

DSH

Digital Solutions Hub

Bringing

40

Petabytes of
Environmental
Data

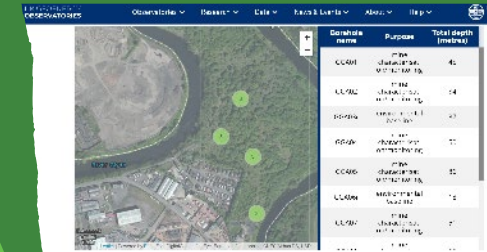
+

To your
doorstep

Richard Kingston
Professor of Urban Planning & GISc
Director of NERC Digital Solutions Programme
Director of Digital Futures Platform
The University of Manchester

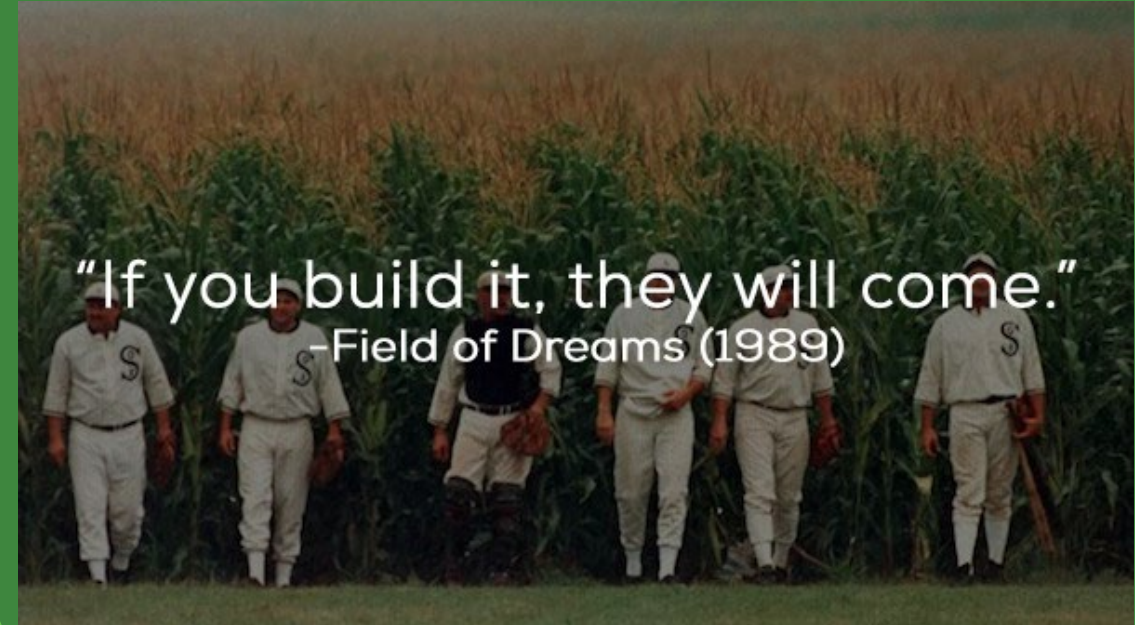
NERC DIGITAL SOLUTIONS PROGRAMME

- ▶ 5 year £8m investment to build a UKRI ‘national facility’ – the Digital Solutions Hub – during phase 1
- ▶ DSH & NERC’s core focus is to work closely with stakeholders across the public / third sector and industry
- ▶ Making NERC’s 40+ PBs data more discoverable to non-academic users – following the **FAIR principles**
 - ▷ to make better use of their data from the 5 data centres
 - ▷ connecting with **social, economic, health** and other **environmental** data across the **whole of the UK**
- ▶ **Developed a number of use cases and services for user testing**
- ▶ **Big challenge now is what happens from 1st October....?**



OVERALL APPROACH

- ▶ Build it and they will come.
- ▶ No, no, no.
- ▶ So, you spent 4 years building this thing, it's great it can do A, B and C but we also want it to do X, Y and Z !

