The potential for saltmarsh (merse) and pseudo-saltmarsh reinstatement or creation through managed realignment on the Solway Firth, Dumfries & Galloway.

Report prepared by Dr Larry R Griffin, Director of ECO-LG Ltd for the Solway Firth Partnership –

March 2023

Background to the project:

ECO-LG Ltd was commissioned by the Solway Firth Partnership (SFP) on 22 August 2022 after an initial meeting and series of emails to discuss the possible aims of the project – formulated within the document "*Draft – Saltmarsh Opportunity mapping brief v5*" produced by SFP (last updated 25 August).

The project brief specified a timeline of October 2022 to February 2023, though the official start-up meeting did not occur until 10 November 2022.

The work plan specified ~15.5 days desk-based research (including meetings, emails/correspondence, data collection, mapping, online landowner detail collection and report writing) and ~5.5 days field work (visiting landowners and sites if necessary).

Sources of digital map data used:

Coastline:

Initially a polygon to best represent current knowledge of the UK coastline of relevance to the project aims was sought and the shapefile of the '*Mean High Water Springs Polygon*' available as Opensource data at the '*Edinburgh DataShare*' portal (The University of Edinburgh) appeared to be the most up to date source available for the Solway Firth area:

https://datashare.ed.ac.uk/handle/10283/2619 (accessed October 2022)

Citation: *Holmes, Ian. (2017). Mean High Water Springs Polygon, [Dataset]. University of Edinburgh. https://doi.org/10.7488/ds/1969.*

Saltmarsh:

Current knowledge regarding the distribution of saltmarsh plant communities, and associated habitat types in Scotland, was available from the recent survey carried out by NatureScot (formerly SNH) and described thus [sic]:

"*…From 2010-2012 all known saltmarshes larger than 3ha were surveyed across the Scottish mainland and offshore islands, to compile the first detailed comprehensive national survey of this habitat in Scotland. All saltmarsh and brackish swamp was mapped using the National Vegetation Classification. All mapped areas were digitised to a 1:4,000 scale GIS database. The condition of each saltmarsh site visited was assessed.*

A total of 249 sites were visited and 7,704ha of saltmarsh were recorded and mapped. 5,840ha of the habitat was dominated by saltmarsh vegetation; 870ha of the habitat was dominated by swamp vegetation; and 994ha of other vegetation/land cover types were also present…"

The shapefile polygons of the Scottish Saltmarsh Survey (SSS-2016) were available to download from the online digital portal under an Open Government license:

https://www.data.gov.uk/dataset/5ed5df7a-a81f-4dba-9cd0-7e03c437aa71/saltmarsh-survey-of-scotland (accessed October 2022)

Citation: *Haynes, T.A. 2016. Scottish saltmarsh survey national report. Scottish Natural Heritage, Commissioned Report No. 786.*

Landscape surface height data:

In order to establish the current height of existing saltmarsh habitats in the D&G region and the potential sites inland of those habitats which might be of a suitable similar height for possible saltmarsh-type community establishment, all other factors being equal, fine-scaled Open Government license LiDAR data of 50*50cm resolution in GeoTiff "raster" format were downloaded at:

https://remotesensingdata.gov.scot/data#/map (accessed October 2022 - January 2023)

At this website it is possible to select '*LiDAR for Scotland Phase III DSM*' 10*10km tiles from the interactive map for the D&G coastal region – typically up to ~350MB per tile. To reduce waiting times and overall file storage issues only the coastal tiles that looked likely to be within the zone of interest were downloaded.

The dataset is described thus [sic]:

"*…The Scottish Public Sector LiDAR (Phase 3) was initially captured by Fugro for Scottish Power Energy Network (SPEN) in 2015 and 2016 and to monitor their overhead power cable network under their Virtual World Asset Management program. In addition, two flights were included flown on behalf of the Scottish Border Council project Whiteadder in 2019. The Scottish Government procured this dataset with a contribution from SEPA for public use in 2019. This dataset covers total 11, 772 square kilometers (note the dataset does not have full national coverage). This dataset reflects the Digital Surface Model (DSM) produced from the point cloud data …*"

These LiDAR data had some gaps in coverage in some small coastal areas, including at sensitive MOD sites, though these did not affect the current study in terms of mapping *potential* inland areas for saltmarsh opportunities as they mainly missed some outer lying areas of existing saltmarsh habitat.

Data manipulations within the GIS:

All GIS procedures were conducted using freeware 'QGIS 3.16.15-Hannover' on a DELL Inspiron 7700 DESKTOP-8PGGESV, with 11th Gen Intel Core i7-1165G7 @2.80GHz, 16GB RAM, 64-bit operating system and 1TB SSD storage.

Even with this p.c. specification it was necessary to reduce the LiDAR GeoTiff tile file sizes wherever possible to avoid QGIS procedures crashing. Therefore, the 'Mean High Water Springs Polygon' was initially clipped to a simple rectangular "Solway D&G region" polygon such that the D&G segment of this tide-based polygon was retained. This polygon segment of coastline of D&G was then buffered to 1,500m internally, this distance being chosen based on local knowledge of the landscape in the region and the likely maximum extent to which the project partners would be willing to explore managed realignment and saltmarsh creation in practice. This 1.5km coastal buffer strip polygon was then used to clip the raster tiles of LiDAR DSM data sequentially so that file size could be reduced.

There were 90 tiles totaling 23GB of data in all, and these were batch processed in QGIS in groups of 5-10 for clipping to the 1.5km coastal strip. With the original tiles downloaded in such batches from the website then being saved to an external drive so that processing and file space could be retained.

