Florida County Digital Orthoimagery Program Standards

2026 Edition

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1. ABBREVIATIONS AND DEFINITIONS

Abbreviation	Definition
AOI	The Area of Interest defines the project's boundaries.
AT	Aerial Triangulation. Also known as Aerotriangulation
ASPRS	American Society for Photogrammetry & Remote Sensing
CADD	Computer Aided Design & Drafting
CSDGM	Content Standard for Digital Geospatial Metadata
DEM	Digital Elevation Model
ESRI	Environmental Systems Research Institute
F.A.C.	Florida Administrative Code
Feet	Refers to the US survey foot
FGDC	Federal Geographic Data Committee
FIPS	Federal Information Processing Standards
FCDOP	Florida County Digital Orthoimagery Program
FDOT	Florida Department of Transportation
FPRN	Florida Permanent Reference Network (established and maintained by FDOT)
F.S.	Florida Statutes
GeoTIFF	a Tiff-based file format that includes georeferenced metadata. A GeoTIFF fully complies with the TIFF 6.0 specifications, and its extensions do not in any way go against the TIFF recommendations, nor do they limit the scope of raster data supported by TIFF. GeoTIFF utilizes a limited set of reserved TIFF tags to store a wide range of georeferencing information, catering to both geographic and projected coordinate system needs.
GNSS	Global Navigation Satellite System (includes GPS)
GSD	Ground Sample Distance
IMU	Inertial Measurement Unit
Infrastructure, Transportation	Transportation systems and facilities features include, but are not limited to roads, bridges, railways, airport paved surfaces, associated paved surfaces directly serving those facilities, transportation facilities buildings, traffic mask arms, traffic responsive controllers, pedestrian crossings, sound walls, high mast light poles, and gantry signs.
INS	Inertial Navigation System
Lidar	Light Detection and Ranging
LAS	A binary file standard supported by ASPRS for storing point location and attribute information, primarily used for LiDAR data.
MrSid (.sid)	Highly compressed format for large raster images
NAD83 (2011)	North American Datum of 1983, NGS 2011 realization

NAVD88	North American Vertical Datum of 1988
NGS	National Geodetic Survey
NSRS	National Spatial Reference System
NSSDA –	National Standard for Spatial Data Accuracy
Orthoimagery (Digital)	Digital orthoimages are georeferenced images of the Earth's surface collected by a sensor. They are then corrected for sensor distortions and orientation, as well as terrain relief, to remove image object displacement. They encode the optical intensity of sensed radiation across one or more bands of the electromagnetic spectrum as discrete values in an array of georeferenced pixels representing the observed scene. ***Federal Geographic Data Committee FGDC-STD-014.2-2015 Geographic Information Framework Data Content* Standard Part 2: Digital Orthoimagery**
Orthorectification	A special case of image resampling in which the effects of image perspective and relief displacement are removed, resulting in a uniformly scaled orthoimage with pixels resembling those of a planimetric map. (Source: American Society for Photogrammetry and Remote Sensing *Manual of Photogrammetry, Fifth Edition*, 2004, page 963)
Photogrammetry	The art, science, and technology of obtaining reliable information about physical objects and the environment through processes of recording, measuring, and interpreting photographic images and patterns of electromagnetic radiant energy and other phenomena. (Source: American Society for Photogrammetry and Remote Sensing *Manual of Photogrammetry, Fifth Edition*, 20, page 2)
PSM	Professional Surveyor and Mapper
RMSE	Root Mean Square Error
RTK	Real Time Kinematic
RTN	Real Time Network
USGS	United States Geological Survey
US FT	United States foot
XML	Extensible Markup Language

2. INTRODUCTION

Since 1972, Florida Statutes have required cooperation among the USGS, FDOT, FDOR, and the State Water Management Districts to facilitate statewide topographic mapping efforts. Currently, the horizontal component of the statewide topographic map is being accomplished through the Florida County Digital Orthoimagery Program (FCDOP). Partnerships and agreements between several state and county agencies support the FCDOP. The current FCDOP mapping efforts consist of statewide orthoimagery coverage of Florida on a three-year cycle, with a maximum GSD resolution of 0.5 feet.

