NHERI RAPID Facility: Site User Manual

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PI: Joseph Wartman, University of Washington

Co-PI's: Jeffrey Berman, University of Washington, Michael Olsen, Oregon State University, Jennifer Irish, Virginia Polytechnic Institute, Nicole Errett, University of Washington

Senior Personnel: Laura Lowes, University of Washington, Troy Tanner, University of Washington, Kurtis Gurley, University of Florida, Michael Grilliot, University of Washington, Che Erzhuo, Oregon State University, Jamie Vickery, University of Washington

Site Operations Engineer: Andrew Lyda, University of Washington
Site Operations Specialist: Jaqueline Zdebski, University of Washington
Natural Hazards Data Scientist: Karen Dedinsky, University of Washington

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1. OVERVIEW OF RAPID AND ITS RESOURCES

1.1 Mission and Values of the RAPID:

The RAPID Facility's mission is to enable transformative research by providing natural hazard and disaster researchers with the instrumentation and support needed to collect, process, and analyze perishable data from extreme events. These unique open datasets serve various purposes, including developing and calibrating scientific natural hazard simulation models.

To achieve our mission, we engage in a wide range of activities, including operating state-of-the-art field instrumentation, developing mobile software, providing advisory services and logistics support for reconnaissance field investigations, training a broad and diverse user base through workshops and other activities, and engaging the public through mission-related community outreach and education. The RAPID Facility user base includes extreme event reconnaissance (EER) organizations, NSF-supported researchers, and federal agencies.

1.2 Strategic Activities of the RAPID:

To achieve its mission, the RAPID engages in the following strategic activities

1. Acquiring, maintaining, and operating state-of-the-art data collection equipment.
2. Developing and supporting mobile applications to support interdisciplinary field reconnaissance.
3. Providing advisory services and basic logistics support for research investigations.
4. Facilitating the systematic archiving, processing and visualization of acquired data in DesignSafe-CI.
5. Training a broad user base through workshops and other activities.
6. Engaging the public through citizen science, as well as through community outreach and education.

1.3 Who is the RAPID:

The RAPID is headquartered at the University of Washington (UW) and is a collaboration between researchers at UW, Oregon State University (OSU), Virginia Tech (VT), and the University of Florida (UF). The RAPID staff are pictured and listed below.

1.4 Contacting the RAPID:

The RAPID Facility headquarters are located in the Civil & Environmental Engineering building, More Hall, Room 116, in Seattle, WA. More Hall is about 20 miles from the SeaTac International Airport and can be reached by car (pick-up at the airport), shuttle (pick up at

the airport), bus (exiting at the University of Washington HUB), or link light rail (exiting at the University of Washington station).

RAPID Headquarters Email and Phone:

(206) 616-3318
uwrapid@uw.edu

RAPID Headquarters Shipping Address:

201 More Hall
University of Washington
3760 E Stevens Way NE
Seattle, WA 98195
Care of: Jake Dafni.

Map to RAPID Headquarters in More Hall (click)

RAPID Staff Contact Information:

PRIMARY CONTACT: Michael Grilliot, PhD **Operations Manager** Research Scientist/Engineer, Geomorphology Civil & Environmental Engineering University of Washington (206) 616-3318 dafnij@uw.edu	
Erzhuo Che, PhD **Data Analytics Lead** **Assistant Professor, Senior Research,** Geomatics Civil & Construction Engineering Oregon State University (541) 737-4934 **erzhuo.che@oregonstate.edu**	

Karen Dedinsky
Natural Hazards Data Scientist
Civil & Environmental Engineering
University of Washington
(206) 616-3318
kdedinsk@uw.edu

Alex Dioso
Senior Software Engineer
Applied Physics Laboratory
University of Washington
(206) 685-3087
adioso@apl.washington.edu

Andrew Lyda, MS
Operations Engineer
Geospatial and Geological Sciences
Civil & Environmental Engineering
University of Washington
(206) 616-3318
awlyda@uw.edu

Daniel Stromecki
Software Engineer
Applied Physics Laboratory
University of Washington
(206) 897-1472
troyt@apl.uw.edu

Jaime Vickery, PhD
Social Sciences Specialist
Research Coordinator, Environmental and
Occupational Health Sciences
School of Public Health
University of Washington
vickeryj@uw.edu

Jaqueline Zdebski
Operations Specialist
Civil & Environmental Engineering
University of Washington
(206) 616-3318
jpeltier@uw.edu

RAPID Leardership Team Information:

Joseph Wartman, PhD
Director
Professor, Geologic Hazards
Civil & Environmental Engineering
University of Washington
(206) 685-5303
wartman@uw.edu

Jeffrey Berman, PhD
Operations Director
Professor, Structural Engineering
Civil & Environmental Engineering
University of Washington
(206) 616-3530
jwberman@uw.edu

Michael Olsen, PhD
Technical Director
Professor, Geomatics
Civil & Construction Engineering
Oregon State University
(541) 737-9327
olsen@oregonstate.edu

Jennifer Irish, PhD
Coastal Hazards Lead
Professor, Coastal Engineering
Civil & Environmental Engineering
Virginia Tech
(540) 231-2298
jirish@vt.edu

Nicole Errett, PhD
Social Sciences Lead
Assistant Professor, Environmental and Occupational
Health Sciences
School of Public Health
University of Washington
nerrett@uw.edu

Laura Lowes, PhD
ECO Director
Structural and Earthquake Engineering Specialist
Professor, Structural and Earthquake Engineering
Civil & Environmental Engineering
University of Washington
(206) 685-2563
lowes@uw.edu

Troy Tanner
IT Director
Principal Software Engineer, Environmental and
Information Systems
Applied Physics Laboratory
University of Washington
(206) 685-2770
troyt@apl.uw.edu

Kurt Gurley, PhD
Wind Hazards Lead
Professor, Wind and Coastal Engineering
Civil and Coastal Engineering
(352) 392-9537
kgurl@ce.ufl.edu

Scott Miles, PhD
Social Sciences Advisor
Senior Principal Research Scientist, Social Science
Human Centered Design and Engineering
University of Washington
milessb@uw.edu

Ann Bostrom, PhD
Social Sciences Advisor
Weyerhaeuser Endowed Professor in Environmental Policy
Evans School of Public Policy & Governance
University of Washington
abostrom@uw.edu

1.5 RAPID Resources

Resources and Equipment offered by the RAPID is tabulated below, and includes equipment useful for investigations across various natural hazards and disciplines (e.g., computing, laser scanning, surveying, unmanned aerial systems, digital imaging, data visualization, and backpacks with natural hazards reconnaissance essentials), and equipment for more specific data collection in the areas of site characterization, ground investigation, coastal monitoring and investigation, and social science data collection. Notably, the multi-hazard equipment is useful for structural earthquake and wind induced damage assessment.

RESOURCE CATEGORY	DEPLOYING EQUIPMENT	TYPES OF MEASUREMENT / USAGE	# OF UNITS
Social Science/ Interdisciplinary	iPad Pro 10.5s and iPad Pro 11s with accessories: -Apple Pencil -ZAGG Rugged Case -Tripod with adapter -External Battery -256GB Wireless Flash Drive -HD Microphone	Equipped with RApp (RAPID App) allowing users to identify, capture, aggregate, organize, store, and manage social science, engineering, and geoscience reconnaissance data in the form of typed or handwritten notes, photographs, audio and video recordings, map vectors, questionnaires, and metadata. Data is seamlessly integrated with DesignSafe for archiving. iPads are required to operate some pieces of RAPID equipment	19
Field Computing	Field Laptop	Data collection, processing, and communication with other field equipment	6
	2TB Backup Drive	Data storage and backup during reconnaissance work	5

Laser Scanning (lidar)	Leica BLK360	Close range (< 60 meters) lidar scanning for collection of 3D point cloud data	3
	Maptek I-Site XR3	Extra long range (< 2,400 meters) lidar scanning for collection of 3D point cloud data	1
	Maptek I-Site LR3	Long range (< 1,200 meters) lidar scanning for collection of 3D point cloud data	1
	Leica ScanStation P50	Long range (< 1,000 meters) lidar scanning for collection of 3D point cloud data	1
	Leica RTC360 3D Laser Scanner	Close range (< 130 meters) lidar scanning for collection of 3D point cloud data	2
Surveying	Leica Nova TS16I	Surveying total station with integrated camera for collection of spatial data (range of 3,500 meters with prism; 1,000 meters on any surface). Includes prism, prism pole and survey level	1
	Leica LS15	Surveying digital level with integrated camera for collection of spatial data (range of 110 meters)	1
	Leica GS18T	Self-learning GNSS with IMU for collection of spatial data and georeferencing. Can include 2 meter GPS poles (4), bipods (3), spike mounts (2), tribrachs (3), adapters (3) and 0.25m or 0.05m offsets (4 each).	6
	Heavy Duty Tripod	Can be used with lidar scanners, total station, digital level, or GNSS units	2
	Light Duty Tripod	Can be used with lidar scanners, total station, digital level, or GNSS units	5
	Thermometer/Barometer/Digital Compass/Humidity Sensor	Calibration information for survey data collection (also includes wind speed)	5
Unmanned Aerial Systems (UAS)	DJI Mavic Pro	Small copter drone (napsack size) for imagery and damage assessment	2
	DJI Phantom 4 Pro+	Small copter drone (backpack size) for imagery, damage assessment, and SfM data collection	1
	DJI Phantom 4 RTK	Small copter drone (backpack size) for imagery, damage assessment, and SfM data collection with RTK adjustments	2
	DJI Inspire2	Medium-sized copter drone for imagery, damage assessment, and SfM data collection	1

