



November 9, 2018

Mr. Sean D. Reich, P.E., PMP
City Engineer
City of Boerne
Public Works Department
400 E. Blanco
Boerne, TX 78006

Subject: City of Boerne NOAA Atlas 14 Assessment Memorandum

Mr. Reich:

The National Oceanic and Atmospheric Administration Atlas 14, *Precipitation-Frequency Atlas of the United States* (NOAA Atlas 14) volumes refers to the updated precipitation frequency estimates for various parts of the United States and affiliated territories. The NOAA Atlas 14 precipitation values were updated by the Hydrometeorological Design Studies (HDSC) within the office of Water Prediction of the NOAA National Weather Service. The precipitation values for Texas were released in digital format from the NWS Data Server (https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=tx), on September 27, 2018. According to NOAA, the accompanying documentation describing the data, metadata and methodology will be released around December 30, 2018.

The precipitation frequency estimate from NOAA Atlas 14 are to supersede the estimates of the following publications:

- NOAA Technical Memorandum NWS HYDRO-35
- Weather Bureau Technical Paper No. 40
- Weather Bureau Technical Paper No. 49

The purpose of this memorandum is to evaluate the NOAA Atlas 14 rainfall implications for the jurisdictional area of the City of Boerne, Texas. Additionally, this memorandum will provide a recommendation for the rainfall intensities revisions necessary to the City of Boerne's Subdivision Ordinance No. 2007-56.

City of Boerne NOAA Atlas 14 Revised Intensities

The precipitation data for the state of Texas was retrieved from the NWS Data Server in a gridded ASCII format with a grid cell resolution of 0.00833333 decimal degrees (latitude and longitude) and a horizontal spatial reference based on the North American Datum of 1983 (GCS North American 1983). The ASCII gridded precipitation values are distributed by the NWS as integers in inches with a multiplier of 1,000 (cell value = depth in inches x 1,000). The isopluvial lines representing the various precipitation in inches were generated from the NWS gridded precipitation raster. As depicted in the attached exhibit, the City of Boerne is located within a general area of constant precipitation depth.

The current 24-hour 100-year rainfall depth specified in the City of Boerne’s Subdivision Ordinance No. 2007-56 is 9.60 inches. Based on the Atlas gridded precipitation raster, the approximate 100-Year 24-hour rainfall intensity ranges from 12.80 to 12.86 inches within the City of Boerne city limits, which represents an approximate increase of 3.23 inches or 33.65% compared to the current drainage criteria. The following **Table 1** compares the current rainfall depths to the updated Atlas 14 rainfall rough estimated depths for the frequency storm events published in the ordinance:

Table 1

Frequency	Current Rainfall Depth (in)	Atlas 14 Rainfall Depth (in)	Difference (Atlas 14 - Current)	Difference (%)
2-Year	4.08	4.14	0.06	1.47%
5-Year	5.52	5.53	0.01	0.18%
10-Year	6.48	6.88	0.4	6.17%
25-Year	7.68	8.95	1.27	16.54%
50-Year	8.88	10.8	1.92	21.62%
100-Year	9.6	12.83	3.23	33.65%

As tabulated in Table 1, the revised rough estimated rainfall intensities proposed by the Atlas 14 publication will increase the current rainfall depths adopted by the City of Boerne. The higher frequency storm events (2-year to 10-year) will likely not have a significant impact. Furthermore, infrastructure designed to the lower frequency storm events (25-year to 100-year) will likely see impacts to size and cost due to the higher rainfall depth proposed.

Nearby Communities implementation of NOAA Atlas 14

Nearby communities and governmental entities are currently in the process of digesting the results from the Atlas 14 publication. The following is a summary of the known entities and the process they are following to implement the revised rainfall intensities as of the date of this memorandum:

TxDOT

The Texas Department of Transportation has confirmed their plans to fully implement the NOAA Atlas 14 rainfall. They are currently in the process of obtaining all of the data statewide and developing the rainfall intensity-duration-frequency (IDF) relationship for each county. The preliminary release date for adopting the Atlas 14 rainfall within the Hydraulic Design Manual is approximately April-June 2019.

