



FDOT Staffhour Worksheet TAB 28-Photogrammetry Surveying & Mapping Office



Celebrating 100 Years of Innovation, Mobility and Economic Development

Design Staff Hour Spreadsheet and Guidelines

- Review Photogrammetry Tab 28



<http://www.dot.state.fl.us/projectmanagementoffice/Publications/default.shtm>



GUIDELINES FOR SURVEY, PHOTOGRAMMETRY, MAPPING, AND TERESTRIAL MOBILE LIDAR (Work Activities 27 – 30)

These four work activities are interrelated. Not all projects will require photogrammetry, mapping or terrestrial mobile LiDAR: the need or extent of any of these will have a direct relationship on the tasks included in the survey work activity.

All ranges shown in the Survey tasks are for 4-person crew days based on an 8 hour day. The ranges presented in the photogrammetry section represent the work effort that might be expected for individual tasks on typical mapping projects, including topographics, planimetrics, image processing, and fixed and rotary wing flight operations.

The staff hour ranges presented in this section represent the work effort that might be expected for individual tasks on typical roadway projects, ranging from a standard 2-lane resurfacing project (lower end of range) to a complicated reconstruction project (upper end of range). The ranges represent neither the minimum nor maximum hours that might be negotiated on a project for individual survey tasks. Hours below or above the presented ranges may be applicable based on the constraints or requirements that are specific to the individual project. Whenever possible, examples of individual tasks will be included to provide guidance in determining what types of effort are associated with each individual task.

The following are general examples of the types of projects which would contain work effort from below the staff hour ranges contained in this handbook to above the ranges. This list is not inclusive, or always exact, but will provide the basis for beginning estimation and negotiation of staff hours for a project.

Survey Levels 1 through 4 are defined in Plans Preparation Manual (PPM), Chapter 25.



GUIDELINES FOR SURVEY, PHOTOGRAMMETRY, MAPPING, AND TERESTRIAL MOBILE LIDAR (Work Activities 27 – 30)

Below to Lower End of Range Projects

- Urban and rural 2-lane resurfacing Level 1 survey
- Rural 2-lane 3R (minor safety, earthwork, and utility involvement) Level 1 or 2
- Rural 4-lane 3R (minor safety, earthwork, and utility involvement) Level 1 or 2
- Urban 3R (minor safety, earthwork, and utility involvement, primarily only milling and resurfacing) Level 1 or 2
- Multi-lane limited access resurfacing (minimal interchange involvement) Level 1 or 2

Lower End of Range Projects

- Rural 2-lane 3R (major safety, earthwork, and utility involvement) Level 2 or 3
- Rural 4-lane 3R (major safety, earthwork, and utility involvement) Level 2 or 3
- Urban 3R (major safety, earthwork, and utility involvement) Level 2 or 3
- Rural 2-lane to multi-lane widening/resurfacing (minor ROW, earthwork and utility impacts) Level 2 or 3
- Rural 2-lane new construction (new alignment, ROW, earthwork and utility impacts) (This is for full design survey and ROW) Level 4
- Rural 2-lane to urban multi-lane reconstruction (minor ROW and utility impacts, minimal intersection involvement) (This is for full design survey and ROW) Level 4
- Rural or urban 4-lane to 6-lane widening/resurfacing (widening in median, minor ROW, earthwork, and utility impacts, minimal intersection improvement) Level 3 or 4
- Rural 2-lane to 4-lane widening/resurfacing (major ROW, earthwork and utility impacts) Level 3 or 4 for full design model
- Multi-lane limited access resurfacing (minor safety, earthwork, and utility involvement, minimal intersection involvement) Level 2 or 3
- Rural 2-lane to urban multi-lane widening/resurfacing (utilizing existing pavement, minor cross slope correction, major ROW and utility impacts, intersection involvement) Level 3 or 4 for full design model



GUIDELINES FOR SURVEY, PHOTOGRAMMETRY, MAPPING, AND TERESTRIAL MOBILE LIDAR (Work Activities 27 – 30)

