Australian Government

Department of the Environment and Energy

Carbon Farming Initiative (CFI)

Mapping Guidelines

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Glossary of Terms

Term	Definition and explanation
Attributes	The properties of a Carbon Estimation Area (CEA), for example, when mapping forested land, attributes might be the project name, tree species present and the planting date of the forest.
Carbon Estimation Area (CEA)	A stratum of the Project Area; land which is homogenous for the purpose of abatement calculations, has consistent biophysical characteristics and is established and managed in a consistent way. CEAs may be defined by a single CEA Polygon or, where a specific method allows, more than one CEA Polygon (see Split CEA). The CEA is the area defined by the CEA Polygon(s) less the area defined by any Exclusion Area Polygon(s) within the CEA Polygon(s).
Carbon Estimation Area (CEA) Polygon	A polygon defining the external boundary of a CEA or, for Split CEAs, the external boundary of a CEA Part. Note: The CEA Polygon(s) are distinct from any Exclusion Area Polygon(s) that contribute to defining CEAs.
CEA Part	For a Split CEA, a single CEA Polygon exclusive of any Exclusion Areas within the CEA Polygon defines a CEA Part.
Carbon Maintenance Obligation	A Carbon Maintenance Obligation requires landowners (including subsequent owners of the same land) to maintain carbon stocks. The Clean Energy Regulator may impose a Carbon Maintenance Obligation in relation to an area or areas of land for which a relinquishment requirement has not been complied with as required under the *Carbon Credits (Carbon Farming Initiative) Act 2011*.
Exclusion Area	Areas of land within the Project Area that do not contribute to abatement. Examples of Exclusion Areas are given in the section below on *Defining and mapping Exclusion Areas*.
Exclusion Area Polygon	A polygon defining an Exclusion Area. Each CEA can contain zero, one or more than one Exclusion Area(s). An Exclusion Area Polygon may occur wholly within a CEA Polygon, for example, representing a dam or road), or fall partly outside a CEA Polygon.
Geographic Information System (GIS)	An electronic system used to manage geographic data which may include creating and storing maps; overlaying and analysing different types of spatial information; and displaying, editing, formatting and printing new maps resulting from spatial analysis.
Interchangeable digital GIS formats (data file)	Used to encode map data as an electronic file. A set of sub-files lists the types of geometric features in the data (polygons in the case of Emissions Reduction Fund projects), the data that defines the polygon locations, the attributes of each polygon, and the map projection in which the polygon locations are given.
Line Segment	A straight line bounded by two end points, with each end point having distinct map coordinates.

Term	Definition and explanation
Metadata	Descriptive data that provides information about another set of data. Metadata can include, but is not limited to, data title, data source, and accuracy.
Model Point	A static location defined by latitude and longitude coordinates for each CEA for the purpose of estimating carbon stocks using either the Full Carbon Accounting Model (FullCAM) or Reforestation Modelling Tool (RMT).
Orthorectify	Removal of distortions in an image so the new image has a consistent scale.
Polygon	A closed shape bounded by a single connected polyline that does not cross, such that the map coordinates of the end point of the polyline are the same as the map coordinates of the start of the polyline. Polygons can define the boundaries of a Project Area, CEA, CEA Part, or Exclusion Area.
Polyline	A continuous line composed of one or more connected line segments.
Project	An eligible offsets project which is registered with the Clean Energy Regulator. A project can be a sequestration project or an emissions avoidance project.
Project Area	An area of land on part, or all, of which the project has been, is being, or is to be, carried out.
Project Area Polygon	A polygon defining the external boundary of a Project Area. Project Areas which are located in more than one place will require a set of Project Area polygons to define their external boundaries.
Project Proponent	The person who is responsible for carrying out the project, and has the legal right to carry out the project.
Split CEA	A CEA consisting of two or more non-contiguous CEA Parts. In some methods Split CEAs are referred to as a CEA comprised of a set of polygons.
Stratification	The subdivision of the land within a Project Area according to biophysical characteristics and management regimes, or by other characteristics as allowed or required within a specific method.

