CITY OF GEARHART

Staff Report

For Planning Commission Discussion 09/12/2019

Subject - Hazard Analysis Methodology

Synopsis:
A natural hazards mitigation plan (NHMP) identifies hazards, vulnerabilities, and risks facing a local, state, or tribal government, and prioritizes actions to reduce the risks. An NHMP has two core parts: a risk assessment and a mitigation strategy.

Hazard analysis is part of the Gearhart hazard mitigation plan. Conducting the hazard analysis described in the attached document is a useful step in planning for hazard mitigation, response, and recovery.

The methodology produces scores for local natural hazards that range from 24 (lowest) to 240 (highest). The City of Gearhart staff with the help of the Oregon Department of Land Conservation and Development updated our hazard analysis matrix worksheet this spring.

The next step in adopting the matrix is to allow the public to comment on our hazard matrix in October during the planning commission meeting. City staff is bringing the matrix to the September planning commission meeting to familiarize the members with the process and draft matrix.

Chad Sweet will be on hand to go through the process, discuss the matrix, and answer any questions you may have. This is simply a discussion with the planning commission and is not a hearing.

Attachments:
- Hazard Analysis Methodology.
- Gearhart Draft analysis matrix worksheet (handwritten).

Recommendation:
Staff recommends the planning commission:
1) Read about the analysis methodology prior to the meeting (documents attached);
2) Staff will answer questions about the process and matrix;
3) Propose changes to the matrix.

Financial Analysis:
None at this time

Respectfully Submitted,
Chad

Clatsop County MJNHMP 2020 Plan Update
Adaptation of: Oregon Office of Emergency Management (OEM)
HAZARD ANALYSIS METHODOLOGY

BACKGROUND AND OVERVIEW

This hazard analysis methodology was first developed by FEMA circa 1983, and gradually refined by OEM over the years. During 1984, the predecessor agency to OEM (Emergency Management Division) conducted workshops around the State of Oregon that resulted in all of Oregon's 36 counties (and many cities and districts) producing an analysis using this methodology.

The methodology produces scores that range from 24 (lowest possible) to 240 (highest possible), one order of magnitude from lowest to highest. Vulnerability and probability are the two key components of the methodology. Vulnerability examines both typical and maximum credible events, and probability endeavors to reflect how physical changes in the jurisdiction and scientific research modify the historical record for each hazard. Vulnerability accounts for approximately 60% of the total score, and probability approximately 40%.

For local governments, conducting the hazard analysis described in this document is a useful early step in planning for hazard mitigation, response, and recovery. This method provides the jurisdiction with a sense of hazard priorities, or relative risk. It doesn't predict the occurrence of a particular hazard, but it does "quantify" the risk of one hazard compared with another. By doing this analysis, planning can first be focused where the risk is greatest.

Among other things, this hazard analysis can:

- Help establish priorities for planning, capability development, and hazard mitigation;
- Serve as a tool in the identification of hazard mitigation measures;
- One tool in conducting a hazard-based needs analysis;
- Serve to educate the public and public officials about hazards and vulnerabilities; and
- Help communities make objective judgments about acceptable riskFor OEM and other state and regional organizations such as the Oregon Department of Land Conservation & Development, this analysis allows comparison of the same hazard across various local jurisdictions. Each local hazard analysis produced using this methodology is ultimately comprised of two main pieces: a hazard analysis matrix (table) and a narrative.

POSSIBLE HAZARDS TO CONSIDER

NATURAL HAZARDS

In accordance with Statewide Planning Goal 7, jurisdictions must examine the following hazards when they overlap with their legal boundary: earthquakes and related hazards, wildfires, floods (coastal and riverine), landslides and debris flows, coastal erosion, and tsunamis. Jurisdictions should also develop scores, where applicable, for coastal hazards other than erosion, for drought, dust storms, windstorms, winter storms, and for volcanic hazards. With respect to volcanic hazards, score direct hazards such as blast and lahar separately from secondary hazards such as ashfall.

COMPLETING THE HAZARD ANALYSIS MATRIX

The Hazard Analysis Matrix Worksheet on page 5 is provided for you and your team to complete. You would probably benefit by transferring this worksheet onto a large format, such as a flipchart, dry erase board, etc., to assist in facilitating your meeting.

SEVERITY RATING: In this analysis, *severity ratings* are applied to the four categories of: history, vulnerability, maximum threat (worst-case scenario), and probability. Your jurisdiction can choose to score low-medium-high (choose 1 rating) and assign one number to each category or provide nuance by choosing one of the numbers in the range, based on the ranges below:

LOW = 1 point (or a number between 1-3)
MEDIUM = 5 points (or a number between 4-7)
HIGH = 10 points (or a number between 8-10)

WEIGHT FACTORS: *Weight factors* also apply to each of the four categories as shown below.

