GEOSPATIAL DATA SUBMISSION STANDARDS

GEOSPATIAL DATA SUBMISSION STANDARDS FOR WORK AS EXECUTED (WAE) OF ELECTRICAL NETWORK ASSETS

This document outlines the geospatial data standards required for submission of geospatial data for incorporation in Evoenergy's geographic information system (GIS).

CONTENTS

DEFINITIONS

Document Specific Terms and Definitions

TERM	DESCRIPTION
ArcFM	Third party GIS application by Schneider Electric used in conjunction with ESRI's ArcGIS to maintain a geospatial database of the electrical network assets and connectivity. The GIS Database shows the normal state of the network and is the point of truth for network data which feeds other systems like ADMS.
As-Built	See "Work as Executed".
Asset, new	New network assets are assets which have not previously existed in the network. They are being installed/constructed for the first time.
Asset Replacement	Replacement of an asset can be defined by the removal (demolition, abandonment, other) of an asset and installation of another asset in its place.
Asset Upgrade	Assets that are upgraded are a replacement (in full or part) of an existing asset however their level of service, type or capacity may have changed. An upgrade is not a like for like replacement.
Asset Relocation	Relocation of assets include the removal of one asset from a site and the reinstatement of the same asset at another site.
Asset Removal	This involves the removal or all or part of an asset. The asset in question is physically removed from site and disposed of in some manner.
Asset Abandonment	Abandoned assets are disconnected from the network and left in situ because they will be used later, or it is not possible or economical to remove the asset. It is still a requirement to confirm the geospatial location of an asset that will be abandoned as they are still relevant to current works and Dial Before You Dig.
Child Asset	Any asset falling within or on another asset.
Data Format	Refers to the required format for return of geospatial information: Point, line or polygon.
Data Quality	The Quality classification of data into a four-level system outlined by this standard. Quality level in this context provides a measure of confidence in accuracy and method used to capture location.
BYDA	See Before You Dig Australia.
Before You Dig Australia	Before You Dig Australia is a free national referral service designed to aid in preventing damage and disruption to underground infrastructure and service networks.
Fixed-Point Location	A location that can be used as a reference point to take a manual measurement from to obtain a measurement at fixed asset location.

Geographic Information System	A computer system for collecting, storing, checking, analysing and displaying data relating to a position on the Earth's surface (see geospatial data).
GIS	See Geographic Information System
Mark-up	See Work As Executed
Measurement Location	This describes the location at which a measurement must be taken on this asset.
Minimum Attribution	Minimum attribution is the least amount of detail which can be provided to adequately define an assets type, date of install, location of install, when it was installed, its configuration and electrical connectivity.
Parent Asset	This is the asset which houses or supports other assets (child assets). It is the primary measurement location for all assets falling on or within it.
Redline drawing	See Work As Executed
Snapping	Snapping in GIS occurs during the editing of a GIS dataset. Snapping involves connecting a geometric vertex or edges of one feature to another**.** Snapping is an important setting when editing or creating GIS data because it ensures that edges and vertices that need to be adjoining are cleanly connected.
Geospatial Data	Geospatial data is considered any data that directly, or indirectly, references a point in real life. In this procedure, any location information relating to an Evoenergy electrical asset is considered as geospatial data. This data my take the form of a: Set of coordinates (x/y/z location); CAD file that is geospatially referenced; Shapefile or another native GIS file format that has been geospatially referenced; Red line mark-up with measurements from confirmed geospatial features (boundary, kerb etc); Georeferenced aerial image; Relationship(s) to other known locations within the network (child of parent asset); and Photograph of apparatus, at a known location. Data that does not directly or indirectly refer to geospatial data is termed "aspatial".
Survey Marker	Survey marks, survey monuments, or geodetic marks, are objects placed to mark key survey points on the Earth's surface**.** They are used in geodetic and land surveying. Evoenergy has a point layer of survey marks in the GIS which can be turned on and off in mapping applications, stored displays, and mobile mapping solutions.
Topology	Topology is the arrangement of how point, line, and polygon features share geometry.
WAE	See Work As Executed
Work As Executed	Work-as-Executed Documents are plans showing details of work as actually constructed. They identify departures, additions and deletions from approved design plans. Data for preparing work-as-executed drawings is obtained by measurement and survey as and/or after works are completed.
X coordinate	The x coordinate is the x value in an ordered pair (of mathematical objects i.e., x,y) used for measuring distance from an origin perpendicular to the y value axis. The combination of x and y can locate a point in two-dimensional space.

Y coordinate	The y coordinate is the y value in an ordered pair (of mathematical objects i.e., x,y) used for measuring distance from an origin perpendicular to the x value axis. The combination of x and y can locate a point in two-dimensional space.
Z coordinate	The z value used in this standard is a measure of depth/height of an object from relative ground level or in AHD1971. When used in conjunction with x, and y values will place a point in three-dimensional space.

GEOSPATIAL DATA STANDARD

1. BACKGROUND

Evoenergy utilises Geographic Information System (GIS) as the data repository of electrical network asset information. It is the single source of truth. The GIS is designed to store and depict electrical network assets geospatially to represent their geographical location as well as their attribution.

There is a requirement for network asset data stored in the GIS to accurately reflect their locations in the field. This accuracy is dependent on the consistency of submitted Work as Executed (WAE) or mark-ups of electrical network changes.

Poor quality geospatial network information has the potential to affect:

- Safety
- Before You Dig Australia (BYDA)
- Customers and outage notification
- Reputation
- Compliance and reporting National Energy Customer Framework (NECF)
- Financial performance
- Environment

2. OBJECTIVE

The aim of this document is to improve the geospatial accuracy of the electrical network within the GIS, promote consistency in submitted WAE and provide a level of confidence in network geospatial accuracy.

This document will define the following:

- Type and format of geospatial data that must be submitted.
- When geospatial data must be submitted.
- How geospatial information can be given to Evoenergy.
- Best practices to ensure a correct field capture of data.

3. SCOPE

The scope of this document is to provide requirements for the location and classification of electrical network geospatial data. While a complete WAE submission requires both geospatial and attribute data, this document focuses on geospatial data only.

Procedural step-by-step instructions and role-based responsibilities within the organisation are outside the scope of this standard document.

4. STAKEHOLDERS

4.1 Internal Stakeholders

This procedure will apply to all Evoenergy Employees who are involved in the implementation of, or change to the electrical network, and/or any officers who find discrepancies between the GIS data and field network assets.

4.2 External Stakeholder

Contractors and private construction will be held to the same data submission standards as internal Evoenergy projects. The accountability and requirement to ensure these standards are met will apply to the primary Evoenergy Employee managing the contractor and/or the project.

5. REFERENCES

5.1 Relevant Legislation

- The Electrical Network Asset Management Code 2013 (ENAMC 2013)

The Code is made under the *Utilities Act 2000, section 65 (Application of industry code provisions)* and is listed as *Utilities (Management of Electrical Network Assets Code) Determination 2013 Disallowable instrument DI203-222.*

The ENAMC 2013 *"…requires electricity distributors to protect integrity and reliability of the electricity network and to ensure the safe management of the electricity network without injury to any person or damage to property and the environment".*

Section 5.1 (1) and (2) of the Electrical Network Asset Management Code 2013 state:

> *(1) An electricity distributor must maintain a record of all underground and aerial lines under its control. The record must contain details sufficient to enable every line to be located and identified.*
>
> *(2) The electricity distributor must ensure that this information is available to the public during business hours.*

Section 6.1 (1) of the Electrical Network Asset Management Code 2013 states that:

> *(1) An electricity distributor must have an Electricity Network Safety Management System that complies with AS 5577 Electricity Network Safety Management System.*

5.2 Related Australian Standards

The primary Australian Standards considered in the creation of this document are:

- *Classification of subsurface utility information AS 5488.1:2019.*
- *Electrical Network Safety Management Systems AS 5577:2013 (Legislated)*

5.3 Deviations from the Australian Standards

While this document references *AS 5488.1:2019*, it deviates in minor ways to provide a company standard that is most applicable to the way Evoenergy depicts and uses GIS data.

If any conflicts between Evoenergy Standards and the Australia Standards exist, Evoenergy Standards will take precedence, where standards are not legislated.

5.4 Evoenergy Policies and Procedures

Evoenergy policies and procedures refer to the requirement to submit Work as Executed (WAE) information and/or the confirmation of geospatial location for assets.

- *Electrical Network Safety Management System Guide* PO06155 – Section 17 Records

- *Major Project Design Manual* PO0823 – Section 5.7 Work As Executed
- *Customer Technical Services Design Process Manual* PO07467 – *Section 5.7 Work As Executed*
- *Underground Distribution Design Manual* PO07420 – Section 4 System Record
- *Civil Works Manual* PO0793 – Section 2.2 Locating Section; Section 6 Locating Buried Assets / Services; Section 23.1.24 Work as Executed
- *Capital works design checklist* PO0785 – 4.2 During the construction phase; 4.3 After the construction phase.
- *Telecommunication Pits including Specification and Installation* PO07401 – 5.9 Work as Executed Data for Optical Fibre Pits
- *Protection and Control Project, Safety in Design Checklist* PO07326 – 2 and 27
- *Allocation of Pillar Distribution Cubicle Point of Entry Identification Numbers* PO0732 – 4.7; 4.8 and 5
- *Drawing Transmittal Procedure* PO07138 – 3.3, 4, 5
- *Conductor Stringing* PO0740 – Appendix A ITP Checklist Table, Activity 10
- *Design Work Order – Network Initiated* PO07120 – whole document (sections unnumbered)
- Network Initiated Workflow PO07456 – Section 14 Field Complete, Section 15 Closure
- Major Projects Procedure PO0856 – 3.4 Project Closure, 3.5 Steps and Responsibilities, Figure 2.

