



SMART CITIES USE CASE

 **Green Stream**



senet

Connecting the IoT Revolution

LoRa Technology: Flood Sensor Monitoring with Real-time Data

GREEN STREAM TECHNOLOGIES ADVISES WHEN THE WATER RISES



HAMPTON ROADS AT GROUND ZERO

The metropolitan region in Southeastern Virginia called “Hampton Roads” is prone to flooding. The area is home to two million citizens and 14 military installations, including Langley Air Force Base and Naval Station Norfolk, the largest naval complex in the world. Like many of the 665 coastal communities in the U.S., this region regularly floods during moderate to heavy rains and high tides. Hampton Roads has the additional burden of experiencing land subsidence – the ground is sinking as sea level water is rising.

Recurrent flooding leaves neighborhood roads with standing water and stalled vehicles. The Director of IT development for the City of Norfolk approached Jim Gray, an electrical and systems engineer, at a local Makerspace about the city’s chronic flooding problem. What started as an innovative pilot project to keep the city apprised of how high waters were getting and which roads were impassable is now Green Stream Technologies, which leverages Semtech’s LoRa devices and wireless radio frequency technology (LoRa Technology).

“I proposed using this new technology called Semtech’s LoRa Technology and take low-cost sensors and put them up on bridges and poles to monitor flooding.”

– Jim Gray, President and CEO, Green Stream Technologies

Green Stream Technologies is an environmental technologies company. The business helps to create smarter, safer, more resilient communities with the power of IoT technology and data analytics.

THE ROAD TO RESILIENCE THROUGH IOT

Green Stream’s end-to-end flood monitoring solutions are designed using commercial, off-the-shelf ultrasonic sensors and easy to deploy LoRa-enabled gateways. The data is communicated over a network provided by Senet, a leading provider of LoRaWAN™ services platforms that enable IoT connectivity.

The Green Stream flood sensors are autonomous, requiring no external power or wired network connection. Each sensor is a self-contained, weather-proof, solar-powered unit that comes with a universal mounting bracket and extension arm. They are small enough to be installed on top of crosswalks, light or electric poles and bridges. The rugged devices are positioned above a body of water or over dry land.

“You get to the intersection and see that it is flooded, but you have to get to work. There is no way to tell how deep the water is, so you drive into it and it’s much deeper than anticipated. Hampton Roads lost several cars and two police vehicles during Hurricane Matthew.”– Karen Lindquist, COO, Green Stream Technologies



DNA of IoT Use Case

IoT Challenge

- Monitor real-time flooding data in coastal communities
- Notify citizens of hazardous conditions
- Reduce vehicle loss on impassable roadways

LoRa Technology Used

- LoRa delivers low-power wireless technology
- LoRaWAN network provided by Senet allows extensive coverage
- Easy to install off-the-shelf LoRa-enabled ultrasonic sensors

Business Value

- Real-time flood monitoring end-to-end solution
- Data integration with emergency management systems
- Hyper-local weather alerts at a neighborhood level

Green Stream systems measure the distance from the surface to the LoRa-enabled sensor and calculates precise water height and depth. The data sampled is communicated in 6-minute intervals to gateways and sent to the Green Stream Cloud. The flood data can be viewed on Green Stream's web-based dashboard or mobile devices. Green Stream also integrates into consumer smart phone apps like Waze and direct warning systems that provide push notifications.

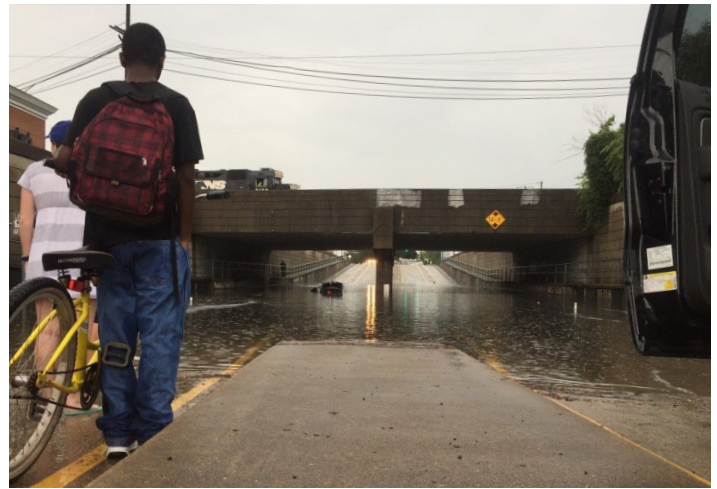
GREEN STREAM PINPOINTS FUTURE OPPORTUNITIES

