Visibility and Visual Impact Assessment

Southern Rhode Island Transmission Project

Warwick, East Greenwich, North Kingstown,
Exeter, South Kingstown, and Charlestown
Rhode Island

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GLOSSARY/LIST OF ACRONYMS

Circuit	A continuous system of conductors providing a path for electricity.
Conductor	A wire, cable, busbar, rod or tube which serves as a path for electric flow. The most common conductor is the overhead wire.
Cross Section	A profile of the terrain that illustrates sources of visual screening along a line of sight between the proposed project and a specific viewer/resource location.
DEM	Digital elevation mapping
DOQQ	Digital ortho quarter quadrangle. Digital Aerial photographs with embedded geo-referencing information.
EDR	Environmental Design & Research, P.C.
GPS	Global positioning system.
Insulator	The porcelain support used to insulate the conductors from the pole or tower.
Kilovolt (kV)	1,000 volts
LSZ	Landscape similarity zone. Area of similar landscape/aesthetic character based on patterns of landform, vegetation, water, land use, and user activity.
MCS	Management Classification System. A component of the U.S. Army Corps of Engineers Visual Resources Assessment Procedure that defines the aesthetic quality of each landscape similarity zone and the degree of acceptable visual change within.
Narragansett	Narragansett Electric Company, a National Grid Company
RIDEM	Rhode Island Department of Environmental Management
RIGIS	Rhode Island Geographic Information System
RIHPHC	Rhode Island Historic Preservation and Heritage Commission
ROW	Right-of-way
Substation	A small building or fenced-in yard containing switches, transformers and other equipment and structures. Adjustments of voltage, monitoring of circuits and other service functions take place in this installation.
Tap	A connection between conductors or between a conductor and certain equipment such as transformers.
Transmission Line	Any line operating at 69,000 or more volts.
Transformer	A device used to transform voltage levels to facilitate the transfer of power from the generating plant to the customer. A step-up transformer increases the voltage while a step-down transformer decreases it.
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
VIA	Visual impact assessment
Viewshed	Area of potential project visibility defined by maximum structure height and mapped topography within the study area.
VRAP	Visual Resources Assessment Procedure. A visual impact assessment procedure developed by the U.S. Army Corps of Engineers.

INTRODUCTION

Environmental Design & Research, P.C. (EDR) was retained by The Narragansett Electric Company (Narragansett), to undertake an analysis of the potential visibility and visual impact of proposed additions and upgrades to transmission facilities in the southern Rhode Island area. The analysis performed by EDR was designed to address the following questions:

1. What is the visual/aesthetic character of the project site/study area?

2. What sensitive receptors might have views of the existing and proposed facilities?

3. From what locations could the existing and proposed facilities potentially be seen?

4. What will the proposed facilities look like, as compared to the existing facilities?

5. What is the potential visual impact of the project?

The study undertaken by EDR addressed these questions through viewshed analysis, line-of-sight cross sections, field evaluation, computer-assisted visual simulations, and evaluation of visual impact by an in-house panel of landscape architects. This approach conforms to the policies, procedures, and guidelines contained in established visual impact assessment methodologies (see Literature Cited/ References Section).

PROJECT DESCRIPTION

Project Site

Narragansett is proposing various transmission system upgrades, including extension of the existing L-190 115 kilovolt (kV) transmission line and reconductoring of three existing 115 kV overhead electrical transmission lines in the southern Rhode Island area. The approximately 25.8 mile section of new and upgraded overhead transmission lines transverse portions of Warwick, East Greenwich, North Kingstown, Exeter, South Kingstown, and Charlestown, Rhode Island. The transmission corridor is located 15-miles south of the City of Providence, Rhode Island and approximately 12-miles east of the Connecticut/Rhode Island state line (Figure 1). The project also includes the construction of a new substation on Tower Hill Road in North Kingstown. Within a 1-mile radius of the proposed facilities, land use includes residential neighborhoods, commercial and industrial areas, road and rail corridors, parkland, farmland and undeveloped forestland.

Proposed Project

The southern Rhode Island transmission projects proposed by Narragansett involve the following individual project components:

1. Reconductoring of 5.3 miles of the existing the L-190 115 kV line from the Kent County Substation to the Old Baptist Road Tap Point.

2. Constructing a new 12.3 mile extension of the L-190 115 kV line from the Old Baptist Road Tap Point to the West Kingston Substation.

3. Reconductoring of 4.3 miles of the existing 1870N 115 kV line from the West Kingston Substation to the Kenyon Substation.

4. Reconductoring of 3.9 miles of the 1870 115 kV line from the Kenyon Substation to the Wood River Substation.

5. Constructing of the new 115 kV Tower Hill Substation and two new 0.75 mile 115 kV tap lines from this new substation to the existing G-185S 115 kV transmission line right-of-way (ROW).

6. Expanding the existing West Kingston substation located in South Kingstown to accommodate the new 115 kV L-190 transmission line.

Reconductoring of the existing transmission lines, as described above in items 1, 3, and 4, will involve replacement of the existing conductors and only minor structural changes to the existing support structures. Expansion of the existing West Kingston substation will involve the replacement of some existing equipment and new fencing on the developed substation property. These actions will result in very little visual change to the existing facilities, and therefore were not addressed in this study. The Visual Impact Assessment (VIA) conducted by EDR focuses only on the new construction described in items 2 and 5, which will result in a perceptible visual change to the existing transmission corridor. Therefore, the project considered in this VIA includes the 12.3 miles of new construction between the Old Baptist Road Tap Point in the Town of East Greenwich and the West Kingston Substation in the town of South Kingstown, and construction of the new Tower Hill Substation in the Town of North Kingstown (Figure 2).

The proposed new construction will include additional clearing of the existing ROW by up to 65 feet, and installing 147 new tubular corten steel poles within the transmission line corridor. The new steel poles will be placed 40 feet to the west of the existing wood H-frame structures in the established ROW. All of the new corten steel poles within the transmission line corridor will be davit arm structures that will support three conductors and a shield wire. These structures will range in height from 55 feet to 90 feet and be spaced approximately an average of 450 feet apart (see transmission line plans and details in Appendix A).

In addition to extension of the L-190 line, the VIA conducted by EDR also considered the construction of the new Tower Hill Substation. The new substation will consist of a small-enclosed control house structure, linearly arranged transformers, overhead lines and carriers, and two H-frame dead-end structures. The substation will be fully enclosed by a chain link fence and will be lighted only as necessary during service periods (see substation plans and details in Appendix A). The proposed tap lines follow an existing 40 foot-wide ROW from the L-190 line to the proposed Tower Hill Substation. Visibility of the proposed tap lines is being investigated as part of a supplemental assessment being undertaken by EDR.

EXISTING VISUAL CHARACTER

Visual Setting

Based on established visual assessment methodology and site-specific topographic and land use conditions that limit project visibility, the study area for this project was defined as the area within a 1-mile radius of the proposed transmission line corridor and substation (Figure 3). Landscape character within this area is defined by the existing pattern of landform (topography), vegetation, land use, and water features, and was evaluated during field visits by EDR staff on March 9 and 10, and June 29, 2005.

The transmission line corridor is located in the Southern New England physiographic region of Rhode Island, which includes the entire Boston to New York City corridor (blm.gov website). This physiographic region is characterized by flat coastal topography, maritime marshes, and mature deciduous and coniferous forests. Within the study area, elevations range from 20 feet to 320 feet above sea level, and topography varies from level plains to gently rolling hills and valleys. Land use is a mix of undeveloped forestland, open agricultural fields (active and reverting), as well as suburban and urbanized areas. Forest vegetation is primarily an oak-hickory community intermixed with white pine/red pine forest. Mature forest vegetation typically occurs in large intact blocks that provide a strong sense of enclosure and screening along streets and around residential and

commercial areas. Open space uses include active cropland, turf farms, and parklands. Agricultural lands typically occur in contiguous blocks and corridors adjacent to the Amtrak railroad line, while parklands tend to be nestled within the forested portions of the study area. There are several ponds, rivers, and small streams within the study area, but they are typically obscured from direct view by dense forest vegetation.

