Virtual Assessment Structural Team (VAST) Handbook: Product Preparation

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Note that StEER is responding to events while its policies, protocols and membership are still in active development. All policies, procedures and protocols in this handbook should be considered preliminary and will be refined with community input as part of StEER's operationalization throughout 2019.

PREFACE

The National Science Foundation (NSF) awarded a 2-year EAGER grant (CMMI 1841667) to a consortium of universities to form the Structural Extreme Events Reconnaissance (StEER) Network (see https://www.steer.network for more details). *StEER builds societal resilience by generating new knowledge on the performance of the built environment through impactful post-disaster reconnaissance disseminated to affected communities.* StEER achieves this vision by: (1) deepening structural engineers' **capacity** for post-event reconnaissance by promoting community-driven standards, best practices, and training, as well as their understanding of the effect of natural hazards on society; (2) **coordination** leveraging its distributed network of members and partners for early, efficient and impactful responses to disasters; and (3) **collaboration** that broadly engages communities of research, practice and policy to accelerate learning from disasters. StEER works closely with other extreme event reconnaissance organizations and the Natural Hazards Engineering Research Infrastructure (NHERI) to foster greater potentials for truly impactful interdisciplinary reconnaissance after disasters.

Under the banner of NHERI's CONVERGE node, StEER works closely with the wider Extreme Events Reconnaissance consortium including the Geotechnical Extreme Events Reconnaissance (GEER) Association and the networks for Nearshore Extreme Event Reconnaissance (NEER), Interdisciplinary Science and Engineering Extreme Events Research (ISEEER) and Social Science Extreme Events Research (SSEER), as well as the NHERI RAPID equipment facility and NHERI DesignSafe CI, long-term home to all StEER data and reports. While the StEER network currently consists of the three primary nodes located at the University of Notre Dame (Coordinating Node), University of Florida (Atlantic/Gulf Regional Node), and University of California, Berkeley (Pacific Regional Node), StEER aspires to build a network of regional nodes worldwide to enable swift and high quality responses to major disasters globally.

StEER's founding organizational structure includes a governance layer comprised of core leadership with Associate Directors for each of the primary hazards as well as cross-cutting areas of Assessment Technologies and Data Standards, led by the following individuals:

- **Tracy Kijewski-Correa (PI),** University of Notre Dame, serves as StEER Director responsible for overseeing the design and operationalization of the network and representing StEER in the NHERI Converge Leadership Corps.
- **Khalid Mosalam (co-PI),** University of California, Berkeley, serves as StEER Associate Director for Seismic Hazards, leading StEER's Pacific Regional node and serving as primary liaison to the Earthquake Engineering community.
- **David O. Prevatt (co-PI),** University of Florida, serves as StEER Associate Director for Wind Hazards, leading StEER's Atlantic/Gulf Regional node and serving as primary liaison to the Wind Engineering community.
- **Ian Robertson (co-PI),** University of Hawai'i at Manoa, serves as StEER Associate Director for Assessment Technologies, guiding StEER's development of a robust approach to damage assessment across the hazards.
- **David Roueche (co-PI),** Auburn University, serves as StEER Associate Director for Data Standards, ensuring StEER processes deliver reliable and standardized reconnaissance data suitable for re-use by the community.

DOCUMENT SCOPE & ACKNOWLEDGEMENTS

This document assembles guidance and instructions to support StEER members participating in Virtual Assessment Structural Teams (VASTs) and should be at minimum reviewed by all Level 1 StEER members, as participation in VASTs is the primary mechanism by which StEER members elevate to Level 2 status eligible to deploy to conduct field assessments. This document specifically guides VAST members in their process of activation for authorship of StEER event reports. This handbook and other materials to support VASTs in this and other functions within StEER are archived in the Resources folder on the StEER Members Shared Drive on Google. In addition to this document, StEER will be releasing online modules and conducting webinars to assist in training VAST members. These will be available at https://www.steer.network/resources.

StEER is indebted to the open platform and support provided by Fulcrum Community, which is the primary data acquisition framework for its door-to-door damage assessments, used by the VASTs in this handbook to assist in the authorship of the Early Access Reconnaissance Report (EARR).

This material is based upon work supported by the National Science Foundation under Grant No. CMMI 1841667. Any opinions, findings, and conclusions or recommendations expressed in this material are those of StEER and do not necessarily reflect the views of the National Science Foundation.

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ABBREVIATIONS

DE/QC	Data Enrichment and Quality Control
EARR	Early Access Reconnaissance Report
FAST	Field Assessment Structural Team
GEER	Geotechnical Extreme Events Reconnaissance Association
ISEEER	Interdisciplinary Science and Engineering Extreme Events Research
NEER	Nearshore Extreme Events Reconnaissance
NHERI	Natural Hazards Engineering Research Infrastructure
NSF	National Science Foundation
PVRR	Preliminary Virtual Reconnaissance Report
PI	Principal Investigator
RAPID	Type of NSF grant intended to support capture of perishable data Also refers to NHERI EF renting equipment to capture perishable data
StEER	Structural Extreme Events Reconnaissance
SSEER	Social Science Extreme Events Research
URL	Universal Resource Locator
VAST	Virtual Assessment Structural Team

VAST Expectations

StEER mobilizes its membership as Virtual Assessment Structural Teams (VASTs) and possibly Field Assessment Structural Teams (FASTs) to assess damage to the built environment after notable tsunamis, earthquakes, hurricanes, tornadoes and other natural hazard events. The level of mobilization is determined by StEER's leadership based upon many factors including the intensity and size of the event, its impact on communities and the opportunity to observe unique phenomenon/performance issues.

StEER's efforts to preserve perishable data following natural hazard events is an undertaking that requires committed effort of many. The immediate VAST members plays a crucial role in several phases of a StEER mission:

1. in the early days following an event, reporting on the immediate observations through either an Event Briefing or a Preliminary Virtual Reconnaissance Report (PVRR), enabling StEER to determine whether a Field Assessment Structural Team (FAST) should be deployed;
2. processing assessments acquired by the FAST within a week of their deployment to generate the Early Access Reconnaissance Report (EARR);
3. for weeks following the event, continuing to examine the collected data set and execute StEER's Data Enrichment and Quality Control (DE/QC) protocol to prepare it for long-term curation.

For additional information on these products, or StEER's response protocols, please refer back to the Member Guidelines. Additional in-depth guidance on the DE/QC process, please see the VAST Handbook for DE/QC. It is expected that all VAST members participating in authorship of the PVRR and/or EARR review this handbook for additional guidance.

Preliminaries

All StEER members will be automatically added to StEER's Fulcrum Community account. It is expected that members will complete the following steps well before they join a VAST:

1. You will receive a notification email from Fulcrum once the StEER Administrator has added you to the platform. Complete the process outlined in that email to set up your Fulcrum account and access the platform StEER uses for door-to-door (D2D) damage assessments;
2. Verify that your DesignSafe Slack account is active: https://designsafe-ci.slack.com. Contact the DesignSafe team of any issues with Slack.
3. Familiarize yourself with the Fulcrum web-interface on your computer: https://www.fulcrumapp.com/;
4. In addition to reviewing this and other relevant VAST handbooks, when available, access and complete the training modules or attend the webinars advertised by StEER.

Modules (when released) and recordings of all webinars will be available at in the Resources folder on your StEER Members Shared Drive on Google (see Figure 1).

