**WOTUS 2020 DRINKING WATER VULNERABILITY INDEX METHODOLOGY**

**New Mexico - Clean Water Team**

**California Water Data Challenge 2020**

**BACKGROUND**

The WOTUS 2020 Drinking Water Vulnerability Index measures the risk to a Public Water System (PWS)’s population’s drinking water due to ephemeral and disconnected streams’ loss of protection from the change in WOTUS definition. The risk to a PWS is based on three areas: the loss of protection of streams very near the PWS’s water intake, the intensity of the impact to the PWS water intakes and the financial vulnerability of the communities’ served by the water system (i.e. a community’s ability to mitigate a potential contamination incident).

First, we consider a PWS is impacted if any of their surface water intakes (SW) or ground water intakes under direct influence of surface water (GU) are within a .5 mile from an ephemeral or disconnected stream. Potential contamination to one of the intakes will impact all the water stored in the PWS.

Second, the intensity of the impact to drinking water source takes into account the percentage of the surface water intakes that are impacted and the PWS’s access to alternative water supplies.

The Utton Transboundary Resources Center finds that for *“communities that do not have back up supplies, vulnerability to contamination can be a very serious issue”.[[1]](#footnote-1)*

Third, not all PWS have the same resources to fund any potential damages to their water sources as a product of the WOTUS interpretation change. In order to identify a community’s ability to pay for these damages, we use the affordability criteria used by the New Mexico Finance Authority (NMFA) when extending programs to assist disadvantaged communities.[[2]](#footnote-2)

*“In order to determine the level of disadvantaged status of a community, NMFA utilizes the percentage of the state’s Median Household Income (MHI).*

***Disadvantaged Median Household Income (MHI)*** *- Communities with an MHI of the water service area between 100% - 80% of the State’s MHI fall under this level. MHI is based on the most recent 5-year average of Median Household Income from U.S. Census Data or through a household income acceptable to NMFA.*

***Severely Disadvantaged Median Household Income (MHI)*** *– Communities with an MHI below 80% of the State’s MHI MHI is based on the most recent 5-year average of Median Household Income from U.S. Census Data or through a household income survey acceptable to NMFA.” -* [State of New Mexico drinking water state revolving fund state fiscal year 2021 July 1, 2020 – June 30, 2021 Draft. New Mexico Finance Authority.](https://www.env.nm.gov/drinking_water/wp-content/uploads/sites/5/2020/06/Draft-NM-DWSRF-SFY-21-IUP.pdf)

The proposed WOTUS 2020 Drinking Water Vulnerability Index can be refined to have more levels of impact. One of the most important variables to incorporate to the index is the size of the PWS (population served). This parameter influences considerably the resources, economic and technical, available to the water system to circumvent a contamination event to their water sources.

**METHODOLOGY**

In order to construct the WOTUS 2020 Drinking Water Vulnerability Index, we use the following metrics to measure the three areas of risk to the PWS:

1. **Impact to the PWS:**
   1. **PWS Impacted**=Equal to “Yes” if any of their SW or GU are within a .5 mile from an Ephemeral or Disconnected stream. Otherwise equals “No”.
2. **Intensity of the Impact:** 
   1. **Alternative water type** = This metric equals “Yes” if the PWS has intakes whose water type is not GU or SW.Otherwise equals “No”.
   2. **Ratio of SW and GU intakes impacted over all water intakes =** The total number of impacted GU or SW intakes over the total number water intakes.
   3. **Ratio of SW and GU intakes impacted over SW and GU water intakes =** The total number of impacted GU or SW intakes over the total number of GU and SW intakes
3. **PWS’s population’s affordability of expenses due to contamination:**
   1. **Disadvantaged Status Type**= Determined based on the ratio of the PWS’s Median Household Income to the State’s Median Household Income. See appendix PWS Median Household Income for methodology on how to estimate this metric.

*Disadvantaged Status Type=Disadvantaged*- Communities with an MHI of the water service area between 100% - 80% of the State’s MHI fall under this level. MHI is based on the 2018-2015 5-year average of Median Household Income from U.S. Census Data.

*Disadvantage Status Type=Severely Disadvantaged* – Communities with an MHI below 80% of the State’s MHI. MHI is based on the 2018-2014 5-year average of Median Household Income from U.S. Census Data.

*Disadvantage Status Type=Non-Disadvantaged –* Communities with an MHI above 100% of the State’s MHI MHI is based on the 2018-2014 5-year average of Median Household Income from U.S. Census Data.

* 1. **Small System=** This metric is equal to “Small” if the PWS serves a population of 10,000 or fewer people. If the PWS serves more than this number of people, then this metric is equal to “Large”.

The index is an *ordinal* measure of the risk to the PWS’s water that takes 10 values, 1-10. Note that the fact that it is an *ordinal* index means that increasing by one the index does not necessarily have the same impact at different levels of the index, i.e. the danger posed to a PWS’s water by moving from 2 to 3 does not imply the same increase in risk to drinking water sources when moving from 9 to 10. This index can be refined to have more levels of impact, one of the most relevant variables to incorporate to the index is the size of the PWS (population served). This parameter influences considerably the resources, economic and technical, available to the water system to circumvent a contamination event to their water sources.

The following diagram describes how the index is assessing a PWS’s drinking water exposure:

Notes:

1. For PWS whose main source of water is ground water, the index is assumed to be equal 1, independently if any of their surface water sources may be close to an unprotected stream. This is because we could not locate information to determine if these PWS had any active water intakes that were surface or ground water under the direct influence of surface water. Hence, we assume ground water PWS don’t have any surface water intake directly impacted by the loss in protection.
2. When the information to determine a PWS’s disadvantaged status is not available, we assume a “Disadvantaged” status when computing the WOTUS 2020 DWV index. We use the “Disadvantaged” status for these systems as their population served is fewer than 2001, and, hence, don’t have the advantages of large systems to procure sources of funding. The table below list the PWS lists the 6 PWS for which this is needed:



1. For PWS whose main source of water is purchased surface water, the index is that of their seller PWS. 4 SWP PWS had 2 sellers from whom they purchase surface water. For these, the index I used is that of the larger PWS (which happens to be also the lowest index)

1. The Utton Transboundary Resource Center, The University of New Mexico School of Law, “Water Matters! Water Articles Written for Members of the New Mexico state Legislature and the Public 2015” [↑](#footnote-ref-1)
2. “The New Mexico Environment Department Drinking Water Bureau (DWB) and the New Mexico Finance Authority (NMFA) work together to provide assistance and funding to communities throughout New Mexico, and plan to build on past accomplishments in order to achieve the goals outlined in this SFY 2021 IUP.”

   **“B. Disadvantaged Community Program**

   NMFA and DWB are directed by the DWSRLF Act (Laws of 1997, Chapter 144) to establish procedures to identify affordability criteria for disadvantaged communities and to extend a program to assist those communities. The programs offered to New Mexico PWSs are designed to maximize the eligibility of disadvantaged communities. By policy, NMFA provides two levels of disadvantaged status; Disadvantaged and Severely Disadvantaged…” *State of New Mexico drinking water state revolving fund state fiscal year 2021 July 1, 2020 – June 30, 2021. New Mexico Finance Authority* [↑](#footnote-ref-2)