The clipped tiles were then assembled into five main coastal areas chosen based on logical units defined typically by non-saltmarsh areas of the D&G coastline often defined by steep rocky cliffs (these broad coastal strips approximated to: Loch Ryan, Luce Bay, Wigtown to Kirkcudbright, Rascarrel to Southerness and Nith Estuary to Gretna). Assembling the clipped raster data into these five units aided overview of the coast in a reasonable timeframe when zooming in and out within the GIS whereas if all the clipped tiles had been combined into one raster file this would have created excessive lags in simply displaying the data or the further GIS operations/manipulations of the data described below.

The "Solway D&G polygon" described previously was also used to clip the saltmarsh polygons in the region of interest from the SSS-2016 shapefile. Again, this reduced file sizes and the time taken for subsequent GIS operations.

The clipped saltmarsh polygons were then overlaid onto the LiDAR raster height data so that the "zonal histogram" for each saltmarsh NVC category (661 polygons with prefix "SM" within the 'MAIN-HAB' attribute category of SSS-2016; a smaller number of 439 polygons mostly less than 1Ha in size and classed as habitat types such as 'Grassland', 'Swamp', 'Mire' 'Woodland', 'Sand Dune', 'Water', 'Shingle', 'Bare mud/rock/sand' or 'Buildings/roads' were omitted from further analysis; and a further 309 polygons, including some with saltmarsh vegetation communities, did not overlay the DSM LiDAR height data because of the gaps in the coverage of the latter).

This GIS overlay operation produced a summary table for each polygon detailing the mean, median, stdev, min, max and variance of the height values per 50*50cm within each polygon area, and the number of 0.25m^2 cells sampled within those polygons from which these summary statistics were derived.

The height profiles of the saltmarsh compartments were generally "normally-distributed" in nature albeit with outliers at the minimum and maximum extremes represented by elements, based on local knowledge, such as creeks or dried pan areas or the tops of fence strainer posts, occasional bushes, or detritus on the saltmarsh such as tree stumps or barrels and other litter etc. with other high points even representing livestock such as cows due to the high resolution of the LiDAR data. As such the *mean* height measure derived for each saltmarsh 'SM-type' (N=19) habitat polygon was then summarized as a "box-and-whisker" plot to gauge the typical heights at which these different saltmarsh communities tended to occur and the variation shown within them (Figure 1).

The most common NVC saltmarsh community types mapped across the sites for which height data were available were SM13a, SM16e and SM28 (81, 109 & 107 polygons respectively) which correspond to "Lower saltmarsh" *Puccinellia maritima* dominated sub-community, "Upper saltmarsh" *Leontodon autumnalis* sub-community and "Strandline and disturbance communities" *Elymus repens* saltmarsh, respectively. All community types are detailed in Haynes (2016). Some sub-community types such as SM12a, SM13c, SM13x, SM14c, SM17, SM27, SM6 and SM8 were represented by less than ten polygons across the area, albeit within those polygons mapped many 1,000's of 0.25m^2 raster cells from the underlying LiDAR DSM raster will have been sampled.

Within the SSS-2016 dataset the saltmarsh polygons are also classified according to the broader marsh areas of which they are a part geographically under the 'SITE NAME', being named for example, "Wigtown", "Kirkconnell Merse" etc. The 23 broad areas used by SSS-2016 were therefore numbered ascendingly from west to east so that the saltmarsh polygon mean heights in those broad geographical areas could be plotted in a more meaningful way to check whether areas of saltmarsh that have developed in different parts of the Solway show any relation with this west-east axis, for example, do saltmarshes in the west tend to develop at lower elevations than those in the east or vice versa (**Figure 2**).