1. Introduction

These mapping guidelines are designed to complement provisions contained within the *Carbon Credits (Carbon Farming Initiative) Act 2011* (the Act), the *Carbon Credits (Carbon Farming Initiative) Regulations 2011 (*the Regulations)*,* the *Carbon Credits (Carbon Farming Initiative) Rule 2015* (the Rules), any amendments to the Act, Regulations, or Rules and the associated methodology determinations (methods). Project proponents should use these guidelines to prepare geospatial mapping for the purposes of:

- meeting project compliance obligations under the ERF
- providing information to the Clean Energy Regulator (the Regulator), and
- estimating abatement.

These mapping guidelines may be reviewed and updated as necessary.

Further information regarding mapping requirements, including the evidence required to support mapped boundaries, for project proponents can be found in the Act, Regulations, Rules and specific methods (all available on the ComLaw website: http://www.comlaw.gov.au/).

2. When is mapping required?

Geospatial information is relevant for most land sector projects; the amount of information required varies according to the activity type and method in use. Each method describes the specific mapping requirements. In circumstances where carbon emissions and removals are independent of the land area, a single point location may be adequate information. When abatement is influenced by the location and area of the land where the project mechanism occurs, more detailed and precise delineation of the Project Area is necessary.

Project proponents may be required to provide geospatial mapping information about their Project Area to the Regulator when:

- applying for a declaration as an eligible offsets project
- the Regulator declares a project to be an eligible offsets project
- reporting estimated abatement
- applying for ACCUs
- providing information to the ERF project register
- a project proponent applies for a voluntary variation of declaration of eligible offsets project, including to amend the Project Area, or to restructure an eligible offsets project
- the Regulator informs the relevant land registration official about a sequestration project,
- responding to a request for information from the Regulator.

The Regulator requires this information to establish compliance with the relevant legislative requirements, including:

- whether Project Areas overlap
- that a land area is not registered twice for an offsets project under the same method
- if the project proponent has the legal right to carry out the project on the designated Project Area – whether the land is Torrens title or Crown land, whether there is native title over the land and who has a registered interest in the Project Area. Project proponents are advised to

consult the Regulator if the Project Area is classed as land rights land, or may be subject to native title

- whether a Project Area is subject to a Carbon Maintenance Obligation.

3. Mapping requirements

3.1 General description of mapping for land sector projects

Please note: further detail on mapping concepts is in Appendix 1.

Most land sector projects require collection and reporting of some geographic information. The specific requirements for a project are detailed in the applicable method, but broadly include a single point location, and/or detailed geographic boundaries.

When defining boundaries, key points and corners should be established using the tools, data sources and standards defined in this document. Boundaries of a Project Area may be simple or complex in shape (see Figure 1).

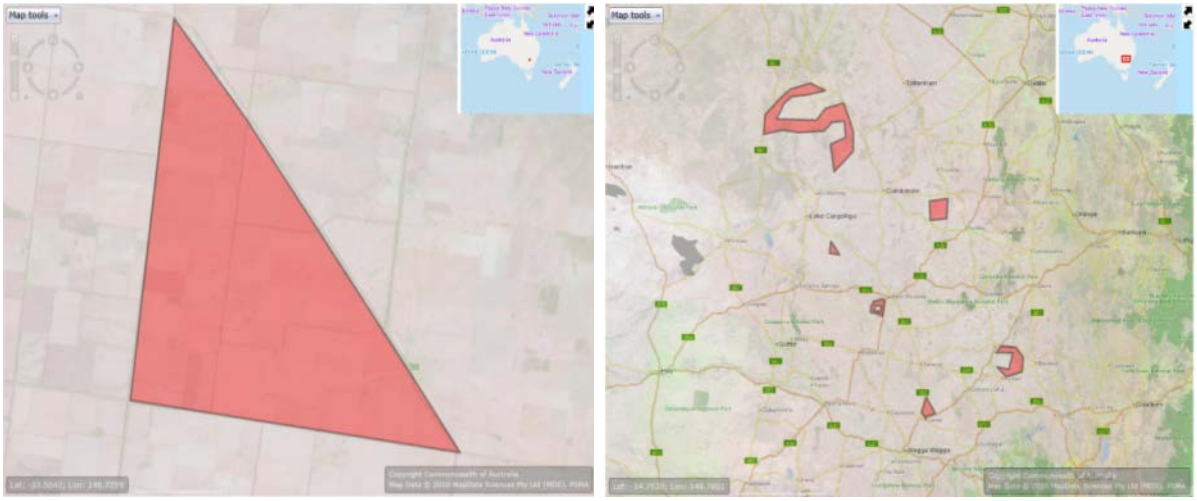

Figure 1: Examples of project areas that are simple (left) and complex (right) in shape.