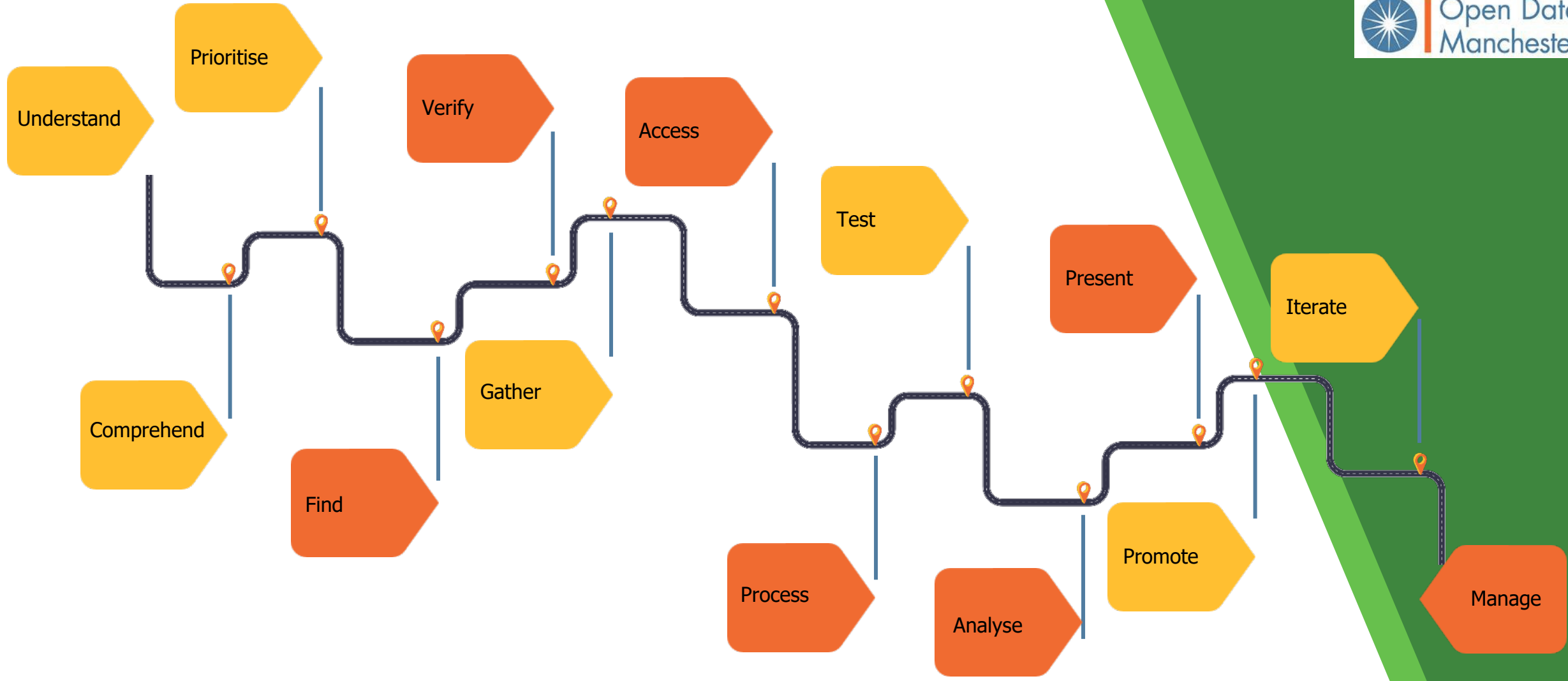




England



USER JOURNEY



DEFINE

GET

ANALYSE

SHOWCAS
E

MANAGE

ARCHETYPES (PERSONAS)



