

# Transmission Easement Requirements and Typical Challenges

## Guideline

### DOCUMENT HIERARCHY

This document resides within the Planning component of Western Power’s Asset Management System (AMS).

### DOCUMENT DATE

This document was last updated in December 2023

### IMPLEMENTATION DATE

This document came into service in January 2024

### DOCUMENT CONTROL

Record of endorsement, approval, stakeholders, and notification list is provided in internal version of EDM 67008692

### RESPONSIBILITIES

Western Power’s Asset Performance Function is responsible for this document

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## Revision Details

Version	Date	Summary of change	Section
1	14/03/2023	Original release in brochure format	Previous format
2	26/07/2023	Clarification of requirements for vegetation encroachment	Previous format
3	8/09/2023	Correction of regrowth zones	Previous format
4	8/11/2023	WP internal to public facing with new template	All

## 1 Introduction

The corridors of land on which transmission network is built are referred to as transmission line easements. Western Power easement secure a corridor of land or “right of way” for existing and future lines and allows maintenance to be carried out, ensuring that safety risks are eliminated So Far As Is Reasonably Practicable (SFAIRP) and if not practical to eliminate safety risks, reduce them SFAIRP. Easements also provide adequate mitigation of reliability and environmental risks by reducing the risks of outage or ground fires.

To enable the safe and effective management of the Western Power network, Western Power seeks to establish easements over the transmission, and often distribution, corridor, registered on the Certificate of Title (C/T) of those properties interfacing with the asset.

Current legislation stipulates that an easement (or other appropriate interest) is only required on voltages at 200 kV and above<sup>1</sup>. However, where it is reasonably practicable, it is Western Power’s preference to acquire easements for transmission lines at 66 and 132 kV. It is also Western Power’s preference to acquire easements on underground cables where it is reasonably practicable.

In the absence of a registered easement, Western Power uses the term “safety clearance zone” to describe the area adjacent to a power line where AS7000:2016 clearance requirements apply. The distances from the structure applied in the area adjacent to a power line are the same regardless of the easement registration status so for this document uses the term “easement”.

Every Transmission Line has an established easement (regardless of its registration status in the C/T). The easement width is defined based on blowout calculations.

The physical space that forms the easement is divided into management zone, regrowth zone, clearance zone and no-go-zone/ danger zone /minimum approach distance (MAD). See Definitions for a detailed description of each zone within the easement.

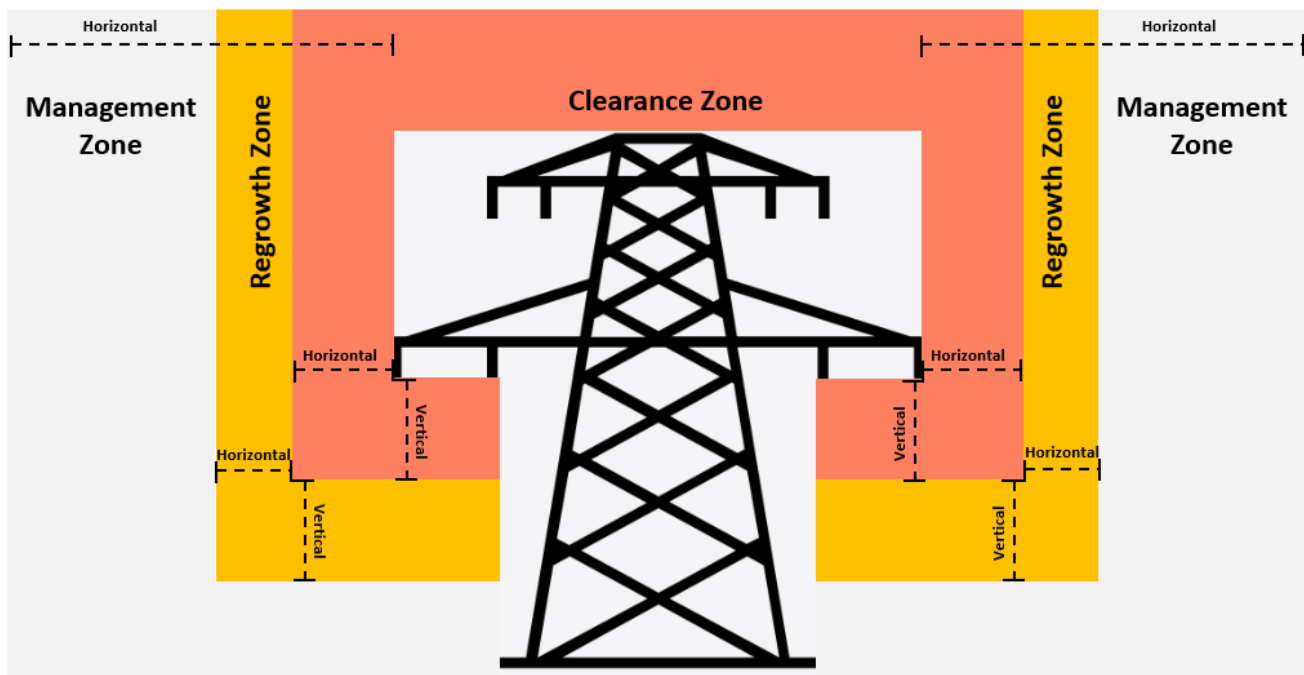
The width of Management, Regrowth, and Clearance Zones as well as the MAD are defined in the Tx & Dx Easement Strategy, informed by AS7000:2016, line configuration, structure heights, voltage, and bay/span length.