	DJI Matrice 210	Medium-sized, weather-proof copter drone for imagery, damage assessment, and SfM data collection	2
	DJI Matrice 210 V2 RTK	Medium-sized, weather-proof copter drone for imagery, damage assessment, and SfM data collection with RTK adjustments	1
	Freefly Astro Map	Medium-sized, weather-proof copter drone for imagery, damage assessment, and SfM data collection; DoD approved	1
	Freefly Alta X with Phoenix MiniRanger	Large copter drone with lidar scanner for imagery, damage assessment, and collection of 3D point cloud data (lidar can also be car mounted); DoD approved	1
	Skyshot Hybrid HeliKite	Tethered balloon for imagery and damage assessment in drone restricted areas	1
	SenseFly Ebee X	Fixed-wing drone used to create orthomosaics and 3D maps of large areas; DoD approved	1
	Quantum Trinity F90+	Fixed-wing drone used to create orthomosaics and 3D maps of very large areas; DoD approved	1
Imaging	Applied Streetview	8K 360-degree panorama camera system for driving or walking; can get individual images as an output	1
	Brinno BCC200 Time Lapse Camera	Time lapse video camera for imagery	2
	Canon DSLR EOS 7D Mark II with fixed and zoom lense	Imagery and SfM data collection; includes Wi-Fi Adapter	2
	GigaPan Epic Pro V with tripod	Robotic camera mount for imagery and SfM data collection	1
	Insta360 One 360 degree camera	Hand-held 360 degree imagery	5
	iSTAR Pulsar+	11K 360-degree panorama GPS camera system for driving or walking	1
	MicaSense Altum Multispectral Camera	Drone camera for simultaneous capture of 5 discrete bands + thermal	1
	Zenmuse X4S Camera	20 megapixel, 1-inch sensor RGB camera option for DJI drones	2
	Zenmuse X5S Camera	20.8 megapixel, 4/3-inch sensor RGB camera option for DJI drones	1
	Zenmuse Z30 Camera	Highest-detail drone camera, 30x optical and 6x digital zoom	1
Site Characterization	ATOM Wireless Seismic Data Acquisition System	Ground motion data, shear wave velocity structure using MASW or passive techniques	1

	Centaur Seismometers	Ground motion data, horizontal-to-vertical ratios for fundamental frequency analysis	6
Structural	TitanEA Accelerometers	Strong motion Ethernet accelerograph with power-over ethernet and Network Timing capabilities	3
Ground Investigation	AMS 3-1/4-inch Basic Soil Sampling Kit (Hand Augers)	Soil collection for engineering characterization through field or lab tests (hand auger kit)	1
	Geotester Pocket Penetrometer	In situ soil strength for engineering characterization	2
	Hand Operated Dynamic Cone Penetrometer System	In situ soil density, strength, stiffness, and penetration rates for engineering characterization	1
	PANDA Lightweight CPT System	Portable cone penetrometer system used for compaction control and site investigation	1
	Schmidt Hammers	In situ compressive strength of rock or concrete (RockSchmidt and SilverSchmidt)	2
Coastal	Aquadopp Profiler	Acoustic doppler current profiler	1
	DPR-275 Diver Pinger-Receiver	Instrument location/recovery for offshore deployment	1
	Petit Ponar Grab Sampler	Waterbed sampling device	1
	Teledyne Digibar S Sound Velocity Profiler	Sound velocity measurement device	1
	TruBlue 255 Water Level Gauge	Water level and storm surge measurements	13
	ULB 350/37 Underwater Acoustic Beacon	Instrument location/recovery for offshore deployment	1
	Z-Boat 1800 with ODOM Single Beam Dual Channel Echo Sounder, Ekinox-D MRU, and two GNSS antennas	Bathymetric spatial data, underwater imagery, and damage assessment	1
Miscellaneous	Suaoki 222 Wh Portable Generator	Power supply/charging of equipment	2
	Suaoki 400 Wh Portable Generator	Power supply/charging of equipment	1
	Power Inverter	Power supply/charging of equipment	15
	Walkie Talkies	Field personnel communication	5
RapPack	Includes: -Backpack -First Aid Kit -Safety Glasses -Safety Vest -Hard and Soft Measuring Tape -Leica Disto D2 Range Finder -Digital Caliper	Grab bag of essential natural hazards reconnaissance items, including for safety and first aid, localized 1D and 2D measurements, hand level surveying, and damage assessment.	5

