

**GUDE DRIVE LANDFILL ANNUAL
METEOROLOGICAL REPORT
FOR 2022**

**Prepared for
THE MONTGOMERY COUNTY GOVERNMENT**

By

TECHNICAL ENVIRONMENTAL SERVICES, LLC

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1. INTRODUCTION

The purpose of this report is to provide a summary of the 2022 meteorological data collection at the Gude Dr. Landfill Remission site. All the calculations used hourly meteorological data from the Gude Dr. meteorological tower. The hourly averaged data came from the onsite Campbell Scientific CR-300 data logger. The data are collected daily via a cellular modem. The meteorological tower location was moved to a site near the Gude Drive entrance on December 29, 2022.

2. INPUT DATA

2.1 Meteorological Data

The meteorological data used in all calculations was generated by the onsite Campbell Scientific data logger. The data are hourly averages, except for the rainfall data that is the total rainfall for the hour. Technical Environmental Services collected this data by downloading data to computer via cellular modem. Once the data was received it is reviewed and edited where necessary by a meteorologist. Periods of bad or missing data were left out of all calculations.

3.

SUMMARY OF GUDE DRIVE LANDFILL, 2022 METEOROLOGICAL DATA

The meteorological data collection at Gude Dr. was very good in 2022 with all parameters averaging near 100% for the year. All the data were collected using the onsite CR-300 data logger. The rainfall data was compared with data from the National Weather Service at Dulles Airport and other cooperative sites in Maryland. Table 1 summarizes the data collection for 2022.

There was only one instrument problem during 2022. The rain gauge was found to be clogged with spider webs in September. The rainfall totals for September were possibly affected by this problem. The meteorological instrumentation was calibrated during April and October.

Figures 1 through 5 show annual and seasonal wind roses from the 3m level. The predominant wind direction at Gude Dr. during 2022 was from the northwest. This was followed by secondary peak of winds from the north-northwest and the south-southwest. The winds vary with the season with winds predominantly from the northwest to the north-northwest in the winter and during the spring months. During the summer winds were predominantly from the south-southwest and northwest to north-northwest. The fall showed winds predominant winds from the northwest to the north-northwest. The predominant wind direction for any given month is highly correlated to the weather pattern. During periods of cold weather, the winds are from the northwest to the north-northwest. During warm periods the winds are from the south-southwest. The average wind speed for the year was 3.8 mph and the highest hourly average was 21.0 mph on February 18, 2022. The average annual wind speed for the year was lower than the three-year average (4.38 mph). Table 2 shows the average hourly wind speed for each hour of the day over the annual period of 2022.

Figures 6 and 7 show plots of the daily maximum, minimum and average temperatures and relative humidity. The temperatures for the year averaged a little above normal. Temperatures were above average for nine of the 12 months. Only January was significantly below average. This resulted in an overall average temperature for the year of 56.0 ° F at Gude (56.7° F at Dulles airport), which was 1.5 ° F above the long-term average temperature of 55.2° F (at Dulles airport ⁽¹⁾). The maximum temperature in 2022 was 94.5° F. on August 4th and the minimum temperature was 3.9° F. on December 24th. Table 2 shows the average hourly temperature at Gude Dr. over the annual 2022 period. Also, shown in Table 2 are hourly averages of relative humidity. The annual average relative humidity reading of 67.8% was a little lower than the long-term average of 70% from Dulles Airport and a recent five-year period at the Gude site.

The rainfall total at Gude Dr. for 2022 was 45.88 inches. There was a period in September when the rain gauge was clogged by spider webs so the exact September total for the site maybe a little low when compared to nearby National Weather Service sites. The total at Gude was a little higher than Dickerson and Dulles Airport with a total near 46 inches which is somewhat above the area annual average of 41 inches. Table 3 shows monthly and annual rainfall totals for the year from Gude Dr. and several other NWS and cooperative sites ⁽²⁾ in the area. There was good agreement between Gude Dr., Dulles airport and the other cooperative sites. Also, the Gude rain gauge does not have a heater, so snowfall is for the most part not accounted for. During 2022 there were 17 days when more than one inch of rain fell. The maximum daily rainfall occurred on August 10th with 2.42 inches. It was dry during the first four months of the year and then mostly wet (particularly in May and July) during the remainder of the year.

