SECTION 3.0 - PROJECT COMPONENTS

This section of the COM Plan introduces the components associated with the construction of the projects. Included in this section is a brief description of the facility design including tower and pole structures, foundations, conductors, insulators and associated hardware, overhead ground wire, fiber optic cable and regeneration (regen) sites, access roads, and substations. Also included in this section is information regarding right-of-way acquisition and right-of-way and line crossings.

3.1 FACILITIES DESIGN

The design, construction, operation, and maintenance of the project facilities will meet or exceed the requirements of the National Electrical Safety Code (NESC) and U.S. Department of Labor, Occupational Safety and Health Standards. The Construction Contractor will be responsible for properly grounding all metallic fences that parallel the transmission line for more than 500 feet and are located within 150 feet of the centerline. Grounding also will include large metal buildings and other types of metallic objects within 150 feet of the centerline.

Based on Avian Power Line Interaction Committee recommendations (Avian Power Line Interaction Committee 1996), adequate spacing between conductors (8 feet or greater based on the wingspan of female Bald Eagle) will be implemented. In addition, shield wires will be grounded at regular intervals and insulated hardware and conductors will be used. Characteristics of the transmission line for the SWIP – Southern Portion and SWIP – Central Portion are described below and summarized in Table 3-1.

3.1.1 Towers and Poles

Lattice towers will be used for the majority of the proposed 500kV transmission line. The towers will be self-supporting, steel lattice made of galvanized steel with a dulled finish. The proposed single-circuit tangent and dead-end, lattice tower configurations and design are illustrated in Figures 3-1 and 3-2 (following Table 3-1). Tower-to-tower spans (ruling span) will average 1,200 to 1,600 feet. Single-circuit tower heights will range between 90 to 175 feet. Double-circuit towers will be used for a total combined length of approximately 2.7 miles of the line, along Bothwick Road in the SWIP – Central Portion, and west of the Delamar Wilderness Area in the SWIP – Southern Portion (see Map Set 2, pages 21 and 167 to 169). The double-circuit, lattice tower configuration and design are illustrated in Figure 3-3 (following Table 3-1). Double-circuit, lattice tower heights will range between 150 to 190 feet and will span 800 to 1,600 feet.

TABLE 3-1
DESIGN CHARACTERISTICS OF THE SWIP 500KV TRANSMISSION LINE

Feature	Description
Line Length	264 miles for both projects. • 230 miles for the SWIP – Southern Portion • 34 miles for the SWIP – Central Portion
Type of Structure	Self-supporting, steel lattice towers, steel poles, and steel H-frame structures
Structure Height	Lattice towers - 90 to 175 feet; steel poles - 120 to 150 feet; H-frames - 120-160 feet
Span Length	Lattice towers - 1,200 to 1,600 feet; steel poles - 1,200 to 1,600 feet; H-frames - 1,200-1,600 feet

TABLE 3-1 DESIGN CHARACTERISTICS OF THE SWIP 500KV TRANSMISSION LINE	
Feature	**Description**
Number of Structures per Mile	3 to 5
Right-of-Way Width	200 feet
Land Temporarily Disturbed	
Structure Work Area	Right-of-way width x 200 feet length per structure (assembly, erection and crane pads typically require 200 x 200 feet per structure)
Wire-Pulling and Tensioning Sites	Right-of-way width x 600 feet for dead-end structure conductor and shield wire sites (at all deadend structures) Right-of-way width x 600 feet for mid-span conductor and shield wire setup sites (approximately every 9,000 feet) 100 feet width x 600 feet for fiber optic cable setup sites (approximately every 18,000 feet)
Wire-Splicing Sites	Right-of-way width x 600 feet per conductor and shield wire setup site (approximately every 9,000 feet) Right-of-way width x 600 feet each for fiber optic cable setup site (approximately every 18,000 feet)
Construction Yards	12 to 14 total locations expected for both projects collectively (10-12 for the SWIP – Southern Portion and 2 for the SWIP – Central Portion), but not yet determined (possible locations: Ely/McGill area; Preston/Lund area; Sunnyside area; Hiko/Alamo area; Moapa/Apex area)
Batch Plant Sites	18 to 19 locations expected for both projects (estimated size approximately 2-3 acres) • 16 locations for the SWIP – Southern Portion • 2 to 3 locations for the SWIP – Central Portion
Guard Structures	100 x 100 feet at road and existing electrical line crossings
Land Permanently Required	
Structure Base	Lattice Tower (tangent) - 28.56 square feet (4 x 3 feet diameter foundations) Lattice Tower (angle) - 50.24 square feet (4 x 4 feet diameter foundations) Lattice Tower (dead-end) - 113.04 square feet (4 x 6 feet diameter foundations) H-Frame Structure (tangent) - 76.93 square feet (2 x 7 feet diameter poles) H-Frame Structure (dead-end/angle) - 235 square feet (3 x 10 feet diameter poles)
Regen Sites	• In area west of Tower 110 – within or near Thirtymile Substation • In area south of Tower 254, near power line - north of Highway No. 6 and south of White River • In area north of Tower 394, near power line crossing - west of Tule Field Reservoir • In area east or south of Tower 596, near power line crossing - west of Burnt Springs Range • In area near Tower 751, near existing substation and power line - east of Pahranagat National Refuge • In area south of Tower 892, near power line crossing - southeast of intersection of Highway 93 and Highway 168
Access Roads	
Paved Roads	These roads are typically highways and state routes and will be used for travel to existing and new dirt roads to access the right-of-way. (e.g., US 93, US 50, US 6 , and SR 318)
Dirt Roads (no improvement)	Requires no improvement to dirt/gravel road
Dirt Road (with improvements)	Improvement of existing dirt road up to 20-foot-wide access road with a 2-foot berm on either side (assuming existing 10-foot-wide road)
New Access Road (bladed)	Road, graded to a width of up to 20 feet, with a 2-foot berm on either side
Overland Access	Drive and crush (maximum width is 24 feet)
Electrical Properties	
Nominal Voltage	525,000 volts alternating current
Capacity	Up to 3,000 megawatts