	-Weld Gauge -Crack Gauge -Hand Level -Pocket Rod -Plumb Bob		

The RAPID also provides equipment at the RAPID headquarters for data visualization, data processing and computing. This includes custom built high-powered graphics processing workstations which can be utilized to develop and interrogate models from lidar and structure from motion (SfM) data and analyze data using software associated with RAPID equipment. This also includes a computer automated virtual environment (CAVE) which can be used to further investigate point cloud data (from lidar or SfM) and a 3D printer. The RAPID will assist with limited data processing and archiving of raw data to DesignSafe. For additional data processing needs inquire with the RAPID.

EQUIPMENT CATEGORY	NON-DEPLOYING EQUIPMENT	TYPES OF MEASUREMENT / USAGE	# OF UNITS
Computing	Rapid Server	Short-term storage of data collected by RAPID users (long-term storage will be on DesignSafe)	2
	Processing Server	Shared computing for processing imagery, point cloud, survey data, and SfM analysis. These have Leica and Maptek geomatics software, Pix4D and Agisoft Photoscan software, and other RAPID equipment software, as well as basic programs, such as Office.	1
	Data Processing Desktop	For processing imagery, point cloud, and surveying data, and performing SfM analysis. These have Leica and Maptek Geomatics software, Pix4D and Agisoft Photoscan software, and other RAPID equipment software, as well as basic programs, such as office.	8
Visualization	Computer Automated Virtual Environment (CAVE)	For visualizing and additional exploration of point cloud data (both lidar and SfM). Can interact with the data and continue to perform damage assessment, including taking measurements, after returning from the field.	1
	3D Printer	For visualization and modeling of 3D data for demonstration or learning purposes	1

1.5 RAPID Software (The RApp)

To facilitate field data collection and data transfer to DesignSafe, the RAPID has also developed a custom mobile application called the RApp, which will continue to have features added. The RApp will be installed on field tablets provided by the RAPID. It affords users the ability to identify, capture, aggregate, organize, store and manage social science, engineering, and geoscience reconnaissance data, as well as to a lesser extent disseminate, analyze, and visualize that data. RApp also enables the collection of metadata that will be linked to data collected by RAPID instruments, the collection of social science data through

surveys, communication and organization of field team members, geospatial tagging of all collected data, and will assist with troubleshooting equipment in the field by providing equipment manuals and other important features. Prior to deploying with RAPID equipment, the RApp can be setup via a web-interface as described in a later section.

1.6 RAPID Services

RAPID services include:

- Maintaining and calibrating the RAPID equipment and computing devices for use by natural hazards reconnaissance researchers;
- Providing staff assistance for field data collection when necessary;
- Assisting with proposal preparation:
    - General advice
    - Integration with RAPID and NHERI science plans
    - Provide budget information for RAPID equipment and staff
- Logistical support:
    - Arrange and assist with equipment delivery and return
    - RApp (RAPID App) to help with team organization/coordination
- Data archiving:
    - Raw data collected on all RAPID equipment will be archived to DesignSafe by RAPID staff. In some cases, such as initial registration of lidar data, limited data processing and archiving of the processed data can be done by RAPID staff. Contact RAPID for more details.

The following common requests are outside the scope of RAPID's services:

- Coordinating reconnaissance missions or across various reconnaissance teams;
- Setting the scientific objectives for reconnaissance missions;
- Providing funding for reconnaissance missions.

1.7 RAPID and User Workflow

The following illustrates the workflow for RAPID users and RAPID staff to support a deployment of RAPID equipment. Each portion of the workflow is discussed in the sections of the User Manual that follow.

