

## **Data Management Plan**

**Name of Contractor: University of Wyoming**

**Name of the Project: Automating the Implementation of the Updated Grade Severity Rating System (GSRS) for Wyoming Mountain Passes**

**Project Duration: 24 Months    Start Date: May, 2020                      End Date: May, 2022**

**DMP Version: Version 1**

**Date Amended, if any:**

**Name of all authors, and ORCID number for each: Milhan Moomen (0000-0001-8324-7540), Khaled Ksaibati (0000-0002-9241-1792)**

**WYDOT Project Number:**

- **Name of all peer reviewed publications, which have been generated using data from this project to include:**
  
- **Any Digital Object Identifier (DOI), assigned to any peer reviewed publication or data generated by this project:**
  
- **URLs for all peer reviewed publications which have been generated using data from this project:**
  
- **Dataset URL, if available:**

What constitutes data will be determined by the Principle Investigator, Project Champion, and the Research Manager. In general, your plan should address final research data. This includes recorded factual material commonly accepted in the scientific community as necessary to validate research findings. Final research data do not include laboratory notebooks, partial datasets, preliminary analyses, drafts of scientific papers, plans for future research, peer review reports, communications with colleagues, or physical objects, such as gels or laboratory specimens. As part of your research, you may also generate unique data, which are data that cannot be readily replicated. Your DMP should also address unique data that may arise from your research.

WYDOT expects the timely release and sharing of data to be no later than the acceptance for publication of the main findings from the final dataset, unless the Principle Investigator will be embargoing the data. In such a case, the data cannot be embargoed for a period longer than 12 months. See Chapter 11 for information on retention and embargos.

## 1. Introduction

The purpose of this research project is to:

To develop procedures and a program to automate the implementation of the Grade Severity Rating System (GSRS) for Wyoming mountain passes.

## 2. Definitions

- a. Code or scripts include code used in the collection, manipulation, processing, analysis or visualization of data, but may also include software developed for other purposes.
- b. Copyright is a set of legal rights extended to copyright owners that govern such activities as reproducing, distributing, adapting, or exhibiting original works fixed in tangible forms.
- c. Data means the recorded factual material commonly accepted in the scientific community as necessary to validate research findings, but not any of the following: preliminary analyses, drafts of scientific papers, plans for future research, peer reviews, communications with colleagues. Recorded material excludes physical objects (e.g. laboratory samples). Research data also does not include trade secrets, commercial information, materials necessary to be held confidential; and personnel and medical information and similar information the disclosure of which would constitute a clearly unwarranted invasion of personal privacy.
- d. Data Archive is a site where machine-readable materials are stored, preserved or possibly redistributed to individuals interested in the materials.
- e. Data Management Plan is a document that specifies your plans for managing your data and files for a research project.
- f. Dataset means collection of data.
- g. Metadata refers to structured data about data that helps define administrative, technical, or structural characteristics of the digital content.

## 3. Data Types and Storage

The types of data and/or datasets generated and/or used in this project include ...

Field data will be collected from tests. This will be temperature data measured using a hand held sensor. Weight and speed readings will also be recorded. The data readings will be recorded on data sheets which will then be transferred to Microsoft excel files after the data collection process.

The data documentation will have information describing the data collection procedure, data processing, what is contained within the dataset, time of collection, persons involved in the collection and data quality assurance processes. The data will be reproducible. Field data may be collected again if the data becomes unusable.

The combined size of the data is expected to be a maximum of a few gigabytes. The data is not expected to change over the project period. Microsoft excel will be used to process and visualize the data. Standard software programs including R, Python and SAS will be utilized for statistical analysis. Pre-existing data collected from phase 1 of the study will be used for comparison purposes. The data will be stored on computer warehouses within the University of Wyoming's servers. The principal investigators will also have copies of the data.

Provide a description of the data that you will be gathering in the course of your project. You should address the nature, scope, and scale of the data that will be collected. Describe the characteristics of the data, their relationship to other data, and provide sufficient detail so that reviewers will understand any disclosure risks that may apply. Discuss value of the data over the long-term. Please provide the name of all repositories where the data will be housed during the lifetime of the project.

#### Checklist

- What type of data will be produced?
- How will data be collected? In what formats?
- How will the data collection be documented?
- Will it be reproducible? What would happen if it got lost or became unusable later?
- How much data will it be, and at what growth rate? How often will it change?
- Are there tools or software needed to create/process/visualize the data?
- Will you use pre-existing data? From where?
- Storage and backup strategy?

#### **4. Data Organization, Documentation, and Metadata**

The plan for organizing, documenting, and using descriptive metadata to assure quality control and reproducibility of these data include ...