TABLE 3-1 DESIGN CHARACTERISTICS OF THE SWIP 500KV TRANSMISSION LINE	
Feature	**Description**
Circuit Configuration	Single-circuit with 3 phases per structure, 3 sub-conductors per phase, double-circuit with 6 phases per structure, 3 sub-conductors per phase
Conductor Size	1,590 aluminum-stranded conductors with a steel-stranded reinforced core (ACSR)
Ground Clearance of Conductor	31 feet minimum at 212 degrees Fahrenheit
Substation Properties	
Substation (Thirtymile)	Approximately 77 acres, 500/345kV Breaker and one-half configuration
Harry Allen	1 new 500kV line position needed and one new series capacitor built within the existing fenced area

At the request of the BLM and Nevada Department of Wildlife, H-frame structures will be used in certain areas determined to be critical to the Greater Sage Grouse (SWIP – Central and Southern Portions) and the Mojave Desert Tortoise (SWIP – Southern Portion), and which are conducive to construction of such structures. Self-supporting steel poles will be used in conjunction with the H-frame design at points requiring heavy angles or deadend structures. The locations of these structures are identified in Appendix B2 – Biological Protection Plan and depicted in Map Set 2. The self-supporting steel poles and H-frame structures will be designed as single-circuit structures made of corten or with a painted steel coating. The proposed pole configuration and design is illustrated in Figures 3-4 and 3-5. Pole-to-pole spans (ruling span) will average 1,200 to 1,600 feet. Pole heights will be approximately 120 to 160 feet. It should be noted that the weight of the H-frames precludes the use of helicopters for construction.

On the single-circuit portion of the route, tower spans were designed to allow for the longest spans practical for this type of construction. Engineering constraints and terrain requirements dictated tower locations in the double-circuit portion of the routes in the SWIP – Southern Portion and SWIP – Central Portion.

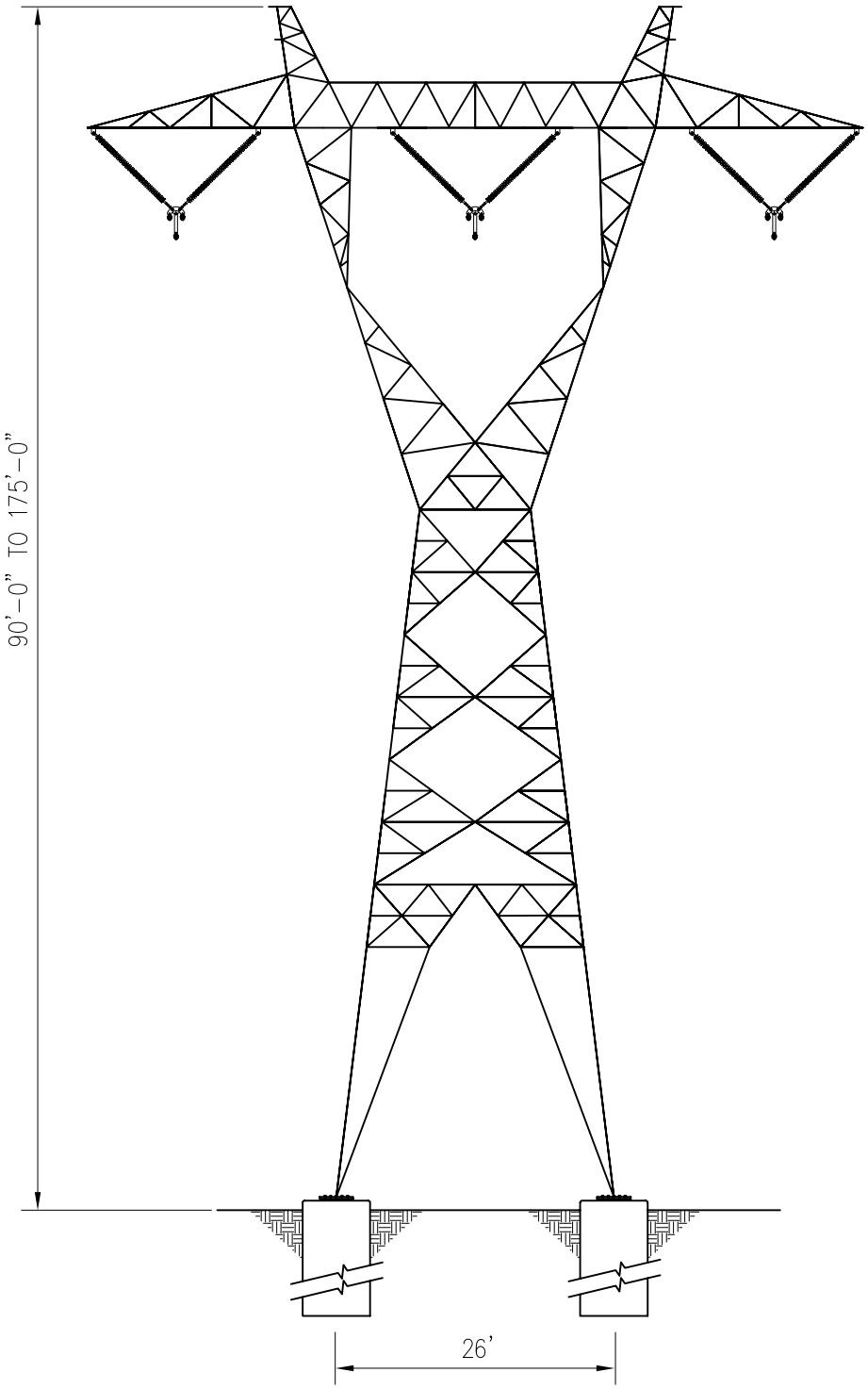
3.1.2 Foundations

The 500kV self-supporting, steel-lattice towers require four footings. The foundations for the steel-lattice towers will be cast-in-place concrete approximately 3 to 5 feet in diameter for single-circuit with a 15- to 20-foot depth and 4 to 6 feet in diameter for double-circuit with a 25- to 35-foot depth.

