARDEE POWER STATION
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10.0 HARDEE POWER STATION PROJECT AND SITE RECLAMATION REQUIREMENTS

The purpose of this chapter of the SCA/EA is to highlight the proposed Hardee Power Station and Associated Facilities in light of the Agrico reclamation plan. The Hardee Power Station is proposed to be constructed and operated on approximately 526 ha (1,300 acres) of mined and unmined lands (see Section 1.2 Overview of Hardee Power Station/Project, 2.2.2 Zoning and Land Use Plans, 2.3.5 Vegetation/Land Use). Of this area, approximately 231 ha (570 acres) will be used for construction of a cooling reservoir, and intake and discharge structures. All remaining facilities will be built on unmined lands. This chapter outlines the consistency between FDNR's reclamation requirements and standards and the construction and operation of the proposed project.

SECI will work in coordination with Agrico in modifying Agrico's current reclamation plan to accommodate the cooling reservoir engineering requirements as described in this application. To the extent that Some of the criteria as identified in Chapter 16C-16 F.A.C. cannot be fully met because of engineering and functional requirements, variances from Chapter Section 16C-16.0051(1), F.A.C., and Section 16C-16.0051(5) will be required. This variance request is discussed in Appenidix 11.10. SECI is currently and will continue to work with Agrico and FDNR's Bureau of Land Reclamation regarding modifications of the reclamation plan.

10.1 BACKGROUND OF SITE RECLAMATION REQUIREMENTS AND PLANS

10.1.1 Past and Present Reclamation Plans

Agrico has been given approval for a reclamation plan for the Payne Creek Mine property which now includes the proposed Hardee Power Station site. As a part of that reclamation plan, 162+ ha (400+ acres) of mined lands were to be reclaimed into lakes. The cooling reservoir for Hardee Power Station will occupy 231 ha (570 acres) and will be built on portions of the mined-out lands of the Payne Creek Mine. The cooling reservoir is considered as a reclamation alternative for the originally proposed reclaimed lakes.

in addition, Agrico is establishing a 205 ha (506 acre) reclamation project adjacent to the Payne Creek floodplain in Sections 23 and 26, Township 32S,

Range 23E, some distance west of the Hardee Power Plant site, to mitigate for current and planned mining. The Agrico reclamation project will include the creation of 83 ha (206 acres) of wetlands. Approximately 42 ha (104 acres) will be forested wetland and 42 ha (104 acres) will be herbaceous wetlands. Forested wetland trees will include water oak (Quercus nigra), sweet bay (Magnolia virginiana), swamp bay (Persea palustris), pop ash (Fraxinus caroliniana), blackgum (Nyssa biflora), dahoon holly (Ilex cassine), bald cypress (Taxodium distichum), pond cypress (Taxodium ascendens) and water hickory (Carya aquatica). Marshes will be planted with native plants found in the region and will specifically exclude cattail, primrose willow, and exotics. This part of the reclamation project will not be affected by the Hardee Power Station project.

The reclamation plans for Agrico's Payne Creek Mine include mined areas of the Hardee Power Station. This reclamation plan proposes pastureland and mixed forest as post-mining uses. The wetlands that are mined in this area are to be replaced by created wetlands consisting of forested wetlands. The original Agrico reclamation plan showed that some of these wetlands would border lakes created during reclamation and would also include a created drainage to replace a tributary that was destroyed by mining. This original plan cannot be completely implemented when the Hardee Power Station is built because of the construction of the cooling reservoir and must be amended by a new reclamation plan. The amended Agrico reclamation plan will reflect the construction of the 231 ha (570 acre) cooling reservoir as a part of the reclamation plan for the Payne Creek Mine.

10.1.2 Applicable FDNR Reclamation Rules

Chapter 16C-16 F.A.C. sets forth phosphate mine reclamation requirements of the State of Florida. All are applicable to the Agrico mining and reclamation plan. Certain sections of these requirements have particular applicability to the Hardee Power Station project which will utilize some of the mined out lands for its facilities. Table 10.1.2-1 lists the FDNR reclamation requirements applicable to the Hardee Power Station project and the information sources which describe relevant corresponding

Table 10.1.2-1. FDNR Reclamation Requirements (Chapter 16C-16 FAC)
Applicable To The Hardee Power Station Project (Cooling
Reservoir) (Page 1 of 2)