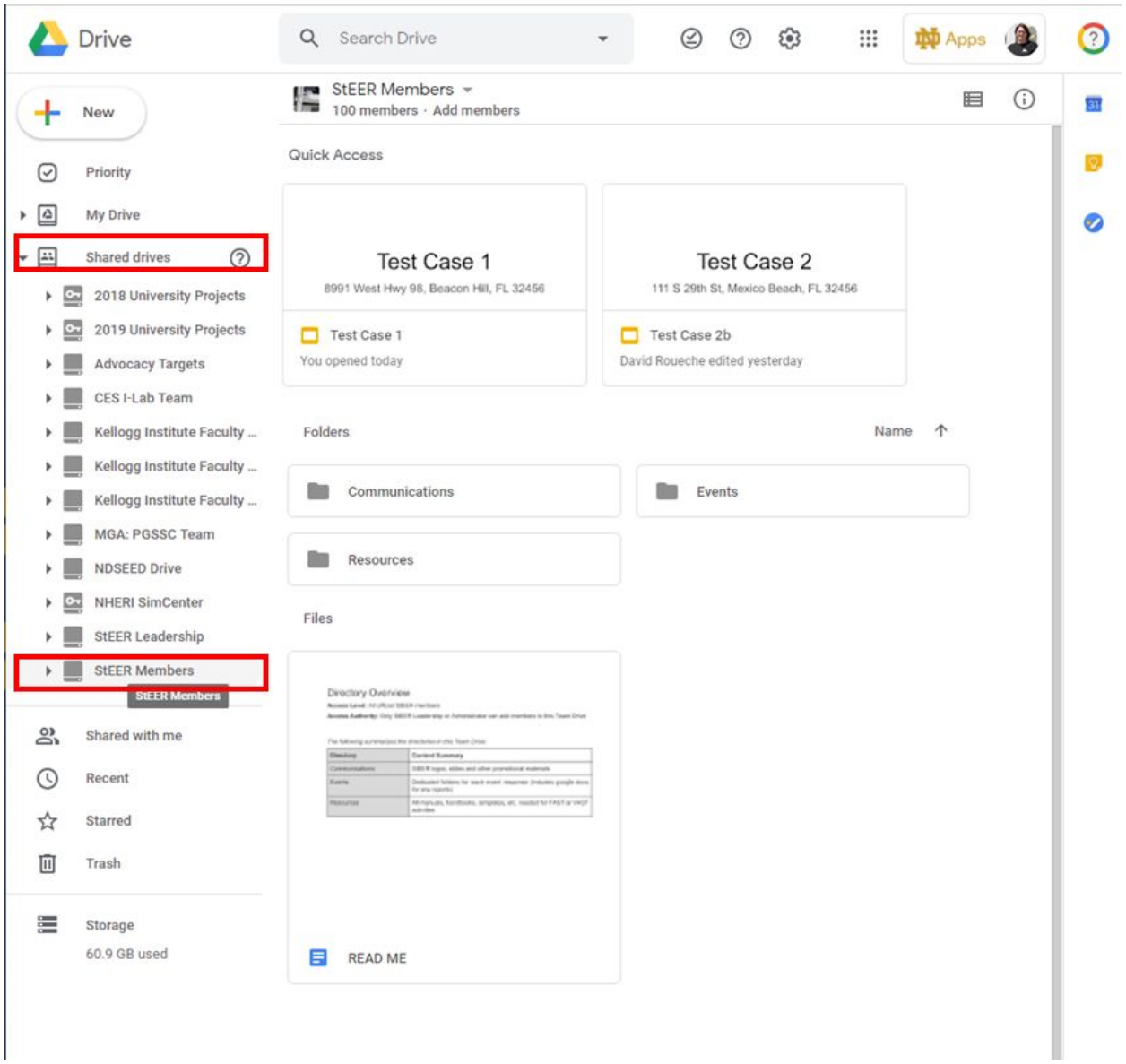

Figure 1. Accessing StEER Members Shared Drive through the left hand menu of Google Drive.

VAST Activation

1. When StEER is mobilizing an event response, it will reach out to all members by email to invite participation in the event VAST in the initial event response and specifically in preparing the Event Briefing, PVRR and EARR. Interest in participation is generally communicated through a Google Form. As VAST activities will continue for weeks

following an event, StEER will initiate subsequent rounds of recruitment via email to ensure adequate support for the DE/QC process after data collection has concluded.

2. StEER will appoint, from those expressing interest in VAST participation, a VAST Lead responsible for coordinating the VAST response.
3. Once joining the VAST, all coordination and communication will be managed in the secure Slack channel dedicated to that event's VAST. All VAST members will be added to the secure Slack channel created for their work. It is expected that VAST members will interact on this dedicated Slack channel for all of their efforts, sharing resources and information. Key resources will be pinned to this dedicated Slack channel for easy access by VAST members.
4. StEER's goal is to share its findings of its FAST as swiftly as possible, and generally within a week of their deployment. Given the speed with which StEER hopes to share its findings, VAST members must use StEER's coordination channels, protocols, and report templates.

Authoring the Event Briefing

1. The first possible phase of the response is the authorship of an Event Briefing. When that process initiates, which is typically immediately after the event transpires, the VAST Lead will create an event folder in the Events Directory of the StEER Members Shared Drive on Google. In that folder, the VAST Lead will make a copy of the Event Briefing Template and will post the link to that template in the dedicated Slack channel. From this point onward, the template is open to contributions from VAST members.
2. VAST members should review the Event Briefing Template and decide which sections are of the most interest to them/compatible with their expertise and indicate their interest in working on them. **Members should do this by adding their name as a comment on the heading of interest. This helps to coordinate the writing effort.** More than one VAST member can and should likely be working on each section. The VAST Lead will use the dedicated Slack channel to request assistance or direct efforts on specific sections as gaps are noted.
3. Having claimed their sections, VAST members will then begin scouring the internet for media and eyewitness reports from the impacted area. Some may choose to explore social media such as Twitter and Facebook for photos, videos and reports of damage. As information is discovered, it is summarized and integrated into the relevant sections of the Event Briefing Template, always acknowledging or citing the source of the information.
4. If particularly rich sources of information are discovered, the VAST members are expected to share that source and its URL in the dedicated Slack Channel. If that is in the form of a reports, datasets or other asset that could be helpful long-term resources, they should download and save a copy of that file in the event folder in the Events Directory on the StEER Members Shared Drive on Google, where the Event Briefing Template is currently housed.

5. The VAST Lead is responsible for authoring certain high-level or summary sections of the briefing. These are generally the last section on Recommendations for Further Study and the Key Lessons at the start of the briefing. See **CHAPTER 2: Event Briefing** for specific sections assigned to the VAST Lead.
6. Once the content for all sections is assembled, the VAST Lead will edit and spellcheck the entire briefing, ensuring completeness, cohesion and compliance with the guidelines in **CHAPTER 2: Event Briefing**. After this review is completed, the VAST Lead will notify the StEER Leadership team that the briefing is ready for editorial review.
7. During the Editorial Review, the VAST Lead will create the project on DesignSafe that will house the Event Briefing and will update the first page with the project number from DesignSafe. See the Quick Reference Sheet for Product Curation Handbook for guidance on project set up.
8. Once Editorial Review is completed, the VAST Lead will download the briefing as a PDF, ensure that it renders correctly and does not orphan content at page breaks in any disruptive way. Once a quality PDF has been assured and saved in the dedicated Event folder where the original template was housed, the PDF is uploaded to the DesignSafe project and the project is published following the protocol in the Product Curation Handbook.
9. Once the DOI is generated in DesignSafe (which is within minutes on most days), the VAST Lead will paste the final citation into the Slack channel.
10. The StEER Administrator will then initiate the dissemination process discussed in the Product Curation Handbook.