The self-supporting, steel poles (three single poles for turning structures, as illustrated in Figure 3-5) require one footing for each pole and H-frame structures require two footings. The self-supporting tubular-steel structures will be installed on a single pier with anchor-bolt foundations or directly imbedded into the foundation. Foundations for these structures will typically be 6 to 10 feet in diameter and 25 to 55 feet in depth.

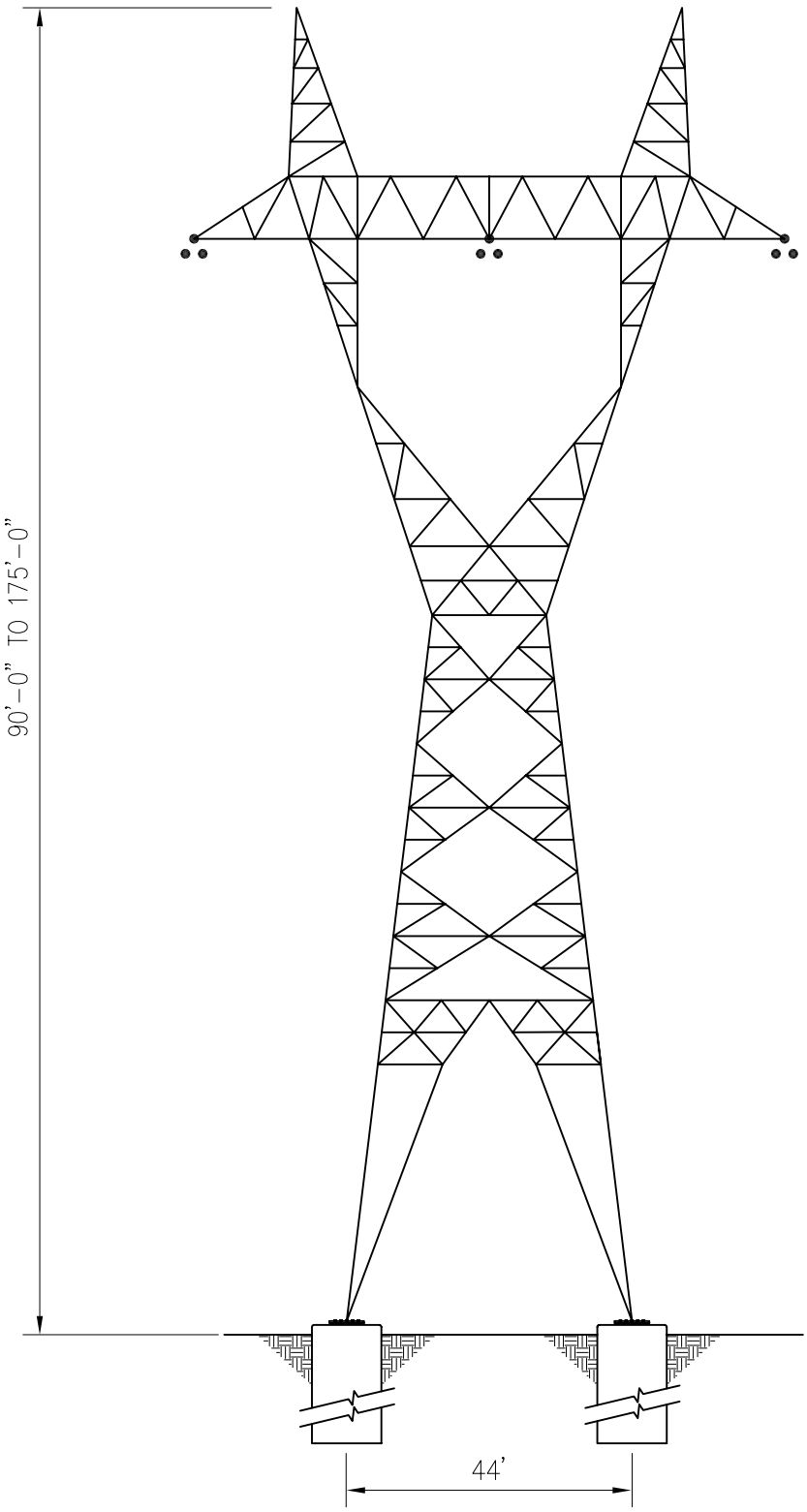
3.1.3 Conductors

The 500kV line will consist of three phases for the single-circuit and six phases for the double-circuit, with a three-conductor bundle (i.e., three sub-conductors) per phase in an equilateral triangle, 18 to 24 inches per side. Each conductor will be aluminum stranded, non-specular conductors of the ACSR core design.



