

APPENDIX D

Geological Context

Geology 1:50,000 Maps Legends

Artificial Ground and Landslip

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	MGR	Made Ground (Undivided)	Artificial Deposit	Not Supplied - Holocene
	WMGR	Infilled Ground	Artificial Deposit	Not Supplied - Holocene
	SLIP	Landslide Deposit	Unknown/Unclassified Entry	Not Supplied - Quaternary

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
		Faults		
		Rock Segments		

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay, Silt, Sand and Gravel	Not Supplied - Holocene
	GFDUD	Glaciofluvial Deposits, Devensian	Sand and Gravel	Not Supplied - Devensian
	TILLD	Till, Devensian	Diamicton	Not Supplied - Devensian
	HMGDD	Hummocky (Moundy) Glacial Deposits, Devensian	Diamicton	Not Supplied - Devensian
	PEAT	Peat	Peat	Not Supplied - Quaternary
	LDE	Lacustrine Deposits	Clay	Not Supplied - Quaternary
	LDE	Lacustrine Deposits	Sand and Gravel	Not Supplied - Quaternary

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	PLCM	Pennine Lower Coal Measures Formation	Mudstone, Siltstone and Sandstone	Not Supplied - Westphalian
	RSC	Riddle Scout Rock	Sandstone	Not Supplied - Westphalian
	OL	Old Lawrence Rock	Sandstone	Not Supplied - Westphalian
	MLRS	Milnrow Sandstone	Sandstone	Not Supplied - Westphalian
	HER	Helpet Edge Rock	Sandstone	Not Supplied - Westphalian
	GAS	Great Arc Sandstone	Sandstone	Not Supplied - Westphalian
	RYSA	Royley Sandstone	Sandstone	Not Supplied - Westphalian

Geology 1:50,000 Maps

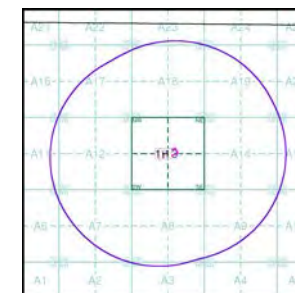
This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:50,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around the site. This mapping may be more up to date than previously published paper maps.

The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page. Not all layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:50,000 Maps Coverage

Map ID: 1
Map Sheet No: 085
Map Name: Manchester
Map Date: 2010
Bedrock Geology: Available
Superficial Geology: Not Available
Artificial Geology: Not Available
Faults: Not Supplied
Landslip: Not Available
Rock Segments: Not Supplied

Geology 1:50,000 Maps - Slice A

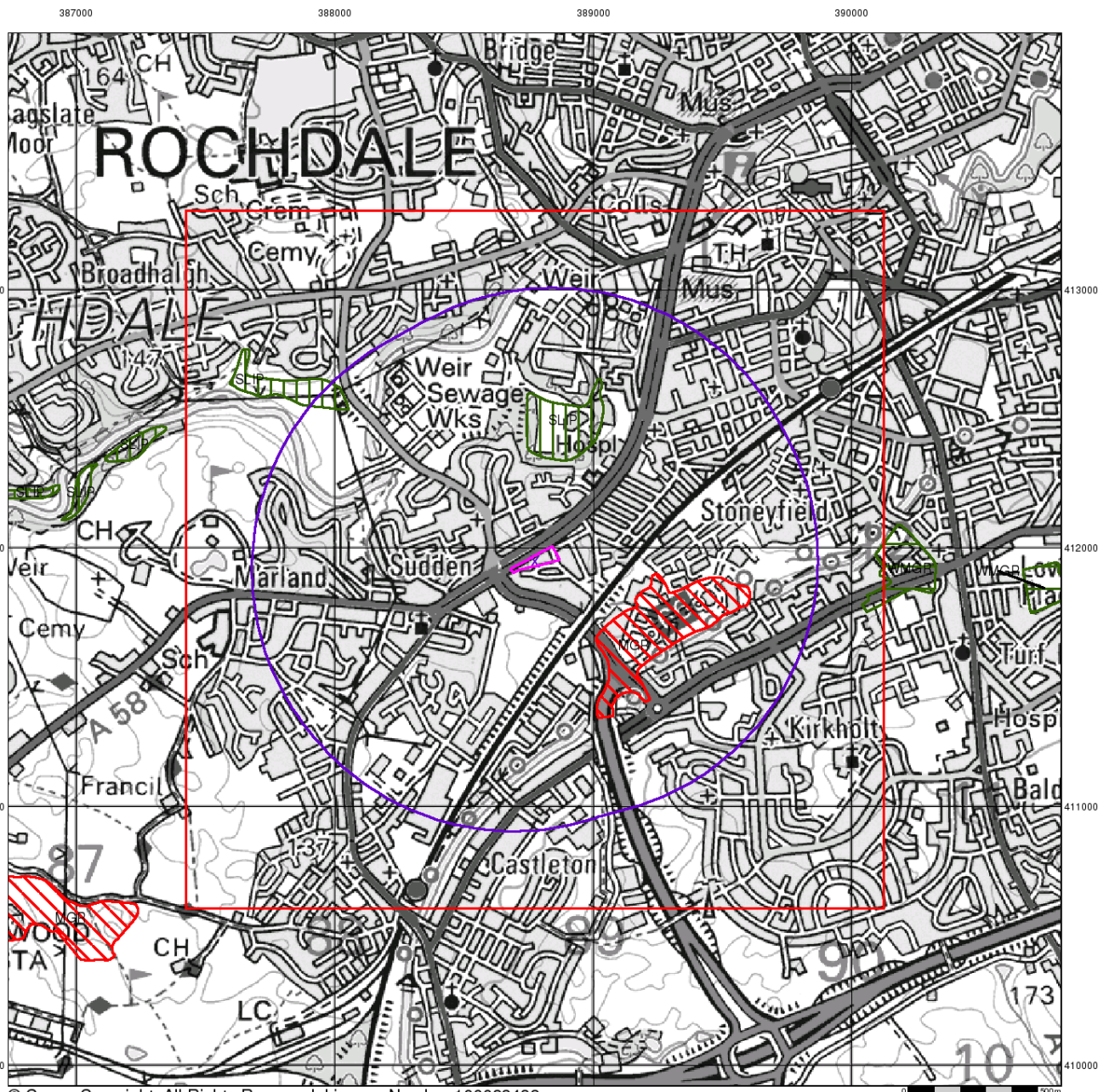


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Slice: A
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Artificial Ground and Landslip

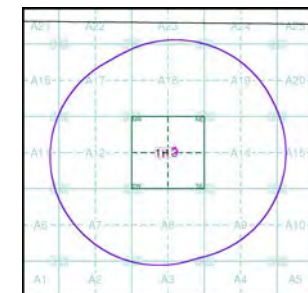
Artificial ground is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Information about previously developed ground is especially important, as it is often associated with potentially contaminated material, unpredictable engineering conditions and unstable ground.