3. PURPOSE

This document defines the minimum standards for providing Florida county digital orthoimagery products for inclusion into the FCDOP. Any exceptions to these standards may be requested in writing from FDOR before commencement of work.
All final data will be considered public records as defined by applicable Florida Statutes.
Any products created from oblique aerial imagery acquired during the orthoimagery project collection are beyond the scope of this document.
All work performed must be in accordance with the ***Standards of Practice***(Florida Statutes)as outlined in ***Rule Chapter* 5J-17*, F.A.C.***, pursuant to ***Chapter 472, F.S.***

4. ORTHOIMAGERY SPECIFICATIONS

4.1 DIGITAL CAMERA

All imagery shall be collected using a digital aerial camera capable of capturing multispectral imagery in natural color (RGB) bands and near-infrared band (NIR)**.** The sensor must also have a documented bore-sight calibration performed within six months of image acquisition.

4.2 FLIGHT SEASON

The specified flight season will be from October 1 to March 15. Every effort should be made to collect imagery before January 30th. Imagery collected outside of this flight season will require written approval from the contracting agency before the acquisition of the imagery.

4.3 IMAGE SPATIAL RESOLUTION

The consultant shall deliver images resampled to the desired resolution of 0.5 feet. The original imagery must have native sensor resolution at least as fine as the desired final resolution of the orthoimagery. Higher-resolution images can be used to create lower-resolution orthoimages, but the reverse is not acceptable. The allowable RMSEx and RMSEy shall be less than or equal to 1.0 feet (2 pixels). Reference: FGDC-STD-014.2-2015 2.8.2 Resolution

4.4. HORIZONTAL AND VERTICAL DATUM

Orthoimagery and other topographic products shall be referenced to the most current national datum, which presently is the NAD83 (2011). The map projection referenced shall be the appropriate Florida State Plane Coordinate System, expressed in units of US Ft. Orthoimagery and other topographic products shall be referenced to the NAVD 88, US Ft.

Unless otherwise stated, the horizontal and vertical accuracy of orthoimagery products shall meet the requirements of the ASPRS Positional Accuracy Standards for Digital Geospatial Data[1].

1 American Society for Photogrammetry and Remote Sensing. Positional Accuracy Standards for Digital Geospatial Data. Edition 2, Version 2 (2024). Retrieved from https://www.asprs.org

4.5 ACCURACY

Horizontal accuracy of orthoimagery products shall be tested to meet 2.5 feet at the 95% confidence interval, Figure 1.

Figure 1 – Accuracy Table for .50 ft GSD Orthoimagery

Common Ortho Image Pixel Size (Feet)	Horizontal Accuracy Class RMSEx and RMSEy (Feet)	Ortho Image RMSEx and RMSEy in terms of pixels	Horizontal Accuracy RMSEr (Feet)	Maximum Ortho Image Mosaic Seamline Mismatch (Pixels)	Maximum Ortho Image Mosaic Seamline Mismatch (Feet)	Allowable Aerotriangulation (AT) or INS-based (in feet)		Allowable Ground Control RMSE (Feet)		NSSDA Horizontal Accuracy at the 95% Confidence Level (Feet)
						RMSEx and RMSEy	RMSEz	Horizontal x and y	Vertical z	
0.5	1.0	2-pixels	1.414	4*	2.0	0.500	1.00	0.250	0.500	2.45

*****The maximum allowable orthoimage mosaic seamline mismatch is 3 pixels for all transportation infrastructure features, unless approved in writing by FDOR or FDOT.

The ASPRS standards require direct comparison to checkpoints from an independent source of at least three times greater accuracy. The minimum number of well-distributed checkpoints should meet the ASPRS recommendations, see Figure 2

Figure 2 – Recommended Number of Checkpoints Based on Area

Project Area (Square Kilometers)	Horizontal Accuracy Testing of Orthoimagery and Planimetrics
	Total Number of 2D/3D Checkpoints (Clearly Defined Points)
≤1000	30
1001-2000	40
2001-3000	50
3001-4000	60
4001-5000	70
5001-6000	80
6001-7000	90
7001-8000	100
8001-9000	110
9001-10000	120
>10000	120

Source: ASPRS Positional Accuracy Standards for Digital Geospatial Data, Edition 2, Version 2.0 (2024) - Table C.1

Note: Some project conditions may require more or fewer checkpoints to ensure the project's accuracy. When fewer checkpoints are proposed than the recommended number, or when the distribution of checkpoints is limited, an exception to the ASPRS recommendations may be approved if requested in writing from FDOR or

FDOT. The request shall include a digital map file (*.kml) displaying proposed locations of AT control and checkpoints, aerial imagery footprints, and a written explanation of why the exception is necessary.

