SANTA MARIA VALLEY WATER CONSERVATION DISTRICT

Twitchell Operations Committee
Regular Meeting
Thursday, April 11, 2024
5:00 p.m.

District Office
2255 S. Broadway, Ste. 8E
Santa Maria, California

AGENDA

1. CALL TO ORDER/ROLL CALL

2. PUBLIC COMMENT

*Members of the public may address the Committee on any subject within the jurisdiction of the Committee and which is **not** on the agenda for Regular Meetings or that **is** on the agenda for Special Meetings. The public is encouraged to work through District staff to place items on the agenda for Board consideration. No action can be taken on matters not listed on the agenda. Comments are limited to five (5) minutes.*

3. TWITCHELL DAM OPERATIONS REPORT – Casey Conrad, Chair

4. DISCUSSION ITEMS:

The Committee may give direction to staff or may make recommendations to the Board of Directors on these items.

a) FEMA update/site inspection
b) Temp dam support update
c) Shaft house clean up/records relocation/office container
d) Removal of personal items from district property – follow up
e) Aerial survey

5. UPDATE ON DAM GATE CONTROLS MAINTENANCE – Andy Adam

6. NEXT MEETING: May 9, 2024

7. ADJOURNMENT

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POSTED/PUBLISHED:
April 8, 2024

STAFF REPORT

TO: SMVWCD Twitchell Operations Committee

FROM: Carol Thomas-Keefer, Interim General Manager

DATE: April 9, 2024

RE: Item 4 - Discussion Items for Committee Consideration

4a. FEMA Update/Site Inspection

Discussion:

The committee will receive a brief report on discussions with the new FEMA project manager as well as possible coordination of a site visit this month.

Recommendation:

For information only.

4b. Temporary Dam Support Update

In response to the immediate need for dam tending services while the District seeks a full-time employee (or determines the best way to fill the dam tending needs), inquiries were made with various local agencies and consultants regarding the cost and availability of temporary contract support. Several consultants expressed interest in providing service. Ultimately, with concurrence of President Hadick, staff retained the services of Gaedeke Hydologic Consulting, LLC, at a daily rate of $390, Monday through Friday, with an optional hourly rate of $110 for work outside of the collection and submittal of daily site observations. Mr. Gaedeke's firm has been retained through the General Manager's signing authority for a 2-week period, with a longer-term agreement (up to 6 additional weeks) to come before the board on April 18. Mr. Gaedeke is also willing to collect weekend observations during this interim period; consequently, staff will prepare an amendment to the consulting agreement to extend services from Monday through Friday to Monday through Sunday.

Recommendation:

For information only.

4c. Shaft House Clean-up/Records Relocation/Office Container

As discussed last month, the transition to new staffing and potential changes in operating methods may warrant a clean-up of document storage in the shaft house. The addition of an office container to the site has been previously discussed by the committee; this container could also serve as the new location for records currently maintained in the shaft house storage room and could provide a space for a desk and/or other office equipment that could be stored in such a unit.

Recommendation:

The committee should consider recommending that the Board authorize purchase of a mobile container for the dam and direct staff and others to initiate a clean-up and transfer of records from the shaft house storage room to the new container. Because this is an unbudgeted expense, the committee may wish to recommend that this expense be budgeted for the FY 2024-25 fiscal year.

4d. Removal of personal items from district property – follow up

Last month, the committee discussed the need for the District's properties at the dam to be cleaned out and readied for use by a potential new full-time dam tender. Additionally, any property or equipment not owned by the District or specifically authorized for storage on District property should be identified for removal. Based on the committee's discussion, the Board, at its March 21 meeting, directed staff to prepare a policy for Board adoption that would clarify the terms and conditions under which non-district-owned property may be stored on district premises (i.e., only by contractors during work in progress), and also establish a procedure for requiring or initiating removal of personal property. A draft policy is expected to be brought to the Board for consideration at the April 18 regular meeting. However, a policy is not required to begin an inventory of equipment and identification of owners or to initiate a site clean-up.

Recommendation:

The committee should consider organizing a clean-up of District property, beginning with an inventory and owner identification of all vehicles and equipment stored at District facilities.

4e. Aerial Survey

In accordance with USBR dam management guidelines, the District must periodically perform a survey of reservoir sedimentation and storage capacity. The last survey was performed in 2018, and a new survey is needed. The District's consultant, HORNE, recently obtained a quote from LiDAR America to perform an Aerial LiDAR and sediment analysis. The current quote is $42,500; however, survey data cannot be acquired when water is present in the reservoir or waterways. Consequently, the survey cannot be scheduled until sufficient releases can be made and impending storm flows are not anticipated.