If any conflicts between this document and the above listed Evoenergy Documents exist, this document will take precedence.

External agencies or contractors who wish to access the above-mentioned documents can do so by requesting via:

- Emailing the project officer relating to the contract the vendor has with Evoenergy,
- Calling General Enquiries on 13 23 86 between 8am-4pm,
- Submit an online enquiry to Evoenergy's Enquiry Form, or
- Visit the reception team at Evoenergy's Greenway depot at Corner Anketell & Oakden Streets, Greenway ACT 2900 between 9am-3pm weekdays.

REQUIRED GEOSPATIAL DATA

6. DATA REQUIREMENTS

Data submissions to Evoenergy must include plans/drawings showing the extent of works and all required network assets which fall into the five (5) key requirements below:

- Data Quality Level — Section 6.1 and Section 7
- Asset Location — Section 6.2, 7 and Table 2
- Acceptable fixed-point locations — Section 6.3
- Electrical Connectivity — Section 6.4
- Minimum Attribution — Section 6.5

6.1 Data Quality Level

A geospatial quality level indicator (Section 7) must be assigned, at the time of recording, for each asset's geospatial location. Where the geospatial quality level is the same for all assets located, one quality level can be assigned for all assets and a statement indicating this will be made on the WAE plan.

6.2 Asset Location

Asset Locations are recorded in sets of both x/y for horizontal locations, and z values representing depth or height (where relevant and varying from standard depth/height). Asset locations are categorised into child and parent assets where the location of the parent asset will define the location of all children under it (Geospatial Measurement Locations Table 2).

6.3 Acceptable Fixed-Point Locations

Fixed point locations are generally considered to be visible cadastral or infrastructure features, such as:

- Kerb (back of kerb) - Preferred
- Block boundary - Preferred
- Survey marker - Preferred
- Ground Mounted Structures (Padmount Subs), where the ground mounted structure has been located first.
- Pole, where the pole has been located first

6.4 Electrical Connectivity

WAE Information detailing the electrical supply and connectivity arrangement must be provided for all electrical assets. Electrical connectivity information must be clear and unambiguous leaving no doubt about electrical connections. Where electrical connectivity cannot be shown geospatially, supplementary notes, schematics and/or details will be provided.

Examples of electrical connectivity may be:

- Which side of a link services are connected on,
- Where to reconnect existing services when removing an overhead span,
- What phases are energised in a cable,
- What the normal state of a link/switch is — open or closed,
- Which cables and connections may have more than one feeder,
- Confirmation of service feeder connection.

6.5 Minimum Attribution

The following lists the minimal requirements relating to aspatial (non-geospatial data) attribution for each asset where applicable:

- Relevant dates — Commissioning date, Manufacture date etc
- General identifier — Make, model, manufacture etc
- Unique identifier — Asset Number, Serial Number, Tx Number etc
- General features — Diameter, material, etc
- Unique features — Phase, Tx Setting, Configuration etc

7. DATA QUALITY LEVELS

To provide a level of confidence in the GIS geospatial data, quality levels will be used to classify submitted information.

Those gathering and/or submitting WAE information will need to define the Quality Level of geospatial information supplied in their data submission (i.e., on their plan or within the data attributes supplied).

The Geospatial Data Quality Level Matrix (Table 1) will be used to grade geospatial data submissions. This is to be done on an asset-by-asset basis, or where the geospatial quality level is the same for all assets located, then one quality level can be assigned for all assets (a statement indicating this will need to be made on the data submission).

Note: The recorded Quality Level of each asset is assumed to be ‘Quality Level D’ as set out in this document, unless specified otherwise in the submitted WAE information.

TABLE 1. GEOSPATIAL DATA QUALITY LEVEL MATRIX (LEVELS A TO D)

DATA QUALITY LEVEL	MINIMUM ACCURACY LEVEL	DESCRIPTION	COMMENT
Level A*	+/- 50mm for X/Y/Z	High accuracy survey by a Certified Surveyor.	*The accuracy level of the geospatial data must be certified as data quality level A (Plans are Dated, Signed and Stamped by the Certifying Individual or Company). Failure to demonstrate this will mean resulting data is downgraded to B or lower.
Level B*	+/- 300mm (X/Y) and +/- 200mm (Z) (Geospatial Accuracy Assumed)	High Accuracy GPS used by anyone**. Detection methods where location is confirmed by High Accuracy GPS.	*The Accuracy level of the device in use must be demonstrated/provided to be graded as Data Quality B. Failure to demonstrate this will mean resulting data is downgraded to C or D. ** the term anyone refers to anyone without a Surveyors Certification.
Level C	Manual Measured Dimensions (variable Accuracy) for X/Y Values. May or may not include a Z value.	Manual Measurements from cadastre or acceptable fixed-point locations.	Fixed point location examples: Back of kerb, lot boundary, survey mark.
Level D	Unconfirmed accuracy for both X/Y and Z location values if applicable.	Location is unconfirmed. And may be inferred or indicative within a set vicinity.	No location measurements are taken, or the method used is unreliable in accuracy.

7.1.1 Data Quality Level A Defined

Quality level A, is the highest geospatial confidence level. It indicates a certified survey accuracy for X/Y and Z locations taken directly at the exposed asset.

QUALITY LEVEL A	
Geospatial Requirements	Field confirmed asset existence with both X/ Y geospatial location and Z if applicable
Geospatial Accuracy	+/- 50mm for horizontal (x/y) and +/- 50mm vertical (z) location coordinates
Certified	Yes – by a Qualified Surveyor
Asset Accessibility	Field confirmed asset existence with assets accessible, exposed and visible.
Asset Location Methods	Surveying – high accuracy GPS equipment with coordinates taken directly at asset.

7.1.2 Data Quality Level B Defined

Quality level B, is an above average confidence level. It indicates a field confirmed network asset existence with both X/Y geospatial location and will include Z depth/height geospatial location where applicable to the asset.

QUALITY LEVEL B	
Geospatial Requirements	Field confirmed asset existence with both X/ Y geospatial location and Z if applicable
Geospatial Accuracy	+/-300mm for (x/y) and +/-200mm for (z) if applicable. Accuracy level assumed. Note: Any methods used in data quality level B that cannot demonstrate geospatial data quality accuracy will down grade to Level C
Certified	No – individual without Surveyors' Certification
Asset Accessibility	Site inspection to confirmed asset existence (Asset sighted or detected)
Asset Location Method	Both X/Y geospatial location taken from a fixed-point location with measuring wheel, tape or a trade level GPS unit with capabilities to confirm geospatial accuracy (Trimble, etc). Z values to be provided where detection is used or where applicable to the asset.

7.1.3 Data Quality Level C Defined

Quality level C, is a below average confidence level. It indicates a field inspection confirmed network asset existence within proposed vicinity with both X and Y geospatial locations and may or may not include Z depth/height geospatial location.

QUALITY LEVEL C	
Geospatial Requirements	Field confirmed asset existence within proposed vicinity and both X and Y for geospatial location
Geospatial Accuracy	Manual measured dimensions - variable geospatial accuracy. Note: Any methods used in data quality level B that didn't demonstrate geospatial data quality accuracy of B will be graded at Level C
Certified	No – individual without Surveyors' Certification
Asset Accessibility	Assets are sighted to confirm existence, buried underground assets may be inferred.
Asset Location Method	Site inspection to confirmed asset existence within proposed vicinity. Both X and Y for geospatial location taken from a fixed-point location* with measuring wheel, tape or other hand measuring device.
***Acceptable Fixed-Point Locations**	Back of kerb, lot boundary, survey mark, other permanent infrastructures (where located).

7.1.4 Data Quality Level D Defined

Quality level D, is the lowest geospatial confidence level. It indicates a network asset existence within proposed vicinity with an unconfirmed X/Y/Z asset location.

QUALITY LEVEL D	
Geospatial Requirements	Confirmed asset existence within a proposed vicinity.
Geospatial Accuracy	Nominal location information. Unconfirmed accuracy for both X/Y and Z location values if applicable.
Certified	No – individual without Surveyors' Certification
Asset Accessibility	Assets are sighted to confirm existence, buried underground assets may be inferred.
Asset Location Method	Sketches without asset location or measurement, photos, schematics, designs, plans and or anecdotal evidence is the only form of feedback supplied.

7.1.5 Historical Data Quality Level Assumptions

All data prior to this document publish date will be considered historical and assumed to be Data Quality Level D unless proven otherwise through supporting information on the Work Order. Data that is historical will be marked with "H" in the Data Quality Level field.

7.1.6 Examples of Data Quality by Method

The table on the following page provides common examples of data location methods which have been graded into data quality levels.