HISTORY (weight factor for category = **2**) History is the record of previous occurrences. Events to include in assessing history of a hazard in your jurisdiction are events for which the following types of activities were required:

- The EOC or alternate EOC was activated;
- Three or more EOP functions were implemented;
- An extraordinary multi-jurisdictional response occurred; and/or
- A "Local Emergency" was declared.

LOW – 1 point (or a number between 1-3) based on 0 - 1 event past 100 years.
MEDIUM – 5 points (or a number between 4-7) based on 2 - 3 events past 100 years.
HIGH – 10 points (or a number between 8-10) based on 4 + events past 100 years.

VULNERABILITY (weight factor for category = **5**) Vulnerability is the percentage of population and property likely to be affected under an "average" occurrence of the hazard.

LOW – 1 point (or a number between 1-3) based on < 1% affected.
MEDIUM – 5 points (or a between 4-7) based on 1 - 10% affected.
HIGH – 10 points (or a number between 8-10) based on > 10% affected.

MAXIMUM THREAT (weight factor for category = **10**) Maximum threat is the highest percentage of population and property that could be impacted under a worst-case scenario.

LOW – 1 point (or a number between 1-3) based on < 5% affected.
MEDIUM – 5 points (or a between 4-7) based on 5 - 25% affected.
HIGH – 10 points (or a number between 8-10) based on > 25% affected.

PROBABILITY (weight factor for category = **7**) Probability is the likelihood of future occurrence within a specified period of time.

LOW – 1 point (or between 1-3) based one incident likely within 75 to 100 years.
MEDIUM – 5 points (or between 4-7) based on one incident likely within 35 to 75 years.
HIGH – 10 points (or between 8-10) based on one incident likely within 10 to 35 years.

By multiplying the *weight factors* associated with the categories by the *severity ratings*, we can arrive at a subscore for history, vulnerability, maximum threat, and probability for each hazard. Adding the subscores will produce a total score for each hazard.

For example, look at "landslide" on the "Sample Hazard Analysis Matrix" shown on page 6. The history of landslides is high in the sample jurisdiction. History has a weight factor of two (2), and in this case, high is scored with ten (10) points for the severity rating. 2 X 10 = subscore of 20. The vulnerability of the sample jurisdiction is medium. However, a landslide normally would not affect much more than 1% of the people and property in the jurisdiction. Vulnerability has a factor weight of five (5) and this team decided on four (4) points for the severity rating. 5 X 4 = subscore of 20. After figuring maximum threat and probability, the total score for landslides is 133.

The total score isn't as important as how it compares with the total scores for other hazards the jurisdiction faces. By comparing scores, the jurisdiction can determine priorities: Which hazards should the jurisdiction be most concerned about? Which ones less so?

COMPLETING THE NARRATIVE

Your hazard analysis should begin with a description of the local jurisdiction (sometimes called a community profile). These often include an overview of key demographic information, and sometimes include climate data or a climate summary.

In addition to the matrix used to score the hazards, each local hazard analysis should include a narrative that describes how these hazards affect that particular local jurisdiction, especially critical facilities, key infrastructure, and the most important facilities of the jurisdiction's economic base.

One should provide this narrative minimally on those hazards receiving the highest total scores in the jurisdiction; for example, you may include history, areas of vulnerability, areas of planned or current mitigation measures, maps and displays, or any other facts or data that may be relevant.

Some jurisdictions include a brief section on hazards that were considered, but not scored (or scored, but not included in the written hazard analysis), offering the rationale for not scoring or not writing narrative about certain minor hazards.

OTHER METHODOLOGIES

There are many other ways of assessing risk. The OEM Hazard Analysis Methodology should be considered simply one tool in the risk assessment "tool bag." This methodology, in fact, is a "big picture" tool that will often lead to more detailed vulnerability assessments and risk analyses. Among the other prominent tools are various Geographic Information Systems (GIS), FEMA's Hazards U.S. (HAZUS), and Oregon Department of Forestry's (wildfire) "Communities at Risk Assessment." This is only a partial list of the many ways of evaluating risk.

The OEM Hazard Analysis Methodology can and should be one tool used in the development or revision of risk assessments required as part of the local natural hazard mitigation planning process under 44 CFR 201.6(c)(2), which have as their bottom line using best available data.