Artificial ground includes:

- Made ground - man-made deposits such as embankments and spoil heaps on the natural ground surface.
- Worked ground - areas where the ground has been cut away such as quarries and road cuttings.
- Infilled ground - areas where the ground has been cut away then wholly or partially backfilled.
- Landscaped ground - areas where the surface has been reshaped.
- Disturbed ground - areas of ill-defined shallow or near surface mineral workings where it is impracticable to map made and worked ground separately.

Mass movement (landslip) deposits on BGS geological maps are primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground. The dataset also includes foundered strata, where the ground has collapsed due to subsidence.

Artificial Ground and Landslip Map - Slice A



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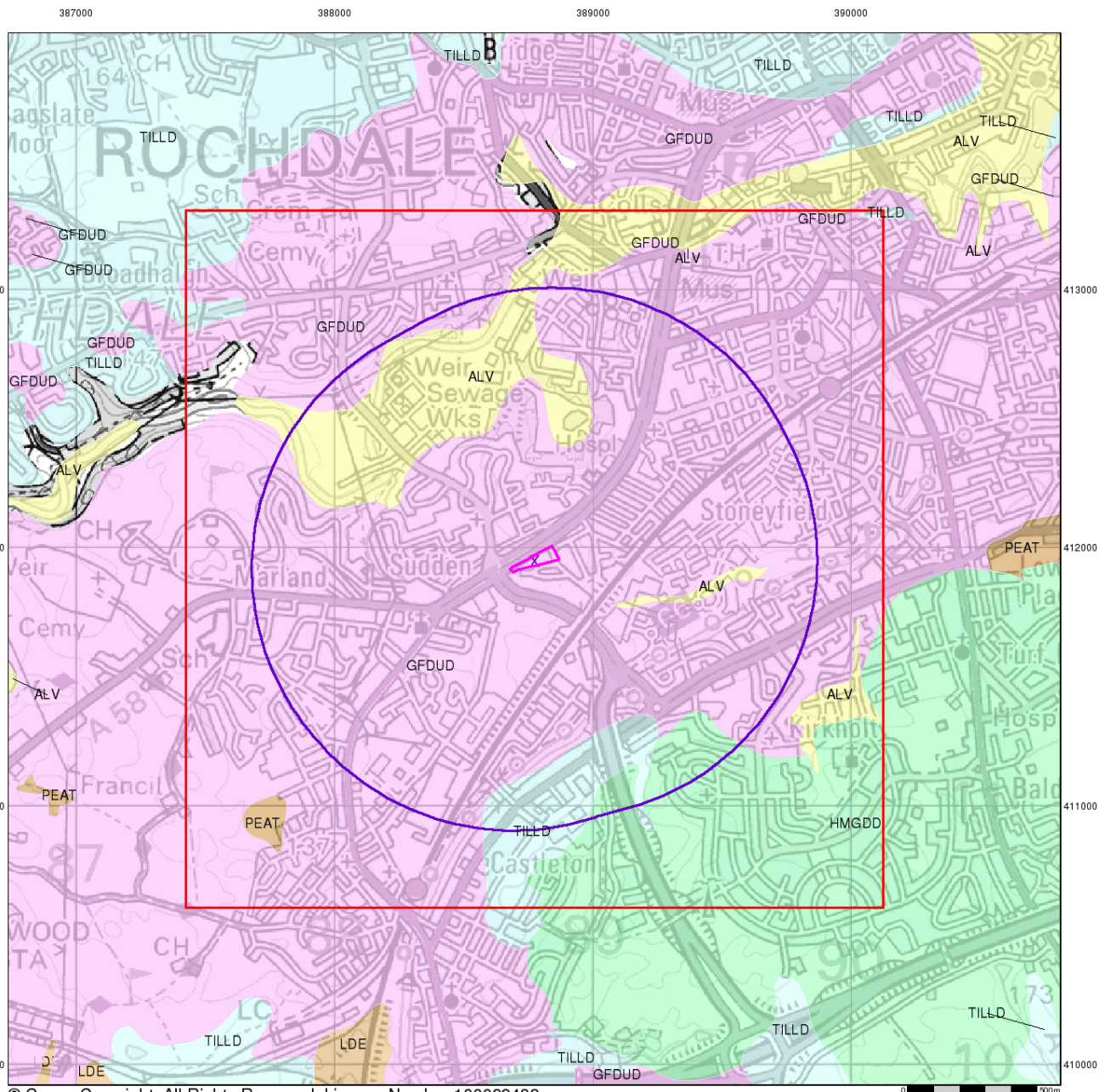
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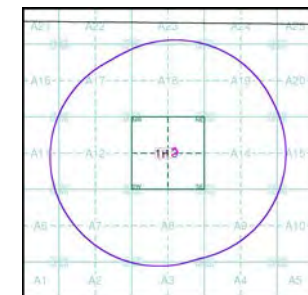
Superficial Geology

Superficial Deposits are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks referred to as Bedrock. This dataset contains Superficial deposits that are of natural origin and 'in place'. Other superficial strata may be held in the Mass Movement dataset where they have been moved, or in the Artificial Ground dataset where they are of man-made origin.

Most of these Superficial deposits are unconsolidated sediments such as gravel, sand, silt and clay, and onshore they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A



