Soils of the Murrumbidgee, Coleambally and Murray Irrigation Areas of Australia
I: A user guide to accessing and identifying soils using digital soil maps and Google Earth™

John Hornbuckle, Nicholas Car, Bob White and Evan Christen

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Cover Picture

Description: Soil map ‘Part of Jernargo Extension Map 2’.
Photographer: CSIRO Land and Water, Griffith
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Reports in this series

This is a series of three reports on the soils of the Murrumbidgee, Coleambally and Murray irrigation areas. The first report describes how one can access all the available soils maps via Google Earth™ software. The second and third reports provide collated data on soil properties:

1. Soils of the Murrumbidgee, Coleambally and Murray Irrigation Areas of Australia I: A user guide to accessing and identifying soils using digital soil maps and Google Earth™

2. Soils of the Murrumbidgee, Coleambally and Murray Irrigation Areas of Australia II: Physical properties

3. Soils of the Murrumbidgee, Coleambally and Murray Irrigation Areas of Australia III: Chemical properties

Foreword

The aim of this exercise has been to make the soils information for the Murrumbidgee, Coleambally and Murray irrigation areas easily available to anyone with an interest, whether farmer, agency staff or academic. This has been undertaken in two parts;

1. Digitising of the soil maps for the regions and making them easily available by using the Google Earth™ geographic information software.
2. Collating all the available physical and chemical data on the soils.

There are over 90 individual soil types mapped in these regions. Often the differences between soils are relatively minor. From a practical viewpoint this large number of soil types is confusing and reduces the accessibility of soils information for land managers and academics alike. To reduce this complexity we have categorised all these soils into six groups. This greatly simplifies understanding the soils of these regions and allows the relatively sparse available data on each soil type to be drawn together to provide a larger data set for each group and hence greater understanding of the soil properties.

This soils data collation work was started in 1999 with the report “Physical properties of soils in the Murrumbidgee and Coleambally irrigation areas”. With the support of the Riverina Branch of the Australian Soil Science Society for Jeanene Thacker’s studentship this report was updated to include soils of the Murray irrigation area and a report on the chemical properties of the soils was drafted. Now with the support of the CRC for Irrigation Futures we have been able to finalise these reports and prepare the digitised maps and Google Earth™ access to them.

We dedicate this series of reports to all the soils scientists past and present who have worked in these regions, each adding their contribution to the greater understanding, and to the Riverina Branch of the Australian Soil Science Society which has kept the critical mission of understanding and managing our soils alive.

Dr. Evan Christen and Dr John Hornbuckle
Tools for irrigation profitability and longevity project
CRC for Irrigation Futures
Executive summary

There are over 90 different soil types mapped in the Murrumbidgee (MIA), Coleambally (CIA) and Murray Valley irrigation areas. These soils have different properties that are important for the design and establishment of irrigation and farming systems and also for managing and sustaining existing farming systems. These soils have been mapped by various people and agencies over a number of decades. This publication describes how these maps have been made accessible via the web.

Free public access to the soils maps soils has been made possible using a website where the public can either search or browse for particular maps. Searching requires a user to enter in a geo coordinate latitude and longitude value and browsing gives access to all the soil maps sorted by name.

Along with the maps themselves, soil type information is also available on the website with soil descriptions linked to colour and textual keys that are found on the maps.

The website is http://www.irrigateway.net/tools/soil-maps.aspx.
# Table of contents

1. **Introduction**  
   
2. **Objectives**  
   
3. **Information available**  
   3.1. Map names and extent of coverage  
   3.2. Soil type description information  
      3.2.1. Soil types listing  
      3.2.2. Soil types descriptions  
   
4. **Information access**  
   4.1. Website access and description  
   4.2. Searching for maps  
      4.2.1. Search results  
   4.3. Browsing for maps  
   4.4. Accessing soil type descriptions  
   
5. **Information use**  
   5.1. Types of map information delivered  
      5.1.1. Image file use  
      5.1.2. Google Earth™ information use  
   
