Smart Water

Reducing the cost of maintaining our national drainage system

Reducing the risk of and damage caused by flooding

Managing the level of contaminants.

APSE Roads & Lighting Services Advisory Group

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Agenda

- Internet of Things (IoT)

- Our Changing Environment

- Building a Preventative Maintenance Solution

- Gully Profiling

- Gully Instrumentation

- Self Learning System

- Summary

- Next Steps
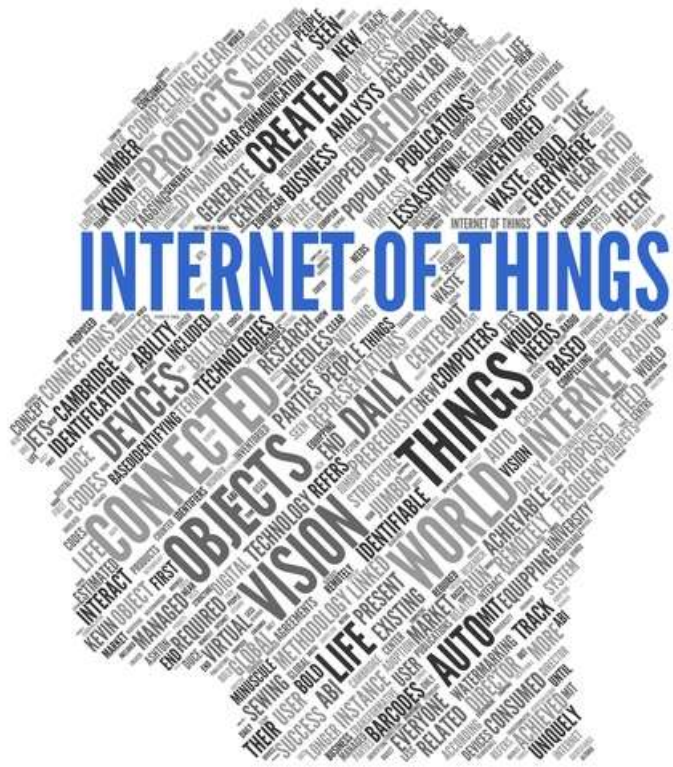
www.smartstreetshub.com

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Our Changing Environment

Current Status

- National drainage system is a key asset in prevention of flooding.
- 14M gullies in UK
- 1800 flooding incidents pa on HA managed roads (2% of total road network)*
- 60% of HA flooding asset related – 40% due to extreme weather*
- £4.9bn – cost of flooding since 2007
- £36M to repair flood damaged roads in Hampshire in 2014
- 1 day in every 5 – flooding incidents

Challenges

- Changes in UK weather patterns leading to increase in flooding incidents.
- Greater focus needs to be given to preventative maintenance.**
- Detailed knowledge of the state of the asset base is lacking but necessary.**
- Agencies need to deliver cost savings in current economic environment.
- Agencies facing increased pressure to manage level of contaminants entering the natural water courses through the drainage system.

* Highways Maintenance Efficiency Programme
** Maintaining Strategic Infrastructure: Roads; Report by Public Accounts Committee, 10 Sep 2014

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Gully Data

- Drives informed cleaning regimes resulting in cost savings.
- Forms a comprehensive and accurate foundation layer of data:
  - Gully location (via GPS)
  - Current state (at time of cleaning)
  - Silt level
  - Faults/physical condition
- Mapping of problem and safe gullies
  - To allow adjustment to cleaning intervals
- Data Collection:
  - Via maintenance & inspection crews using hand-held device.
  - Data uploaded to central server via 3G or wifi directly from hand-held.
  - Pre-configured data templates ensuring consistency and accuracy.