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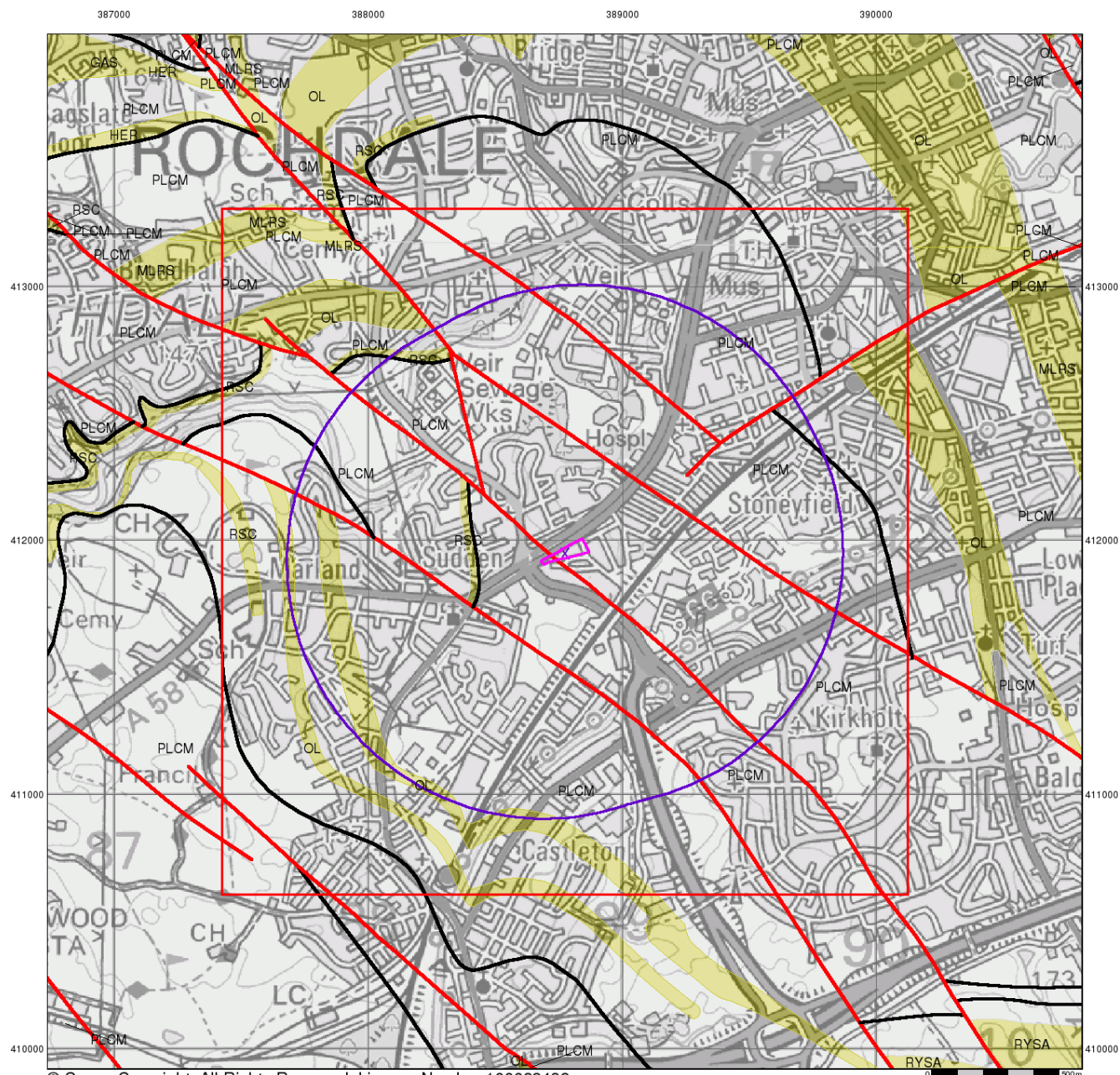
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Bedrock and Faults

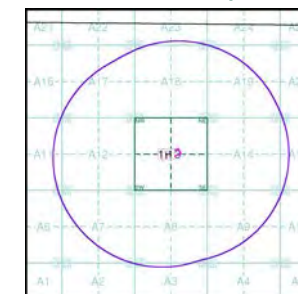
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

The bedrock has formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

The BGS Faults and Rock Segments dataset includes geological faults (e.g. normal, thrust), and thin beds mapped as lines (e.g. coal seam, gypsum bed). Some of these are linked to other particular 1:50,000 Geology datasets, for example, coal seams are part of the bedrock sequence, most faults and mineral veins primarily affect the bedrock but cut across the strata and post date its deposition.

Bedrock and Faults Map - Slice A



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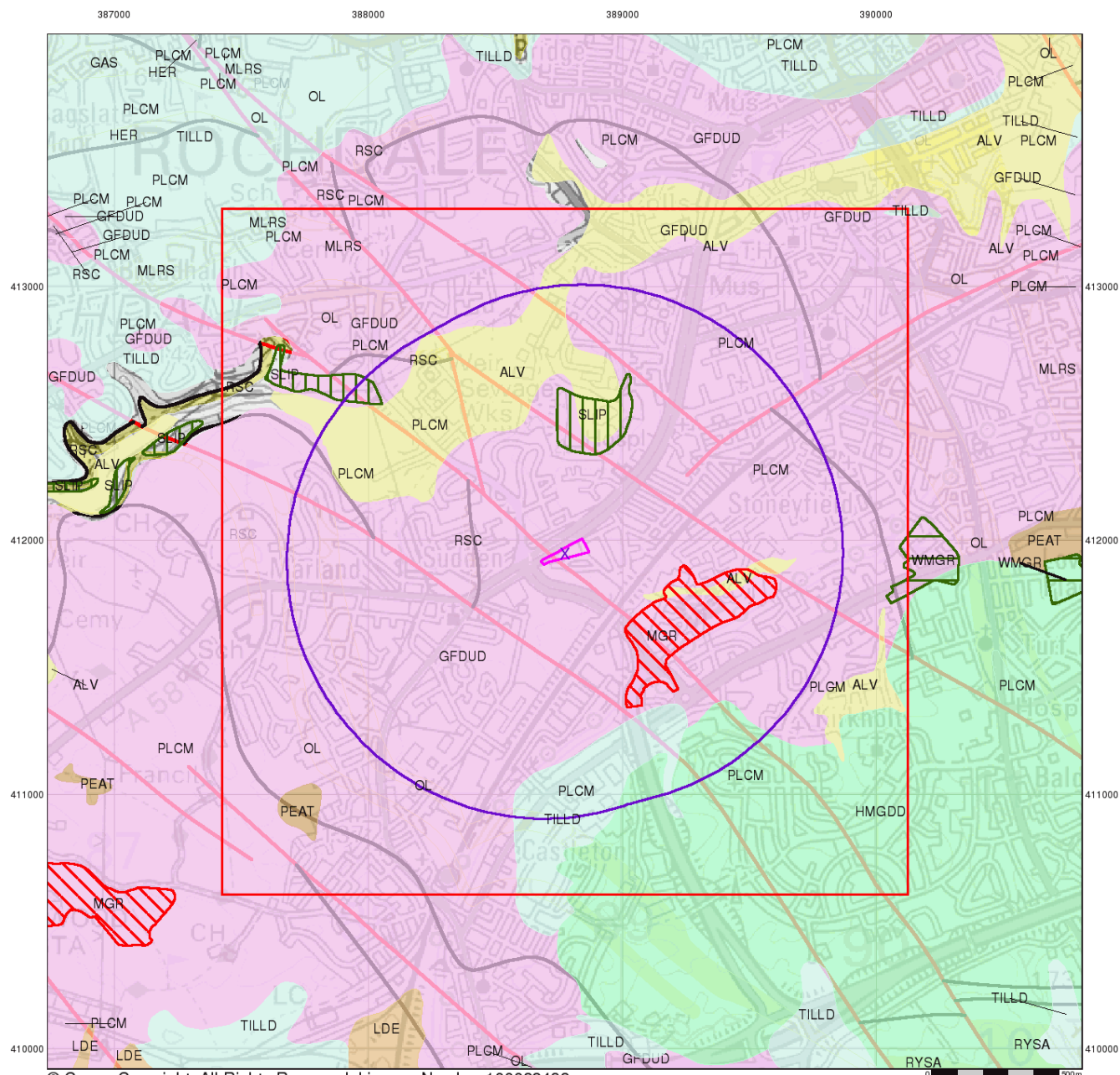
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Combined Surface Geology