Recommendation:

The committee should consider referring the proposal from LiDAR America to the full board for consideration. Representatives from HORNE should provide additional information as needed.

Attachment:

- Proposal from LiDAR America

Aerial LiDAR & Sediment Analysis.

Technical & Economic Proposal

Aerial Survey

LiDAR America Inc.
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Tel: (714) 752- 6903
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Submitted to:
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Director, Government Services
HORNE

Table of Content

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1. Project's summary

The purpose of this project is to obtain the topographic of Twitchell Reservoir located in Santa Maria CA. We understand as well as the necessity to ensure you are given the most accurately collected data as possible.

Figure 1 Polygon of AOI

2. Scope of Work

To obtain a modern LIDAR dataset of the Twitchell Reservoir located in Santa Maria CA, it will be necessary to execute activities, which will be explained in detail in the following pages.

2.1. Project Overview:

Conduct a manned LiDAR survey over Twitchell Reservoir located in Santa Maria CA, to assess sediment deposits, comparing the newly acquired data with the dataset obtained in 2018 by The Santa Maria Valley Water Conservation District and MNS Engineers Inc.

2.2. LiDAR Survey Specifications:
   a. Utilize manned LiDAR technology to capture high-resolution point cloud data.
   b. Collect data at specified intervals and grid resolutions for accurate sediment analysis.
   c. Ensure data acquisition during optimal weather conditions for LiDAR survey accuracy.

2.3. Data Acquisition Responsibilities:
   a. LIDAR America will be responsible for planning, executing, and post-processing the 2024 LiDAR survey.
   b. The 2018 LiDAR dataset will be provided by The Santa Maria Valley Water Conservation District or MNS Engineers Inc. LIDAR America is not responsible for obtaining the 2018 dataset.

2.4. Coordination with Data Providers:
   a. Collaborate with The Santa Maria Valley Water Conservation District or MNS Engineers Inc. to obtain accurate 2018 LiDAR data.
   b. Ensure seamless integration of the 2018 and 2024 datasets for comprehensive sediment deposit analysis.

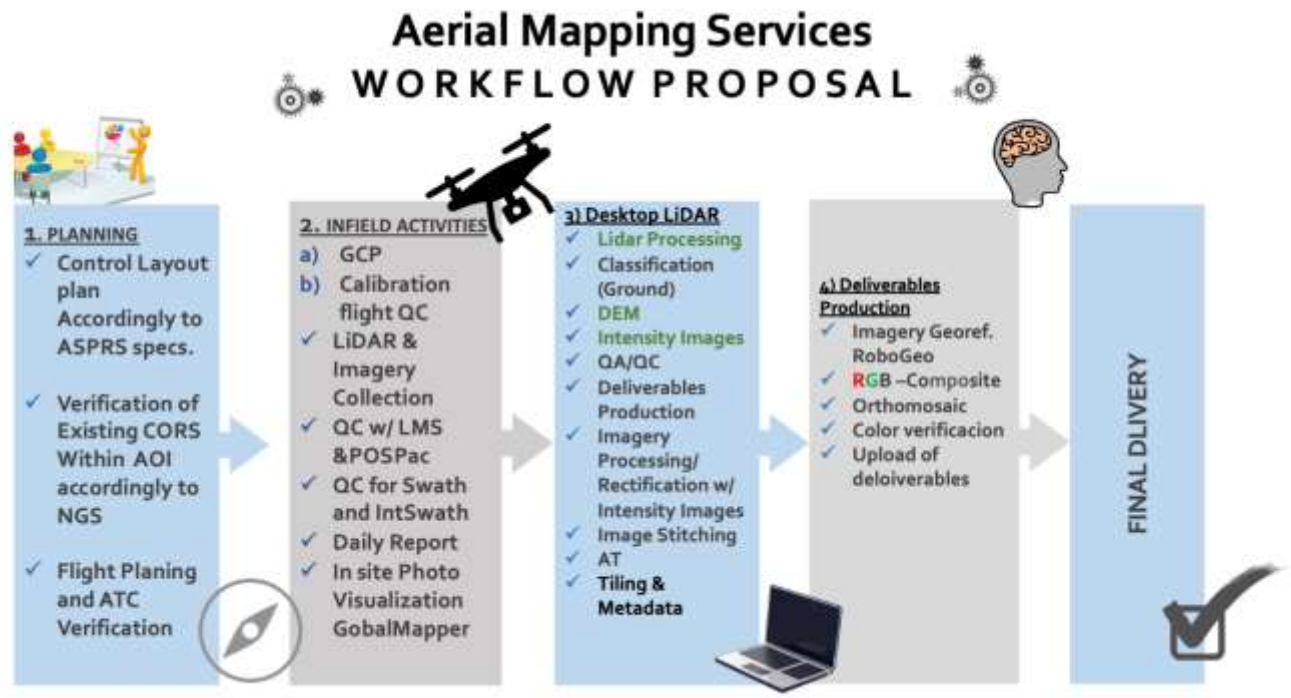
2.5. Lidar Survey Analysis.