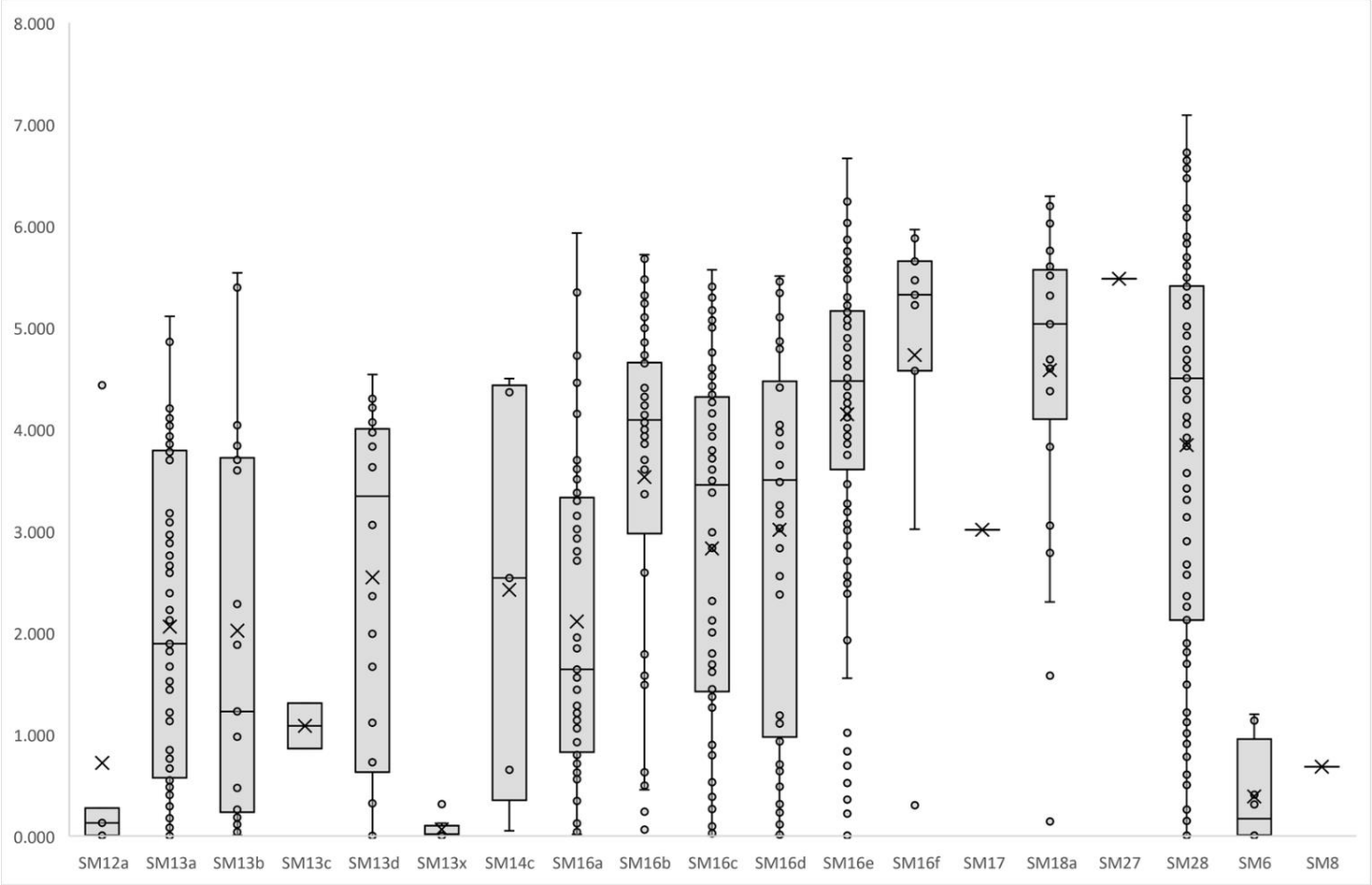


Figure 1. *Box-and-whisker plots of the mean heights (m), where available, of 19 NVC saltmarsh sub-communities on the Solway Firth, within D&G, for 661 polygons mapped across the area during SSS-2016 as determined from the LiDAR III DSM data. The 'x' in the shaded boxes denotes the average of the mean values derived for each polygon of a habitat type, and the points show the variation in the mean height measures recorded across the different polygons within that habitat type. The horizontal lines in the shaded boxes represent the median of those means and boxes extend from the lower to upper quartile of the variation in mean values, with the whisker lines extending to 1.5x the interquartile range with any mean values beyond that being represented as point outliers.*