Overview of Using the RAPID

Before Deployment

Before Requesting Equipment:	Request Equipment (Preferred 2 Weeks Prior to Deployment):	Discussion Between RAPID And User (Within 2 Business Days of Equipment Request):	Setup RApp (if Needed):	Receive Equipment:
• Read RAPID Site User Manual • Review equipment list and specifications • Review User Agreement • Review user rates and fees • Verify liability insurance • Verify reconnaissance funding source • Complete user training (recommended)	• Check current status of equipment • Complete the RAPID Equipment Request Form	• Equipment needs • Schedule • Rates • Shipping logistics • Complete RAPID User Agreement	• User setup of RApp via web interface • RAPID prepares field tablets • Verify DesignSafe account is active	• Options: At home, in field, from RAPID HQ, carried by RAPID staff, handoff from another team

Deployment   After Deployment

Collect Data:	Return Equipment:	Data Archival:	Data Processing:	Pay User Rates:
• Use manufacturer or RAPID developed equipment manuals (loaded on RApp or otherwise provided) • RAPID remote support as needed • RAPID staff in-field (if needed)	• Options: Shipping, returned by hand, returned by RAPID staff, handed off to another team • RAPID will inspect and verify equipment condition	• Raw data uploaded to DesignSafe by RAPID staff • Good practice to back up data during deployment as well on backup devices or computers	• If needed RAPID HQ has processing capabilities • Can setup as part of initial user agreement or arrange afterwards • Processed data uploaded to DesignSafe by user	• RAPID invoices per the user agreement • Payment expected within 30 days

Workflow for Requesting, Receiving, Using and Returning RAPID Equipment

2. HOW TO REQUEST RAPID EQUIPMENT/RESOURCES

2.1 Preparing for an Equipment Request:

Before filling out the RAPID Equipment Request Form, users should:

- Read the RAPID Site User's Manual (this document);
- Review equipment list and specifications;
- Review the RAPID User Agreement;
- Review the RAPID User Rates and Fees;
- Verify the user has liability insurance (for example, UW employees have general liability insurance when performing university duties [including research] as described here); and
- Participate in RAPID user training (recommended but not required).

Users should then prepare answers for the following questions as they appear on the RAPID Equipment Request Form:

- Is the project funded or is it in the proposal stage?
    - The RAPID charges user rates and fees to support its operations, which are partially subsidized by NSF. These rates and fees should be included in project budgets.

- It is recommended that the RAPID Equipment Request Form be submitted and a discussion between the user and RAPID staff occur, prior to the user submitting a research proposal to use the RAPID equipment to a funding agency.
- What equipment are you requesting?
  - At the stage of submitting the Equipment Request Form users should know the general categories of equipment they are requesting and be able to discuss the data they would like to collect. Following form submission the RAPID staff can assist with selection of specific equipment during discussions between the RAPID and the user.
- Do you know how to use the equipment you want?
  - Users will be asked to describe their experience with the equipment they are requesting and whether they have attended RAPID user training workshops. Note that UAVs require a remote pilot certificate to operate.
- Will you need field assistance from RAPID staff (required for certain equipment)?
  - RAPID staff can assist with data collection in the field. There are additional user fees associated with this. The miniRanger (lidar equipped UAV) and the Z-Boat (unmanned watercraft equipped with single-beam sonar) require RAPID staff to operate.
- Will you need assistance processing the data (especially lidar data and development of point cloud models)?
  - The RAPID facility offers high-speed data processing computers specifically built for processing lidar point cloud data and building structure-from-motion (SfM) models. They can also provide access to the CAVE and laptops. RAPID staff can also assist with processing for an additional fee.
- Do you need training on specific equipment prior to deployment?
  - The RAPID can, in some instances, provide training on specific equipment prior to deployment, depending on staff availability.

2.2 Making a RAPID Equipment Request:

Once users have considered the above, the RAPID equipment form can be completed and submitted (the request form is available by pushing the "Request RAPID Equipment" button on the RAPID website). The form is brief and takes no longer than 5 to 10 minutes to complete. The RAPID staff will contact the user within two business days of form submission (often much faster). The user and the RAPID staff will then begin discussing:

- The user's equipment and staff needs;
- User's experience with the equipment and any training requested or required;
- Schedule for the equipment;
- User rates and preparation of a quote for the requested equipment and services;
- Shipping logistics (how and where the user will receive the equipment);
- User Agreement completion, including providing identification, credit card information and verifying liability insurance;
- Setting up RApp, the RAPID's custom developed reconnaissance software.

Once the RAPID and user complete a User Agreement, the equipment will be reserved and that reservation will be forwarded to the Network Coordination Office. They will update the equipment schedule that other potential RAPID users will see.