Authoring the PVRR

1. The second possible phase of the response is the authorship of the PVRR. When that process initiates, which is typically immediately after the event transpires, the VAST Lead will create an event folder in the Events Directory of the StEER Members Shared Drive on Google. In that folder, the VAST Lead will make a copy of thePVRR Template and will post the link to that template in the dedicated Slack channel. From this point onward, the template is open to contributions from VAST members.
2. VAST members should review the PVRR Template and decide which sections are of the most interest to them/compatible with their expertise and indicate their interest in working on them. **Members should do this by adding their name to the status tracker table located after the title page. (This table is deleted before publication). This table is used to coordinate the writing effort. The status column of this table should be updated to reflect the current status or gaps in each section.** While more than one VAST member can and should likely be working on each section, it is encouraged that Sections 1-7 have at least one VAST member working on it. The VAST Lead will use the dedicated Slack channel to request assistance or direct efforts on specific sections as gaps are noted.

3. Having claimed their sections, VAST members will then begin scouring the internet for media and eyewitness reports from the impacted area. Some may choose to explore social media such as Twitter and Facebook for photos, videos and reports of damage. As information is discovered, it is summarized and integrated into the relevant sections of the PVRR Template, always acknowledging or citing the source of the information.
4. If particularly rich sources of information are discovered, the VAST members are expected to share that source and its URL in the dedicated Slack Channel. If that is in the form of a reports, datasets or other asset that could be helpful long-term resources, they should download and save a copy of that file in the event folder in the Events Directory on the StEER Members Shared Drive on Google, where the PVRR Template is currently housed.
5. The VAST Lead is responsible for authoring certain high-level or summary sections of the report. These are generally written after Sections 1-7 are completed. See **CHAPTER 3: Preliminary Virtual Reconnaissance Report (PVRR)** for specific sections assigned to the VAST Lead.
6. Once the content for all sections is assembled, the VAST Lead will edit and spellcheck the entire report, ensuring completeness, cohesion and compliance with the guidelines in **CHAPTER 3: Preliminary Virtual Reconnaissance Report (PVRR)**. After this review is completed, the VAST Lead will notify the StEER Leadership team that the report is ready for editorial review.
7. During the Editorial Review, the VAST Lead will create the project on DesignSafe that will house the PVRR and will update the cover sheet of the PVRR with the project number from DesignSafe. See the Product Curation Handbook for guidance on project set up.
8. Once Editorial Review is completed, the VAST Lead will download the report as a PDF, ensure that it renders correctly and does not orphan content at page breaks in any disruptive way. Once a quality PDF has been assured and saved in the dedicated Event folder where the original template was housed, the PDF is uploaded to the DesignSafe project and the project is published according to the procedures in the Product Curation Handbook.
9. Once the DOI is generated in DesignSafe (which is within minutes on most days), the VAST Lead will paste the final citation into the Slack channel.
10. The StEER Administrator will then initiate the dissemination process discussed in the Product Curation Handbook.
11. VAST members should familiarize themselves with the Pre-Deployment Briefing issued by StEER to its FAST to be aware of the objectives and scope of any field deployment.

Authoring the EARR

1. If a FAST is formed and deploys, the second phase of the response will unfold with the authorship of the EARR. As soon as the FAST deploys, the VAST Lead will make a copy of the EARR Template in the event folder in the Events Directory of the StEER Members

Shared Drive on Google and will post the link to that template in the dedicated Slack channel. From this point onward, the template is open to contributions from VAST members.

2. VAST members should review the EARR Template and decide which sections are of the most interest to them/compatible with their expertise and indicate their interest in working on them. **Members should do this by adding their name to the status tracker table located after the title page. (This table is deleted before publication). This table is used to coordinate the writing effort. The status column of this table should be updated to reflect the current status or gaps in each section.** While more than one VAST member can and should likely be working on each section, it is encouraged that Sections 1-4, 5-9 have at least one VAST member working on it. The VAST Lead will use the dedicated Slack channel to request assistance or direct efforts on specific sections as gaps are noted.
3. VAST members should familiarize themselves with the Pre-Deployment Briefing issued by StEER to its FAST to be aware of the objectives and scope of any field deployment. This will be pinned to the dedicated Slack channel. This information will support the authorship of Section 5. See **CHAPTER 4: Early Access Reconnaissance Report (EARR)** for more guidance
4. Sections 1-2 can be authored immediately with the goal of providing a concise summary of the content in the PVRR (without reproducing the PVRR in its entirety) and supplementing it with any new information gleaned from media reports, social media and other reconnaissance efforts. Section 4 can also be initiated but likely should be refined based on the specific construction practices that are affecting the performance noted in Section 6 (so may need to wait until the FAST work concludes). See **CHAPTER 4: Early Access Reconnaissance Report (EARR)** for more guidance.
5. Sections 6-9 will be updated daily as the FAST acquires data. At the close of each day's effort, the VAST Lead will share the Daily Summary (see Example) with the VAST. VAST members will extract any relevant information and images from that summary and integrate them into the EARR sections they are working on. Some VAST members will also review the Fulcrum entries daily and use that information to author their sections. See **CHAPTER 4: Early Access Reconnaissance Report (EARR)** for more guidance.
6. If particularly rich sources of information are discovered, the VAST members are expected to share that source and its URL in the dedicated Slack Channel. If that is in the form of a reports, datasets or other asset that could be helpful long-term resources, they should download and save a copy of that file in the event folder in the Events Directory on the StEER Members Shared Drive on Google, where the EARR Template is currently housed.
7. The VAST Lead is responsible for authoring certain high-level or summary sections of the report. These are generally written after Sections 1-2 and 5-9 are completed. See **CHAPTER 4: Early Access Reconnaissance Report (EARR)** for specific sections assigned to the VAST Lead.

8. Once the content for all sections is assembled, the VAST Lead will edit and spellcheck the entire report, ensuring completeness, cohesion and compliance with the guidelines in **CHAPTER 4: Early Access Reconnaissance Report (EARR)** for more guidance. After this review is completed, the VAST Lead will notify the StEER Leadership team that the report is ready for editorial review.
9. During the Editorial Review, the VAST Lead will create the project on DesignSafe that will house the EARR and will update the cover sheet of the EARR with the project number from DesignSafe. See the Product Curation Handbook for guidance on project set up.
10. Once Editorial Review is completed, the VAST Lead will download the report as a PDF, ensure that it renders correctly and does not orphan content at page breaks in any disruptive way. Once a quality PDF has been assured and saved in the dedicated Event folder where the original template was housed, the PDF is uploaded to the DesignSafe project and the project is published according to the procedures in the Product Curation Handbook.
11. Once the DOI is generated in DesignSafe (which is within minutes on most days), the VAST Lead will paste the final citation into the Slack channel.
12. The StEER Administrator will then initiate the dissemination process discussed in the Product Curation Handbook.

The third phase of the VAST response will activate once the FAST data collection concludes. A description of this workflow will be provided in subsequent releases of this handbook.

The following chapters provide additional guidance on report authorship. As discussed in the chapters that follow, in the process of report authorship, VAST members will interact with a number of resources beyond this handbook. These are summarized in **APPENDIX A. LIST OF RESOURCES** for quick reference.

CHAPTER 1: General Guidelines

StEER requests that its members adopt the following best practices when preparing any StEER written communication.