The data formats will be in Microsoft excel which can be read easily by different software packages. The data will be prepared and stored in accordance with the SQL standard. A data directory will be generated that will serve as a link to the master database. This directory will be based on a standard query structure. The project number will be adopted as the format for the file naming convention. Changes to files will be tracked by appending a sequence of numbers or letters to the project number. Data will be shared by providing access to the principal investigator and other students working on the project.

Data validation will be done by applying identifiable rules that will ensure that the data is accurate. Data that does not meet minimum levels of acceptable quality will be flagged and removed from the database.

Your DMP should describe the anticipated formats that your data and related files will use. To the maximum extent practicable, and in accordance with generally accepted practices in your field, your DMP should address how you will use platform-independent and non-proprietary formats to ensure maximum utility of the data in the future. If you are unable to use platform-independent and non-proprietary formats, you should specify the standards and formats that will be used and the rationale for using those standards and formats.

**NOTE: Attach the Metadata Schema, URL for data generated, and all peer reviewed publications from this project.**

#### Checklist

- What standards will be used for documentation and metadata?
- Is there good project and data documentation format/standard?
- What directory and file naming convention will be used?
- What project and data identifiers will be assigned?
- Is there a community standard for metadata sharing/integration?

### **5. Data and/or Database Access and Intellectual Property**

What access and ownership concerns are there...

No intellectual property issues are expected to exist with the data to be collected for this project. This study does not have individuals as research participants. Data collected from the field tests will be owned by the Wyoming Department of Transportation (WYDOT). WYDOT will be responsible for allowing access to the data for processing and modification, and for access restrictions. Access to the data will involve seeking authorization from WYDOT who may then allow access to a part or the whole dataset. There will be no embargo periods to uphold.

Protecting research participants and guarding against the disclosure of identities and/or confidential business information is an essential norm in scientific research. Your DMP should address these issues and outline the efforts you will take to provide informed consent statements to participants, the steps you will take to protect privacy and confidentiality prior to archiving your data, and any additional concerns. If necessary, describe any division of responsibilities for stewarding and protecting the data among Principal Investigators.

If you will not be able to identify the data in a manner that protects privacy and confidentiality while maintaining the utility of the dataset, you should describe the necessary restrictions on access and use. In general, in matters of human subject research, your DMP should describe how your informed consent forms will permit sharing with the research community and whether additional steps, such as an Institutional Review Board (IRB), may be used to protect privacy and confidentiality.

#### Checklist

- What steps will be taken to protect privacy, security, confidentiality, intellectual property or other rights?
- Does your data have any access concerns? Describe the process someone would take to access your data.
- Who controls it (e.g., PI, student, lab, University, funder) ?
- Any special privacy or security requirements (e.g., personal data, high-security data) ?
- Any embargo periods to uphold?

## 6. Data Sharing and Reuse

The data will be released for sharing in the following way ...

Property rights for the data created will be held by WYDOT. The data will be collected and stored in a manner that allows for the efficient sharing of the data with other interested parties. The data will be submitted to WYDOT after the project and may be shared through the WYDOT Data Warehouse. Interested parties will seek permission for access to the data from WYDOT. The data will be available for access and modification using standard data and statistical software such as Microsoft Excel and SAS.

Describe who will hold the intellectual property rights for the data created by your project. Describe whether you will transfer those rights to a data archive, if appropriate. Identify whether any copyrights apply to the data, as might be the case when using copyrighted instruments. If you will be enforcing terms of use or a requirement for data citation through a license, indicate as

much in your DMP. Describe any other legal requirements that might need to be addressed.

#### Checklist

- If you allow others to reuse your data, how will the data be discovered and, shared?
- Any sharing requirements (e.g., funder data sharing policy) ?
- Audience for reuse? Who will use it now? Who will use it later?
- When will I publish it and where?
- Tools/software needed to work with data?

## 7. Data Preservation and Archiving

The data will be preserved and archived in the following ways ...

After the completion of the project, the data may be archived by WYDOT in the National Transportation Library repository as recommended by the US Department of Transportation public access plan.

Describe how you intend to archive your data and why you have chosen that particular option. You may select from a variety of options including, but not limited to:

- Use of an institutional repository.
- Use of an archive or other community-accepted data storage facility.
- Self-dissemination.

You must describe the dataset that is being archived with a minimum amount of metadata that ensures its discoverability. Whatever archive option you choose, that archive must support the capture and provision of the National Transportation Library metadata requirements. In addition, the archive you choose must support the creation and maintenance of persistent identifiers and must provide for maintenance of those identifiers throughout the preservation lifecycle of the data. Your plan should address how your archiving and preservation choices meet these requirements.