REFERENCES:

1. NOAA, NCDC, Local Climatological Data from Dulles Airport for 2022.
2. NOAA, NCDC, Cooperative Weather Stations, Maryland Stations of Gaithersburg, Sharpsburg, Hagerstown and Damascus for 2022.

<p style="text-align: center;">TABLE 1</p> <p style="text-align: center;">GUDE DRIVE METEOROLOGICAL TOWER DATA RECOVERY JANUARY-DECEMBER 2022</p>	
PARAMETER	RECOVERY (percent)
Wind Speed 3m	100.0
Wind Direction 3m	100.0
Temperature 2m	100.0
Relative Humidity 2m	100.0
Precipitation	100.0

Table 2

Hourly and Annual Average of Wind Speed,
Temperature and Relative Humidity for 2022

Time of day	Wind Speed (mph)	Temperature (°F)	Relative Humidity (%)
0	2.96	53.32	73.32
1	2.84	52.48	75.25
2	2.73	51.67	77.04
3	2.67	50.97	78.77
4	2.54	50.36	80.05
5	2.45	49.77	81.19
6	2.46	49.22	82.14
7	2.52	48.97	82.59
8	2.71	50.11	80.48
9	3.29	52.67	75.20
10	4.13	55.45	68.84
11	4.81	57.69	63.42
12	5.14	59.62	59.46
13	5.35	61.11	56.74
14	5.42	62.29	54.58
15	5.51	63.10	53.18
16	5.40	63.41	52.68
17	5.14	63.01	53.45
18	4.72	62.10	55.23
19	4.21	60.67	57.53
20	3.65	58.88	60.77
21	3.29	56.96	64.66
22	3.13	55.47	68.19
23	2.99	54.27	71.17
Annual Average	3.75	55.98	67.75
Five Year Average 2018-2022	4.16	56.42	68.61

TABLE 3 – 2022 Yearly Rainfall

	Gude Dr.	Dulles	Dickerson	Sharpsburg+	Damascus	Gaithersburg
January	3.83	3.90	3.17	2.73	3.34	3.56
February	2.37	2.30	1.19	1.91	2.04	2.31
March	2.29	1.92	1.84	1.89	1.59	1.75
April	1.99	2.25	2.60	3.57	2.83	2.92
May	5.87	6.85	5.21	5.63	8.04	6.18
June	3.63	2.75	2.04	2.37+	2.00	3.63
July	6.71	5.23	3.14	3.84+	3.21	6.60
August	4.91	2.30	4.37	2.57+	1.54	1.92
September	3.15	3.28	5.58	5.11+	5.22	4.37
October	3.23	2.24	2.56	2.27+	3.18	3.33
November	3.05	2.79	2.89	3.31+	3.00	3.14
December	4.85	4.95	5.03	5.25+	5.24	5.24
Total	45.88	40.76	39.62	40.45	41.23	44.95