The Combined Surface Geology map combines all the previous maps into one combined geological overview of your site.

Please consult the legends to the previous maps to interpret the Combined "Surface Geology" map.

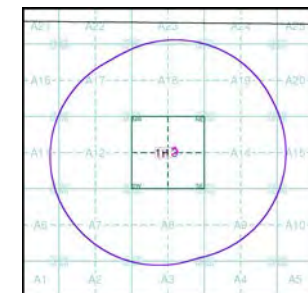
Additional Information

More information on 1:50,000 Geological mapping and explanations of rock classifications can be found on the BGS website. Using the LEX Codes in this report, further descriptions of rock types can be obtained by interrogating the 'BGS Lexicon of Named Rock Units'. This database can be accessed by following the 'Information and Data' link on the BGS website.

Contact

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website: www.bgs.ac.uk

Combined Geology Map - Slice A



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SITE INVESTIGATION DEPT.

PARKSIDE LANE**LEEDS LS155X.**Contract No. **M2922/F1294**Borehole No. **7**Location **A58 Rochdale**

Ground Level

Client **Rochdale County Borough**Date **21.1.70.****BOREHOLE LOG**

STRATA	Legend	Depth below Ground Level	Thickness of Strata	Type of Sample	c lb/sq. ft.	ϕ deg.	m.c. %	γ lb/cu. ft.	N
Loose Dark Soil		1'6"	1'6"	2'6"					
Loose/Compact Medium-Fine Brown Sand with some Gravel			8'6"	I					8
		10'0"		7'6"					10
Loose to Compact Medium/Fine Brown slightly silty Sand			11'0"	I					9
		21'0"		17'6"					10
Firm Grey Silty Clay			5'0"	I	1300	5	17.3	137	
		26'0"		22'6"					
Compact Dark Brown Clayey Sand			5'0"	I					13
		31'0"		29'6"					
Stiff Brown/Grey Silty Clay			4'0"	I	1870	6	18.4	131	
		35'0"		33'0"					
Compact Brown and Grey Silty Sand			5'0"	I					19
		40'0"		38'6"					

Water Struck at **None Encountered During Boring** Maximum Observed Water Level **19'0"**

Undisturbed Sample ☐
 Disturbed Sample ☐
 Water Sample ☐
 Penetration Test ☐

c = Cohesion
 ϕ = Angle of Internal Friction
 m.c. = Moisture Content
 γ = Bulk Density
 N = Standard Penetration Value

Water levels are subject to seasonal or tidal variation and should not be taken as constant

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HOLST & CO. LTD.

SITE INVESTIGATION DEPT.

PARKSIDE LANE

LEEDS LS115SX.

Contract No. M2922/P1294

Location A 58 Rochdale

Client Rochdale County Borough

Borehole No. 8

Ground Level

Date 23.1.70

BOREHOLE LOG

STRATA	Legend	Depth below Ground Level	Thickness of Strata	Type of Sample	c lb/sq. ft.	ϕ deg.	m.c. %	γ lb/cu. ft.	N
Loose dark soil		2'0"	2'0"						
Compact brown clayey sand			5'0"	3'6" I					13
		7'0"		7'6" I					15
Compact medium brown sand		13'0"	6'0"						
Firm brown silty clay		14'6"	1'6"	14'0" I	0	24	21.2	109	
Fine brown sand		17'6"	3'0"	15'6" I					13
Firm grey silty clay			4'6"	18'0" I	800	0	21.2	134	
		22'0"		23'0" I					14
Compact medium brown silty sand			7'0"						
		29'0"		28'6" I					22
Compact grey sandy silt			11'0"	33'6" I					29
				38'6" I					36
		40'0"							

Water Struck at None encountered during boring Maximum Observed Water Level 12'0"