   a. Employ advanced LiDAR processing techniques to extract relevant information regarding sediment deposits.
   b. Compare the 2018 and 2024 datasets to quantify sediment changes over the Twitchell Reservoir area.

2.6. Reporting and Deliverables:
   a. Generate a comprehensive report detailing sediment deposit estimates based on LiDAR data analysis.
   b. Provide visual representations of sediment distribution changes using, graphs, and 3D models.
   c. Deliver raw and processed LiDAR datasets in industry-standard formats.

2.7. Quality Assurance and Validation:
   a. Implement quality control measures during data acquisition and processing to ensure accuracy.
   b. Conduct validation checks to verify the reliability and consistency of the LiDAR survey results.

For an easy introduction to our methodology, a very clear workflow has been already pre-established targeting goals. Such workflow can be easily noted in the following chart



TASK IDENTIFICATION & IMPLEMENTATION PLAN.

Simultaneous Lidar & 4 Band Data Acquisition			
Project Design Parameters		**Flight Parameters**	
Areas of Interest (SQMI)	20.5	Nominal Flying Height (AGL, m)	**1250**
Buffered Project Area (ft)	50 ft	Nominal Air Speed (km/h)	**95**
Nominal Pulse Spacing (m)	0.68	Total Passes	**38**
Nominal Swath Overlap (%)	50% LiDAR	Total Length	**629km**
Sensor Settings		Total Laser Time	**01.11.33**
Sensor Scan Angle (degree)	13°	Total Flight Time expected	**03.31.33**
Scan Frequency (Hz)	45	Swath Area in Sqm	**-**
Pulse Rate of Scanner (kHz)	500	Total Frames	**0**
Capacity			
Number of Missions	2	Days on Site (1 sensor)	**2**
Weather Factor	2:1	Number of Sensors	**1**
Reflights weather standby	**1**	**Total Days On Site**	**2**

2.8. Flight Planning and Data acquisition

Lidar America created a suitable flight plan for the AOI that will consider overlap of 30% for Lidar flight lines, flying at an altitude of 1250m AGL and buffer to ensure full coverage of the AOI requested over the Area of Interest, to collect flawless and seamless point of cloud over the terrain.

Weather Conditions and Reflights: Acquisition flights will only occur only when conditions permit. Lidar data will only be captured when the ground is not obscured by snow, haze, fog, or dust, and water. Streams and waterways will be emptied. Data will not be collected when crosswinds are 15 knots or greater. Data will not be collected in strong turbulence to provide a stable platform for sensors. If any unacceptable data is collected, Lidar America will re-fly the impacted areas at no additional cost.

2.9. Data Processing

Post-processing, trajectories and calibration

After aerial acquisition, the data containing the flight paths, coverage areas and flight kinematics information such as IMU and GNSS Lever arms, are sent to the post-processing department. The LiDAR points and the orthophotos are referenced to a fixed GPS station that collects information from the known position while the capture flights are carried out. These flights, in turn, collect information about their trajectory and the kinematics of the aircraft through a GPS system and an inertial measurement unit (IMU). Using the POSPac processing software, it is necessary to set the start and end times of the flights, as well as the level arms and mounting angles. The static and dynamic GPS information are post-processed after each acquisition flight to obtain better accuracy of the position of the aircraft for each instant of measurement. PosPAC helps to generate a trajectory file that includes the corrected information of the aircraft for all sets of positioning data obtained during the entire flight. The generated trajectory file will be incorporated into a Smoothed Best Stimated Trajectory (SBET) file that contains accurate and continuous information of the position of the aircraft.