+Hagerstown, MD

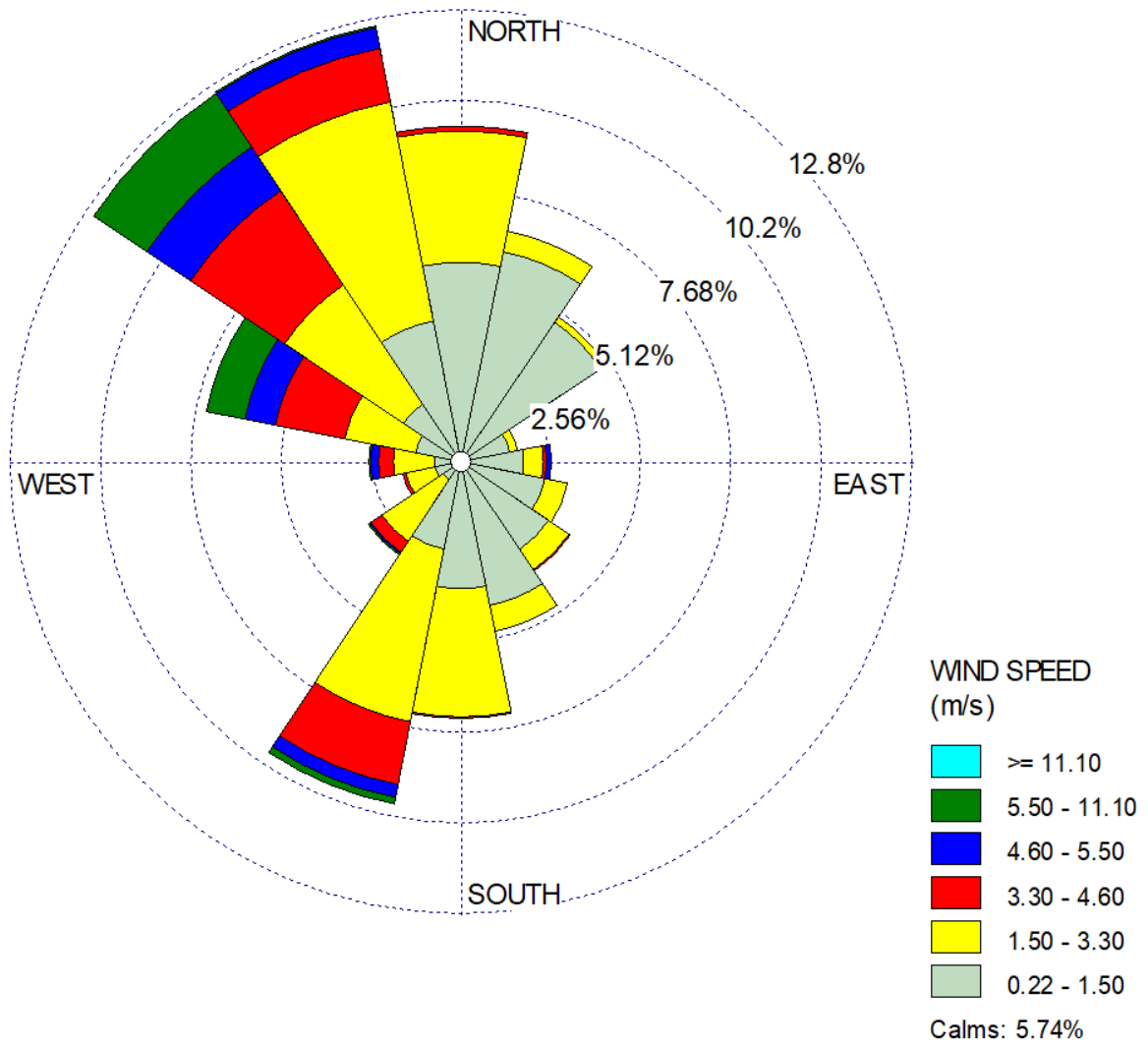


Figure 2 - Gude Dr. Winter Wind Rose for 2022