Figure 1.1 shows a visual representation of the easement, clearance, regrowth and management zones. Please note this is a conceptual representation and is not intended as a representation of scale. The general requirements of the easement management strategy are also applicable to distribution lines, with the distances indicated in Western Power’s Tx and Dx Easement Management Strategy.

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<sup>1</sup> Energy Operators (Powers) Act 1979 (WA) - Clause 45 - Claims against the energy operator for the use of land and the application of the Land Administration Act 1997 (WA) – (4)(b)

Figure 1.1: Graphical view of a transmission easement



### 1.1 Purpose and scope

A transmission easement is established for every transmission line to:

- Mitigate the risk of injury to public and workforce from ground fires;
- Mitigate the risk of injury to public and workforce from electric shocks;
- Mitigate the risk of bushfires;
- Mitigate loss of supply from encroachments (vegetation and structural);
- Ensure 24h access for heavy fleet; and
- Ensure safe conditions for maintenance crews.

The scope of transmission easement strategy includes the following elements:

- Vegetation – managing vegetation in the easement;
- Structural – avoid structural encroachments in the easement; and
- Access Track – managing access tracks to and within the easement.

The purpose of this document is to specify the easement requirements that need to be met by any new transmission line, and the typical challenges in establishing an easement.

Establishing an easement for constructing and maintaining a transmission line over its life can be challenging due to the need to:

- Secure social license<sup>2</sup> to install transmission structures on private property or disturb heritage sites;
- Complete surveys and studies that have a specific window to be done (e.g. Spring surveys);
- Obtain permits for clearing vegetation that can at times be part of a protected habitat or area;

<sup>2</sup> Directions Paper - Social licence for electricity transmission projects

- Find sites for vegetation clearing offset when required; and
- Account for enough vegetation clearing to allow for maintenance to be carried out, as it requires a wider clearing area than what is required for construction, particularly if construction uses helicopter stringing.

Failing to complete the tasks above on a timely manner can cause significant delays to a project (e.g. if Spring surveys window is missed, or if area in the clearing permits is insufficient).

This document supports Western Power Customers in developing a project to construct a transmission line, so that appropriate planning is put in place to meet the easement requirements.

This document is part of the suite of documents that form the Planning component of Western Power’s Asset Management System, it is informed by applicable legislation, international standards, internal network standards and related strategies as referred in References.

## 1.2 Acronyms

**Table 1.1: Acronyms used in the document**

Acronym	Definition
C/T	Certificate of Title
EPR	Earth Potential Rise
EWP	Elevated Work Platform
LFI	Low Frequency Induction
LGA	Local Government Area
MAD	Minimum Approach Distance
SAD	Safe Approach Distance
SFAIRP	So Far As Is Reasonably Practical
Tx	Transmission
WP	Western Power

## 1.3 Definitions

**Table 1.2: Definitions of key terms in the document**


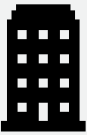

Term	Definition
No-Go-Zone/ Danger Zone/ Minimum Approach Distance (MAD)	Minimum Approach Distance - The minimum separation distance that must be maintained by a trained and competent person, mobile plant (including its load) or any object (other than insulated objects designed for contact with live conductors) from electrical apparatus.
Clearance Zone	The physical space around power lines, which is to be kept clear of vegetation.
Regrowth Zone	A physical space around the Clearance Zone, in which the presence of vegetation is allowable, but when pruning is applied it should be to a distance which allows for vegetation growth in between pruning treatments so that the vegetation does not grow into the Clearance Zone.