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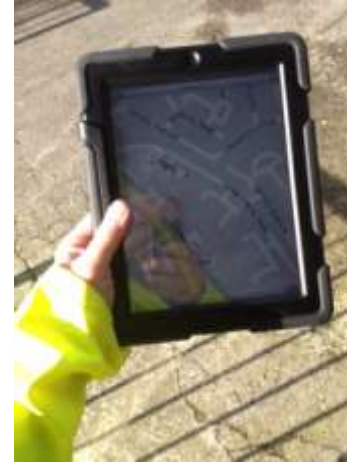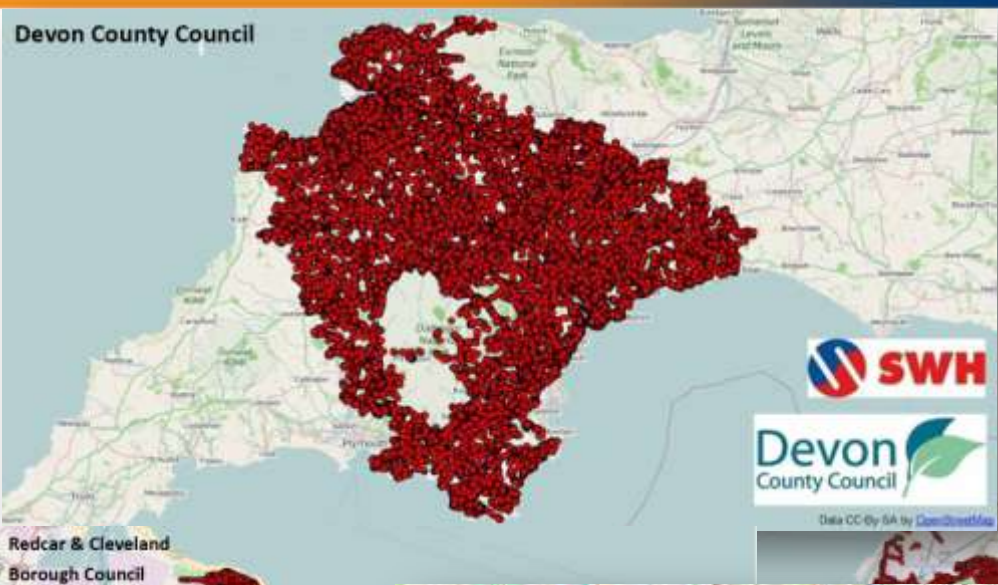
Gully Instrumentation

- Real-time management of problem gullies to reduce flooding and levels of contaminants.

- Monitoring safe gullies for peace of mind.

- Optimises maintenance costs through correct prioritisation of resources.

- Gully sensors provide real time data:
  - Water level/flood level
  - Silt level
  - Contaminants
  - Local rain sensor data

- Multiple sensors wirelessly networked to local hubs that forward data to central data hub.

- Powered by solar cells with battery back up.

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Gully IoT Data Hub

Smart Gully Sensor   **Comms Hub**   **Mobile network**   **Data Hub**

- Central data hub:
  - Real time and historic gully data, time stamped.
  - Static gully data from profiling work.
  - Weather forecast data from Met office.

- Management console:
  - Report generator
  - Map interface showing location, silt levels and contaminant levels of gullies (real time and static data).
  - Flooding alerts from instrumented gullies.
  - Prioritised list of gullies to be cleaned.

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Intelligent Modelling

Model accepts inputs such as Weather, Manually Collected Gully Observations, Gully Locations, Tree Coverage, Road Traffic Counts and other powerful indicators of gully performance.

Inputs inform the InTouch modelling software and an initial understanding of the gully network is created. This understanding will continue to improve over time.

Model outputs flood risk alerts, map visualisations of gully cleaning priority, recommended cleaning schedules and other valuable information about the network.

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Benefits of a Predictive Model

The proposed gully inspection scheme will provide informative data on the gully network, particularly those that are of a high flooding risk.
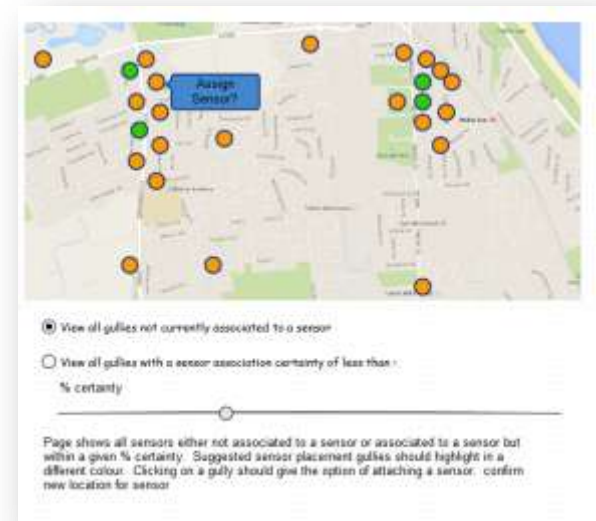
This additional data will allow the InTouch model to:

- Gain a better understanding of the gully network;

- Form more accurate predictions about a gully's state; and,

- Reduce reliance on manual inspections.
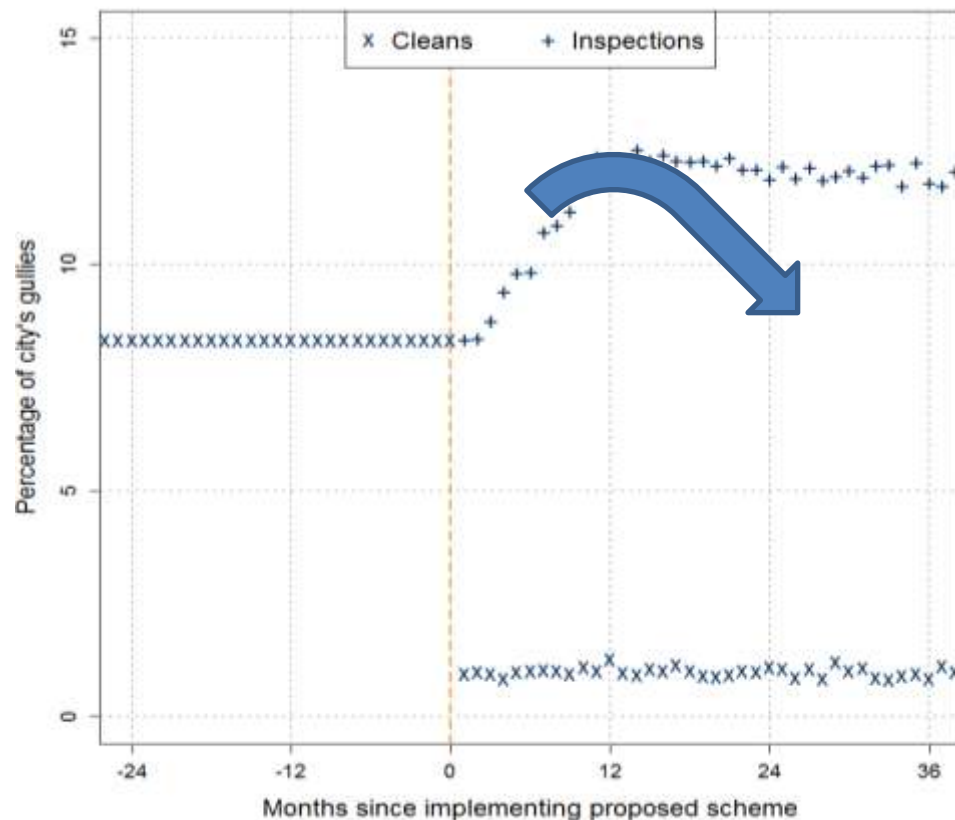
Self Learning System

- Optimisation of the number of instrumented gullies.

- System learns how individual or clusters of gullies behave to given environmental and weather conditions.

- System predicts state of gullies given recent weather and environmental conditions.

- System forecasts how gullies will behave given forecast weather conditions:

  – Sending alerts for gullies in danger of flooding.

  – Allowing prioritisation of maintenance activity ahead of flooding.

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Solution

- Smart Water:
  - Drives improved maintenance regimes for the national drainage system.
  - Refocuses maintenance effort on preventative activities.
- By deploying state of the art technology within the national drainage system, Smart Water:
  - Reduces maintenance costs by more than 50%.
  - Reduces the incidents and impact of flooding.
  - Provides a real time status of the gully network – early warning for problem gullies; peace of mind for safe gullies.
  - Reduces levels of contaminants.

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Summary

- Incidents of flooding are on the increase.

- Local Authorities and Agencies are under pressure to reduce maintenance costs.

- More focus needs to be given to preventative maintenance.

- Greater understanding of the asset base is required.

- Smart Water can help deliver a solution to all these issues.

Any Questions?

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