Visually Sensitive Resources

Scenic resources of national significance are not present within the study area. The area includes no national scenic byways (byways.org website), national recreational/scenic trails (e.g., Appalachian Trail) or recognized scenic views or vistas. The nearest scenic byways are portions of Route 102 and Ministerial Road (Route 110) just outside the study area. None of the water bodies in the study area are listed as wild, scenic or recreational rivers, and there are no National Wildlife Refuges, National Parks, National Seashores, National Forests, National Natural Landmarks, or National Heritage Areas within a mile of the proposed project. However, the study area does include a number of resources/sites that could be considered visually sensitive from a statewide, regional or local perspective.

The area within a 1-mile radius of the proposed project includes multiple historic sites listed by the Rhode Island Historic Preservation and Heritage Commission (RIHPHC), as well as sites identified by the RIHPHC as candidates for listing (Rhode Island Geographic Information System [RIGIS]). These sites are illustrated in Figure 4 (Sheet 1) and listed in Table 1 below.

Table 1. Historic Resources.

RIHPHC Listed Sites:		
Site	Town	Distance from Nearest New Structure
Six Principle Baptist Church	North Kingstown	.13 miles East
Rathbun House	North Kingstown	.68 miles West
Joseph Slocum House	North Kingstown	.68 miles West
Old Narragansett Cemetery	North Kingstown	1.0 mile East
Kingston Rail Road Station	South Kingstown	.68 miles East
Washington County Courthouse	South Kingstown	.88 miles East
Tillinghast Road District	North Kingstown	.88 miles West
Davisville Historic District	North Kingstown	.68 miles North
Devil's Foot Cemetery	North Kingstown	1.75 miles East
Scrabbletown Historical District	North Kingstown	.25 miles West

Layfayette Village Historic District	North Kingstown	.25 miles East
Shady Lea Historic District	North Kingstown	.75 miles South
Gardner House District	North Kingstown	.68 miles East
Spink Farm District	North Kingstown	.88 miles East
Cottrell Homestead District	South Kingstown	.13 miles East
Henry Marchant Farm District	South Kingstown	1.13 miles West
Ministerial Road Rt. 110 District	South Kingstown	.88 miles East

RIHPHC Candidate Sites:		
Site	Town	Distance from Nearest New Structure
Huguenot Settlement Site	North Kingstown	.25 miles West
Silas Jones House	North Kingstown	.13 miles West
D. Larston Farm, 1633 Stony Ln.	North Kingstown	.13 miles East
360 Annaquatucket Road	North Kingstown	.75 miles East
Old Belleville School	North Kingstown	On site
Dorset Mill/ Yawgoo Mfg. Co.	South Kingstown	.25 miles North
The Wells Place	South Kingstown	.75 miles West
Kenyon Homestead	South Kingstown	.75 miles East
Great Swamp Fight Site	South Kingstown	.50 miles West

Recreational Areas/Natural Areas

According to the RIGIS database, the study area also includes several recreational and natural areas that could be considered visually sensitive due to the type or level of use they receive. Parks within the study area include Feuher Park, Central Park (which together make up the Ryan Park System), and Donald Downs Park. Feuher Park is located off of Lafayette Road in North Kingstown. The park includes open lawn, a baseball diamond, and forested areas with pedestrian and bike trails. Central Park is located adjacent to Feuher Park and includes multiple pedestrian and bike trails and open lawn areas within a forest setting. Central Park extends down along the transmission line corridor, with pedestrian and bike trails crossing the existing transmission ROW. Donald Downs Park, located off of Indian Corner Road east of Slocum, includes lawn areas, parking lots, a baseball diamond and clubhouse, and areas of undeveloped forest vegetation. Other recreational areas within the study area include Woodland Golf Course, located south of Davisville, and Rolling Greens Golf Course, located west of Wickford Junction (see Figure 4, Sheet 2).

Water bodies within the study area include Belleville Pond, Secret Lake, Silver Spring Lake, Yawgoo Pond, and Hundred Acre Pond. These are important recreational resources for the community, and are used by significant numbers of people for swimming, boating, fishing, and passive recreational activities. However, because of their relatively small size and forested shorelines, these waterbodies are relatively minor aesthetic features in the landscape. The study area also includes several large public natural areas, including Cocumscussoc Brook Reserve and Great Swamp Management Area. These areas are used for wildlife observation, nature study and other forms of passive recreation. The location of these and other recreational, natural, and open space resources within the study area are illustrated in Figure 4 (Sheet 2) and listed in Table 2.

Table 2. Recreational/Natural Areas.

Audubon Society Lands:		
Site	Town	Distance from Nearest New Structure
Davis Memorial Wildlife Refuge	North Kingstown	.13 miles North
Cocumscussoc Brook Reserve	North Kingstown	1.75 miles East
Lafayette Cedar Swamp	North Kingstown	.50 miles West
Eldred Wildlife Refuge	South Kingstown	.50 miles East
Protected Open Space:		
Site	Town	Distance from Nearest New Structure
Briggs Farm	North Kingstown	1.0 mile North
Hunt River Preserve	North Kingstown	On site
State Conservation & Rec. Areas:		
Site	Town	Distance from Nearest New Structure
Hunt River Swamp	North Kingstown	.25 miles North
Sunridge Totlot	North Kingstown	.50 miles North
Davisville Elementary School	North Kingstown	1.0 miles East
Devil's Foot Rock	North Kingstown	1.75 miles East
Woodland Golf Course	North Kingstown	On site
Stony Lane School	North Kingstown	.25 miles East
Matantuck Grove	North Kingstown	.13 miles West
Rolling Rock	North Kingstown	1.5 miles East
Cocumscussoc Park	North Kingstown	.68 miles East
Narragansett Bow Hunters	North Kingstown	.75 miles West
Rolling Greens Golf Course	North Kingstown	.68 miles West

Feuer Park	North Kingstown	On site
Wickford Branch Rail Road	North Kingstown	.38 miles East
Lafayette Hatchery	North Kingstown	.38 miles West
Wickford Junior High School	North Kingstown	1.38 miles East
Central Park	North Kingstown	.13 miles East
Secret Lake Preservation Area	North Kingstown	On site
Hamilton Area	North Kingstown	.50 miles East
Donald Downs Park	North Kingstown	On site
Shady Lea	North Kingstown	.75 miles South
Silver Spring	North Kingstown	.75 miles South
Camp Canonicus	North Kingstown	.75 miles North
Murmuring Pines	North Kingstown	On site
Yawgoo Valley Ski Area	North Kingstown	.25 miles East
Camp Sunshine	North Kingstown	.75 miles East
Barber's Pond	South Kingstown	.13 miles West
Abbey Perry Center	South Kingstown	.50 miles West
Cottrell Farm	South Kingstown	.13 miles East
Waites Corner Grove	South Kingstown	.13 miles West
West Kingston School	South Kingstown	.68 miles East
Chickasheen Brook	South Kingstown	.38 miles East
University of RI Campus	South Kingstown	2.0 miles East
Chipuxet River Area	South Kingstown	1.13 miles East
Kingston Station	South Kingstown	.68 miles East
Camp Hoffman-GSA	South Kingstown	.68 miles East
Larkin's Pond Club	South Kingstown	1.0 mile South
Great Swamp Management Area	South Kingstown	On site
RIDEM Protected Public Lands:		
Site	Town	Distance from Nearest New Structure
Briggs Farm\Graham	North Kingstown	1.0 mile North
Hunt River Glen	North Kingstown	.13 miles North
Boesch Farm	North Kingstown	.75 miles West
Cocumscussoc	North Kingstown	.68 miles East
Lafayette Hatchery	North Kingstown	.38 miles West
Central Park/ Belleville Pond	North Kingstown	.13 miles East
Croessus Limited-Winfield Tucker	North Kingstown	.50 miles West

Silver Spring Wilderness Area	North Kingstown	.68 miles South
Covell Farm	South Kingstown	1.0 mile West
Barbers Pond	South Kingstown	.13 miles West
Cottrell Farm	South Kingstown	.13 miles East
Rose	South Kingstown	On site
Taylor Landing	South Kingstown	1.3 miles East
URI Foundation	South Kingstown	On site
Dawley	South Kingstown	.75 miles East
Marchant Farm	South Kingstown	1.3 miles West
Perreault	South Kingstown	.25 miles West
Great Swamp	South Kingstown	On site

Scenic Areas:

The RIGIS database also indicates that there are several sites within the study area that are considered sensitive visual resources by the Rhode Island Department of Environmental Management (RIDEM) due to their scenic quality. According to the RIGIS database, these areas include trails, natural areas, and agricultural lands that evoke the New England and southern Rhode Island experience. South County Trail (Route 2) weaves together villages, historic homesteads, forestland, and farms in the study area. The trail highlights the colonial heritage of Rhode Island as well as its rich natural resource heritage (Rhode Island Heritage Trails Web Site). The locations of this trail and other scenic resources within the study area are illustrated in Figure 4 (Sheet 2) and listed in Table 3.