		Asset Visible	Asset Buried
Survey / GPS Device	Survey by a Certified Surveyor +/- 50mm	A	A
	High Precision GPS device (Uncertified Individual), Level B Geospatial Accuracy Obtained	B	B
	Other GPS Device (Uncertified Individual), Accuracy Variable	D	D
Underground Detection Methods	Bores / Directional Drilling with a location and depth log	N/A	B
	Detection Methods (Underground Assets Not Sighted), location given at detection point using High Accuracy GPS. Level B accuracy Obtained.	N/A	B
	Detection Methods (Underground Assets Not Sighted), location given at detection point using Other GPS Device, unable to obtain Level B Accuracy.	N/A	D
	Detection Methods (Underground Assets Not Sighted), location given at detection point using Manual Measuring Devices.	N/A	C
	Detection Methods (Underground Assets Not Sighted), Detected but location not measured.	N/A	D
Manual Measuring	Measuring Wheel/Tape/Rod (from survey mark)	C	C
	Measuring Wheel/Tape/Rod (from fixed infrastructure/boundary line that is visible on the GIS Map)	C	C
	Pacing Out	D	D
	Measuring from existing network assets (e.g., pole or sub) which are not location confirmed.	D	D
Anecdotal Evidence	Inferred from surrounding features (No Measurements)	D	D
	As per Design (No measurements confirmed)	D	D
	Photos	D	D
	Sketch/Plan (without Measurements)	D	D
	Desktop Survey (using imagery)	D	D

8. ASSET MEASUREMENT LOCATION

The appropriate field measurement location to take x/y and z coordinates for individual asset types is shown in Table 1. To locate an asset, the following general rules are applied:

- For assets that sit on or in a parent asset, present the geospatial location of the parent asset only
- Small parent assets (<1m) can be represented by a single measurement point in the centre e.g., Distribution support structure (pole)
- Large parent assets (>1m) should be represented by the footprint (maximum extent of the asset) e.g., Zone Substation
- Depth is required only where the asset depth is non-standard. (e.g., Where a cable is laid deeper/shallower than the Evoenergy standard). WAE asset data submitted without depths is assumed to be at standard depth

8.1.1 Measurement Location Limitations

Only assets considered part of the electrical distribution network, which have a visible geospatial layer drawn in the GIS are represented in Table 1. All other GIS layer assets are not included in the asset measurement location table.

For Example: Poles are included in table 1 as they are drawn in the GIS but crossarms are not included in Table 1 because they are not drawn separately in the GIS (they are a relationship table only).

8.2 Measurement Location Diagrams

Where survey and GPS equipment are unavailable to record asset information, field measurements must be taken from a known reference point such as a property boundary, back of kerb or survey mark. For examples of how to correctly capture the location of a point, refer to Appendix A - *Example Measurement Locations* which includes examples for:

- Measuring a Joint
- Cable Bend
- Cable Pit
- Cable Route
- Road crossings and ducts
- Pillars
- Substations

The point of measurement for each asset is defined in Table 2 on the following pages.

TABLE 2. GEOSPATIAL MEASUREMENT LOCATIONS

Asset Category	PARENT ASSET		CHILD ASSET		Data FORMAT requested	X/Y Location	Z Location Only where non-standard	Comments
	Asset	WAE geospatial location required	Asset	WAE geospatial location required				
Support Structure	Support Structure - Transmission Poles/ Towers	Yes	-	-	Point	Centre point, base of structure	-	-
	Support Structure - Distribution Poles	Yes	-	-	Point	Centre point, base of structure	-	-
Support Structure: Attached Feature	-	-	Spacer	No	Point	-	-	Specify the quantity of spacers between each span.
	-	-	Stay Anchor	Yes	Point	Centre point, base of anchor	-	-
	-	-	Stay Wire	No	-	-	-	Defined by the locations of pole and anchor.
Ground Mounted Structures	Pad mount Substation	Yes	-	-	Polygon	All four corners of the structure	-	-
	HV Switching station	Yes	-	-	Point	Centre point, base of structure	-	-
	Distribution Box	Yes	-	-	Point	Centre point, base of structure	-	-
	Pillars	Yes	-	-	Point	Centre point, base of structure	-	-
	Point of Entry	Yes	-	-	Point	Centre point, base of structure	-	-
	Kiosk	Yes	-	-	Polygon	All four corners of the structure	-	-
	Pregnant Column	Yes	-	-	Point	Centre point, base of structure	-	-
	SCADA Cubicle	Yes	-	-	Point	Centre point, base of structure	-	-
	Streetlight Control Cubicle	Yes	-	-	Point	Centre point, base of structure	-	-
Electrical Supply Site	Chamber Substation	Yes	-	-	Polygon	All corner points of structure footprint	-	-
	Mobile Zone Substation	Yes	-	-	Polygon	All corner points of structure footprint	-	-
	Zone Substation	Yes	-	-	Polygon	All corner points of structure footprint	-	-
	132kV Switching Station	Yes	-	-	Polygon	All corner points of structure footprint	-	-

Asset Category	PARENT ASSET		CHILD ASSET		Data FORMAT requested	X/Y Location	Z Location Only where non-standard	Comments
	Asset	WAE geospatial location required	Asset	WAE geospatial location required				
Electrical Supply Site cont. …	Customer switch room	Yes	-	-	Polygon	All corner points of structure footprint	-	-
	Bulk Supply Station	Yes	-	-	Polygon	All corner points of structure footprint	-	-
	Stockade	Yes	-	-	Polygon	All corner points of structure footprint	-	-
	-	-	Overhead Substation	No	-	-	-	Take the geospatial location of the parent structure
Transformers	-	-	Auxiliary Transformer	No	-	-	-	Take the geospatial location of the parent structure
	-	-	Current Transformer	No	-	-	-	Take the geospatial location of the parent structure
	-	-	Distribution Transformer	No	-	-	-	Take the geospatial location of the parent structure
	-	-	Earthing Transformer	No	-	-	-	Take the geospatial location of the parent structure
	-	-	Power Transformer	No	-	-	-	Take the geospatial location of the parent structure
	-	-	Voltage Transformer	No	-	-	-	Take the geospatial location of the parent structure
	-	-	Voltage Regulator	No	-	-	-	Take the geospatial location of the parent structure
Switchgear	-	-	Switchboards	No	-	-	-	Take the geospatial location of the parent structure
	-	-	Switchgear	No	-	-	-	Take the geospatial location of the parent structure

Asset Category	PARENT ASSET		CHILD ASSET		Data FORMAT requested	X/Y Location	Z Location Only where non-standard	Comments
	Asset	WAE geospatial location required	Asset	WAE geospatial location required				
	-	-	Panel	No	-	-	-	Take the geospatial location of the parent structure
Protection	-	-	Switch or Link	No	-	-	-	Take the geospatial location of the parent structure or pole. Indicate which side of the pole the switch is situated on (i.e., which circuit it affects).
	-	-	Fuse	No	-	-	-	Take the geospatial location of the parent structure or pole. Indicate which side of the pole the fuse is situated on (i.e., which circuit it affects).
	-	-	Fault Limiter	No	-	-	-	Take the geospatial location of the parent structure.
	-	-	Recloser	No	-	-	-	Take the geospatial location of the parent structure.
Protection Cont.….	-	-	Sectionaliser	No	-	-	-	Take the geospatial location of the parent structure.
	-	-	Surge Diverter	No	-	-	-	Take the geospatial location of the parent structure.
	-	-	Circuit Breaker	No	-	-	-	Take the geospatial location of the parent structure.
Circuit Segments (including communication cables)	Overhead Conductors	Yes	-	-	Line	Conductor Support structure Point	-	-
	Underground Cables	Yes	-	-	Line	All cable vertices (variation bends) points.	Points locations where depth	-

Asset Category	PARENT ASSET		CHILD ASSET		Data FORMAT requested	X/Y Location	Z Location Only where non-standard	Comments
	Asset	WAE geospatial location required	Asset	WAE geospatial location required				
							varies from the standard.	
	-	-	Busbar	No	Line	-	-	-
Earth	-	-	Earth Electrode	Yes	Point	Centre point of Electrode	-	-
	Earth Mat	Yes	-	-	(polygon)	All Earth Cable vertices (variation bends) points.	-	This will overlay the structure footprint in part or full.
Joints (including communication joints)	Joint	Yes	-	-	Point	Centre point of Joint	Centre point of Joint where Joint depth varies from the standard.	-
UG/OH Connection Point	-	-	UG/OH Connection Point	Yes	Point	-	-	Take the geospatial location of the parent pole structure. Indicate related underground cable.
Customer and Service	Point of Attachment / Point of Entry	Yes-	-	-	point	Centre point at Point of Attachment or Point of Entry (Location of meter box or distribution board is also required.)	-	Where dual occupancies exist, also show the unit number for the service point in the attributes.
Pits	Pit <= 1m squared	Yes	-	-	Point	Centre of Pit	-	-
	Pit > 1m squared	Yes	-	-	Polygon	Pit footprint	-	-
Duct / Conduit	Duct / Conduit	Yes	-	-	Line	Centre of Duct, start points, end points, bend points.	Points locations where depth varies from the standard.	-
	Underbore Ducts / Conduit	Yes	-	-	Line	Centre of Duct, start points, end points, bend points.	Points locations where depth varies from the standard.	-

Asset Category	PARENT ASSET		CHILD ASSET		Data FORMAT requested	X/Y Location	Z Location Only where non-standard	Comments
	Asset	WAE geospatial location required	Asset	WAE geospatial location required				
Miscellaneous Equipment	-	-	Battery Charger	No	Point	-	-	Take the geospatial location of the parent structure
	-	-	UPS	No	Point	-	-	Take the geospatial location of the parent structure
	-	-	Network Generator	No	Point	-	-	Take the geospatial location of the parent structure
	-	-	Remote Terminal Unit	No	Point	-	-	Take the geospatial location of the parent structure
	-	-	Network Analyser	No	Point	-	-	Take the geospatial location of the parent structure
	-	-	GPS Clock	No	Point	-	-	Take the geospatial location of the parent structure
	-	-	Communication Switch	No	Point	-	-	Take the geospatial location of the parent structure

DATA SUBMISSIONS

8.3 Submission Triggers

The requirement for a geospatial data submission is triggered by any work on the electrical network that results in any new addition or alteration to the existing network (includes both electrical and non-energised related assets). These works may be undertaken by either Evoenergy (and its contractors) or through other private construction and will include any combination of scenarios below:

- New installations
- Replacements
- Upgrades
- Relocation works
- Removal
- Abandonment

For specific definitions on the above-mentioned type of works, refer to Section 6.