After the generation of the SBET, it is necessary to make some revisions in the data to ensure the precision in the generation of the LAS files. The tests involve the review of the number of satellites (not less than 6), the IMU and the PDOP. With this last revision it is possible to ensure the accuracy of the position data of the aircraft, with which the final trajectory file can be generated, which will be sent to the LiDAR data processing department, as well as the photogrammetric processing department.

The next step is the generation of LAS files. Trajectory files, as well as data range (swaths) are the initial instruments. For every LiDAR flight executed it will be necessary to look for any type of anomalies in the data, such as data gaps. When the data has been corrected for any anomalies, the LMS data can be exported as LAS.

A calibration flight can be performed, if necessary. Generally, these calibration flights are carried out in two opposite directions on the same calibration area. Additionally, parallel flights are made to the opposite directions with an overlap specified by the needs of the client. The results obtained in one direction are compared with the opposite direction. The attitude misalignment parameters derived from the calibration flights and the modeled "windup" values will be used in post-processing to resolve systematic errors in the data.

LiDAR Data Processing

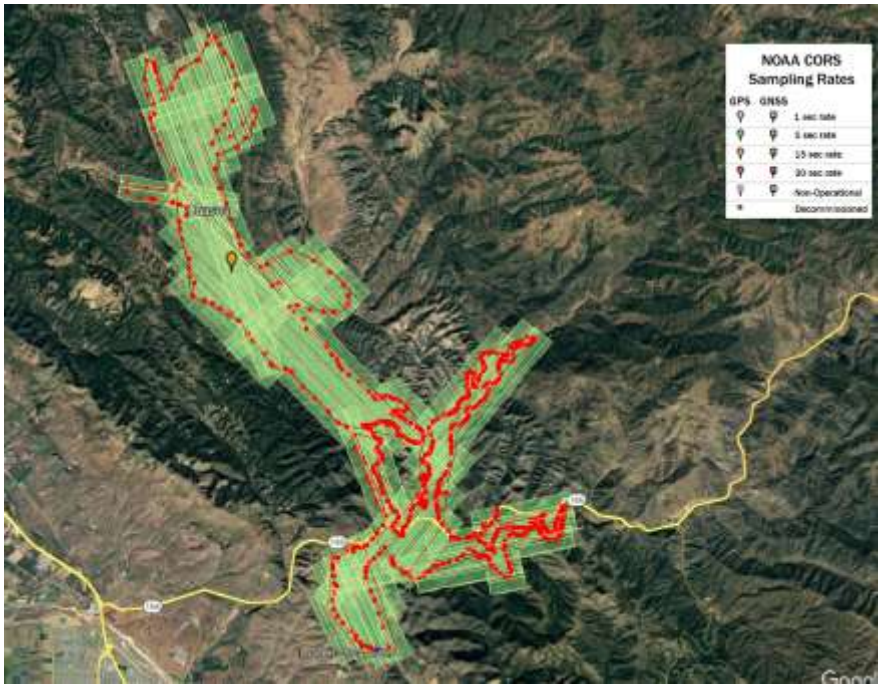
After post-processing of the data in POSPac and LMS, the resulting data (LAS and SBET files) is sent to the LiDAR data processing department. Each point belonging to the point cloud has a corrected position. This point cloud is classified using an algorithm to classify objects according to their height and shape. Subsequently, an exhaustive quality control must be done manually, with the intention of identifying Low high and Mid vegetation this classification will be needed to create accurate polygons, therefore evaluate the existing line for clearance violations

3. Delivery

The products to be delivered are:

1. LAS file with ground classification only
2. DEM in Geotiff format

Our Project Manager will keep you informed of the progress of the project. A Final Project Report will be compiled and delivered by the Project Manager. Lidar America Inc, will be the sole and exclusive owner of all right, title and interest in and to the work materials and deliverables until Lidar America Inc receives full and final payment of all invoices for performance of the services and delivery of the deliverables. When payment in full has been made, the Customer will have such rights, title, and interest in and to the work materials and deliverables. To the extent that the work materials and deliverables are considered public domain information, Lidar America Inc will retain all rights to utilize the work materials and/or deliverables in its business practices, without restriction. To the extent that the work materials and deliverables are not considered public domain information.