The **Analyst**

Analysts monitoring the environment

The **Author**

Authors of monitoring frameworks

The Data **Leader**

Data leaders in organisations

The **Investigator**

Analysts answering questions with data

The Data **Specialist**

GIS specialists and data support

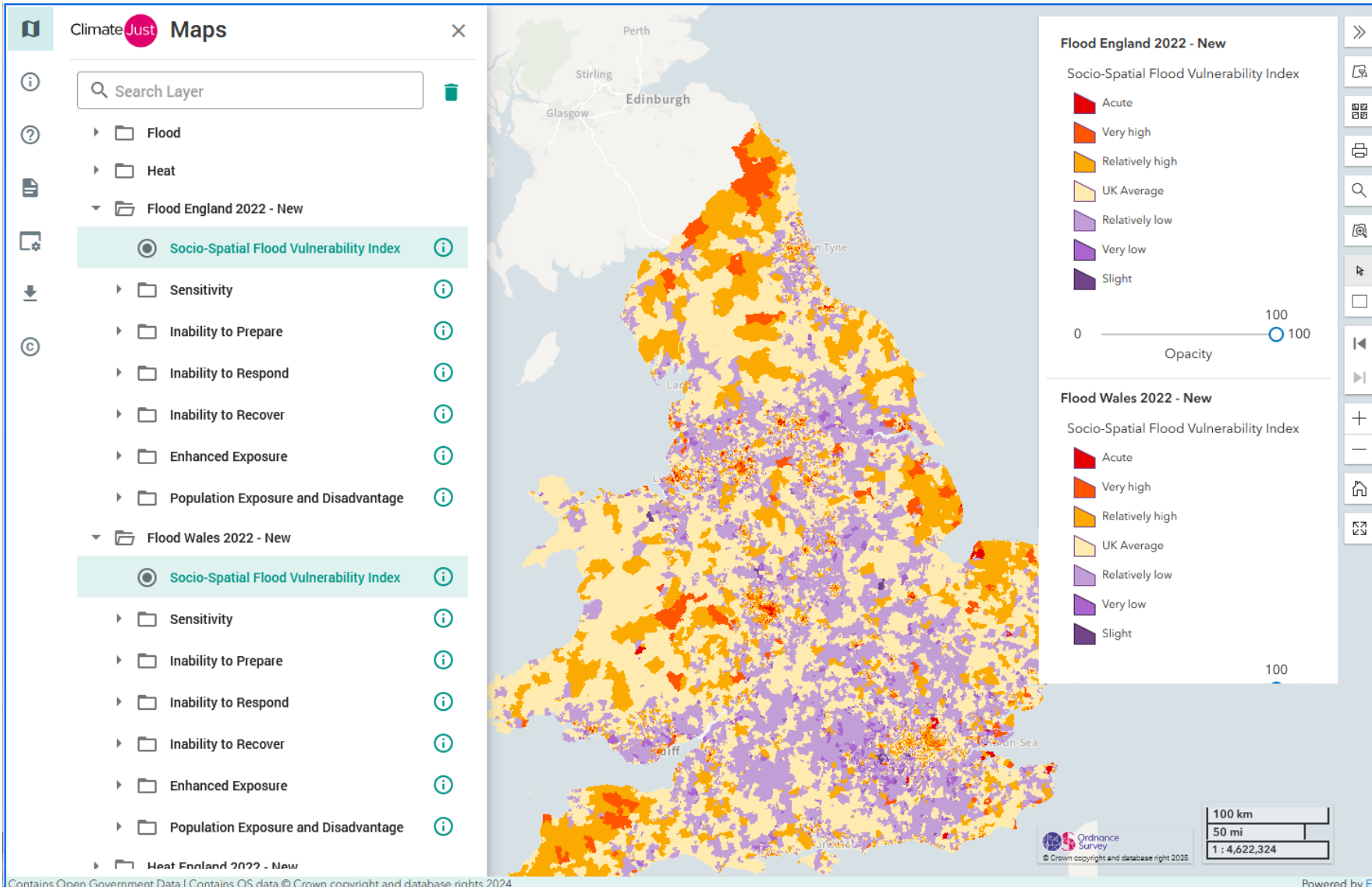
The Data **Steward**

Focusing on data quality and sharing

Researchers & YOU!

Kingston et al (in rev) Mapping the UK Environmental Data Ecosystem as a Multi-Stakeholder Organisational Network. *Journal of Data, Information & Management*.

@nercdsh



- ▶ Understanding socio-spatial vulnerability to climate change
- ▶ Referred to in the recent House of Commons Environmental Audit Committee report
- ▶ www.climatejust.org.uk

**We all know with the rise of open data
more datasets are online than ever before.
But how do you find the datasets you need
if you aren't exactly sure what you are
looking for?**

ENABLING BETT

► Search and d

where will the hottest place in the UK be in 2030

No results found!

Where will be t hottest place ii the UK in 2030

Search for NERC data

Where will be the hottest place in the UK in 2030?

Results

UKCP Local Projections at 2.2km Resolution for 1980-2080

Convection permitting climate model projections produced as part of the UK Climate Projection 2018 (

UKCP18 Convection-Permitting Model Projections for the UK at 2.2km resolution

Climate model runs at convection-permitting scale for the UK for three time slices (1981-2000, 2021-

UKCP18 Regional Projections for UK Countries for 1980-2080

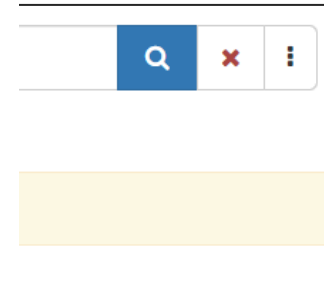
Regional climate model projections produced as part of the UK Climate Projection 2018 (UKCP18) proje

UKCP18 Regional Projections by Administrative Regions over the UK for 1980-2080

Regional climate model projections produced as part of the UK Climate Projection 2018 (UKCP18) proje

Thermal imagery of England

Thermal imagery for selected areas of England was taken by a FLIR SC 6000 HS thermal camera mounted



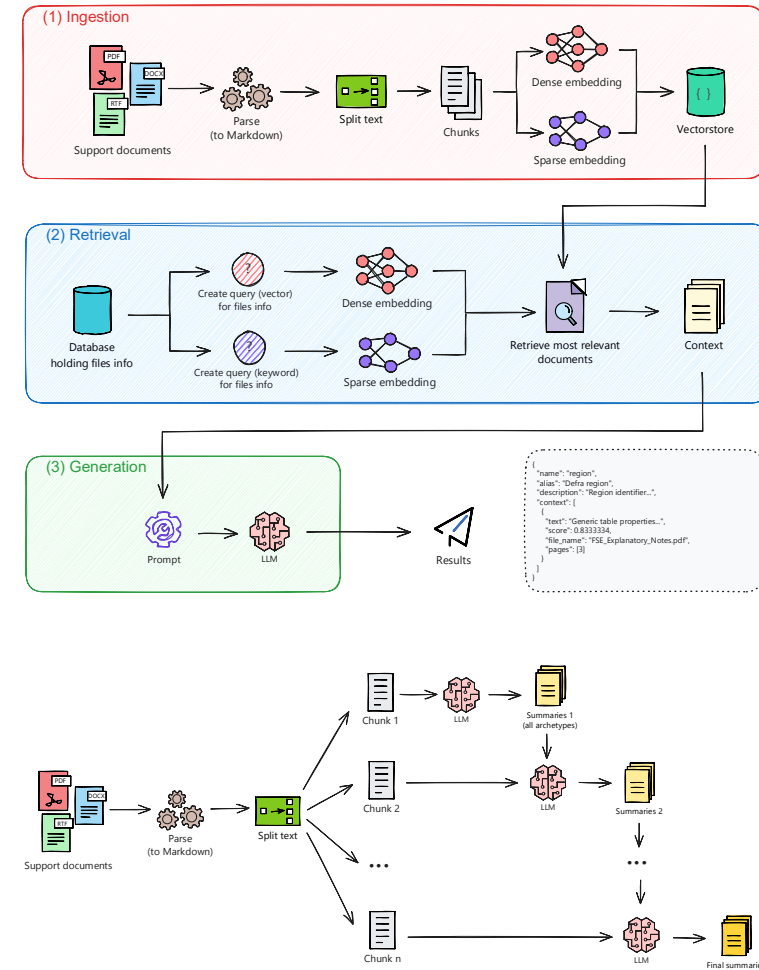
many users not aware of NERC and its data.

