
DigitalGlobe Core Imagery Products Guide

Table of Contents

1	Introduction	4
2	DigitalGlobe Imagery Products	4
2.1	Product Overview	4
2.2	Constellation Order Fulfillment	5
2.3	Imaging Band Options	5
2.3.1	Multispectral Products	6
2.3.2	Pan-sharpened Products	6
2.3.3	Band Option Summary.....	6
2.4	Basic Imagery Products	7
2.4.1	Specifications Table for Basic Imagery	7
2.5	Basic Stereo Pair Imagery Products.....	8
2.5.1	Specifications Table for Basic Stereo Imagery	10
2.6	Standard Imagery Products	11
2.6.1	Specification Table for Standard Imagery Products	13
2.7	Ortho Ready Stereo Imagery products.....	13
2.7.1	Specifications Table for Ortho Ready Standard Stereo Imagery Products	14
2.8	Advanced ortho Series	15
2.8.1	Custom Orthorectified Products.....	17
2.8.2	Precision Aerial	19
3	Satellite Constellation	21
3.1	QuickBird Satellite	23
3.2	WorldView-1.....	24
3.3	WorldView-2.....	25
4	Imagery Acquisition	26
4.1	Tasking.....	26
4.1.1	Collection Feasibility	26
4.1.2	Select Tasking	26
4.1.3	Select Plus Tasking	27
4.1.4	Assured Tasking	28
4.1.5	Single Shot Tasking	29
4.2	ImageLibrary.....	30
4.3	Order Polygon.....	31
4.3.1	Product Delivery	31
4.4	File Formats	31
4.5	Delivery Options	32
4.6	Media	32
4.7	Tiling	32
4.7.1	Pixel Based Tiling	34
4.7.2	Map Based Tiling.....	34
4.7.3	No Tiling.....	34
4.8	Resampling Kernels	36
4.9	Projections and Datums	37

4.10	Delivery Timelines	37
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List of Tables

Table 1: Core Products Suite	5
Table 2: Summary of Product Band Options	6
Table 3: Physical Characteristics of Basic Imagery	8
Table 4: Physical Characteristics of Basic Stereo Pair Imagery	11
Table 5: Physical Characteristics of Standard Imagery	13
Table 6: Physical Characteristics of Ortho Ready Standard Stereo Imagery	15
Table 7: Advanced Ortho Series Imagery Products and Associated Accuracies	15
Table 8: Vision and Vision Premium Processing Parameters	16
Table 9: Aesthetic Quality Specifications	17
Table 10: Physical Characteristics of Ortho Imagery	18
Table 11: Physical characteristics of Vision Premium Aerial Precision	20
Table 12: Product Availability By Sensor	21
Table 13: Comparison of Sensor Bands among the DigitalGlobe Constellation	22
Table 14: QuickBird Spacecraft Characteristics	23
Table 15: WorldView-1 Spacecraft Characteristics	24
Table 16: WorldView-2 Spacecraft Characteristics	25
Table 17: Select Tasking Parameters	27
Table 18: Select Plus Tasking Parameters.....	28
Table 19: Assured Tasking Parameters	29
Table 20: Single Shot Tasking Parameters	30
Table 21: Example of Ascii Text File Format	31
Table 22: QuickBird File Size Estimates in MB	35
Table 23: WorldView-1 File Size Estimates in MB	35
Table 24: WorldView-2 File Size Estimates in MB	36
Table 25: DigitalGlobe Resampling Kernels	36
Table 26: Digitalglobe Support Map Projections, Ellipsoids and Datums.....	37
Table 27: Expected Delivery Times, by Product Type and Tasking Type	38

List of Figures

Figure 1: Three Ordering Scenarios 14km length Stereo Imagery.....	10
Figure 2: Product Structure for Standard and Orthorectified Imagery Products within a single strip	12
Figure 3: Product Structure for Projected multi-strip Products	12
Figure 4: Visual Comparison of Sensor Bands	22
Figure 5: Tile Naming.....	33
Figure 6: Tile Map Naming Example	33

1 INTRODUCTION

This product guide provides customers with a detailed description of Core Imagery Products, including product levels, specifications, available options, tasking levels and delivery methods. It is intended for an external audience and is DigitalGlobe's official product offering.

2 DIGITALGLOBE IMAGERY PRODUCTS

2.1 PRODUCT OVERVIEW

DigitalGlobe's core imagery products are derived from high-resolution satellite and aerial images. Our core products vary according to processing level and geolocational accuracy. Each product is delivered with a set of support files to assist you in analyzing or further processing the imagery.

All DigitalGlobe products are corrected for radiometric and sensor distortions. Radiometric corrections include relative radiometric response between detectors, non-responsive detector fill, and conversion for absolute radiometry. Sensor corrections include corrections for internal detector geometry, optical distortion, scan distortion, line-rate variations and mis-registration of the multispectral bands where applicable.

Core Products	Accuracy (CE90)	Processing			Geographic Availability
		Radiometrically and sensor corrected	Georectified	Orthorectified	
Basic	5 m – 23 m*	•			Worldwide
Basic Stereo Pair	5 m*	•			Worldwide
Standard	5 m – 23 m*	•	•		Worldwide
Ortho Ready Standard	5 m – 23 m*	•	•		Worldwide
Ortho Ready Standard Stereo	5 m*	•	•		Worldwide
Vision Premium Precision Aerial	2.7 m – 5.4 m	•		•	Lower48 US + Western EU
Vision Premium Precision	4.2 m	•		•	Worldwide, limited to fine DEM coverage (SRTM + USGS NED)
Vision Premium Mapping	10.2 m	•		•	Worldwide, limited to fine DEM coverage (SRTM + USGS NED)
Vision Premium Display	25.4 m	•		•	Worldwide, limited to fine DEM coverage (SRTM + USGS NED)
Vision Precision	4.2 m	•		•	Worldwide, limited to fine DEM coverage (SRTM + USGS NED)
Vision Mapping	10.2 m	•		•	Worldwide, limited to fine DEM coverage (SRTM + USGS NED)
Vision Display	25.4	•		•	Worldwide, limited to fine DEM coverage (SRTM + USGS NED)

TABLE 1: CORE PRODUCTS SUITE

* Depending on the sensor, at <30 ° off nadir, excluding terrain effects

2.2 CONSTELLATION ORDER FULFILLMENT

DigitalGlobe offers order fulfillment from the constellation. This means that a given order, archive or tasking, can be sourced from any sensor capable of fulfilling the product requirements. This capability enables faster collection and delivery by using all constellation resources to fulfill the order.

2.3 IMAGING BAND OPTIONS

DigitalGlobe offers three image band options.

- **Panchromatic** - Products include only one band and are black and white.
- **Multispectral** - Products include 4 or 8 multispectral bands.
- **Pan-sharpened** - Products combine the visual information of the multispectral data with the spatial information of the pan data, resulting in a higher GSD color product.

2.3.1 MULTISPECTRAL PRODUCTS

The band sequence for 4-band and 8-band multispectral products is in order of shortest wavelength to longest wavelength. The band order in a 4-band multispectral product is Blue, Green, Red, and NIR1. The band order in an 8-band multispectral product is Coastal, Blue, Green, Yellow, Red, Red Edge, NIR1, NIR2. For more information on the specific ranges of the pan and multispectral bands, see section 3.

2.3.2 PAN-SHARPENED PRODUCTS

Pan-sharpened products are offered as 3-band and 4-band products. 3-band Color Products are available in Natural Color (Blue, Green and Red bands) and in Color Infrared (Green, Red and NIR1 bands). The 4-band pan-sharpened product uses the Blue, Green, Red, and NIR1 bands. All pan-sharpened products are tiled due to large file sizes. Pan-sharpened products are available in both 50 cm and 60 cm GSD and are only available as Standard and Ortho level products.

2.3.3 BAND OPTION SUMMARY

Product Type	Pixel Resolution	Image Bands (in order)
Pan Only	50 cm, 60 cm, 2.0 m	Panchromatic
Multispectral (4-band)	2.0m, 2.4 m	Blue, Green, Red, NIR1
Multispectral (8-band)	2.0m	Coastal, Blue, Green, Yellow, Red, Red Edge, NIR1, NIR2
Bundle (pan + 4-band)	50 cm, 60 cm 2.0m, 2.4 m	Panchromatic Blue Green, Red, NIR1
Bundle (pan + 8-band)	50 cm 2.0m	Panchromatic Coastal, Blue, Green, Yellow, Red, Red Edge, NIR1, NIR2
Natural Color	30 cm, 50 cm, 60 cm	Blue, Green, Red
Color Infrared	50 cm, 60 cm	Green, Red, NIR1
Pan-sharpened (4-band)	50 cm, 60 cm	Blue, Green, Red, NIR1

TABLE 2: SUMMARY OF PRODUCT BAND OPTIONS

2.4 BASIC IMAGERY PRODUCTS

Basic Products are designed for customers with advanced image processing capabilities. These imagery products, when combined with supplied attitude, ephemeris, and camera model information, are suitable for advanced photogrammetric processing (i.e., orthorectification).

Each unique image in a Basic Product is processed individually; seamlines will be visible in products requiring multiple images to cover the area of interest. Basic products are available in Pan, Multispectral, and Bundles. The pan-sharpening option is not available with a Basic Product.

Processing: Basic Imagery products are radiometrically corrected and sensor corrected, but not projected to a plane using a map projection or datum. The sensor correction blends all pixels from all detectors into the synthetic array to form a single image. The resulting GSD varies over the entire product because the look angle slowly changes during the imaging process.

Accuracies: The Basic Imagery product is in the satellite frame of reference; it is not tied to ground location, and is therefore a geometrically raw product with no implied accuracy. However, when the data are processed with the supplied refined Image Support Data (ISD) and user-supplied DEMs and GCPs, horizontal accuracies of at least 4.0 meter CE90, can be achieved.

Physical Structure: Basic Imagery products are delivered as scenes. Scenes are approximately full swath width, cut into consistent lengths. Depending on area ordered, the length of the last piece of imagery used to fulfill the Area of Interest could be less than length specified below. There will be at least 1.8 km overlap between scenes of the same strip.

- QuickBird Scene-framed products are approximately 18.0 km x 16.4 km at nadir.
- WorldView1 Scene-framed products are approximately 17.6 km x 14 km at nadir.
- WorldView2 Scene-framed products are approximately 16.4 x 14 km at nadir.

2.4.1 SPECIFICATIONS TABLE FOR BASIC IMAGERY

The following table lists the processing specifications, product parameters, and delivered Image Support Data files for Basic Imagery products.