Term	Definition
Management Zone	The area immediately adjacent to Western Power’s Network in which the Services are carried out in order to maintain at least the prescribed minimum clearance distances of Vegetation from the Network.
Encroachment	A third-party structure or vegetation which encroaches on the distribution or transmission electricity network.
Access tracks	Tracks that Western Power crews need to travel in order to reach the network assets. Usually runs underneath the line but can also run parallel to the line with cut ins/ cut outs for accessing structures.

## 2 Easement Requirements

Table 2.1 summarises the minimum functional requirements for establishing a transmission line easement, while more detailed requirements are provided in sections 2.1 to 2.3.

**Table 2.1: Requirement Overview**

Scope Item	Requirements		
 (Vegetation)	<b>Across the Easement:</b> No overhanging trees at all times. No vegetation that can grow higher than 3m underneath the conductor.	<b>In the Regrowth Zone:</b> Permits to cut secured. (Cut if it risks encroaching into clearance zone).	<b>In the Clearance Zone:</b> No vegetation at all times.
 (Structural)	<b>Across the Easement:</b> No structural encroachment at all times.		
 (Access)	<b>Access to the Network:</b> Western Power requires 24h full access to all assets from day 1. Easement + Access Tracks.	<b>Vegetation Management:</b> Vegetation removed (including stumps) all across the access track.	<b>Access Track construction:</b> Requires desktop and field scoping. Varies depending on location of the line, length and terrain.

If the clearing approvals for the line are narrower than required, it may result in design inefficiencies such as shorter spans (to limit conductor swing) resulting in more structures and hence greater cost.

Deviations from a straight line may result in higher cost structures necessary to physically support direction changes.

Except where previously approved by Western Power, clearing permits/approvals shall be enough to accommodate ground based maintenance.

### 2.1 Vegetation Management Requirements

When building a line, the team responsible for the project shall include the following requirements in the scope of works of the project, including securing clearing permits from State and Federal authorized agencies. Western Power can provide guidance on how to comply with these requirements.

- No trees overhanging the conductors or structures at any time;
- No vegetation in the clearance zone;
- No vegetation in the regrowth zone that has the risk of encroaching into the clearance zone (if risk to grow into clearance zone is low or negligible, secure permit for future cuts);
- Permits to cut vegetation away from the line in the future must be secured;
- No vegetation that can grow higher than 3m present underneath the conductor (from the centre of the pole to the conductor attachment point); and
- Vegetation cleared all around the structures as per drawing T5003-11-0-001-001 (see section 2.3 for an extract of the drawing containing the requirements).



Western Power must comply with the obligations outlined in the Environmental Protection Act, except where that act exempts Western Power from doing so by expressly referencing the Energy Operator (Powers) Act. This does not, in all cases, give Western Power the ability to maintain an easement that has not been cleared previously. Therefore, Western Power requires a clearing permit over the entire easement area to allow it to perform ongoing maintenance and operate the line.

Table 2.2 shows clearance, regrowth and management zones dimensions for a transmission line on flat terrain and straight line route.

These are minimum distances intended as guidance. The final easement dimensions will also depend on:

- Blowout calculations;
- Line route and configuration;
- Construction, Operation and Maintenance; and
- Terrain conditions (elevation, protected flora/fauna, heritage, etc).