4.6 GEOSPATIAL METADATA

A metadata file in XML format must be delivered for each GeoTIFF image file, the DEM used for orthoimage production, and any other relevant mapping files.

ISO Compliant metadata

Metadata must comply with the International Organization for Standardization requirements: ISO 19115-2:2019 (Imagery and Gridded Data) with Amendment 1:2022 and the ISO 19139 XML Schema.

The following information will be provided in all orthoimagery tile metadata:

- Date of flight information included in metadata should specify the actual date(s) of image collection for each orthoimage tile. The use of date ranges for image collection will not be accepted.
- QA/QC Processes (processStep)
- Project name and usage (title)
- Citations, abstract, and purpose (citations, abstract, purpose)
- Minimum bounding rectangle entry
- Geospatial information (coordinate system, units, horizontal datum).
- All processing steps and software utilized
- All image corrections should be well documented in the metadata
- Photo editing polygon ID and coordinates will be included in the description
- Accuracy statement. RMSE and confidence interval at 95% should be reported
- Aircraft type and tail number
- Average flying/acquisition height (AGL)
- Sensor manufacturer and model
- Camera calibration process
- Raw imagery pixel resolution and bit depth
- Final pixel resolution of the product
- Total bands of data acquired
- Sources of elevation data used and a detailed process description for terrain editing

4.7 DIGITAL ELEVATION MODEL

A surface model that adequately supports the orthoimagery accuracy specifications identified for this project must be created to accurately orthorectify the imagery. The consultant is responsible for evaluating the accuracy of the DEMs used in the orthorectification process and, if necessary, collecting supplemental data to further enhance the DEMs.

Bridges and overpasses requiring surface edits shall be adequately represented as a 3d surface, and the resulting surface shall be utilized in the orthorectification process. These elevated features will not be included in the delivered DEM data.

One DEM file per tile, matching the approved index tile scheme, must be delivered. All DEMs will be delivered according to the tile index provided.

Approved Formats

- USGS DEM
- Raster GeoTIFF
- ERDAS IMAGINE (IMG) Format
- Floating Point Raster File (.flt)
- ASCII XYZ
- LAS/LAZ

The consultant will submit information in the final survey report and metadata that document the source, enhancements made, and density of the surface data used for the orthoimage mapping project.

In addition, if lidar data is acquired as part of the project, the classified scan data must be provided in LAS file format, as per the ASPRS LAS Specification R15 (2019), along with associated metadata.

4.8 IMAGE RECTIFICATION

The image rectification methodology must be compliant with the FGDC Geographic Information Framework Data Content Standard (FGDC-STD-014.2-2015), specifically Section 2.9, "Image Rectification and Restoration."

Supplemental Photo Editing

Edit Polygon File. A shapefile shall be provided that contains polygons designating the areas where image anomalies and warping were photogrammetrically corrected and edited into the orthoimage using photo editing software. The description of this image editing process will be included in the tile metadata and orthoimagery reports provided by the consultant. Polygons will be assigned unique ID numbers and coordinate values for each occurrence. Individual orthoimage tile metadata will reference only those polygon IDs that occur within that image tile.

4.9 GROUND CONTROL POINTS

Enough ground control points shall be established to support orthoimage mapping. All control points shall meet the requirements of Section 5.2: Survey Control, FCDOP.

4.10 GNSS/INS SOLUTIONS

Unless otherwise approved, all GNSS/INS measurements shall be differentially processed to the FPRN; the resulting solutions shall be included in the aerotriangulation bundle adjustment.

4.11 IMAGE QUALITY

Imagery shall be acquired to minimize excessive tilt/lean in buildings, obstruction by shadows, image smear, environmental conditions (clouds, haze, smoke, glare, solar reflection over water bodies, etc.), vegetative conditions, etc. Every effort should also be made to acquire imagery under optimal tidal conditions (low tide). Radiometric and color balancing of the imagery is described in Section 7.3: Image Deliverables. All images must be collected at a sun angle of at least 30°. Imagery shall be acquired at

sufficient overlap coverage in “high-rise” urban areas to ensure all transportation infrastructure is clearly visible.