6. **Conclusion**  

**Glossary**  

**References and bibliography**
List of figures

Figure 1-1: Location of the MIA, CIA and Murray Valley irrigation areas........................................ 1
Figure 3-1: Outlines of the maps available with respect to towns (from Google Earth™)............... 2
Figure 3-2: Areas covered by soil information with respect to towns (from Google Earth™)......... 2
Figure 3-3: A listing of a soil type with description showing a coloured map soil key.................. 3
Figure 3-4: A listing of a soil type without description showing a text soil key............................ 3
Figure 4-1: A typical coordinate, used to search for maps, entered into the Search web page........ 4
Figure 4-2: A search showing a positive result for map 'MirroolIrrigationArea05'......................... 5
Figure 4-3: An example of a coloured soil type key.................................................................. 6
Figure 5-1: An example of a map in image file format................................................................ 7
Figure 5-2: An example of a map in Google Earth file format with fader sliding control indicated.......................................................................................................................... 8
Figure 5-3: A portion of the soil map file seen in Figure 5.2, zoomed and faded......................... 9
1. Introduction

The Murrumbidgee and Coleambally irrigation areas (MIA and CIA respectively) lie in the northeast of the Riverine Plain, whilst the Murray Valley irrigation area is in the southern part of the Riverine Plain. The MIA and CIA are irrigated from water diverted from the Murrumbidgee River. The Murray Valley irrigation area is subdivided into the Berriquin, Denimien, Cadell, Deniboota and Wakool irrigation areas. These areas are supplied by water from the Murray River. A locality map is shown in Figure 1-1.

![Figure 1-1: Location of the MIA, CIA and Murray Valley irrigation areas.](image)

Soils are essential for farming, and knowledge of soil physical properties is essential to manage and utilise soils to their full extent. The Riverine Plain irrigation areas are reliant on farming enterprises for income, hence knowledge of soil properties is important, not only in design and establishment of irrigation systems, but also for managing and sustaining the farming systems.
2. Objectives

The objectives of this user guide were to:

1. Describe what information (maps and soil descriptions) are available and the areas covered by the maps.
2. Detail how the public may access that information through the internet
3. Relate how to view the information on the internet as well as on a desktop computer with Google Earth™

3. Information available

3.1. Map names and extent of coverage

Currently there are 25 soil maps available on the web:

- Deniboota Irrigation District 01
- Deniboota Irrigation District 02
- Deniboota Irrigation District 03
- Deniboota Irrigation District 04
- Denimein Irrigation District
- East Murrakool A
- Jernargo Extension 01a
- Jernargo Extension 01b
- Jernargo Extension 02
- Kooba Estate
- Lower Murrakool 01
- Lower Murrakool 02
- Mirrool Irrigation Area 01a
- Mirrool Irrigation Area 01b
- Mirrool Irrigation Area 02
- Mirrool Irrigation Area 03
- Mirrool Irrigation Area 04
- Mirrool Irrigation Area 05
- Mirrool Irrigation Area 06
- Yanco Irrigation Area 00
- Yanco Irrigation Area 06
- Yanco Irrigation Area 07a
- Yanco Irrigation Area 08a
- Yanco Irrigation Area 08b
- Yanco Irrigation Area 09

It is expected that more maps will be added to this list.

Figure 3.1 shows the outlines of the maps with respect to towns in New South Wales and Victoria. As can be seen from the image, some areas are covered by the outline of more than one map.

Figure 3.2 shows the areas of the maps that contain actual soil information. This is somewhat smaller than the map outline area. When users search for maps using a geo coordinate and receive a positive result, they are made aware as to whether their point is covered by the actual soil information of a map or just the map’s outline.

It is important to recognise that even though a person’s point of interest may not be covered by any map’s actual soil information, if it is within the outline of a map, then there may be benefit in a user downloading the map still. This is due to the fact that the soil types of points close to actual soil information coverage may be estimated.
The two methods used to access these map files, ‘search’ and ‘browse’ are described in the next section of this report.

Figure 3-1: Outlines of the maps available with respect to towns (from Google Earth™).

Figure 3-2: Areas covered by soil information with respect to towns (from Google Earth™).
3.2. Soil type description information

3.2.1. Soil types listing

Every soil type indicated on the maps is listed on the website. They can be found in a table on the index page of the ‘descriptions’ section at http://irrigateway.net/dev/tools/soilmaps/Descriptions.aspx. Each soil type is listed in one of two formats according to whether there is information for that soil or not.