Table 3. Scenic Areas.

Site	Town	Distance from Nearest New Structure
Frenchtown Rd./ Tillinghast Rd.	North Kingstown	.88 miles West
South County Trail	North Kingstown	.5 miles West
Belleville Pond	North Kingstown	.13 miles East
Shermantown Road	North Kingstown	.13 miles South
Gilbert Stuart Estates	North Kingstown	.88 miles East
West Allenton Road Turf Farms	North Kingstown	On site
Slocum Turf Farms/Yawgoo Pond	North Kingstown	.68 miles West
State Route 2 Bike Trail	South Kingstown	.5 miles West
Horse Farm on South County Trail	South Kingstown	.25 miles West

Site	Town	Distance from Nearest New Structure
Worden Pond/ Larkin Pond	South Kingstown	1 mile East

Areas of Intensive Land Use

Areas of intensive land use are also considered visually sensitive due to the number of potential viewers that use these sites. Areas of intensive land use within and adjacent to the study area include the Towns of East Greenwich and North Kingstown, and the University of Rhode Island, which is located just beyond the limits of the study area. The University of Rhode Island is a liberal arts and science college located in South Kingstown. The University enrolls approximately 10,320 undergraduates and 3,115 graduate students and has a teaching faculty of 615 within its 1,200-acre campus. Numerous individuals (residents, customers, employees, commuters) also make use of the services offered by the commercial development along Ten Rod Road (Route 102) between Wickford and Route 2 in the Town of North Kingstown. Heavy concentrations of residential suburban development are located in close proximity to the commercial corridor in the Town of East Greenwich and North Kingstown.

The study area also includes several highways that could be considered visually sensitive due to the number of drivers that travel these roads on a daily basis. U.S. Route 1, as well as State Routes 2, 4, 102 and 138, all traverse the study area. According to the Rhode Island Department of Transportation (RIDOT) website, 2003 Annual 24-hour Average Daily Traffic Counts on these roads were as follows:

- North-south travel on State Route 2 between the State Route 401 and State Route 102 averaged between 9,800 and 14,800 vehicles per day.

- North-south travel on State Route 4 between the State Route 401 and State Route 102 averaged between 44,800 and 54,000 vehicles per day.

- North-south travel on State Route 2 between the State Route 402 and State Route 138 averaged between 8,800 and 14,800 vehicles per day.

- North-south travel on State Route 4 between State Route 402 and State Route 138 averaged between 36,500 and 54,400 vehicles per day.

- East-west travel on State Route 102 between State Route 2 and U.S. Route 1 averaged 14,000 vehicles per day.

- East-west travel on State Route 138 between State Route 2 and U.S. Route 1 averaged between 3,900 and 20,800 vehicles per day.

Landscape Similarity Zones

Within the project study area, EDR defined five distinct landscape similarity zones (LSZ's). LSZ's are areas of similar landscape/aesthetic character based on patterns of landform, vegetation, water resources, land use, and user activity. These areas were identified within the study area in general accordance with the U.S. Army Corps of Engineers (USACE) Visual Resources Assessment Procedure (VRAP) and other visual assessment methodologies (Smardon et al., 1987; USDA Forest Service, 1995; USDOT Federal Highway Administration, 1981). The location of these LSZ's within the study area is shown in Figure 5, Sheet 1, and representative photos are included in Figure 5, Sheets 2-6. Descriptions of these LSZ's are presented below:

Zone 1. Suburban Residential

The Suburban Residential LSZ occurs consistently along the north-south axis of the transmission line corridor, within the Towns of East Greenwich, North Kingstown, Exeter, and South Kingstown. These areas are characterized by medium to high-density residential neighborhood development, that typically occurs along cul-de-sacs spurring off the main roads. Buildings are relatively new one- and two-story wood-framed structures with peaked roofs and clapboard type siding, surrounded by well-maintained lawns and landscaped yards. The neighborhoods often occur in wooded areas with pockets of remnant forest vegetation within the subdivisions and a scattering of individual trees along the roads. The streets are well organized in layout and appearance, and often curvilinear in form. The typical user activities include home and yard use/maintenance, as well as local travel. Views that are available in this landscape similarity zone are generally limited by the undulating topography and forest vegetation that occurs at the edges of the residential yards.

Zone 2. Commercial

The primary Commercial LSZ occurs along Ten Rod Road (State Route 102) in the northern sector of the study area. Development in this area is a combination of modern large retail complexes (typically including an anchor retail establishment such as Wal-Mart), older strip development, historic structures (such as renovated mill buildings) that now host small retail boutiques and

restaurants, and free-standing two-story residential style structures with retail on the first floor and housing above. Consequently, the businesses within this LSZ present a wide variety of façade treatments, architectural styles, and signage that often results in visual clutter. Because vehicular transportation is required to access the businesses within this zone, numerous automobiles and significant areas of paved road and parking lot are also significant components of the Commercial LSZ. Views within the zone are generally oriented along road corridor and toward the commercial buildings.

Zone 3. Rural Residential/ Agricultural

The Rural Residential/Agricultural LSZ tends to be concentrated to the lower central and southern sectors of the study area, adjacent to the Amtrak railroad corridor. The landscape in this area is characterized by relatively flat topography with a mix of farms and rural residences, open fields, and numerous woodlots. Dominant agricultural uses include dairy farming, crop production, and sod/turf farming. Due to the presence of large open fields, views within this LSZ are more open and long distance than those available in other zones within the study area. These open views typically include a relatively flat foreground landscape, with a low rise of woodland vegetation in the distance. Typical viewer activity within this zone includes residential activity, agricultural trade, and local travel.

Zone 4. Undeveloped Forestland

The Undeveloped Forestland LSZ is characterized by relatively large tracts of successional and mature forest, typically including both deciduous and coniferous species. Isolated residences, local roads, parkland, and trails occur within this zone, but were not called out as separate LSZ's due to their relatively small size and the visual dominance of the surrounding forest. Significant areas of undeveloped forestland are located throughout the study area, and typically occur in and around recreational areas, natural areas, and other visually sensitive resources. Public access to these areas is limited, and long-distance views within the zone are generally either fully or partially screened by wooded vegetation. Areas of agriculture are typically bordered by forestland and many of the suburban residential areas are fully enclosed by adjacent forest. This similarity zone provides screening and framing of views from adjacent transportation and residential/agricultural zones.

Zone 5. Transportation

The Transportation LSZ occurs along the State Route 2 and State Route 4 corridors within the northern portion of the study area. These sections of highway are divided, limited access roads that are dominated by utilitarian, transportation-oriented features, including automobiles, large expanses

of pavement, guardrails, overpasses, and directional signs. Other portions of these highways, and smaller local roads, are included within other LSZs because they lack the major transportation infrastructure characteristic of this similarity zone. Views within the Transportation LSZ are generally focused along the orientation of the highway. Viewer perspective is generally at ground level, although the zone is occasionally elevated and offers some more distant peripheral views. However, adjacent forest vegetation and/or roadside development generally limits these views.

Viewer/User Groups

Specific viewer groups within the study area were identified to evaluate viewer sensitivity and assure the selection of appropriate representative viewpoints during the visual impact evaluation. Four categories of viewer/user groups were identified within the study area:

1. Commuters and Through-travelers

These viewers pass through the study area on a regular basis in automobiles on their way to work or other destinations. On most roads within the study area, views will be from street level, although travelers on State Route 4 are afforded intermittent elevated views of the surrounding area. Typically, drivers will have limited views of the transmission line corridor, except at locations where the line crosses the road. This is due to the dense vegetative screening that generally exists between the transmission line corridor and these roads. Commuters and through travelers are typically moving, have a relatively narrow visual field due to roadside vegetation and/or structures, and for the most part are preoccupied with traffic and navigating the roadway network. For these reasons commuters and through travelers' perception of (and sensitivity to) visual quality and changes in the visual environment are likely to be relatively low. However, passengers in moving vehicles will have greater opportunities for off-road views of the project than will drivers.

