

P4 INFRASTRUCTURE

Asset Management Using IoTand GIS-Based Solutions

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Internet of Things (IoT) and Geographic Information Systems (GIS)

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Internet of Things

Wikipedia's Definition:

The Internet of things (IoT) is a network of physical devices, vehicles, home appliances, and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these things to connect, collect and exchange data.



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Internet of Things



theverge.com

At grocery store and not sure if I need ketchup?

Shoot! Did I leave the garage door open?

picclick.com

Honey, did you adjust the temperature before we left?

electronicdesign.com

∩est

AIRWAVE 74



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Internet of Things — Internet of Infrastructure





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Geographic Information Systems (GIS)



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Geographic Information Systems (GIS)



www.releeinc.com - Robert E. Lee and Associates (website image)



Asset Management Using IoT and GIS Solutions





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Permeable Pavement as a Stormwater Solution



nacto.org

Kazemi, H., Rockaway, T.D., Rivard, J., Abdollahian, S. (2017). "Assessment of Surface Infiltration Performance and Maintenance of Two Permeable Pavement Systems in Kentucky", *Journal of Sustainable* Water in the Built Environment, June 30, 2017, American Society of Civil Engineers, Reston, VA.



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Wisconsin Administrative Code:

NR 115 – Wisconsin's Shoreland Protection Program

- Shoreland within 300' of ordinary high water line is limited to 15% impervious area
- Can be increased to 30% if proper stormwater management techniques are implemented, but a permit and engineering review is required
- Impervious surfaces are allowed to become pervious to offset a new building footprint



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Wisconsin Administrative Code: NR 115 Requirements

WCCA* Guidebook for Implementation of NR 115 – Wisconsin's Shoreland Protection Program, states the following:

4. <u>Permeable Paver System</u>. The key word here is system. The pavers are just a cap for the pervious system below. They are expensive and need to be installed properly and maintained. The WCCA shoreland committee has concerns about products that are marketed as pervious and depend on installation, maintenance and long-term compliance. If counties are going to allow the pervious pavers, they should consider an operation and maintenance agreement. Product representatives have recommended that <u>on-site inspections should be required to ensure proper installation</u>, and to ensure proper maintenance is occurring at 5 and 10 years. They require that contractors or product representatives ensure the systems stay pervious. Some counties consider permeable paver systems to be pervious and others do not.

*Wisconsin County Code Administrators



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LiquaLevel An IoT-Based Solution for Permeable Pavement Management

S1

microcontrollers, Gateway and Solar Panels

- microcontrollers collect data and send to Gateway
- Gateway aggregates data from all sensors on site and sends information to cloud

S2

- V//

Float Sensor

Tipping

Bucket

Rain

Gauge

A S G



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S3



Example – Permeable Strip "Up Stream" of Inlet with Clogging Front





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Project Location



Tipping Bucket Rain Gauge



Float Sensor – S3A





Float Sensor – S1A







Rainfall **Total Clogged** Total = 2 IN Surface Area Intensity = 0.5 IN/HR Volume of Water Infiltrated 2,018 GAL **Estimated Time Until** Cleaning **Total Tributary Watershed 28 MONTHS** 105,000 SF



LiquaLevel

Asset Management Using IoT and GIS Solutions NGICP Training | Milwaukee, WI | March 22, 2019

Questions?

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Connected & Sustainable Infrastructure

Other Applications for:

Stormwater Management, Flood Protection and Water Treatment:

LiquaLevel

- Stormwater Storage Systems
- Bioremediation Systems (e.g. bioswales)
- Blue Roof Systems
- Constructed Wetlands
- Permeable Reactive Barrier