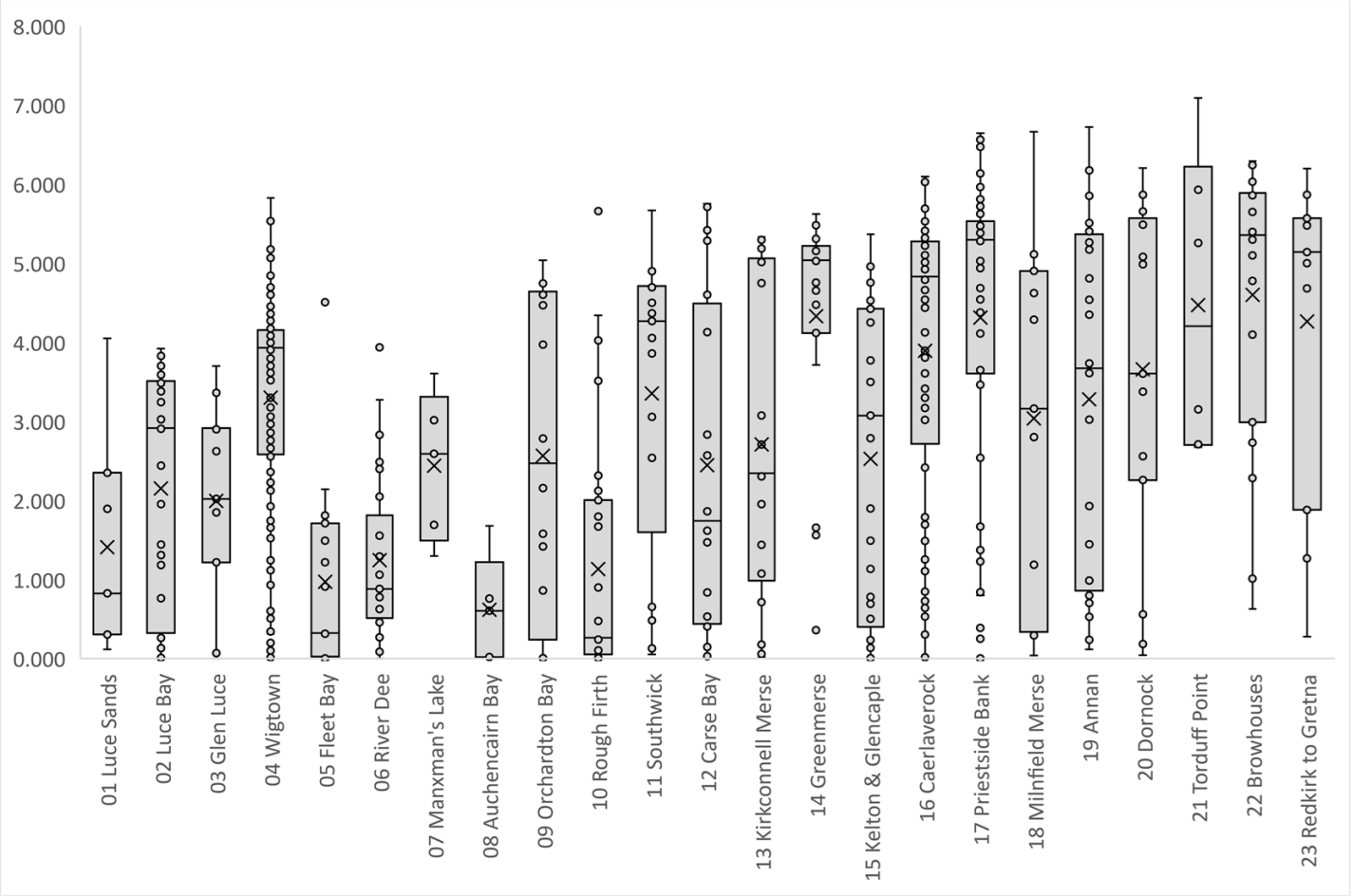


Figure 2. *Box-and-whisker plots of the mean heights (m), where available from the LiDAR IIIDSM data, of 661 NVC saltmarsh polygons classified according to 23 broad geographical areas of the Solway Firth, on the D&G coast arranged from west to east, identified within SSS-2016. The 'x' in the shaded boxes denotes the average of the mean values derived for each polygon within a geographical area, and the points show the variation in the mean height measures recorded across the different polygons within that area. The horizontal lines in the shaded boxes represent the median of those means and boxes extend from the lower to upper quartile of the variation in mean values, with the whisker lines extending to 1.5x the interquartile range with any mean values beyond that being represented as point outliers.*

This preliminary analysis of the height data derived from the saltmarsh polygons of SSS-2016 and the underlying LiDAR data suggested that most saltmarsh on the Solway develops within height bands ranging from ~1m to 7m although some key sub-communities tend to develop below 6m. It is not known what the "datum" is for the height values expressed in the LiDAR dataset and whether they represent a.m.s.l. (Newlyn) but for the purposes of the current study it was not thought to be important as this project aims to map *relative* heights of inland areas in relation to existing saltmarsh area heights. Therefore, the LiDAR raster data across the entire Solway coastal region, as divided into the five key areas, was then categorized within QGIS into relative height bands (**Table 1**).

Table 1. *LiDAR III DSM heights bands and classification categories applied to each 0.25m^2 cell according to the relational rule: Min ≤ cell value < Max.*

Minimum cell value	Maximum cell value	Re-classified value
-3	1	0
1	4	4.0
4	5	5.0
5	6	6.0
6	7	7.0
7	7.1	7.1
7.1	7.2	7.2
…and in 10cm slices from 7.2-7.7	…7.3-7.8	…7.3-7.8
7.8	7.9	7.9
7.9	8	8.0

These coloured height bands were then used to manually digitize polygons inland of existing saltmarsh with land heights of 4-8m included (not including unfenced and unbanked areas identifiable along inland channels and streams leading out into main rivers and estuaries), but only if within ~1km of the SSS-2016 digitized saltmarsh areas and where the resulting polygon would contain >0.2 hectares of new potential habitat of less than 7m height. As far as possible areas of dense existing infrastructure such as housing, farm steadings or industrial and sewage farm areas were excluded from such polygons.

Within these polygons the 'zonal histogram' command was used to assess the amount of agricultural land within each height band as defined in **Table 1**. This number of raster cells in each height band was then multiplied by the cell size of 0.25m^2 and then all the areas within the different height bands were summed to give an attribute containing an overall total land height of 4-8m within which saltmarsh or a pre-cursor of such habitat could develop.

Saltmarsh opportunity maps for the Solway:

The opportunities for saltmarsh development identified within the map figures in the following section highlight those land areas where, if given access to tidal cycles, it is thought saltmarsh communities could develop over time. This process may take many decades or possibly centuries and any plant communities developing could probably be better described as pseudo-saltmarsh wetland communities.

Opportunities on land up to 8m are depicted because of the predicted sea level rise expected to occur, with UK Met Office Climate Projections for a mean sea level anomaly along east Scotland estuaries of up to ~0.9m by the year 2100 (under RCP8.5, with ~0.1-0.3m highly likely, ~0.25-0.55m likely and ~0.5-0.9m a possibility by 2100 under the RCP2.6 – lower value in each range, 4.5 & 8.5 – upper value in each range, scenarios; Austin et al. 2022). No sea level scenarios are specifically depicted in this report, but the land levels from 7m (the highest level at which saltmarsh communities currently occur on the Solway; **Figure 2**) to 8m are given in 10cm increments to represent the sorts of possible sea level rises that might be expected over the next decades and what this might mean for the extra land areas that could become available on the inland edges of any sites selected for further investigation.

Conclusions:

Across the Solway for Dumfries & Galloway as a whole, the methodology identified ~1,537Ha of land in the 1-6m height bracket that probably has the potential to become a variety of pseudo-saltmarsh or fen/marsh wetland communities over the next 25-50 years even under current sea level conditions. Any positive anomalies in the mean sea level as predicted by 2100, including possible predictions of up to 0.9m under some climate scenarios will make this eventuality more and more likely during the current century. A further 1,891Ha in the 6-8m height bracket is identified across the same D&G coastal strip, and some or all of that land may become available to a greater frequency of tidal inundation under the more extreme climate scenarios, with such storm surges also having a reliance on possible increases in Atlantic storm severity over this century as part of a complex picture of Gulf Stream weakening and increased energy/moisture available within the Earth's atmosphere, alongside the physical water inputs from melting glaciers globally and the denuding Greenland ice cap.