- Utilize the appropriate StEER template. StEER has developed templates for Event Briefings, Early Access REconnaissance Reports (EARRs), Preliminary Virtual Reconnaissance Reports (PVRRs) and Data Reports (that accompany datasets curated in DesignSafe). These templates are housed in the StEER Members Shared Drive on Google in the Resources Folder (see VAST subfolder).
- Apply style tags for Heading 1, Heading 2, Heading 3, etc. so these are automatically included in the table of contents.
- Number all figures and tables sequentially, in the order they are cited in the text.
- Figures can be cited as Figure # or as (Fig. #) and tables as Table #
- Use the following format for captions on figures (which appear below the figure): **Figure X.Y.Z.** Caption where X is the major section (Heading 1-Level) amd U is the minor section heading (Heading Level 2, if applicable) and Z is a sequential numbering. Every image taken from another source should have (Source: XXXXX) in the caption to properly attribute this to its source. An example is provided below.
- Use the following format for captions on tables (which appear above the table): **Table X.X** Caption where X is the major section (Heading 1-Level) amd U is the minor section heading (Heading Level 2, if applicable) and Z is a sequential numbering. An example is provided below.
- Please number all section headings sequentially. Add or remove headings/subheadings from the template as needed.
- It is sufficient to embed sources of images directly in the figure caption in parenthesis (see the example below). They do not need to be added to the references section.
- All past StEER reports are listed on the StEER website: https://www.steer.network/products and provide illustrative examples for VASTs to reference as they author their reports. Please note reports issued in 2018 and 2019 predated the creation of standard templates, guidelines, branding and terminology established in Fall 2019 for StEER products. Please defer to the formatting and guildeines in this handbook.

Figure 2.1.1. Peel and stick membrane over joints in the roof sheathing. (Source: IBHS)

Table 2.2.1. Summary of DE/QC Stages

Stage	Purpose	Target Timeframe
1	Verify the location of the record.	1 week after FAST deployment completes
2	Validate or fill out the minimum fields that can be considered a complete record in accordance with the StEER data standards. These fields are marked as QC Stage 1 in Table 1.	1-3 weeks after FAST deployment completes

The chapters that follow are each dedicated to a StEER product and step through the elements of that product and best practices for authoring each of these elements.

CHAPTER 2: Event Briefing

Purpose

The Event Briefing is a short-form document that compiles publicly-available information on a natural hazard event, including hazard characteristics, performance of the built environment, and impacts on community resilience. Authorship on this briefing includes all contributing VAST members, as well as StEER Leadership who provided editorial review. This briefing is released within days of the natural hazard event and is generally used in cases where there are lessons to be learned, but not to the extent that it would warrant initiating a PVRR or activating the FAST.

Examples

See these illustrative examples of past Event Briefings for events caused by wind and seismic hazards:

- Kijewski-Correa, T. Cortes, M. Gutierrez Soto, M. Javadinasab Hormozabad, S. Roueche, D. Prevatt, D. Robertson, I. (2020) "Event Briefing", in StEER - Hurricane Eta. DesignSafe-CI. https://doi.org/10.17603/ds2-jdgs-1667.
- Gunay, Selim; Archbold, Jorge; Hu, Fan; Tsai, Alicia; Mosalam, Khalid; Kijewski-Correa, Tracy; Robertson, Ian; Prevatt, David; Roueche, David (2020) “StEER - 15 December 2019 Earthquake in the Philippines: Event Briefing.” DesignSafe-CI. https://doi.org/10.17603/ds2-82rp-h963.

Template

- To begin an Event Briefing, please make a copy of the Event Briefing Template and save it in the Events folder - within the sub-folder named for this response - on the StEER Members Shared Drive on Google.
- The following subsections further guide the content and best practice for each element of the Event Briefing.
- Note that while the overall structure of the document is the same, specific sections are customized by hazard class.
- Section 5 is optional and should be retained only if the VAST coordinated with those making first-hand observations of damage in the field. If this is not included, renumber the sections that follow accordingly.
- VAST members should feel free to add Level 2 and 3 headings as needed to further organize the contents of each Level 1-headed section.

Briefing Header

The first page header should be updated with the Event Name, Event Date, Region and Date the briefing is released and the DesignSafe Project identification number. Each VAST member who contributed to the report should enter their name and affiliation in the authors block. Every StEER Leadership team member who helped to edit the report should similarly provide their name and affiliation in the editors block.

Key Lessons

- *The VAST Lead is responsible for this section. Typically authored last.*
- This box itemizes 3-4 key lessons or takeaways from the event in bulleted form.
- Sentences should be concise.

Introduction

- Numbered as Section 1.0
- *All VAST members are welcomed to contribute to this section.*
- This should introduce the event including date, impacted geography and intensity.
- Recommend a high-level summary of the different hazards generating damage, e.g., fire following earthquake, tsunami waves vs. strong shaking, storm surge/wave action vs. wind, inland flooding. Note Section 2.0 is used for more detailed hazard information so this is just an overview.
- Summarize impacts, acknowledging this is the information available at the time this report was authored, including:
    - loss of life and injuries
    - scope of economic impacts (direct and indirect losses)
    - disruption to social and economic functioning of the affected area
- Closes with standard language (see template) that establishes objectives that can be further customized based on the briefing scope.

Hazard Characteristics

- Numbered as Section 2.0
- *All VAST members are welcomed to contribute to this section.*
- Describes relevant features of the hazard, usually with visual descriptions of intensity and its distribution geospatially.
    - **Hurricanes:** storm timing and characteristics at landfall (wind speeds, storm surge heights)
    - **Tsunami:** discusses intensity, geophysical features and tsunami generation mechanisms
    - **Earthquakes:** discusses intensity, tectonic features, aftershocks; if available, may include information on recorded ground motions

    - **Tornadoes:** distribution of tornadoes, intensities, meteorological conditions spurring tornadoes, and timing
- Additional sub-sections (Heading 2, Heading 3, etc.) can be used as desired to further organize or expand upon this information, depending on the extent of information available.

Damage to Structures

- Numbered as Section 3.0
- *All VAST members are welcomed to contribute to this section.*
- This section overviews reports of building damage, making heavy use of photos third-party photos (with appropriate source acknowledgement).
- Highlight case studies or examples of areas or types of construction that were most affected.
- May also note styles of construction or mitigation measures that appear to have performed well.
- Emphasis should be placed on structural damage but non-structural damage should also be noted, particularly when it is a major driver of losses.
- The section can be organized into subsections (3.1, 3.2, etc.) by structure type, e.g., hospitals, residential buildings, schools, etc. or by city/locale. May use subsections to organize damage to infrastructure vs. buildings as well as geotechnical failures that impact infrastructure and societal functioning (if geotechnical failures are substantial, they may be given their own section 4.0 and the subsequent sections renumbered accordingly).
- Note: A separate Level 1 Heading may be added after this section for geotechnical failures (breached levees, liquefaction, scour, landslides, etc.), including 1-2 third-party photos (with appropriate source acknowledgement).

Impacts on Community Resilience

- Numbered as Section 4.0
- *All VAST members are welcomed to contribute to this section.*
- This may include descriptions of disruption to functionality, displacement, and utilities/services performance.
- For earthquakes, this may include PAGER estimates of population exposed, municipalities exposed; PAGER loss projections, which can be compared to actual reports.

Impacts on Community Resilience

- Numbered as Section 5.0
- *All VAST members are welcomed to contribute to this section. Retain only if observations from contacts in the field are shared with the VAST.*

- Any specific observations of collaborators in the field
- If there are none, remove this section and update the subsequent numbering.

Recommended Response Strategy

- Numbered as Section 6.0
- *The VAST Lead authors this section in collaboration with StEER Leadership, typically once all other sections are completed.*
- Begin with standard language in the template; refine it to clarify the extent of StEER response and actions going forward. Generally this will be continued monitoring and possibly reactivation of VAST for PVRR.
- Summarize any areas warranting further investigation by the community.