- Difficult to find data
- Using a Large

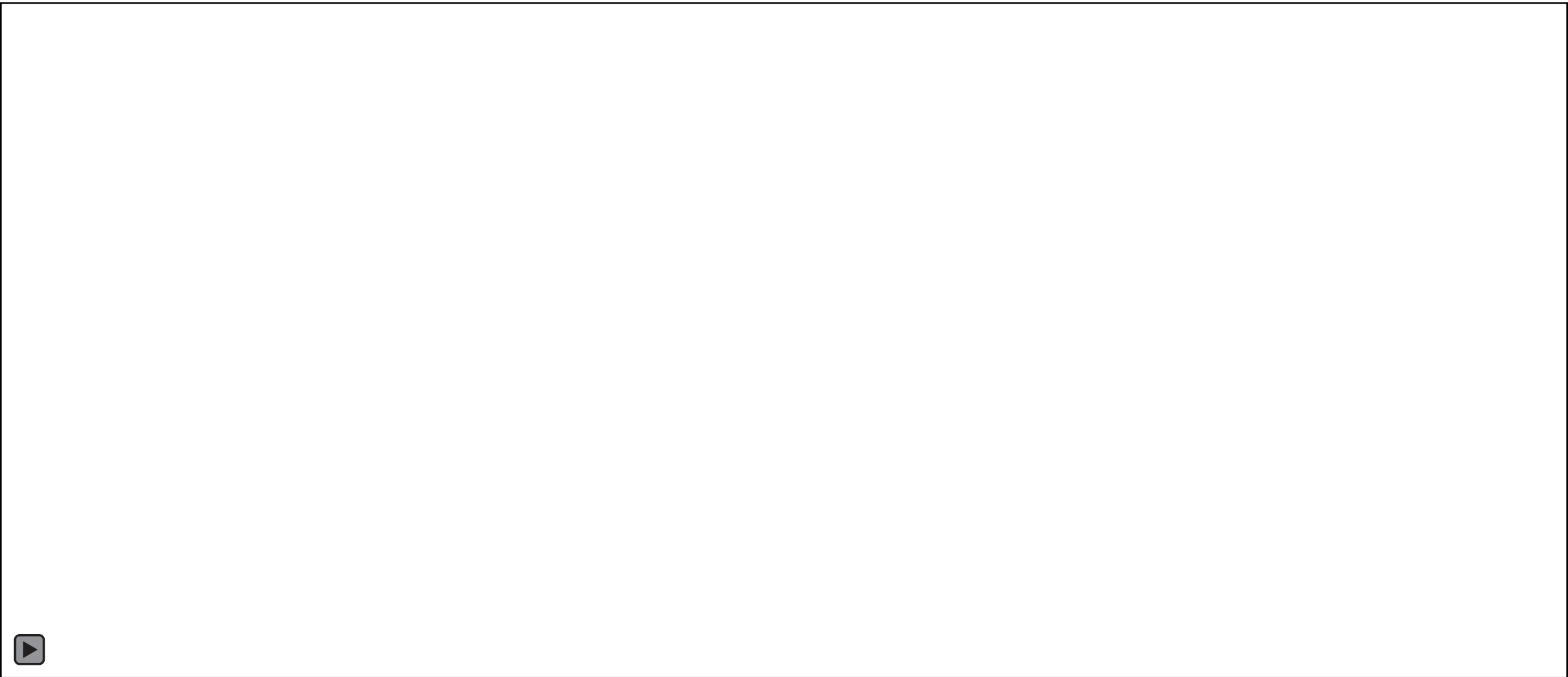
Language Model (LLM) we have trained it on all the NERC meta-data records.