#### Checklist

- How will the data be archived for preservation and long-term access?
- How long should it be retained (e.g., 3-5 years, 10-20 years, permanently) ?
- What file formats? Are they long-lived?
- Are there data archives that my data is appropriate for (subject-based? Or institutional)?

- Who will maintain my data for the long-term?

**NOTE:**

Researchers evaluating data repositories as the option(s) for storing and preserving their data should examine evidence demonstrating that the repository:

- a. Promotes an explicit mission of digital data archiving.
- b. Ensures compliance with legal regulations, and maintains all applicable licenses covering data access and use, including, if applicable, mechanisms to protect privacy rights and maintain the confidentiality of respondents.
- c. Has a documented plan for long-term preservation of its holdings.
- d. Applies documented processes and procedures in managing data storage.
- e. Performs archiving according to explicit workflows across the data life cycle.
- f. Enables the users to discover and use the data, and refer to them in a persistent way through proper citation.
- g. Enables reuse of data, ensuring appropriate formats and application of metadata.
- h. Ensures the integrity and authenticity of the data.
- i. Is adequately funded and staffed, and has a system of governance in place to support its mission.
- j. Possesses a technical infrastructure that explicitly supports the tasks and functions described in internationally accepted archival standards like Open Archival Information System (OAIS).

**NOTE: This DMP is created as a derivative from the DMP belonging to the University of Minnesota and can be found at <https://www.lib.umn.edu/datamanagement/DMP>**

## Metadata Schema

Elements	Example of what is expected for each element
<b>Title<sup>1</sup></b>	Human-readable name of the asset. Should be in plain English and include sufficient detail to facilitate search and discovery. A name given to the publication or data element. All substitute or alternative titles must have a different Metadata Transmittal Schema.
<b>Creator/contact point</b>	An entity/person(s) primarily responsible for making the content of the resource. Contact person's name, ORCID number, and email for the asset.
<b>Publication Date(s)</b>	The date associated with the final report/dataset.
<b>Description/Abstract</b>	Human-readable description (e.g., an abstract) with sufficient detail to enable a user to quickly understand whether the asset is of interest. May include abstract, table of contents, reference to a graphical representation of content or a free text account of the content.
<b>Subject and Keywords</b>	The topic of the content of the resource. Tags (or keywords) help users discover your dataset; please include terms that would be used by technical and non-technical users.
<b>Identifier<sup>2</sup> and/or source</b>	A unique identifier for the dataset/publication. Examples: URI, URL, DOI, ISBN, ISSN.
<b>Collection and Related Documents</b>	If there is a secondary dataset, cite source. The collection of which the dataset is a subset should be listed. Include all identifiers and/or sources.
<b>Edition</b>	Most recent date on which the dataset was changed, updated or modified.
<b>Related Documents</b>	Related documents such as technical information about a dataset, developer documentation, etc.
<b>Coverage</b>	Spatial location, temporal period, jurisdiction.
<b>Language</b>	The language of the dataset/publication.

<sup>1</sup> To include alternate title; conference title; and journal title, if they are different.

<sup>2</sup> To include record numbers; report numbers; NTIS number; TRIS Accession Number; OCLC Number; ISBN; ISSN; contract number; and DOI if available.



Elements	Example of what is expected for each element
<b>Publisher/Distributor</b>	FHWA and Wyoming Department of Transportation List all other publishing companies that this publication has been sent to.
<b>Funding agency</b>	FHWA and Wyoming Department of Transportation
<b>Access Restrictions</b>	The degree to which this dataset could be made publicly available, <i>regardless of whether it has been made available</i> . Choices: public (Data asset is or could be made publicly available to all without restrictions), restricted public (Data asset is available under certain use restrictions), or non-public (Data asset is not available to members of the public).
<b>Intellectual Property and Other Rights</b>	This may include information regarding access or restrictions based on privacy, security, or other policies. This should also serve as an explanation for the selected “accessLevel” including instructions for how to access a restricted file, if applicable, or explanation for why a “non-public” or “restricted public” data asset is not “public,” if applicable.
<b>License</b>	The license or non-license (i.e. Public Domain) status with which the dataset or API has been published.
<b>Code and software needs</b>	List all code specific information. Is there specific software needed to run the database or data.
<b>Format</b>	The machine-readable file format. May include media type or dimensions. Used to determine the software, hardware or other equipment needed to display or operate the resources.
<b>Choice of Repository</b>	If you have a preference, list the repository where you will archive your data/datasets.

**NOTE: Each separate report, dataset, collection, existing collection, and software developed must have its own table. All fields in this Schema must be completed at the time of the final report.**

**NOTE: This Metadata Schema is created as a derivative from the Common Core required fields which can be found at <https://project-open-data.cio.gov/schema/>.**