5. GROUND CONTROL SURVEY REQUIREMENTS

5.1 PURPOSE

The purpose of this document is to specify the requirements for a geodetic control survey to support county aerial orthoimagery mapping at a 0.5-foot ground sample distance resolution. The positional accuracy required for this imagery resolution is 2.5 feet at the 95% confidence level. All surveying and mapping work performed shall meet the ***Standards of Practice*** outlined in ***Chapter 5J-17, F.A.C.,*** pursuant to ***Chapter 472, F.S.***

5.2 SURVEY CONTROL

- GNSS techniques shall be used to establish horizontal and vertical positions on the targeted and/or well-defined photo-identifiable points that will be used as control for aerial photogrammetric mapping. New photo control point positions shall be identified in the field by a survey mark.
- Positions may be established by static, rapid-static, or RTK/RTN methods. If real-time methods are used, at least two observations at least 60 minutes apart are required.
- When aerial panels are used, the vertical offset from the top of the mark to the panel surface
- shall be measured and recorded.
- Ground control shall be referenced to NAD83(2011) based on redundant ties to the FPRN.
- The photogrammetric ground control network shall meet the horizontal and vertical accuracies necessary to support the required map accuracy of orthoimagery. The ASPRS standards require direct comparison to checkpoints from an independent source of at least three times greater accuracy.
- A minimum of four published NAVD88 benchmarks shall be included in the control network to ensure accurate elevations can be computed from GNSS measurements through local network adjustment using the latest FPRN Geoid Model.
- Where conditions dictate, differential leveling may be used to establish elevations on photo control points from the nearest ground control network station or published NSRS vertical station within a 5-mile radius from the photo control point. Leveling procedures adequate to support vertical accuracy specifications of orthoimagery shall be observed and documented.
- In rare circumstances where the photo-identifiable control point cannot be occupied directly, either horizontally and/or vertically, offset distances of less than 0.5 feet from the occupied survey mark may be used. Field survey measurements with sufficient precision must be collected and recorded to enable accurate computation of the coordinates of the photo-identifiable point from the offset mark.
- With prior approval of the orthoimage project surveyor, ground control points may be moved from their original proposed locations to ensure safety, or if the proposed point is ambiguous or no longer exists. Such control points shall be documented as moved.
- A field sketch with survey date, GNSS satellite visibility, and weather conditions at the time of GNSS data collection shall be prepared for each ground control and check point site.

- Digital image(s) shall be taken showing the exact location of the ground control and check point, preferably while the GNSS unit setup occupies the point. Image filenames shall include the control point name. See Figure 3.

Figure 3 Control Point reference images

- Point names shall be consistent in all delivered files.
- GCP Directory Structure
- Files should be filed in subfolders by file type, e.g., datasheets, reports, images.
- GCP Naming Convention should be used for consistent organization and data management. Example: 2025-55-DOT-36
- Year: four-digit year
- County Code:
- Company Identifier: three-character identifier, e.g., DOT
- Unique control point identifier

5.3 GROUND CONTROL SURVEY REPORT

- Project title and reference number
- Name and address of corporation
- Certificate of authorization number
- Surveyor in responsible charge, including contact information
- Survey dates (first and last date of field measurements)
- Introduction, purpose, and objective
- Scope of work
- Abbreviations
- Final deliverable listing of files stating filename with extension and delivery date in the appendix of the survey report.
- Describe equipment, software, etc.
- List the field and office personnel
- Describe the monumentation recovered and set.
- Describe the accuracy standards and specifications, procedures, and methodology for establishing ground control

- Describe and list the geodetic control (existing and newly established), displaying the horizontal and vertical coordinates, datum used, geoid model, and individual point errors (RMSE, standard deviation, or 95% confidence level)
- Map overlay, which will display the following items:
  - GNSS baseline network indicates repeated measurements
  - Existing horizontal and vertical geodetic control
  - Newly established photogrammetric control
  - Base map features (ex, county boundaries, cities, major roads)
- When revisions are made, a note will be made indicating that the report has been revised and will reference the date of the original report
- Any pre-existing or previously collected survey control information (including prior control reports, coordinates, or supporting data) that is relied upon, referenced, or incorporated into the current project's ground control network shall not be submitted as a stand-alone or separate deliverable. This information shall be incorporated into the current survey report, either within the body of the report or as a labeled appendix, and shall be clearly identified as to its source, original collection date, and certifying PSM.