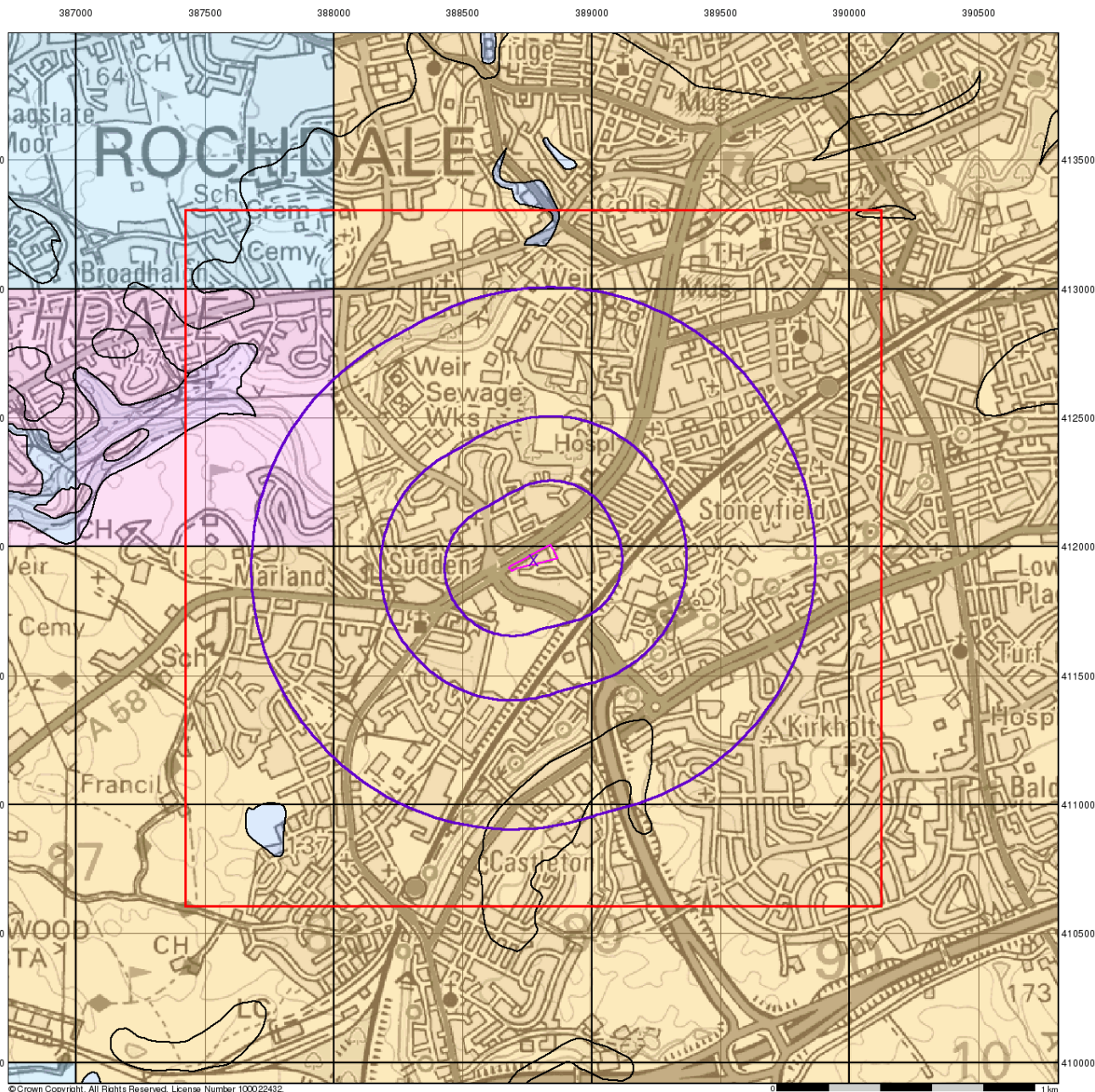
Undisturbed Sample {}
 Disturbed Sample o
 Water Sample Δ
 Penetration Test I

c = Cohesion
 ϕ = Angle of Internal Friction
 m.c. = Moisture Content
 γ = Bulk Density
 N = Standard Penetration Value

Water levels are subject to seasonal or tidal variation and should not be taken as constant

APPENDIX E

Groundwater Vulnerability and Flood Maps



Groundwater Vulnerability

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

Bedrock Aquifers

- High Vulnerability, Principal Aquifer
- High Vulnerability, Secondary Aquifer
- Medium Vulnerability, Principal Aquifer
- Medium Vulnerability, Secondary Aquifer
- Low Vulnerability, Principal Aquifer
- Low Vulnerability, Secondary Aquifer

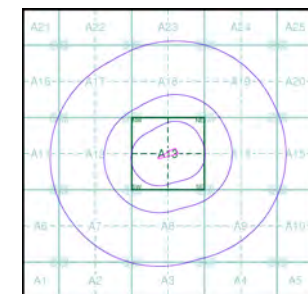
Superficial Aquifers

- High Vulnerability, Principal Aquifer
- High Vulnerability, Secondary Aquifer
- Medium Vulnerability, Principal Aquifer
- Medium Vulnerability, Secondary Aquifer
- Low Vulnerability, Principal Aquifer
- Low Vulnerability, Secondary Aquifer

