

Press release

Freelancer.com and the Bureau of Reclamation award \$184,000 to winners of Counting Every Drop Challenge

Hosted by Freelancer.com on behalf of the Bureau of Reclamation, the Counting Every Drop Challenge aims to develop new and improved ground-based precipitation measurement devices that are accurate, reliable, low-maintenance, and able to operate for extended periods in remote locations under extreme weather conditions.

SAN FRANCISCO, California – 3 October 2024 – [Freelancer.com](https://www.freelancer.com) (ASX: FLN, OTCQX: FLNCF), the world's largest freelancing and crowdsourcing marketplace by number of users and jobs posted, today announced the winners of the "Counting Every Drop Challenge" with the Bureau of Reclamation ("Reclamation") and the USDA Natural Resources Conservation Service (NRCS).

Hosted by [Freelancer.com](https://www.freelancer.com) on behalf of Reclamation, USDA NRCS and in partnership with GEONOR, the [Counting Every Drop Challenge](#) aimed to develop new and improved ground-based precipitation measurement devices for use in remote locations and extreme weather conditions. The ability to accurately and reliably measure precipitation is critical to monitoring and understanding the hydrologic cycle. Precipitation measurements from remote areas such as mountain headwater catchments also inform critical water resources management decisions that directly impact human safety and environmental health, including water management for flood control, irrigation and municipal water supplies, and environmental benefits.

While current precipitation measurement devices are generally effective, they face significant operational and maintenance challenges, such as relying on fluids, oils, batteries, and solar panels that need to be replaced frequently. These challenges limit the ability of existing devices to provide accurate and reliable measurement at remote locations and increase the cost of operating and maintaining monitoring sites. Additionally, these devices have recognized limitations in terms of measurement accuracy and long-term stability.

For this [Challenge](#), solvers were tasked with developing new and innovative designs that meet specific requirements with respect to reliability, accuracy, operation and maintenance requirements, and ability to operate in remote locations under extreme environmental conditions. The ideal solution would not require fluids, such as antifreeze, to measure solid precipitation such

as snow and hail.

Over the course of two years, participants from around the world designed and built prototype precipitation measurement devices that incorporate various innovative technologies such as the use of solid state sensors and machine learning (ML) as well as innovative adaptation of an existing design. Launched in August 2022 and completed in August 2024, this challenge included 8 months of field testing and awarded \$239,000 USD over two phases **for the development of precipitation measurement devices**.

Final Challenge Awardees

In Phase 2, contestants completed and demonstrated their prototypes, which then underwent lab and field testing. Solutions that met the requirements were eligible for final awards for the results and innovation features presented. As a result, three teams were awarded with final Phase 2 prizes.

PMASS

\$73,000 USD total received in prizes

Team: Daniel Gebhardt, Ph.D., Karl Gebhardt, P.E., P.H.

Location: United States (San Diego, California; Boise, Idaho; Salt Lake City, Utah)

The Precipitation Measurement with Advanced Solid-state Sensors (PMASS) instrument combines three solid-state sensors: a downward-facing pulsed coherent radar, a camera-based sensor, and a temperature sensor. Instantaneous precipitation rate and accumulated precipitation depth are then estimated from features extracted from the sensor readings. The instrument is fluid-free, movement-free, and has minimal required maintenance.

Rahavi Brothers

\$63,000 USD total received in prizes

Team: Seyed Mohammadhadi Rahavi, M.Sc., Seyed Reza Rahavi, Ph.D.

Location: Delta, BC, Canada

Intelligent Precipitation Measurement System (IPMS) is an innovative twist on an established design. Instead of using an electric heating element to melt solid precipitation to measure its liquid water content, IPMS uses a propane heating element. This allows IPMS to successfully operate at remote sites where the electric power supply is not sufficient to power an electric heating element. The device includes an AI powered control board that monitors and controls the heating process to minimize fuel consumption and increase accuracy and performance.

PGRAWS

\$48,000 USD total received in prizes

Team: Daniel Gebhardt, Ph.D., Karl Gebhardt, P.E., P.H.