This potential land area, if developing from intensive pastures to mid-level saltmarsh will likely store ~50-60 t C ha^{-1} in the top 10cm of soil that develops under typical carbon fluxes (as per east coast estuary examples calculated in Austin et al. 2022, and that cited in Gregg et al. 2021). This equates to ~90,000 t C across the whole Solway if *all* land identified of less than ~6m inland of sea walls was allowed to develop into saltmarsh through managed retreat.

To put that into some sort of context, the average family car running on petrol or diesel emits about 0.65 t C yr^{-1} (assuming 12,000 miles yr^{-1}) and so this potential large-scale carbon storage is equivalent to the one-off annual emissions of about 140,000 cars. Once any mid-level saltmarsh has fully developed, its capacity for carbon storage each year is then much lower at about 1.4 t C ha^{-1} yr^{-1}, and so it is then only able to account for the emissions of about 3,000 cars annually at that point if all areas in the D&G region identified became good quality saltmarsh.

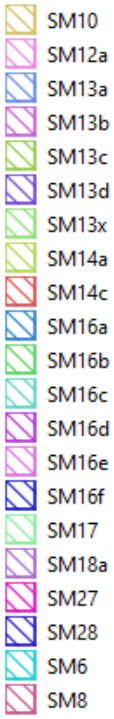
Across that period to the year 2100 though, the lower-mid level saltmarshes currently in existence on the Solway will also become subject to greater inundation frequencies and durations and so they may well erode and decay and release carbon if they can no longer maintain a densely vegetated surface and so the carbon balance of creating new saltmarsh habitat opportunities is less likely to be as clear cut in terms of simple positive gains in carbon storage.

As such, and as emphasized throughout the accompanying six report sections produced to accompany this document, it may be better to think in terms of biodiversity gains, rather than straight carbon storage gains, as the realistic aim of any proto- or pseudo-saltmarsh creation projects in the region. Biodiversity would be gained at the new sites themselves but also through the creation of buffer areas to intensive agricultural activities and the creation of corridor habitats for the biodiversity on adjacent existing natural and semi-natural saltmarsh areas that are often SSSIs in the Solway region, and so could therefore aid the maintenance of these rich and vulnerable habitats in 'Favourable Condition'; it also being suggested that such "buffer habitats" could reduce diffuse nutrient and sediment run-off into our rivers and estuaries and thus aid aims to increase river and bathing water quality for example. These aspects should at least be considered as potential multiplier benefits of any investments in "Blue Carbon" projects going forwards.

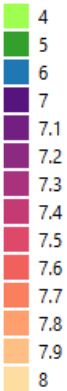
The accompanying six reports to this main methodological report cover the direct photographic inspection of the sea wall, inland habitats and drainage structures at 16 of the main sites identified in this report (see **Table 2**), covered over ~5 days of fieldwork, with the sites being selected based on how amenable they appeared to possible sea wall adjustments but also in relation to the significant areas of land at these sites that were below 6m and thus more likely to be amenable to pseudo-saltmarsh conversion under current or near-future tidal regimes. Most sites also had less intensive agriculture operating on the fields identified. Sites along the river Nith south of Dumfries look especially appropriate for managed realignment and habitat creation as well as those in the Palnackie/Orchardton Bay area. Often it was observed that in the lower-lying areas of the existing inland pastures or wet rush pastures, saltmarsh plant communities were already developed/developing, associated with eroding or poorly maintained drainage and flap-valve structures. In many cases sea walls were also partly eroded or nearly non-existent. At these sites it is probably important to encourage the further lapse in management of sea wall and drainage structures and avoid landowners newly investing in what are likely to be unsustainable efforts to create sea walls and renewed drainage.

With a lack of automated sea buoy monitoring within the Solway itself and a likely "funneling-effect" of storm surge tides into the inner Solway and its sub-estuaries as they narrow, it is suggested that the deployment of perhaps 10-20 infra-red trail cameras across some of these sites, focused on the low-lying areas inland of the sea wall and set on a 30-minute time lapse day and night over the 6 months of winter, could provide useful data about the *actual* frequency/duration of current tidal inundations to help guide future decisions and understand how tide height interacts with 'Low' and 'High' pressure systems and the prevailing wind direction and strengths.

For the following maps the polygons are shaded according to the legends:

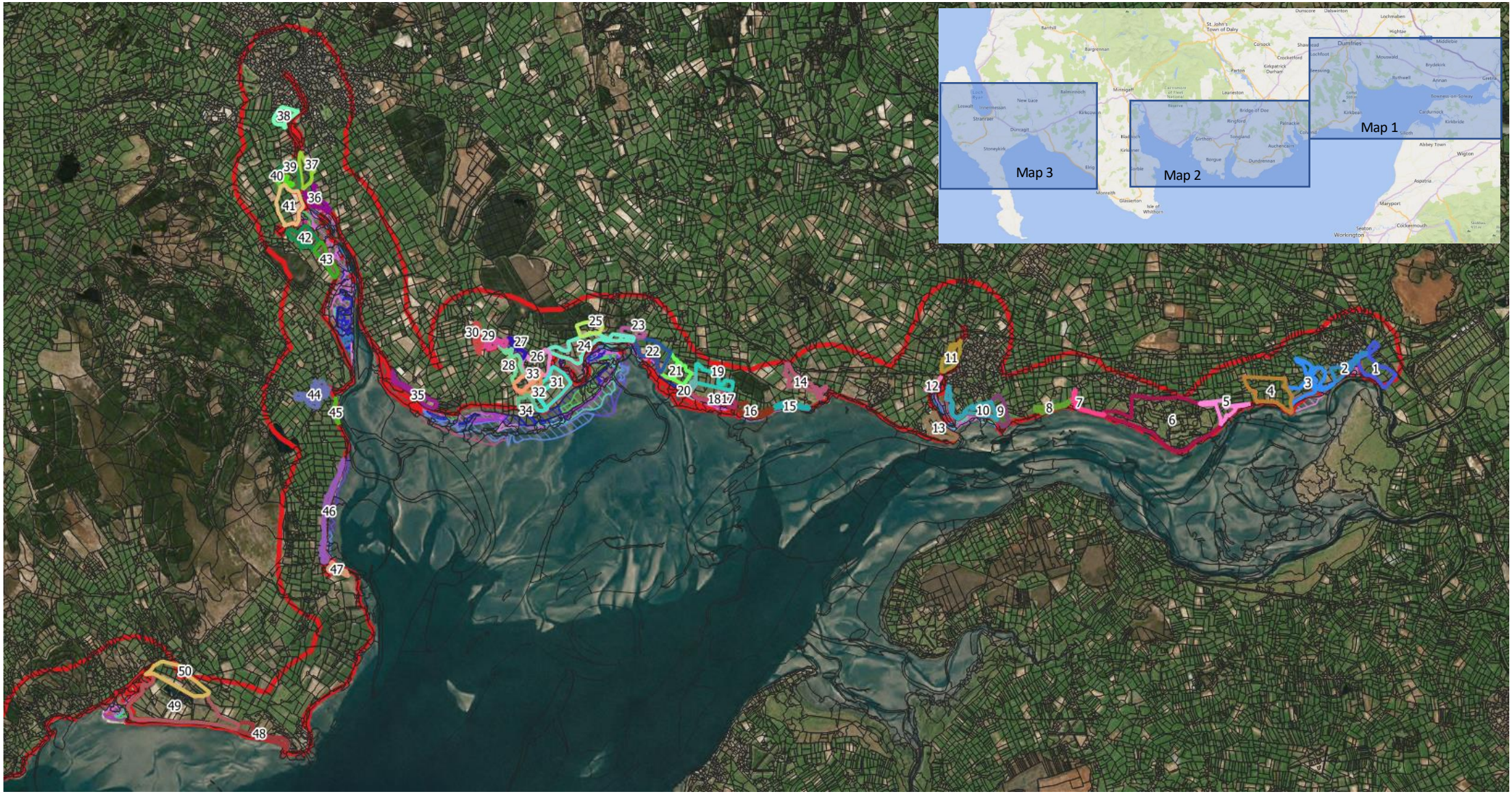


NVC saltmarsh "SM-prefix" polygons (SSS-2016)