Physical Characteristics - Basic Imagery	
Minimum orderable area	Single Scene (230-272 km ²)
Product Framing	Scene-based
Pan strip width (km, approximate at nadir)	16.4 km – 18.0 km
Processing Specifications	
Absolute geolocation accuracy (nadir)	Geometrically raw. With supplied image support data imagery can be processed to 5 m CE90 (WV-1, WV-2) or 23 m CE90 (QB) at less than 30° off-nadir, excluding terrain effects.
Product Parameters	
Product Options	Pan, 4-band, 8-band, pan + 4-band bundle, pan+8-band bundle
Number of bits per pixel in delivered product	8 or 16
Digital scaling method	Linear with a maximum value set to 255

(applies to 8 bit only)	
Resampling option	4x4 cubic convolution, MTF kernel (default for pan only), Enhanced Kernel (pan only)
Output pixel spacing	As collected (pixels collected at less than 50 cm are resampled)
Cloud Cover	0-15% default, other options available upon request
Delivery Parameters	
Output product delivery media options	FTP Pull, DVD, External Hard Drive
Image data format options	NITF 2.0; NITF 2.1; GeoTIFF 1.0
Image Support Data	
ISD files supplied to customer	Delivery (top level index) README file; Layout file, shapefiles, browse image, Product README, image metadata file, ephemeris file; attitude file; geometric calibration file; RPC00B file; license text file; tile map file
Spacecraft telemetry	Refined attitude/ephemeris (supplied with ISD)

TABLE 3: PHYSICAL CHARACTERISTICS OF BASIC IMAGERY

2.5 BASIC STEREO PAIR IMAGERY PRODUCTS

Basic Stereo Pair Imagery products are suitable for customers with a high level of image expertise and software that is capable of ingesting, processing, and/or displaying stereo imagery. Basic Stereo Pair Imagery products are typically used to create Digital Elevation Models (DEMs) or for three dimensional feature extraction.

Basic Stereo Pair Imagery products are comprised of one or more pairs of Basic Images with 100% overlap over the customer’s Area of Interest (AOI). Stereo mates are collected on the same satellite orbit and with specific look angles in order to attain imagery appropriate for stereo viewing. Basic Stereo Imagery is available in Panchromatic, 4-band Multispectral, or Pan + 4-band Multispectral Products.

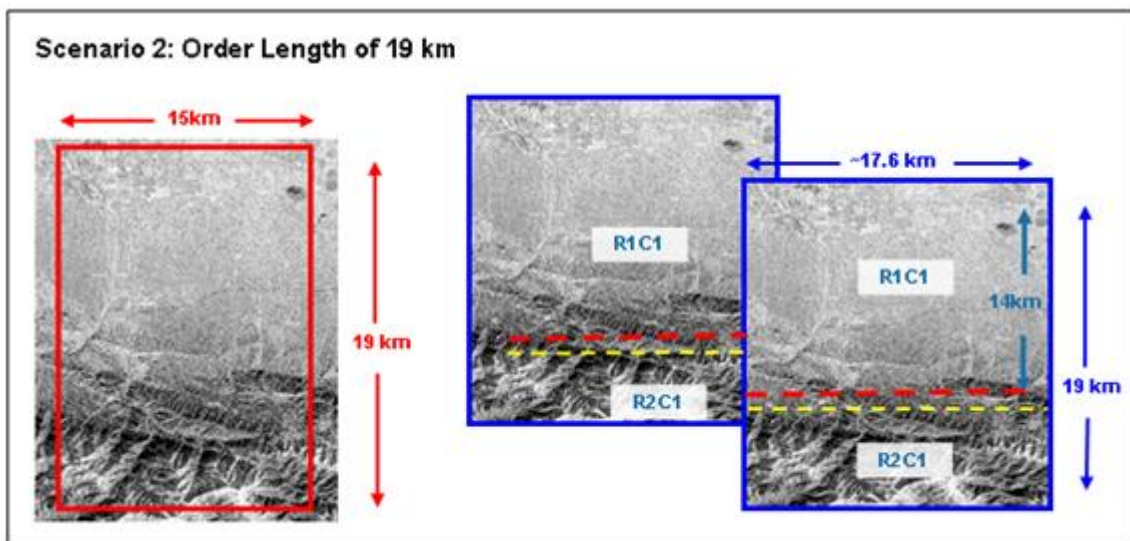
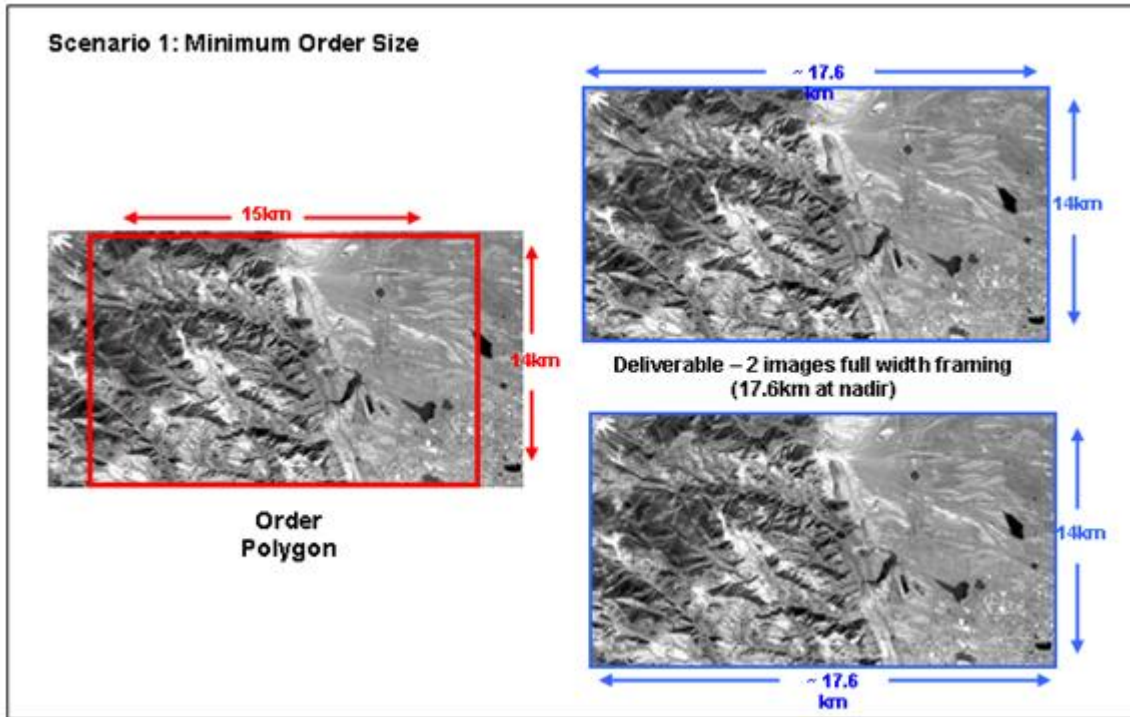
Processing: Basic Stereo Pair Imagery products are radiometrically corrected and sensor corrected, but not projected to a plane using a map projection or datum. The sensor correction blends all pixels from all detectors into the synthetic array to form a single image. The resulting GSD varies over the entire product because the attitude & ephemeris slowly change during the imaging process.

Accuracy: The Basic Imagery product is in the satellite frame of reference. It is not tied to ground location, and is therefore a geometrically raw product with no implied accuracy. However, when the data are processed with the supplied refined Image Support Data (ISD), a horizontal geolocational accuracy of 5 m CE90, excluding terrain and off-nadir effects, can be achieved, with actual accuracy in the range of 4.0 - 5.5 m CE90 at less than 30° off-nadir. Vertical accuracy is 5 m LE90 at less than 30° off-nadir.

Physical Structure: The minimum order size for Basic Stereo Products is 15 km wide x 14 km long up to a maximum of a one degree cell (approximately 100 km x 100 km). Basic Stereo Pair Imagery products are full-width framed delivered at full swath width, which is 16.4 km at nadir, for WorldView-1 Imagery and 17.6 km for WorldView-2. Due to file size constraints, Stereo products often must be divided into smaller image segments. They can be segmented in two different ways: cut up into 14 km lengths or, for larger areas, the length of the image strip can be divided into equal parts along the image strip.

Products cut up into 14 km lengths will be delivered in 14km increments, except for the last increment in the strip, which may be a fractional increment. Products that are divided into equal segments can be divided by 1, 2, 4, or 7 parts. Customers who require small, manageable files sizes or who are interested

in achieving higher processing speeds should opt to divide the strips into more parts by selecting a larger number of parts. Those users who can manage large file sizes and desire a fewer number of images to cover the AOI should select smaller number of parts. For either method of division, there will be at least 1 km overlap between adjacent stereo pairs.



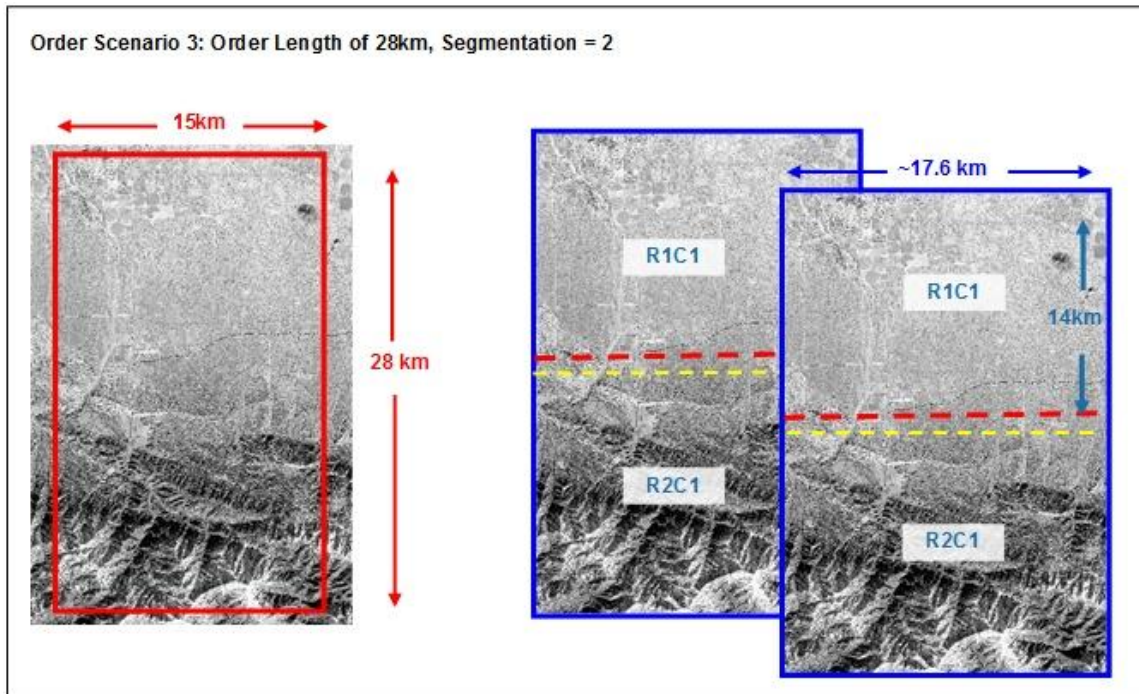


FIGURE 1: THREE ORDERING SCENARIOS 14 KM LENGTH STEREO IMAGERY

2.5.1 SPECIFICATIONS TABLE FOR BASIC STEREO IMAGERY

The following table lists the processing specifications, product parameters, and delivered Image Support Data files for Basic Stereo Imagery products.