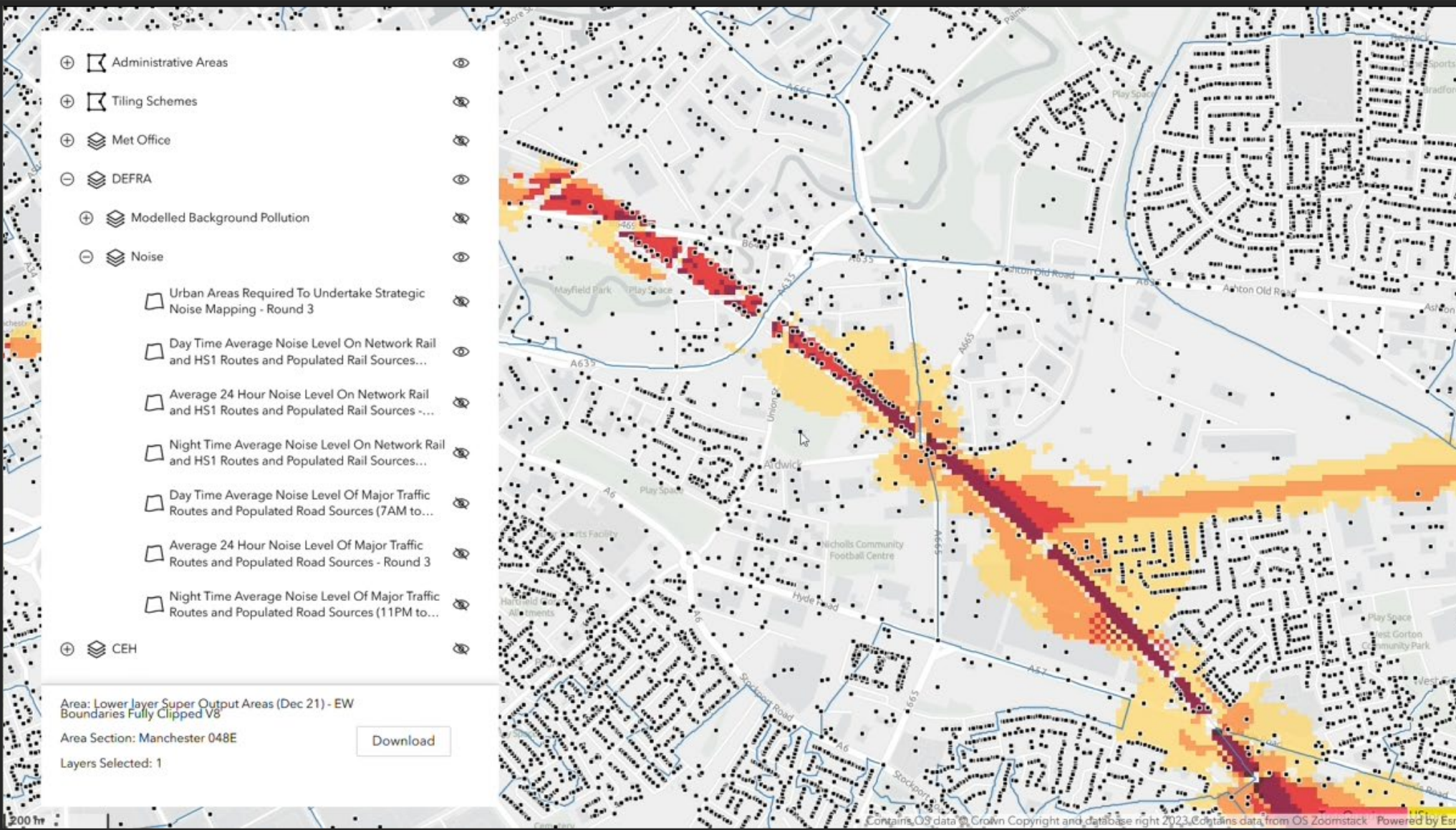
- When we ask the same question...

- ▶ Navigating large volumes of documentation can be a significant challenge.
- ▶ To address this, we've developed an AI-powered system that processes and analyses a collection of publicly available support documents, making the information within them easier to access and understand.
- ▶ Our work demonstrates two key AI capabilities: answering complex questions and summarizing lengthy documents.
- ▶ We have implemented a technique called Retrieval Augmented Generation (RAG) to build a question-answering system. After downloading and processing a corpus of documents, our system can answer questions by first searching these documents for the most relevant information. It then uses that specific context to generate a precise and trustworthy answer, ensuring the information is grounded in the source material.
- ▶ To tackle long and complex documents, we built a summarization tool that uses AI to produce clear and concise summaries. The system has been designed to effectively read through lengthy material and extract the key points, generating a summary that captures the main ideas of the original document.