Unproductive Aquifer

Soluble Rock

Site Sensitivity Context Map - Slice A

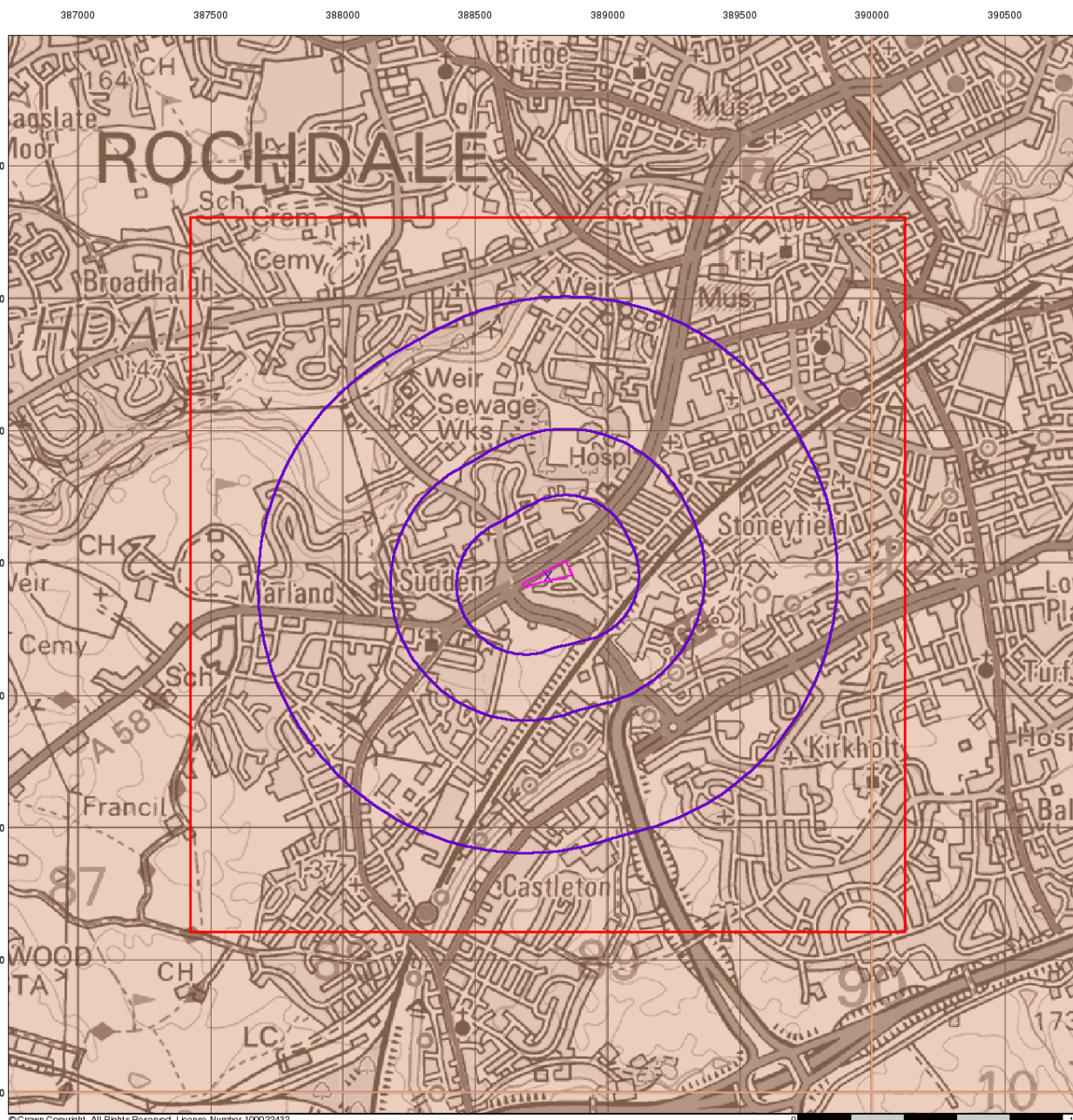


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Bedrock Aquifer Designation

General

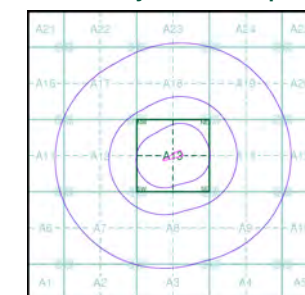
-  Specified Site
-  Specified Buffer(s)
-  Bearing Reference Point
-  Slice
-  Map ID

Agency and Hydrological

Geological Classes

-  Principal Aquifer
-  Secondary A Aquifer
-  Secondary B Aquifer
-  Secondary Undifferentiated
-  Unproductive Strata
-  Unknown
-  Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A

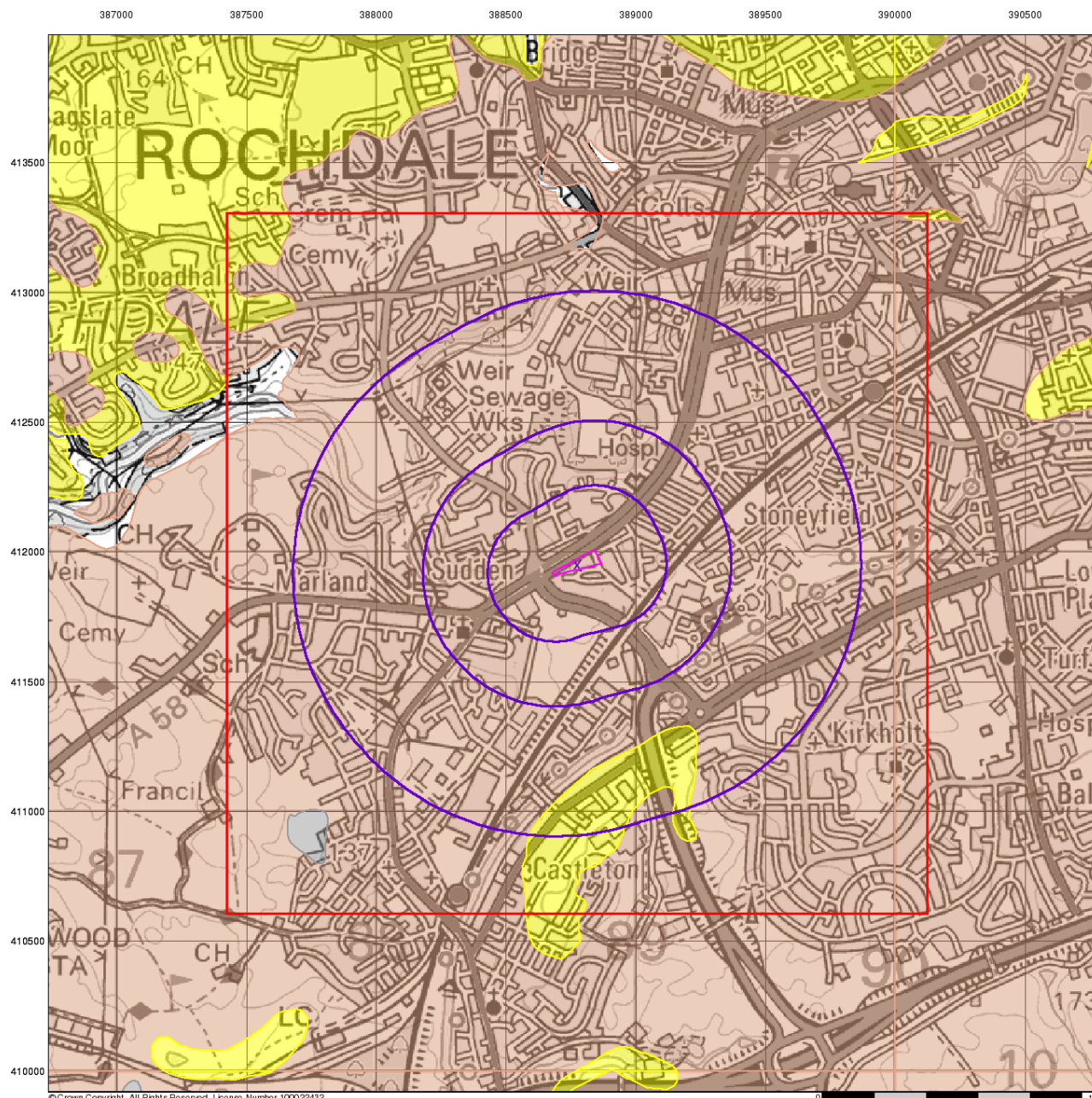


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0 1 km

Superficial Aquifer Designation

General

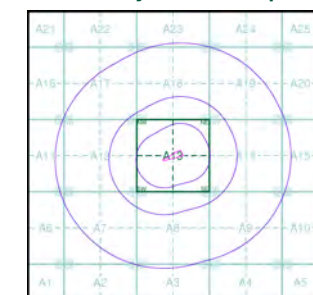
- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A