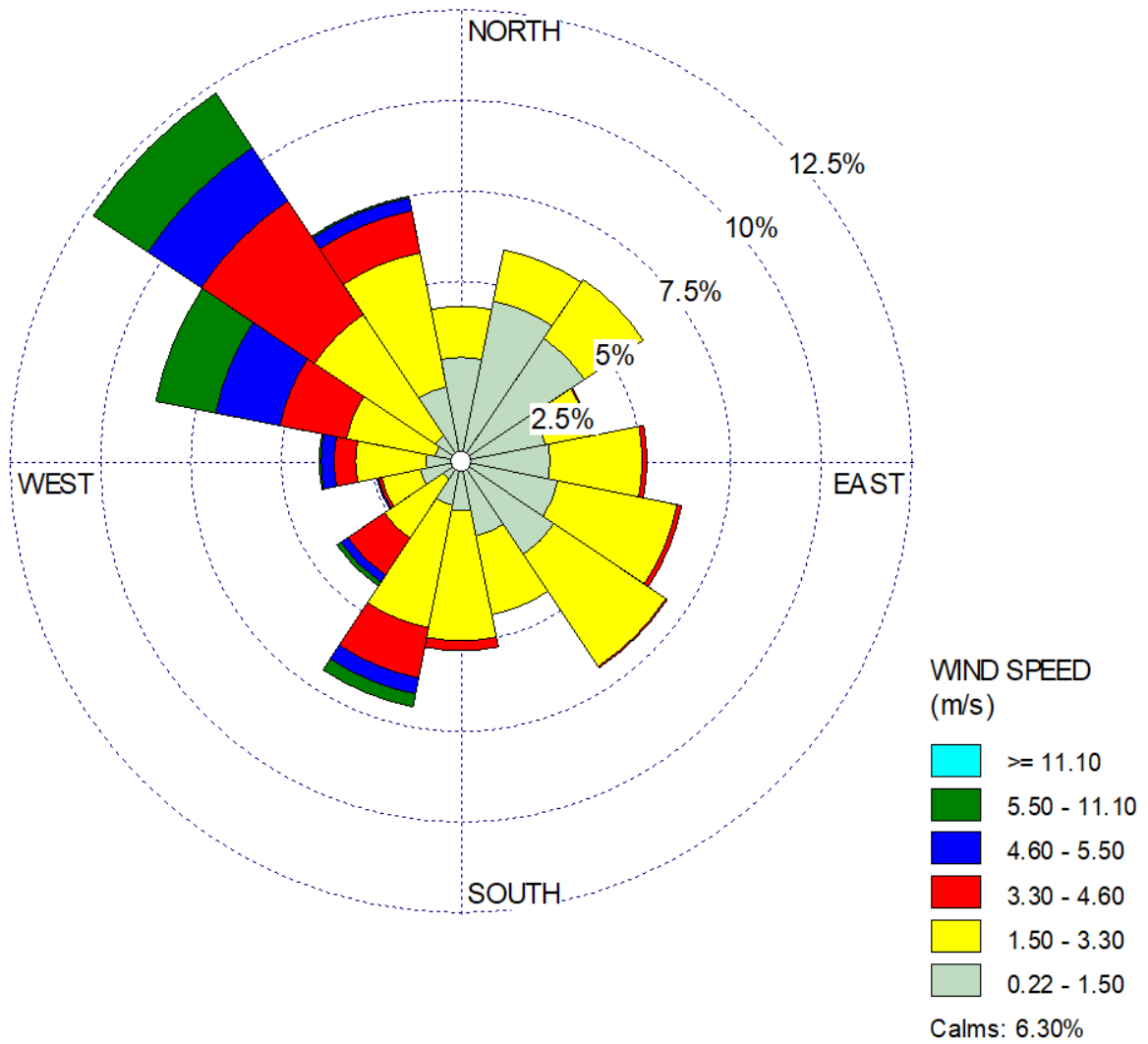


Figure 3 - Gude Dr. Spring Wind Rose for 2022