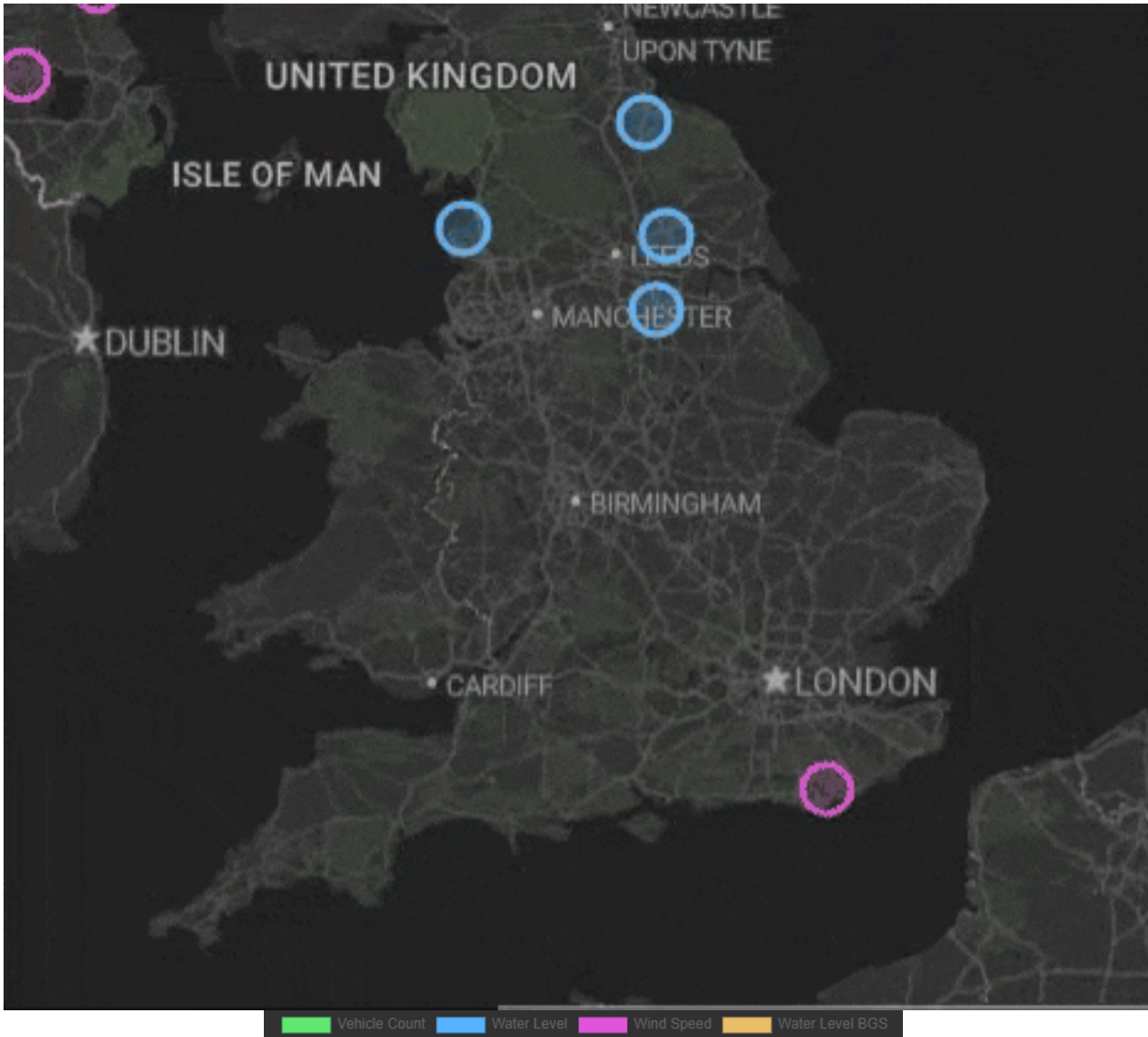
- ▶ **Constraining your search to your own data is the most important take-away here.**
- ▶ **Using RAG to combine a vector search engine with an LLM.**
- ▶ **Instead of the model answering from general knowledge, it first **retrieves relevant chunks from your data**, then **generates an answer based only on that.****





UPRNs – Unique Property Reference Number

OS product more detailed than a postcode.

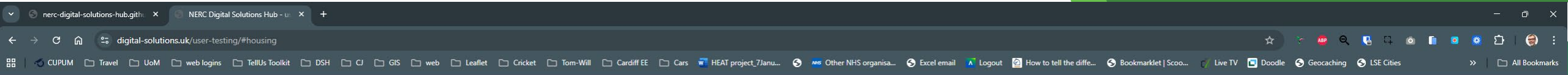


As more real time data becomes available this can be 'plugged in' using an API

Facilitates near real time responses to events.