Soil types for which there is information are listed as in Figure 3.3. Four pieces of information are given:

1. Index number
2. Soil name
3. Authors of the source documentation
4. Soil Key

The index number is for use on the website only. In the case of soils with descriptions, the soil name is a hyperlink to the full soil description. The source of the description is the report authors’ names. The soil key is either an image of a soil key if the map soil key is in colour or the text of the soil key if the map soil key is in black and white.

![Soil Key Example](image)

**Figure 3-3:** A listing of a soil type with description showing a coloured map soil key

Soil types for which there is no information are listed as in Figure 3.3. In this instance, the same information is given as for the sol with description but the soil name is not linked to a further page of information about the soil.

| 83 | Purdanima Sandy Loam | Stannard | Psl |

**Figure 3-4:** A listing of a soil type without description showing a text soil key

3.2.2. Soil type descriptions

For each soil with a description, a web page exists that is linked to the page listing the soil types (see subsection 3.2.1 above).

Each description page has at least an image of the soil key, if coloured on the maps or text of the soil key in the case of black and white maps, and a section called ‘Profile Description’. Some soil types have additional information such as horizons and images.
4. Information access

4.1. Website access and description

The website section containing all of the information detailed in this report is located at: http://irrigateway.net/tools/Soil-maps.aspx.

There are 3 subsections of the website underneath the main page named:

1. Search
2. Browse
3. Soil Descriptions

Links to the subsections and the main section index are given at the top left of each webpage in the section. Each of the subsections contains at least one page and some contain many.

4.2. Searching for maps

Searching for maps is undertaken in two ways. The search page is located at: http://irrigateway.net/dev/tools/soilmaps/Search.aspx.

Searching allows a user to determine whether or not a map exists for a certain point defined by a geo coordinate. Searching requires the user to follow 3 basic steps that are outlined on the search page indicated above. These steps are:

1. Entering a geo coordinate via a latitude and longitude, both in decimal degrees
2. Clicking a ‘Find Maps’ button
3. Choosing a file format to download

Step 1: Coordinates must be in the decimal degree format with a minus sign before the latitude to indicate Southern Hemisphere. Entering a typical coordinate would result in a screen like that of Figure 4.1.

![Figure 4-1: A typical coordinate, used to search for maps, entered into the Search web page](image)

Information on how to obtain a geo coordinate for a point of interest is given on the website. Two methods are suggested. The first is to use a handheld Global Positioning System (GPS)
to record the coordinates of the point by visiting it. All makes of GPS contain a function to record points. GPS readings may be in either degrees, minutes and seconds format or decimal degree formats. Readings in degrees, minutes and seconds may be converted to decimal degrees using an online converter such as that provided by the U.S. Federal Communication Commission’s webpage at http://www.fcc.gov/mb/audio/bickel/DDDMSS-decimal.html.

Step 2: This step runs the website’s search function to determine if any maps cover the entered point.

Step 3: Maps for download are presented in two formats; Google Earth™ files and image files. The Google Earth files are zipped Keyhole Mark-up Language files containing XML data describing the location of the map and an image of the maps in JPEG format. The image files are simply the JPEG format file without the Google Earth data.

More information on Keyhole Mark-up files can be found at Google Inc’s page ‘KML Documentation Introduction’: http://code.google.com/apis/kml/documentation/.

Either or both of the files for a map may be downloaded. A user may simply click on the file link in which case the image file is opened in the user’s internet browser (this is not recommended due to large file sizes) and the Google Earth file suggested to be ‘Saved As’ to the user’s desktop computer. A user may also right click the image file and chose to ‘Save As’ this file to their desktop (recommended).

4.2.1. Search results

There are three possible search results:

1. Negative result – when no maps cover the geo coordinate entered
2. Provisional positive result – when a map does cover the geo coordinate but may not contain soil information (e.g. the point is within the map boundaries but under the title or other non graphical portion of the map)
3. Positive result – when a map covers the point with soil information

When obtaining a provisional positive result, it is indicated as such underneath the name of the map returned. A typical positive result would be displayed as in Figure 4.2.