References

- *All VAST members are expected to contribute to this section.*
- Include, in alphabetical order, all sources of information cited in the document, including websites, media, academic papers.
- The template provides formatting examples for each major class of reference.
- If a reference is used only as the source for a figure, it is sufficient to provide a credit in the caption, but inclusion in the reference list is preferable.

Appendices

- Begins on a new page.
- *All VAST members are welcomed to contribute to this appendix.*
- This optional appendix can be used to share videos or other links that provide richer multi-media documentation of the event, e.g., videos of the tsunami coming ashore or strong motions displacing building contents.
- If there are none to share, delete this section of the briefing.

Acknowledgements

- Achieved through a standard block of language on the last page of the document.
- Do not edit.

CHAPTER 3: Preliminary Virtual Reconnaissance Report (PVRR)

Purpose

The Preliminary Virtual Reconnaissance Report (PVRR) compiles publicly-available information on a natural hazard event, including hazard characteristics, impacts to various elements of the built environment, regulatory context and conditions within impacted communities. Authorship on this report includes all contributing VAST members, as well as StEER Leadership who provided editorial review. This report is released within a week of the natural hazard event and helps to inform whether a FAST will be deployed, and if so, the scope of their mission.

Examples

See these illustrative examples of past PVRRs for events caused by wind and seismic hazards[1]:

- StEER - HURRICANE MICHAEL: FIELD ASSESSMENT TEAM 1 (FAT-1) EARLY ACCESS RECONNAISSANCE REPORT (EARR)" , DesignSafe-CI [publisher], Dataset, doi:10.17603/DS2G41M (DOI: https://doi.org/10.17603/DS2G41M
- STEER - EERI ALASKA EARTHQUAKE: PRELIMINARY VIRTUAL ASSESSMENT TEAM (P-VAT) JOINT REPORT" https://doi.org/10.17603/DS2MQ38

Template

- To begin an PVRR, please make a copy of the PVRR Template and save it in the Events folder - within the sub-folder named for this response - on the StEER Members Shared Drive on Google.
- The following subsections further guide the content and best practice for each element of the PVRR.
- Note that while the overall structure of the document is the same, specific sections are customized by hazard class.
- Sections 4-6 are optional and should be retained only if damage was reported for that class of structure. If these are not included, renumber the sections that follow accordingly.
- VAST members should feel free to add Level 2 and 3 headings as needed to further organize the contents of each Level 1-headed section.

Title Page

The title page should be updated with the Event Name, Event Date, Date the report is released and the DesignSafe Project identification number. Each VAST member who contributed to the report should enter their name and affiliation on the first page. Every StEER Leadership team

[1] Please note branding, terminology and templates for StEER written products were unified in August of 2019, so older products will have some structural and stylistic differences.

member who helped to edit the report should similarly provide their name and affiliation in the VAST tables. Multiple versions of the VAST table are provided in the event that VAST members or editors are large in number. VAST Lead is also listed on the title page in the designated area at the top of the table. The Title page should be reformatted as needed to occupy only one page.

Preface

- Begins on a new page.
- This is standard language provided in the template and should not be modified.

Acknowledgements

- Begins on a new page.
- *The VAST Lead is responsible for this section.*
- Retain the first and third paragraph without modification.
- The second paragraph should be retained and built out only if there are individuals and organizations that shared data or other information critical to this report, e.g., local researchers who are near the site of the event and shared information regarding conditions on the ground.
- Green call out box should be retained at the bottom of this page without modification.

Table of Contents

- Begins on a new page.
- Provided Heading 1, 2, 3, etc. tags are appropriately used, this table of contents will populate automatically.
- *The VAST Lead is responsible for refreshing the table of contents regularly to capture the headings and page numbers as the report is edited.*

Executive Summary

- Begins on a new page.
- *The VAST Lead is responsible for this section. Typically authored last.*
- The summary is no more than one page in length.
- Structure:
    - First paragraph begins with a recap of the event and its severity (taken from Section 1.0). Then summarizes some specific hazard characteristics (taken from Section 2.0)
    - Second paragraph summarizes damage and impacts (taken from Sections 4-6, as appropriate)
    - Final paragraph introduces purpose/scope of the PVRR (taken from last subsection of Section 1: Report Scope).

Introduction

- Begins on a new page.
- Numbered as Section 1.0
- *All VAST members are welcomed to contribute to this section.*
- This should introduce the event including date, impacted geography and intensity
- Recommend a high-level summary of the different hazards generating damage, e.g., fire following earthquake, tsunami waves vs. strong shaking, storm surge/wave action vs. wind, inland flooding. Note Section 2.0 is used for more detailed hazard information so this is just an overview.
- Summarize impacts, acknowledging this is the information available at the time this report was authored, including subsections on:
    - Societal Impacts: scope of economic impacts (direct and indirect losses) & disruption to social and economic functioning of the affected area
    - Loss of Life and Injuries: discuss preliminary injuries and death tolls; nature of deaths if known, e.g., drowned in freshwater flooding, killed by collapsed building, etc.
- Level 2 heading on: Official Response of state, local or federal officials, including warnings and watches. Inventory of states of emergency and evacuations can be summarized herein or tabularized in an Appendix if multiple jurisdictions are involved. This can also include the response of humanitarian or other non-governmental actors, e.g., Red Cross.
- Sub-sections (Heading 2, Heading 3, etc.) can be used as desired to further organize this information.
- Last Level 2 heading is Report Scope. It is generally written at a later stage of the PVRR process.
    - First paragraph summarizes why this event is significant; why StEER is interested in it, i.e., rationale for assembling a VAST and initiating this PVRR. This generally will be completed by StEER Leadership.
    - Then customize the second paragraph's standard language to summarize the objectives of this PVRR. VAST Lead may author this second paragraph.

Hazard Characteristics

- Numbered as Section 2.0
- *All VAST members are welcomed to contribute to this section.*
- Heading is immediately followed by one of the following subsections, depending on hazard type:
    - **2.1 Meteorological Background:** Used for wind events including hurricanes or tornadoes. For hurricanes, the following Level 3 headings are often included:

            - **2.1.1 Early Development:** A paragraph on the progression of the storm prior to landfall, as NHC began tracking it. Provide at least one image or sequence of images showing evolution of the track.
            - **2.1.2 Landfall and Inland Progression:** A paragraph on the characteristics at landfall and the progression of the storm as it moved inland. Provide at least one image showing the size of storm at landfall (radar or sat imagery)
        - **2.1 Geophysical Features and Tsunami Generation:** Used for tsunamis.
    - **2.1 Earthquake Features and Tectonic Summary:** Used for earthquakes.
        - If available, the following sections may also be included:
            - **2.1.1 Recorded Ground Motions**
            - **2.1.2 Response Spectra**
- For hurricanes, the following Level 2 headings are often included:
    - **2.2 Hurricane Wind Field:** Summarize any officially recorded wind speeds at airports/meteorological stations in the region. Identify peak gust. Position these observations within the context of historical storms that have impacted that region, when possible. Also discuss any instruments that were field deployed pre-landfall by research teams. Summarize, ideally with image, the locations of those instruments. Note the terrain or exposure these are situated within.
    - **2.3 Storm Surge and Coastal Flooding:** Summarize storm surge as simulated by established models like ADCIRC, directly measured or reported by eye-witnesses. Emphasize any aspects of the storm that influenced storm surge levels. Include at least one figure showing geospatial distribution of storm surge.
    - **2.4 Rainfall and Inland Flooding:** Model-predicted or observed rainfall levels, flood stages of rivers or other reports of inland flooding. Emphasize any aspects of the storm that influenced rainfall totals and situate the rainfall levels within historical storms. Include at least one figure showing geospatial distribution of rainfall. describe any areas significantly impacted or isolated by flooding.
    - **2.5 Tornadoes:** If relevant, include information about any tornadoes that may have been documented during the hurricane.
- Additional sub-sections (Heading 2, Heading 3, etc.) can be used as desired to further organize or expand upon this information, depending on the extent of information available. The inset box below provides additional guidance by hazard type.