City of San Antonio

The City of San Antonio is currently analyzing the NOAA Atlas 14 rainfall and has formed the “Atlas 14 – Rainfall Intensity Focus Group” to help define how the new rainfall should be implemented. The stakeholders for the focus group is composed of governmental staff, developers and hydrology and hydraulic engineers who currently work within the City of San Antonio. Because the revised rainfall impact varies across Bexar County, the focus group has decided to create five (5) different Rain Fall Area zones. The preliminary release date for adopting the

Atlas 14 rainfall within the Unified Development Code for the City of San Antonio is approximately March-April 2019.

City of Austin

The City of Austin is planning on fully implementing the revised Atlas 14 rainfall intensities until the Travis County Digital Flood Insurance Rate Map Study (DFIRM) is completed. At this time, it is unknown by Maestas when the Travis County DFIRM will be completed. Because many of the City of Austin floodplain regulations are based on the 100-year flood, they are proposing to use the 500-year flood for future regulations.

Recommendation

As aforementioned, the revised intensities proposed by the NOAA Atlas 14 rainfall intensities will increase the adopted rainfall intensities by the City of Boerne. This increase will result in a lower level of service for the existing drainage infrastructure and an increase in size and cost for any future drainage infrastructure.

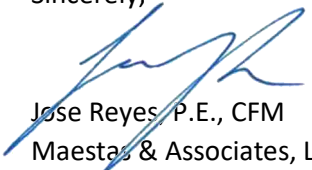
As seen in the attached exhibit, the City of Boerne is located within an area of constant isopluvials. Maestas recommends that the City of Boerne continue to use the Type II distribution per TR-55 and begin a process to update the 24-hour rainfall intensities per the revised NOAA Atlas 14 rainfall data. Additionally, the Boerne Rainfall Intensity-Duration-Frequency Curves can also be derived from the updated rainfall data.

Updating the 24-hour rainfall intensity will have significant impacts on the community and could materially increase the number of properties that are shown to be impacted stormwater runoff. We would still recommend moving to the new and applicable data, but also recommend that the City of Boerne form a committee similar to those in surrounding jurisdictions. The committees could take account of local concerns of implementation.

The process should address the potential for updating FEMA FIRM maps and the timing of the updates. Consideration should be given to working with Kendall County if the joint effort would be more efficient. The City of Boerne should also determine how to assess infrastructure needs based on the new rainfall data. We would recommend a frame work that establishes a feasible time frame for implementing any improvements is critical prior to open public debate to reduce concern of major and imminent spending. Clearly, the feedback from public can shape the final approach but a measured and steady response to the change criteria will likely best address the new rainfall intensity implications.