Middle of Range Projects	
• Rural 2-lane to urban multi-lane reconstruction (major ROW and utility impacts, intersection involvement) (This is for full design survey and ROW) Level 4	
• Rural multi-lane new construction (new alignment, ROW, earthwork and utility impacts, minimal intersection involvement) (This is for full design survey and ROW) Level 4	
• Urban multi-lane new construction (new alignment, major ROW and utility impacts, intersection involvement) (This is for full design survey and ROW) Level 4	
• Multi-lane limited access widening/resurfacing (minor ROW and utility impacts, interchange involvement) Level 3 or 4 for full design model (This is for full design survey and ROW)	
• Multi-lane limited access reconstruction (minor ROW and utility impacts, interchange involvement) (This is for full design survey and ROW) Level 4	
• Multi-lane limited access new construction (new alignment, minor ROW and utility impacts, minimal interchange involvement) (This is for full design survey and ROW) Level 4	
Upper End to Above Range Projects	
• Multi-lane widening, reconstruction or new alignment with major interchange involvement (major ROW and utility impacts, urban interchange involvement, major access management impacts) (This is for full design survey and ROW) Level 4	
• Urban limited access (widening or reconstruction with multi-level interchanges) (This is for full design survey and ROW) Level 4	
• Multi-lane limited access new construction (new alignment, major ROW and utility impacts, major interchange involvement) (This is for full design survey and ROW) Level 4	



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Photogrammetry Tab 28.1-2

Task No.	Task	Units	No. of Units	Hour / Unit	Hours						Total Range	Comments
					PSM	Data Compiler	Map/Data Editor	Ortho Analyst	Lab Processor	Flight Crew		
28.1	Flight Preparation	Frame	0	0							0.00	Flight crew only
		Frame	0	0		0.00					0.00	Compiler only
28.2	Control Point Coordination											
	Post ID	Point	0	0	0.00						0.00	PSM only
		Point	0	0		0.00					0.00	Compiler only
Task No.	Task	Units	Staff Hour Range	Basis for Staff Hour Range								
28.1	Flight Preparation	Frame	0.0 to 0.10	Includes research, target diagrams, and mission planning. The low end of the range is for uncontrolled airspace with available planning images. The high end of the range is for controlled airspace with no planning images.								
28.2	Control Point Coordination Post ID	Point	0.0 to 0.083	Includes photo identifiable control point determination and marking prints. The low end of the range is for urban areas. The high end of the range is for rural areas.								



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Photogrammetry Tab 28.3-4

Task No.	Task	Units	No. of Units	Hour / Unit	Hours				Total Range	Comments
28.3	Mobilization									
	Fixed Wing	Hour	0	0				0	0.00	Flight crew only
	Rotary Wing	Hour	0	0				0	0.00	Flight crew only
28.4	Flight Operations									
	Fixed Wing	Mile	0	0				0	0.00	
	Rotary Wing	Mile	0	0				0	0.00	

Task No.	Task	Units	Staff Hour Range	Basis for Staff Hour Range
28.3	Mobilization			
	Fixed Wing	Hour	2 to 2 hours each	Includes performing aircraft pre- and post flight inspection, loading and unloading aerial film, installing and removing aerial cameras in aircraft.
	Rotary Wing	Hour	4 to 4 hours each	
28.4	Flight Operations			Includes the operation of the aircraft, aerial camera, and other instruments for the purpose of obtaining aerial photography or remotely sensed data. (Fixed wing: Includes transit flight time based on a range of airspeeds from 110 mph to 200 mph, and onsite flight time based on a range of airspeeds from 80 mph to 200 mph.) (Rotary wing: Includes transit flight time based on a range of airspeeds from 70 mph to 100 mph, and onsite flight time based on a range of airspeeds from 30 mph to 60 mph.)
	Fixed Wing	Mile	See Basis for Staff Hour Ranges	
	Rotary Wing	Mile	See Basis for Staff Hour Ranges	



Photogrammetry Tab 28.5-8

Task No.	Task	Units	No. of Units	Hour / Unit	Hours				Total Range	Comments
28.5	Film Processing	Frame	0					0	0.00	
28.6	Photo Products	Sheet	0	0				0	0.00	
28.7	Scanning	Frame	0	0			0		0.00	Ortho Analyst only
		Frame	0	0				0	0.00	Lab Processor only
28.8	Lidar	Mile	0	0	0.00				0.00	PSM only
		Mile	0	0		0.00			0.00	Compiler only
		Mile	0	0			0.00		0.00	Map/Data Editor only

Task No.	Task	Units	Staff Hour Range	Basis for Staff Hour Range
28.5	Film Processing	Frame	See Basis for Staff Hour Ranges	Includes processing, checking, and annotating aerial film. Staff hours are based on a standard of 20 frames per hour.
28.6	Photo Products	Sheet	0.05 to 1.0	Includes contact prints, diapositives, and photo enlargements. The low end of the range is for black and white contact prints. The high end of the range is for color photo enlargements.
28.7	Scanning	Frame	0.25 to 1.0	The low end of the range is for black and white 28-micron scans. The high end of the range is for color 14-micron scans.
28.8	Lidar	Mile	0.05 to 4.0	Includes post processing of lidar data to XYZ coordinates. Staff hours are inversely proportional to the length of the project in flight line miles.