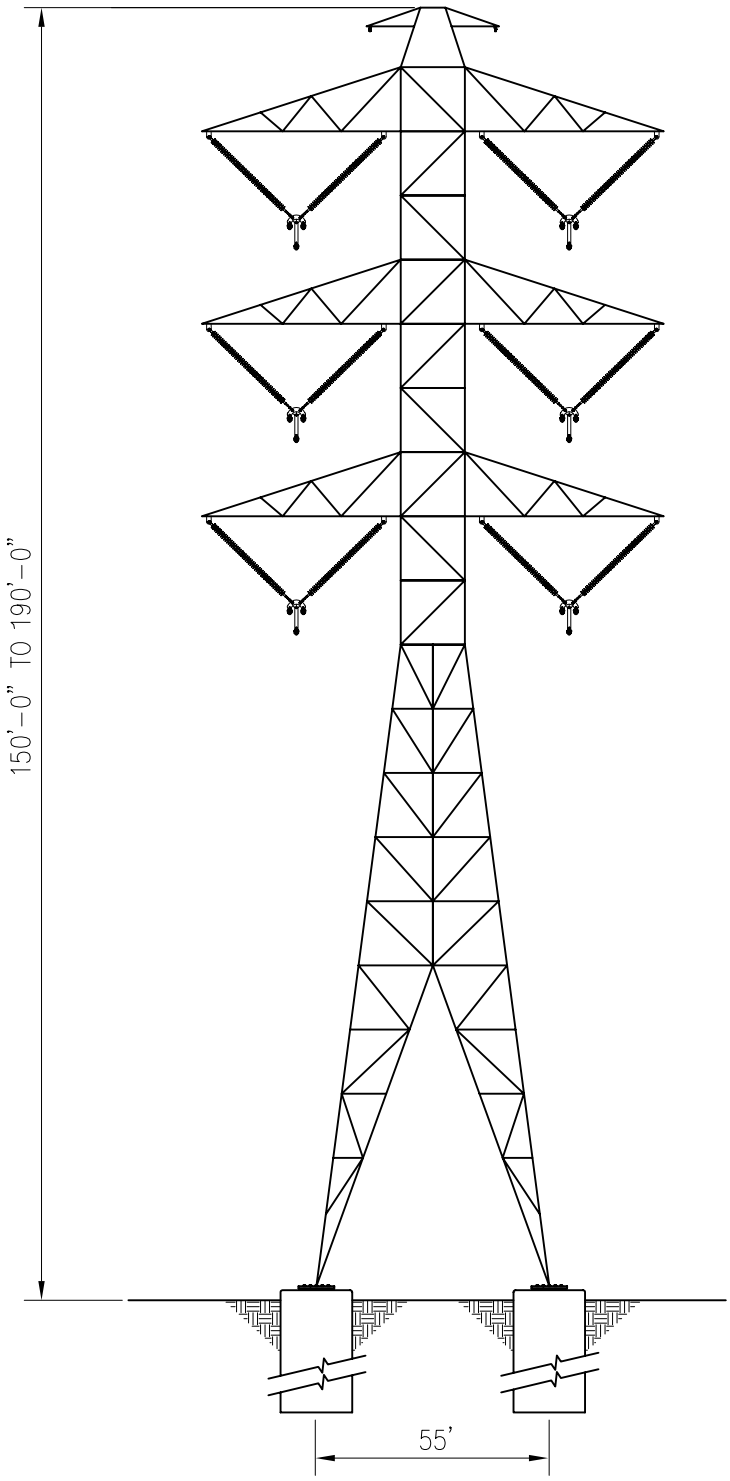
Typical 500kV Single Circuit Lattice Tangent Structure

Figure 3-1



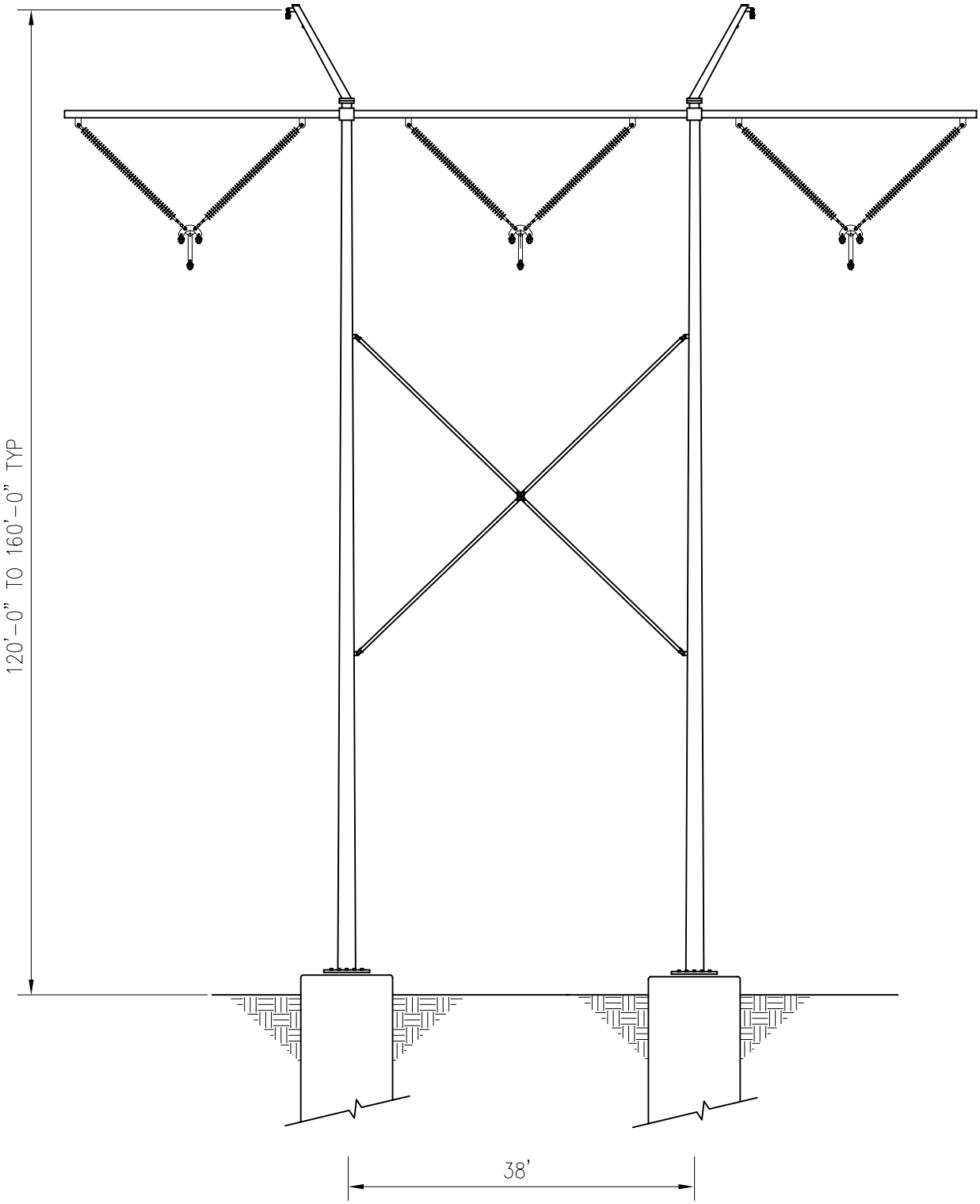
Typical 500kV Single Circuit Lattice Dead End Structure

