

# How-To Guide: Submitting LiDAR Letters of Map Amendment

This How-To Guide describes the process for preparing the documentation needed to submit a LiDAR Letter of Map Amendment (LOMA) in compliance with the Federal Emergency Management Agency's (FEMA) requirements. Use of FEMA's Online LOMC Tool to submit the LOMA is highly recommended, to avoid unnecessary reproduction of hard copy documentation and mailing costs. Register for an account and learn more about the Online LOMC Tool at <https://hazards.fema.gov/femaportal/onlineLOMC/signin>. Training on the use of the Online LOMC Tool for LOMAs is available at <https://www.fema.gov/media-library/assets/documents/30274>. This Guide was created in compliance with Section 5.0 of the MT-1 Technical Guidance document; [https://www.fema.gov/media-library-data/1520966727494-8c05ecc18e141449aa79665641bd9fe3/MT1\\_Technical\\_Guidance\\_Feb\\_2018.pdf](https://www.fema.gov/media-library-data/1520966727494-8c05ecc18e141449aa79665641bd9fe3/MT1_Technical_Guidance_Feb_2018.pdf).

## 01 Required Input Data

The following items are needed to prepare the documentation for a LiDAR LOMA:

1. LOMA Structure data generated using LiDAR LOMA Processing Guide from here: <http://coloradohazardmapping.com/riskMap/lidarLomaPilot>.
2. National Flood Hazard Layer (NFHL) database which can be obtained from the FEMA Map Service Center (MSC) or viewed as a base layer in ArcGIS.
3. Contour dataset associated with the LiDAR used in the LiDAR LOMA Processing Guide. If contours were not provided or are not on a one- or two-foot interval, see the Generating Contours Section in the next section of this Guide.
4. Effective Flood Insurance Study (FIS) for the community, which can be obtained from <https://msc.fema.gov>.
5. Deeds for all the structures identified for the LOMA which should be obtained by contacting your local assessor's office.

## 02 Generating Contours

This section describes how to generate contours if there are none currently available.

1. Open a new ArcGIS session.
2. Import the Digital Elevation Model (DEM) that was used in the LiDAR LOMA Processing Guide.
3. Open ArcToolbox.
4. Expand 3D Analyst Tools, then expand Raster Surface and then double click on the Contour Tool.
5. For Input Raster, select the DEM.
6. For Output Polyline Features, navigate to a working folder and enter a filename such as Stream\_Name\_Contour\_1ft.
7. For Contour Interval, enter 1.
8. Click OK.

## 03 Preparing the Annotated FIS Profile

An annotated copy of the FIS profile(s) for the LiDAR LOMA project area is required to show that the water surface elevations (WSEL) estimated using the GIS data in the Processing Guide are consistent with the FIS. This section describes how to place structure locations on the effective FIS profile so that FEMA's reviewers can verify the 1% Annual Chance WSEL at each structure.

10. Download the latest FIS from FEMA's Map Service Center website at <https://msc.fema.gov>.
11. Within the downloaded PDF, locate the FIS profile for the LiDAR LOMA stream.
12. Extract the relevant profile pages as a new PDF, name accordingly and save in the folder of your choice. This will be the "Submittal Folder" for this Guide.
13. Start a new ArcGIS session.
14. Load the profile baseline (S\_Profil\_BasLn) and cross sections (S\_XS) for the LiDAR LOMA project area from the NFHL data. If S\_Profil\_BasLn is not present, load S\_Wtr\_Ln.
15. Load the final LOMA structures dataset created using the LiDAR LOMA Processing Guide.
16. Add an aerial basemap.
17. Using known locations along the stream that are shown on the FIS profile, such as lettered cross sections and hydraulic structures, use

the Measure Tool  in ArcGIS to measure along the S\_Profil\_BasLn (or S\_Wtr\_Ln) feature to a point perpendicular to each of the LOMA structures. **Note:** This can also be accomplished using paper FIRMs and a scale bar if available.

18. Using distances from the previous step, measure along the FIS profile to locate the LOMA structures. Use the commenting tools in Adobe Acrobat Reader to place a box on the 1% Annual Chance Flood profile line at each structure location. Label the locations using the street address for the structure. Use of a leader to connect the labels to the structure boxes is recommended. **Note:** This can also be annotated on a printed version and scanned. For an example determination, see: [https://www.dnr.state.mn.us/waters/watermgmt\\_section/floodplan/bfe.html](https://www.dnr.state.mn.us/waters/watermgmt_section/floodplan/bfe.html).
19. Repeat the process for all LOMA structures.
20. Verify that the 1% Annual Chance WSEL shown on the FIS profile in each structure location is consistent with the estimated WSEL for that structure developed using the LiDAR LOMA Processing Guide.
21. Close the unnamed ArcGIS session.

## 04 Gather Property Deeds

An unofficial copy of the Deed of Sale must be submitted for each structure included in the LiDAR LOMA to verify the legal address of the property. Copies of deeds are typically available through the community's website, usually under the office of the Assessor or Clerk.