Location: United States (San Diego, California; Boise, Idaho; Salt Lake City, Utah)

Precipitation Gauge with Redundant Array of Weight Scales (PGRAWS) is a novel precipitation gauge based on weight measurement of all forms of precipitation. Redundant collection buckets with independent mechanical operation contribute to a high instrument reliability. An aerodynamic bucket profile increases accuracy by lowering wind-induced undercatch compared to traditional collecting gauges. Other innovative elements include the use of an intelligent algorithm to dynamically correct for wind interference, fallen debris, roosting birds, or component failure and the use of vibration to periodically empty solid precipitation from the collection buckets.

Phase 1 Review

In Phase 1, contestants submitted white papers describing their novel precipitation measurement device, how it addresses the requirements, and ability to complete a prototype.

Phase 1 winners included:

PMASS (@dangebhardt)

Team location: United States

Brief description: The PMASS instrument, using solid state radar, camera-based sensors, and temperature sensors, leverages machine learning to estimate precipitation rates and depth, offering a fluid-free, maintenance-minimal solution.

Rahavi Brothers (@Mecasia)

Team location: Delta, BC, Canada

Brief description: The Intelligent Precipitation Measurement System (IPMS) uses propane to melt solid precipitation, with an AI-powered control board optimizing the process for improved accuracy and performance.

PGRAWS (@dangebhardt)

Team location: United States

Brief description: PGRAWS is a precipitation gauge that uses redundant weight-based collection buckets, with features like aerodynamic design to reduce wind interference and intelligent algorithms for error correction.

The Planet Earth (@majidbayati)

Team location: Vancouver, Canada

Brief description: The fluid-free precipitation metering device includes a pot that is mounted on a load cell. After completing the precipitation weighing process, the precipitation will be discharged into the environment using a wiper that cleans the pot continuously.

Top Solvers (@jflnewport)

Team location: Philadelphia, United States

Brief description: Our proposed device uses an array of precipitation sensors together with a custom control unit. This meets and exceeds all the challenge requirements providing both the required accuracy together with fail safe redundancy.

Orion Labs (@smeschbe)

Team location: Nunn, CO, United States

Brief description: Orion Labs rain gauge system provides a fluid-free solution for accurate precipitation detection and measurement. Our solution builds upon existing rain gauge collection methods, adds enhancements with software capabilities and a custom designed collection unit for a unique, low power, low cost redundant solution.

Rixel (@richardvecsey)

Team location: Budapest, Hungary

Brief description: Our solution is a fluid-free and active precipitation station that measures any form of precipitation. Based on sensors' signals the built-in microcomputer manages the heating system. It can operate in really harsh environments from extreme cold to hot. The fluid free eco-friendly design discharges only water into the environment. Our device is a deploy-and-collect solution since it doesn't require any maintenance aside from collecting the data.

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About Freelancer.com

Twelve-time Webby award-winning Freelancer.com is the world's largest freelancing and crowdsourcing marketplace by total number of users and projects posted. More than 70 million registered users have posted over 21 million projects and contests to date in over 2,000 areas as diverse as website development, logo design, marketing, copywriting, astrophysics, aerospace engineering and manufacturing. Freelancer Limited is listed on the Australian Securities Exchange under the ticker ASX:FLN and is quoted on OTCQX Best Market under the ticker FLNCF.

About the Bureau of Reclamation

Established in 1902, the Bureau of Reclamation is best known for the [dams, powerplants, and canals](#) it constructed in the 17 western states. These water projects led to homesteading and promoted the economic [development of the West](#). Reclamation has constructed more than 600 dams and reservoirs including [Hoover Dam](#) on the Colorado River and [Grand Coulee](#) on the Columbia River.

The Bureau of Reclamation is the largest wholesaler of water in the USA. Brings water to more than 31 million people, and provides one out of five Western farmers (140,000) with irrigation water for 10 million acres of farmland that produce 60% of the nation's vegetables and 25% of its fruits and nuts.

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