6. DIGITAL SIGNATURE AND SEALING OF SURVEYING REPORTS

6.1 PURPOSE

This section outlines the requirements for using digital signatures and seals on survey reports submitted under the Florida Counties Digital Orthoimagery Program (FCDOP). These requirements ensure the authenticity, integrity, and legal validity of digital deliverables in compliance with Florida law and professional standards.

6.2 REQUIRED CERTIFICATION STATEMENT

All digital survey reports submitted under FCDOP must include the following certification statement, clearly displayed on the cover page or certification page of the report:

"This document has been digitally signed and sealed by a Florida-licensed Professional Surveyor and Mapper in accordance with Chapter 5J-17, Florida Administrative Code. Any printed copy of this document is not a certified document and shall not be considered signed and sealed. The authenticity of the digital signature must be verified to ensure compliance with Chapter 472, Florida Statutes."

7. DELIVERABLES

All deliveries will be the property of the contracting agency and are considered public record. The consultant will document all data deliveries with an itemized transmittal letter. Written permission from the agency must be obtained to release data to any party before final publication. Per ***Rule Chapter 5J-17.053(5)(a), F.A.C.,*** the consultant shall keep a copy of the original data for a minimum of six (6) years. The consultant shall contact the agency before destroying the data.

7.1 DELIVERABLE PACKAGE

Digital files shall be submitted on an external hard drive (USB version 3.0 or later) and be accompanied by an itemized transmittal letter. All portable hard drives will become the property of the agency.

The hard drive shall contain:

- Scope of Work, aka Scope of Services, from the contracting agency
- Digitally signed copy of the orthoimagery survey report
- Digitally signed copy of the control survey report (if separate from orthoimagery report)
- Four-band (RGBN) source imagery
- Four-band (RGBN) orthoimagery image tiles
- Metadata XML file for each image tile
- Image sensor calibration documentation (machine-readable)
- Boresight calibration files
- Flight Index map in .kml/kmz format. This shall include the project area outline, flight lines, and image centers.
- Final elevation data used to rectify imagery
- Survey control and checkpoint locations in kml\kmz format and comma-delimited coordinate files
- Metadata XML for Digital Elevation Model
- Digital orthoimagery tile limits and layout (.dxf or .shp)
- Delivery of the breaklines collected and used in support of the project is required for FCDOP projects. This includes breaklines used for modeling bridge surfaces. Breaklines will be in a shapefile format, including PolylineZ and PolygonZ feature classes.
- Digital orthoimagery seamlines and dates associated with the images (see Section 7.3.3)
- Aerial triangulation control coordinates and aerial triangulation blocks, along with statistical summaries (PDF)
- Outline polygon of each aerotriangulation block (.kml or .shp)
- Classified lidar data files (*.LAS) (if applicable)
- Airborne sensor trajectory/exterior orientation report
- All horizontal and vertical ground control identifying which points were constrained during aero triangulation and which points were used for check during NSSDA analysis (PDF)

7.2 DELIVERABLE LABELING

The hard drive shall be labeled on the outside with the following information:

- Project title
- Consultant name and contact information
- Contracting agency contract number
- Date of survey
- Mobile Survey Tracking System (MSTS) number (FDOT) if available

7.3. IMAGERY DELIVERABLES

7.3.1 ORIGINAL SOURCE IMAGERY

Source imagery shall be delivered as uncompressed four-band TIFF images, consisting of natural color (RGB) and near-infrared (NIR) bands, at the sensor's native bit depth per band.

7.3.2 TILED ORTHOIMAGERY

The consultant shall deliver ortho-rectified, uncompressed four-band GeoTIFF image tiles. These image tiles shall consist of natural color (RGB) and near-infrared (NIR) bands, each with an 8-bit bit depth, and include

valid projection header information. Orthoimagery tiles shall be produced using a four-band workflow, meaning all processes affecting the final orthoimagery tile shall be performed using the aforementioned four-band imagery. Tiled orthoimagery shall meet the requirements outlined in the ***Federal Geographic Data Committee (FGDC) STD-014.2-2015 Geographic Information Framework Data Content* Standard Part 2: Digital Orthoimagery**.