Local Codes and Construction Practices

- Numbered as Section 3.0
- *All VAST members are welcomed to contribute to this section.*
- Summarizes governing codes and standards and/or typical construction practices in the affected region and evolution of regulatory environment around mitigation for the types

of hazards in this event. May include figures of the design wind speed for the affected area from governing building code/reference standard, e.g., IBC or ASCE 7
- May include a history of past hazard events and/or revisions to codes and construction practices following past events
- For Gulf Coast and Atlantic States, the IBHS Rating the States report is often a good starting point. The website **www.Inspect2Protect.org** also provides a database of codes and standards across US jurisdictions.
- Subsections (3.1, 3.2, etc) can be added to further organize this information by region/state/country/municipality affected

Damage to Buildings

- Numbered as Section 4.0
- *All VAST members are welcomed to contribute to this section.*
- This section overviews reports of building damage, making heavy use of photos third-party photos (with appropriate source acknowledgement).
- Highlight case studies or examples of areas or types of construction that were most affected.
- May also note styles of construction or mitigation measures that appear to have performed well.
- Emphasis should be placed on structural damage but non-structural damage should also be noted, particularly when it is a major driver of losses.
- The section should be organized into subsections (4.1, 4.2, etc.) based on one of two layout strategies.
    - **Layout Option 1:** based on building type or usage. Possible sub-section headings include:
        - 4.1 Single-Family Residential Buildings
        - 4.2 Multi-Family Residential Buildings
        - 4.3 Commercial Buildings
        - 4.4 Health Care Facilities
        - 4.5 Schools
        - 4.6 Government Facilities
        - 4.7 Mobile/Manufactured Homes
        - 4.8 Critical Facilities
        - 4.9 Historical Buildings
        - 4.10 Religious Institutions
    - **Layout Option 2:** by geographic location/region where damage was reported. Subsection headings are provided for each location (4.1, 4.2, etc.)
- Additional headings (Heading 2, Heading 3, etc.) can be used as needed

Damage to Infrastructure

- Numbered as Section 5.0 and included only if damage was reported to non-building structures
- *All VAST members are welcomed to contribute to this section.*
- Summarize the impacts reported. Include as relevant any maps or visuals of geographic extent.
- This section makes heavy use of third-party photos (with appropriate source acknowledgement)
- The primary heading (5.0) is immediately followed by subsections (5.1, 5.2, etc.), respectively dedicated to the different non-building types for which damage was reported. Possible sub-section headings include:
    - 5.1 Power & Telecommunications Infrastructure
    - 5.2 Airports
    - 5.3 Bridges
    - 5.4 Roadways
    - 5.5 Other Lifelines
        - Examples: water, wastewater, natural gas
    - 5.6 Port Facilities
- For hurricanes, an additional Level 2 heading **5.7 Coastal Protection** is often included to summarize damage to coastal protective systems such as levees and seawalls.
- Additional headings (Heading 2, Heading 3, etc.) can be used as needed

Observed Geotechnical Failures

- Numbered as Section 6.0 and included only if geotechnical failures (breached levees, liquefaction, scour, landslides, etc.) were reported
- *All VAST members are welcomed to contribute to this section.*
- This section makes heavy use of third-party photos (with appropriate source acknowledgement)
- The section may be further subdivided by the failure type, as second-level headings (6.1, 6.2, etc).
- Additional headings (Heading 2, Heading 3, etc.) can be used as needed

Current Conditions and Access

- Numbered as Section 7.0
- *All VAST members are welcomed to contribute to this section.*
- This critical section should summarize any information regarding access restrictions, outages of power, water, etc., curfews or states of emergency/mandatory evacuations still in place at the time the report was authored and thus important to consider before deploying.

- The section should be organized into subsections (7.1, 7.2, etc.) based on one of two layout strategies.
    - **Layout Option 1:** summarizing all of these conditions by outage type, overviewing in each subsection the regions/geographies where this type of outage was reported. Subsection headings may include:
        - 7.1 Power Outages: generally reported by service providers
        - 7.2 Water and Sanitation Disruption: generally reported by service providers, e.g., municipal authorities
        - 7.3 Cellular Outages: generally reported by service providers
        - 7.4 Road Closures: generally taken from local department of transportation or other government authority
        - 7.5 Curfews/Restricted Access: generally reported by government authority at local, regional or national level
    - **Layout Option 2:** introduce geographic location/regions and summarize which of the above issues are reported there -- this is the more commonly adopted strategy with subheadings are provided for each impacted location/region (7.1, 7.2, etc.)
- Additional headings (Heading 2, Heading 3, etc.) can be used as needed

Recommended Response Strategy

- Begins on a new page.
- Numbered as Section 8.0
- No more than one page in length.
- *The VAST Lead authors this section in collaboration with StEER Leadership, typically once all other sections are completed.*
- This critical section provides a high level summary of the themes or topics under which the observation of this PVRR tend to cluster. Each major topic or theme is highlighted and an itemization of noteworthy failures, issues or unresolved questions are outlined.
- These topics/themes are often centered around a specific hazard observed in the event or the performance of a particular class of building or infrastructure.
- The last paragraph will be StEER's official recommendation as to whether this event warrants field investigation by StEER. One of three standard responses provided in the template should be retained and customized. These possible responses include:
    - FAST mobilizing
    - Plans tentative
    - No FAST planned

Appendices

- Begins on a new page.
- *All VAST members are welcomed to add an appendix if it is helpful to support a section they are working on.*

- Appendices are optional and order by letter, Appendix A, Appendix B, Appendix C, etc.
- Use page breaks so that each appendix, including the first, begins on its own page
- VASTs should include appendices for any supplemental information that may be of interest to the readers but would otherwise be too detailed or cumbersome to include in the main body of the report
- Appendices may be used, but not limited to:
    - large tables of data such as closure or outage reports

References

- Begins on a new page.
- *All VAST members are expected to contribute to this section.*
- Include, in alphabetical order, all sources of information cited in the narrative report, including websites, media, academic papers
- The template provides formatting examples for each major class of reference.
- If a reference is used only as the source for a figure, it is sufficient to provide a credit in the caption. That source need not be included in this reference list.

CHAPTER 4: Early Access Reconnaissance Report (EARR)

Purpose

The EARR builds upon the PVRR to further expand upon the documentation of hazard characteristics and performance of the built environment, as informed by the observations of StEER's first FAST. The EARR includes updated reporting on conditions in the affected communities as well as recommendations for further study. Authorship of the PVRR includes all FAST members who collected data and all VAST members who contributed to the report authorship, recognizing especially the VAST and FAST Leads, as well as StEER Leadership who provided editorial review.