When Green Stream looked at connectivity options, Wi-Fi did not provide the range needed and cell technology was not practical due to its battery consumption requirements. LoRa Technology was the preferred choice for its long-range, low-power capabilities and small footprint. Senet, a contributing member of LoRa Alliance, provides LoRaWAN network connectivity.

"We are looking forward to working a lot more with Semtech and Senet. They are smart and provide a seamless, collaborative process."

– Karen Lindquist, COO, Green Stream Technologies

After a series of product prototyping, refinement and calibration testing, the first Green Stream deployment occurred in the City of Norfolk in April 2017, specifically in the Ghent neighborhood



and around the Hague Footbridge. Deployments in Virginia Beach and numerous communities in North Carolina soon followed.

Green Stream's main customers are municipalities – at the state or local level – and private environmental firms. Green Stream's sales cycle is quite fast as system expenses often fall under pre-defined expenditure caps, eliminating the requirement for a cumbersome RFP process.

"Part of our appeal is that while some municipalities may already have government-sponsored sensors in place, they are quite large and very expensive. We are hearing, 'for the same amount of money we pay for one sensor, we're getting 10 to 20 of yours' and the cost to maintain them drops drastically with our system."

– Jim Gray, President and CEO, Green Stream Technologies

HOW IT WORKS: GREEN STREAM



The step-by-step process of Green Stream's LoRa-enabled solution.

Green Stream is expanding beyond Hampton Roads and coastal communities into U.S. inland communities around the Missouri River basin and into parts of the globe where Senet has deployed its network infrastructure.

Green Stream is working with sea-level rise experts at Old Dominion University's Department of Ocean, Earth & Atmospheric Sciences to establish a standard model for deployment in new areas – determining how many LoRa-enabled sensors are needed and where should they be placed. Green Stream is also working on a predictive analytics model utilizing ground water saturation sensors and hyper-local weather data to quickly tell what will happen before flooding occurs.

Need a real-time flood monitoring solution:
www.greenstream.com

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LoRa Technology platform**

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Semtech's LoRa devices and wireless radio frequency technology is a widely adopted long-range, low-power solution for IoT that gives telecom companies, IoT application makers and system integrators the feature set necessary to deploy interoperable IoT networks, gateways, sensors, module products, and IoT services worldwide. IoT networks based on the LoRaWAN™ specification have been deployed in over 100 countries and Semtech is a founding member of the LoRa Alliance™, the fastest growing IoT Alliance for LPWAN applications.



Semtech Corporation is a leading supplier of high performance analog, mixed-signal semiconductors and advanced algorithms for high-end consumer, enterprise computing, communications, and industrial equipment. Semtech, publicly traded since 1967, is listed on the Global Select Market under the symbol SMTC and has more than 32 sales and application support offices in 14 countries as well as representatives and distribution support locations in more than 30 countries. Semtech is dedicated to providing proprietary platforms, differentiated by innovation, size, efficiency, performance, and reach.



The LoRa Alliance is an open, nonprofit association that has become one of the largest and fastest-growing alliances in the technology sector since its inception in 2015. Its members closely collaborate and share experiences to promote the LoRaWAN protocol as the leading open global standard for secure, carrier-grade IoT LPWAN connectivity. With the technical flexibility to address a broad range of IoT applications, both static and mobile, and a certification program to guarantee interoperability, the LoRaWAN protocol has already been deployed by major mobile network operators globally and connectivity is available in over 100 countries, with continuing expansion ongoing.