- *Natural Color Imagery* – The natural color, RGB, bands will be color-balanced across the entire area of interest to allow viewing of the image tiles as a seamless mosaic. During radiometric processing, care shall be taken to avoid loss of detail in shadows and overexposure on bright surfaces such as bare ground and light-colored building roofs.
- *Color Infrared Imagery* – The near infrared band will be radiometrically processed in a manner that preserves original image characteristics. Corrections for seasonal variations in ground cover are not to be performed. However, care should be taken to ensure that the coloration of different vegetation types (e.g., deciduous, evergreen) is evident.
- All orthoimagery tiles should have a neutral color balance and should closely represent the natural color of the ground at the time of image collection.

One GeoTIFF file per tile image will be delivered according to the approved index tile scheme. Tiles will be contiguous and non-overlapping, allowing for the creation of a seamless image mosaic without data void cells or gaps. Tile naming convention is as follows:

YYYY__NNNNNN.TIF
Where:
YYYY = Ending year of the flying season that typically ends in March.
NNNNNN = Appropriate tile (cell) index number values from the project tiling index provided.

Example: Orthoimage tile that was acquired during the 2020-2021 flying season. *2021_200001.tif*

7.3.3 IMAGE SEAMLINE FEATURE CLASS

The consultant will include a shapefile named “ProjectName_Seamlines”, containing a feature class of non-overlapping polygons with no data voids for the area of interest. Each polygon will delineate images by capture date and time, used in the mosaicking process to produce orthoimagery, as shown in figures 4 and 5 below.

The feature class should conform to the area of interest and have the following attributes:

FRAME CAMERA

DOF = Date of Flight
EXPOSURE = Exposure filename
TIMESTAMP = GNSS time in HH:MM:SS
HEIGHT = Approximate height of aircraft at time of exposure

	FID	Shape	NAME	DOF	EXPOSURE	TIMESTAMP	HEIGHT
	0	Polygon	035_0067	12-Feb-2016	6409_035_0067	19:14:59	4525
	1	Polygon	033_0067	12-Feb-2016	6409_033_0067	19:40:01	4516
	2	Polygon	016_0041	17-Feb-2016	6409_016_0041	16:09:09	4562
	3	Polygon	017_0067	17-Feb-2016	6409_017_0067	15:53:49	4576
	4	Polygon	019_0067	17-Feb-2016	6409_019_0067	15:27:24	4566
	5	Polygon	023_0067	13-Feb-2016	6409_023_0067	17:14:11	4567
	6	Polygon	018_0042	17-Feb-2016	6409_018_0042	15:42:43	4590
	7	Polygon	015_0067	17-Feb-2016	6409_015_0067	16:20:22	4578
	8	Polygon	032_0041	12-Feb-2016	6409_032_0041	19:55:05	4505
	9	Polygon	029_0067	13-Feb-2016	6409_029_0067	15:53:47	4537
	10	Polygon	022_0041	13-Feb-2016	6409_022_0041	17:29:45	4506
	11	Polygon	021_0067	13-Feb-2016	6409_021_0067	17:40:42	4507

Figure 4 Frame Camera Attributes

PUSHBROOM SENSOR

DOF = Date of Flight
IMAGE = Image Filename
START TIME = GNSS time in HH:MM:SS for Line Begin
END TIME = GNSS time in HH:MM:SS for Line End
HEIGHT = Approximate height of aircraft at time of exposure