Geospatial data submissions will typically relate to a point in time when:

- Construction is finished in the form of a WAE

Other scenarios that will trigger a submission is the need to confirm an asset:

- Location and/or information for the purpose of a design
- Location information when construction works result in a change to the GIS of connected assets, or
- Where a discrepancy is found between the GIS and the field asset location (e.g., Network Map Updates)

8.3.1 Third party assets

Third party assets that interact with Evoenergy assets will be recorded up to the connection point. Recording third party assets beyond this point will be on a case-by-case basis.

9. FILE FORMAT

Data submitted in digital format must meet the following specifications:

- Only accepted file types are to be submitted (see 10.1)
- X and Y coordinates must use either GDA2020 or ACT Standard Grid where GPS devices are used,
- Elevation readings (Z values) such as depth and height must use the Australian Height Datum (AGD1971) where GPS devised are used,
- Drafted outputs (CAD and GIS) must use appropriate topology settings,

9.1 Accepted File Types

In most cases, more than one type of file will need to be submitted so that the minimum required information is satisfied for WAE submissions.

Any of the below listed electronic file types will be accepted:

- CAD Files (.dxf/.dwg)
- GIS Files (.shp/.gdb /.mdb /.kml /.wkt)
- Tables (.xlsx / .txt / .psv / .csv / map info tables)
- Bore logs (as any file type listed in 9.1)
- Issued for construction drawings (as marked-up .pdf or .jpg)
- Photos and Imagery (any image file format)
- Schematic Diagrams (as any file type listed in 9.1)

9.1.1 Other File Types

Other file types will be considered upon request and confirmation must be sought from the Geospatial Data Team if the proposed file type is suitable for use within Evoenergy's GIS.

9.2 CAD Files (.dwg / .dxf)

Work as Executed information can be provided in CAD format provided that other requirements of this document are satisfied. CAD files submitted need to be:

- Clearly presented with mark-up lines, points and closed polyline or surface features only (remove or turn off unnecessary features from the file so as not to cause confusion).
- Shown in the correct geospatial projection.
- Displayed with distinct types of assets recorded as different layer types with a different line type and colour to make them easy to understand.
- Drawn as lines where the feature is linear (e.g., cables and conduits).
- Drawn as closed polyline or surface with the correct size and orientation where the feature constructed has a significant surface area (e.g., Subs and chamber subs).
- Drawn as points where the feature constructed is a small area feature (e.g., Micropillar) or a point location feature (e.g., Joints and conduit end points). Small area features need to be drawn in the centre point of the feature.
- Able to show AHD levels for height and depth as points where features deviate from the standard in height or depth.
- Annotated or labelled correctly within the file.
- Supported by a supplementary PDF plan of the WAE mark-up.
- Supported by a supplementary table of attributes where the CAD structure attributes are insufficient to define the type of asset being constructed.

GIS Files (.shp/.gdb /.mdb /.kml /.wkt)

Work as Executed information can be provided as a GIS file such as shapefiles, geodatabase files, feature classes, keyhole mark-up language files, and well-known-text files. When providing GIS data in this format ensure that:

- X- and Y- values are provided in the correct geospatial projection.
- Z- values use the correct height datum.
- The geospatial attribute table has been populated with the minimum attributes required.

9.3 Tables (.xlsx / .txt / .psv / .csv / map info tables)

Work as Executed information can be provided in several tabular formats such as excel, text files, pipe separated values, comma separated values and map info tables. When providing attributes and data in this format ensure that:

- X- and Y- values are provided in the correct geospatial projection.
- Z- values use the correct height datum.
- The table is free of duplication (one row per point).
- The minimum required attribution is present in each row.
- A unique identifier (UID) should be present in each row to refer to. This should relate to any PDF plan labels and CAD files or shapefiles that area also provided.

9.4 Bore Logs

Where directional drill bores are used to install assets, the bore log files showing depth and chainage must be returned with the Work As Executed information submitted usually in a tabular format. These Bore logs will then be used to adjust asset depth information where the depth of an asset is above or below the required Depth set by Evoenergy Standards.

9.5 Issued for Construction Plans (.pdf / .jpg)

Issued for construction plans are not considered a WAE submission unless as-built information has been marked-up on them in the following ways:

- The plan must be dated, signed and amended to state it is a “Work As Executed” plan,
- Text and lines can be marked-up in adobe comments and saved as a WAE.
- Hand drawn mark-ups will also be accepted on the top of the issued for construction plans where they have been scanned and submitted digitally.

9.6 Photographs and Imagery

Photos of completed works can be an important supplementary source of information to a WAE plan but cannot replace GPS or measured geospatial locations. Photo files submitted must:

- Be of sufficient visual quality that relevant features are clearly visible.
- Include a description on the photo indicating the photo subject.
- Provide relevant information to ensure GIS editors can translate all relevant information without the need of electrical/technical qualifications.

9.7 Schematic Diagrams

All relevant schematics showing electrical connectivity should be updated and provided as part of a WAE submission.

10. GEOSPATIAL REFERENCING AND RELATIONSHIPS

10.1 Coordinate Systems

Evoenergy’s geospatial database is based on the ACT (Australian Capital Territory) Standard Grid, commonly termed as ‘Stromlo ACT’. Coordinates on the Stromlo ACT are listed in Table 3.

All data provided can either be submitted as GDA2020 or Stromlo ACT coordinate system. Please note, all data provided to Evoenergy will be converted to Stromlo ACT.

TABLE 3. ACCEPTED COORDINATE SYSTEM

STROMLO ACT

```
        AUTHORITY["EPSG","6202"]],
    PRIMEM["Greenwich",0],
    UNIT["degree",0.0174532925199433],
    AUTHORITY["EPSG","4202"]],
PROJECTION["Transverse_Mercator"],
PARAMETER["latitude_of_origin",0],
PARAMETER["central_meridian",149.00929483],
PARAMETER["scale_factor",1.000086],
PARAMETER["false_easting",200000],
PARAMETER["false_northing",4510193.494],
UNIT["METER",1]]
```

10.2 Elevation

For geospatial data collection, surveyed points should be returned with a Z-value (elevation) in meters using the commonly used Australian Height Datum (AGD1971).

Field measurements captured should provide a measured height or depth of the asset compared to ground level, at the point of measurement. E.g., A 12m tall pole or a 2m deep trench.

Note, there are construction standards associated with elevation (depth/height) for construction items like trenches or poles. For this reason, it is recommended that point elevation/depth measurements be supplied only where the feature (or parts of it) have not been constructed to standard due to a trial design or localised environmental factors resulting in an unavoidable non-standard depth installation.

10.3 Topology

When presenting drawings in digital form you must ensure the connection or relationship between neighbouring or adjacent features is maintained. To do this, ensure the software used has appropriate levels of snapping or topology turned on in while drafting or capturing data. This will ensure that line, point and polygon features that are supposed to be physically connected or related, connect in the output drawing and all plans generated from it (Refer 6 for Electrical Connectivity)

11. DATA LABELS

11.1 Labelling/Annotation

Those submitting marked up plans, drawings, CAD files or other digital drawings as WAE, must ensure the submission is clear and unambiguous. This can be achieved with the use of:

- Labels
- Legend
- Notes, and
- Attributes

11.2 File Name Conventions

Submitted files must have a clear naming convention identifying the subject and will include the prefix “WAE” so any submitted WAE information on the Work Order will be clearly identifiable from other scoping or planning files already attached to the work order.

For Example, the following file names would be considered clear file naming conventions:

- WAE_S12345_EarthMat.dwg
- WAE_S12345_TXplate.jpg

- WAE_S12345_LVfuses.jpg
- WAE_S12345_ComissioningFrm.pdf

11.3 GPS Point Labelling Conventions

All GPS Points must be labelled on plans, cad files or GIS files using a unique identifier for each point. Where coded identifiers are used a key to the code should be provided.

12. DATA SUBMISSION METHODS

Work as Executed information must be submitted as part of the Cityworks Work Order. All WAE information for geospatial data submission must:

- be attached to the Work Order or be completed in the Work Order's default inspection forms.
- be attached to the work order that houses the GIS40 task (not a related child or parent workorder).
- be attached and complete, prior to completing the InspAsset.info task on the Work Order.

For consistency in corporate record keeping WAE information must only be attached to the Work Order and not emailed directly to the Geospatial Data Team or its members.

12.1.1 Notifying of Network Map Updates

Network Map Updates are to be submitted in Cityworks as per the Network Map Update procedure found on The Evoenergy Grid.

12.2 Contractors and External Data Sources

Contractors must submit work as executed information to their designated contact within Evoenergy who will then attach information to the work order as per Section 12 above.