3.2 Procedure for mapping

3.2.1 Identifying the Project Area

The Project Area includes the land on which the project has been, is being, or is to be, carried out. A Project Area is subject to legislative rules and requirements. Where the Project is defined by a point location, such as a landfill facility, the Project Area may be defined as a single reference point (latitude and longitude). For projects where it is necessary to determine the size of the area(s) on which the project mechanism is being applied to estimate the abatement, a geographic map is required.

A Project Area can consist of land covered by multiple land titles. Subject to the requirements of the Act and a particular method, a Project Area can consist of land areas that are separated by any distance provided they are still within the geographic bounds of Australia and Australia's external territories (see left panels in Figures 1 and 2).

For methods where estimating the abatement requires determining the size of the area(s) on which the project mechanism is being applied , project proponents may wish to include the whole land title as their Project Area, even if the project mechanism is only being applied on a part of the land. In this case the project will be required to create a geographic map identifying, within the Project Area Polygon, the Carbon Estimation Ares (CEAs) where the project mechanism is being applied (Figure 2, left panel). Alternatively, project proponents may wish to define their Project Area narrowly, to include only the areas where the project mechanism is being applied (Figure 2, right panel).

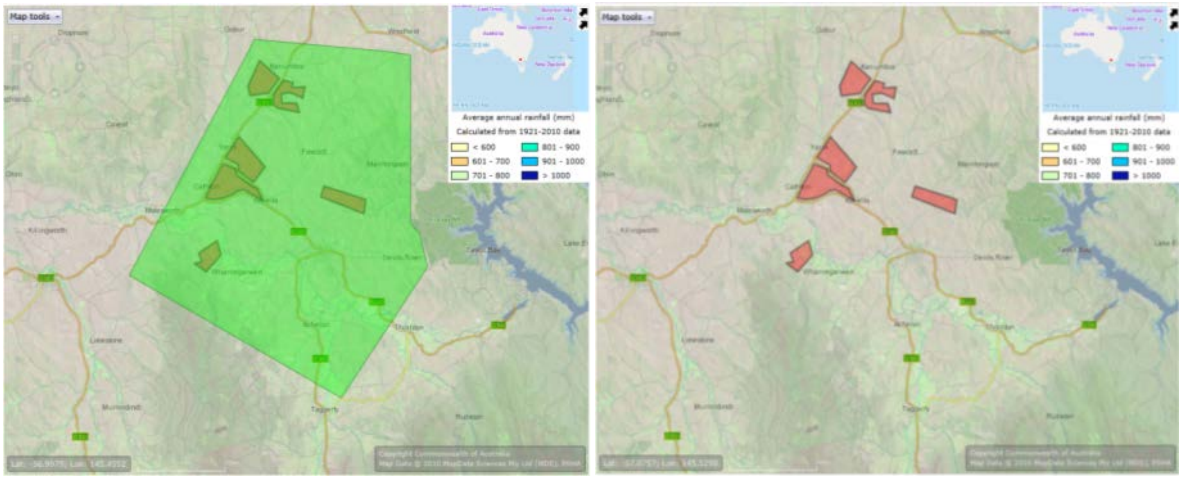

Figure 2: A project proponent may opt to define the Project Area according to the land on which they have the legal right to carry out the project (green-coloured area on left) and report only on the abatement achieved in CEAs (salmon-coloured areas) within this project area. Alternatively a Project Area may include only the areas on which the project mechanism is currently being applied (right).

Under the Act, variations to the declared Project Area require the project proponent to apply to the Regulator. By having declared a Project Area that includes all land where the proponent has the legal right to carry out a project, the proponent has the flexibility to increase the area to which they apply the project mechanism, for example, more CEAs without the requirement to vary the project area.