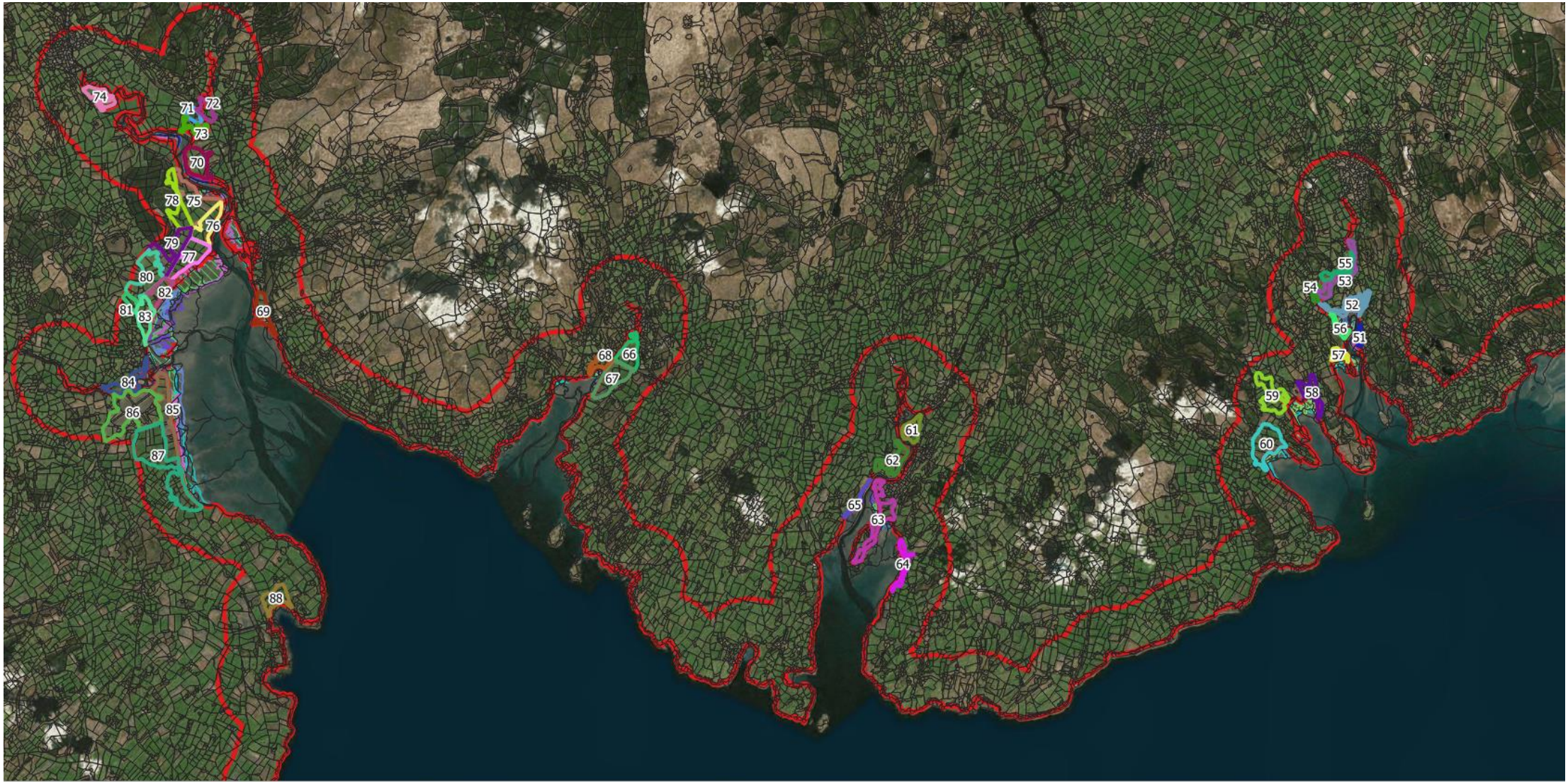


Land height classification (m) (LiDAR DSM; Table 1)

The maps produced below are all presented at between ~1:14,000 to ~1,18,000 scales except for the initial three overview figures which are presented at ~1:100,000 scale.



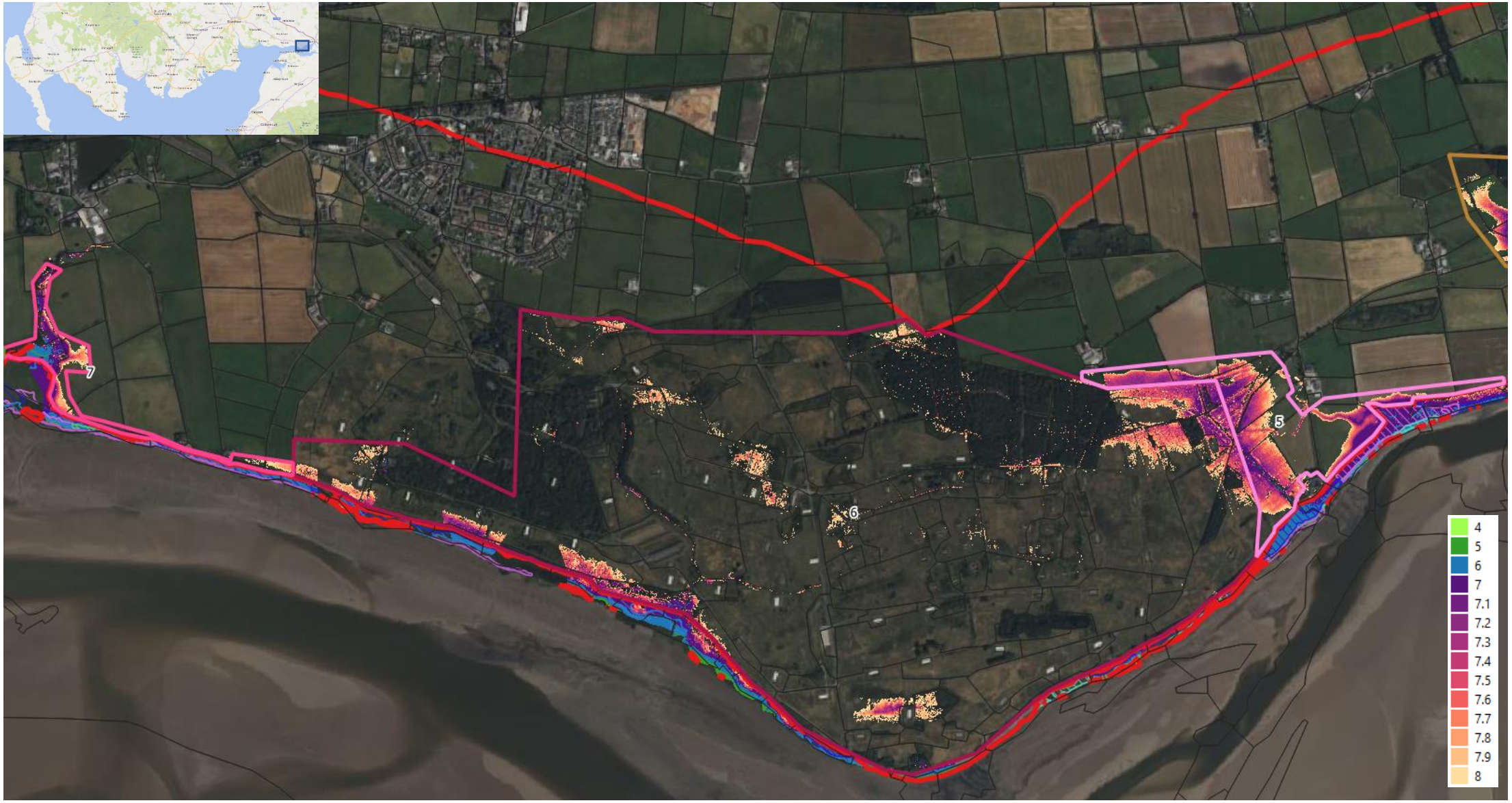
Site overview – map 1. Saltmarsh opportunity mapping overview from east to west for D&G for sites 1-50 spanning the north Solway from Gretna to Southwick. Coloured site polygon boundaries shown alongside hatched areas of NVC "SM-prefix" habitat types. Red lines denote mean high water springs and its "buffer" to 1.5km inland. Field boundaries overlaid onto BING imagery.