Physical Characteristics - Basic Stereo Imagery	
Minimum Orderable Area	210 km ² (15 km x 14 km)
Product Framing	Full width
Pan strip width (km, approximate at nadir)	16.4 - 17.6
Processing Specifications	
Absolute Geolocation Accuracy	Geometrically raw. With supplied image support data imagery can be processed to 5 m CE90 at less than 30° off-nadir, excluding terrain effects.
Absolute Vertical Accuracy	5 m LE90 at less than 30° off-nadir
Product Parameters	
Product Options	Pan, 4-band, pan + 4-band bundle
Number of bits/pixel for deliverable image	8 or 16
Digital scaling method (8 bit only)	Linear with a maximum value set to 255
Resampling option	4x4 cubic convolution, MTF kernel, Enhanced Kernel

Output pixel spacing	As collected; no worse than 75 cm
Overlap of AOI	100%
Convergence angle C	30-60
Bisector elevation angle (BIE)	60-90
Asymmetry	< 20 degrees
Delivery Parameters	
Output product delivery media options	FTP (pull), DVD, External Hard Drive
File format options	NITF 2.0, NITF 2.1, GeoTiff 1.0
Image Support Data	
ISD Files supplied to customer	Delivery (top level index) README file; Layout file, shapefiles, browse image, Product README, image metadata file, ephemeris file; attitude file; geometric calibration file; RPC00B file; license text file; tile map file, stereo file
Spacecraft Telemetry	Refined attitude/ephemeris (supplied with ISD)

TABLE 4: PHYSICAL CHARACTERISTICS OF BASIC STEREO PAIR IMAGERY

2.6 STANDARD IMAGERY PRODUCTS

Standard Imagery products are suitable for users requiring modest absolute accuracy and/or large area coverage. Users of Standard Imagery products usually possess sufficient image processing tools and knowledge to manipulate and exploit the imagery for a wide variety of applications.

Processing: Standard Imagery products are radiometrically corrected, sensor corrected, and projected to a plane using the map projection and datum of the customer's choice. Standard Imagery products are available in black & white at 50 cm, 60 cm or 2 m GSD, pan-sharpened at 50 cm or 60 cm GSD, or multispectral at 2.0 m or 2.4 m GSD depending on the sensor. All Standard Imagery products have uniform GSD throughout the entire product.

The radiometric corrections applied to this product include: relative radiometric response between detectors, non-responsive detector fill, and a conversion for absolute radiometry. The sensor corrections account for internal detector geometry, optical distortion, scan distortion, any line-rate variations, and registration of the panchromatic and multispectral bands. Geometric corrections remove spacecraft orbit position and attitude uncertainty, Earth rotation and curvature, and panoramic distortion.

Standard Imagery comes in two varieties:

Standard Imagery: Standard Imagery has a coarse DEM applied to it, which is used to normalize for topographic relief with respect to the reference ellipsoid. The degree of normalization is relatively small, so while this product has terrain corrections, it is not considered orthorectified.

Ortho Ready Standard Imagery: Ortho Ready Standard Imagery has no topographic relief applied with respect to the reference ellipsoid, making it suitable for orthorectification. Ortho Ready Standard Imagery is projected to a constant base elevation, which is calculated on the average terrain elevation per order polygon or can be supplied by the customer.

Accuracies: Standard and Ortho Ready Standard Imagery product accuracies vary by sensor. For QuickBird imagery, the geolocation accuracy specification is 23 m CE90. The WorldView-1 and WorldView-2

accuracy specification is 5 m CE90 at less than 30° off-nadir, with actual accuracy in the range of 4.0 – 5.5 m CE90. These accuracies are excluding any topographic displacement and off-nadir viewing angle. Ground location is derived from refined satellite attitude and ephemeris information without requiring the use of Ground Control Points (GCPs).

When Ortho Ready Standard Imagery is processed using supplied RPCs, a high quality DEM (e.g. DTED Level 2) and sub-meter GCPs, accuracies in the range of 4 meter CE90 may be achieved.

Physical Structure: With the exception of lack of terrain correction, Ortho Ready Standard Imagery products have all the same specifications as Standard Imagery products. All the specifications in this section apply to both Standard Imagery products and Ortho Ready Standard Imagery products.

If the order polygon crosses more than one strip, one product is made for each image strip that is used to fulfill the order. As the Standard Product is not mosaicked, one product will be delivered for each strip the order polygon intersects. The delivered area for Standard Products is the order polygon, black-filled to the Minimum Bounding Rectangle. The following figures show the final product structure for order polygons that fall within a single strip, and that cross multiple strips.

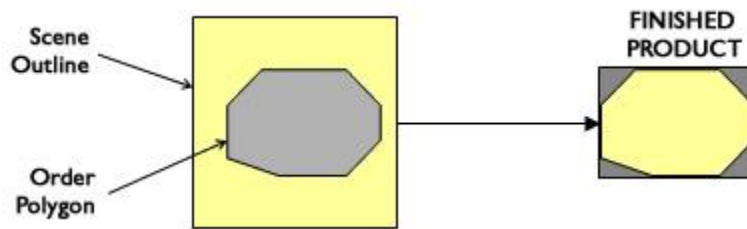


FIGURE 2: PRODUCT STRUCTURE FOR STANDARD AND ORTHORECTIFIED IMAGERY PRODUCTS WITHIN A SINGLE STRIP

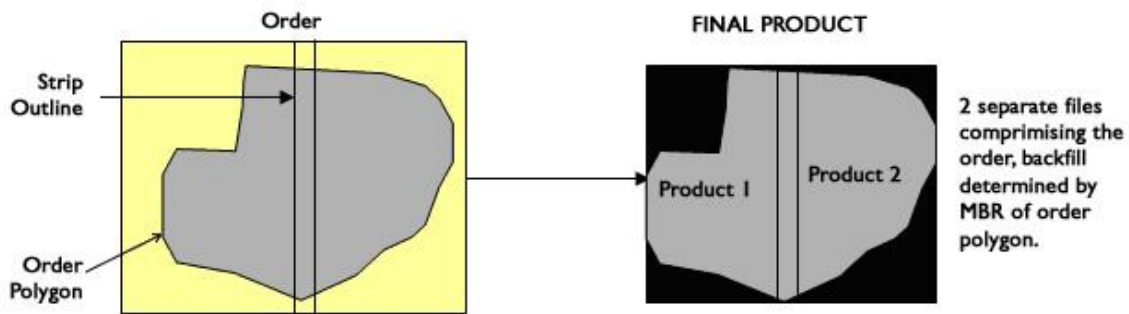


FIGURE 3: PRODUCT STRUCTURE FOR PROJECTED MULTI-STRIP PRODUCTS

Standard Imagery products are delivered as one image file for each strip the order polygon intersects. If the order polygon intersects more than one strip, the imagery in each strip will be delivered as separate files, will not be mosaicked together to form a single image, and will not be radiometrically balanced.

2.6.1 SPECIFICATION TABLE FOR STANDARD IMAGERY PRODUCTS

The following table lists the processing specifications, product parameters, and delivered Image Support Data files for Standard Imagery products.

Physical Characteristics - Standard and Ortho Ready Standard Imagery	
Minimum orderable area	25 km ² (ImageLibrary); new collection subject to minimum price for tasking level selected, not less than 25 km ²
Product Framing	Area- based
Processing Specifications	
Absolute geolocation accuracy	Geolocation accuracy specification of 5 m CE90 (WV-1, WV-2) or 23 m CE90 (QB) at less than 30° off-nadir, excluding terrain effects.
Geometric corrections applied	Spacecraft orbit position and attitude uncertainty; Earth rotation; Earth curvature; panoramic distortion; terrain elevation (coarse)
Geolocation information applied	Ephemeris and attitude; rotation and alignment to map projection
Applied terrain information	Average base elevation or customer specified elevation (Ortho Ready Standard); coarse DEM (Standard)
Product Parameters	
Product Options	Pan, 4-band, 8-band, pan + 4-band bundle, pan + 8-band bundle Natural Color, Color Infrared, 4-band Pan-Sharpended
Number of bits per pixel in delivered product	8 or 16
Digital scaling method (applies to 8 bit only)	Linear with maximum value set to 255 (if highest DN is <= 255, no scaling is applied)
Resampling option	4x4 cubic convolution, Nearest neighbor, MTF kernel, Enhanced Kernel, Pan-sharpening
Dynamic Range Adjustment (DRA) option	Color correction and contrast enhancement (8-bit only)
Output tile size options	None; 8k x 8k pixels; 14k x 14k; 16k x 16k pixels; Map-based
Output pixel spacing	Pan: 50 cm, 60 cm, 2 m Pan-sharpened: 50 cm or 60 cm Multispectral: 2.0 m or 2.4 m
Output alignment	Rotated to Map North up
Cloud Cover	0-15% default, other options available upon request
Delivery Parameters	
Output product delivery media options	FTP Pull, DVD, External Hard Drive
Image data format options	NITF 2.0; NITF 2.1; GeoTIFF 1.0
Image Support Data	
ISD files supplied to customer	Delivery (top level index) README file; Layout file, shapefiles, browse image, Product README, image metadata file, RPC00B file; license text file; tile map file
Spacecraft telemetry	Refined attitude/ephemeris (used to create the product)

TABLE 5: PHYSICAL CHARACTERISTICS OF STANDARD IMAGERY

2.7 ORTHO READY STEREO IMAGERY PRODUCTS

Ortho Ready Standard Stereo Imagery products are suitable for customers with a high level of image expertise and software that is capable of ingesting, processing and/or displaying stereo imagery. They are typically used to create Digital Elevation Models (DEMs) or for three dimensional feature extraction. Customers ordering stereo products who require a small area of interest (AOI) should order the Ortho

Ready Standard Stereo Product while customers requiring large area coverage should opt for the Basic Stereo Product.