For reforestation and afforestation methodologies, unless otherwise specified in a method, the default CEA Polygon is defined by a polyline not more than 2 metres from the stems of any trees planted in the area. For the Environmental and Mallee Plantings method there are further details on setting boundaries in Appendix 2.

3.2.2 Defining and mapping Exclusion Areas

Some methods require Exclusion Areas to be identified and delineated. An Exclusion Area may be an area of land where it is not possible to apply the project, for example a large rock outcrop or an access road, or an area of land that doesn't meet eligibility requirements. Alternatively, an Exclusion Area may be an area of land which the project proponent does not wish to include in the project, for example a paddock used for grazing. Exclusion Areas can be a substantial size if entire land titles are identified as project areas.

If a method details that certain areas of land—for example areas of land without forest cover—must be identified as Exclusion Areas, then these provisions apply to:

- features greater than five metres in width; and

- areas less than five metres in width that total more than five per cent of the Project Area, for example, a Project Area that is one hectare in area should exclude any and all areas where the project mechanism is not applied if the total of these areas exceeds 500 m^2.

For reforestation and afforestation methods, unless otherwise specified in a method, the default boundary of an Exclusion Area is defined by a polyline not more than 2 metres from the stems of any trees planted in the area.

3.2.3 Stratifying Carbon Estimation Areas

Some methods, including many for sequestration projects, require project proponents to stratify the land within a Project Area into more homogenous units. These units are generally referred to as CEAs. Stratification intends to improve the accuracy of abatement calculations; appropriate stratification will ensure the key variables affecting emissions abatement are controlled.

Methods will set out the rules and basis for stratification. Stratification is usually based on spatially variable attributes that may affect abatement calculations, such as species composition, physical characteristics, common management regimes, or site history.

The project proponent may need to re-stratify a CEA or create new CEAs over time, for example, where disturbance events occur or growth is not uniform, to ensure accurate estimation of project abatement.

3.2.4 Model Point Location

Many methods require each CEA in the Project Area to have a Model Point location at the approximate centre of the CEA (see Figure 3).

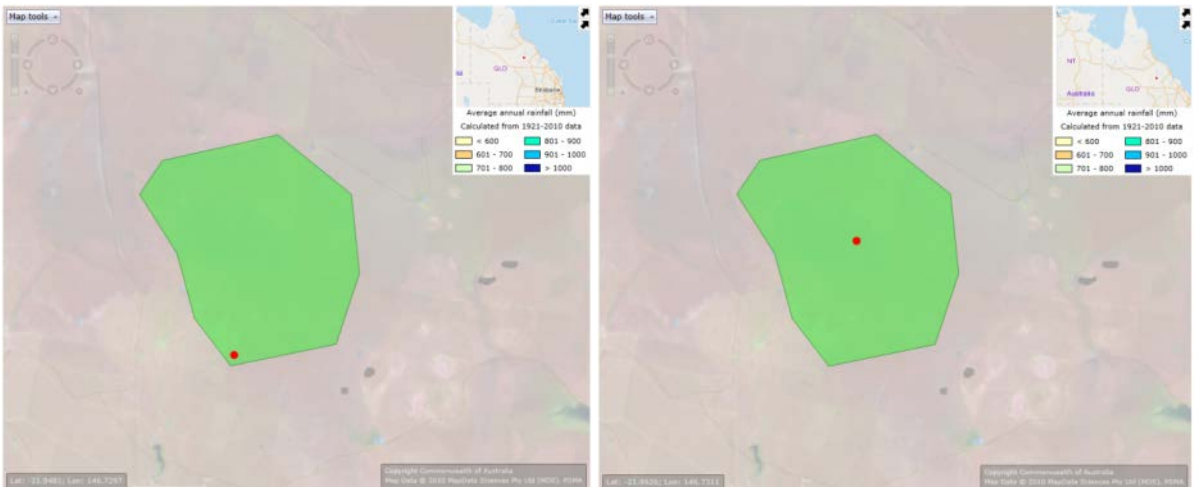

Figure 3: This project has one CEA, shown in green. The Regulator may reject the CEA Model Point location (shown as the red dot) in the left panel, as it is not in the approximate centre as per the right panel example.