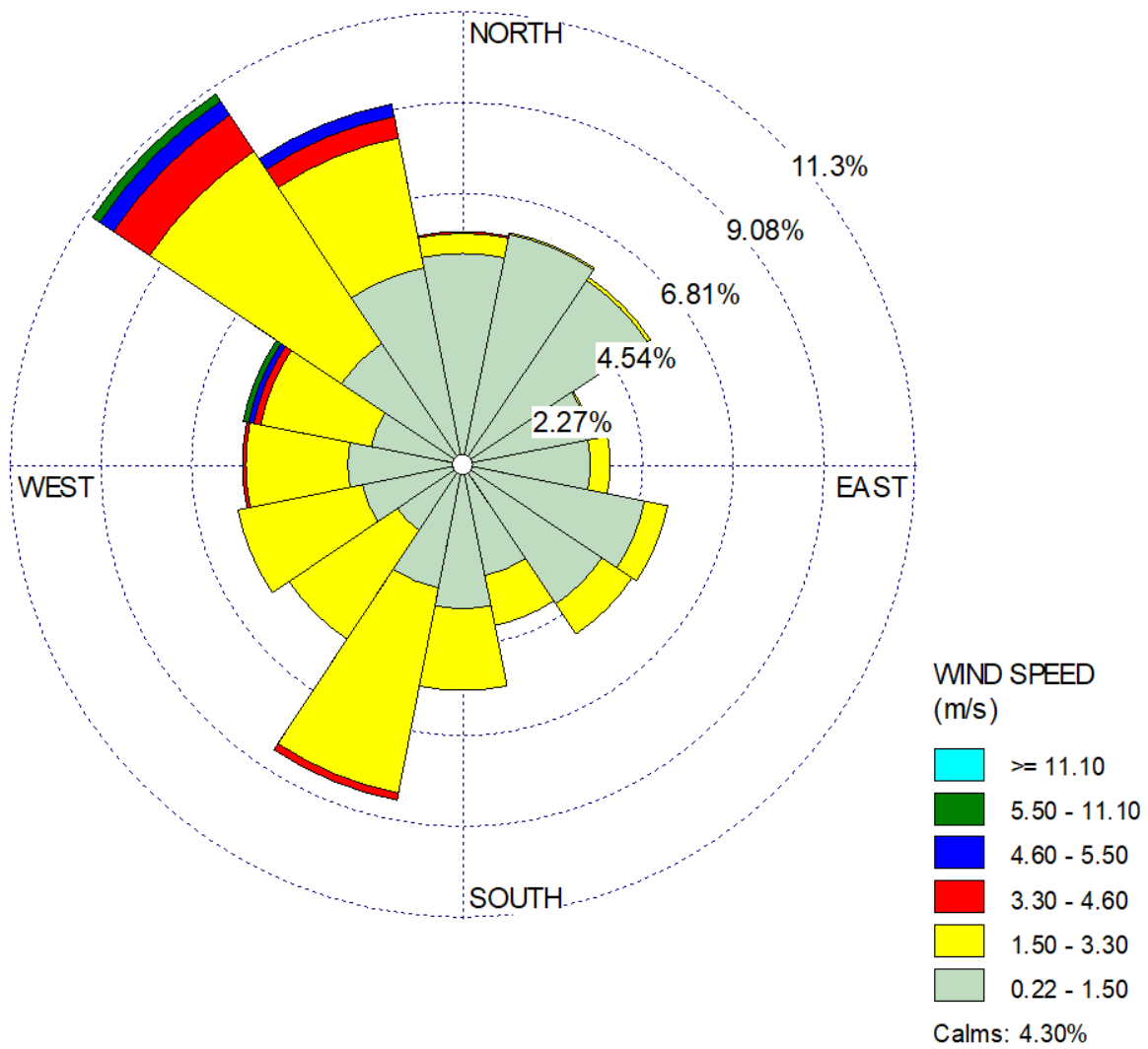


Figure 4 - Gude Dr. Summer Wind Rose for 2022