**Table 2.2: Clearance zone, Regrowth zone and Management zone as per transmission line span**

Transmission Line Span	Clearance Zones		Regrowth Zones		Management Zone (m)
	Horizontal Clearance Zone (meter)	Vertical Clearance Zone (meter)	Horizontal Regrowth Zone (meter)	Vertical Regrowth Zone (meter)	
Less than 100 m	3	3	1	2 (urban area) 3 (other area)	10
100m*-200m	4	4	1	2 (urban area) 3 (other area)	10
200m-350m	10	5	1	2 (urban area) 3 (other area)	15
350m-450m	13	5.5	1	2 (urban area) 3 (other area)	15
450m-650m	25	6	1	2 (urban area) 3 (other area)	25
650m-800m	37	6	1	2 (urban area) 3 (other area)	40
800m and above	47	6	1	2 (urban area) 3 (other area)	50
*For spans on the limit, apply the above bracket (for 100m spans, horizontal clearance is 4m)					

## 2.2 Structural Encroachment Requirements

Compliance with the requirements and use limitations inside the Line Easement will mitigate the risk of structural encroachment. Always ensure engagement with Western Power before starting construction near a Transmission Line. When considering the width of an easement to provide clearance from structures, the position of the conductors or cables under the influence of wind at any point along the span should be considered. A safety clearance should also be included.

When building a line, the team responsible for the project shall design and construct the line so that no structural encroachment is present on a line at any moment.

AS7000:2016 indicates the minimum distances that must be observed at all times to ensure a safe distance from the Network.

Figure 2.2 shows how structural to measure encroachments.

**Figure 2.1: Extract from AS7000:2016 indicating requirements to avoid structural encroachment**

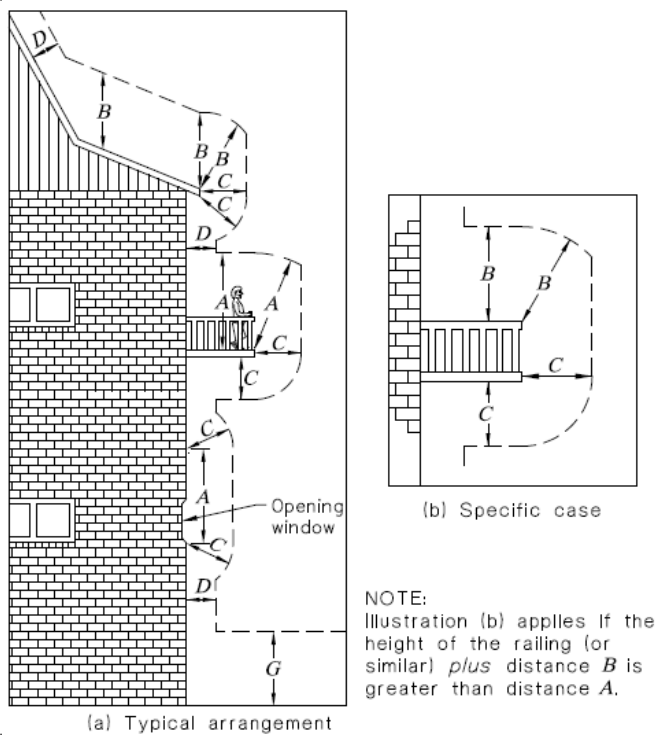


Table 2.3 indicates the minimum distances at all times, for each transmission voltage

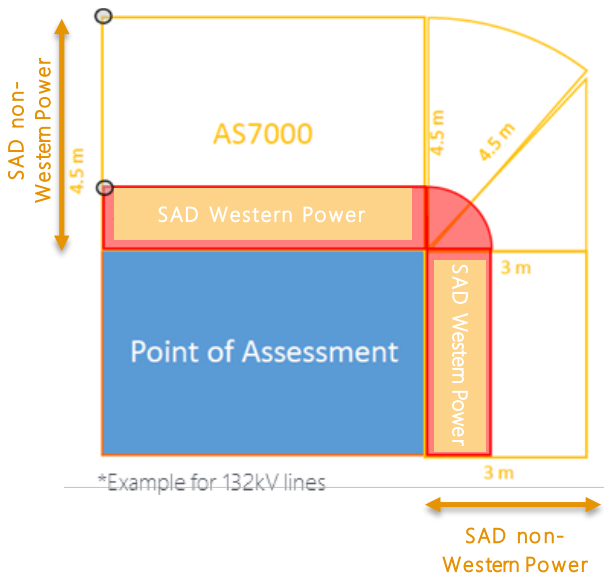
**Table 2.3: Minimum distances between structure and line for different voltage levels**