2. Local Residents

These individuals may view the project from stationary locations, such as their yards and homes, and while driving along local roads. Some homeowners in newer residential developments have frequent and/or prolonged views of the existing transmission line due to their proximity to the ROW and/or clearing of the forest vegetation that occurred during construction of the development. However, older, more well established residential areas have limited opportunities for such views due to the general orientation of residential structures toward the adjacent streets, and the buffers of existing forestland that typically surround these neighborhoods. The sensitivity of residents to visual quality is variable, and may be tempered by the viewer’s exposure to the existing transmission

facilities and other visually discordant features already in view. However, it is assumed that most residents will be highly sensitive to changes in the landscape that can be viewed from their homes and neighborhoods.

3. Business Employees

These individuals work at local businesses, primarily in the commercial portions of the study area. Business employees will generally experience limited views of the transmission line corridor except at road crossings (while driving to work) or where the transmission ROW abuts their places of employment. Most business employees will be working in one- and two-story structures that may or may not have views to the outside. Those views that are available will generally include numerous, often discordant, built features. For this reason, and because most business employees will be focused on their job responsibilities rather that views of the landscape, they are not likely to have high sensitivity to changes in the landscape.

4. Recreational Users

This group generally includes local residents and tourists involved in outdoor recreational activities at local parks, recreational facilities, and natural areas. This group includes baseball players, bicyclists, children, joggers, and those involved in more passive recreational activities (picnicking, walking, nature observation, etc.). Scenery and visual quality may or may not be an important part of the recreational experience for these viewers, although in general, recreational enjoyment is almost always enhanced in a setting that has not been visually degraded. For some recreational users, scenery may be a very important part of their recreational experience, and their activities may afford continuous views of landscape features over relatively long periods of time. Such viewers are likely to have a high appreciation for visual quality and high sensitivity to visual change. However, it is worth noting that certain recreational users within the study area presently have clear views of portions of the existing transmission line, especially in areas where trails cross under or run parallel to the existing transmission line corridor. Proximity of the existing line may temper their expectations of visual quality and sensitivity to visual change.

VISUAL IMPACT ANALYSIS

The Visual Impact Analysis (VIA) procedures used in this study are based on methodologies developed by the U.S. Army Corps of Engineers (USACE) (Smardon, et al., 1988). They are also consistent with guidance provided by the U.S. Department of the Interior, Bureau of Land

Management (1980), U.S. Department of Agriculture, National Forest Service (1974), the U.S. Department of Transportation, Federal Highway Administration (1981), and the New York State Department of Environmental Conservation (not dated). The specific techniques used in this study and the results of the VIA are described below.

Project Visibility

An analysis of potential project visibility was undertaken to identify those locations within the study area where there is a relatively high probability that the proposed facility will be visible. The analysis includes identifying potentially visible areas on viewshed maps, preparing line-of-sight cross sections, and verifying visibility in the field.

Viewshed Analysis

To evaluate potential project visibility, EDR performed a viewshed analysis of the existing and proposed transmission line structures. To determine potential project visibility from sensitive sites outside the 1-mile radius study area, the viewshed analysis was extended out to 3 miles. Any sensitive sites outside the study area with potential views of the project could thus be identified and field checked to determine if they needed to be included in the VIA. The viewshed analysis was based on the existing and proposed location of representative structures along the transmission line corridor. Selection of these structures was based on their even spacing along the transmission line corridor. Heights of existing structures sampled in this analysis ranged from 50 feet to 70 feet, while height of the proposed transmission structures ranged from 55 feet to 90 feet.

A viewshed map was prepared using U.S. Geological Survey (USGS) digital elevation model (DEM) data (7.5-minute series and 1:250,000 scale) and a computer program called Global Mapper®. The Global Mapper® program defines the viewshed (using topography only) by running elevational cross sections, in a 360-degree circle around each sampled pole. It samples elevational points every 10-30 meters (33-99-feet) along the 3-mile long section lines. The resulting viewshed map defines the maximum area from which the tallest elements of the existing and proposed lines (i.e., the tops of the transmission line structures) could potentially be seen from ground-level vantage points (existing grade plus 5.1 feet to account for average viewer height). Because the viewshed analysis is based on the maximum height of the project components and does not take into account the screening effect of vegetation or built structures, it provides a very conservative (i.e., “worst case”) assessment of project visibility. Its accuracy is also directly related to the accuracy of the USGS DEM data used in the analysis.

The viewshed analysis for the proposed transmission line improvements involved mapping of the potential visibility of the existing transmission line structures, and similar mapping for the new transmission line structures. These two maps were then compared and overlaid to show the areas of potential increased visibility due to the addition of the proposed transmission structures. The viewshed maps for both the existing and proposed structures show a very similar pattern and extent of potential visibility (Figure 6, Sheets 1-2). Areas of potential visibility in the northern portion of the study area are broken and sporadic, reflecting the rolling hill and valley topography in this area, which results in screening of views in valleys and on the backsides of hills. Potential visibility of both the existing and proposed structures is mixed within the central portion of the study area. In the flat agricultural lands to the west of the line, broad areas of potential visibility are indicated, while the hilly areas to the east exhibit extremely limited and sporadic visibility due to the rolling topography. Areas of potential visibility in both the northern and central portions of the line are strongly concentrated within the 1-mile radius study area. Due to broad areas of relatively flat topography in the southern portion of the study area, potential visibility of both the existing and proposed structures is greatest in this area, and in places extends well beyond the 1-mile radius study area boundary.

Overlaying the two viewshed maps confirms that there is very little change in potential visibility with the proposed project in place (Figure 7, Sheet 3). The largest areas of increased potential visibility are located 2-3 miles from the transmission line corridor, where intervening vegetation and the effects of distance are likely to limit any increase in actual project visibility. Sensitive sites that occur within the viewshed of the proposed project are, in almost all cases, already within the viewshed of the existing line. Consequently, there should be few instances where views of the proposed project do not already include existing transmission facilities. Although not considered in the viewshed analysis, it is clear that significant areas of mature forest vegetation that occur throughout the study area will block or significantly screen actual visibility of the transmission line from many of the areas indicated as having potential visibility in the viewshed analysis.

Cross Sections Analysis

To more accurately account for the screening effect of vegetation and structures within the study area, six line-of-sight cross sections (each approximately 3 miles long) were cut on either side of the transmission line corridor. As with the viewshed analysis, the 3-mile distance was used to consider any sensitive areas outside the 1-mile study area that might require further investigation during the field verification process. Cross section locations were chosen so as to include visually sensitive areas (e.g., trails, water bodies, historic sites, recreational areas) and other areas of intensive land use (e.g., villages, roads, etc.). These cross sections analyze visibility along selected lines-of-sight (i.e., from specific receptor locations to specific sites along the line), but taken together, are

representative of potential project visibility and screening that occurs throughout the study area. The cross sections are based on forest vegetation and topography as mapped on the 7.5-minute USGS quadrangle maps and 2-foot resolution aerial photographs (Figure 7, Sheet 1). For the purposes of this analysis, a uniform 40-foot tree height was assumed. A 10-fold vertical exaggeration was used to increase the accuracy of the cross section analysis.

As a whole, the cross sections illustrate that the extensive forest vegetation and undulating topography within and adjacent to the study area will effectively screen views of the proposed project from most locations. Areas of potential visibility occur almost exclusively within 1 mile of the transmission line corridor. Views to the proposed project that are available are most likely to occur in areas with open fields and relatively flat topography. However, it should be noted that these are the same areas most likely to have views to the existing transmission line, thus reducing the proposed project's impact on the aesthetic perception of the viewer. Potential project visibility along each of the individual line-of-sight cross sections evaluated in this study (Figure 7, Sheets 2-7) are described below:

- Cross section A-A' indicates that trees and topography will be effective in screening the transmission line from most ground-level views along this line of sight, including views from the South County Trail, Chickasheen Brook, and State Routes 138, 2, and 110. However, in isolated areas of open agricultural land, such as the historic Cottrell Farm, the proposed transmission line, as well as the existing line, are likely to be visible.