Download the deed for each structure, name accordingly, and save in the Submittal Folder. Saving the deeds with a filename based on structure address is recommended.

If submitting a LiDAR LOMA for manufactured homes located in a manufactured home park, the deed of sale is required for the parcels encompassing the entire park. Although not required, providing the vehicle title for each individual manufactured home will assist the FEMA reviewer in verifying the address of each individual home. Creating a map showing the locations of each mobile home as it relates to the overall parcel is recommended.

## 05 LiDAR Data

The LiDAR data used to evaluate the structures in the LiDAR LOMA project area must be submitted. The data must be from a Federal, State, or local agency and must ALSO be available at a freely-accessible website. Include the following information in the submittal folder:

1. The LiDAR LAS files that cover the project area
2. The LiDAR documentation:
  - a. Accuracy Report
  - b. Metadata
  - c. Any other files that provide information to verify that the LiDAR data meets the United States Geological Survey's Quality Level 3<sup>1</sup> specifications.

<sup>1</sup> The USGS' LiDAR quality levels are defined in *Lidar Base Specification, Version 1.3*, February 2018, which can be downloaded here: <https://pubs.er.usgs.gov/publication/tm11B4>

## 06 Creating a FIRMette

A FIRMette, or excerpt from the Flood Insurance Rate Map (FIRM), must be submitted for each structure included in the LiDAR LOMA submittal. Follow these steps to generate a FIRMette on FEMA's NFHL Viewer website:

1. Open the NFHL Viewer: <https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=b0adb51996444d4879338b5529aa9cd>
2. Click OK on the main screen pop up.
3. In the "Find address or place" search bar, enter one of the LOMA structure addresses and click the search button.
4. Once the map viewer zooms to location, click the  button on the "Print Flood Map" window and place a pin over the LOMA structure location.
5. Maintain the defaulting settings of FIRMETTE for Size and PDF for File Format.
6. Click Run. The extraction process may take several minutes; once it's finished, the Output tab of the Print Flood Map window will show a link.
7. Click the link to retrieve the FIRMette PDF which will open in your browser window.
8. Once the PDF is loaded, click the  button on the Adobe Acrobat Reader popup context menu and save the PDF to the Submittal Folder. Saving the PDF with a filename based on the structure address is recommended.
9. Repeat this process to create a FIRMette for each LOMA structure.

## 07 Study Memo

Although not required, providing a memorandum describing LiDAR LOMA submittal and providing details on the process used to develop the data is highly recommended. The memorandum should be used to provide any project specific information that is unique to the project area, such as LOMA structures that include manufactured homes and vehicle titles being submitted or that a discrepancy was found in distances. For an example memo, see the Niver Creek Tributary M submittal here:

<http://coloradohazardmapping.com/riskMap/lidarLomaPilot>.

## 08 Creating LOMA Exhibits

An individual exhibit must be submitted for each LOMA structure included in the LiDAR LOMA submittal. A map template that can be used to generate these maps can be downloaded from <http://coloradohazardmapping.com/riskMap/lidarLomaPilot>. This section describes how to use the map template to generate the required maps for your LiDAR LOMA project area.