Examples

See these illustrative examples of past PVRRs for events caused by wind and seismic hazards[2]:

- StEER - PALU EARTHQUAKE AND TSUNAMI, SUWALESI, INDONESIA: FIELD ASSESSMENT TEAM 1 (FAT-1) EARLY ACCESS RECONNAISSANCE REPORT (EARR) https://doi.org/10.17603/DS2JD7T
- StEER - 3 March 2019 Tornadoes in the Southeastern US: Field Assessment Structural Team (FAST) Early Access Reconnaissance Report (EARR) https://doi.org/10.17603/ds2-qav0-t570

Template

- To begin an EARR, please make a copy of the EARR Template and save it in the Events folder - within the sub-folder named for this response - on the StEER Members Shared Drive on Google.
- The following subsections further guide the content and best practice for each element of the EARR.
- Note that while the overall structure of the document is the same, specific sections are customized by hazard class.
- Sections 7-9 are optional and should be retained only if that class of assessment was conducted. If these are not included, renumber the sections that follow accordingly.
- VAST members should feel free to add Level 2 and 3 headings as needed to further organize the contents of each Level 1-headed section.

Title Page

The title page should be updated with the Event Name, Event Date, Date the report is released and the DesignSafe Project identification number. Every member of the FAST whose data is

[2] Please note branding, terminology and templates for StEER written products were unified in August of 2019, so older products will have some structural and stylistic differences.

analyzed in the report should be listed in alphabetical order with affiliation, in the table on the front page. Two FAST member table formats are provided in the template; use the two column format for large FASTs. Similarly, each VAST member who contributed to the report should enter their name and affiliation on the first page. Every StEER Leadership team member who helped to edit the report should similarly provide their name and affiliation in the VAST tables. Multiple versions of the VAST table are provided in the event that VAST members or editors are large in number. Leads of the FAST and VAST are also listed on the title page in the designated areas on their respective tables. The Title page should be reformatted as needed to occupy only one page.

Preface

- Begins on a new page.
- This is standard language provided in the template and should not be modified.

Acknowledgements

- Begins on a new page.
- Retain the first and final paragraphs without modification.
- The second paragraph should be retained and built out only if there are individuals and organizations that made the FAST mission possible (e.g., facilitated access, secured clearance/permissions, shared critical data, etc.) The FAST Lead can generally provide this information
- The third paragraph is retained without modification only if equipment from the NHERI RAPID EF was used by the FAST.
- Green call out box should be retained at the bottom of this page without modification.

Table of Contents

- Begins on a new page.
- Provided Heading 1, 2, 3, etc. tags are appropriately used, this table of contents will populate automatically.
- *The VAST Lead is responsible for refreshing the table of contents regularly to capture the headings and page numbers as the report is edited.*

Executive Summary

- Begins on a new page and is no more than one paragraph.
- Communicate the most relevant findings, assuming some readers will only review the Executive Summary.
- Example language is provided in the template and can be customized as needed.
- Structure is typically 3-4 paragraphs organized as follows:
    - First paragraph explains the key features of the event: location, timing and societal impacts

    - Second paragraph summarizes the configuration of the FAST, members, disciplinary backgrounds and the methodologies engaged, e.g., Door to Door Assessments, UAS, Applied Street View, geographies covered and the dates of the data collection.
    - Third paragraph reports the key findings of the team and may emphasize the hazards that specifically drove the damage observed. Observations may be further organized as a bulleted list organizing information by theme/topic
    - Closes with a standard limitations statement (see template for details)
- *The VAST Lead is responsible for this section. Usually written last.*

Introduction

- Begins on a new page.
- Numbered as Section 1.0
- *All VAST members are welcome to contribute to this section. Can begin writing immediately.*
- There is no need to repeat verbatim the material in the PVRR; the authors can even cite to the PVRR.
- This should summarize event (which was already introduced in the PVRR) but focus on any new information or updated facts/statistics since the time the PVRR was authored.
- Should introduce the event including date, impacted geography and intensity (Note: Details of the hazard characteristics will come in Section 2.0 and structural impacts in sections that follow, so this is a high-level introduction)
- Include updated summary of loss of life and injuries
- Update the scope of economic impacts (direct and indirect losses) and disruption to social and economic functioning of the affected area
- Summarize ongoing response of state, local or federal officials, emphasizing new information since the PVRR.
- Sub-sections (Heading 2, Heading 3, etc.) can be used as desired to further organize this information.

Hazard Characteristics

- Numbered as Section 2.0
- *All VAST members are welcome to contribute to this section. Can begin writing immediately.*
- There is no need to repeat verbatim the material in the PVRR and the authors can even refer to the PVRR.
- This should summarize characteristics (which were already introduced in the PVRR) but focus on any new information and possibly data that was not available at the time the PVRR was authored.
- Heading is immediately followed by one of the following subsections, depending on hazard type:

    - **2.1 Meteorological Background:** Used for wind events including hurricanes or tornadoes
    - **2.1 Geophysical Features and Tsunami Generation:** Used for tsunamis.
    - **2.1 Earthquake Features and Tectonic Summary:** Used for earthquakes.
        - If available, the following sections may also be included:
            - **2.1 Recorded Ground Motions**
            - **2.2 Response Spectra**
- Additional sub-sections (Heading 2, Heading 3, etc.) can be used as desired to further organize or expand upon this information, depending on the extent of information available.

StEER Response Strategy

- Numbered as Section 3.0
- No more than one page in length
- *The VAST Lead authors this section in collaboration with StEER Leadership. Can be written immediately based on Pre-Deployment Briefing and possibly refined if subsequent FASTs will follow.*
- Example language is provided and can be customized as needed.

Local Codes and Construction Practices

- Numbered as Section 4.0
- *All VAST members are welcome to contribute to this section. Generally written once trends in performance are evident from FAST data.*
- There is no need to repeat verbatim the material in the PVRR, and the authors can even cite to the PVRR.
- This should summarize any key points (which were already introduced in the PVRR), such as the governing edition of the code and any special local regulations for the hazard in question.
- Focus should be placed on any new information or perspectives not captured in the PVRR or aspects of construction and mitigation practice that are especially relevant in light of the damage observed by the FAST.
- Subsections (4.1, 4.2, etc) can be added for each region/state/country/municipality affected

Reconnaissance Methodology

- Numbered as Section 5.0
- *All VAST members are welcome to contribute to this section. Can be written immediately using Pre-Deployment Briefing.*
- This section opens with a high level summary of the geographies surveyed, dates of the FAST mission and organization of the team in the field.

- This is immediately followed by subsections (5.1, 5.2, etc.) to describe each of the methodologies/instrumentation used. Possible sub-section headings include:
    - 5.1 Door to Door (D2D) Assessments
    - 5.2 Unmanned Aerial Surveys (UAS)
    - 5.3 LiDAR Scanning
    - 5.4 Applied StreetView Imaging
- Standard language is available in the template and should be further customized as desired
- Additional headings (Heading 2, Heading 3, etc.) can be used as needed

Observed Performance of Buildings

- Numbered as Section 6.0
- *All VAST members are welcome to contribute to this section. Built out daily based on FAST data.*
- This is the most important section as it provides a summary of the observations from the FAST with the disclaimer that this data is in its raw form and has not undergone any quality assurance; thus assessments are solely based on the opinions of the FAST members
- This section should be built up daily as FAST data becomes available; due to the swift timeline on this report, the report is largely authored based on door to door damage assessments in Fulcrum as other data types are unlikely to be processed in time
- VASTs should use the Daily Summary (see Example) published by the FAST on the dedicated Slack channel as the starting point for this section.
- VASTs should also do a cursory review of the Fulcrum entries from that day to glean additional trends or illustrative photos for this section; VAST members may agree to divide up the Fulcrum records and write up observations for this section based on the entries they reviewed.
- This section makes heavy use of photos from the FAST; occasionally third-party photos or graphics may be included (with appropriate source acknowledgement) to further support the FAST observations.
- Emphasis should be placed on structural damage but non-structural damage should also be noted, particularly when it is a major driver of losses.
- The section should be organized into subsections (6.1, 6.2, etc.) based on one of four layout strategies.
    - **Layout Option 1:** based on the types of buildings assessed by the FAST (used when there is a wide range of structure types assessed). Possible sub-section headings include:
        - 6.1 Single-Family Residential Buildings
        - 6.2 Multi-Family Residential Buildings
        - 6.3 Commercial Buildings
        - 6.4 Health Care Facilities