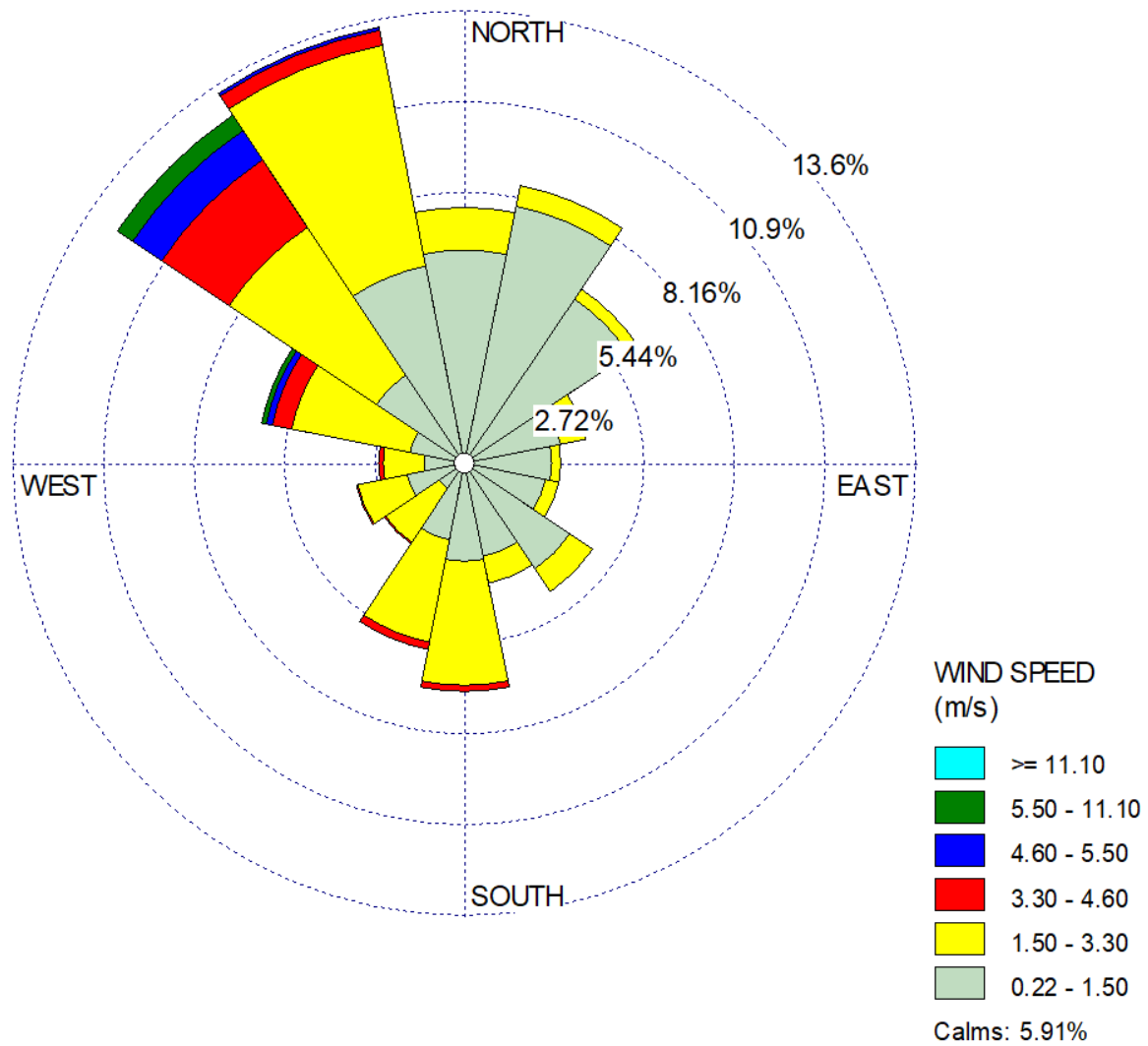


Figure 5 - Gude Dr. Fall Wind Rose for 2022