DATA ACCEPTANCE

13. ACCEPTANCE OR REJECTION OF GEOSPATIAL DATA

13.1 Acceptance Qualification Guide

Acceptance of geospatial data submitted as a Work As Executed will be based around the requirements set out in Section 6 Data Requirements. Where a submission has failed to meet the requirements of this standard the submitted work will be rejected back to the supervisor listed on the Work Order. Where the work order is again submitted without remedy of the initial rejection reason, the data may be processed and classified at a data quality level appropriate to the content.

Where geospatial data does not satisfy the requirements of Section 6:

- The GIS task on the work order will be marked as “Pending” and the task associated with the collection of Asset information (e.g., InspAsset.Info) will be marked as “Current”.
- A comment will be left on the work order in the main comments field indicating why the work order has been rejected.
- The Status of the Work Order will be marked as “WAE Rejected” and it will be submitted to the Site Lead or PDL responsible for the works as listed on the Work Order.
- Regular monthly reporting on the number and type of work orders being rejected will be recorded and reported up the chain for investigation.

13.2 Submission Revision

Geospatial Data Submissions will be reviewed and processed once:

- All other tasks on the work order preceding the “GIS40” task have been completed,
- The status of the work order changes to field complete or complete,
- The actual finish date is populated, and
- The GIS task status is “Current”

13.3 Notification of Rejection/Acceptance

All notification of acceptance and rejection will be presented at the Work Order level through Cityworks. Responsible individuals should ensure they have appropriate views set up in their Cityworks Inbox to filter and notice work orders sent back due to missing or incomplete data requirements (Section 6).

Work as Executed information that is complete, delivered in a required format, and at an acceptable geospatial accuracy will be processed and the GIS task closed on the Work Order.

DOCUMENT ADMINISTRATION

14. VERSION CONTROL

VERSION	DETAILS	UPDATED
1.0	Initial Document, replaces PO060100 previously archived.	Maria Nguyen Senior Real Time System Administrator

15. APPROVAL CONTROL

DOCUMENT OWNER	DOCUMENT CUSTODIAN	PUBLISH DATE	REVIEW DATE
Group Manager Strategy and Operations	Senior Real Time System Administrator	28/10/2024	28/10/2027

APPENDIX

APPENDIX A – EXAMPLE MEASUREMENT LOCATIONS

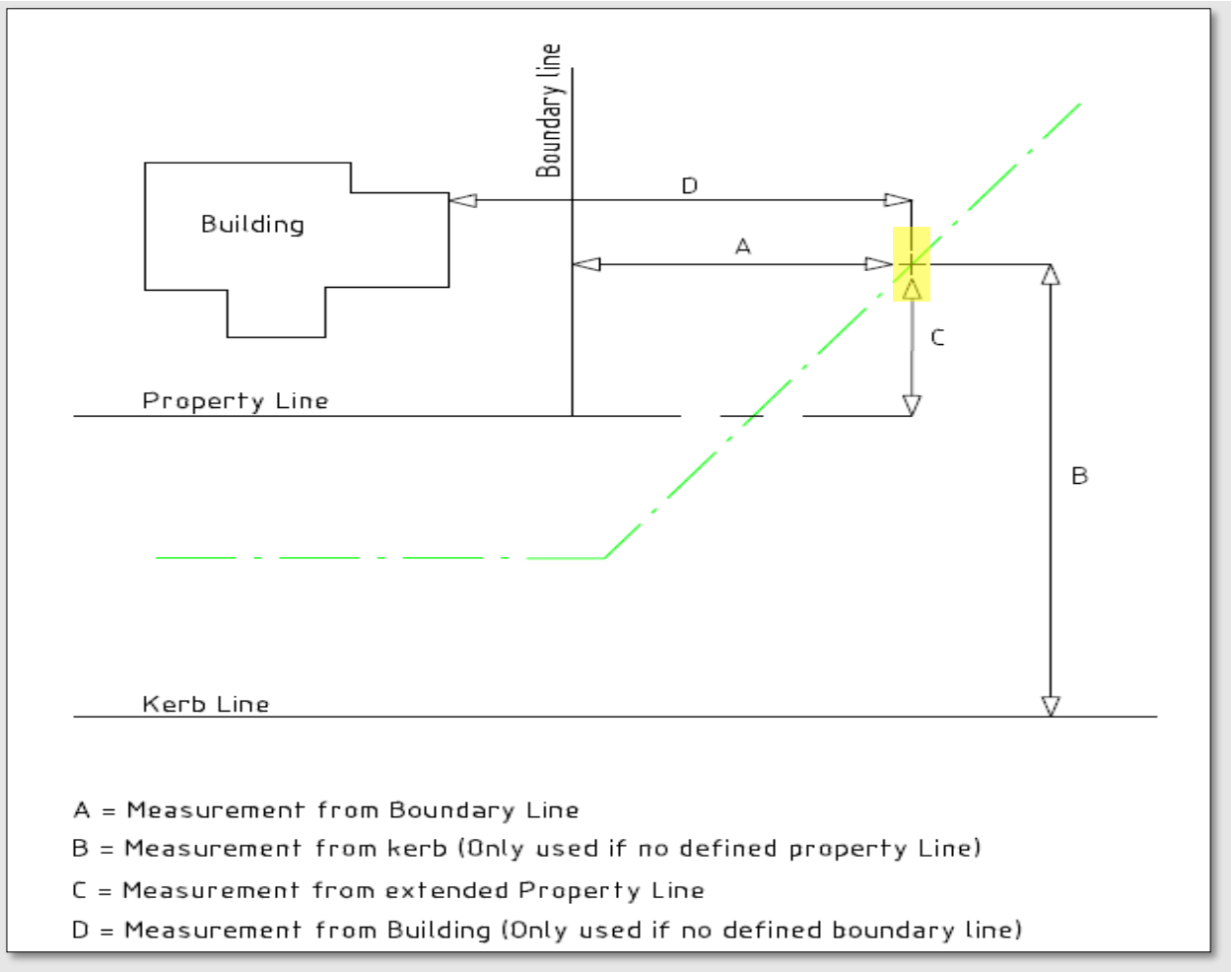

FIGURE 1. MEASUREMENT OPTIONS FOR LOCATING A JOINT IN THE FIELD (NEAR A BUILDING)

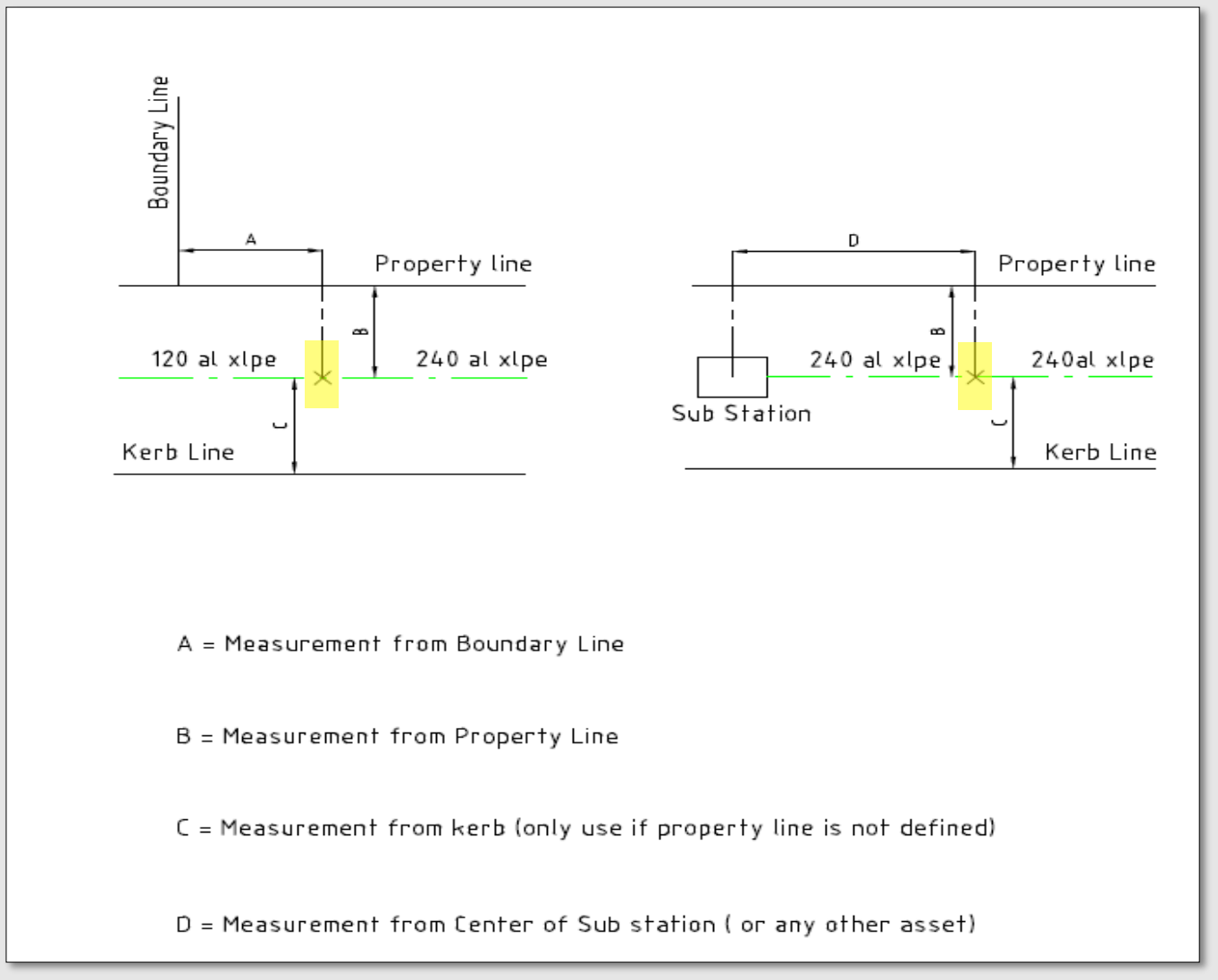

FIGURE 2. MEASUREMENT OPTIONS FOR LOCATING A JOINT IN THE FIELD (NEAR ANOTHER ASSET)