- Cross-section B-B' shows the project's relationship to the University of Rhode Island. While there may not be visibility from ground-level views from within the University campus, the project is likely to be visible from some elevated vantage points, such as the upper floors of buildings, and from the open agricultural lands adjacent to the campus. The South County Trail, Chipuxet River, and Hundred Acre Pond recreational area will not experience views of the project along this line of sight due to the screening effect of adjacent forest vegetation.

- Cross-section C-C' indicates that views to the project along this line of sight are limited to isolated open agricultural settings, such as the West Allenton Road Turf Farm. These areas also have occasional views to the existing transmission line due to elevation, lack of tree cover, and/or proximity to the transmission line ROW. Elsewhere along this section line, the Amtrak railroad, South County Trail, and a water body labeled as "the Reservoir" should not have views of the proposed project.

- Cross-section D-D' shows that State Routes 2, 4 and 1A, as well as recreational resources such as Secret Lake, the Annaquantucket River/Reservoir, and Narragansett Bay should not have views of the existing or proposed transmission lines along this line of sight. Trees and topography successfully screen the transmission line from all locations along this line, outside the cleared ROW.

- Cross-section E-E' similarly shows that the vast majority of sites along this section line, including Ryan Park, the Amtrak railroad, State Routes 4, 102, 1A, and U.S. Route 1, should not have views to the existing or proposed lines. However, recreational resources adjacent to the transmission line, including Belleville Pond and Feuher Park are likely to have moderately increased views of the proposed line due to the greater height of the new structures.

- Cross-section F'-F' indicates that topography and vegetation will successfully screen the transmission line corridor from the majority of sites along this section line. These sites include the South County Trail (State Route 2), Tillinghast Road, the Amtrak Railroad, and State Route 4.

Field Verification

As mentioned previously, because the viewshed analysis ignores the screening effect of existing vegetation and structures, it represents an extremely conservative analysis of potential visibility. Similarly, because the cross sections only consider large blocks of vegetation and assume a 40-foot tree height, they also tend to overestimate project visibility from ground-level vantage points. To more accurately evaluate the potential visibility of the proposed project, the area within a 1-mile radius of the line, and selected areas within 3 miles of the line, were field reviewed on March 9 and 10, 2005. Views toward the project site from 149 representative/sensitive viewpoints were documented with photos and field notes (see Appendix B and C). Global Positioning System (GPS) coordinates were also obtained at each viewpoint to document viewer location, and the existing transmission structures were used as locational reference points. Documented viewpoints typically offered the most open, unobstructed views toward the project site, and/or included areas identified as visually sensitive, or having a high level of public use/visitation. Viewpoint locations within the study area are shown in Figure 8. The photos obtained during this field evaluation were used to determine where the proposed transmission facilities might realistically be visible, and which viewpoints would be appropriate for use in the preparation of visual simulations.

Field verification confirmed that the visibility of the existing transmission line is limited in the northern portion study area due to the hill and valley topography and the dense forest vegetation surrounding most public roads and areas of development. Longer distance views are generally confined to agricultural lands in the central and southern portions of the study area. However, corridors and patches of forest vegetation are still effective in screening most views to the existing lines in these open, flat landscapes. Throughout the study area visibility of the existing transmission line is largely limited to locations where the transmission line crosses existing roads or is in proximity to cleared yards in recently developed residential subdivisions. In these settings, foreground views of the line and the cleared ROW are available to drivers and residents. At the road crossings, open views are generally restricted to the cleared ROW (i.e., under the line, looking down the ROW). In these views the large size of the structures and linear orientation of the line and ROW can clearly be seen. However, these road crossing views are fleeting, and generally completely obscured by existing vegetation once the viewer is outside the limits of the cleared ROW. In some newer subdivisions, clearing for residential yards and subdivision roads has opened views to the existing line. In these situations, portions of the line can be seen through small openings and areas of remnant vegetation. These views are typically perpendicular to the line, and thus limited in terms of how much of the existing facilities (structures, conductor, and/or cleared ROW) can be seen. However, because they occur in a residential setting, they are often at foreground distance and perceived over prolonged periods of time. The dense forest vegetation that often borders sensitive sites (e.g., water bodies, natural areas, parks, and historic sites) generally impedes the viewer's perception to the line and/or cleared ROW. The proposed Tap line route and Tower Hill Substation site are also generally well screened from adjacent roads and residences by trees and blocks of mature forest vegetation. These conditions suggest that the type and extent of proposed project visibility will not be significantly different than that of the existing line.

Selected Viewpoints

Review of photos obtained from 149 viewpoints within and adjacent to the study area during the March 9 and 10, 2005 field verification resulted in the selection of eight viewpoints for use in the development of visual simulations. The selected viewpoints show representative views of the existing transmission line from various distances and directions. However, because distant visibility of the line is almost nonexistent (due to structure size and screening), all of the selected viewpoints are within the foreground (<0.5 mile) distance zone. This, along with the fact that photos were taken during the winter when trees lacked foliage, resulted in viewpoints that present a "worst case" image of project visibility and visual impact. Viewpoints were selected to include each of the identified viewer/user groups and LSZ's within the study area that would have views of the proposed project. The locations of the selected viewpoints are shown on Figure 9, and include the following:

Viewpoint 34 - View near Slocum Road, looking south.

Viewpoint 42 - View into Donald Downs Park, looking east.

Viewpoint 45 - View from the Slocum Woods residential development off of Slocum Road, looking northeast.

Viewpoint 46 - View from The Glen residential development between Shermantown Road and Slocum Road, looking northwest.

Viewpoint 71 - View from the Stony Lane transmission line crossing, looking south.

Viewpoint 115 - View from the Meadows Office Park off State Route 102, looking north.

Viewpoint 124 - View to the proposed substation site from Tower Hill Road, looking east.

Viewpoint 147 - View from State Route 102, southeast of Wal-Mart, looking northwest.

These viewpoints are illustrated as the existing conditions photographs in Figures 9 through 16.

Visual Simulations

To illustrate the anticipated visual changes associated with the proposed project, high-resolution computer-enhanced images were used to create realistic photographic simulations of the completed project (transmission line and substation) from each of the selected viewpoints. The photographs were taken with a Nikon D-70 digital camera with a 50 mm lens setting, to accurately represent scale as perceived by the human eye. Photographic simulations were developed using the transmission line and substation specifications and survey coordinates provided by the project engineers (see Appendix A). The proposed site layout plan and field survey data were translated into a common datum and a wire frame model of selected existing site features (vegetation, structures, existing transmission line, topography) was built in AutoCAD® 2005. Existing transmission line structures within the photos were modeled in their proper location based on survey information obtained from Narragansett Electric. The locations of other built features were determined using 2-foot resolution digital ortho quarter quad (DOQQ) and DEM data obtained from the University of Rhode Island Digital Image Server. The wire frame models were imported into 3D Studio Max 7.0® and three-dimensional components added. The model was then superimposed over the existing photos and aligned to existing elements visible in the photo to assure accurate scale, proportion and perspective. Minor adjustments were made to camera position, field of view, roll, and direction (within the GPS and camera range of error). Lighting was added to the model based on the latitude, longitude, date, and time of day the picture was taken. Consequently, the alignment, elevation, lighting, and location of the visible elements of the project, as shown in the simulations, are accurate and true to the proposed design and layout. To the extent possible, surface color, texture, and shading of the proposed materials (wood, corten steel, aluminum, and galvanized steel) were selected to replicate those proposed by Narragansett Electric or typically utilized on similar projects.

Simulations of the proposed project from each of the eight selected viewpoints are presented as the simulated views in Figures 9-16. Descriptions of the existing view from each of these viewpoints, along with a discussion of how these views would change with the proposed project in place, are presented below.