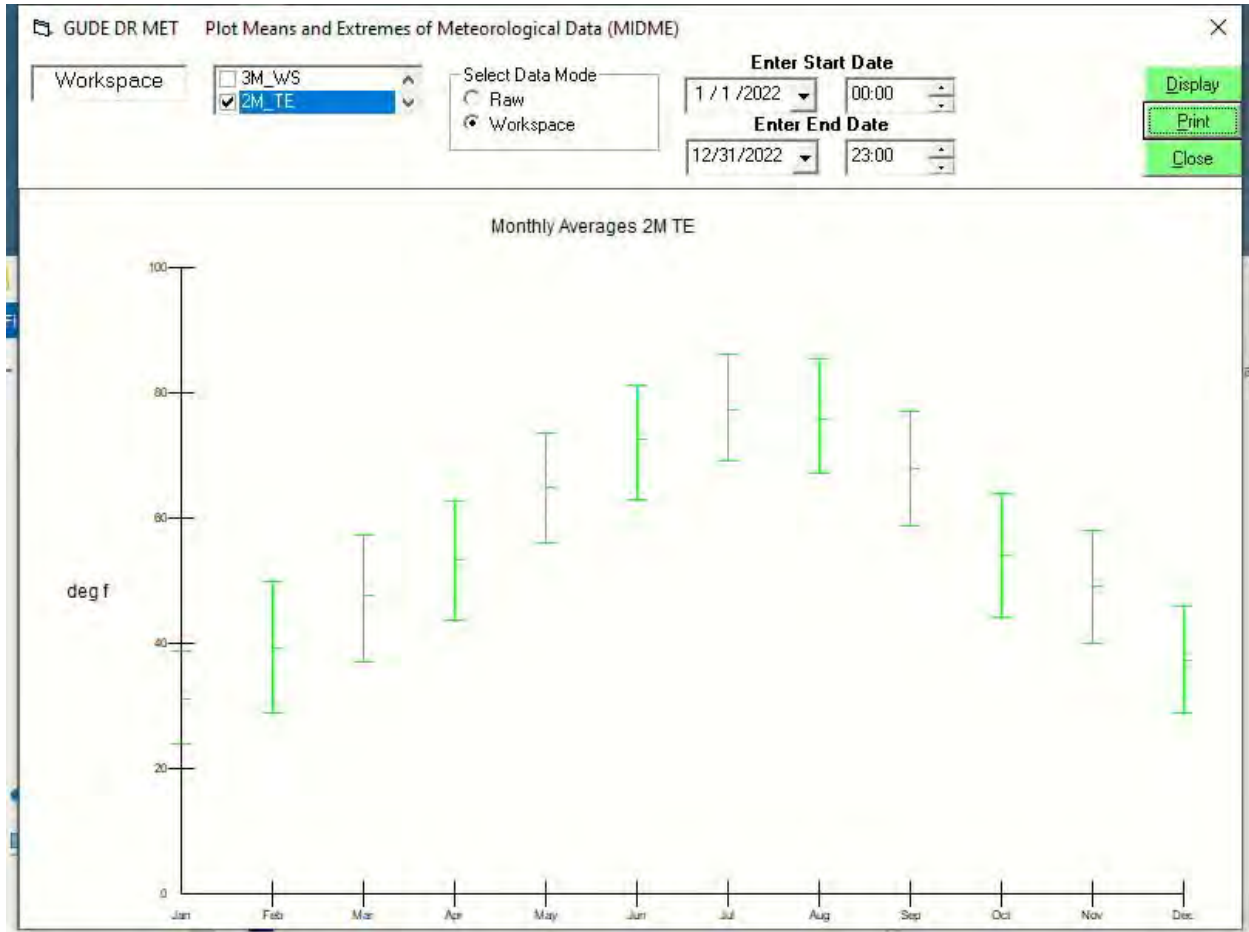


Figure 6 - Gude Dr. 2M Temperature Max. Avg. and Min. for 2022