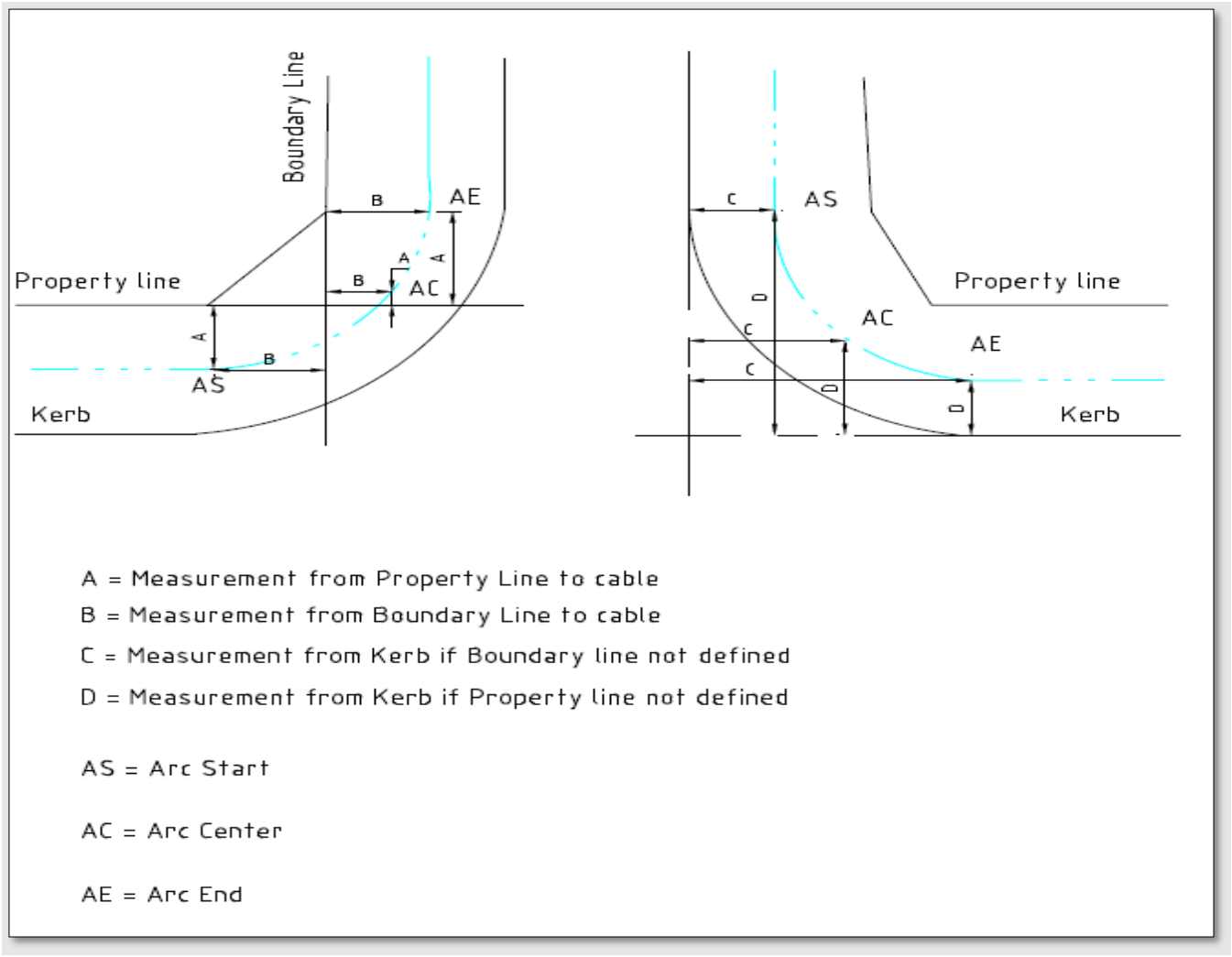

FIGURE 3. MEASUREMENT OPTIONS FOR LOCATING A CABLE BEND

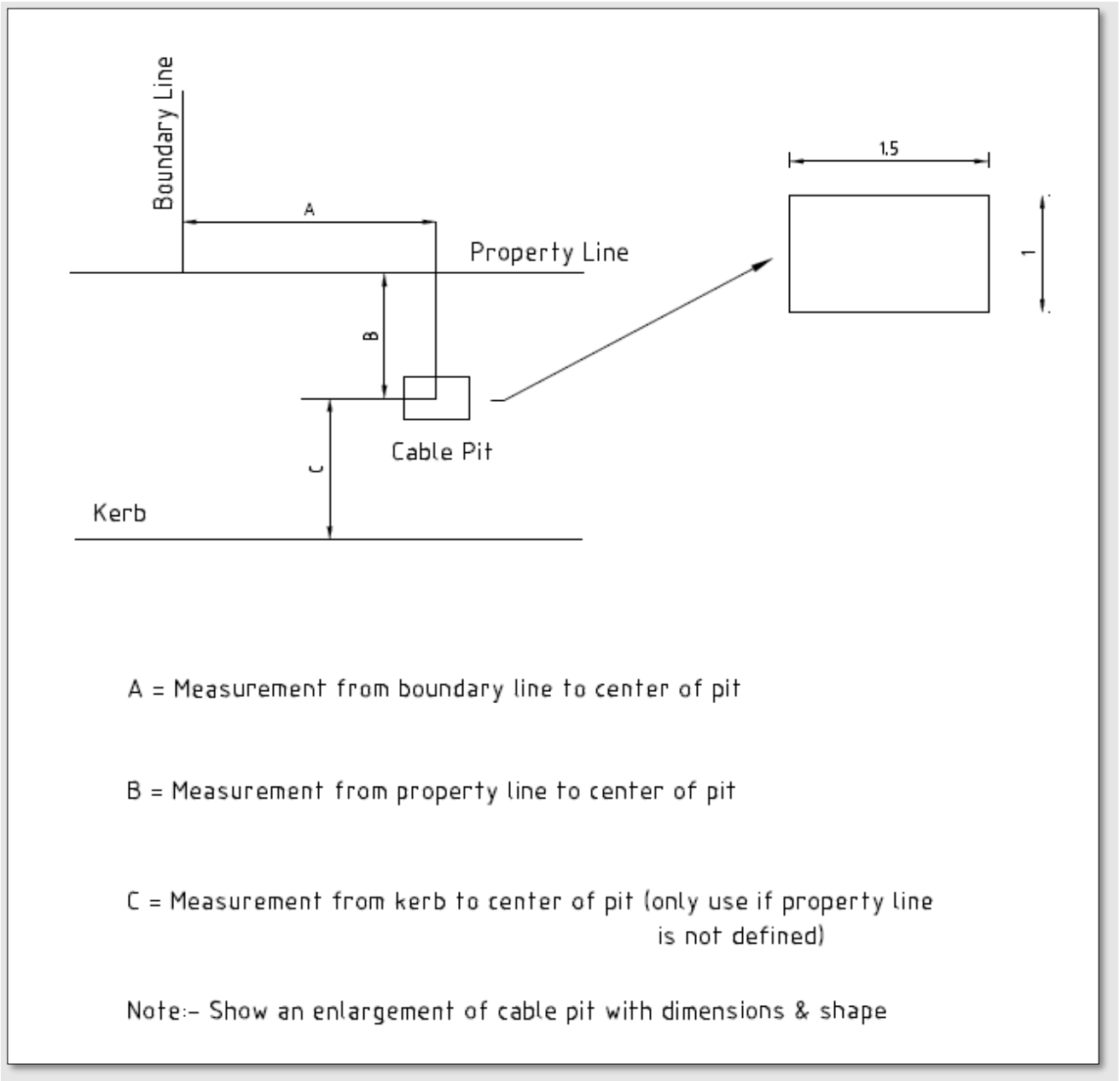

FIGURE 4. MEASUREMENT LOCATIONS FOR A CABLE PIT

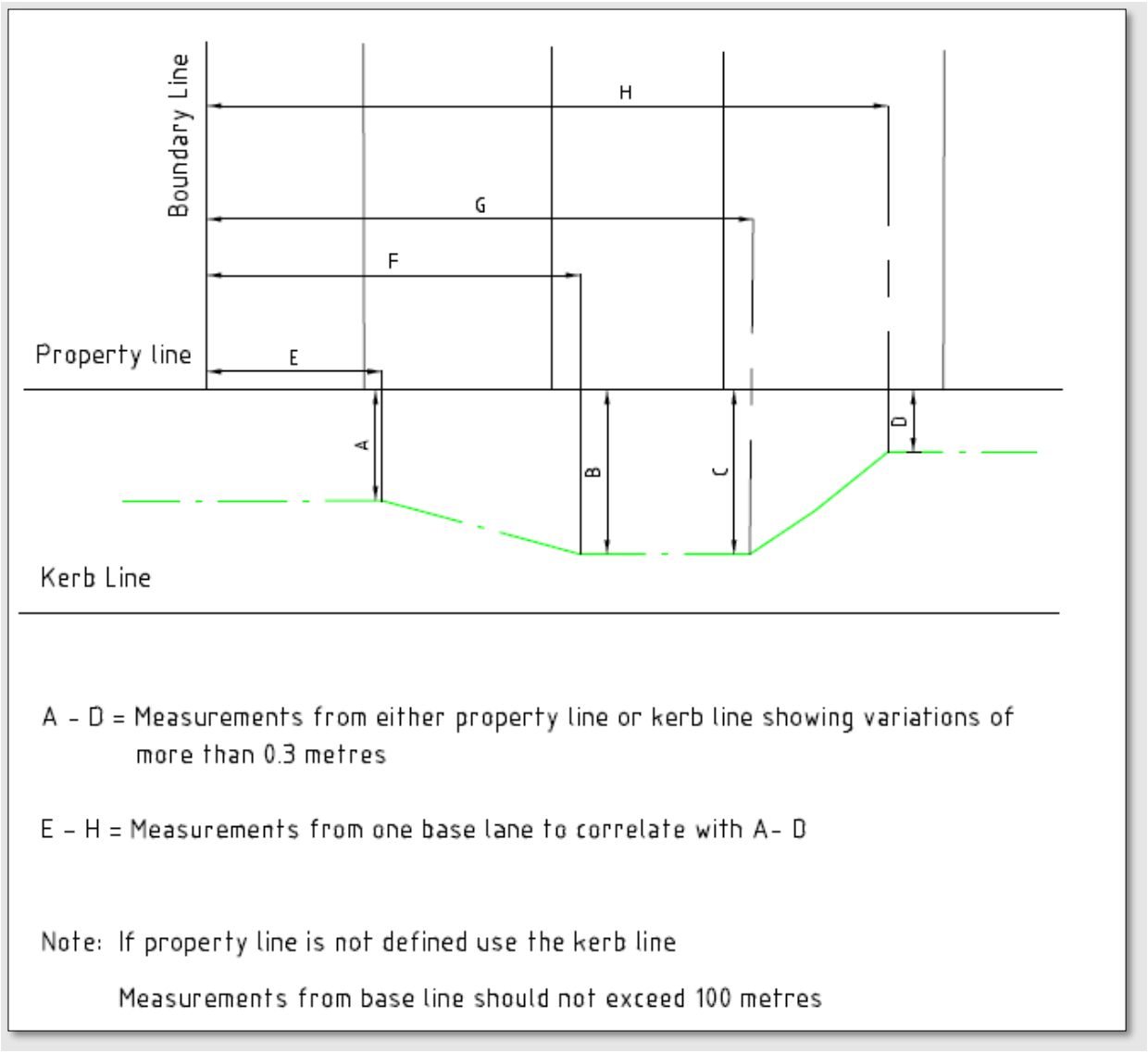