Analysis of Existing Viewpoints and Potential Project Visibility

Viewpoint 34 (Figure 9)

Existing View

Viewpoint 34 is from Old Yawgoo School Road near Slocum Road, in Slocum. The viewpoint is approximately 784 feet north of the nearest new transmission structure. This view typifies the working agricultural landscape scattered throughout the southern portion of the study area. Viewpoint 34 also illustrates the contrast between the flat, open cropland and the undulating band of heavy forest that forms a backdrop in most open views within the Rural Residential/Agricultural LSZ. In this photo, the existing 115 kV transmission line cuts across the open field in the midground, with the vertical H-frame structures punctuating the horizon line. The existing transmission line is visually significant and attracts the viewer's attention due to its vertical line, which contrasts with the horizontal field edges and tree line. Visibility of the existing line is enhanced by the flatness and openness of the foreground view.

Proposed Project

With the project in place, the new transmission line is clearly visible running parallel to the existing line. The existing 115 kV transmission line appears subordinate to the new line, due to the greater height and structural heaviness of the single-shaft steel poles in comparison to the visually lighter H-frame wood poles. The combination of the parallel utility lines and repeated pattern of pole placement increases the visual dominance of the transmission structures against the sky and their contrast with the horizontal line of the background trees and the agricultural fields. However, the land use contrast of the proposed line is significantly reduced due to the presence of the existing line.

Viewpoint 42 (Figure 10)

Existing View

Viewpoint 42 is toward Donald Downs Park from Indian Corner Road, east of Slocum. The viewpoint is approximately 721 feet west of the nearest proposed transmission line structure and is one of the most open views available from a recreational site within the study area. The view into the park includes a well-groomed recreation area and clubhouse with baseball field and bleachers,

ornamental landscape plantings, and a parking area. However, views from the park to the surrounding landscape are dominated by the dense vegetation that typifies the Undeveloped Forestland LSZ. Because Indian Corner Road borders multiple sides of the park, views in this area are available to local residents as well as recreational users. A single existing wood H-frame structure is visible against the dense deciduous and evergreen forest that defines the midground horizon line. Since the conductors do not exceed the vegetation in height, they are not obvious in this view.

Proposed Project

With the proposed project in place, the recreational facilities of Donald Downs Park remain the dominant visual elements in the view. However, one new davit arm structure is clearly visible in proximity to the existing H-frame structure. In addition, the vegetative clearing that was required to accommodate the placement of this structure is also evident. However, the dense evergreen forest behind the line, and site vegetation in front of the poles, blend the structure into the view and minimize its visual dominance and impact. This vegetation also completely obscures other proposed structures along the new line. The repeated existing vertical elements in the view (light poles, flag poles, park plantings) further reduce the visual contrast of the new davit arm structure.

Viewpoint 45 (Figure 11)

Existing View

Viewpoint 45 is from Slocum Road near the new Slocum Woods residential development in North Kingstown. The viewpoint is within the existing transmission line ROW, and approximately 170 feet southwest of the nearest proposed transmission structure. The existing transmission line dominates the foreground and midground view and strongly contrasts the surrounding natural vegetation and residential structures. The deciduous vegetation to the left of the transmission line frames the corridor, as does the narrow vegetation buffer adjacent to the new homes. The development advertising sign adds visual clutter and causes visual tension in the center of the view due to its skewed alignment. This photo represents a “worst case” scenario within the Suburban Residential LSZ, where vegetative screening is minimal (especially during the winter when trees are bare) and the existing transmission line and cleared ROW are dominant foreground features in the view.

Proposed Project

The proposed view shows the new transmission line running parallel to the existing line. At this distance, the new structures appear very large, and all components are clearly visible down the cleared ROW. Although compatible with the existing use of the ROW, the color and scale of the new structures contrast strongly with the adjacent residential land use. Forest vegetation on the left side

of the ROW is dense enough to accommodate the required clearing for the new structures, while still maintaining a visual buffer. However, the lack of substantial vegetative screening along the right side of the ROW will allow clear views of the project from adjacent residential properties. Although the new davit arm structures contrast with the existing structures in scale and color, they are similar in their vertical line and rhythmic spacing, creating a unified pattern and visual continuity in the view.

Viewpoint 46 (Figure 12)

Existing View

Viewpoint 46 is from Sylvan Court (off of Shermantown Road) in a residential development (The Glen) in North Kingstown. The viewpoint is approximately 565 feet southeast of the nearest proposed transmission structure, and is similar to those that may be available from older residential developments where greater amounts of forest vegetation buffer residences from the adjacent ROW. A paved roadway, edged by roadway signage, mailboxes, and landscape plantings, dominates the view. This road crosses Douglas Drive and terminates as a dead-end at the existing transmission line ROW. The view is carried through an opening in the forest vegetation at the road's terminus, across open agricultural lands and residential properties, to a vegetated background ridge (with a cell tower visible on the ridge top). The long distance view across agricultural lands is unusual in most residential settings, but typifies those available in the Rural Residential/Agricultural LSZ. The foreground vegetation to the west screens both the residential property and much of the existing transmission line in the midground view. In addition, the existing utility distribution poles and associated wires are clearly visible against the sky, thereby reducing the visibility and visual contrast of the transmission line conductors, which cross the midground of this view.

Proposed Project

With the project in place, one new structure is clearly visible to the right of the residence in this view. However, the character of the view has not significantly changed, and the continued dominant view is along the roadway, out to the rural agricultural fields and background ridge. Although the new conductors are visible, the existing overhead lines and forest vegetation significantly obscure their visibility. The existing forest and residential landscape plantings also break up or screen views of the transmission line structures, significantly reducing the visual impacts of the new line. The new davit arm structure contrasts the existing H-frame structures in scale and color, but is consistent in line, form, and perceived scale with the utility pole along the roadside. The roadside utility pole is visually dominant over the new structure due to its proximity to the viewer and light color.

Viewpoint 71 (Figure 13)

Existing View

Viewpoint 71 is from Stony Lane, east of Route 2 in North Kingstown, at the road crossing of the existing transmission line. The viewpoint is within the existing cleared ROW, approximately 95 feet north of the nearest proposed transmission structure. The existing structures and overhead lines (115 kV and 34.5 kV) are the dominant features in this view. Their dominance and visual contrast is accentuated by the strong contrast between the light and dark elements within this view due to the low sun angle and back-lit sky condition. The mature forest vegetation along the edges of the ROW also focuses the view into the center of the transmission corridor, further reinforcing the visual dominance of the existing H-frame structures. However, the topography conceals portions of the existing transmission line, and its visual dominance is reduced as the poles recede into the distance. This view is from the Undeveloped Forestland LSZ, and illustrates the only condition (i.e., a road crossing) under which the existing line and cleared ROW are fully visible within this zone.

Proposed Project

With the project in place there is not a significant change in the character of the view. The installation of the new davit arm structures requires additional vegetative clearing within the ROW, but the perceived width of the cleared ROW is not significantly greater, and the remaining vegetation is substantial enough to maintain an effective visual buffer. Due to the back-lit condition, the color of the new steel poles does not contrast significantly with the existing wood structures. The line and perceived scale of the new structures are also fairly compatible with the existing structures in this view.

Viewpoint 115 (Figure 14)

Existing View

Viewpoint 115 is from the Meadows Office Park off State Route 102 in North Kingstown The viewpoint is approximately 577 feet south of the nearest proposed transmission structure that will be visible from this location. This view is from the Commercial LSZ, but contains multiple land uses, including a historic cemetery. The historic cemetery is adjacent to, and in full view of, the office building and the parking area. Vehicular parking dominates this view and extends on multiple sides of the office building. Large shade trees settle the building into the site and balance the view across the parking lot. The existing transmission line is visible on the wooded hillside in the midground. However, the existing H-frame structure and conductors are not visually dominant in the view, since they are well concealed within the forest vegetation that borders the ROW.

Proposed Project

With the project in place, the level of visual change is fairly significant, and the character of the view is changed. The greatest change results from the vegetation clearing that is required to accommodate the installation of the new transmission line. With the proposed project in place, existing vegetative screening along the edge of the ROW has been removed, and the cleared ROW, existing structures, and proposed line all become clearly visible. With the removal of trees, the open slope takes on a disturbed/developed appearance. The existing H-frame and three-pole corner structures are visually co-dominant with the new davit arm structures due to their consistent vertical line and perceived similarity in height (due to the grade change along the cross slope of the ROW). The sense of enclosure and containment in this view has been compromised by the vegetation removal, as has the aesthetic quality of the historic cemetery. However, it should be noted that this view is a worst case scenario, and does not typify those available within the Commercial LSZ.