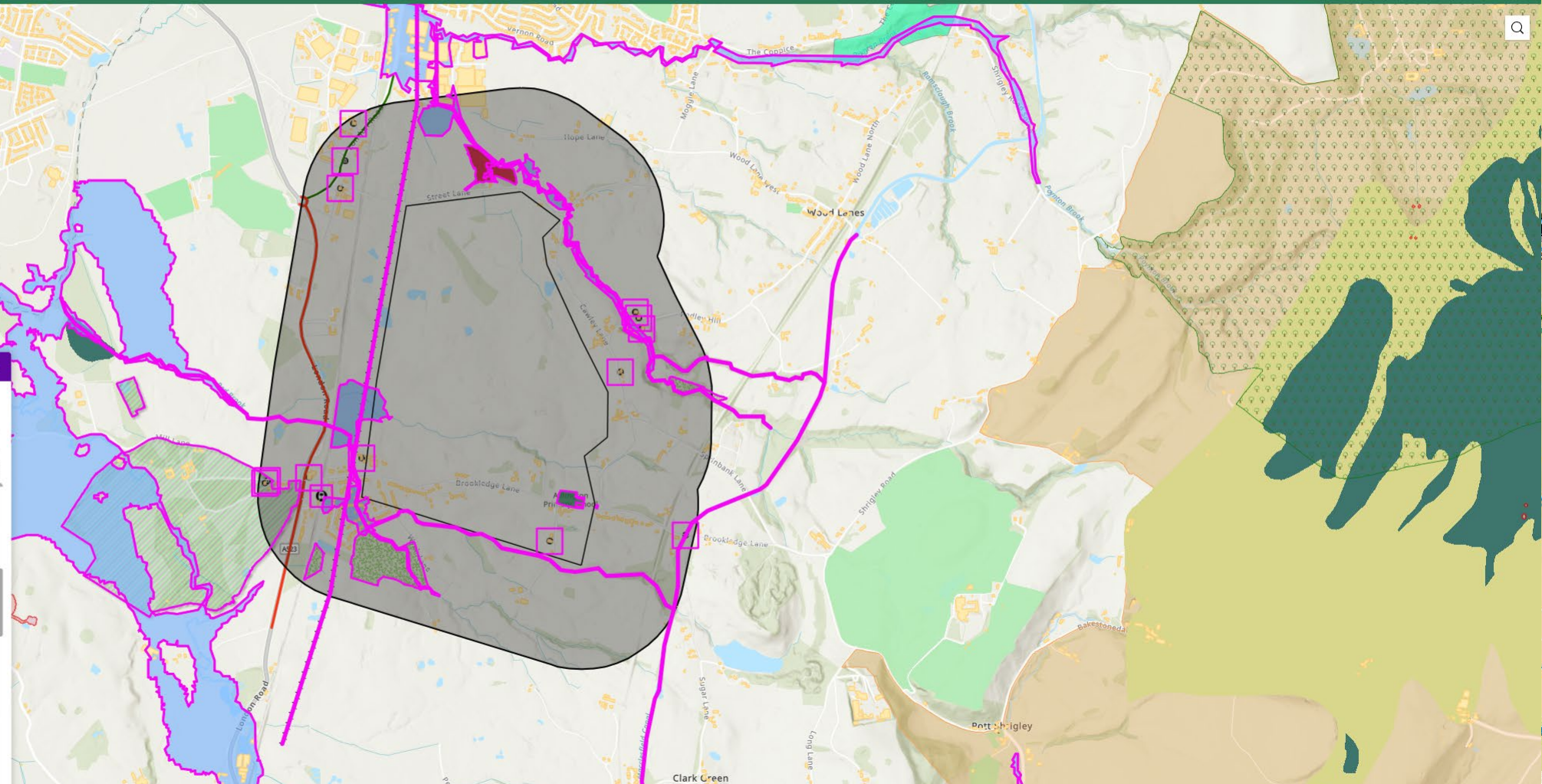
- NHS – raised air pollution levels leads to increases in patients arriving at A & E within 36 hours.
- UKHSA – chemical, radiological and nuclear threats to health.
- National Rail – coastal flooding (overtopping)





Layers

- Buildings and Infrastructure
- Boundaries
- Water and Flooding
- Transport
- Heritage
- Green / Blue Space
- Land Use / Land Cover
- UKCP