Flight plan

3.1. Quality Control Program

QA Checklist	
PRE-ACQUISITION **REVIEW:** These checks are to make sure flight planning is done according to the contractual requirements.	✓ Project boundaries ✓ Flight plan ✓ Sensor settings ✓ Weather conditions ✓ Survey plan ✓ Base station location
DATA ACQUISITION **REVIEW:** These checks are to make sure that the contractor collected the data according to the contractual requirements.	✓ Nominal pulse Spacing ✓ Intensity values ✓ Data voids ✓ Scan angle ✓ Swath overlap ✓ Sensor anomalies
DATA CALIBRATION **REVIEW:** These checks are to ensure that the data meets the contractual accuracy requirements.	✓ GPS-IMU accuracy review ✓ Vertical accuracy ✓ Relative accuracy
SURFACE QUALITY **REVIEW:** These checks are to ensure that the lidar point cloud is classified in accordance with contractual requirements.	✓ Misclassification ✓ Noise ✓ Artifacts ✓ Surface consistency
DATA COMPLETENESS and FORMATING **REVIEW:** These checks are to ensure that all the products listed in the contract are delivered, that they are in the right formats, and that they completely cover the project area.	✓ Delivery layout ✓ LAS format ✓ Classification levels ✓ GPS time ✓ Horizontal datum ✓ Vertical datum ✓ Units ✓ Coverage checks of deliverables ✓ Deliverables ✓ DEM format and resolution ✓ Metadata

Quality Control Process/Accuracy Standards:

Quality control Process happen in different stages, every procedure in our methodology has been stablished to comply with the Lidar Base Specification, Chapter 4 of Section B, U.S. Geological Survey Standards, Book 11, Collection and Delineation of Spatial Data.
Accuracy, and Quality verifications steps are in place with a check list right after downloading data, during postprocessing data, while tiling all data, and so on, until final integration is done. Even after final delivery is ready, a final random tile selection is tested to ensure that the final Lidar data products meets the criteria set out in the project plan.

4. Project's Acquisition schedule

	Time Line															
Days	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Activity																
Approval and advance																
Preparation																
Mobilization																
GCP																
Base station																
Aerial Acquisition																
Processing																
Classification																
DEM generation																

5. 2018 Dataset Analysis schedule

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
2018 Data reception																		
2018 Data review																		
2018 Data Analysis																		
2018 Data Adjutments																		
2018 Data output																		
2018 DEM Generation																		

6. 2024 vs 2018 Sediment Analysis schedule.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Software preparation																
Data import																
Running analysis																
Report preparation																
Report delivery																

7. Pricing

Proposed Pricing: Acquisition of Lidar Data over Twitchell Reservoir	
LIDAR	**$ 27,877.50**
Base station	$ 1,200.00
Classification and DEM generation	$ 3,075.00
Crew Mobilization	$ 1,350.00
Crew Accommodation	$ 1,160.00
Crew Per diem	$ 900.00
Project Manager	$ 2,088.00
Subtotal	$ 37,650.50
Volumetric Sediment Calculation and Report	$ 4,850.00
Total	$ 42,500.50

Terms & Conditions:

Payment Method

- ✓ 50% Non-refundable Retainer due for operational expenses.
- ✓ 20% payment after acquisition.
- ✓ 15% for product review.
- ✓ 15% upon delivery.
- ✓ Firm Fixed Price Contract
- ✓ Electronic payments accepted.
- ✓ This price includes all expenses related to the project, not just wages.

Client responsibility and possible additional expenses

- ✓ Client is responsible for obtaining access permits to the areas of interest.
- ✓ Client is responsible for providing LIDAR and/or DEM 2018 dataset. (Lidar America can assist)
- ✓ Stand-by day cost is $2,500.00.
- ✓ Data acquisition is not possible when there is water in the reservoir.

8. Other Resources

8.1. Remote sensing equipment

Lidar Equipment

Optech Gemini and Optech Aquarius The ALTM Gemini laser aerial mapping system incorporates a multi-pulse technology that allows users to double conventional operating altitudes without compromising data density. With a sampling rate of nearly 170,000 pulses per second and the latest in hermetic coupling inertial technology, the ALT Gemini maximizes efficiency in ground mapping data collection.
In addition, Lidar America has the ALTM Aquarius (green laser), which is a solution for coastal mapping and shallow water bodies, which is 100% compatible with the ALTM system. When working together, both sensors allow simultaneous capture of terrain measurements and shallow bathymetry, creating a dataset that incorporates the land-water interface. This system is fully integrated with Phase One camera, it is a fantastic tool for better georectification than aerodynamic triangulation.