3.2.5 Split Carbon Estimation Areas

If permitted under a specific method a CEA may be a Split CEA (see Figure 4). Some methods refer to Split CEAs as a CEA comprised of a set of polygons. For Split CEAs:

- The Model Point for the CEA must be located approximately in the centre of the area encompassed by all of the CEA Parts. The Model Point does not need to be contained within a CEA, the location can be in an Exclusion Area or outside of the Project Area.

- Where an applicable radius is specified in a method, it defines a radius from the model point within which the entire area of each CEA Part in a Split CEA must fall.
- All CEAs and CEArts must comply with any stratification requirements specified in the method.

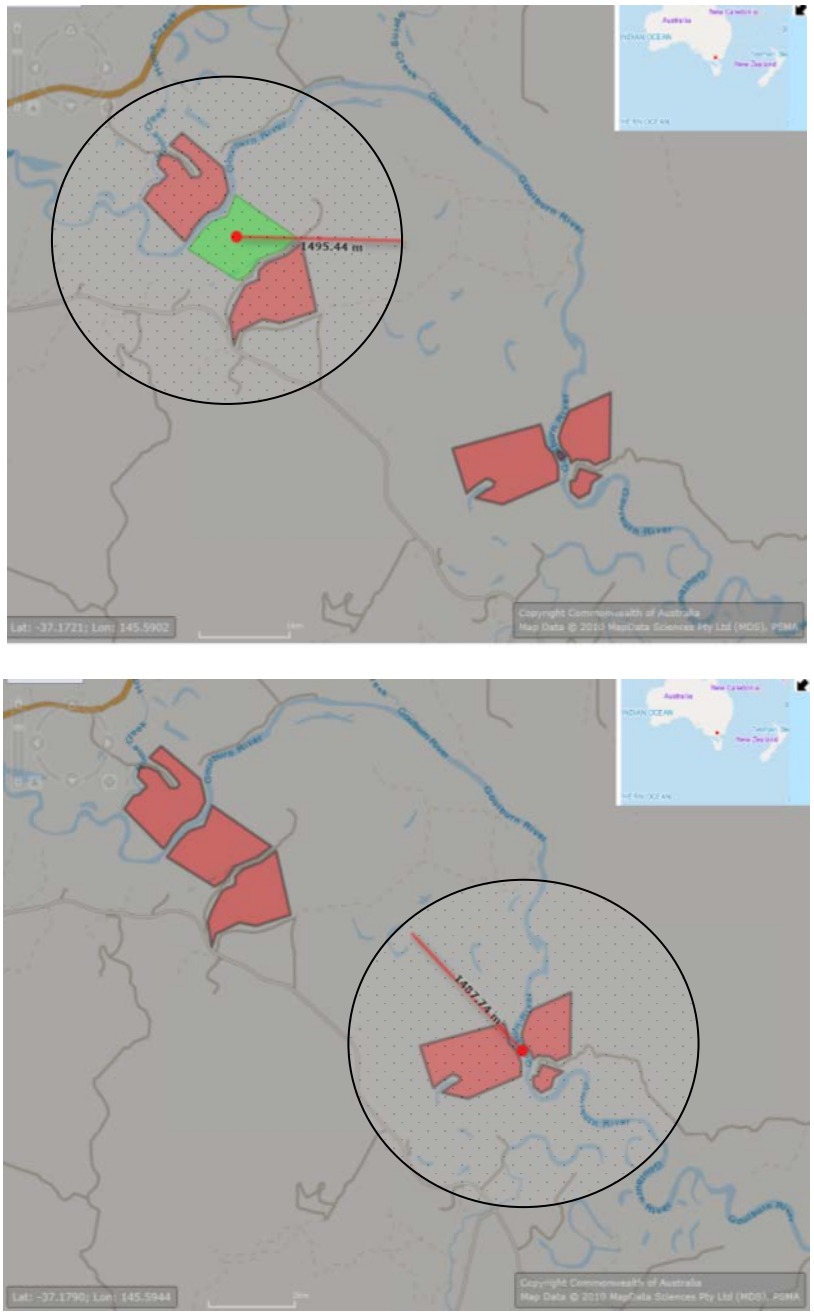

Figure 4: The method for this project allows for Split CEAs and has an applicable radius of 1.5 km. This project has two split CEAs which each have three CEA Parts. In the top image, the Model Point location falls within a CEA part. In the lower image, the Model Point location is in the approximate centre of the area encompassed by the CEA Parts. For each CEA, all three CEA parts fall entirely within the maximum applicable radius of 1.5 km from their respective Model Points.

