**Nutrient Sensor Action Challenge** 

**Registration**

Upload the completed form to challenge.gov by clicking on the

“**Submit Solution**” tab on the [Nutrient Sensor Action Challenge](http://www.challenge.gov/nutrient-sensor-action-challenge-stage-II) page.

**General Information**

**Project Lead:**

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| First name: | | | Shahid | | Last name: | | Malik |
| Organization: | | | | South Platte Water Renewal Partners (SPWRP) | | | |
| Title: | Environmental Science, Innovation & Optimization Programs Manager | | | | | | |
| Phone: | | 303-762-2611 | | | Email: | smalik@englewoodco.gov | |

**Contact for matters of communication and media:**

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| First name: | | | Kacie | | Last name: | | Allard |
| Organization: | | | | South Platte Water Renewal Partners (SPWRP) | | | |
| Title: | Communications Supervisor | | | | | | |
| Phone: | | 3037836821 | | | Email: | kallard@englewoodco.gov | |

Do you agree to allow EPA to share project information with journalists for potential coverage of the project?

☐ Yes

☒ No

Are there others who should be notified via email about webinars and other updates? (provide as many as needed)

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| --- | --- | --- | --- | --- | --- | --- | --- |
| First name: | | | Anna | | Last name: | | Schroeder |
| Organization: | | | | South Platte Water Renewal Partners (SPWRP) | | | |
| Title: | Science Innovation & Optimization Engineer | | | | | | |
| Phone: | | 303-783-6884 | | | Email: | aschroeder@englewoodco.gov | |

Is there is any information about the project that should be treated as confidential?

☐ Yes

☒ No

If yes, please explain:

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**Project Description and Potential for Impact [limit 250 words]**

Describe the specific nutrient issue that the project will address.

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| In light of the implementation of Regulation 85 in July 2023, the SPWRP will be required to meet more stringent final effluent limitations. Regulation 85 highlights numeric phosphorus and nitrogen standards for lakes and reservoirs based on the protection of public health. As the SPWRP discharges directly into the South Platte River, it is important that we act as stewards of our watershed and start adapting technologies as early as possible. To help aid in the adaptation of the new limits, technology-based studies will be conducted and nutrient monitoring will be critical in defining the scope of treatment. |

How will the addition of data and information from nutrient sensors inform and improve specific decisions and actions pertaining to nutrient management?

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| A new Nitrate control strategy for the denitrification filters was implemented in May. This new control method compares real time effluent TIN, as measured by YSI ammonia and nitrate probes and compares those values to the TIN target. An algorithm within the plant control system then determines what the target denitrification filter effluent nitrate should be. The target is then compared to the most recent effluent nitrate and the methanol pump dosages are then adjusted to achieve this target. DN filters will be turned off in the summer months (August-October) and will be brought online during November to remain under the 15 mg/L TIN limit. |

What are the potential impacts and benefits of the project?

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| Environmental benefits including the reduction of nitrogen in the South Platte River and downstream lakes, Barr Lake, Milton Reservoir, and providing data to support site-specific stream standards for nutrients in 2027. It is expected to result in a better chemical and nutrient management plan. |

**Sensors**

Provide the following information for each type of sensor that will be used in the project.

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| Manufacturer/Model | YSI NitraVis 705 IQ |
| Parameter being measured | Nitrate |
| Sensor Price | $12,539.20 |
| Maintenance Requirements | Maintenance-free WTW ultrasonic cleaning |
| Accuracy | (+/-)3% of the measured value (+/-) 0.5 mg/L |
| Precision | 0.1 mg/L |
| Range | 0.00-50.00 mg/L NO3-N |
|  |  |
| Manufacturer/Model | YSI VARiON AmmolLyt 700IQ |
| Parameter being measured | Ammonium |
| Sensor Price | $4,210.00 |
| Maintenance Requirements | Annual calibration, weekly cleaning of case |
| Accuracy | + 5% of measured value or + 0.2 mg/L |
| Precision | 0.1 mg/L |
| Range | 0.1 to 100.0 mg/L |
|  |  |
| Manufacturer/Model | ChemScan UV-6101 |
| Parameter being measured | nitrate |
| Sensor Price | $12,651.20 |
| Maintenance Requirements | Annual calibration |
| Accuracy | 2-5% of range |
| Precision | 2% of Range |
| Range | 200-450 nm |

**Monitoring [limit 250 words]**

What is the general schedule for the project? Include: sensor deployment, maintenance and calibration, data analysis, and approximate date that data will be available to the Challenge Administrator.

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| May-July: Collect TIN data from sensor. Continue to calibrate and validate data  July: Install nitrate probe in Clearwell (CW) influent if approved  July: Calibrate nitrate probe in CW influent.  August-October shut down DN filters due to limited budget  November-December: DN filters back online, continue to monitor sensors |

Describe location (provide map or link to a map) and monitoring frequency for each sensor.

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If applicable, describe any existing monitoring data being collected in the area and whether these data will be integrated:

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| Previous work completed on the DN filters began in November 2017. It was decided to conduct a stress test of all eight DN filters from December 2017 to March 2018. Baseline data was gathered during this time as power demand, chemical use, and O&M was monitored. Nitrate targets were manually input and periodically changed based on trending data. |

**Data Architecture [limit 250 words]** [Web service endpoint and authentication information are due to Challenge Administrator by November 1, 2018.]

Describe the plan for sensor data collection and management. Please provide any information about plans to meet data and web interface standards. Also identify any software products you intend to use that support the use of the standards.

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| Currently, we manually input a target effluent nitrate concentration value of each DN filter. We select this value based on ammonia sensors at the nitrifying trickling filters (NTFs) and chlorine contact tanks (CCTs).  The automated program will take real-time data from ammonia probe located in the CCTs along with the target final effluent TIN input. The following equation will be modeled to adjust the nitrate target concentration:  TIN (mg/L): input value  (mg/L): ammonia sensors- real time  (mg/L): nitrate Chemscan auto sampler Clearwell  (mg/L): nitrite Chemscan auto sampler  The target variable will increase or decrease at a set step interval (approx. 1 mg/L per 30 minutes) after a sample cycle is completed and the result TIN is calculated and compared to the target TIN.  An added challenge to the program is only seven filters are set to denitrification mode: six filters are set to a different target than one of the filters while the remaining filter is in filtration mode. To accommodate individual filter settings, minimum and maximum caps will be set to help guide the target values. One of the filters will be run at a low target as a stress test, so programming a maximum cap of 2 mg/L nitrate will inhibit a higher target. The other six filters will be at a higher target value off the equation described above.  All data will be available as PI excel data. |