FDOT Photogrammetry Handbook

• General Requirements (continued)

- **Only digital photography will be accepted.** Any film imagery shall be of sufficient quality that when scanned with a calibrated photogrammetric scanner, the resulting digital imagery meets the accuracy requirements for the project based on the same ground sample distance (GSD) accuracy criteria for digital camera imagery presented later in this document. Aerial film developed for design purposes shall be scanned with an appropriate pixel resolution of 5um to 15um. Mapping projects with smaller scale such as County Orthophoto mapping may be scanned with an appropriate pixel resolution of $\leq 25\mu\text{m}$. The Aerial Surveying and Mapping Consultant shall submit the scanner technical specifications and calibration information to the Department.
- All digital photographic image files shall be saved to final media using the following file naming convention: AAAABB_CCCC (A=PD number, B=Flight Line number, C=Exposure number). Example: 492201_0010.tif Digital data shall be provided to the Department in a format which is immediately readable by the Surveying and Mapping Office and the Department.
- Meta Data – All final image files provided to the Department shall have a corresponding named metadata file in Extensible Markup Language (xml) format that meets the CSDGM. Example: 492201_0010.xml



Photogrammetry Tab 28.9-10

Task No.	Task	Units	No. of Units	Hour / Unit	Hours				Total Range	Comments
Aerial Triangulation										
28.9	Field Control	Frame	0	0	0.00				0.00	PSM only
		Frame	0	0		0.00			0.00	Complier only
	With Aerial GPS Control	Frame	0	0	0.00				0.00	PSM only
		Frame	0	0		0.00			0.00	Complier only
Surfaces										
28.10	Digital Elevation Model	Model	0	0		0.00			0.00	Complier only
	Digital Terrain Model	Model	0	0		0.00			0.00	Complier only

Task No.	Task	Units	Staff Hour Range	Basis for Staff Hour Range
28.9	Aerial Triangulation	Frame	1 to 1	Includes preparation, pugging, mensuration, and adjustment. May include merging airborne GPS control data with conventional control to derive a solution.
	With Aerial GPS Control		1 to 2	
28.10	Surfaces	Model	1 to 30	Includes collection of spot elevations and break lines.
	Digital Elevation Model			
	Digital Terrain Model			



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Photogrammetry Tab 28.11-14

Task No.	Task	Units	No. of Units	Hour / Unit	Hours				Total Range	Comments
28.11	Ortho Generation	Image	0	0			0.00		0.00	Ortho Analyst only
28.12	Rectified Digital Imagery (Georeferenced)	Image	0	0			0.00		0.00	
28.13	Mosaicking	Image	0	0			0.00		0.00	
28.14	Sheet Clipping	Sheet	0	0			0.00		0.00	Map/Data Editor only
		Sheet	0	0			0.00		0.00	Ortho Analyst only

Task No.	Task	Units	Staff Hour Range	Basis for Staff Hour Range
28.11	Ortho Generation	Image	2 to 4	Includes creation of the final image. (Work that is performed before creation of the final image is covered under other tasks.)
28.12	Rectified Digital Imagery (Georeferenced)	Image	1 to 3	Includes creation of the final image. (Work that is performed before creation of the final image is covered under other tasks.)
28.13	Mosaicking	Image	0.5 to 4	Includes the creation of a mosaic from multiple images. Units refer to the number of images that exist before the mosaic is created.
28.14	Sheet Clipping	Sheet	1 to 4	Includes clipping sheets from the database into final product



Photogrammetry Tab 28.15-19

Task No.	Task	Units	No. of Units	Hour / Unit	Hours				Total Range	Comments
28.15	Topographics (3D)	Model	0	0			0.00		0.00	Compiler only
28.16	Planimetrics (2D)	Model	0	0			0.00		0.00	
28.17	Drainage Basin	Sheet	0	0			0.00		0.00	Map/Data Editor only
		Sheet	0	0			0.00		0.00	Ortho Analyst only
28.18	CADD Edit	LS	25%			0.00	0.00	0.00	0.00	Enter in formula for CADD Edit
28.19	Data Merging	Model	0	0			0.00		0.00	Map/Data Editor only
		Model	0	0			0.00		0.00	Compiler only

