



Ordnance Survey

# OS MASTERMAP IMAGERY LAYER

Product guide

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## Product guide

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## Preface

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## Using this specification

The documentation is supplied in portable document format (PDF) only. Free Adobe® Reader® software, which displays the specification, incorporates search and zoom facilities and allows you to navigate within. Hyperlinks are used to navigate between associated parts of the specification and to relevant Internet resources by clicking on the blue hyperlinks and the table of contents.

# Chapter 1 Introduction

## Overview

The OS MasterMap Imagery Layer adds a visual and contextual capability to the other OS MasterMap Layers and OS data. Ordnance Survey has set the specification and quality levels for the OS MasterMap Imagery Layer with the aim of providing a reliable and consistent source of orthorectified aerial photography for general business use in Great Britain.

## Key Features

OS MasterMap Imagery Layer contains images that are;

- fully orthorectified
- processed to a high quality 25 cm ground resolution
- supplied in tiles that are 1 km by 1 km in 24-bit colour;
- processed to a stringent set of capture specifications and guidelines
- full georeferencing using National Grid control or Global Navigation Satellite Systems (GNSS) data
- consisting of a combination of traditional orthorectified photos (images displaying some building lean) and true orthorectified images (images without building lean);
- accompanied by detailed metadata files

Ordnance Survey seeks to ensure that OS MasterMap Imagery Layer is consistent in its quality across all of Great Britain by adopting a set of standards in relation to:

- the image capture (to follow RICS® specifications or equivalent);
- camera;
- orthorectification procedures, including quality of the terrain model to be used;
- geometric accuracy;
- image appearance, including thresholds for cloud cover and digital artefacts within the image; and
- mosaicing, including quality of joins and colour balance that significantly enhance the captured image.

## Applications

OS MasterMap Imagery Layer can be used in applications often reducing the need for costly site visits;

- property insurance
- risk analysis
- asset management
- site evaluation
- land-use cover analysis
- agricultural land use and crops inventory
- property management
- planning applications
- route planning and accessibility assessments
- location-based services
- vegetation studies and environmental analysis

Further information on using imagery in applications can be found on the [OS MasterMap Imagery Layer](#) website page.

## Chapter 2 Product Overview

### Ordnance Survey Imagery Layer

As the use of GI and GIS spreads to a wider community of users, imagery has an important part to play with its powerful visualisation properties. It is especially attractive to customers who are less familiar with looking at and interpreting information from maps

Imagery has the ability to reveal additional detail, such as street furniture, car park spaces, foliage, moored boats, roof types or cleared development sites, which is not represented in topographic mapping.

In the Imagery Layer, Ordnance Survey has adopted production processes that are aimed at minimising the potential impact of factors such as time and date of flying, the flying conditions and post-capture processing techniques that can reduce the ability to derive information from aerial images.

The product is colour balanced and edge matched such that analysis of information across image boundaries is not seriously affected by misalignment or inconsistency. Variations across the Imagery Layer are however inevitable. Time of day differences, for example, lengthening shadows, colour changes; time of year differences, such as, vegetation changes, river levels; and variations in the age of imagery, affecting for example, new developments, road changes can effect image appearance. In addition, slight variations between images may exist in instances where remedial action would introduce an artificial unevenness to the imagery, detracting from natural colours and real world features.

### Image Capture

Images are captured aurally as part of the Ordnance Survey Integrated Capture Programme. This process uses carefully calibrated digital cameras flown in regular linear paths across designated parts of the country. There is a large amount of overlap between each path so that only the most central part of the image – that with the least distortion- is used in the final orthorectification process.

The flying season is typically between March and November, minimising the effects of cloud cover and shadow whilst retaining accuracy and currency. The imagery is captured under a set of strictly regulated flying conditions, for example stipulating that the images must be captured with the sun angle being 20 degrees to the horizon or greater to minimise light distortion from the sun.

### Mosaic

Although Imagery is delivered in 1 km by 1 km tiles, images can be viewed collectively. Most viewing software, with the aid of georeferencing files can mosaic the customer's tiles together into a seamless image of their area of interest.

To reduce the appearance of the tile edges, a number of enhancement processes are carried out on the images. These processes are detailed in the technical specification section of this document.