Clearance between Structure and Line	33kV- 132kV (meter)	220 kV (meter)	330 kV (meter)	>330 kV (meter)
A-Vertically above those parts of any structure normally accessible to persons.	5	6.5	7	8
B-Vertically above those parts of any structure not normally accessible to persons but on which a person can stand	4.5	6	6.5	7.5
C-In any direction (other than vertically above) from those parts of any structure normally accessible to persons, or from any part not normally accessible to persons but on which a person can stand	3	4.5	5	6
D. In any direction from those parts of any structure not normally accessible to persons	2.5	3.5	4	5
G- Ground Clearance; distance from the conductors to the ground (Over carriageway of roads)	6.7	7.5	8	9
G- Ground Clearance; distance from the conductors to the ground (Over land other than the carriageway of roads)	6.7	7.5	8	9

Clearance between Structure and Line	33kV- 132kV (meter)	220 kV (meter)	330 kV (meter)	>330 kV (meter)
G- Ground Clearance; distance from the conductors to the ground (Over land not traversable by vehicles more than 3 meters high)	5.5	6	6.7	7.5
Safe Approach Distance (SAD)- Phase to Phase	3	4.5	6	6 (8 for mobile plant)
Safe Approach Distance (SAD)- Pole to Earth	3	4.5	6	6

Figure 2.2 shows an example of how to measure structural encroachment at ground level for a structure installed on a 132 kV line.

**Figure 2.2: Application of structural encroachment distances for a 132 kV line**



### 2.3 Access Track Requirements

When building a line, the team responsible for the project shall include the following requirements in the scope of works of the project, including securing clearing permits from State and Federal authorized agencies. Western Power can provide guidance on how to comply with these requirements.

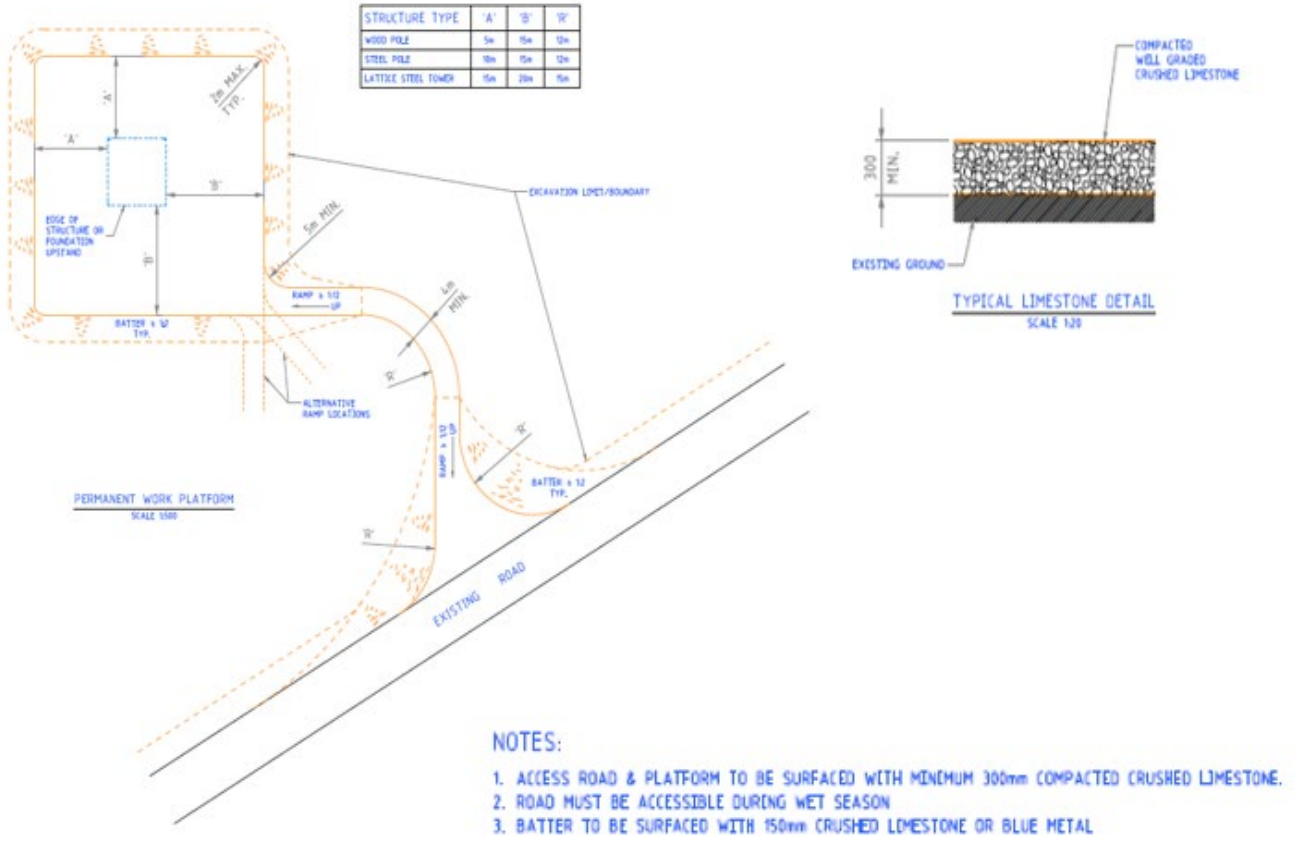
- All assets in the line must be accessible to Western Power crews 24/7;
- Western Power crews require unimpeded 24/7 access by heavy fleet;
- Access tracks to be made of 300mm compacted well graded crushed limestone;
- Biosecurity stations in place as applicable;
- Asset tracks run underneath the line;
- Vegetation removed across all access tracks, including stumps;
- Curve radius of access tracks as per drawing T5003-11-0-001-001;
- Cleared area around structures as per drawing T5003-11-0-001-001<sup>3</sup>; and
- Access tracks width  $\geq$  4 meters