1. Download the Esri Data Driven Pages Map template from <http://coloradohazardmapping.com/riskMap/lidarLomaPilot>.
2. Open the template in ArcGIS.
3. The template uses the 'Data Driven Pages' function of ArcGIS. Activate the 'Data Drive Pages' toolbar, if needed.
4. The template is pre-loaded with the NFHL data, as well as an aerial image basemap for the Layers dataframe and a streets basemap for Locator Map dataframe. If these datasets do not pre-load, use the 'Add Data from ArcGIS Online' and 'Add Basemap' tools in the "Add Data" dropdown to add them.
5. The template is pre-loaded with a dataset labeled Contours. Right click on the dataset in the Table of Contents (TOC) pane, select Data, then select Repair Data Source. Navigate to and select the contour dataset associated with the LiDAR data for the project area. If one- or two-foot contours were not provided with the LiDAR, see the Generate Contours Section at the beginning of this Guide.
6. Right click on the Structs for LOMA dataset in the TOC pane, select Data, then select Repair Data Source. Navigate to and select the LOMA structures file created with the LiDAR LOMA Processing Guide.
7. To assist the FEMA reviewer, it is helpful to identify the contour line nearest to the Lowest Adjacent Grade (LAG) elevation and emphasize it on the map. For this Guide, this contour is the "LAG Contour." The following steps describe how to identify and depict the LAG Contour:
  - a. Start a new ArcGIS session.
  - b. Using the "Add Data" tool, load the Structures for LOMA and the Contours datasets.
  - c. Right click the Contours dataset in the TOC pane, select Open Attribute Table, and use the Add Field tool to add a field named "Address" with Type = "Text" and with Length = 250.
  - d. Start editing the Contours dataset.
  - e. At the top of the TOC Pane, select the "List by Selection" button . Right click the LAG Contour layer and select "Make This the Only Selectable Layer".
  - f. For one structure at a time, use the Select Features Tool  to select the contour line nearest in elevation to the LAG elevation identified for the structure from the LiDAR LOMA Processing Guide. Choose the line nearest in elevation (rounded up) to the LAG without crossing the structure itself.
  - g. In the Contours Attribute Table, navigate to the selected contour and enter the structure's address into the Address field.
  - h. If the same contour applies to more than one structure, right click the record in the Attribute Table, and choose "Copy Selected". Enter the second structure's address into the Address field on the copied record.
  - i. Repeat Steps f-h until a LAG Contour has been identified for each of the LOMA Structures.
  - j. Save edits and stop editing the Contours dataset.
  - k. Close the unnamed ArcGIS session. Return to the Map Template session.
  - l. The Map Template is pre-loaded with a dataset called LAG Contour. You'll need to use the steps described above to Repair Data Source to link the LAG Contour dataset you've just created to the pre-loaded file.
8. Verify the locator map is displayed and shows a red box over the general area of the first structure listed in the LOMA Structures attribute table.
9. To export all maps
  - a. Click the File menu; select Export Map.
  - b. In the pop-up window, navigate to the Submittal Folder. Click the Create New Folder button  and name the folder "LOMA Maps".
  - c. In the 'Save as Type' dropdown, select PDF.
  - d. Click Options.
  - e. Click the Pages tab and select All.
  - f. In the 'Export Pages As' dropdown, select Multiple PDF Files (page names).
  - g. Click Save.
10. Using File Explorer, navigate to the LOMA Maps folder. Open each map and verify that the Address, LAG Contour, Structure footprint correctly shown for each LOMA structure.

## 09 MT-1 Elevation Form

Even with using the Online LOMC Tool, a copy of the Elevation Form from the MT-1 forms set is needed to document the legal descriptions and structure elevations when a LOMA is requested for multiple structures.

1. Download the MT-1 Elevation Forms packet from: [https://www.fema.gov/media-library-data/1481645177759-45fab05c02f887cb6b93c7aab0241c0a/mt\\_1\\_form\\_rev\\_04\\_2013\\_fixed.pdf](https://www.fema.gov/media-library-data/1481645177759-45fab05c02f887cb6b93c7aab0241c0a/mt_1_form_rev_04_2013_fixed.pdf)
2. This is a fillable PDF. Skip to Form 2 Elevation Form.
3. At Item 1, enter the National Flood Insurance Program Community Number, which can be found in the title block of the FIRMettes, and at Property Name or Address, enter 'See Table'.
4. At Item 2, check the box for existing.
5. At Item 3, select crawl space or slab on grade, or both if applicable to the LOMA structures. Recall that structures for LiDAR LOMAs cannot have a basement (See LiDAR LOMA Processing Guide.)
6. At Item 4, select no.
7. At Item 5, select the vertical datum that matches the LiDAR. This is typically NAVD88 for new lidar sets.
8. Leave Item 6 blank.
9. In the Table enter address, parcel information, lowest adjacent grade, base flood elevation (BFE) and BFE source (NFHL) for the first two LOMA structures.
10. At Certifiers Name, enter 'See Memo'.
11. On the next page, enter addresses for the remaining LOMA structures. for the LOMA submittal
12. Save PDF into the Submittal Folder. Only save the pages you've entered data into. All other information will be provided in the Online LOMC Tool.

*You are now ready to generate your Amendment request in the Online LOMC Tool. See more information about the tool in the Introduction to this Guide. If you are not a community representative, make sure to coordinate with the community's Floodplain Administrator prior to submission.*

### Acronyms

BFE	Base Flood Elevation
DEM	Digital Elevation Model
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
GIS	Geographic Information Systems
LAG	Lowest Adjacent Grade
LOMA	Letter of Map Amendment
LOMC	Letter of Map Change
MSC	Map Service Center
NFHL	National Flood Hazard Layer
TOC	Table of Contents
USGS	United States Geological Survey
WSEL	Water surface elevation

### Questions? Comments?

For any questions or comments on this How-To Guide please contact:  
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For assistance with LiDAR LOMA within the Mile High Flood District, please contact:  
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### Disclaimer

*This analysis in this How-To Guide was prepared using ESRI ArcGIS version 10.2.2 with the 3D Analyst and Spatial Analyst extensions. Using newer or older versions or different GIS software, such as QGIS, could require use of different tools. Additionally, this Guide assumes the user has a basic knowledge of ArcGIS and the use of the ArcToolbox to conduct spatial analyses. No warranties are made regarding the likelihood that a LOMA submitted based on data processed using this method will result in an approved LOMA. Eligibility for a LOMA does not preclude a property from being at risk of flooding. It is highly recommended that property owners maintain flood insurance even if a LOMA is granted.*