Ortho Ready Stereo Imagery: Ortho Ready Stereo Imagery is map projected but has no topographic relief applied with respect to the reference ellipsoid, making it suitable for orthorectification. Ortho Ready Stereo Imagery is projected to a constant base elevation, which is calculated on the average terrain elevation per order polygon or can be supplied by the customer.

The Ortho Ready Stereo product takes on all of the same stereo collection angle specifications as the Basic Stereo Products however are available for customers who either prefer a map corrected stereo product or require a smaller minimum Area of Interest.

Accuracy: Ortho Ready Imagery product accuracies vary by sensor. The WorldView-1 and WorldView-2 accuracy specification is 5 m CE90 at less than 30° off-nadir, with actual accuracy in the range of 4.0 – 5.5 m CE90. These accuracies are excluding any topographic displacement and off-nadir viewing angle. Ground location is derived from refined satellite attitude and ephemeris information without requiring the use of Ground Control Points (GCPs). Vertical accuracy is 5 m LE90 at less than 30° off-nadir. QuickBird Stereo products are not offered.

Physical Structure: Ortho Ready Stereo Imagery products offer 100% stereo coverage over the AOI. The minimum AOI size for this product is 100 km². These products have the same physical structure as Ortho-Ready Standard Imagery products. Refer to section 2.6 for details on physical structure.

2.7.1 SPECIFICATIONS TABLE FOR ORTHO READY STANDARD STEREO IMAGERY PRODUCTS

The following table lists the processing specifications, product parameters, and delivered Image Support Data files for Ortho Ready Standard Stereo Imagery products.

Physical Characteristics - Ortho Ready Standard Stereo Imagery	
Minimum Order Size	100 km ² (10 km x 10 km)
Maximum Order Size	300 km ²
Product Framing	Area-based
Final Product Physical Structure	Product tiling available
Pan strip width (km, approximate at nadir)	17.6 km (WV-1) 16.4 km (WV-2)
Processing Specifications	
Absolute geolocation accuracy	Geolocation accuracy specification of 5 m CE90 (WV-1, WV-2) at less than 30° off-nadir, excluding terrain effects.
Geometric corrections applied	Spacecraft orbit position and attitude uncertainty; Earth rotation; Earth curvature; panoramic distortion
Geolocation information applied	Ephemeris and attitude; rotation and alignment to map projection
Applied terrain information	Average base elevation or customer specified
Product Parameters	
Product Options	Panchromatic, 4 or 8-band Multispectral or Bundle, 3 or 4-band Pan-sharpened
Number of bits/pixel for deliverable image	8 or 16
Digital scaling method (8 bit only)	Linear with a maximum value set to 255

Resampling option	4x4 cubic convolution (default), Nearest neighbor, MTF kernel, Pan-Sharpener kernel, ENH kernel
Dynamic Range Adjustment (DRA) option	Color correction and contrast enhancement (8-bit only)
Output tile size options	None; 8k x 8k pixels; 14k x 14k; 16k x 16k pixels; Map-based
Output pixel spacing	Pan: 50 cm, 60 cm, 2 m Pan-sharpened: 50 cm or 60 cm Multispectral: 2.0 m or 2.4 m
Output alignment	Rotated to Map North up
Cloud Cover	0-15% default, other options available upon request
Map projections	Geographic (Lat/Lon), UTM, State Plane
Ellipsoids and Datums	NAD27, NAD83, WGS84
Convergence Angle	30-60
Bisector elevation angle (BIE)	60-90
Asymmetry	< 20 degrees
Delivery Parameters	
Output product delivery media options	FTP (pull), DVD, Firewire
File format options	NITF 2.0, NITF 2.1, GeoTIFF 1.0
Image Support Data	
ISD Files supplied to customer	Delivery (top level index) README file; Layout file, shapefiles, browse image, Product README, image metadata file; RPC00B file; license text file; tile map file, stereo file

TABLE 6: PHYSICAL CHARACTERISTICS OF ORTHO READY STANDARD STEREO IMAGERY

2.8 ADVANCED ORTHO SERIES

Orthorectified Imagery products are GIS-ready and are used for numerous applications. They provide an ideal base for creating and revising mapping and GIS databases, or for registering existing feature layers. Ortho products can also be used for change detection and other analytical applications that require a high degree of absolute accuracy. As shown in Table 6, the product levels equate to different levels of processing and geolocation accuracy.

DigitalGlobe offers Ortho Products for consumers of imagery products who require clearly defined aesthetic and accuracy specifications with an emphasis on aesthetic quality. Table 6 describes these options.

Accuracy Type	Accuracy CE90	Accuracy RMSE	Vision Premium	Vision
Precision Aerial	2.7 m – 5.3 m	1.8 m – 3.5 m	<ul style="list-style-type: none"> Superior aesthetics with high touch services Virtually cloud and haze free Tonally balanced 3-5 day delivery* 	N/A
Precision	4.2 m	2.8 m		<ul style="list-style-type: none"> Standard aesthetics with automated production 2-3 day delivery*
Mapping	10.2 m	6.6 m		
Display	25.4 m	16.5 m		

TABLE 7: ADVANCED ORTHO SERIES IMAGERY PRODUCTS AND ASSOCIATED ACCURACIES

* Satellite Delivery times based on areas smaller than 1500 km². Larger areas will be delivered within 5 days for Ortho Vision; within 10 days for Ortho Vision Premium

Processing: Orthorectified Satellite Imagery products are radiometrically corrected, sensor corrected, and orthorectified with a fine digital terrain model using the map projection and datum requested by the customer. Orthorectified Imagery products require DEMs to remove relief displacement. Ground Control Points (GCPs) can also be used to improve the absolute accuracy. Before an order for an Orthorectified Imagery product is accepted, DigitalGlobe will determine whether it has the appropriate support data to make the desired product. The accuracy of the DEMs and/or GCPs required to make each product depends on the Orthorectified Imagery product ordered. Quotes for the support data will be provided on request (for locations where GCPs can be collected). Table 98 summarize the processing parameters used for Vision Premium and Vision Ortho Products.

Processing Parameter	Vision	Vision Premium
Product Options	WV02 and QB02 default is 3 band pan-sharpen; other options acceptable	
Resolution	50 cm, 60 cm, 2 m	50 cm, 60 cm, 2 m, 30 cm aerial
Customer Framing	Area-Based	
Bit Depth	8 bits per pixel	
Resampling Kernel	Enhanced for pan-sharpen, MTF for pan	
File format	GeoTIFF is default, other options in section 4.4 acceptable	
Mosaic	Yes, if applicable	
Radiometric Balancing	General balancing required for mosaics	Precise balancing required for mosaics
DRA	On	
Datum/Projection/Units	Default is UTM WGS84 (m), other supported options are acceptable (refer to table 10 below)	
Tiling	Default is 8k tiling, other supported options are acceptable (refer to table 10 below)	
Delivery	Any from supported delivery options (refer to table 10 below)	

TABLE 8: VISION AND VISION PREMIUM PROCESSING PARAMETERS

Aesthetics: DigitalGlobe offers two options for aesthetic quality of Ortho Products; Vision Premium and Vision. Vision Premium aesthetics are of the highest quality, with more rigorous specifications for cloud, haze, snow, geometric breaks, and cutline placement requiring high touch processing. Vision aesthetics are of good quality and have less rigorous specifications for cloud, haze, snow, geometric breaks and cutline placement. This product type requires low touch and can be generated more quickly and at larger scale. Table 9 below describes the specifications for Vision Premium and Vision Products in detail.

Quality Type	Vision Premium	Vision
Cloud Cover	Less than 10%	Up to 20% for the AOI
Haze, Pollution & Fog	None or Scarce	Allowable
Snow	Only persistent allowed	Allowable
Tonal Balancing	Required; input imagery is seasonally consistent	Optional; If requested, optimal results may not be achieved
Geometric Breaks	Minimized to less than 1 m	Allowable up to one half the product CE 90
Cutline Placement	Seamless	Automated, visible radiometric breaks are allowable

TABLE 9: AESTHETIC QUALITY SPECIFICATIONS

2.8.1 CUSTOM ORTHORECTIFIED PRODUCTS

DigitalGlobe also offers customers the opportunity to order Custom Orthorectified Imagery products. These products can be produced to standard NMAS scale with no aesthetics specifications using either customer supplied or DigitalGlobe support data. For products that use customer provided support data to orthorectify the imagery, there is no stated accuracy associated with because the quality and accuracy of the finished product is directly dependent on the quality and accuracy of the support data. DEMs and GCPs are the most typical types of support data that customers provide to DigitalGlobe. Please contact DigitalGlobe for a complete list of acceptable types of support data and formats.

Physical Structure: The delivered area for Orthorectified Products is the order polygon is black-filled to the Minimum Bounding Rectangle and optionally tiled.

2.8.1.1 SPECIFICATION TABLE FOR SATELLITE ORTHO IMAGERY PRODUCTS

The following table lists the processing specifications, product parameters, and delivered Image Support Data files for custom ortho Imagery products.

Physical Characteristics –Ortho Imagery	
Minimum Orderable Area	100 km ²
Maximum Orderable Area	10,000 km ²
Product Framing	Area-based
Processing Specifications	
Absolute geolocation accuracy (nadir)	4 m - 25 m CE90
Geometric corrections applied	Spacecraft orbit position and attitude uncertainty; Earth rotation; Earth curvature; panoramic distortion; terrain elevation (fine)
Geolocation information applied	Refined ephemeris and attitude; rotation and alignment to map projection
Applied terrain information	Fine DEM
Spatial mosaicking	Images mosaicked to minimize seamlines – optional
Tonal balance	Contiguous tonal balancing across multi-image mosaics – optional
Product Parameters	
Product Options	Pan, 4-band, 8-band, pan + 4-band bundle, pan + 8-band bundle Natural Color, Color Infrared, 4-band Pan-Sharpended
Number of bits per pixel in delivered product	8 or 16
Digital scaling method (applies to 8 bit only)	Linear with maximum value set to 255 (if highest DN is <= 255, no scaling is applied)
Resampling Option	4x4 cubic convolution , MTF kernel, Enhanced Kernel, Pan-sharpening
Dynamic Range Adjustment (DRA)	Color correction and contrast enhancement (8-bit only) optional
Output tile size options	None; 8k x 8k pixels; 14k x14k; 16k x 16k pixels Product Units-customer specified (mosaics only)
Output pixel spacing	Pan: 50 cm, 60 cm, 2 m Pan-sharpened: 50 cm or 60 cm Multispectral: 2.0 m or 2.4 m
Map projections, Ellipsoids and Datums	See Table 7
Output alignment	Rotated to Map North up
Cloud cover	15%
Delivery Parameters	
Output product delivery media options	FTP Pull, DVD, External Hard Drive
Image data format options	NITF 2.0; NITF 2.1; GeoTIFF 1.0
Image Support Data	
ISD files supplied to customer	Delivery (top level index) README file; Layout file, shapefiles, browse image, Product README, image metadata file, license text file; tile map file
Spacecraft telemetry	Refined attitude/ephemeris (used to create product)

TABLE 10: PHYSICAL CHARACTERISTICS OF ORTHO IMAGERY

2.8.2 PRECISION AERIAL

The Precision Aerial Product is a Premium Precision ortho but has a number of specifications that differ from the Satellite derived Advanced Ortho Series Products. The Advanced Ortho Aerial Program is a joint effort with Microsoft to produce the first and largest of wall-to-wall 30 cm Natural Color and 60 cm Color Infrared orthomosaics of the contiguous United States and Western Europe.