SAMPLE HAZARD ANALYSIS MATRIX

Hazards		History WF = 2	Vulnerability WF = 5	Maximum Threat WF = 10	Probability WF = 7	Total Score
FLOOD	WF X SR	2 X 10	5 X 9	10 X 7	7 X 10	
	Subscore	= 20	= 45	= 70	= 70	**205**
WILDFIRE	WF X SR	2 X 10	5 X 8	10 X 5	7 X 10	
	Subscore	= 20	= 40	= 50	= 70	**180**
EARTHQUAKE	WF X SR	2 X 2	5 X 10	10 X 10	7 X 3	
	Subscore	= 4	= 50	= 100	= 21	**175**
WINDSTORM	WF X SR	2 X 8	5 X 6	10 X 6	7 X 8	
	Subscore	= 16	= 30	= 60	= 56	**162**
HAZMAT	WF X SR	2 X 7	5 X 5	10 X 6	7 X 6	
	Subscore	= 14	= 25	= 60	= 42	**141**
LANDSLIDE	WF X SR	2 X 10	5 X 4	10 X 3	7 X 9	
	Subscore	= 20	= 20	= 30	= 63	**133**
DAM FAILURE	WF X SR	2 X 1	5 X 5	10 X 2	7 X 2	
	Subscore	= 2	= 25	= 20	= 14	**61**

SEVERITY RATINGS (to be applied to the four categories)

LOW = 1 - 3 points
MEDIUM = 4 - 7 points
HIGH = 8 - 10 points

WF = weight factor
SR = severity rating

The following categories are used in developing the scores for this analysis:

HISTORY (record of previous occurrences)

LOW 0 - 1 event per 100 years
MEDIUM 2 - 3 events per 100 years
HIGH 4 + events per 100 years

VULNERABILITY (percentage of population and property likely to be affected)

LOW < 1% affected
MEDIUM 1 - 10% affected
HIGH > 10% affected

MAX. THREAT (% of population and property impacted under a worst-case scenario)

LOW < 5% affected
MEDIUM 5 - 25% affected
HIGH > 25% affected

PROBABILITY (the likelihood of occurrence within a specified period of time)

LOW one incident likely within a 75 to 100 year period
MEDIUM one incident likely within a 35 to 75 year period
HIGH one incident likely within a 10 to 35 year period

WF = weight factor
SR = severity rating

HAZARD ANALYSIS MATRIX WORKSHEET

JURISDICTION: _____ **DATE:** _____ **PARTICIPANTS:** (SIGN IN ON REVERSE)

Hazards	History WF = 2	Vulnerability WF = 5	Maximum Threat WF = 10	Probability WF = 7	Total Score
WINDSTORMS & SEVERE WINTER STORMS 2007	L M (H) 2 X 10 = 20	L M (H) 5 X 10 = 50	L M (H) 10 X 10 = 100	L M (H) 7 X 10 = 70	(*) 240 1
EARTHQUAKE CSZ	(L) M H 2 X 1 = 2	L M (H) 5 X 10 = 50	L M (H) 10 X 10 = 100	L (M) H 7 X 5 = 35	187 2
~~Distant~~ **TSUNAMI** L1 (local)	(L) (M) H 2 X 5/1 = 10 12	L (M) (H) 5 X 5/10 = 25 50	L (M) (H) 10 X 5/10 = 50 100	L (M) H 7 X 5/5 = 35 35	120 187 3
FLOOD 2018 1776 #54M (3) claims (106 SF) #16K	(L) M H 2 X 1 = 2	(L) M H 5 X 1 = 5	(L) M H 10 X 1 = 10	~~(L)~~ (M) H 7 X 5 = 35	52 7
LANDSLIDE (not rains)	(L) M H 2 X 1 = 2	L (M) H 5 X 5 = 25	(L) M H 10 X 1 = 10	L (M) H 7 X 5 = 35	72 5
WILDFIRE 20-50A	L M (H) 2 X 10 = 20	L (M) H 5 X 5 = 25	L (M) H 10 X 5 = 50	L M (H) 7 X 10 = 70	165 (*) 4
COASTAL EROSION	(L) M H 2 X 1 = 2	(L) M H 5 X 1 = 5	(L) M H 10 X 1 = 10	(L) M H 7 X 1 = 7	24 8
VOLCANIC ASH FALL	(L) M H 2 X 1 = 2	L M (H) 5 X 10 = 50	(L) (M) (H) 10 X ~~5~~ 1 = ~~10~~ 10	(L) M H 7 X 1 = 7	69 ~~104~~ 6
May 2019 **Drought**	L 1 2	L 1 5	L 1 10	~~MED~~ L 1 7	24 9