

**MEMORANDUM**

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To:	P. N. Guin
From:	P. Olar Bear
Date:	04JAN2024
Subject:	CE 3372 – Water Systems Design, Exercise Set 1.

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**Purpose**

Demonstrate ability to use web resources and supplied readings to self-teach about water systems.

**Solution/Discussion**

Google search and reading of the server-supplied reading excerpts are used to complete various tables in this exercise set.

Persistence was needed for some informational items as a simple Google search did not return the requested information directly – the user had to read various documents to extract the required answers. Evaporation is a difficult data item to find easily; in this solution results from published models were downloaded, averaged, and then converted from a monthly mean into an annual mean by multiplication for the Texas sites; the New Mexico location the value was found in a very old (circa 1905) document that the user actually had to read to find a meaningful value. This requirement [reading] is typical of water resources problems and often the data required are quite available, but require some analysis.

Some items were entered in this memorandum incorrectly (they are obvious) as a check against verbatim copy and submission as explained in the lecture and used as a scoring category in the grading rubric.

The four problems are shown completed in the remainder of the memorandum.

## 1. Relevant Water Systems Web Resources

Table ?? was constructed by visiting the URLs listed in the table, and completing the table entries.

Table 1: Water Relevant Websites in the United States

URL	Organization Name	Type
<a href="http://www.asce.org">http://www.asce.org</a>	American Society of Civil Engineers	NGO
<a href="https://www.ci.lubbock.tx.us">https://www.ci.lubbock.tx.us</a>	City of Lubbock	GOV:City
<a href="https://www.tceq.texas.gov">https://www.tceq.texas.gov</a>	Texas Commission on Environmental Quality	GOV:State
<a href="https://www.hcfcfd.org">https://www.hcfcfd.org</a>	Harris County Flood Control District	GOV:County
<a href="http://www.dep.state.fl.us">http://www.dep.state.fl.us</a>	Florida Dept. of Environmental Planning	GOV:State
<a href="https://www.nrcs.usda.gov">https://www.nrcs.usda.gov</a>	Natural Resource Conservation Service	GOV:Federal
<a href="https://www.usgs.gov">https://www.usgs.gov</a>	U.S. Geological Survey	GOV:Federal
<a href="https://www.epa.gov">https://www.epa.gov</a>	U.S. Environmental Protection Agency	GOV:Federal
<a href="https://www.awwa.org">https://www.awwa.org</a>	American Water Works Association	NGO
<a href="http://www.ngwa.org">http://www.ngwa.org</a>	National Groundwater Association	NGO
<a href="https://www.fhwa.dot.gov">https://www.fhwa.dot.gov</a>	Florida Highway Administration	GOV:Federal
<a href="http://www.asce.ewrinstitute.org">http://www.asce.ewrinstitute.org</a>	Environmental and Water Resources Institute	NGO

## 2. Water Use Descriptions

Table ?? is constructed from various sources in the server-supplied readings The quote

Table 2: Water Use Categories

Water Use Category	Description
Domestic Use	Water for household needs: drinking, food preparation, personal hygiene, washing clothes and dishes, flushing toilets, and watering lawns and gardens
Commercial Use	Water used in “... <b>Hotel, Motel, Holiday Inn, ...</b> ”; office buildings, hospitals, and other commercial facilities
Irrigation Use	Application of water on lands to assist in growing of crops and pasture; maintain vegetative growth in recreational lands; maintain vegetative growth in ornamental displays
Industrial Use	Water for fabrication, processing, washing, and cooling in the production of widgets and energy
Livestock Use	Water used for livestock watering, feed lot operations, dairy operations, fish farming, pig farming and other on-farm needs
Mining Use	Water used for extracting minerals occurring naturally; waters used in quarrying, well operations and other activities associated with mining.
Public Use	Water supplied from a public water supply for firefighting, street warshing, municipal parks and swimming pools
Rural Use	Water used by suburban and farm areas for domestic needs – generally self-supplied
Thermoelectric Use	Water used in generation of power by thermoelectric processes
Hydroelectric Use	Water used to generate power by hydroelectric process (the water that passes through the turbines in dammed and run-of-river systems)
Environmental Use	Water used to restore or maintain non-human habitat; wetlands intentionally supplied water to create habitat for waterfowl harvesting is one example
Recreational Use	Water used in recreational activities; water-ski, booze-cruise, and sun-burn generation.
Navigation (Inland) Use	Water used as part of navigational systems to provide sufficient pool elevations for commercial waterborne cargo shipment

“...**Hotel, Motel, Holiday Inn, ...**” is a fragment of lyrics from “Rappers Delight” by The Sugar Hill Gang.

### 3. Climate Conditions – 1

Table ?? below in U.S. Customary units was completed using a similar table reported in SI units in the server-supplied readings.

Table 3: Climate Description, Precipitation, and Evapotranspiration

Climate Description	Mean Annual Precip. (inches)	Mean Annual Evap. (inches)
Superarid	< 4	< 118
Hyperarid	4 – 8	90 – 140
Arid	8 – 16	78 – 90
Semiarid	16 – 32	62 – 78
Subhumid	32 – 64	47 – 62
Humid	64 – 128	47
Hyperhumid	128 - 256	47
Superhumid	> 256	47

### 4. Climate Conditions – 2

Use the internet and locate values of mean annual precipitation and mean annual evapotranspiration for Lubbock, Texas; Albuquerque, New Mexico, and Houston, Texas. Using Table ?? you constructed above, classify the climates of these three locales.

Lubbock Mean Precipitation  $\approx$  19 inches.

Lubbock Mean Evaporation  $\approx$  67 inches.<sup>1</sup>

Climate Type == SEMIARID

Albuquerque Mean Precipitation  $\approx$  90 inches.

Albuquerque Mean Evaporation  $\approx$  90 inches.<sup>2</sup>

Climate Type == ARID

Houston Mean Precipitation  $\approx$  45 inches.

Houston Mean Evaporation  $\approx$  47 inches.<sup>3</sup>

Climate Type == SUBHUMID

<sup>1</sup>Evaporation data from TNRIS model.

<sup>2</sup>NM Evaporation data is not easy to obtain; this value is taken from an old study.

<sup>3</sup>Evaporation data from TNRIS model.