4. Geospatial information requirements

4.1 Geospatial capture

A project proponent may use any of the following sources of data to delineate the boundaries of Project Areas, Exclusion Areas and CEAs as required by the ERF:

- Global Positioning Systems (GPS) / Global Navigation Satellite System (GNSS)
- field surveys and sampling
- orthorectified aerial photographs
- orthorectified satellite imagery
- cadastral database
- publicly available vegetation datasets

A method may also specify different methods or approaches or accuracy or resolution requirements that must be complied with. Such records need to be made and maintained as evidence.

4.2 Fitness for purpose

Prior to using a dataset, project proponents should assess the appropriateness of the dataset for the intended use, any other evidence required to support it, or its fitness for purpose against criteria that include:

- age
- scale
- resolution
- accuracy
- classification, aggregation, generalisation systems (for example, smoothing)
- integrity of the dataset
- relevance to the proposed ERF activity.

4.3 Accuracy

For all sequestration offsets projects under the ERF, the minimum requirement for spatial data is a horizontal accuracy of at least 10 metres at 95 per cent threshold in accordance with the Intergovernmental Committee on Surveying and Mapping (ICSM) Australian Map and Spatial Data Horizontal Accuracy Standard 2009 (http://www.icsm.gov.au/topo/Spatial_Data_Horizontal_Accuracy.pdf). Evidence of this data accuracy should be included within accompanying metadata.

4.4 Data description and attribute information

When methods require project proponents to submit a map to the Regulator that is created in accordance with these mapping guidelines, they must report minimum attributes for each CEA. These required attributes are specified in Table 1. Additional attributes may also need to be described depending on the requirements of the particular method.

Table 1: Minimum attributes to be submitted for each CEA.

Attribute	Attribute Name	Format
Project name	NAME	Text String
Project number	NUMBER	Integer
Applicable method	METHOD	Text String
CEA name	CEA_ID	Text String
CEA number	CEA_NUM	Integer
Year of inclusion in Project	YEAR_REG	Integer: 4 characters
Year of variation to the CEA	YEAR_VAR	Integer: 4 characters

Project proponents who must report a Model Point for each CEA must report the latitude and longitude.

4.5 Data exchange and formats

Project proponents must supply spatial data in an interchangeable digital Geographic Information System (GIS) format which is consistent with the instructions outlined in these mapping guidelines.

4.6 Data ownership and usage

Project proponents must ensure that they have the necessary rights, for example, a data licence for primary mapping products, to use spatial data for the project. Proponents must also be able to grant the Regulator or its representative's permission to use projects' spatial data for the purpose of administering the ERF.

4.7 General instructions

Geospatial mapping information must meet all of the following requirements:

- include the number or name of each stratum/CEA
- include, where applicable, the Model Point that applies to each CEA
- describe the coordinate system and map projections used, noting that:
    - the datum of all geospatial data must be Geocentric Datum of Australia (GDA94 or GDA2020)
    - all geospatial data must be either projected to Map Grid of Australia (MGA94) or use a geographic coordinate system
- be submitted electronically and use one of the commonly used interchangeable digital GIS file formats
- contain file information on:
    - the feature geometry (that is, the map coordinates of the line segments that make up the Project Area polygons)
    - a positional index of the feature geometry (that is, the location within the file of the start of the data for each CEA)
    - the projection format
    - attribute information
    - the coordinate system and map projection used.

A method typically contains further information and instructions for determining and identifying CEAs in addition to the conditions in this section.

Appendix 1: Further explanation of mapping concepts

Project proponents should familiarise themselves with the following mapping concepts:

Base imagery (orthophotography, or orthorectified satellite imagery)

Mapping tools use processed remote-sensing data such as aerial photographs or satellite images as a backdrop, over which polygons that define the land area of interest may be drawn. Data is orthorectified – that is, corrected for distortions due to topography, camera angle and lens imperfections – resulting in an image that is orthographically-correct or like a map; that is, it has a defined orientation and the area, shape, direction and distance can be determined according to a single scale across the entire area. Orthographically-corrected imagery, including digital photography, is often referred to as orthoimagery. The terms orthophotography and orthorectified satellite imagery are also used, depending on the source of the image data.