3. RAPID USERS AND USES

The RAPID aims to accommodate all reasonable requests for use of its equipment and resources. Conflicting equipment requests may be accommodated with slight changes in schedule. The RAPID facility is open to anyone for any use, including:

- Academics, government agencies, private industry, etc.

There are different user rates for NSF vs. non-NSF users as the RAPID equipment and operations are subsidized by NSF specifically for NSF supported users performing reconnaissance following natural hazards (see the user rates section of this User's Manual). When scheduling conflicts arise the following matrix is consulted to establish priorities between competing equipment requests, with the first priority to serve NSF supported users responding in the near-term to a priority natural hazard (i.e., windstorms, earthquakes, tsunamis and landslides).

User	Data Collection Activity				
	Near-Term Response to a Priority Natural Hazard[1]	Recovery Phase for a Priority Natural Hazard[1]	Experiments at NHERI Facilities	Other Natural Hazards	Other Applications
NSF Supported	1	2	2	3	3
Non –NSF Federal Agency	4	5	5	5	5
Other	5	6	6	6	6

Matrix Establishing Priorities for Scheduling Conflicts for RAPID Equipment and Resources.

[1]Priority Natural Hazards are: Hurricanes, Tornados, Other Windstorms, Storm Surge, Earthquakes, Tsunamis, and Landslides

Serving the needs of NSF supported researchers is the primary objective of the RAPID. RAPID equipment may be requested for any NSF research. This includes:

- RAPID grants;
- NSF supported reconnaissance organizations (GEER http://www.geerassociation.org/), ISEER (https://hazards.colorado.edu/news/center-news/102), and others that may be developed;
- Other NSF grants from Engineering or other Directorates.

4. USER TRAINING

The RAPID offers training to facility users. User training workshops are advertised on the RAPID website (https://rapid.designsafe-ci.org/workshops/upcoming/) and by email through the DesignSafe email list (https://www.designsafe-ci.org/). The following opportunities for user training are offered annually:

- Single day workshops that provide an overview of the RAPID, its equipment and services. These are often affiliated with disciplinary conferences (i.e., the National Conference on Earthquake Engineering) and/or in collaboration with other NHERI equipment sites or reconnaissance organizations such as GEER.
- A weeklong intensive user-training workshop that features hands-on training with RAPID equipment and data processing. These occur each summer at the RAPID Headquarters at the University of Washington. Travel grants are typically available.
- Personalized training on specific equipment and data processing on an as-needed basis as RAPID staff availability permits. Contact the RAPID for more information on personalized training. User fees may apply for some personalized training.

Agendas and slides from previous user training workshops are available on the RAPID website (https://rapid.designsafe-ci.org/workshops/past/).

Manufacturer resources (i.e., user manuals, YouTube videos, etc.) will be made available via the RAPID website during the fall of 2018 and are available now by request. They will also be available on RAPID field tablets via the RApp. Additionally, the RAPID is preparing simplified workflows and user guides for commonly used equipment; those will be made available on the RAPID website and on field tablets.

5. RECEIVING RAPID EQUIPMENT

5.1 General Shipping Considerations

The RAPID will arrange the shipping of RAPID equipment. Shipping logistics are a critical part of the discussions between users and RAPID following the submission of the Equipment Request Form. Users may receive RAPID equipment by the following methods:

- Shipping to the user's home institution/location prior to deployment;
- Shipping to a field location for users to receive;
- Users can pick-up equipment from the RAPID headquarters at UW (this may be convenient if personalized training prior to deployment is desired);
- RAPID staff may meet users with the equipment in the field;
- Users may receive a hand-off from another previously deployed reconnaissance team.

5.2 Shipping Costs

The RAPID has limited funds available for shipping equipment and users are generally responsible for shipping costs. The RAPID is negotiating contracts with a shipping agent

that can be used and has the advantage of the shipping agent being familiar with the equipment and its shipping requirements.

5.3 Special Shipping Considerations for Batteries

All batteries for all RAPID equipment are small enough to be carried as carry-on baggage on most domestic commercial airline flights. Users should verify that batteries for the equipment they are deploying with are acceptable on international flights. If shipped, most batteries can be shipped by air on cargo planes, but otherwise would have to be shipped ground or freight. The RAPID staff can provide battery details for the requested equipment.

5.4 Special International Shipping Considerations

The RAPID will help users with import/export controls. The use of carnets is encouraged as these provide some measure of security when carrying equipment oversees. The RAPID can assist with obtaining carnets but they typically require a lead time of at least one week. In the future, the RAPID may maintain carnets for RAPID equipment that would be transferrable to users. Inquire with the RAPID staff for more information.