Applicable Section	Relevant Information Sources
16C-16.003(1)(d) Amendment	Agrico's Amendment Application
16C-16.0042 Programs and Amendments (2) Amendment	Agrico's Amendment Application and SCA/EA Section 3.5.1 Heat Dissipation
16C-16.0051 Reclamation and Restoration Standards (1)(a) Site Cleanup	Agrico's Amendment Application and SCA/EA Section 4.1 Land Impact
(2) Backfilling and Contouring	Agrico's Amendment Application and SCA/EA Section 4.1 Land Impact
(3) Soil Zone	Agrico's Amendment Application and SCA/EA Section 4.1 Land Impact
(4) Wetlands and (5) Wetlands and Water Bodies	Agrico's Amendment Application and SCA/EA Section 3.5.1 Heat Dissipation System, Section 4.2 Impact on Surface Water Bodies and Uses, and Section 5.8 Changes in Non-Aquatic Species Populations
(6) Water Quality	Agrico's Amendment Application and SCA/EA Section 3.5.1 Heat Dissipation System, Section 4.2 Impact on Surface Water Bodies and Uses, Section 4.3 Groundwater Impacts, Section 5.2 Effects of the Operation of the Heat Dissipation System, and Section 5.3 Impacts on Water Supplies
(7) Flooding and Drainage	Agrico's Amendment Application and SCA/EA Section 4.1 Land Impact
(8) Waste Disposal	Agrico's Amendment Application and SCA/EA Section 5.4 Solid/Hazardous Waste Disposal Impacts
(9) Revegetation	Agrico's Amendment Application and SCA/EA Section 4.1 Land Impact, Section 4.4 Ecological Impact, and Section 5.8 Changes in Non-Aquatic Species Populations

Table 10.1.2-1. FDNR Reclamation Requirements (Chapter 16C-16 FAC)
Applicable To The Hardee Power Station Project (Cooling
Reservoir) (Page 2 of 2)

Applicable Section	Relevant Information Sources
(10) Wildlife	Agrico's Amendment Application and SCA/EA Section 4.1 Land Impact, Section 4.4 Ecological Impact, and Section 5.8 Changes in Non-Aquatic Species Populations
16C-16.0053 Remaining Natural Resources	Agrico's Amendment Application and SCA/EA Chapter 4.0 Effects of Site Preparation, Plant and Associated Facilities Construction and Chapter 5.0 Effects of Plant Operation
16C-16.0068 Release Procedures	Agrico's Amendment Application

information/analysis. Besides Agrico's reclamation amendment application, various chapters and sections of the SCA/EA describe construction and operational conditions and impacts which relate to the use of the mined and reclaimed portions of the site.

10.2 RELATIONSHIP OF PROPOSED PLANT AND ASSOCIATED FACILITIES TO RECLAMATION PLANS

10.2.1 Plant and Associated Facilities Location

The facilities and proposed site layout are described in Chapter 3. The proposed structures, e.g., power block, fuel oil storage tanks, etc., will not be constructed on mined lands and will not affect the proposed reclamation plans or FDNR reclamation rules. An access road will be built from CR 663 to the plant site. This road will be located partially on mined lands.

The cooling reservoir will be constructed by Agrico from mined lands outside of the 100-year floodplain. The Applicant will build an overflow weir and sufficient riprap along the discharge swale and at the border of the discharge swale to prevent erosion and flooding (see Section 3.5.1 Heat Dissipation System). Consistency with the reclamation plan and FDNR's requirements are discussed in Section 10.2.2 and Appendix 11.10.

Three 230 kV transmission lines will be constructed north and south from the plant site (see Section 6.1 Transmission Lines). Only the Pebbledale Line will cross mined and to be reclaimed lands on the site. The other two lines will exit the site to the east and will not affect the planned reclamation. The proposed reclaimed lands along the proposed corridor are pastureland. Construction of the transmission lines will not change or affect the resulting land use.

A 48 cm (18-inch) underground natural gas pipeline will be constructed from the plant site to an existing natural gas pipeline north of the site (see Section 6.2). The proposed pipeline will approach the site from the north

and will use existing highway and railroad ROWs. It will enter the site from CR 663, co-located with the access road.

10.2.2 Plant and Associated Facilities Operational Aspects

The operational impacts of the Hardee Power Station are described in Chapter 5 Effects of Plant Operation. The Hardee Power Station project will not have any significant adverse effect on existing or future natural and cultural resources, including reclaimed areas. Table 10.1.2-1 lists applicable FDNR requirements which assure protection of natural resources including: soils and topography, wetlands and water bodies, water quality, vegetation, and wildlife. The following is a summary of the relevant operational aspects of the project to these natural resources and the reclamation requirements.

SOIL AND TOPOGRAPHICAL CONSIDERATIONS

The proposed cooling reservoir is the only major facility planned to be constructed on mined lands. The reclamation requirements [16C-16.0051 (2)] call for slopes of reclaimed lands to be no greater than 4 to 1. The cooling reservoir design is discussed in Section 3.5.1. Its proposed slopes (4 to 1 inside and 20 to 1 and 30 to 1 outside) and other design aspects are consistent with FDNR requirements. Appropriate vegetative cover will be grown, established and maintained on the outside slopes.