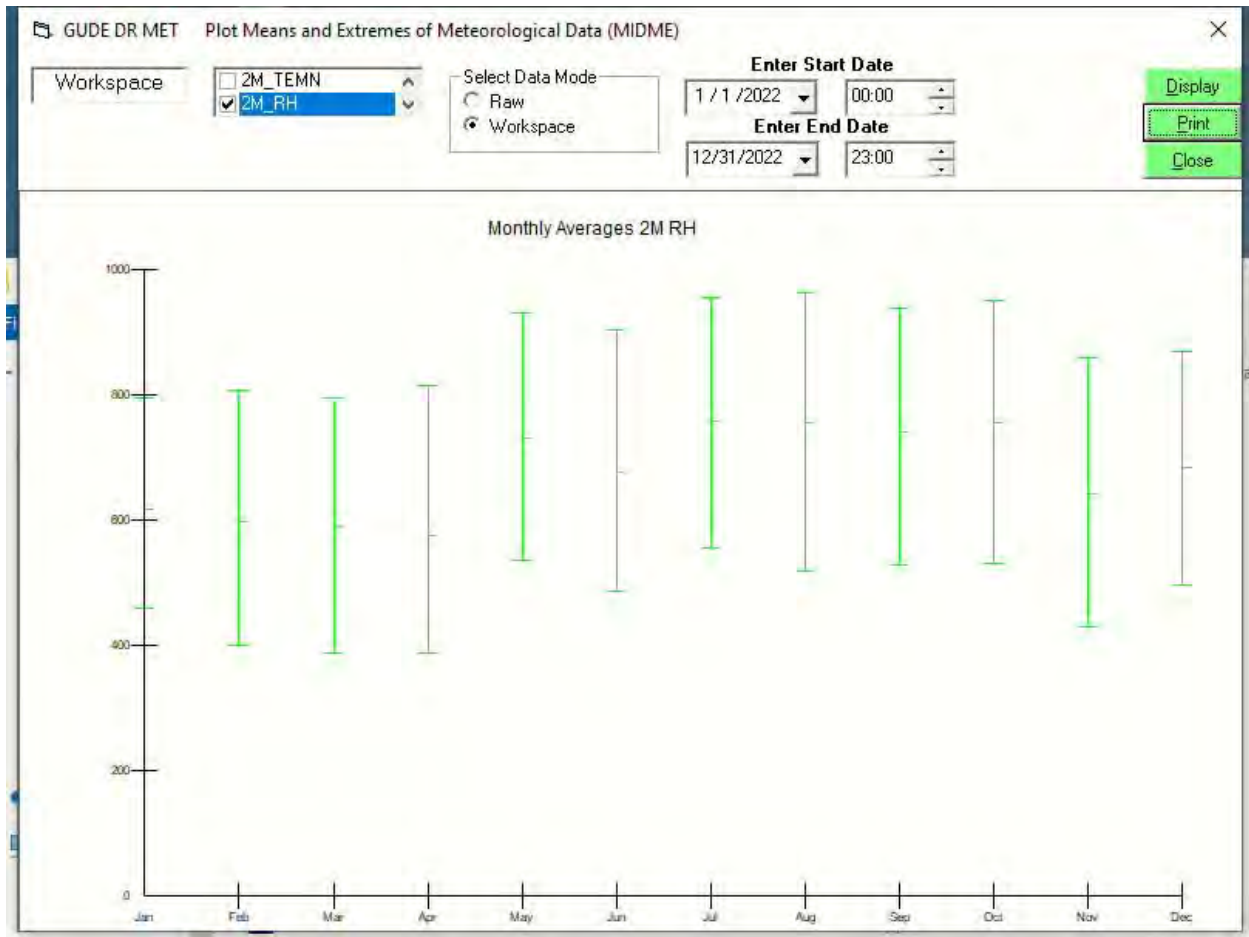


Figure 7 - Gude Dr. 2M Relative Humidity Max. Avg. and Min. for 2022