Figure 3-2



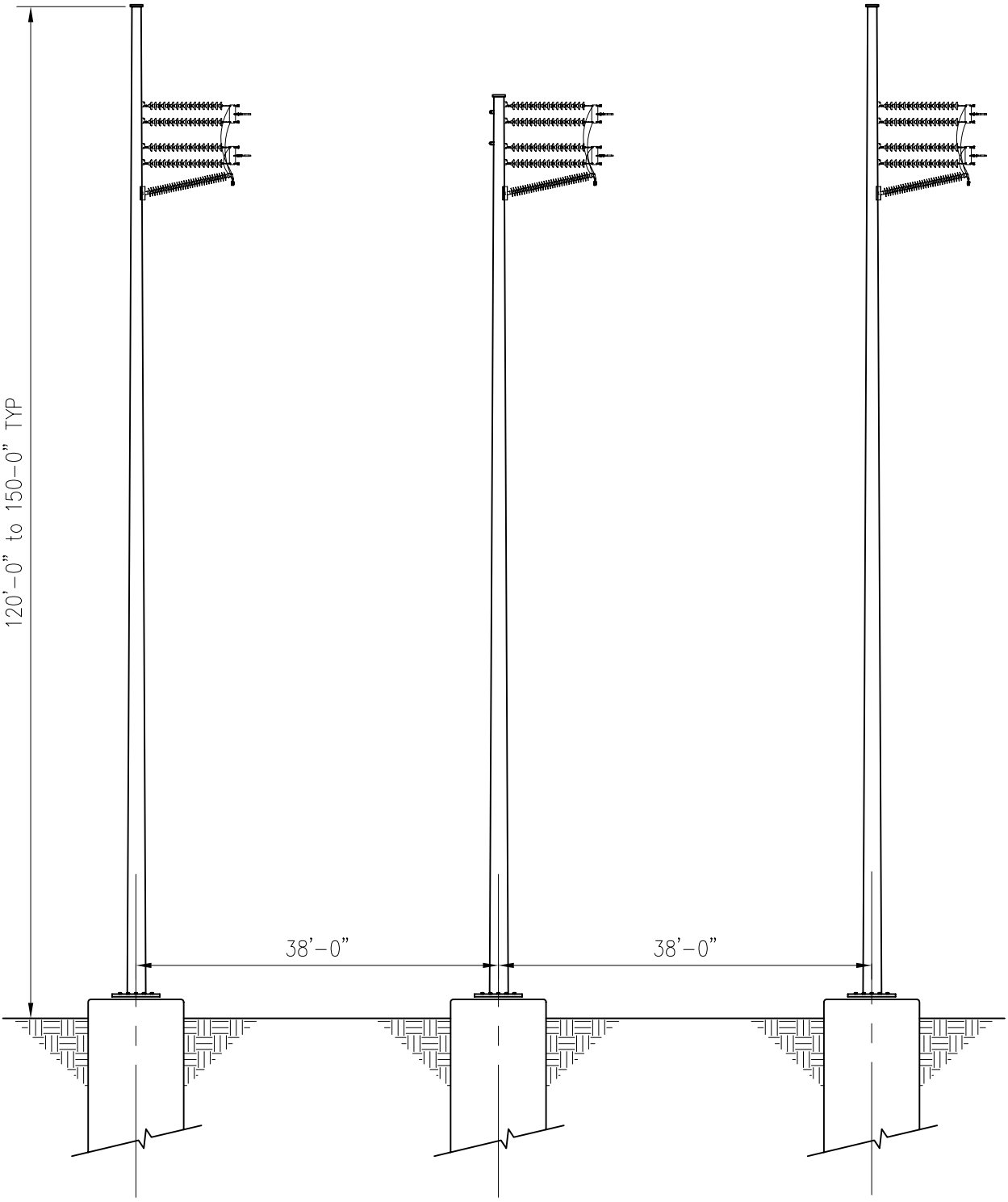
Typical 500kV Double Circuit Lattice Structure

Figure 3-3



Typical 500kV Single Circuit H-Frame Structure

Figure 3-4



Typical 500kV Turning/Angle Steel Pole Structure

Figure 3-5

Minimum conductor height above the ground for the 500kV line will be 31 feet, at 212 degrees Fahrenheit, based on NESC standards. The exact height of each tower will be governed by topography and safety requirements for conductor clearance.