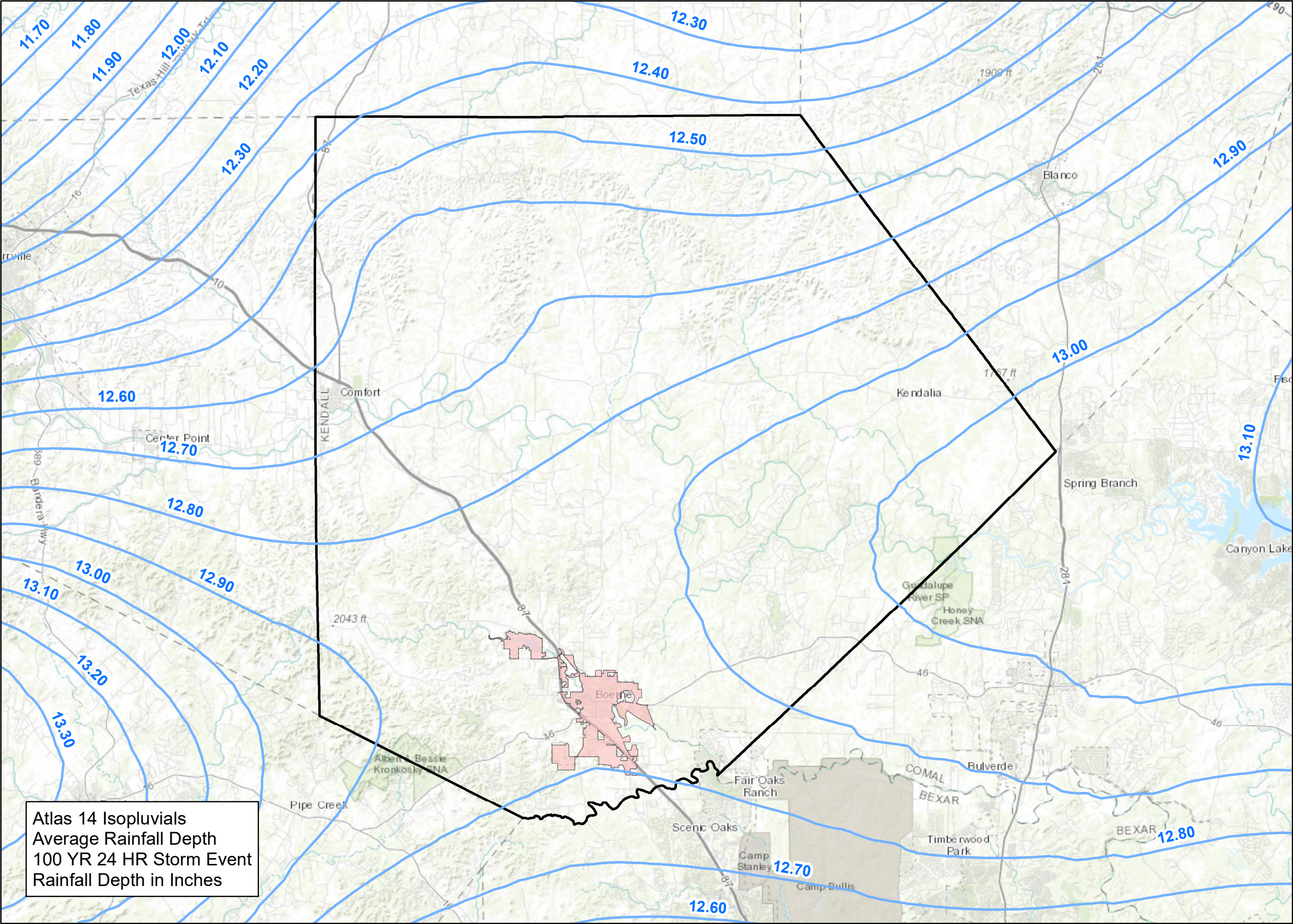
The rainfall intensities published within this memorandum are for informational purposes and should not be used for hydrology and hydraulic analysis or design.

Sincerely,

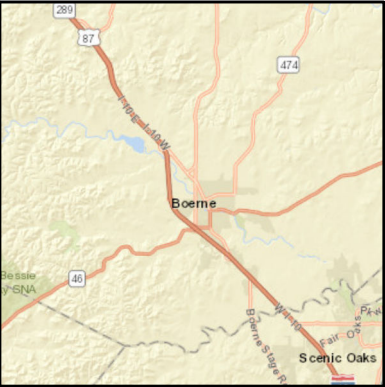


Jose Reyes, P.E., CFM
Maestas & Associates, LLC
Vice President

Attachments: City of Boerne Atlas 14 Exhibit



Atlas 14 Isopluvials
Average Rainfall Depth
100 YR 24 HR Storm Event
Rainfall Depth in Inches



LOCATION MAP
N.T.S.

City of Boerne

LEGEND

- ATLAS 14 Isopluvials
- Boerne_City_Limits
- Kendall County

**City of Boerne
ATLAS 14 Exhibit**



1 inch = 20,000 feet

MAESTAS