Task No.	Task	Units	Staff Hour Range	Basis for Staff Hour Range
28.15	Topographics (3D)	Model	3 to 40	Includes preparation of 3D topographic maps and all tasks associated with the creation of surfaces. Photogrammetrist will not propose hours for Task 10 (Surfaces) and Task 15 (Topographics).
28.16	Planimetrics (2D)	Model	3 to 30	Includes preparation of models and compilation of 2D maps from stereo models
28.17	Drainage Basin	Sheet	1 to 4	Includes preparation of drainage basin maps. Includes final deliverable.
28.18	CADD Edit	LS	See Basis for Staff Hour Ranges	Includes final edit of graphics for delivery of required electronic files. (Microstation .dgn, CADD and Geopak files.) Unit of measure is 25% of selected office hours from tasks 28.1 through 28.12, where CADD system use is applicable.
28.19	Data Merging	Model	1 to 40	Includes merging files from photogrammetry, field survey and data from other sources to develop a complete project database. For projects involving photogrammetry and ground survey, the department expects photogrammetrist and ground surveyor to coordinate data exchange to create deliverables.



Photogrammetry Tab 28.20

Task No.	Task	Units	No. of Units	Hour / Unit	Hours						Total Range	Comments
28.20	Miscellaneous	LS	1	0	0.00						0.00	PSM only
		LS	1	0		0.00					0.00	Compiler only
		LS	1	0			0.00				0.00	Map/Data Editor only
		LS	1	0				0.00			0.00	Ortho Analyst only
		LS	1	0					0		0.00	Lab Processor only
		LS	1	0						0	0.00	Flight Crew only

Task No.	Task	Units	Staff Hour Range	Basis for Staff Hour Range
28.20	Miscellaneous	LS	See Basis for Staff Hour Ranges	Includes any other task not identified by numbered tasks.



Photogrammetry Tab 28.21-25

Task No.	Task	Units	No. of Units	Hour / Unit	Hours						Total Range	Comments					
Photogrammetry Technical Subtotal											0						
28.21	Field Reviews	LS	1	0							0	PSM only					
		LS	1	0		0					0	Map/Data Editor only					
28.22	Technical Meetings	LS		0							0						
28.23	Quality Assurance/Quality Control	LS	5%	0							0						
28.24	Supervision	LS	5%	0							0						
Photogrammetry Nontechnical Subtotal											0						
28.25	Coordination	LS	0%	0							0						
28. Photogrammetry Total											0	0	0	0	0	0	0

Task No.	Task	Units	Staff Hour Range	Basis for Staff Hour Range
Photogrammetry Technical Subtotal				
28.21	Field Reviews	LS	See Basis for Staff Hour Ranges	Includes review of field conditions to verify completeness and accuracy of the compiled data. Identify and measure obscured or profiled features. LS based on average number of people per field review x length of review x number of field reviews.
28.22	Technical Meetings	LS	See Basis for Staff Hour Ranges	LS based on average number of people per meeting x length of meeting x number of meetings. Length of meeting includes travel time for scheduled meetings.
28.23	Quality Assurance/Quality Control	LS	See Basis for Staff Hour Ranges	Includes implementation of QA / QC plan. Also includes subconsultant review, response to comments and any resolution meetings if required, preparation of submittals for review, etc. (LS based on 5% of technical tasks.) Includes all effort required to supervise all photogrammetric activities. (LS based on 5% of technical tasks.)
28.24	Supervision	LS	See Basis for Staff Hour Ranges	These activities must be performed by the project supervisor, a Florida P.S.M. Includes all effort required to supervise all survey activities. (LS based on 5% from tasks 5 through 23, where applicable.) These activities must be performed by the project supervisor, a Florida P.S.M.
Photogrammetry Nontechnical Subtotal				
28.25	Coordination	LS	See Basis for Staff Hour Ranges	For projects involving photogrammetry and ground survey, the department expects photogrammetrists and ground surveyor to review existing photography, inspect the corridor, obtain scope / objective from the project manager, in order to coordinate each party's responsibility and to estimate amount of data merging to be performed. (LS based on 2-3% of all the above tasks.)



Questions?

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