Figure 4-2: A search showing a positive result for map ‘MirroolIrrigationArea05’
Multiple positive results may be returned when more than one map covers the geo coordinate in which case they are listed alphabetically.

See Section 5 for descriptions of how to use the maps.

4.3. Browsing for maps
Browsing for maps is one of the two ways to access them. The browse page is located at: [http://irrigateway.net/dev/tools/soilmaps/Browse.aspx](http://irrigateway.net/dev/tools/soilmaps/Browse.aspx).

The Browse page lists all the soil maps on the system in alphabetical order. A user may select one file from the list at a time to download.

Downloading files from the browse page requires the user to follow 3 steps:

1. Select a map from the list of all maps
2. Select a format to download by clicking either the ‘Download Image’ or ‘Download GE File’
3. ‘Save As’ by right clicking the mouse on the resultant link and choosing to ‘Save As’ the file to the user’s desktop computer.

The Google Earth files are zipped Keyhole Mark-up Language files containing XML data describing the location of the map and an image of the maps in JPEG format. The image files are simply the JPEG format file without the Google Earth data.

See Section 5 for descriptions of how to use the maps.

4.4. Accessing soil type descriptions
Soil types are marked on each of the soil maps as either bounded regions of colour with a soil type text indicator or in bounded regions in black and white with a soil type text indicator. Each map contains a key to the soil types, an example of which is shown in Figure 4.3.

![Figure 4-3: An example of a coloured soil type key](image)

5. Information use

5.1. Types of map information delivered

Both the search and the browse functions described above deliver maps to the user in two file formats. These are Google Earth files, which are zipped Keyhole Mark-up Language files containing XML data describing the location of the map and an image of the maps in JPEG format, and image files in the JPEG format which are the same image files contained in the Google Earth files.

5.1.1. Image file use

The image files are delivered in standard JPEG format; the format of most digital photographs. They will open on any desktop computer. Due to the size of the original maps they are very large images and users may need to zoom in to the file to view information. An example of an open map image file is given in Figure 5.1. Maps opened in this way may simply be viewed and users will need to determine the location of their points of interest on the image unassisted.

![Figure 5-1: An example of a map in image file format](image)

5.1.2. Google Earth™ information use

Maps delivered in the Google Earth format, although a single file, contain two pieces of information; the first is a KML file that positions the map in Google Earth and the second is the image of the map itself. By having both pieces of information in the single file, users may open the file in Google Earth and it will automatically zoom to the geographic location of the area covered by the soil map.

Before using a map in the Google Earth file format, users must have a copy of Google Earth installed on their desktop computer.
A free copy of Google Earth can be downloaded and installed from [http://earth.google.com/](http://earth.google.com/).

Once the Google Earth program is installed, the downloaded map file in Google Earth format, may be opened by simply choosing ‘File > Open’ from Google earth’s main menu and selecting the file. Alternatively, once Google Earth is installed on the user’s desktop computer, the downloaded map file may simply be ‘double clicked’ with the mouse which will cause it to be opened in Google Earth. Once opened, the file will cause Google Earth to zoom to the map’s geographic location. Figure 5.2 shows a downloaded map file open in Google Earth.

![Google Earth interface](image)

**Figure 5-2:** An example of a map in Google Earth file format with fader sliding control indicated

The fader slide control is indicated with a red arrow in Figure 5.2. This control allows the map to be faded in and out by increasing and reducing the transparency of the layer. This allows the underlying satellite image to be viewed compared to map. Figure 5.3 shows a portion of the soil map first shown in Figure 5.2 that has been ‘zoomed in’ to reveal greater detail. It has also been partially faded out by using the fader sliding control to partially reveal the underlying satellite image.
Fading the soil type map layers in this way allows users to see how the soil types actually overlay their farms and blocks.

More information on the use of Google Earth can be found at the Google Earth Help Center: http://earth.google.com/support/.

6. Conclusion

This user guide serves as an introduction to the use of the Soil Type section of the irriGATEWAY website. The previous sections have described what information is held within the website and how the soil maps may be accessed either by searching or browsing and how maps delivered in either the JPEG image or Google Earth file format may be used.

A description of the soil type description subsection of the site was also given to assist users in accessing soil type information.
Glossary

JPEG Joint Picture Expert Group
References and bibliography