FIGURE 5. MEASUREMENT LOCATIONS FOR A CABLE ROUTE

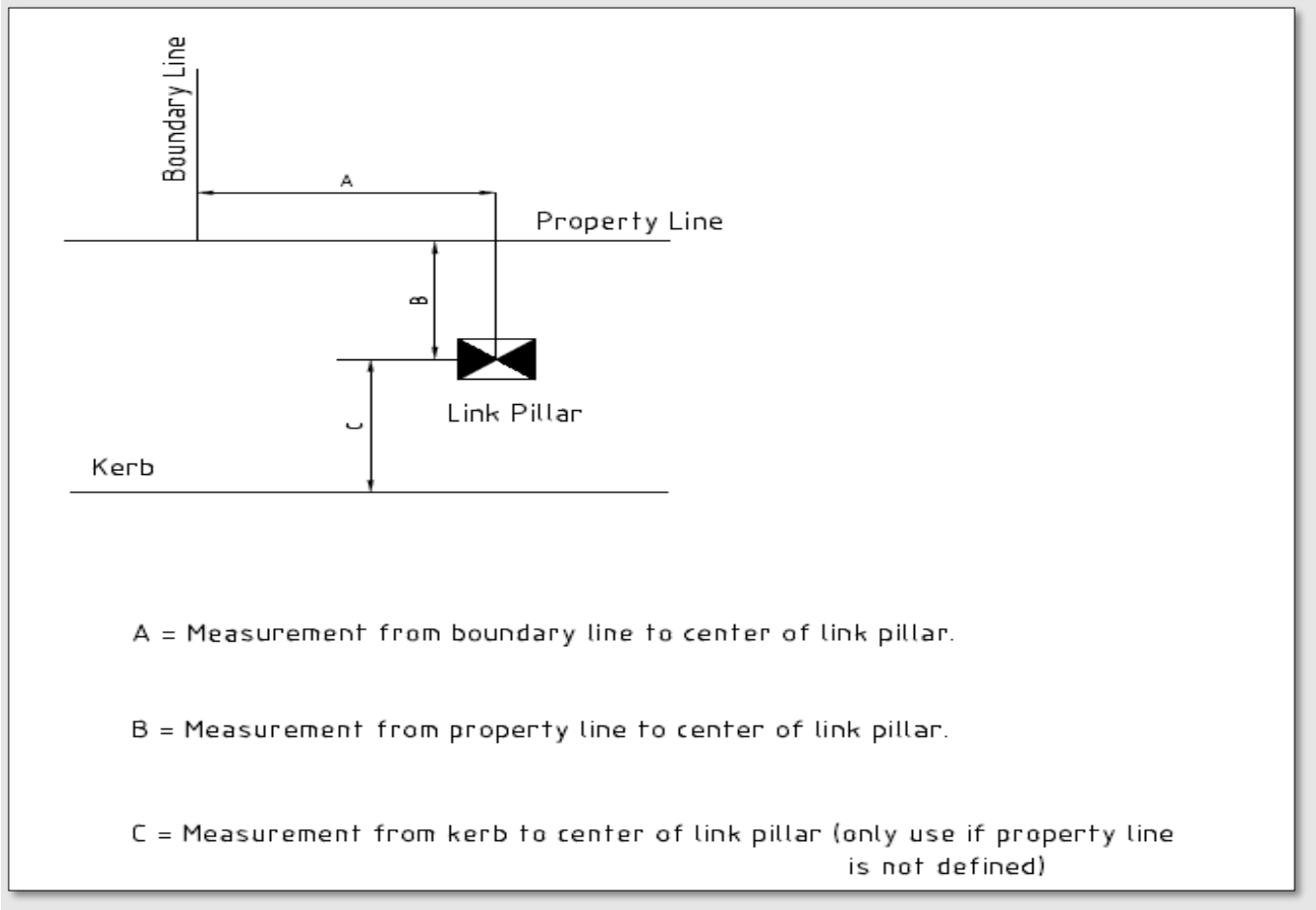

FIGURE 6. MEASUREMENT LOCATIONS FOR A PILLAR

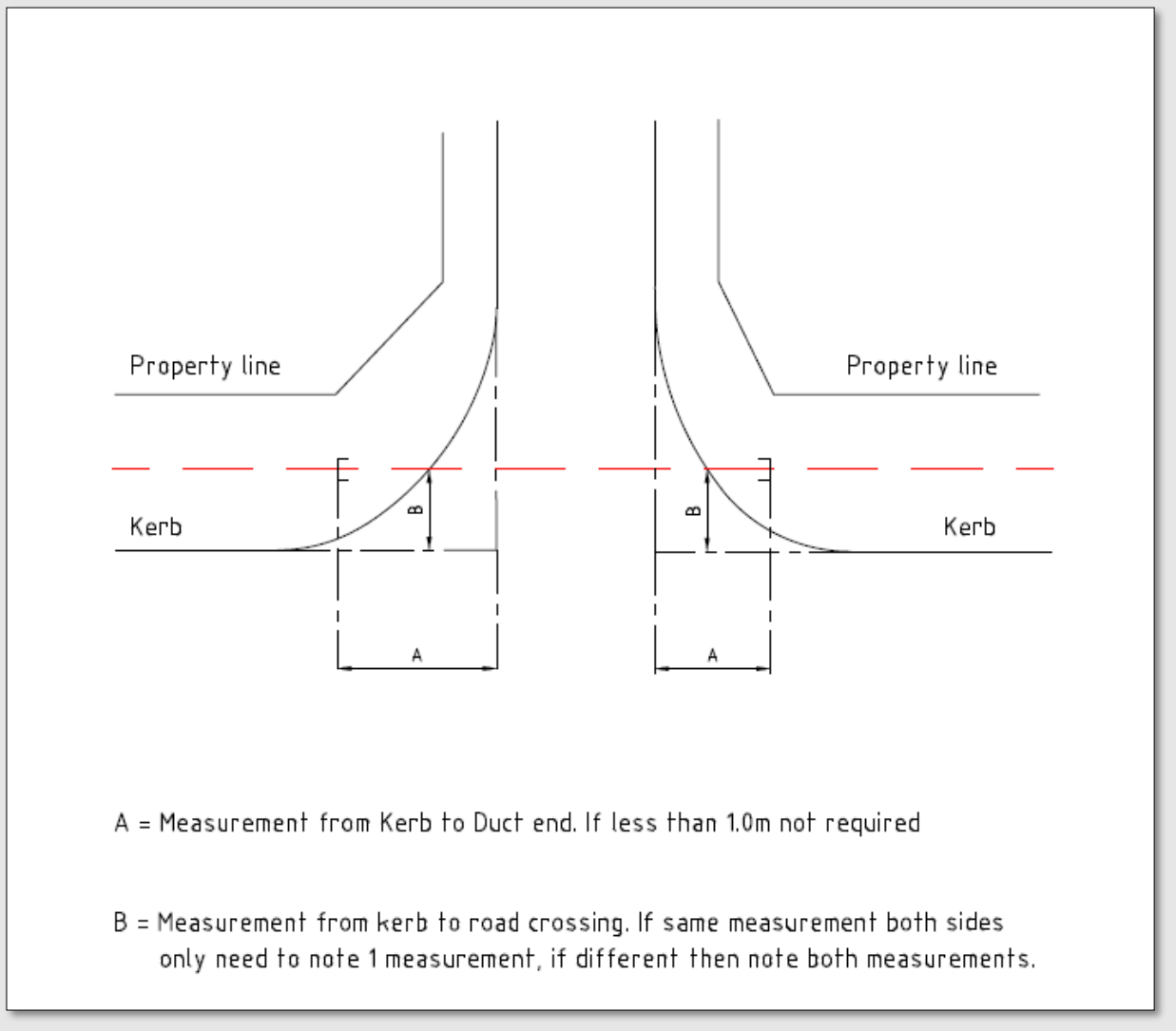

FIGURE 7. MEASUREMENT LOCATIONS FOR A ROAD CROSSING