150MP Phase One camera

The iXM-RS150F enables increased productivity for a wide range of aerial imaging projects, providing wider air coverage compared to previous generations of Phase One. Some key features include:

- 150MP image size
- Combined NIR and RGB 4-band (RGBN)
- Extensive air coverage
- RGB and Achromatic
- Suitable for oblique and Lidar systems

The iXM-RS150F offers wider aerial coverage while maintaining a high ground sample distance (GSD), provided by its new sensor, and was designed specifically for mapping applications. With the iXM-RS150F, area coverage is increased by 89% compared to 80MP, and by 26% compared to 100MP, while width coverage is increased by 38% and 12%, producing fewer flight lines and much higher aerial lift productivity. We are delighted to offer this high-end camera as the main digital camera for this project.

LiAir X3 (UAV)

The X3 system is a high-performance unit that has a new design that integrates lightweight LiDAR, self-developed inertial navigation, a high-resolution mapping camera and on-board computer systems that provide new levels of efficiency. When used with high-precision control points, it forms a complete solution that provides real-time 3D data throughout the day, efficiently capturing the details of complex structures and offering highly accurate reconstructed models.
Generate models of real colored dot clouds in real time.

AIRCRAFTS

Cessnas

The Cessna TU206-A and 205 are reliable and efficient aircraft widely regarded as workhorses of the industry. Lidar America's aircraft are large enough to carry a wide range of equipment and provide an extremely stable surveying platform, without incurring the expenses associated with multi-engine or turbine aircraft of the same size. The aircraft are professionally maintained well beyond FAA airworthiness standards.

Available aircraft

Registration number	**N8438Z**	**N4951F**
Maker	Cessna	Cessna
Model	210-5 (205)	TU206-A
Ayear	1963	1966
Serial Number	2050438	Sub-206-0651
Capacity	6	6
Location	Fullerton, CA	

8.2. Other Resources SW

Equipment List		
LIDAR Working Stations	Microstation Terrasolid suite	8
Imaging Working stations NDVI	Arcmap	8
Spectra Precision	Hemisphere	6
Imagery Rectification	Erdas	8
Imagery Triangulation stations	KTL Aerial Triangulation system	4
Orthophoto generation	KLT Project Ortho	4
Vehicle	Dodge Ram	1
Quad ATV	Yamaha	1
Aircraft	Cessna TU206A	2
Camera RGB-IR	Phase One iXM-RS150F	1
Lens	IR	1
Lens	RGB	1
LIDAR	ALTM Gemini	2
IMU	LN200	1

Processing			
	Item Name/Model or Version	**#**	**Remarks**
Hardware/ Software	Optech LMS Pro LiDAR Processing	2	Processing workflow tool designed specifically for high-volume production processing. From automated lidar calibration to extensive geodetic conversions, accuracy reporting, and parallel processing, Teledyne Optech LMS Standard is fully designed for lidar survey production.
	ALTM-NAV	2	Mission planning, project cost and quality control package that is an ideal complement to the Optech ALTM
	Applanix POS PAC	2	
	GeoCue	7	
	Optech LMS & LMS Pro Survey Suite	2	**Post-processing of ALTM derived LiDAR data— includes classification/filtering functions**
	Spectra TerraModel	7	**Used to review and analysis of 3-D DTM data planning projects (e.g. LiDAR or terrestrial laser acquired data - CYRAX)**
	Terra Solid TerraModeler	7	**MicroStation-based software for classification and manipulation of LiDAR data (or general DTM information)**
	Terra Solid TerraScan	7	
	Global Mapper	7	
	CADD (TerraModel)	**2**	

IMAGERY SOFTWARE		
Name	Usage	Technical Specifications
IMAGINE Photogrammetry Suite	Triangulation and Orthorectification	Comprehensive photogrammetric application capable of Aero-Triangulation, autocorrelation and filtering of DEMs and rectification of orthoimagery
ERDAS Imagine	Image Processing	Remote sensing application that allows for manipulation of data values and positions. Used for image processing tasks, feature extraction, filtering, and quality control
ERDAS ER Mapper	Image Processing	Image processing software used for mosaicking, color-balancing, compression and other image data processes
ESRI ArcGIS	**Data Management**	**Management and tracking of spatial (image) data, GIS data production and metadata generation**
Global Mapper	Image/Dem Processing	**Multi-functional GIS software capable of various capabilities related to manipulation of imagery, DEMs and vector data sources**
Adobe Photoshop	**Image Processing**	**Aesthetic edits for final image products, used to make local adjustments within mosaicked images and batch radiometric enhancements**