WETLANDS AND WATER BODIES

The plant and associated facilities will be constructed outside of the 100-year floodplain. No impacts to offsite wetlands will result from the Hardee Power Station. One contiguous forested wetland [2.4 ha (5.9 acres)] will be lost during construction of the cooling reservoir (see Sections 2.3.6.1 and 4.2.1.2). The loss of this wetland is not considered significant adverse effects because of the small size and isolation due to surrounding mining activities. Since approval for mining of these wetlands has been requested and granted as part of Agrico's mining and reclamation plan and dredge and fill permit, the Applicant will also not seek approval (See Appendix 11.1.3) for dredging of these wetlands as part of construction for the cooling reservoir. The piping and access road will

cross a small section [0.18 ha (0.45 acres)] of currently mined and to be reclaimed vegetated forested wetland (See Appendix 11.13).

The environmental impacts of the loss of this currently mined and to be reclaimed wetland are not considered adverse or significant. The wetland loss is a very small percentage (2.0 percent) of the total forested wetlands reclaimed on the site. No effects will occur to the connection of the upstream wetlands connected to Payne Creek. The drainage function of the reclaimed wetlands passing next to the cooling reservoir will be maintained during construction by the use of temporary culverting. Potential downstream sedimentation impacts during construction will be minimized by proper sediment control techniques. No impacts to Payne Creek are anticipated. These wetland losses will be mitigated as part of Agrico's amended reclamation plan (See Appendix 11.11). Water subsidies to the wetlands after construction of the plant and associated facilities will be similar to, if not better than, those prior to mining (see Section 5.8 Changes To Non-Aquatic Population).

WATER QUALITY AND QUANTITY

All waters leaving the cooling reservoir and the site will meet applicable water quality standards of the Florida Department of Environmental Regulation at the point of discharge or at the end of a mixing zone and will have no adverse impact to fish and wildlife (see Sections 5.1 Effects of Operation of the Heat Dissipation System, 5.2 Effects of Chemical and Biocide Discharges, and 5.3 Impacts on Water Supplies).

As recommended by FDNR, the HEC-1 model was used to evaluate event specific discharges to Payne Creek and associated dilution for the 10-year, 24-hour storm and the 25-year, 24-hour storm (see Section 5.1.1 Temperature Effect On Receiving Body of Water). The format methodology followed that described in the existing Ardaman & Associates study entitled "Hydrological Analysis of the Agrico Payne Creek Mine Reclamation Plan" dated October 5, 1987. The assumptions and use of the model are described in Section 5.1 Effects Of Operation of the Heat Dissipation System. This analysis, along with other analyses, shows that the cooling reservoir will not discharge under the 10-year, 24-hour storm, but only during storms which are larger and

less frequent. The emergency spillway will be adequate to handle all runoff and discharge from the 25-year, 24-hour storm. No reduction in downstream flow conditions or reduced water quality will occur from the construction and operation of the cooling reservoir. As a result, no effects to downstream permit condition, e.g., mixing zones, or other approved activities, will result (see Section 5.3 Impacts on Water Supplies).

No adverse water quality impacts, including impacts on aquatic life, will result from the operation of the cooling reservoir (see Sections 5.1 Effects of Operation of the Heat Dissipation System, 5.2 Effects of Chemical and Biocide Discharges, and 5.3 Impacts on Water Supplies).

WILDLIFE AND ENDANGERED SPECIES

The major wildlife habitat of the site is along Payne Creek (see Section 2.3.6). This habitat and its connection to surrounding habitats will be protected. No significant wildlife habitat will be lost or impacted by construction and operation of the cooling reservoir. The cooling reservoir will provide a water subsidy to the Payne Creek wetlands, which have been hydrologically altered by past mining in the area. The water subsidy from the cooling reservoir will thus enhance this habitat (see Section 5.3.1 Surface Water and Section 5.8 Changes to Non-Aquatic Populations). The wetland losses within the proposed cooling reservoir area will be mitigated through the creation of artificial wetlands as a part of the Agrico reclamation plan. As a consequence, no significant adverse impacts to wildlife and habitat, including endangered and threatened species, will occur.

10.2.3 Release Procedures

It is the intent of SECI to seek release from reclamation requirements prior to operation of the cooling reservoir.

10.2.4 Financial Responsibilities

It is the intent of the Applicant to take responsibility for the Hardee Power Station site after reclamation has been satisfactorily demonstrated to FDNR. Agrico will assume financial responsibility for compliance with

the reclamation plan. The Applicant will maintain the reservoir after taking ownership.

10.3 AMENDMENTS AND VARIANCES

An amendment to the Agrico reclamation plan will be required to incorporate the proposed cooling reservoir. Agrico is preparing this amendment in accordance with 16C-16.0042 Programs and Amendments (See Appendix 11.11).

A variance is sought from Section 16C-16.0051(1), F.A.C., and Section 16C-16.0051(5), F.A.C., Reclamation Standards. Appendix 11.10 includes a request for variance from these standards and provides supporting information for this request.