Collection Program: The Advanced Ortho Aerial Program imagery is collected in 1 degree by 1 degree region tiles (~10,000 km²) in a grid pattern for complete country coverage. Additionally, individual Metros, which are irregular polygons generously drawn around the major cities and population centers, are collected and processed as a complete product to ensure high quality within the populated areas. Processing a Metro contiguously, ensures that seasonality, color balancing, and mosaicking are maintained for a whole Metro regardless of how that metro falls along the 1deg x 1deg Region Tile boundaries. Each Region Tile is categorized into High Value, Standard Value, and Remote Value groups. These categories dictate collection priority. Metros are always High Value. Collection priority is placed on highly populated metro areas, then select standard value region tiles, which will be followed by remote value region tiles. Once completed in Q2 of 2012, all of the Standard Value and High Value Region Tiles, as well as the Metros, will be refreshed by Q4 2014. This will be approximately a 60% refresh, and will be subject to further review as the refresh period approaches.

Physical Structure: Premium Vision Precision Aerial Products are delivered in full Region Tiles or metro areas and are tiled in 25,000 by 25,000 pixels for RGB and 12,500 by 12,500 pixels for CIR.

Processing: Precision Aerial products are orthomosaics that are color balanced within the Region Tiles. Color differences between the frames that make up a mosaic will be minimized. Specifically, individual image frames will be adjusted for side-to-side shading, contrast variations, time-of-day, sun-angle, atmospheric conditions like haze, and the use of multiple cameras over multiple days. Whenever adjacent Region Tiles are available, an overlapping strip of images will be used in color balancing of a new Region Tile, however adjacent Region Tiles and Metros will not be color balanced to each other. Seamlines are minimized by routing through irregular paths through the images to avoid above-ground man-made structures. Seam-lines between images from adjacent flight strips may be noticeable in vegetated or built-up areas. To minimize any potential geometric errors between adjacent region tiles, flying patterns will be adjust such that there always is a flight line centered on the region tile boundary.

The following table defines the characteristics of the Premium Vision Precision Aerial Product. DigitalGlobe makes a best effort to abide by the quality specifications however under rare circumstances we may allow slight variations. These products are all produced to the following specification and available off the shelf. Custom Orthomosaic processing is not available for this product.

Processing Parameter	High Value	Standard block	Remote Block
Sensor	Microsoft UltraCam G		
Maximum Off Nadir Angle	+/- 42.4° ONA CrossTrack +/- 6.8° ONA LongTrack		
Cloud Cover Restrictions	< 1%	<1%	1%
Sun Elevation	30°	20°	20°
Maximum Accuracy Tolerance (CE90)	High Value 2.67 m or 4.01 m	Std Value 4.01 m	Remote Value 4.01 m or 5.34 m
Mosaicking and Color Balancing			
Color Balancing	Yes within complete 1° x 1° region tile, or metro AOI		
Mosaicking	Yes, within Region Tiles and Metros		
Production Parameters			
Processing	Orthorectified Aerial Imagery		
Bits per pixel	8 bits		
Spatial Resolution	RGB Color - 30 cm, CIR - 60 cm		
Dynamic Range Adjustment (DRA)	Yes		
Resampling Kernel	Cubic Convolution		
Spectral Bands	Natural Color: RGB, Color Sharpened Infrared: NRG		
Projection, Datum, Units	UTM, WGS84, meters		
Tile Size	RGB: 25,000 x 25,000 pixels, CIR: 12,500 x 12,500 pixels		
File Format and Associated Parameters	GeoTIFF 1.0		
Naming	Naming: <RGB or CIR>_<LL_LAT_LL_LON>_<yyyy>_<mm>_<dd>_ISO.XML for region tile products Eg. RGB_N40W105_2010_04_30_ISO.XML <RGB or CIR>_<Metro Name>_<yyyy>_<mm>_<dd>_ISO.XML for metro products Eg. CIR_USA-CO-Denver_2010_04_30_ISO.XML		
Metadata	Metadata: ISO 19115		
Environmental Conditions			
Cloud and Shadow Restrictions	0%	< 2%	< 3%
	Must not be black and detail is clearly visible		
Haze	0%	< 2%	< 3%
	Must not be white and detail is clearly visible		
Standing Water	0%	0%	< 1%
Seasonality	Leaf-Off	N/A	N/A
Snow	Permanent Snow	Above Treeline	<3%

TABLE 11: PHYSICAL CHARACTERISTICS OF VISION PREMIUM AERIAL PRECISION

3 SATELLITE CONSTELLATION

The DigitalGlobe Constellation consists of three high-resolution satellites:

- QuickBird – 65 cm, 4-band color
- WorldView-1 – 50 cm panchromatic
- WorldView-2 – 50 cm, 8-band color

Due to the different capabilities of each satellite, they are able to deliver different items from the core product list.

	QuickBird	WorldView-1	WorldView-2
Available Products	Basic, Standard, Ortho-ready Standard and Ortho	Basic, Basic Stereo, Standard, Ortho-ready Standard and Ortho	Basic, Basic Stereo, Standard, Ortho-ready Standard and Ortho
Spatial Resolution	60 cm pan, 2.4 m MS	50 cm Pan	50 cm Pan, 2 m MS
Multispectral bands	Red, Green, Blue, Near-Infrared 1(NIR1)	N/A	Coastal, Blue, Green, Yellow, Red, Red Edge, Near-Infrared 1, and Near-Infrared 2(NIR2)
Native Accuracy (at nadir on flat terrain)	23 m CE90	5 m CE90	Jj 5 m CE90

TABLE 12: PRODUCT AVAILABILITY BY SENSOR

The following table compares the various sensor bands available on each satellite. The band edge values represented here are determined at the 5% points of the band response curves. The Center Wavelength is the mid-point between the upper and lower band edges at the 5% point.

Band	QuickBird			WorldView-1			WorldView-2		
	Lower Band Edge (nm)	Center Wavelength (nm)	Upper Band Edge (nm)	Lower Band Edge (nm)	Center Wavelength (nm)	Upper Band Edge (nm)	Lower Band Edge (nm)	Center Wavelength (nm)	Upper Band Edge (nm)
Panchromatic	405	729	1053	397	651	905	447	627	808
Multispectral									
Coastal Blue	-	-	-	-	-	-	396	427	458
Blue	430	488	545	-	-	-	442	478	515
Green	466	543	620	-	-	-	506	546	586
Yellow	-	-	-	-	-	-	584	608	632
Red	590	650	710	-	-	-	624	659	694
Red Edge	-	-	-	-	-	-	699	724	749
NIR1	715	817	918	-	-	-	765	833	901
NIR2	-	-	-	-	-	-	856	949	1043

TABLE 13: COMPARISON OF SENSOR BANDS AMONG THE DIGITALGLOBE CONSTELLATION

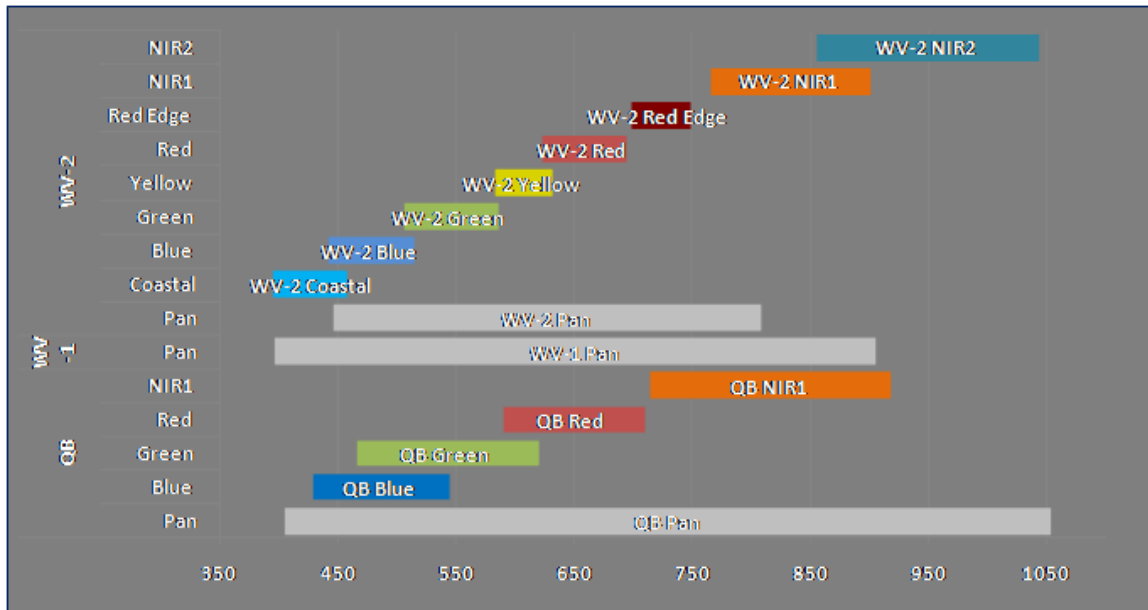


FIGURE 4: VISUAL COMPARISON OF SENSOR BANDS

The following sections outline the capabilities of each satellite.

3.1 QUICKBIRD SATELLITE

DigitalGlobe’s QuickBird satellite provides high resolution panchromatic and multispectral imagery. Its large swath width, combined with ample on-board storage and geolocational accuracy, allows it to efficiently and accurately image large areas of the globe. The QuickBird spacecraft is capable of acquiring over 75 million square kilometers of imagery data annually.