### Image Georeferencing

All of the OS MasterMap Imagery Layer formats can be registered in GIS or image-processing software. This is achieved in different ways depending on the format, either through the georeferencing information contained within the tiles or a separate georeferencing files (World Files) which can be downloaded from Ordnance Survey [imagery layer support webpage](#). Georeferencing provides the co-ordinates of a particular corner of an image and the viewing software uses this information to sort all the images in the right order, so that the images make a coherent geographic image when viewed collectively, as in the mosaic.

## Assessment and enhancement of images

OS assesses the images against a range of criteria before they are accepted into the product. There are certain processes that are used to further enhance image appearance. These processes include:

- Geometric fidelity
- Image appearance
- Absolute accuracy
- Mosaicing and edgematching

These are described in detail in the technical specification.

## Completeness and currency

OS strives to ensure that the Imagery Layer is as up-to-date and as comprehensive as possible. To view imagery layer currency, please refer to OS MasterMap [Imagery Layer currency map](#)

Great care is taken to ensure that the images in the Layer meet our detailed Image Appearance criteria. However, on occasion and under certain circumstances, these rules are relaxed. For example, if opportunities to capture new imagery have been limited by poor weather and existing imagery in the Imagery Layer is deemed out-of-date, then imagery will be accepted provided detail is visible on the ground. In these circumstances, image currency takes precedence over image appearance

Ordnance Survey Imagery layer covers the whole of Great Britain.

## Chapter 3 Product Supply

Imagery can be delivered in 1km by 1km tiles by either download or hard disk drive, depending on the size of order.

### Files and Formats

Imagery is available in three formats:

- Tagged Image File Format (GeoTIFF);
- Joint Photographic Experts Group (JPEG);
- Enhance Compression Wavelet (ECW)

Only one format can be supplied per order. Files supplied in GeoTIFF format are delivered uncompressed. JPEG and ECW are compressed formats. A fuller explanation of compression is given in [Annexe A](#). Compression reduces the image file size though this does result in some loss of definition.

Details of format and file size are shown in table 1.

**Table 1: Formats**

Image format	Compression type	Average file size
TIFF	Uncompressed	46.9 Mb
JPEG	Jpeg compression	4.2 Mb
ECW	ECW wavelet compression	3.2 Mb

For ECW files, a plug-in is normally required. Customers are advised to consult the suppliers of their image viewing software to discuss format requirements prior to placing an order for imagery.

### File Names

As from April 2014, OS MasterMap imagery files follow a simple naming convention. Details of file naming convention can be seen in table 2.

**Table 2: File Names**

Tile Name	File Extension	Metadata
SU1212	.TIF	.XML
SU1212	.JPG	.XML
SU1212	.ECW	.XML

#### For example;

SU1212.TIF           imagery km

SU1212.XML           XML metadata file

Prior to April 2014, OS MasterMap imagery files followed the naming convention set out in table 3. Files before April 2014 also had the additional option of MrSID compression format (SID). This is no longer available. World files are also no longer included in delivery. If required, world files for georeferencing can be downloaded from [Ordnance Survey Imagery Layer support website](#).



Information on GeoTIFF header files can be found in the technical specification.

Ordnance Survey layer reference	Separator	1 km ref to south-west corner of chunk	Separator	Date imagery flown yyyy-mm-dd	Separator	Version	Completeness of km – part incomplete	File extension
OSIM	-	SU1212	-	2012-05-01	-	5	_Part incomplete	.TIF; .JPEG; .ECW, SID
OSIM	-	SU1212	-	2012-05-01	-	5	_Part incomplete	.XML
OSIM	-	SU1212	-	2012-05-01	-	5	_Part incomplete	.TFW; .JPW; .EWW, SIDW

**Table 3:** Tile naming conventions prior to April 2014.

Example of file name using above convention for a TIFF image:

- OSIM\_SU1212\_2012-05-01\_5.TIF for a complete km of imagery
- OSIM\_SU1212\_2012-05-01\_5.XML XML metadata file
- OSIM\_SU1212\_2012-05-01\_5.TFW TIFF world file for georeferencing

## Media type

Imagery orders are delivered by download or on hard disk, depending on the format type and order size.

**Table 4: Delivery media type**

Format	Order size	Media
TIFF	<500 tiles	Download
ECW/JPG	<5000 tiles	Download
TIFF	>500 tiles	HDD (hard disk)
ECW/JPG	>5000 tiles	HDD

## Metadata files

Metadata files are provided for each image file. They are supplied in eXtensible Mark-up Language (XML), which can be read like a text file or in a web browser.