<sup>3</sup> This is a requirement for vegetation clearing (remove trees) as well as for access tracks (remove stumps and ground vegetation).

The final access requirements will be determined during scoping.

Figure 2.3 shows an extract of drawing T5003-11-0-001-001 containing the access tracks and vegetation clearing requirements.


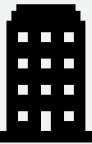

**Figure 2.3: Extract of drawing T5003-11-0-001-001**



### 3 Typical Challenges

There are various challenges such as regulation and legislation, development approvals, access and inspections, state and LGA planning strategies etc. presented in terms of vegetation, structural and access in the following table.

**Table 3.1: Typical Challenge Overview**

Scope Item	Requirements		
 (Vegetation)	<b>Environmental Assessment:</b> Spring surveys (have to wait until Spring season) Federal and State lengthy approval processes. Protected Heritage, Fauna, Flora.	<b>Inter-dependencies:</b> Line route. Access track(s) route(s). Desktop and Location Scoping	<b>Risk-based approach:</b> The volume of clearing will depend on environmental conditions.
 (Structural)	<b>Structural encroachment assessment:</b> Earth Potential Rise (EPR)/Low Frequency Induction (LFI) studies.. Local Government Area (LGA) approval. Work near power lines requirements.		
 (Access)	<b>Access to the Network:</b> Access from the public road to the easement. Ensuring a solid construction that is trafficable by heavy-fleet 24/7.	<b>Vegetation Management:</b> Same challenges as for vegetation management.	<b>Access Track construction:</b> Obstructions that prevent access along the line (e.g.: creek crossing requiring bridge), will result in additional access track requirements – e.g. Install fences and gates. Biosecurity stations.

## 4 Typical Pre-Scoping Deliverables

Each Customer and each project is unique and therefore each project requires detailed engineering, environmental, and asset management assessments.

This document intends to inform the Customer of typical requirements and challenges to help identify a suitable line route corridor early in the development of the project.

The Customer is responsible for providing a line route to Western Power, including details of any constraints, or known issues along the line route. Typical deliverables include but are not limited to:

- Full copies of any biological surveys or reports,
- Boundaries of any surveys conducted (GIS Shapefile format consistent with Geocentric Datum of Australia 1994(GDA94));
- Define any no-go-zones/ danger zones/ MAD;
- Details of ground / soil type, water table;
- Alert Western Power of any land issues within the boundaries of the corridor;
- Copies of existing related regulatory approvals and /or status of any approval applications underway;
- If the clearing approvals for the line are narrower than ideal / desired, then this may result in design inefficiencies e.g., shorter spans (to limit conductor swing) resulting in more structures and hence cost;
- Deviations from a straight line may result in higher cost structures necessary to physically support direction changes;
- Clearing approvals are to accommodate ground-based stringing (helicopter stringing not currently supported).