

# Recommendations for Expansion and Enhancement of the Kentucky Mesonet to Support Statewide Water Resource Management

## Background and Independent Need for Operational Support

The Kentucky Mesonet, the second network of its kind in the United States, was built with project funding secured through the National Weather Service with the effort of U.S. Senator Mitch McConnell. Funding over the period 2006-2010 totaled \$2,905,000. Beginning in 2010, Western Kentucky University paid the entire annual operating cost requiring several hundred thousand dollars per year. Beginning in 2012, the project has received modest support through a Federal program. In 2014, the Kentucky Climate Center kicked off a program to secure local sponsors to help support the operating and maintenance costs of individual stations, and these efforts have contributed modestly to the operating budget, but Western Kentucky University continues to be the primary source of operational support. Our ability to continue to operate the Kentucky Mesonet in support of public safety and economic development across Kentucky depends upon securing annual operating funding through the Commonwealth of Kentucky. **Over the ten years since initial Federal project funding was received, many state agencies have relied upon the availability of weather data from the Kentucky Mesonet. However, State funding has NOT been provided at any level over than period.**

**The Kentucky Climate Center is seeking recurring annual operating funding of \$750,000 through the Commonwealth of Kentucky.** This effort is independent of the proposed project to strengthen monitoring for drought (and extreme weather) through the Kentucky Farm Bureau's Water Management Working Group. **Please note that our ability to add soil monitoring capabilities at existing Kentucky Mesonet sites, as well as add new sites to fill unserved areas, will not be sustainable if the Kentucky Climate Center is unable to secure recurring annual operating funding.**

## Plan for Enhanced Soil (and Weather) Monitoring

Based on National Weather Service recommendations, the initial development plan called for installation of 100 Kentucky Mesonet stations, based on a density of one station per 400 square miles (20mi X 20mi grid). As it currently exists, the Kentucky Mesonet does not provide the targeted coverage throughout Kentucky. Therefore, we recommend the addition of new mesonet stations at strategic locations where soil monitoring is of heightened importance for agricultural practices but is currently unavailable.

The Kentucky Mesonet currently operates 65 weather and climate monitoring stations and has commitments to add three (3) new stations within the next nine months, bringing the network to a total of 68 stations.

The Kentucky Climate Center proposes to strengthen the Commonwealth's weather and climate monitoring infrastructure by adding a minimum of 12 new Kentucky Mesonet stations over a period of three years. This would bring the Kentucky Mesonet to a total of 80 stations, creating more uniform statewide coverage and moving us closer to our targeted level of statewide coverage. The average cost

of a Kentucky Mesonet station is approximately \$15,000. Our site protocol also includes a security fence with an estimated cost of \$5,000. Travel for site identification, preparation, and installation work involves an estimated expense of \$750 per site. The total cost associated with installation of a new Kentucky Mesonet station is thus estimated at \$20,750. **The total cost for instrumentation, materials, and travel for installing new Kentucky Mesonet stations is estimated at \$249,000.** This figure excludes expenses for soil monitoring, which will be addressed in the following section. Note that a requirement of local matching funds would leverage state funds and increase coverage of the Kentucky Mesonet to a greater number of communities across the commonwealth.

The following assessment of soil monitoring needs is based on an assumed total of 80 Kentucky Mesonet stations, reflecting the addition of 12 new stations. Within the current network, soil monitoring is performed at five (5) sites. At each of these sites, soil probes are installed at 2", 4", 8", 20", and 40" depths under sod. Based on present commitments, plans exist to add soil probes at nine (9) additional sites and would bring coverage to include a total of 14 Kentucky Mesonet sites, with all but one of these expected to include probes at five depths.

The Kentucky Climate Center proposes to further expand soil moisture and temperature monitoring across the commonwealth.

- Class D Soil Monitoring  
We recommend a total of 50 Kentucky Mesonet stations to include soil monitoring at 2", 4", 8", 20" and 40" depths under sod and under bare soil following Natural Resources and Conservation Service (NRCS) guidelines. These stations will be labeled Class D (two deep probes). These stations will provide a full depth profile of soil moisture (and temperature). The resulting stations will be classified as Class D. The Kentucky Mesonet currently has 13 monitoring sites either planned or in operation that include soil monitoring at these depths under sod, but none of these include monitoring under bare soil. Allowing for probes already installed at these sites, 435 additional soil probes will be required.
- Class S Soil Monitoring  
Soils in some parts of the state are shallow, thus monitoring at 20' or 40" will not be possible at all stations. We recommend that 30 Kentucky Mesonet stations include soil monitoring at 2", 4", and 8" depths under sod and under bare soil following Natural Resources and Conservation Service (NRCS) guidelines. These stations will be labeled as Class S soil monitoring sites and provide a shallow depth profile of soil moisture (and temperature). This will require 180 additional soil probes.
- We recommend keeping an inventory equal to ten percent of the number of probes installed at Kentucky Mesonet stations, requiring 62 additional soil probes.

The cost of the Stevens Hydraprobe II soil moisture and temperature probe is \$395. The estimated cost for purchase of 677 soil probes is \$267,415. Installation also requires materials and incurs travel expenses. While these will vary from site to site, the estimate is \$100 per site, resulting in an estimated cost of \$8,000. **The total cost for instrumentation, materials, and travel for installing soil probes is estimated at \$275,415.**

Installation and subsequent commitments for maintenance and quality assurance of soil moisture and temperature data will require the hiring of one Mesonet Systems Meteorologist. **The annual cost personnel cost for this position, including salary and fringe benefits, is \$52,500.**

### Total Budgeted Costs for Project and Operating Support of the Kentucky Mesonet

The Kentucky Climate Center requests support for base Kentucky Mesonet operating budget through the Commonwealth of Kentucky at \$750,000 per year, plus \$52,500 for recurring personnel support to provide enhanced soil (and weather) monitoring, for a total request of **\$802,500** annual operating support.

The Kentucky Climate Center requests one-time funding to expand coverage of the Kentucky Mesonet and add soil monitoring capability in the amount of **\$524,415**.

*Note: This proposal does not include any allocation for overhead (facilities and administrative costs) that may be required by Western Kentucky University in conjunction with this project.*