6. RETURNING RAPID EQUIPMENT

RAPID equipment may be returned via the same methods outlined in Section 5.1 for receiving RAPID equipment. Returning the equipment will be a critical part of the discussions between users and the RAPID following the submission of the Equipment Request Form. Users are generally responsible for shipping costs to return RAPID equipment.

7. INSURANCE

The RAPID maintains insurance on all facility equipment that covers equipment loss and damage under approved use by RAPID staff and facility users. RAPID users who will operate RAPID equipment themselves are required to verify and demonstrate that they carry general liability insurance for damages to people and property resulting from RAPID equipment use with a minimum value of one million US dollars. Most academic institutions and employers maintain such liability insurance for their employees when performing university duties or employee activities, including research activities. You should check with your university or employer to see what general liability they carry for their employees and researchers.

8. SETTING UP RAPP PRIOR TO DEPLOYMENT

8.1 Step 1: DesignSafe – Login and Data Archive

DesignSafe provides the login credentials (username & password) for RApp. In order to use RApp you will need a DesignSafe account. If you do not have a DesignSafe account you can register for a new account on DesignSafe account registration page: https://www.designsafe-ci.org/account/register/

In order for RApp to automatically save data to DesignSafe, you will need to have at least one project that you have access to in your Data Depot on DesignSafe. To create a project, first log in to DesignSafe. Then, click the "Research Workbench" menu at the top left of the screen and select the "Data Depot" item. Next, select "My Projects" from the left menu panel. Finally, click the "Add" button. If you wish to use a project that someone else created, you will need to have them add you as an authorized user of that project.

8.2 Step 2: RApp Website – Pre-deployment Planning

The RApp website allows you to configure checklists, create questionnaire templates, and view equipment information prior to deployment. To access the RApp website, go to: https://rapid.apl.uw.edu/rapp/

On the RApp website splash screen, click "Click to Proceed". Once the DesignSafe login panel displays, enter your DesignSafe username and password and sign in.

To create checklists, select "Mission" from the left menu, and "Checklist" from the right menu. In the checklist section you can create new checklists by clicking the + button at bottom right of screen, or download shared checklists by clicking the cloud button at top left of screen. Any changes you make to checklists will automatically be updated in the RApp app.

To create questionnaire templates, select "Inventory" from the left menu, and "Questionnaire Templates" form the right menu. In the questionnaire templates section you can create new templates by clicking the + button at bottom right of screen, or download shared templates by clicking the cloud button at top left of screen Any changes you make to questionnaire templates will automatically be updated in the RApp app.

8.3 Step 3: RApp iOS App – Mission Planning and Data Collection

In order to use RApp, you will need to have a Passcode enabled on the iPad. The Passcode is used to restrict access to both the iPad and RApp. For convenience, once a Passcode is set you may set up Touch ID to use your fingerprints for faster opening of both the iPad and RApp. To access Passcode and Touch ID settings on the iPad go to "Settings" > "Touch ID & Passcode".

When launching RApp, provide the iPad Passcode (or Touch ID if enabled).

If the iPad has a Wi-Fi or cellular network connection, enter your DesignSafe username and password and then sign in. Once signed in, go to "Mission" and select "Data" from the right menu. In the "Data" section you should see a list of DesignSafe projects. Select a project for your data to be associated with. Any data you collect in RApp will automatically be uploaded to the specified project in DesignSafe, as long as you have a network connection. If you do not have any DesignSafe projects, you will need to create one on the DesignSafe website. You may access checklists you created in the RApp website by going to "Mission" > "Checklist".

9. USER RATES AND FEES

The RAPID facility's operations are mostly subsidized for NSF supported research activities. However, that support does not completely cover the costs of RAPID operations. User rates and fees are necessary to ensure the complete operation of the facility under anticipated NSF usage. Use of the equipment for gathering data to support non-NSF activities cannot make use of the NSF funds provided for operations and therefore incur a higher fee. A list of user rates and fees for the RAPID equipment and services is provided on the next page. This list of rates fees is updated annually to reflect updated estimates of facility use.