Viewpoint 124 (Figure 15)

Existing View

Viewpoint 124 is off Tower Hill Road (north of West Allenton Road), looking toward the proposed Tower Hill Substation site. Because views to this site from Tower Hill Road are almost completely screened by structures and vegetation (see Viewpoint 125 in Appendix B), this photo was taken from a backyard location off Tower Hill Road that offered the clearest view to the site. The viewpoint is approximately 578 feet east of the proposed substation site, and located in the Suburban Residential LSZ. The foreground view is dominated by an open yard area that extends from residences to the south. The homes themselves are not included in this view, and are generally well screened from the proposed substation site by dense vegetation, however a few homes do have a screened view into the site. The shrub and tree vegetation in the midground of this view forms a spatial tension and creates distinct foreground and midground spaces. An existing transmission line runs north to south through the site, but does not dominate the view. The dense evergreen vegetation on each side of the viewpoint keeps the viewer's attention focused at ground level.

Proposed Project

With the proposed project in place, the new substation facility and two new corten steel poles are visible along the existing ROW. The edges of a curving access road to the substation are also apparent. The new steel poles and substation facilities draw the viewer's attention due to their contrast with the existing landscape in terms of line, color, and land use. Although this contrast is lessened somewhat by the presence of the existing overhead lines, the new facility changes the more-or-less undeveloped character of the view. A newly installed landscape berm and evergreen screen planting partially screens the proposed substation, which reduces its effect on the visual

character of the view. This screening will become more effective as the planted trees mature and eventually block views of the substation and poles.

Viewpoint 147 (Figure 16)

Existing View

Viewpoint 147 is from State Highway 102 (Ten Rod Road), southeast of the Wal-Mart. The viewpoint is located in the Commercial LSZ, and is approximately 1100 feet southeast of the nearest proposed transmission structure. The view is typical of views within this zone, and is dominated by buildings, highway, automobiles, traffic signals, utility poles, directional signage and streetlights. This view terminates at a midground ridge of forest vegetation that holds the viewer's eye. There is a visual tension between the upright wooden utility poles and their angled support structures on the left side of the view. Strong color contrast is provided by the bright red color of the roof on the right side of the view. This view is cluttered by the varying style and scale of site and roadway features, and the random planting of deciduous and evergreen landscape materials. The existing transmission line crosses the highway in the midground view, but is barely distinguishable among the foreground visual clutter.

Proposed Project

With the proposed project in place, the new davit arm structures and conductors are visible, but difficult to perceive amongst the existing streetlights, utility lines, and visual clutter in this view. The existing light poles, signal and utility poles, and associated overhead lines provide foreground screening of the project and remain the dominant vertical elements within the view. It is likely that the existing foreground visual clutter will continue to obscure views of the new transmission line until viewers pass directly under the lines.

Project Alternatives

Alternatives to the proposed transmission line were illustrated in two of the representative viewpoints. These alternatives included 1) carrying the new line on wood pole, H-frame structures, similar to the existing line, and 2) combining the existing and proposed line on new double circuit, corten steel, davit arm structures. The alternatives were illustrated in viewpoints 34 and 45 because these locations provided the clearest views of the transmission lines, looking both across and down the ROW. Simulations of the alternatives were evaluated in comparison to the project as proposed (see Figures 17-20). The results of this evaluation are summarized below:

Parallel Line on H-Frame Structures (Figures 17 and 19)

With this alternative, visual impact is reduced when compared to the preferred alternative. The existing and proposed structures now appear almost identical, thus eliminating the scale, color and form contrast noted with the davit arm structures. The different color and size of the steel cross-arm and insulators on the new line are visible in viewpoint 45, but the new and existing structures still appear very similar. In both viewpoints, the two lines present a unified style and read as a single entity. As such, they are less discordant with the surrounding landscape. The lower height and narrower profile of the wood poles also appear lighter on the land and against the sky.

Double Circuit Davit Arm Structures (Figures 18 and 20)

Combining the new and existing line onto double circuit davit arm structures also reduces the project's visual impact. Not only does this approach unify the structure types, it also eliminates the need for two parallel lines. Although the proposed structures are taller and heavier than all other alternative structures, and more complex than the single circuit davit arm structure, these impacts are outweighed by the benefits of consolidating the project into a single line. This minimizes visual clutter and presents a coherent, well-defined project. Because it reads as a single line, the difference in impact between the existing line and this alternative is almost negligible. Consequently, this alternative is considered the best in terms of minimizing visual impact (although other environmental, technical and economic impacts would need to be considered to determine if this alternative is desirable).

Visual Impact Assessment Rating

The visual impact assessment methodology utilized on this project follows the USACE Visual Resources Assessment Procedure (VRAP) (Smardon et al., 1988). This is essentially a two-step process. The first step, referred to as the Visual Resource Management Classification System (MCS), uses a numerical rating system to define the aesthetic quality of the various landscape similarity zones (LSZ) within the study area. The second step, referred to as the Visual Impact Assessment (VIA) procedure, involves using a similar numerical rating system to compare representative views with, and without, the proposed project in place and quantify visual impact. A description of this two step rating process is described below.

Visual Resource Management Classification

The aesthetic quality of each of the LSZ's within the study area was evaluated by a professional panel of three EDR Landscape Architects using the MCS developed by the USACE (Smardon et al., 1988). For each zone, six landscape components (landform, water resources, vegetation, land use,

user activity, and special considerations) were rated as “distinct”, “average” or “minimal”, and given a numerical score. These rating categories, as defined by the USACE VRAP, are presented in Table 4, below. Because the rating panel felt that the standard three point rating system used in the USACE VRAP did not allow them to accurately assess existing visual quality, the forms were modified to utilize a scoring range of 1 (minimal) to 9 (distinct) for each landscape component. To generate a composite rating for each zone, the numerical scores from each evaluator were totaled, averaged and scaled back to the 1 to 3 scale used the USACE VRAP. The range of possible scores is from 6 to 18. The composite rating (rounded to the nearest whole number) places each LSZ in one of five Resource Management Classifications defined by the USACE. The Resource Management Classification is used to determine the degree and nature of visual change that is acceptable in a landscape. The five MCS categories, as defined by the USACE VRAP, are presented in Table 5.

Table 4. Levels of Visual Quality.

Distinct – something that is considered unique and is an asset to the area. It is typically recognized as a visual/aesthetic asset and may have many positive attributes. Diversity and variety are characteristics in such a resource.
Average – something that is common in the area and not known for its uniqueness, but rather is representative of the typical landscape of the area.
Minimal – something that may be looked upon as a liability in the area. It is basically lacking any positive aesthetic attributes and may actually diminish the visual quality of surrounding areas.

Table 5. Resource Management Classifications.

Preservation Class – These areas are considered to be unique and to have the most distinct visual quality in the region. They are highly valued and are often protected by federal and state policies and laws. These areas may include significant natural areas, portions of wild and scenic rivers, historic sites and districts, and similar situations where changes to existing visual resources are restricted. While limited project activity is not precluded, it should not be readily evident. MCS Score = 17 or more
Retention Class – These areas are regionally recognized as having distinct visual quality, but may not be institutionally protected. Project activity may be evident, but should not attract attention. MCS Score = 14-16
Partial Retention Class – These areas are locally valued for above average visual quality, but are rarely protected by institutional policies. Project activity may be evident and begin to attract attention. Structures, operations, and use activities associated with the project should remain subordinate to the existing visual resources. MCS Score = 11-13

Modification Class – These areas are not noted for their distinct qualities and are often considered to be of average visual quality. Project activity may attract attention and dominate the existing visual resources. Structures, operations, and use activities may display characteristics of form, line, color, texture, scale, and composition that differ from those of the existing visual resources. However, the project should exhibit good design and visual compatibility with its surrounding. MCS Score = 9-10
Rehabilitation Class – These areas are noted for their minimal visual quality and are often considered blighted areas. Project activity in these areas should improve the existing undesirable visual resources. Structures, operations, and use activities should exhibit good design and display characteristics of form, line, color, texture, scale, and composition that contribute to making the area compatible with the visual character of adjacent higher quality landscapes. MCS Score = less than 8

The MCS evaluation conducted by the rating panel indicated that none of the LSZ's in the study area have the unique, high-quality visual character required for designation as Preservation Class landscapes. In addition, only the Undeveloped Forestland LSZ was considered to possess the visual quality necessary to qualify as a Retention Class landscape. All of the remaining zones were classified as either Partial Retention or Modification. This reflects the rating panel's assessment of landform, vegetation, land use and user activity as typically "average" within most LSZ's in the study area. Results of the visual resource management classification conducted by EDR's in-house panel of Landscape Architects are included in Appendix D and summarized in Table 6 below.