3.1.4 Insulators and Associated Hardware

The single-circuit tangent towers will have three vertical “V” insulator strings suspended from the structure. The double-circuit tangent 500kV towers will have three “I” string insulators per circuit. The 500kV single-circu

3.1.5 Overhead Ground Wire

The overhead ground wire will protect the 500kV transmission line from direct lightning strikes. Two overhead ground wires, 7/16 to 1/2 inch in diameter, will be installed on the top of the structures. Current from lightning strikes will be transferred through the ground wires and structures into the ground.

3.1.6 Grounding

Ground rods will be installed next to the structure foundations to prevent a lightning strike from damaging the overhead conductors. Lattice towers will have up to four grounds installed per structure and steel-pole structures will have up to two grounds installed per structure. After the ground rods have been installed, the grounding will be tested to determine the resistance to ground. If the measurements indicate a high resistance, counterpoise will be installed, which will consist of trenching in-ground wire to a depth of 12 inches in non-cultivated land and 18 inches in cultivated land, with a ground rod driven at the end. The counterpoise will be contained within the limits of the right-of-way and may be altered or doubled back-and-forth to meet the requirements of the project.

3.1.7 Fiber Optic Cable and Regen Sites

In addition to the overhead shield wires, the single- and double-circuit towers will have an All Dielectric Self-Supporting fiber optic cable installed slightly below one of the overhead ground wires. The fiber optic cable will be approximately 0.60 inch in diameter and black in color. The fiber optic cable will be used to facilitate communication needs for the transmission line.

The fiber optic cable will require the installation of regeneration (regen) facilities along the route, which will be located on the right-of-way, in close proximity to existing power sources. The location of these facilities is illustrated in COM Plan Volume II, Map Sets 1 and 2.

3.1.8 Access Roads

Five types of access will be used for this transmission line; paved roads, dirt roads that will not require improvements, dirt roads that may require improvements, new bladed access roads, and

overland access. For a more detailed description of these access types and stipulations associated with these types refer to Appendix A2 – Transportation Management Plan.

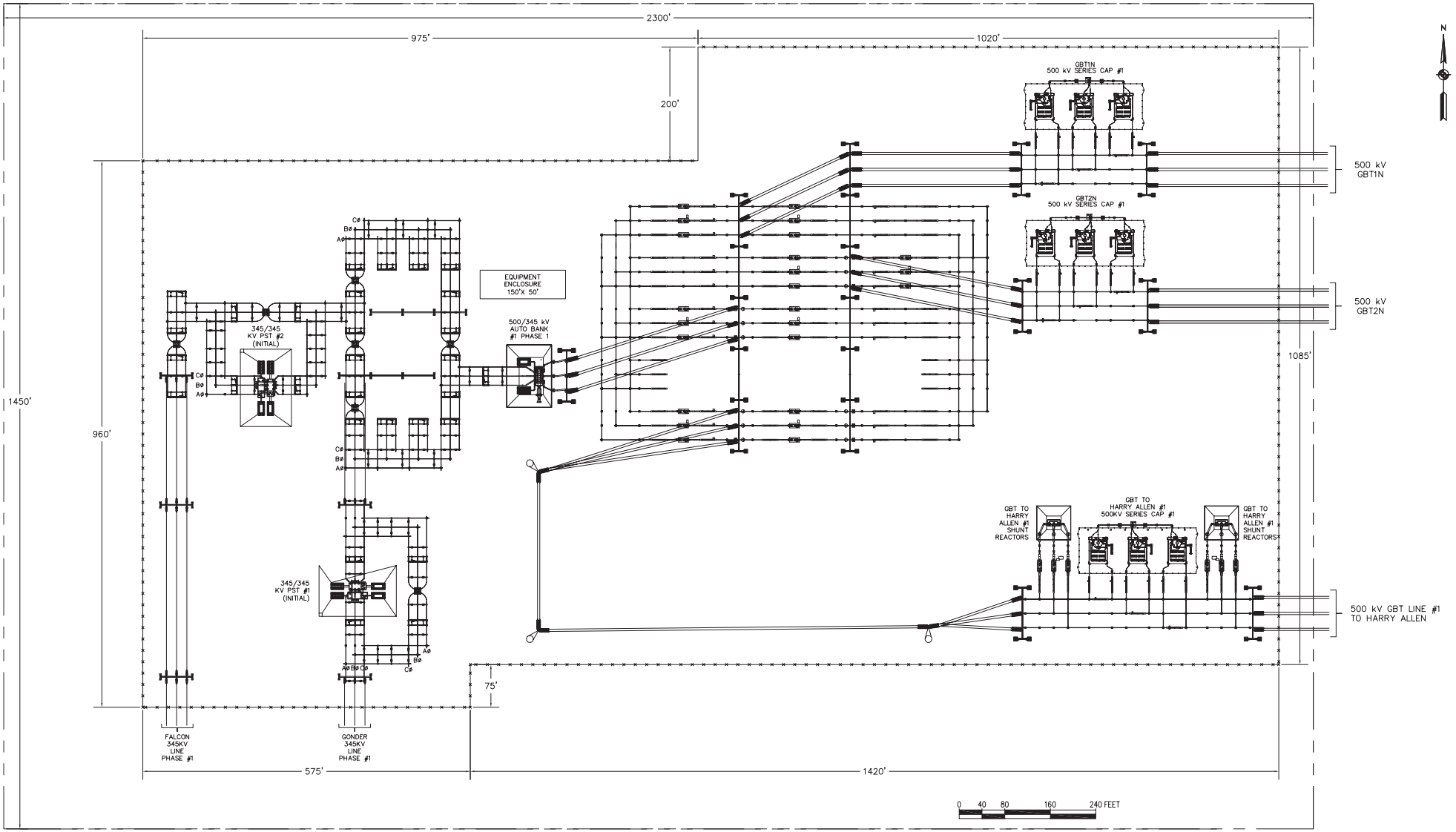
Access to the right-of-way will be via existing roads and trails, to the extent practicable. Usually these existing roads and trails will be used in their present condition without improvements. In areas where improvements are required or are deemed to be in the best interest of the project and for future use, they will be graded to provide a smooth travel surface. Access on the right-of-way, other than in specific areas, will require a road, graded to the width necessary, but not to exceed a maximum width of 20 feet, with a 2-foot berm on either side. In some cases, new roads that must be graded for access along steep slopes (side-hill roads) will most likely exceed a 24-foot width, varying from 24 to 100 feet wide, depending on the amount of displaced soil. These roads typically go directly from structure to structure, except on hillsides, ridgebacks, rock outcrop areas, wash crossings or in treed areas, where the road will meander from structure to structure. In these locations the road will be built in areas that generally cause the least amount of overall disturbance.