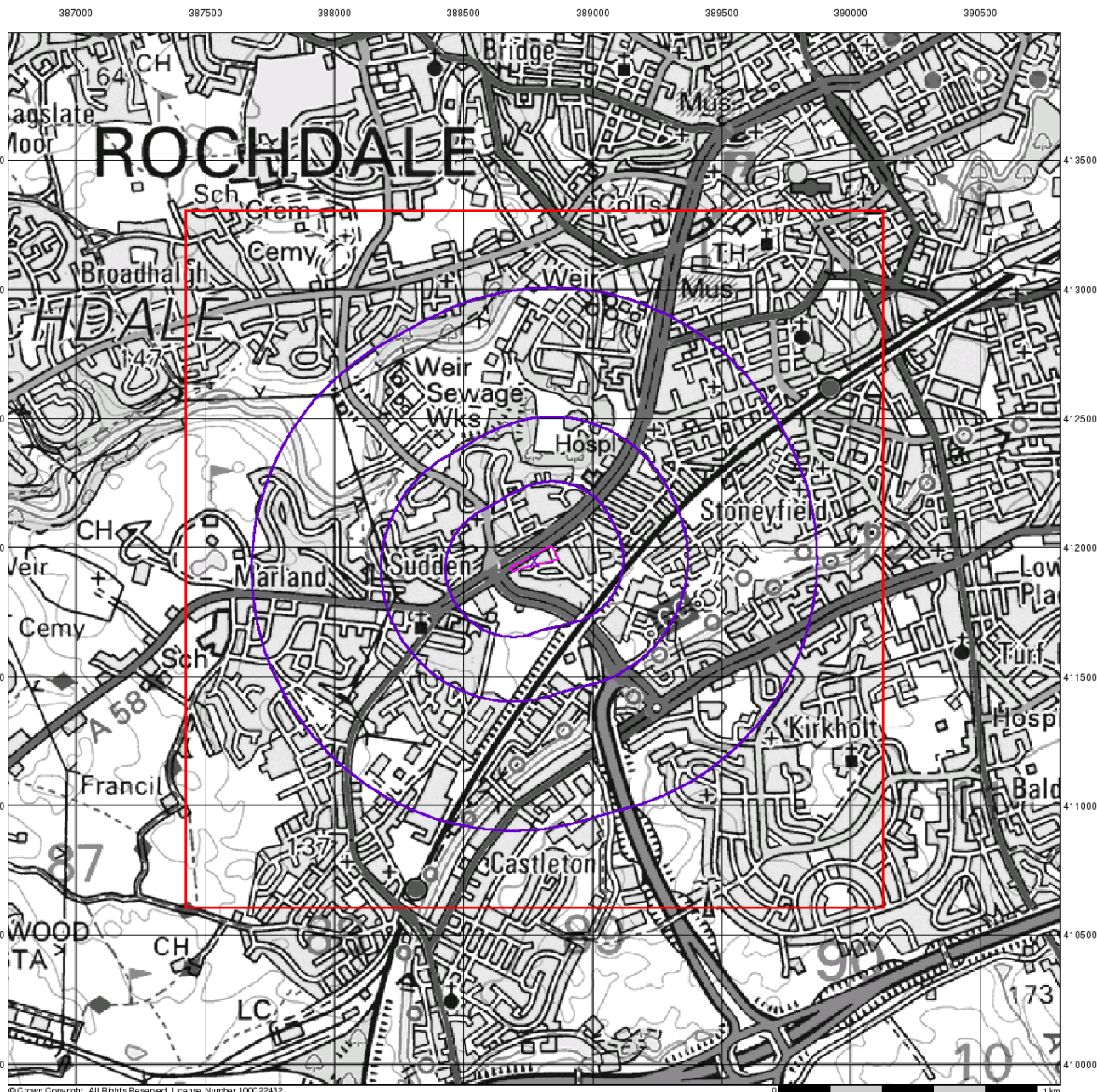


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Source Protection Zones

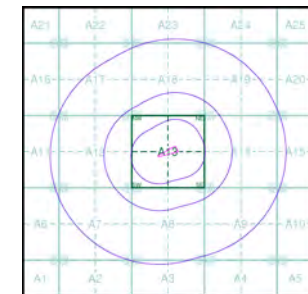
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

- Inner zone (Zone 1)
- Inner zone - subsurface activity only (Zone 1c)
- Outer zone (Zone 2)
- Outer zone - subsurface activity only (Zone 2c)
- Total catchment (Zone 3)
- Total catchment - subsurface activity only (Zone 3c)
- Special interest (Zone 4)