Table 6. MCS Classification of Landscape Similarity Zones.

Zone #	LSZ	MCS Score	MCS Classification
1	Suburban Residential	12	Partial Retention
2	Commercial	10	Modification
3	Rural Residential/ Agriculture	12	Partial Retention
4	Undeveloped Forestland	14	Retention
5	Transportation	11	Partial Retention

The classification ascribed to each LSZ provides guidance as to the degree and nature of visual change (as determined by the VIA) that is acceptable in a landscape.

Visual Impact Assessment

The panel of three EDR landscape architects also evaluated the visual impact of the proposed project using the USACE Visual Impact Assessment (VIA) methodology. The VIA evaluation involved viewing 11"x17" color prints of the selected representative viewpoints described previously.

For each viewpoint, two images were shown, including the existing view and the simulation of the proposed transmission facilities. The location of each viewpoint, its LSZ, typical viewer groups, proximity to sensitive sites, and distance and direction from the project site were also described to the panel.

Following review of the simulations for each viewpoint, the rating panel members evaluated the before and after views and assigned each view quantitative visual quality ratings. The ratings were based on the visual quality of each of six landscape components (landform, water resources, vegetation, land use, user activity, and special considerations). Panel members utilized a rating scale of 1 to 9, and were also allowed to rate in decimal increments. Such fine-tuning of the rating system is allowed under the USACE VRAP (Smardon et al., 1988; page 58) to increase the sensitivity of the analysis. The panel also evaluated various design elements (line, form, color, texture and scale) in each before and after view.

Each panel member's ratings were compiled as an average for each viewpoint and scaled back to the 1 to 3 scale used by the USACE VRAP. The individual ratings were then averaged to generate composite ratings for each viewpoint. The difference between the ratings of the existing and proposed view is the basis for the evaluation of project-related visual change. Impact ratings were then compared to the sensitivity of the LSZ, as determined by their MCS classification. Each MCS classification has the following impact threshold

Preservation Class – 0
Retention Class – No lower than -2
Partial Retention Class – No lower than -5
Modification Class – No lower than -6
Rehabilitation Class – Greater than 0 (i.e. project should only improve visual quality)

Score that exceed these impact threshold values indicate an unacceptable level of visual impact and the need to explore visual mitigation options. Results of the VIA conducted by EDR's panel of Landscape Architects are presented in Appendix D, and summarized in Table 7, below.

Table 7. Visual Impact Assessment Summary.

Viewpoint No.	LSZ	MCS Classification	Impact Threshold	VIA			
				LA1	LA2	LA3	Average
34	Rural Residential/Agricultural	Partial Retention	-5	0	-.17	-.33	-.17
42	Undeveloped Forest	Retention	-2	0	0	0	0
45	Suburban Residential	Partial Retention	-5	-.53	-.33	-.33	-.40
46	Suburban Residential	Partial Retention	-5	0	0	0	0

71	Undeveloped Forest	Retention	-2	0	0	0	0
115	Commercial	Modification	-6	-.67	-.67	-.83	-.72
124	Rural Residential/Agricultural	Partial Retention	-5	-.17	-.17	0	-.11
147	Commercial	Modification	-6	0	0	0	0

As this table shows no visual impact was noted in four out of the eight viewpoints. In these instances, visual change with the project in place was either imperceptible or did not significantly alter the character of the vegetation, landform, land use, or user activity in the view. Some level of adverse visual impact was noted in the remaining viewpoints. In views of the proposed transmission line, this impact typically related to the new structure's contrast in line, color, form, and/or scale with existing elements in the landscape. This included contrast with the existing H-frame wood pole structures. The viewpoint with the greatest impact (Viewpoint 115) was also the one where the effect of additional ROW clearing and loss of vegetative screening was most noticeable.

To a large extent the project's adverse visual impact was mitigated by its proximity to the existing transmission line and cleared ROW. This location limits the extent of required ROW clearing, and significantly reduces the project's contrast with existing land use. In addition, where impacts were noted, they were generally limited due to the screening effects of vegetation that will remain following project construction. Adverse impact was generally confined to near foreground views where existing screening was lacking and/or proposed ROW clearing was obvious. The most significant adverse impacts were noted in those views where the contrast between the new structures and existing land use (including the existing H-frame structures) was most obvious. However, in no case did the level of adverse visual impact come close to exceeding the threshold of allowable impact for any LSZ within the study area. Consequently, the VIA analysis suggests that no additional actions/project modifications are necessary to mitigate adverse visual impact.

Because the VIA did not indicate a significant adverse visual impact, project alternatives were not formally evaluated by the EDR rating panel. However, simulations of these alternatives were reviewed by members of the panel, and determined to have reduced visual impact when compared to the preferred alternative. As described previously, both the parallel H-frame alternative and the double circuit davit arm alternative reduced visual contrast between the existing and proposed line, and presented a more unified project appearance that was more compatible with the surrounding landscape.

CONCLUSIONS

The visual analyses performed by EDR indicate that the proposed project will have limited visibility, will not significantly increase visibility of the existing facilities, and will not significantly impact the visual/aesthetic character of the study area. Specific conclusions include the following:

- Viewshed analysis indicates that potential visibility of the proposed line is almost identical to that of the existing line, and largely confined within the 1-mile radius study area.

- Line-of-sight cross section analysis indicates that existing vegetation, structures and topography will be very effective in screening views of the proposed line from most areas within and adjacent to the study area (including visually sensitive sites).

- Field review confirmed the results of the cross section analysis and revealed that views of the existing line are largely restricted to road crossings, open fields and some newer residential subdivisions with 0.5 mile of the transmission line corridor.

- MCS evaluation of the Landscape Similarity Zones within the study area revealed that the visual quality of landscape components within these zones are generally considered average, and that none of the zones possess the high quality features that would define them as Preservation Class landscapes.

- The VIA conducted by EDR indicated that adverse visual impacts of the line are generally modest and do not exceed the threshold of allowable impact for any LSZ within the study area. This is largely attributable to the occurrence of the proposed project adjacent to an existing transmission line, and the effective screening provided in most views by existing trees.

RECOMMENDATIONS

Although the VIA conducted by EDR did not indicate the need for visual mitigation, several recommendations are provided that would further reduce the project's visual impact. These include the following:

- If considering alternate routing, keep the proposed line within or adjacent to an existing transmission line corridor.

- If considering alternate material/finish for the steel poles, give preference to corten steel over either painted or galvanized finishes.

- The dark color of the corten steel davit arm structures, while appearing natural and blending well with background vegetation, do contrast with the color, scale and form of the existing H-frame structures. The feasibility of either the parallel H-frame alternative or the consolidated double circuit davit arm alternative should be further explored, as both these alternatives reduced adverse visual impact. Because the VIA concluded that such mitigation is not required, the visual benefit of these alternatives must be weighed carefully against any potential adverse environmental, operational, and economic impacts they may entail.

- In selected sensitive locations where ROW clearing significantly increases the visibility of the proposed and/or existing line, the feasibility of screen plantings should be evaluated.

- When building the proposed substation, limit clearing of the existing conifer screen to the fullest extent possible and install supplemental or larger planted trees to screen views of the facility from adjacent residences.

- The cumulative effect of adding a new line to the existing transmission corridor, could be reduced or avoided by pursuing one of the alternatives considered in this evaluation. As mentioned previously, matching the existing structure type or consolidating the existing and proposed lines have visual benefits that should be evaluated relative to other environmental, economic, and/or operational considerations.

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Figures

Appendix A

Construction Plans and Details – On Enclosed CD

Appendix B

Photo Log – On Enclosed CD

Appendix C

Field Notes – On Enclosed CD

Appendix D

MCS and VIA Rating Forms – On Enclosed CD