Additional linear facilities have been proposed for the utility corridor to be occupied by the project. Consolidation of access within the corridor may result in an overall reduction of access related concerns and/or impacts to the environmental resources within and near the utility corridor. At the appropriate time the BLM, in coordination with the Proponent and other potential users of the utility corridor, will determine which of the newly constructed access roads will be closed, restored, or retained for operation and maintenance activity. New access roads not required for operation and maintenance of the projects and/or other planned facilities may be closed using the most effective and least environmentally damaging methods appropriate to that area. Where access is to be restored, the practices identified in this COM Plan will be implemented accordingly.

3.1.9 Substations

As a part of the SWIP – Southern Portion, the line will connect with two substations along the route. The first proposed substation, Thirtymile Substation, is located approximately 18 miles northwest of Ely, Nevada in Section 19 of Township 18 North, Range 61 East, located on the south side of Highway 50, and on the west side of the transmission line alignment. This substation will be a 500/345kV substation that will interconnect initially with the Falcon-to-Gonder 345kV Transmission Line (Figure 3-6). The initial build is planned for three 500kV line terminals, one 500/345kV autotransformer, two 345kV phase-shifting transformers, and two 345kV line terminals. All three 500kV line terminals also will have series capacitor banks to maximize the utilization of available line capacity. The final build out is planned to provide for up to seven 500kV line positions and up to nine 345kV line positions. Both the 500kV and 345kV yards will be a breaker and one-half configuration, typical of these voltage classes throughout the United States. This substation will encompass an area of approximately 77 acres.

The second substation terminal is the existing Nevada Power Company's Harry Allen 500kV Substation located approximately 20 miles northeast of Las Vegas, Nevada (2 miles north and 2 miles east of the intersection of Highway 93 and Interstate 15). This 500kV substation will have a new 500kV line position added, as well as one new additional series capacitor bank.



Preliminary Thirtymile Substation Layout

Figure 3-6

3.2 RIGHT-OF-WAY ACQUISITION

New permanent and temporary land rights are required for the transmission line facilities, such as the transmission line corridor, access roads and temporary work sites (e.g., right-of-way grants, easements, license agreement and fee simple). Areas of temporary and permanent disturbance were calculated using a Geographic Information System (GIS) for the construction areas per the facility specifications presented in Table 3-1. Tables 3-2 and 3-3 show the total temporary and permanent disturbance acreages across administrative jurisdictions for the SWIP – Southern Portion and SWIP – Central Portion, and a detailed breakdown of those disturbance amounts by facility type is presented in Tables 3-4 and 3-5 for each project. As indicated in Section 3.1.8 (above), at the appropriate time the BLM will identify, with the Project Proponent and other potential users of the utility corridor, those new access roads to be closed, restored, or retained for operation and maintenance activity. At this time, all new bladed access as currently depicted in the COM Plan Volume II, Maps Set 1 and 2, has been considered long-term and permanent and is reflected in Tables 3-2 to 3-5 . Should the BLM, Project Proponent, and other potential users of the utility corridor, determine that portions of this access are to be closed and restored; the amount of permanent and temporary disturbance identified in these tables will be updated to reflect these changes.

TABLE 3-2
TOTAL DISTURBANCE ACREAGES ACROSS ADMINISTRATIVE JURISDICTIONS FOR THE SWIP – SOUTHERN PORTION

Jurisdiction	Disturbance Acres for Temporary Use	Disturbance Acres for Permanent Use	Total Disturbance Acres
BLM	**1,351**	**720**	**2,071**
Private	**—**	**—**	**—**
TOTAL	**1,351**	**720**	**2,071**
5% contingency for project variations	**68**	**36**	**104**
Grand Total	**1,419**	**756**	**2,175**
Note: Tables 3-4 and 3-5 provide more detailed information on Temporary and Permanent Disturbance Areas			

TABLE 3-3
TOTAL DISTURBANCE ACREAGES ACROSS ADMINISTRATIVE JURISDICTIONS FOR THE SWIP – CENTRAL PORTION

Jurisdiction	Disturbance Acres for Temporary Use	Disturbance Acres for Permanent Use	Total Disturbance Acres
BLM	**158**	**40**	**198**
Private	**—**	**—**	**—**
TOTAL	**158**	**40**	**198**
5% contingency for project variations	**8**	**2**	**10**
Grand Total	**166**	**42**	**208**
Note: Tables 3-4 and 3-5 provide more detailed information on Temporary and Permanent Disturbance Areas			