Datum and coordinate system

A datum is a set of parameters and control points used to accurately define the three-dimensional shape of the Earth. A coordinate system provides a reference for measuring horizontal and vertical distances on a map. Coordinate systems are usually defined by a map projection, a spheroid reference, a datum and a number of other parameters, for example, standard parallels, a central meridian and possible shifts in the x and y directions.

The two most commonly used coordinate systems in Australia are geographical (latitude and longitude) and the Map Grid of Australia (MGA). Some areas of Australia may use regional or local datum, projections and coordinate systems.

Australia is in the process of changing to a new official geodetic datum called the Geocentric Datum of Australia 2020 (GDA2020) which is replacing the Geocentric Datum of Australia 1994 (GDA94).

Map projection

Mapping involves 'projecting' the three-dimensional surface of the Earth onto a two dimensional surface (sheet of paper or its electronic equivalent). A map projection can be described as a mathematical model or set of mathematical equations that describe the relationship between the same points on the three-dimensional and two-dimensional surfaces and which transforms the spatial relationships of features on the Earth's three-dimensional surface onto a two-dimensional surface. This is done in such a way as to minimise distortions in area, shape, direction and distance. As a flat map does not accurately reflect the shape of the Earth, many different map projections have been developed and used in spatial analysis and map-making. Some projections preserve shape, while others preserve accuracy of area, distance or direction.

The particular set of equations now used for topographic mapping in Australia is the Map Grid of Australia (MGA94).

Mapping tool

A mapping tool is a computer software package designed to allow a user to create, store, edit and display as a map the polygons (and their attributes) that define the boundaries of physical features

visible on base imagery – features such as forests, roads and lakes. The process of creating an electronic representation of such features, by drawing directly over base imagery displayed on a computer screen, is termed 'on-screen digitising'.

Metadata and attributes

Metadata are structured descriptive data that provide information about another set of data. They can be accessed using database and internet technologies that automate search and retrieval capabilities. This search process can be facilitated by data.gov.au. Metadata are maintained and kept up to date in much the same way as spatial data. When metadata are out of date, their utility and value are reduced. Metadata should be maintained in accordance with the relevant state or territory government requirements and any appropriate data policies, for example the Foundation Spatial Data Framework (FSDF) Spatial Information Management Policy from the Spatial Information Council of Australia and New Zealand (ANZLIC).

ANZLIC has developed a metadata standard that sets out minimum requirements for metadata published in the ASDD. The ANZLIC Metadata Profile Guidelines (http://www.anzlic.gov.au/resources/metadata) include information about the metadata standards and have been designed for when creating, storing and distributing core metadata elements. The ANZLIC guidelines document includes introductory information on metadata, their use and management; the metadata guidelines have been widely adopted by data custodians in Australia.

Appendix 2: Mapping an environmental or mallee planting project - Carbon Credits (Carbon Farming Initiative) (Reforestation by Environmental or Mallee Plantings—FullCAM) Methodology Determination 2014

This method is for the establishment of permanent plantings and uses the Full Carbon Accounting Model (FullCAM). In addition to the calibrations for FullCAM permitted in previous methods, this determination allows for the use of additional tree growth calibrations subject to particular requirements. This method permits three planting geometries – narrow linear belt, wide linear belt, and block, each with explicit definitions and strict criteria for use. For a project proponent to apply the calibrations that relate to these different planting geometries, mapping of the CEAs must be accurate and aligned with the way the permitted planting geometries are defined. For example, the boundaries of the CEA for a planting which is established in rows, is (in most cases) one metre from the outer rows of trees, whilst for plantings not established in rows, the boundaries of the CEA for the planting are taken to be immediately outside of the outermost plants. In addition to planting geometry, the method includes additional criteria for mapping and delineating plantings with differing planting densities and tree to shrub proportions.

This method allows a CEA to use Split CEAs defined by multiple polygons within a specified applicable radius, provided each CEA Part is also consistent with the requirements for CEAs as per the determination and these mapping guidelines.