Further information on the contents of the metadata files can be found in the technical specification.

## Data Management

Whether a customer wishes to hold a national set or individual tiles, there are a number of considerations that will determine the most appropriate method of storing and managing the data in terms of distributing the images around the organisation and also in terms of updating the image. The main factors to consider are discussed in the following sections.

## Ordering Updates

After an area has been re-flown, Ordnance Survey will make updates available for order. Customers can order either areas where change only has occurred or their entire area. If customers order updates from the online service, these will comprise all the images that have been added to the product since the customer's last Imagery Layer order. This includes new imagery and edgematched surrounding imagery, to ensure that the updates are added seamlessly to existing holdings.

Information on the currently available coverage is updated monthly on the currency page of the [OS MasterMap Imagery Layer](#) website. Automated quarterly change only updates, for existing imagery holdings, can be arranged by contacting [Ordnance Survey Service Centre](#). This is the recommended method for receiving the most up-to-date imagery.

## Mosaicing

For anyone holding Imagery of continuous geographic area or areas, building a mosaic of the images is recommended as a way to manage the files effectively and efficiently. This method arranges all the images together in correct geographic relationship to each other into one seamless or composite file. The advantages of managing the imagery tiles in this way are as follows:

- only a single file has to be opened to view all the imagery files; this is quicker than loading each tile individually into an application;
- images cannot easily get out of place;
- any updates are immediately available to all;
- it makes the most of the edgematching and colour balancing enhancements; and
- viewing the images seamlessly aides analysis and interpretation of the features.

Creating a mosaic usually requires all the images to be stored in the same file directory, so it is important to keep separate back-ups of the images.

## Large area and national holdings

Customers acquiring very large geographic areas or Great Britain are likely to require a substantial amount of storage, especially if using uncompressed TIFF.

Mosaicing the images is still a recommended first step in managing very large imagery holdings, where customers may wish to view large geographic areas involving tens of tiles at a time.

There are other technologies now available to assist with storing, mosaicing and distributing large amounts of imagery, including spatial databases and image servers. If considering ordering a very large geographic area, customers are advised to contact their system suppliers to discuss options for data management.

## Annexe A Image Formats

### TIFF

TIFF (Tagged Image File Format) is one of the most commonly used *lossless* image formats. TIFF is primarily designed for raster data interchange, and is supported by numerous image-processing applications. It also has the ability to decompose an image by tiles rather than scan lines. This permits much more efficient access to very large imagery that has been compressed, since an entire scan line does not have to be decompressed.

### JPEG

A JPEG image, named after the Joint Photographic Experts Group, uses a lossy compression format. It is designed for compressing full-colour or greyscale images of natural, real-world scenes and so works well on photographs. It has become the de facto standard for photographs on the web.

JPEG files achieve much greater compression than is possible with lossless methods such as TIFF. As JPEG is designed to exploit known limitations of the human eye, notably the fact that small colour changes are perceived less accurately than small changes in brightness, JPEG is intended for compressing images that will be looked at by humans. If the images are to be analysed by computer programs, the small errors introduced by JPEG may affect the results, even if they are invisible to the eye.

A disadvantage of JPEG files is that, due to its lossy compression, the images will lose their quality each time they are saved, closed and then reopened (the image is compressed each time). As repeated saves in TIFFs will not degrade picture quality, and it is therefore advisable to use a lossless format (TIFF) while editing the image, then save as a JPEG to store it or to send out on the Internet. If further edits are anticipated at a later stage, a user is advised to retain an original, unedited lossless master copy to work.

### ECW

The Enhanced Compressed Wavelet (ECW) raster image compression software has been designed to compress, display, internet serve and distribute imagery. The key characteristic of wavelet-based compressions is that they are able to preserve a very good quality of the image with high compression ratios.

This compression format uses mathematical wavelet transformations to store image data, rather than storing a grid of values for image pixels such as TIFF or other common formats. This allows a great reduction in the amount of disk space it takes to store large images, whilst retaining nearly all the original image's quality, colour and detail.

ECW is a lossy format, meaning that some information is lost when the image is converted from its original format to the ECW format. However, wavelet compression is very good at retaining the character of images, so the amount of loss is very small.