QuickBird Characteristics	
Launch Information	Date: October 18, 2001
	Launch Vehicle: Delta II
	Launch Site: Vandenberg Air Force Base
Orbit	Altitude: 482 kilometers
	Type: Sun synchronous, 10:00 am descending node
	Period: 94.2 minutes
Sensor Bands	Panchromatic: 405-1053 Multispectral: Blue: 430 - 545 Green: 466 – 620 Red: 590 – 710 NIR1: 715 - 918
Sensor Resolution (GSD = Ground Sample Distance)	0.65 meters GSD at nadir Panchromatic 2.62 meters GSD at nadir Multispectral
NIIRS Equivalency	NIIRS potential of 4.9
Dynamic Range	11-bits per pixel
Swath Width	18.0 kilometers at nadir
Pointing Accuracy & Knowledge	Accuracy: <500 meters at image start and stop Knowledge: Supports geolocation accuracy below
Retargeting Agility	Acceleration: .086 deg/s/s
	Rate: 2.4 deg/sec
	Time to slew 200 kilometers: 37 seconds
Onboard Storage	128 gigabits capacity
Max Viewing Angle / Accessible Ground Swath	Nominally +/-45° off-nadir = 1005 km wide swath Higher angles selectively available
Per Orbit Collection	331 gigabits
Max Contiguous Area Collected in a Single Pass	18.0 x 360 km mono
Revisit Frequency to target at 40° N latitude	2.5 days at 1 meter GSD 5.6 days at 20° off-nadir or less
Geolocation Accuracy (CE90)	Geolocation Accuracy specification of 23 m CE90 excluding terrain and off-nadir effects

TABLE 14: QUICKBIRD SPACECRAFT CHARACTERISTICS

3.2 WORLDVIEW-1

WorldView-1 is the first of our next-generation equipped with state-of-the-art control moment gyros, which provide stunning agility, rapid retargeting and efficient in-track stereo collection. The WorldView-1 spacecraft is capable of collecting up to 750,000 square kilometers (290,000 square miles) of 50 cm resolution panchromatic imagery per day.

WorldView-1 Characteristics	
Launch Information	Date: September 18, 2007
	Launch Vehicle: Delta II 7920
	Launch Site: Vandenberg Air Force Base
Orbit	Altitude: 496 kilometers
	Type: Sun synchronous, 10:30 am descending node
	Period: 95minutes
Sensor Bands	Panchromatic
Sensor Resolution (GSD = Ground Sample Distance)	0.50 meters GSD at nadir 0.55 meters GSD at 20° off-nadir
NIIRS Equivalency	NIIRS potential of greater than 5.0
Dynamic Range	11-bits per pixel
Swath Width	17.7 kilometers at nadir
Pointing Accuracy & Knowledge	Accuracy: <500 meters at image start and stop Knowledge: Supports geolocation accuracy below
Retargeting Agility	Acceleration: 2.29 deg/s/s
	Rate: 4.45 deg/s
	Time to slew 200 kilometers: 10 seconds
Onboard Storage	2199 gigabits solid state with EDAC
Max Viewing Angle / Accessible Ground Swath	Nominally +/-45° off-nadir = 1035 km wide swath Higher angles selectively available
Per Orbit Collection	331 gigabits
Max Contiguous Area Collected in a Single Pass	111 x 112 km mono 51 x 112 km stereo
Revisit Frequency to target at 40° N latitude	1.7 days at 1 meter GSD or less 5.4 days at 20° off-nadir or less (0.55 meter GSD)
Geolocation Accuracy (CE90)	Geolocation Accuracy specification of 5 m CE90 at less than 30° off-nadir, with actual accuracy in the range of 4.0 – 5.5 m CE90 at nadir, excluding terrain and off-nadir effects With registration of GCPs in image: 2.0 M (6.6 feet)

TABLE 15: WORLDVIEW-1 SPACECRAFT CHARACTERISTICS

3.3 WORLDVIEW-2

WorldView-2 is the first commercially available 8-band multispectral satellite equipped with state-of-the-art control moment gyros. It also has high agility, rapid retargeting and efficient in-track stereo collection, plus with its higher elevation, it provides faster revisit times around the globe. The WorldView-2 spacecraft is capable of collecting up to 975,000 square kilometers (376,000 square miles) of 50 cm panchromatic and 2 m 8-band multispectral imagery per day.

WorldView-2 Characteristics	
Launch Information	Date: October 8, 2009
	Launch Vehicle: Delta II 7920
	Launch Site: Vandenberg Air Force Base
Orbit	Altitude: 770 kilometers
	Type: Sun synchronous, 10:30 am descending node
	Period: 100 minutes
Sensor Bands	Panchromatic: 450 - 800
	Multispectral: Coastal Blue: 400 - 450 Red: 630 - 690 Blue: 450 - 510 Red Edge: 705 - 745 Green: 510 - 580 NIR1: 760 - 895 Yellow: 585 - 625 NIR2: 860 - 1040
Sensor Resolution	0.46 meters GSD at nadir Panchromatic 1.85 meters GSD at nadir Multispectral
(GSD = Ground Sample Distance)	0.52 meters GSD at 20° off-nadir Panchromatic 2.07 meters GSD at 20° off-nadir Multispectral
NIIRS Equivalency	NIIRS potential of greater than 5.0
Dynamic Range	11-bits per pixel
Swath Width	16.4 kilometers at nadir
Pointing Accuracy & Knowledge	Accuracy: <500 meters at image start and stop
	Knowledge: Supports geolocation accuracy below
Retargeting Agility	Acceleration: 1.43 deg/s/s
	Rate: 3.86 deg/s
	Time to slew 200 kilometers: 10 seconds
Onboard Storage	2199 gigabits solid state with EDAC
Max Viewing Angle / Accessible Ground Swath	Nominally +/-45° off-nadir = 1651 km wide swath Higher angles selectively available
Per Orbit Collection	524 gigabits
Max Contiguous Area Collected in a Single Pass	138 x 112 km mono
	63 x 112 km stereo
Revisit Frequency to target at 40° N latitude	1.1 days at 1 meter GSD
	3.7 days at 20° off-nadir or less (0.52 GSD)
Geolocation Accuracy (CE90)	Specification of 5 m CE90 at less than 30° off-nadir, with predicted performance in the range of 4.6 to 10.7 meters (15 to 35 feet) CE90, excluding terrain and off-nadir effects With registration to GCPs in image: 2.0 m (6.6 feet)

TABLE 16: WORLDVIEW-2 SPACECRAFT CHARACTERISTICS

4 IMAGERY ACQUISITION

4.1 TASKING

There are four tasking options for DigitalGlobe Imagery Products: Select, Select Plus, Assured, and Single Shot. Each tasking option offers a different level of service to the customer, and offers different benefits, so the customer should choose the option which aligns best with their needs in terms of collection window, cloud protection, and price. Tasking orders have single or multiple acquisition opportunities and different customer-defined tasking parameters, depending on the tasking type selected.

For Select, Select Plus and Assured Tasking, DigitalGlobe offers a 0-15% default cloud cover. Clouds are defined as pixels through which ground features are obscured either partially or in their entirety due to atmospheric conditions; to be considered cloud cover, a definite boundary between the affected pixels and the unaffected pixels must be visible. All acquired image strips are assessed for cloud cover. Cloud shadows are not accounted for in assessment.

When preparing its collection plan, DigitalGlobe creates the best plan for every pass, which maximizes the benefit to our customer base while adhering to the parameters associated with each tasking option. Several factors are considered in the collection plan, including tasking option, date an order was received, the customer-specified collection window, and the cloud cover forecast. In rare instances, DigitalGlobe may pre-empt some orders due to collection efficiency and/or satellite calibration and maintenance.

4.1.1 COLLECTION FEASIBILITY

DigitalGlobe performs two feasibility studies on all Tasking Orders prior to acceptance of the order:

Physical Feasibility assesses the number of times that the satellites have physical access to your target based upon the parameters you provide. Items that affect physical feasibility include off-nadir angle (wider angles will have more accesses than narrow angles), latitude, and collection windows (the larger the collection window, the more access the satellites will have).

Competitive Feasibility assesses DigitalGlobe's ability to collect your order based upon other orders already on the tasking deck.

The output of the feasibility studies will be shown on the customer's order quotation and confirmation form, and varies depending on the Tasking Level selected (see below for more detail).

4.1.2 SELECT TASKING

- DigitalGlobe's entry level tasking
- Select Tasking offers flexibility to the customer to set their own collection window, or to go with DigitalGlobe's suggested window
- Customer may specify length of collection window that they are interested in, up to 365 days.
- DigitalGlobe will perform a feasibility, and report back a high or low probability of success within the given collection window.

- If the customer’s collection window has a low probability of success, then DigitalGlobe will also give a suggested collection window. The customer may confirm the order with their original collection window, or DigitalGlobe’s suggested collection window, understanding that DigitalGlobe’s suggested window will give the best likelihood of success.
- For orders with a high probability of success, a suggested window will not be given since the original window is feasible.
- DigitalGlobe’s feasibility assesses physical and competitive feasibility at the time of order placement; factors may change after order confirmation which affects DigitalGlobe’s ability to fulfill a Select Tasking order. In the case that DigitalGlobe is unable to collect a Select Tasking order in the original tasking window, the customer will be contacted and given the option to cancel the order or extend the collection window.

Tasking Parameters - Select Tasking		Customer Selected
Minimum Collection Area	Basic Imagery - 1 scene Standard Imagery - subject to minimum price, not less than 25 km ² Orthorectified Imagery - 100 km ²	
Start Collection Date	Customer specified	Yes
End Collection Date	Customer specified number of days from Start Collection Date, up to 365 days from Start Collect	Yes
Maximum Cloud Cover	15%	
Off-Nadir Angle	0° - 20°, 0° - 30°, 0° - 45° Basic, Standard, and Ortho Ready Standard Imagery 0° - 20° Orthorectified Imagery (0° - 15° may be required in areas of rugged terrain)	Yes
Sun Elevation	>= 15° (as collected); >= 30° for Pan-sharpened products	
Sun Azimuth	0° - 360° (as collected)	
Target Azimuth	0° - 360° (as collected)	

TABLE 17: SELECT TASKING PARAMETERS

4.1.3 SELECT PLUS TASKING

- Select Plus Tasking offers a higher level of service to customers than offered for Select Tasking. Customers will see shorter collection windows for Select Plus Tasking, as opposed to Select Tasking, in areas of high competition.
- Select Plus Tasking offers flexibility to the customer to set their own collection window, or to go with DigitalGlobe’s suggested window, if different.
- Customer may specify length of collection window that they are interested in, up to 365 days.
- DigitalGlobe will perform a feasibility, and report back a high or low probability of success within the given collection window.
 - If the customer’s collection window has a low probability of success, then DigitalGlobe will also give a suggested collection window. The customer may confirm the order with their original collection window, or DigitalGlobe’s suggested collection window,

understanding that DigitalGlobe’s suggested window will provide the best likelihood of a success.