FID	SHAPE	IMAGE	DOF	START TIME	END TIME	HEIGHT
0	POLYGON	088_20190110_184413	5-Feb-19	11:05:04	11:06:55	1341
1	POLYGON	092_20190110_180412	5-Feb-19	11:11:58	11:14:19	1341
2	POLYGON	086_20190110_190142	5-Feb-19	11:20:15	11:22:52	1341
3	POLYGON	090_20190110_182422	5-Feb-19	11:27:33	11:30:27	1341
4	POLYGON	096_20190110_171635	5-Feb-19	11:35:23	11:38:34	1341
5	POLYGON	094_20190110_174345	5-Feb-19	11:42:58	11:46:09	1341
6	POLYGON	098_20190110_165912	5-Feb-19	11:50:38	11:54:04	1341
7	POLYGON	095_20190110_172538	5-Feb-19	11:58:14	12:01:55	1341
8	POLYGON	085_20190110_190934	5-Feb-19	12:07:12	12:12:53	1336
9	POLYGON	097_20190110_170714	5-Feb-19	12:15:22	12:20:19	1336
10	POLYGON	099_20190110_165107	5-Feb-19	12:24:15	12:29:13	1336
11	POLYGON	099_20190110_165107	5-Feb-19	12:32:35	12:37:30	1336
12	POLYGON	093_20190110_175342	5-Feb-19	12:41:16	12:46:13	1336
13	POLYGON	091_20190110_181435	5-Feb-19	12:49:38	12:54:21	1336
14	POLYGON	089_20190110_183354	5-Feb-19	12:57:18	13:02:46	1336
15	POLYGON	087_20190110_185345	5-Feb-19	13:05:18	13:10:46	1333
16	POLYGON	084_20190118_193502	5-Feb-19	13:13:18	13:18:46	1333

Figure 5 Push Broom Sensor Attributes

7.4 SURVEY CONTROL DELIVERABLES

Digital files shall be packaged and delivered with the final submittal as described in Sections 4 and 5 of this document and shall include:

- Digitally signed and sealed copy of the control survey report
- Existing geodetic control recovery/to-reach descriptions. The condition of NSRS marks should be reported to the National Geodetic Survey.
- All ground control and checkpoint documentation as stated in Section 4.8 above.
- Copies of GNSS data logs and a listing of GNSS occupations
- All GNSS data observed and produced during the survey (digital format), including the raw observation data, processed baselines, loop closures, and least squares adjustments (free and fixed)
- Microsoft EXCEL spreadsheet file list of final control with datum header information, along with point name, geographic (Latitude, Longitude), grid (State Plane Zone Northing and Easting), and elevation values for control points. Grid coordinates and elevations shall be in units of US FT. Errors at the 95% confidence interval should be included. See Figure 5 below.

Figure 6 – Ground Control Table Example

FINAL ADJUSTED HORIZONTAL AND ORTHOMETRIC HEIGHT VALUES FOR MARION COUNTY (PD6027) POST FLIGHT PHOTO POINT

UNITS ARE US FEET

HORIZONTAL DATUM IS NAD 83 (2011)

STATE PLANE ZONE IS FLORIDA WEST ZONE 0902

ORTHOMETRIC HEIGHT DATUM IS NAVD 88

ALL CONTROL STATION VALUES ARE DERIVED BY STATIC GNSS OBSERVATIONS FROM PUBLISHED NGS CONTROL

	GPS Control Station - Geographic			GPS Control Station – Intl. Ft.			Error (specify RMSE, SD or 95%)	
PHOTO_ID	LATITUDE	LONGITUDE	ELLIP_HGT (meters)	NORTHING	EASTING	ORTHO_HGT	Horizontal Error	Vertical Error
D510S010	29 29 44.73172	-82 24 24.26473	1.757	1876786.20	526773.97	97.18	0.07	0.11
D510S011	29 28 42.07552	-82 3 20.32535	-4.497	1870232.35	638460.51	77.18	0.04	0.08
D510S012	29 30 29.98811	-81 51 49.10517	10.530	1881156.88	699540.72	127.11	0.05	0.09
D510S013	29 19 32.46883	-81 58 11.18511	-5.832	1814716.87	665798.44	72.96	0.04	0.09
D510S014	29 21 52.50874	-81 44 25.40237	-16.367	1828952.74	738861.52	39.27	0.06	0.10
D510S015	29 17 40.65095	-81 39 9.97229	-27.655	1803585.22	766847.02	2.34	0.04	0.07

8. SUMMARY OF CHANGES

This standard has undergone significant reformatting, updates, and new additions. To ensure complete understanding and compliance, readers are strongly encouraged to review the entire document.

- 5.3 Ground Control Survey Report: Any pre-existing or previously collected survey control information (including prior control reports, coordinates, or supporting data) that is relied upon, referenced, or incorporated into the current project's ground control network shall not be submitted as a stand-alone or separate deliverable. This information shall be incorporated into the current survey report, either within the body of the report or as a labeled appendix, and shall be clearly identified as to its source, original collection date, and certifying PSM.