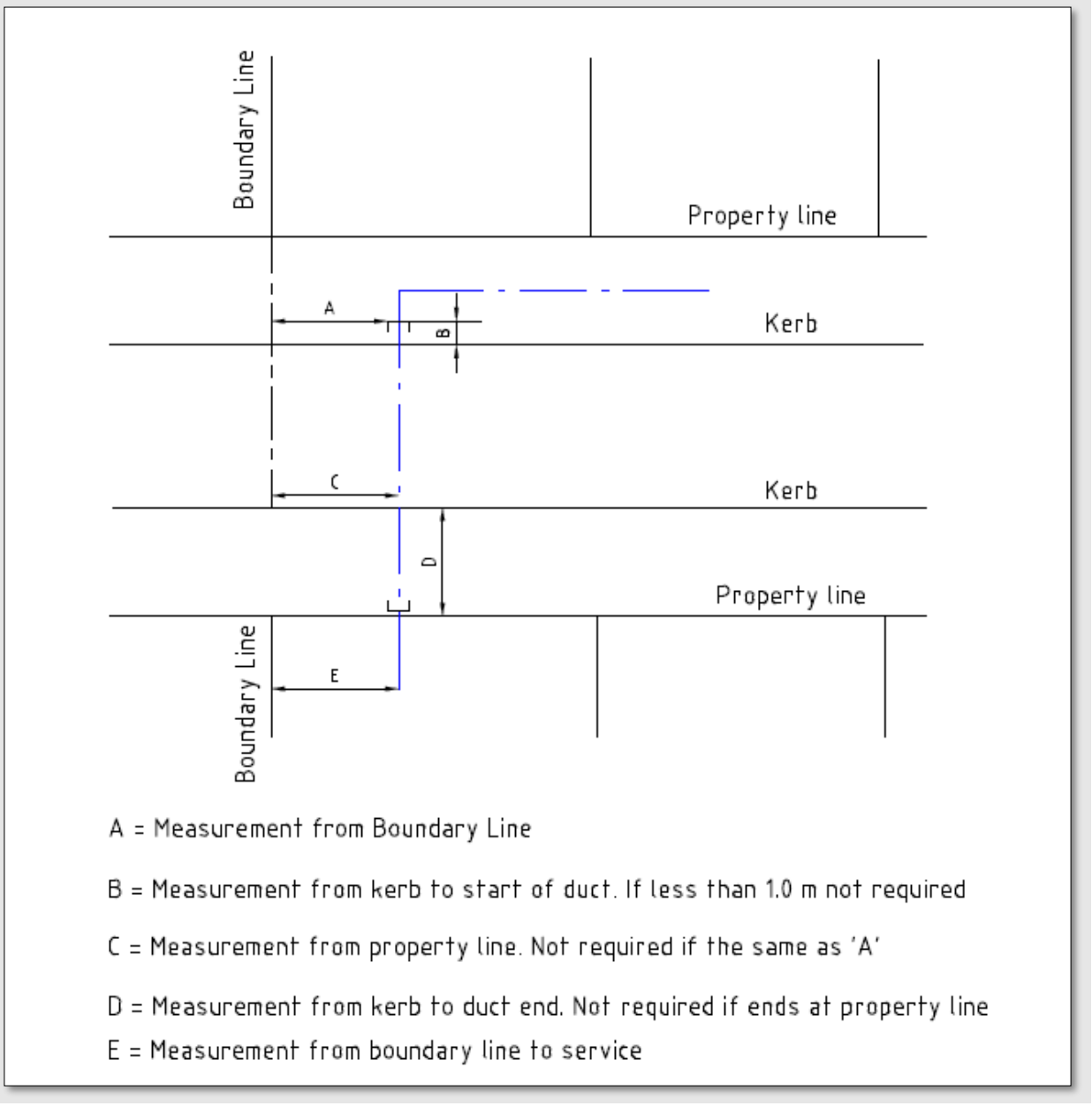

FIGURE 8. MEASUREMENT LOCATIONS FOR ROAD CROSSING WITH DUCTS

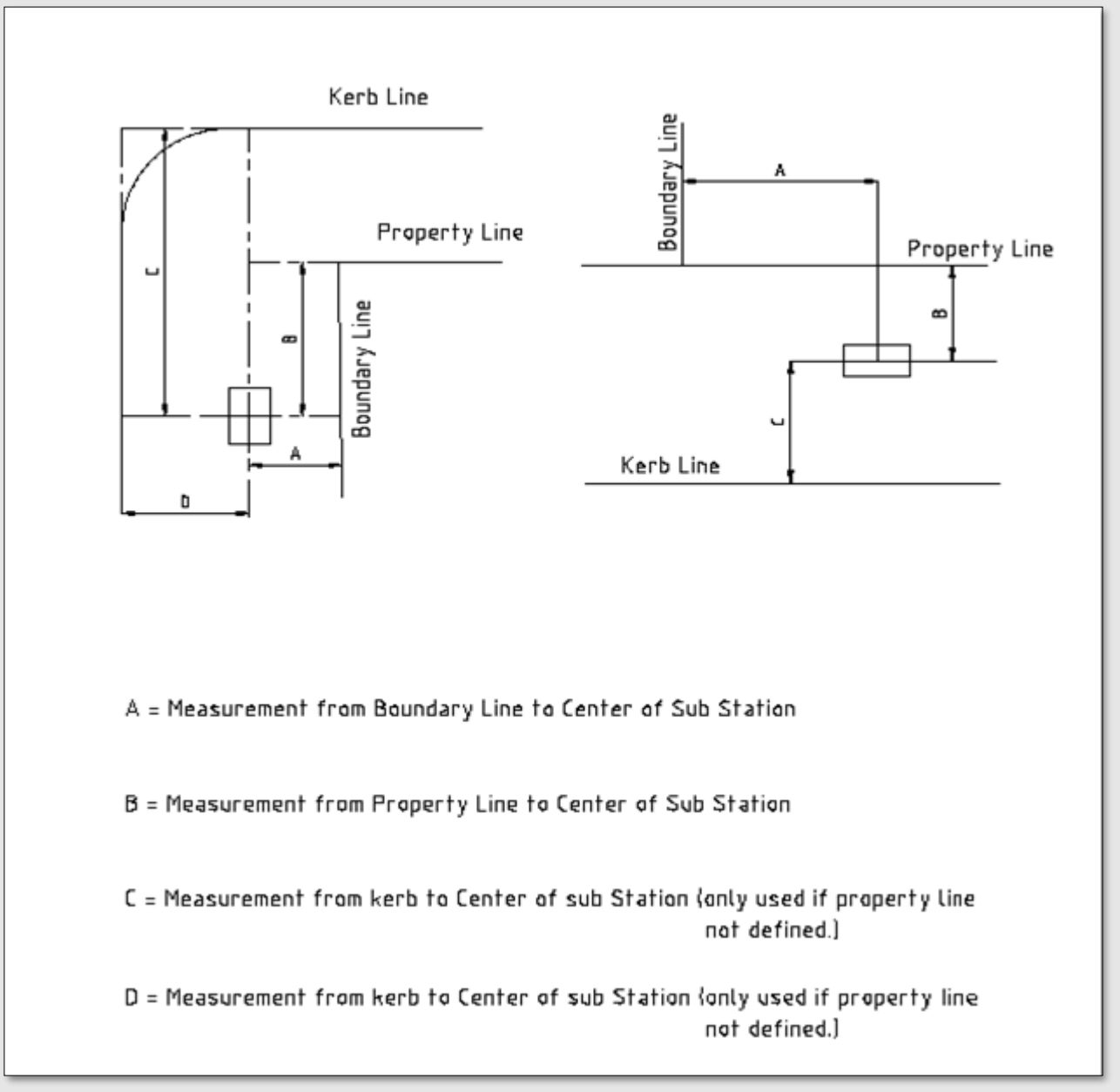

FIGURE 9. MEASUREMENT LOCATIONS FOR A SUBSTATION.