- For orders with a high probability of success, a suggested window will not be given since the original window is feasible.

DigitalGlobe’s feasibility assesses physical and competitive feasibility at the time of order placement; factors may change after order confirmation which affects DigitalGlobe’s ability to fulfill a Select Plus Tasking order. In the case that DigitalGlobe is unable to collect a Select Plus Tasking order in the original tasking window, the customer will be contacted and given the option to cancel the order or extend the collection window.

Tasking Parameters - Select Plus Tasking		Customer Selected
Minimum Collection Area	Basic Imagery - 1 scene Standard Imagery - subject to minimum price, not less than 25 km ² Basic Stereo-1 Scene Ortho Ready Stereo- 100 km ² Orthorectified Imagery - 100 km ²	
Start Collection Date	customer specified	Yes
End Collection Date	Customer specified number of days from Start Collection Date, up to 365 days from Start Collect	Yes
Maximum Cloud Cover	15%	
Off-Nadir Angle	0° - 20°, 0° - 30°, 0° - 45° Basic, Standard, and Ortho Ready Standard Imagery 0° - 20° Orthorectified Imagery (0° - 15° may be required in areas of rugged terrain)	Yes
Sun Elevation	>= 15° (as collected); >= 30° for Pan-sharpened products	
Sun Azimuth	0° - 360° (as collected)	
Target Azimuth	0° - 360° (as collected) - default, selectable in 45° increments	Yes

TABLE 18: SELECT PLUS TASKING PARAMETERS

4.1.4 ASSURED TASKING

- Assured Tasking is for customers who would like the assurance from DigitalGlobe that their order polygon will be collected in the confirmed collection window.
- DigitalGlobe will ensure that the necessary satellite capacity will be allocated to fulfill Assured Tasking orders within the agreed upon collection window.
- Customer may specify the length of collection window that they are interested in, up to 365 days.
- DigitalGlobe will perform feasibility and report back to the customer with a suggested window. For an Assured Tasking order to be confirmed, DigitalGlobe’s suggested collection window must be used.
- For the rare cases in which Assured Tasking orders are not successfully acquired within the collection window (due to unforeseen circumstances, such as particularly bad weather), customer will be given the option to either:

1. Receive free ImageLibrary data for an area equivalent to the unfulfilled order polygon.
- or
2. Extend the order. In these cases, the customer will be given an updated collection window for the unfulfilled portion of the order polygon.
- Assured Tasking is not available for stereo orders.
 - Assured tasking not available on WorldView-1.

Tasking Parameters - Assured Tasking		Customer Selected
Minimum Collection Area	Basic Imagery - 1 scene Standard Imagery - subject to minimum price, not less than 25 km ² Orthorectified Imagery - 100 km ²	
Start Collection Date	DigitalGlobe suggested window	
End Collection Date	DigitalGlobe suggested window	
Maximum Cloud Cover	15%	
Off-Nadir Angle	0° - 45° Basic, Standard, and Ortho Ready Standard Imagery, selectable in 10° increments 0° - 20° Orthorectified Imagery, selectable in 10° increments (0° - 15° may be required in areas of rugged terrain)	Yes
Sun Elevation	>= 15° (as collected); >= 30° for Pan-sharpened products	
Sun Azimuth	0° - 360° (as collected)	
Target Azimuth	0° - 360° (as collected)	

TABLE 19: ASSURED TASKING PARAMETERS

4.1.5 SINGLE SHOT TASKING

- Single Shot Tasking should be used when customers have an immediate need for new imagery, and when customers need a guarantee that imagery will be collected on or near a specific date
- A single collection attempt.
- An initial collection window of 1 - 14 days may be provided by the customer. DigitalGlobe will perform a feasibility and report back to the customer with the first feasible access date within the customer's requested window.
- Order is guaranteed to be shot once confirmed by DigitalGlobe.
- There is no cloud cover protection for the Single Shot Tasking order. The delivered image could contain up to 100% cloud cover.
- Basic and Standard Imagery, in panchromatic and 4-band multispectral options
- Orders can start tasking as soon as 6 hours after order confirmation. Order confirmation is subject to DigitalGlobe business hours. Since Single Shot Tasking orders are planned on a first come, first served basis, it is to the advantage of the customer to place and confirm Single Shot Tasking orders as early as possible prior to the desired collection date to ensure collection.
- Single Shot tasking is only available on QuickBird .

Tasking Parameters – Single Shot Tasking		Customer Selected
Minimum Collection Area	Basic Imagery - 1 scene Standard Imagery - subject to minimum price, not less than 25 km ²	Yes
Maximum Collection Area	18km wide X 360km long (must be able to collect in a single pass)	
Start Collection Date	As soon as 6 hours after order confirmation	Yes
End Collection Date	1 to 14 days after Start Collection Date	Yes
Maximum Cloud Cover	100%	No
Off-Nadir Angle	0° - 45° selectable in 10° increments	Yes
Maximum number of Acquisition Attempts	1	
Sun Elevation	>= 15° (as collected); >= 30° for Pan-sharpened products	No
Sun Azimuth	0° - 360° (as collected)	No
Target Azimuth	0° - 360° (as collected)	No

TABLE 20: SINGLE SHOT TASKING PARAMETERS

4.2 IMAGELIBRARY

DigitalGlobe’s high-resolution satellite constellation has an annual collection capacity of close to 1 billion km². The ImageLibrary is populated with proactive collections of targeted regions, countries, and metropolitan areas as well as project areas worldwide.

The advantage of having an expansive ImageLibrary allows you quick access to all of the imagery you need to complete your project, whether it involves change detection, feature or DEM extraction, base mapping or site planning.

You can search DigitalGlobe’s archive for and assess numerous images from multiple sensors based on sensor, seasonal, atmospheric and temporal considerations to determine which will best meet your project requirements.

When you find the imagery you need in our library, simply place an order, specify your area of interest and the level of processing you need. For delivery timelines see Table 27: Expected Delivery Times, by Product Type and Tasking Type.

4.3 ORDER POLYGON

Each order, whether tasking or an ImageLibrary order, scene based or area based, is defined by an Order Polygon. An Order Polygon may contain a minimum of 4 vertices and a maximum of 1,000 vertices, consisting of longitude/latitude (decimal degrees) geographic coordinates on the WGS84 ellipsoid. The order polygon is also referred to as Area of Interest or AOI.

The minimum and maximum size for an order polygon depends on the order type and the product selected. Refer to Table 3, Table 4, Table 5, and Table 10 for order polygon restrictions by product type. Note that a minimum of 5km is required for the length and height of the polygon. An order polygon may be defined using one of the following methods:

- Upper left and lower right corner coordinates if your area is rectangular.
- A center point and a height and width to define your area.
- Shapefile format –the .shp, .shx, and .dbf files must be supplied. A shapefile must contain only one polygon.
- ASCII text format (.gen) – Arc/Info Generate format. An ASCII text file must contain a closed polygon with a minimum of four points, and a maximum of 1,000 points

Format	Example
"ID"	BRISBANE_AUSTRALIA
Longitude, Latitude	152.808,-27.671
Longitude, Latitude	153.244,-27.671
Longitude, Latitude	153.244,-27.236
Longitude, Latitude	152.808,-27.236
END	END

TABLE 21: EXAMPLE OF ASCII TEXT FILE FORMAT

Order polygons that fit within a 13 km x 13 km box (for both scene and area based framing) will be collected in a single satellite pass, unless otherwise requested by the customer.

4.3.1 PRODUCT DELIVERY

DigitalGlobe provides its Imagery Products to customers on a variety of industry standard image formats and media. In addition to the imagery products, DigitalGlobe also delivers the Image Support Data files in text format as described in Section 5.

4.4 FILE FORMATS

Imagery Products are available in three image formats:

- GeoTIFF 1.0
- NITF 2.0
- NITF 2.1

4.5 DELIVERY OPTIONS

DigitalGlobe provides a variety of direct and timely delivery options for delivering Imagery Products.

These options include:

Standard Delivery Service: DigitalGlobe uses standard delivery services (FedEx, DHL, UPS) to deliver media directly to the customer in a timely fashion. DigitalGlobe selects the most reliable and quickest service based upon customer location.

Electronic Delivery Service: The customer may request electronic delivery. DigitalGlobe supports ftp (pull), where the customer logs on to the DigitalGlobe system and retrieves their imagery.

4.6 MEDIA

DigitalGlobe supports delivery on DVD and External Hard Drives for its Imagery Products. Those customers who select electronic delivery via ftp (pull) will not receive imagery on media.

4.7 TILING

Because some Imagery Products cannot fit in their entirety on all available media types or may be cumbersome to work with due to their large size, DigitalGlobe offers you the option to break up imagery into smaller pieces called tiles. Tiles may be defined by pixel based grids or by map based coordinates. Pixel based tiles may be defined by approximately 8,000 pixels by 8,000 pixels (8k x 8k), 14,000 pixels by 14,000 pixels (14k x 14k), or 16,000 by 16,000 pixels (16k x 16k). Map based tiles are based on map coordinates in product units (meters or feet) and are defined by tile size and tile overlap. Customers who do not wish to tile their imagery may change their media type to one that will accommodate the full size of their product, but should understand that large data files may be difficult to import into some software packages. Please note that most image processing, GIS, and cartographic applications cannot open files over 2 GB in size. Also note that file formats have size restrictions as well. For example, the size restriction for GeoTIFF 1.0 is 4GB.

Tiling is an option for all products, except Basic Imagery. Note that all Pan-sharpened products must be tiled regardless of media type.