        - 6.5 Schools
        - 6.6 Government Facilities
        - 6.7 Mobile/Manufactured Homes
        - 6.8 Critical Facilities
        - 6.9 Historical Buildings
        - 6.10 Religious Institutions
    - **Layout Option 2:** by geographic location/region surveyed by the FAST (used when there are a limited number of structure types assessed, e.g., mostly residential construction). Subsection headings are provided for each location (6.1, 6.2, etc.)
    - **Layout Option 3:** by hazard class (used when different hazards may be driving the damage). Subsections may be used to differentiate earthquake vs. tsunami damage or damage induced by storm surge vs. wind or wind-borne debris.
    - **Layout Option 4:** by prevailing themes in the failures, e.g., Breached Envelope, Load Path Deficiencies, etc. This is used when there is a clear pattern of failure that the VAST hopes to emphasize.
- Additional headings (Heading 2, Heading 3, etc.) can be used as needed

Observed Performance of Infrastructure

- Numbered as Section 7.0 and included only if non-building structures were assessed by the FAST
- *All VAST members are welcome to contribute to this section. Built out daily based on FAST data.*
- As with Section 6.0, this section provides a summary of the observations from the FAST with the disclaimer that this data is in its raw form and has not undergone any quality assurance; thus assessments are solely based on the opinions of the FAST members
- This section should be built up daily as FAST data becomes available; due to the swift timeline on this report, the report is largely authored based on door to door damage assessments in Fulcrum as other data types are unlikely to be processed in time
- VASTs should use the Daily Summary (see Example) published by the FAST on the dedicated Slack channel as the starting point for this section.
- VASTs should also do a cursory review of the Fulcrum entries from that day to glean additional trends or illustrative photos for this section; VAST members may agree to divide up the Fulcrum records and write up observations for this section based on the entries they reviewed.
- This section makes heavy use of photos from the FAST; occasionally third-party photos or graphics may be included (with appropriate source acknowledgement) to further support the FAST observations.
- The primary heading (7.0) is immediately followed by subsections (7.1, 7.2, etc.), respectively dedicated to the different non-building types assessed by the FAST. Possible sub-section headings include:

    - 7.1 Power Infrastructure
    - 7.2 Lifelines
    - 7.3 Airports
    - 7.4 Bridges
    - 7.5 Roadways
    - 7.6 Port Facilities
- Additional headings (Heading 2, Heading 3, etc.) can be used as needed

Observed Geotechnical Failures

- Numbered as Section 8.0 and included only if geotechnical failures (breached levees, liquefaction, scour, landslides, etc.) were observed by the FAST
- *All VAST members are welcome to contribute to this section. Built out daily based on FAST data.*
- As with Section 6.0, this section provides a summary of the observations from the FAST with the disclaimer that this data is in its raw form and has not undergone any quality assurance; thus assessments are solely based on the opinions of the FAST members
- This section should be built up daily as FAST data becomes available
- VASTs should use the Daily Summary (see Example) published by the FAST on the dedicated Slack channel as the starting point for this section.
- This section makes heavy use of photos from the FAST; occasionally third-party photos or graphics may be included (with appropriate source acknowledgement) to further support the FAST observations.
- The section may be further subdivided by the failure type, as second-level headings (8.1, 8.2, etc).
- Additional headings (Heading 2, Heading 3, etc.) can be used as needed

Observed Evidence of Hazard Intensity

- Numbered as Section 9.0 and included only if visible indicators of hazard intensity were observed by the FAST, e.g.,
    - Tree fall patterns or displaced vehicles in wind events
    - Surface ruptures in earthquakes
    - High water marks or debris patterns in hurricanes or tsunamis.
- *All VAST members are welcome to contribute to this section. Build out daily using FAST data.*
- VASTs should use the Daily Summary (see Example) published by the FAST on the dedicated Slack channel as the starting point for this section. Also see Fulcrum for entries in StEER Hazard Indicator.
- This section makes heavy use of photos from the FAST; occasionally third-party photos or graphics may be included (with appropriate source acknowledgement) to further support the FAST observations.
- Additional headings (Heading 2, Heading 3, etc.) can be used as needed

Recommendations for Further Study

- Begins on a new page.
- Numbered as Section 10.0 and typically is 1-2 pages in length.
- *The VAST Lead is responsible for this section in collaboration with the StEER Leadership. Generally written at the end.*
- This critical section outlines (in a numbered list) the topics/issues StEER feels would benefit from further study based on the observations of the FAST
- These recommendations may inform another round of StEER FASTs or efforts by other groups or individual researchers pursuing RAPID grants from NSF
- Standard language is available in the template and should be further customized as desired
- This section is organized into two phases.
    - It begins with a recap of the extent of the FAST-1 mission and an itemized list of structural engineering topics for future study. These topics may be further grouped/organized by theme. View this section as guidance to NSF for the next round of RAPIDs to follow up on the work of StEER.
    - The next phase will itemize any other areas worthy of study that are beyond the mandate of StEER, i.e., not directly related to structural engineering. As appropriate, signal the partners or organizations best suited to continue these efforts, which may include local researchers and organizations.
- The section closes with a statement about StEER's next steps in response to this event which generally will use one of two options for standard language (provided in the template). The first option is used when StEER is not sending another FAST to the field; the second option is used when StEER is sending another FAST to the field and summarizes that follow up mission.

Appendices

- Begins on a new page.
- *All VAST members are welcome to create an appendix to support a section they authored.*
- Appendices are optional and order by letter, Appendix A, Appendix B, Appendix C, etc.
- Use page breaks so that each appendix, including the first, begins on its own page
- VASTs should include appendices for any supplemental information that may be of interest to the readers but would otherwise be too detailed or cumbersome to include in the main body of the report
- Appendices may be used, but not limited to:
    - large tables of data

References

- Begins on a new page.
- *All VAST members are expected to enter references in this section for any citations in the narrative text.*
- Include, in alphabetical order, all sources of information cited in the narrative report, including websites, media, academic papers
- The template provides formatting examples for each major class of reference.
- If a reference is used only as the source for a figure, it is sufficient to provide a credit in the caption. That source need not be included in this reference list.

APPENDIX A. LIST OF RESOURCES

Table A.1. Other resources commonly engaged by VASTs in report preparation

Resource	Purpose	Usage
Event Briefing	Briefing issued by VAST within days of event with brief summary of impacts from publicly-available data	Set-up by VAST Lead for each event with contributions from a smaller team VAST members
PVRR Template	Report issued by VAST within week of event with detailed summary of impacts from publicly-available data	Set-up by VAST Lead for each event with contributions from a larger team of VAST members
EARR Template	Report issued by VAST within week of FAST mission conclusion with key observations/findings from the field	Set-up by VAST Lead for each event with contributions from VAST members
Product Curation Handbook	Documents the procedure used to curate each StEER product in DesignSafe	VAST Lead references this file when setting up and publishing projects on DesignSafe
Daily Summary	A standard daily report assembled by the FAST for rapid sharing of activities and observations	Submitted by FAST daily (one per team per day) and reviewed by VAST to author EARR
Pre-Deployment Briefing	Collection of relevant information including sampling targets and logistical details	Completed by StEER and shared with FAST prior to deployment; reviewed by VAST to author EARR