TABLE 3-4 DISTURBANCE BREAKDOWN FOR THE SWIP – SOUTHERN PORTION				
	Disturbance (Acres) within ROW		**Disturbance (Acres) outside ROW**	
Facility	**Temporary**	**Permanent**	**Temporary**	**Permanent**
Access [1]				
Overland	82	—	6	—
Improved Existing		1.9	—	33
Bladed (new access) [2]		381	—	226
Transmission Structures [3]				
Lattice Tangent	794	.42	—	—
Lattice (angle)		.03	—	—
Lattice (dead end) [4]		.06	—	—
H-Frame (tangent)		.28	—	—
H-Frame (deadend/angle)		.04	—	—
Other Facilities				
Concrete Batch Plants/Construction Laydown Areas	—	—	60	—
Wire Pulling and Tensioning sites	340	—	66	—
Guard Structures [5]	3	—	—	—
Substation	—	77	—	—
Totals	**1,219**	**460**	**132**	**259**
Totals	**1,679[6]**		**391**	
5% contingency for project variations	**84**		**20**	
Grand Total	**1,763**		**411**	

Notes:

[1] The area of disturbance for access may change as the BLM will identify, with the Project Proponent, those new access roads to be closed, restored, or maintained as permanent access prior to initiation of construction.

[2] In select areas additional cut and fill (switchback turns) or side hill cuts (steep grade) may be required, potentially resulting in an additional 200 acres of permanent disturbance.

[3] Temporary work areas are calculated at 200 feet x 200 feet for all structure sites; however, permanent structure disturbance is calculated based on foundation areas.

[4] Double-circuit towers are included in total area of disturbance for angle structures as the amount of related disturbance is similar.

[5] It has been assumed that guard structures will be located at six major road crossings (i.e., U.S. Highway 93). Prior to construction these specific locations will be verified.

[6] Grand Total does not include area of permanent disturbance for transmission structures as it is included in the temporary use area of 200 feet x 200 feet.

TABLE 3-5 DISTURBANCE BREAKDOWN FOR THE SWIP – CENTRAL PORTION				
	Disturbance (Acres) within Right-of-Way		**Disturbance (Acres) outside Right-of-Way**	
Facility	**Temporary**	**Permanent**	**Temporary**	**Permanent**
Access [1]				
Overland	—	—	—	—
Improved Existing	—	1.1	—	11
Bladed (new access) [2]	—	20	—	8
Transmission Structures [3]				
Lattice Tangent	97	.02	—	—
Lattice (angle)		.01	—	—
Lattice (deadend) [4]		.01	—	—
H-Frame (tangent)		.11	—	—
H-Frame (deadend/angle)		.02	—	—
Other Facilities				
Concrete Batch Plants/Construction Laydown Areas	—	—	6	—
Wire Pulling and Tensioning sites	40	—	15	—
Guard Structures [5]	—	—	—	—
Substation	—	—	—	—
Totals	**137**	**21.27**	**21**	**19**
Totals	**158[6]**		**40**	
5% contingency for project variations	**8**		**2**	
Grand Total	**166**		**42**	

Notes:

[1] The area of disturbance for access may change as the BLM will identify, with the Project Proponent, those new access roads to be closed, restored, or maintained as permanent access prior to initiation of construction.

[2] In select areas additional cut and fill (switchback turns) or side hill cuts (steep grade) may be required, potentially resulting in an additional 200 acres of permanent disturbance.

[3] Temporary work areas are calculated at 200 feet x 200 feet for all structure sites; however, permanent structure disturbance is calculated based on foundation areas.

[4] Double-circuit towers are included in total area of disturbance for angle structures as the amount of related disturbance is similar.

[5] It has been assumed that guard structures will be located at six major road crossings (i.e., U.S. Highway 93). Prior to construction these specific locations will be verified.

[6] Grand Total does not include area of permanent disturbance for transmission structures as it is included in the temporary use area of 200 feet x 200 feet.

Regarding disturbance at tower sites, a temporary disturbance area of 200 feet x 200 feet was assumed for each structure (tower pad site), and the area of permanent disturbance is determined by the foundation footing disturbances, which is dependant on the structure type (e.g. Dead-end/Angle, Lattice Tangent, or H-frame structures). The actual dimensions of the temporary area of disturbance may vary depending on factors such as terrain, vegetation. Variations in the area of disturbance will be monitored by the CIC (see Section 4.4 – Deviations during Construction).

Actual work areas will be delineated by the Construction Contractor(s) and dimensions provided to the CIC to track real project disturbance. If either the amount of permanent or temporary actual disturbance exceeds the acreage presented above, consultation with the BLM and other agencies will be required.

While extremely limited, rights-of-way for transmission line facilities on non-federal land will be obtained through perpetual easements (crossing of White River). Every effort will be made to purchase all the land rights on private land through reasonable negotiations with the present owners. Land rights will be obtained in the name of the Project Proponent.

3.3 RIGHT-OF-WAY AND LINE CROSSINGS

The project will require the crossing of various electrical distribution and transmission lines along the alignment. In all cases, the 500kV line will cross over the top of these existing facilities. In particular, the transmission line has been designed to allow for adequate clearance when crossing the Falcon-to-Gonder 345kV and the Gonder-to-Machacek 230kV high-voltage transmission lines and the Lincoln County Power District 69kV transmission line in areas of the SWIP – Southern Portion. In addition, the proposed line will cross US and State Highways (e.g., US 93, US 6, US 50, and SR 318) in certain locations.

Applications for licenses or rights-of-way to permit these crossings will be submitted to appropriate agencies for approval prior to initiating construction. In these areas, safety precautions will be taken to ensure that there are no conflicts with continued use of these existing facilities and guard structures will be erected as outlined in Appendix A1 – Construction Plan and Program.