If an order polygon crosses strip boundaries, then the imagery product will be divided into product components, denoted as P001, P002, etc. When an individual product component exceeds the size limit for the media selected, it is tiled. Each tile, regardless of the tiling option (pixel based or map based) is

then given a number corresponding to its position in rows and columns. (See Figure

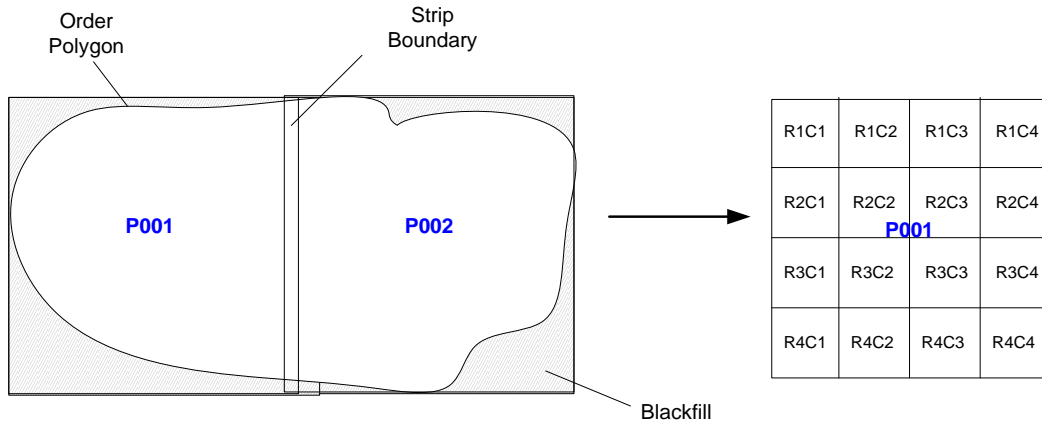


FIGURE 5: TILE NAMING

A tile map file (.til) is delivered with every product to help place the tiles in product coordinates. For more information on the tile map file and more technical information on tiling, see the DigitalGlobe Imagery Support Data (ISD) Documentation.

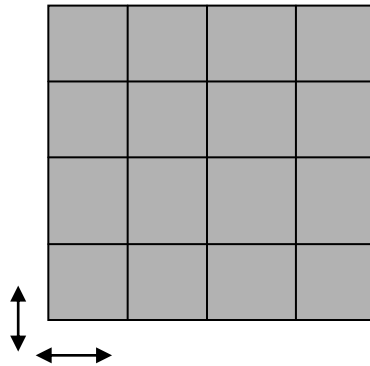


FIGURE 6: TILE MAP NAMING EXAMPLE

4.7.1 PIXEL BASED TILING

DigitalGlobe tiles imagery based on pixel grids by first drawing a minimum-bounding rectangle (MBR) around the image-oriented map. That MBR is then divided into tiles, which are sized according to the tiling option selected. Three pixel based tiling options are available, giving you the ability to specify the amount of data in each tile. These are as follows: 8k x8k, 14k x14k, and 16k x16k.

8k x 8k - 8k x 8k tiles have exactly 8,192 pixels by 8,192 pixels per tile. This tiling option may be easily read by commercial off the shelf (COTS) software products.

When the 8k option is selected, DigitalGlobe starts at the upper left corner of the MBR and counts 8000 x 8000 pixels to create the first tile. (The tiles are actually 8 multiplied by 1024 due to internal blocking, so the first tile would be composed of 8,192 by 8,192 pixels for a panchromatic product. Divide by 4 for a multispectral product). The next tile is generated starting where the first tile ends (pixel 8192, 0), and pixels are counted down and across. (This same process is applied to 14k x 14k and 16k x 16k tiling, although 1024 is multiplied by 14 or 16, respectively, for these options.)

If the amount of imagery in a tile is less than 8192 x 8192 pixels, then the tile is cut off at the edge of the imagery. Some padding, or blackfill, pixels may be included to complete the block. A block is comprised of 1024 panchromatic pixels or 256 multispectral pixels.

14k x14k -14k x14k tiles have exactly 14,336 by 14,336 pixels per tile.

16k x16k -16k x16k tiles have exactly 16,384 X 16,384 pixels per tile.

4.7.2 MAP BASED TILING

Map based tiling is available for all projections except Geographic and defined by product units (meters or feet). With this tiling option, the customer defines the tile size and tile overlap. The default tiling origin is the upper left corner of the minimum bounding rectangle for area based products and the upper left corner of the scene for scene based products. In order to define the tiling layout, the customer will specify length and width of the tiles in the product units. In addition, the amount of overlap is customizable between adjacent tiles. Although this tiling option allows for more custom tiling, tile sizes will be limited by the file size restrictions defined in the No Tiling option below.

4.7.3 NO TILING

DigitalGlobe strives to respect the wishes of its customers in regards to tile size selection. However individual scene size, file size, and media type may determine whether a scene requires tiling, regardless of the option selected. An order polygon whose boundaries intersect multiple scenes may need to have individual scenes tiled. An individual scene will be tiled if it is larger than 2 GB for any available media choice.

The following tables show file sizes for each pixel based tiling options. Please note that these are estimations, and that the actual file size will be dependent on the actual off nadir angle of the imagery.

	Black & White	Multispectral (4-band)	Color (3-band pan-sharpened)	Pan-sharpened (4-band)	Bit Depth
Basic Imagery (one scene)	603	152	NA	NA	8
	1207	304	NA	NA	16
Standard and Orthorectified Imagery (8k x 8k tile)	67	17	200	333	8
	133	33	400	667	16
Standard and Orthorectified Imagery (14k x 14k tile)	206	51	617	1022	8
	411	103	1233	2044	16
Standard and Orthorectified Imagery (16k x16k tile)	269	67	808	1552	8
	539	135	1617	3104	16

TABLE 22: QUICKBIRD FILE SIZE ESTIMATES IN MB

	Black & White	Multispectral (4 band)	Color (3-band)	Pan-sharpened (4-band)	Bit Depth
Basic Imagery (one scene)	1070	NA	NA	NA	8
	2139	NA	NA	NA	16
Standard and Orthorectified Imagery (8k x 8k tile)	68	NA	NA	NA	8
	136	NA	NA	NA	16
Standard and Orthorectified Imagery (14k x 14k tile)	204	NA	NA	NA	8
	408	NA	NA	NA	16
Standard and Orthorectified Imagery (16k x16k tile)	268	NA	NA	NA	8
	536	NA	NA	NA	16

TABLE 23: WORLDVIEW-1 FILE SIZE ESTIMATES IN MB

	Black & White	Multispectral (4 band)	Multi-spectral (8-band)	Color (3-band pan-sharpened)	Pan-sharpened (4-band)	Bit Depth
Basic Imagery (one scene)	997	249	498	NA	NA	8
	1994	498	997	NA	NA	16
Standard and Orthorectified Imagery (8k x 8k tile)	68	17	34	204	272	8
	136	34	68	408	544	16
Standard and Orthorectified Imagery (14k x 14k tile)	204	51	102	612	816	8
	408	102	204	1224	1632	16
Standard and Orthorectified Imagery (16k x 16k tile)	268	67	134	804	1072	8
	536	134	268	1608	2144	16

TABLE 24: WORLDVIEW-2 FILE SIZE ESTIMATES IN MB

4.8 RESAMPLING KERNELS

Resampling is necessary to align the pixels in an image to a coordinate grid. DigitalGlobe offers the following resampling options:

Resampling Kernel	Description
Nearest Neighbor	Selects the radiance value from the nearest pixel in the input image; does not alter the radiance values of the original image. This method can result in a blocky or disjointed image because no averaging is performed.
4x4 Cubic Convolution	Considers nearest 16 pixels synthesizing digital numbers using a polynomial calculation; the default kernel. This method produces a smoother appearance than nearest neighbor method while providing slightly sharper edge detail than the bilinear interpolation method.
MTF	Uses an 8 by 8 pixel window to determine the value of the destination pixel. Based on an empirical modeling of the optical and electronic properties of the sensors. The method produces the sharpest edge detail of all of the methods.
Pan-Sharpening	DigitalGlobe proprietary method designed for pan-sharpened products. This kernel is only available with Pan-sharpened products.
Enhanced	The Enhanced Kernel uses a high pass Laplacian filter applied to the panchromatic data as a pre-processing step before pan-sharpening. The result is an image with very fine detail and excellent color balance. This option is only available for panchromatic and pan-sharpened products.

TABLE 25: DIGITALGLOBE RESAMPLING KERNELS

4.9 PROJECTIONS AND DATUMS

DigitalGlobe supports the following map projections, ellipsoids, and datums:

Map Projections	Ellipsoids and Datums Supported
Geographic (Lat/Long)	GDA 94
	Tokyo Mean
	NAD 27
	NAD 83
	WGS 84
Japanese 19	Tokyo Mean
UTM	NAD 27
	NAD 83
	WGS 84
State Plane	NAD 27
	NAD 83

TABLE 26: DIGITALGLOBE SUPPORT MAP PROJECTIONS, ELIPSOIDS AND DATUMS

4.10 DELIVERY TIMELINES

Delivery time for products depends on the product and product options that a customer selects. Table 27 establishes the average timetables for product delivery. Times in this table indicate the number of business days to shipment, after DigitalGlobe receives all of the necessary support data to process an order. For Basic and Standard Imagery, this is after imagery acquisition. For Orthorectified Imagery, this is after imagery acquisition, and the collection of appropriate DEMs and GCPs. For ImageLibrary imagery, this time is number of days after order confirmation. Your product is delivered immediately upon completion of processing.

Processing time for Basic and Standard-level products is 3 days; for orthomosaic products, the processing time depends on the area of the order. Precision Aerial orthos are quoted on a project-by-project basis.

If you need your ImageLibrary imagery as soon as possible, a Rush ImageLibrary option is available for Basic- and Standard-level products. With the Rush option, the processing time is 24-48 hours, depending on the level of processing selected. See table below for processing timelines by product.

Product Level	Select/Select Plus/Assured Tasking**	Single Shot Tasking**	ImageLibrary**	Rush ImageLibrary**
Basic*	3 days	24 hours	3 days	24 hours
Standard*	3 days	24 hours	3 days	24 hours
Standard - Pan-sharpened*	3 days	24 hours	3 days	48 hours
Vision Premium				
Orthorectified*	2 days	N/A	2 days	N/A
Orthomosaic - less than 1500 km²	5 days	N/A	5 days	N/A
Orthomosaic - more than 1500 km²	10 days	N/A	10 days	N/A
Precision Aerial – 1 Region Tile/Metro	NA	NA	3 days	NA
Precision Aerial – up to 10 Region Tiles/Metros	NA	NA	10 days	NA
Precision Aerial – More than 10 Region Tiles/Metros	NA	NA	Call for quote	NA
Vision				
Orthorectified*	2 days	N/A	2 days	N/A
Orthomosaic - less than 1500 km²	3 days	N/A	3 days	N/A
Orthomosaic - more than 1500 km²	5 days	N/A	5 days	N/A

TABLE 27: EXPECTED DELIVERY TIMES, BY PRODUCT TYPE AND TASKING TYPE

*Processing assumes one image. Additional contiguous scenes in a single order will add a nominal number of days.

**All timelines based on business days (Monday-Friday)