User Rates and Fees for RAPID Equipment and Staff

Rate Number	Category	Equipment/Staff	NSF Supported User Rate ($/Day)	Non-NSF Supported User Rate ($/Day)
Rate 1	Surveying	Leica Nova TS16I robotic total station package	$138.92	$256.83
Rate 2	Surveying	35W Satelline Radio	$46.44	$77.66
Rate 3	Surveying	GEB371 13V 250Wh external Li-ion GNSS battery	$11.24	$19.04
Rate 4	Surveying	Leica LS15 digital level package	$65.51	$113.44
Rate 5	Imaging	Canon 7D Mark II, with narrow and wide angle lenses	$18.65	$33.48
Rate 6	Imaging	GigaPan Epic Pro V (for DSLR) and Tripod	$11.74	$19.54
Rate 7	Imaging	DJI Osmo 3-axis Gimbal and 4k camera	$11.38	$19.18
Rate 8	Imaging	Zenmuse X4S drone camera	$11.44	$19.25
Rate 9	Imaging	Zenmuse X5S drone camera	$22.36	$37.98
Rate 10	Imaging	Zenmuse Z30 drone zoom camera	$34.57	$57.98
Rate 11	Imaging	Micasense Altum multispectral and thermal camera	$71.69	$118.50
Rate 12	Imaging	Flir One Pro thermal camera	$4.83	$7.95
Rate 13	Misc.	RApp Packs	$12.30	$20.80
Rate 14	Site Char.	Nanometrics triaxial, 20s, Trillium seismometer	$82.26	$135.48
Rate 15	Ground	Digi-Schmidt 2000, digital measuring system	$23.64	$39.24
Rate 16	Ground	AMS basic soil sampling kit (hand augers)	$12.15	$19.95
Rate 17	Coastal	Petite Ponar 6"x6" grab sampler w/ 50 ft of rope	$11.74	$19.54
Rate 18	Imaging	Brino Time Lapse Camera	$4.63	$7.75
Rate 19	Imaging	Browning Trail Camera	$4.63	$7.75
Rate 20	Data	256 GB, WiFi+Cellular, Ipad	$12.24	$20.04
Rate 21	Lidar	Leica RTC360 medium range laser scanner	$171.26	$297.77
Rate 22	Lidar	Leica Scanstation P50	$272.77	$505.77
Rate 23	Lidar	Maptek I-Site XR3	$469.48	$861.82
Rate 24	Lidar	Maptek I-Site LR3	$457.28	$849.72
Rate 25	Surveying	Leica GS18T SmartAntenna package	$116.18	$188.31
Rate 26	Coastal	ULB 350/37 underwater acoustic beacon	$4.74	$7.87
Rate 27	Coastal	DPR-275 Diver Pinger Receiver	$47.44	$78.65
Rate 28	Coastal	TruBlue 255 water level data logger	$12.73	$20.53
Rate 29	Coastal	AquaDopp profiler velocimeter with 90deg angle head	$66.96	$115.55
Rate 30	Imaging	Applied Streetview 360 degree panorama GPS camera	$74.53	$121.32
Rate 31	Ground	SmartDCP digital system and hand operated DCP	$42.97	$73.40
Rate 32	Ground	Sol'Solution Panda lightweight portable DCP	$60.33	$103.23
Rate 33	Data	Gigabyte processing field laptops	$25.01	$40.60
Rate 34	Lidar	Leica BLK360 short range laser scanner	$62.63	$113.11
Rate 35	UAS	DJI Mavic Pro small portable drone	$10.71	$19.68
Rate 36	UAS	DJI Mavic Pro 2 small portable drone	$23.32	$42.83
Rate 37	UAS	DJI Mavic Air small portable drone	$12.13	$23.06
Rate 38	UAS	DJI Phantom 4 Pro+ medium-sized drone	$21.30	$39.25
Rate 39	UAS	DJI Inspire2 medium-sized drone	$33.17	$58.93
Rate 40	UAS	DJI Matrice 210 industrial weather resistant drone	$67.48	$115.47
Rate 41	Data	Computer Automated Virtual Environment (CAVE)	$97.71	$160.11
Rate 42	UAS	Sense fly Ebee with RTK and base station	$291.97	$544.06
Rate 43	UAS	DJI Phantom 4 Pro+ RTK	$135.62	$241.90
Rate 44	UAS	DJI Matrice 210 RTK	$160.22	$316.66
Rate 45	Lidar	DJI M600 drone with Phoenix Aerial Mini Ranger LiDAR	$483.27	$812.21
Rate 46	Site Char.	ATOM wireless seismic data acquisition system	$192.51	$317.33
Rate 47	Structures	Nanometrics accelerograph system	$213.89	$364.09
Rate 48	Coastal	Z-boat 1800 with single beam echo sounder	$427.88	$629.47
Rate 49	Misc.	RAPID Field Staff	$514.13	$1,470.66
Rate 50	Misc.	RAPID Staff Data Processing	$514.13	$1,470.66