Site Sensitivity Context Map - Slice A

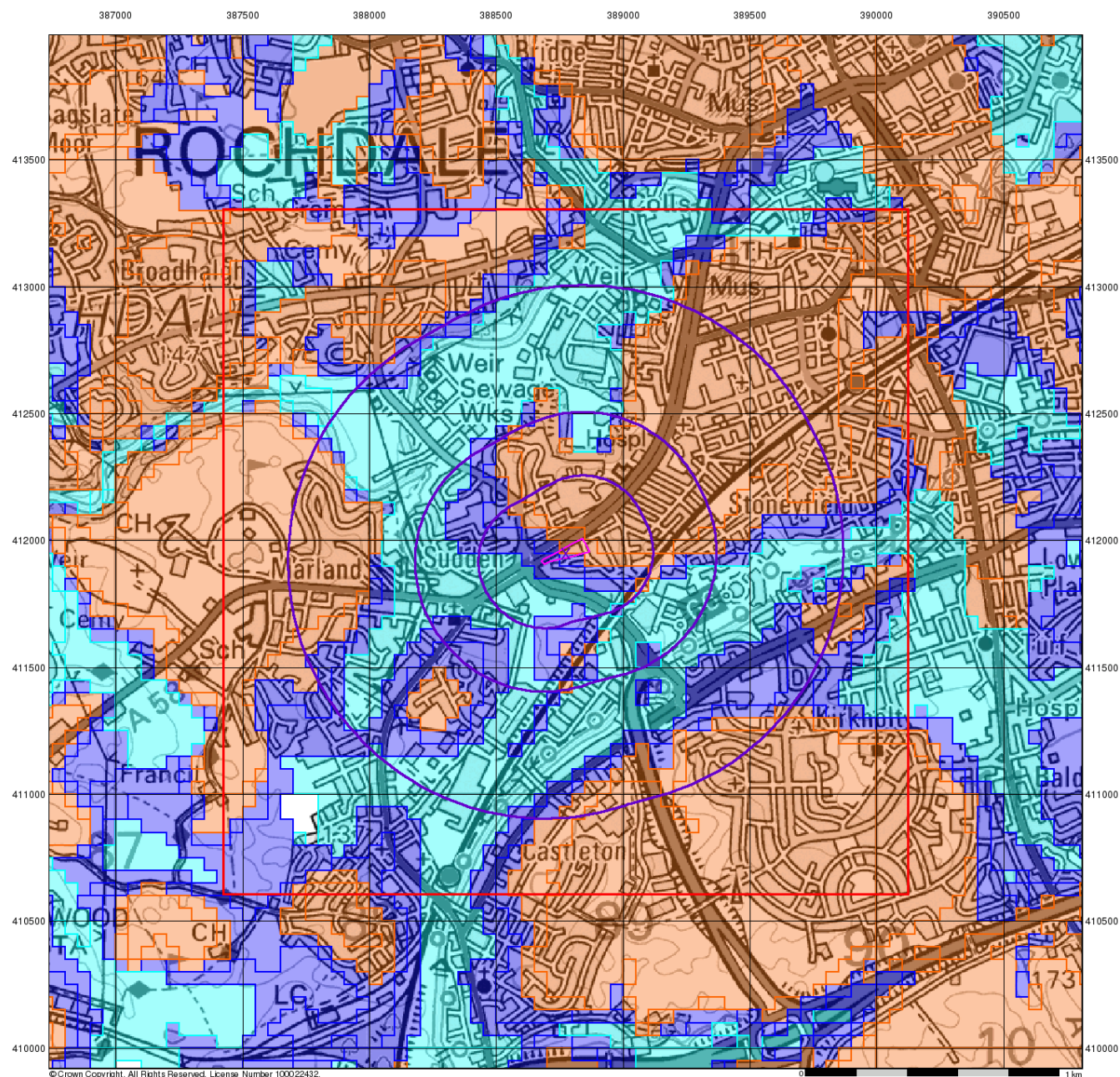


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BGS Flood GFS Data

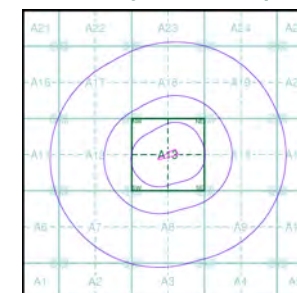
General

-  Specified Site  Specified Buffer(s)  Bearing Reference Point
-  Slice

Agency and Hydrological (Flood)

- Limited Potential for Groundwater Flooding to Occur
■ Potential for Groundwater Flooding of Property Situated Below Ground Level
■ Potential for Groundwater Flooding to Occur at Surface

Site Sensitivity Context Map - Slice A



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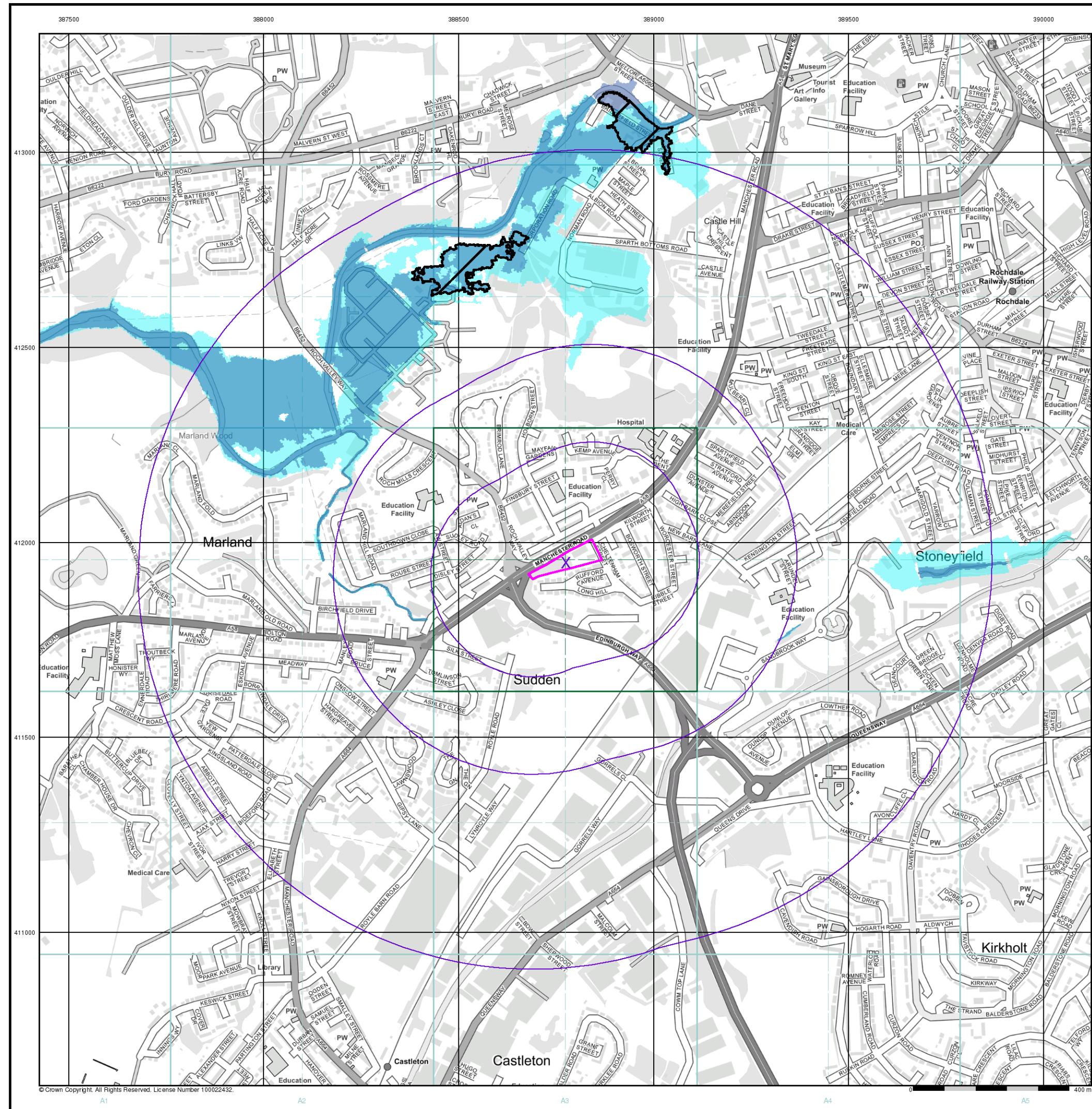
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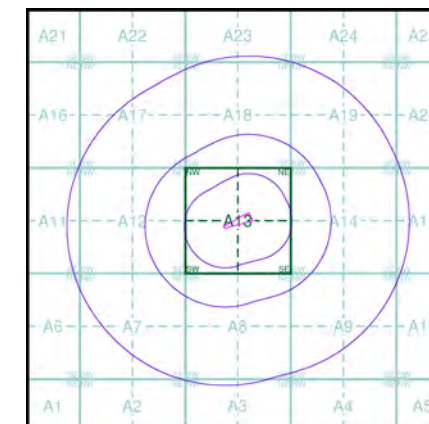
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Agency and Hydrological (Flood)

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Flood Map - Slice A



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