Create and Analyse Site

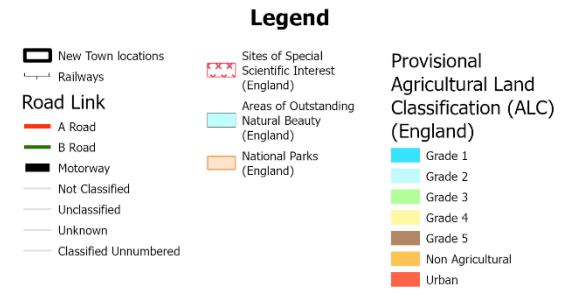
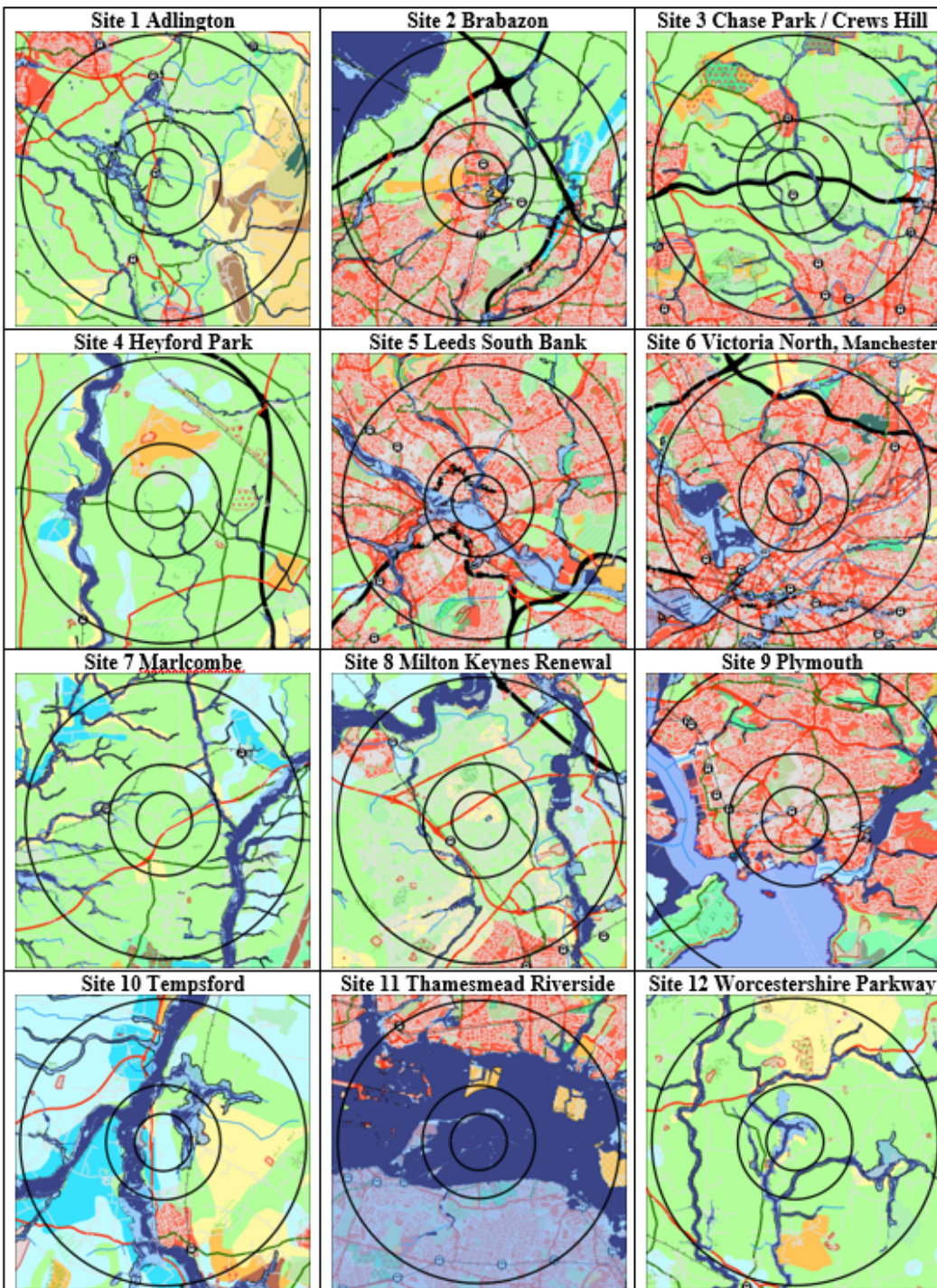
Draw Location (drop a pin or draw a polygon). You can also add a buffer around your site to investigate the nearby area.

Kilometers

- EAST LODGE 0.47 km
- GREENACRES AND WINDLE HEY 0.47 km
- Registered Parks and Gardens 1
- ADLINGTON HALL 0.3 km
- Registered Parks and Gardens: ADLINGTON HALL
- Ancient Woodland (England) 3
- No value 0.13 km

This registered park and garden is ADLINGTON HALL. It is Grade II*. It covers 65.63 ha. The registration date is 10 June 1985.

For more information see: <https://historicengland.org.uk/listing/the-list/list-entry/1000636>.



- ▶ **Services (please note these are all still under development and can break at anytime)**
- ▶ UPRN service
 - ▷ <https://nerc-digital-solutions-hub.github.io/dsh/apps/uprn>
- ▶ Catalogue service
 - ▷ <https://nerc-digital-solutions-hub.github.io/dsh-testing/>
- ▶ **Use cases (more stable)**
- ▶ Climate Just tool
 - ▷ <https://www.climatejust.org.uk/map.html>
- ▶ Housing use case
 - ▷ <https://experience.arcgis.com/experience/910e7fe0c9cf4a7295a691d1ed11e80d>
- ▶ Environmental and Health use case
 - ▷ <https://experience.arcgis.com/experience/254f7226ecdf484f9f8bb01c0310d691>

QUESTIONS & FURTHER DETAILS

Sing-up for our newsletter here:
<https://www.digital-solutions.uk/>

<https://linktr.ee/nercdsh>

Where to build use case
<https://www.digital-solutions.uk/user-testing/#housing>

Thanks to all the DSH team in Manchester.

@NERCdsh @gisplanner