Site overview – map 2. Saltmarsh opportunity mapping overview from east to west for D&G for sites 51-88 spanning the north Solway from Colvend to Wigtown (& Garlieston = site 88). Coloured site polygon boundaries shown alongside hatched areas of NVC "SM-prefix" habitat types. Red lines denote mean high water springs and its "buffer" to 1.5km inland. Field boundaries overlaid onto BING imagery.

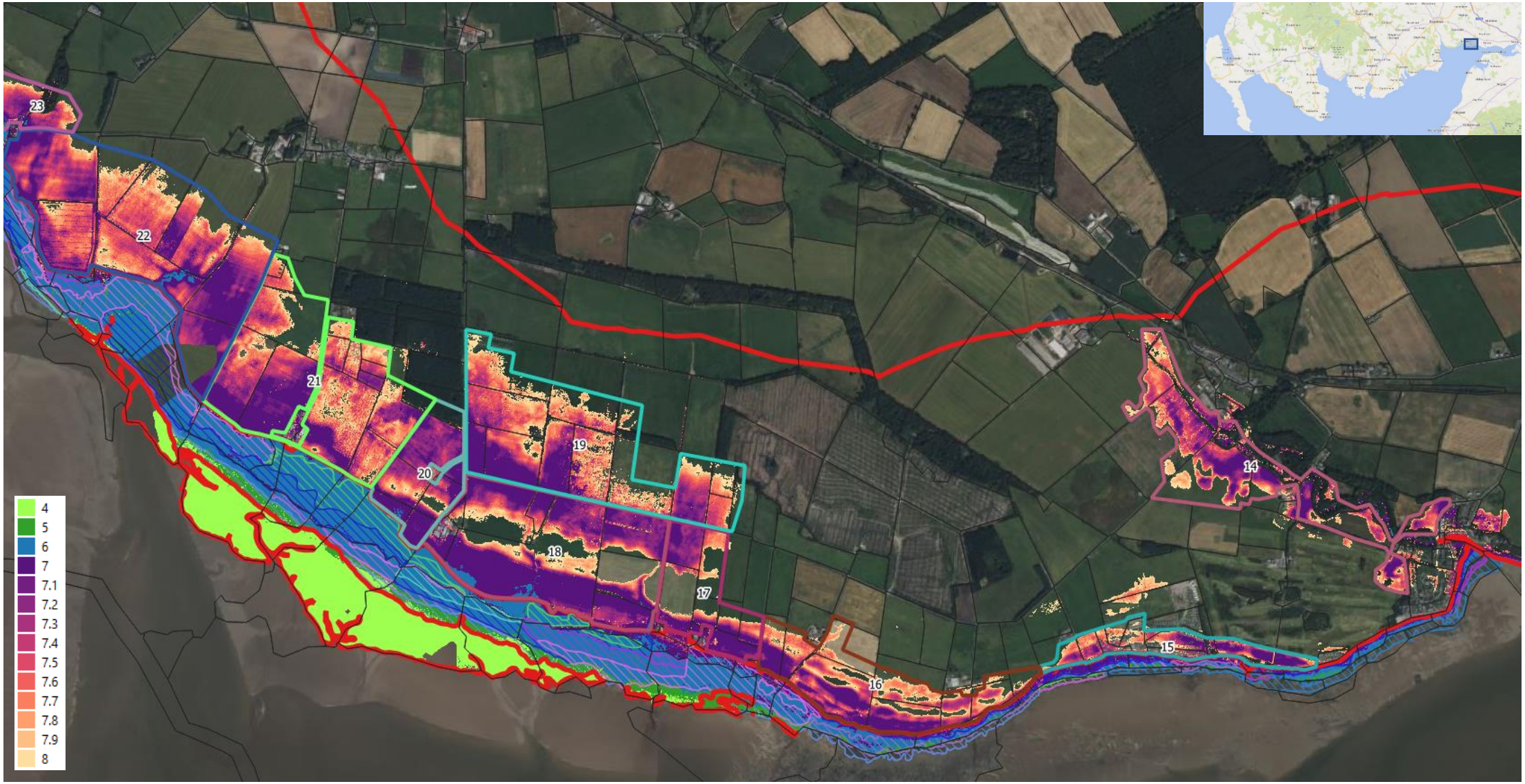
Site overview – map 3. Saltmarsh opportunity mapping overview from east to west for D&G for sites 89-92 spanning the north Solway from Luce Bay to Loch Ryan. Coloured site polygon boundaries shown alongside hatched areas of NVC "SM-prefix" habitat types. Red lines denote mean high water springs and its "buffer" to 1.5km inland. Field boundaries overlaid onto BING imagery.

Saltmarsh opportunity mapping from east to west for D&G for sites 1-4 spanning the north Solway from Gretna to Redkirk (NB: site 1 = England). Coloured site polygon boundaries shown alongside hatched areas of NVC “SM-prefix” habitat types. Red lines denote mean high water springs and its “buffer” to 1.5km inland. Field boundaries overlaid onto BING imagery.

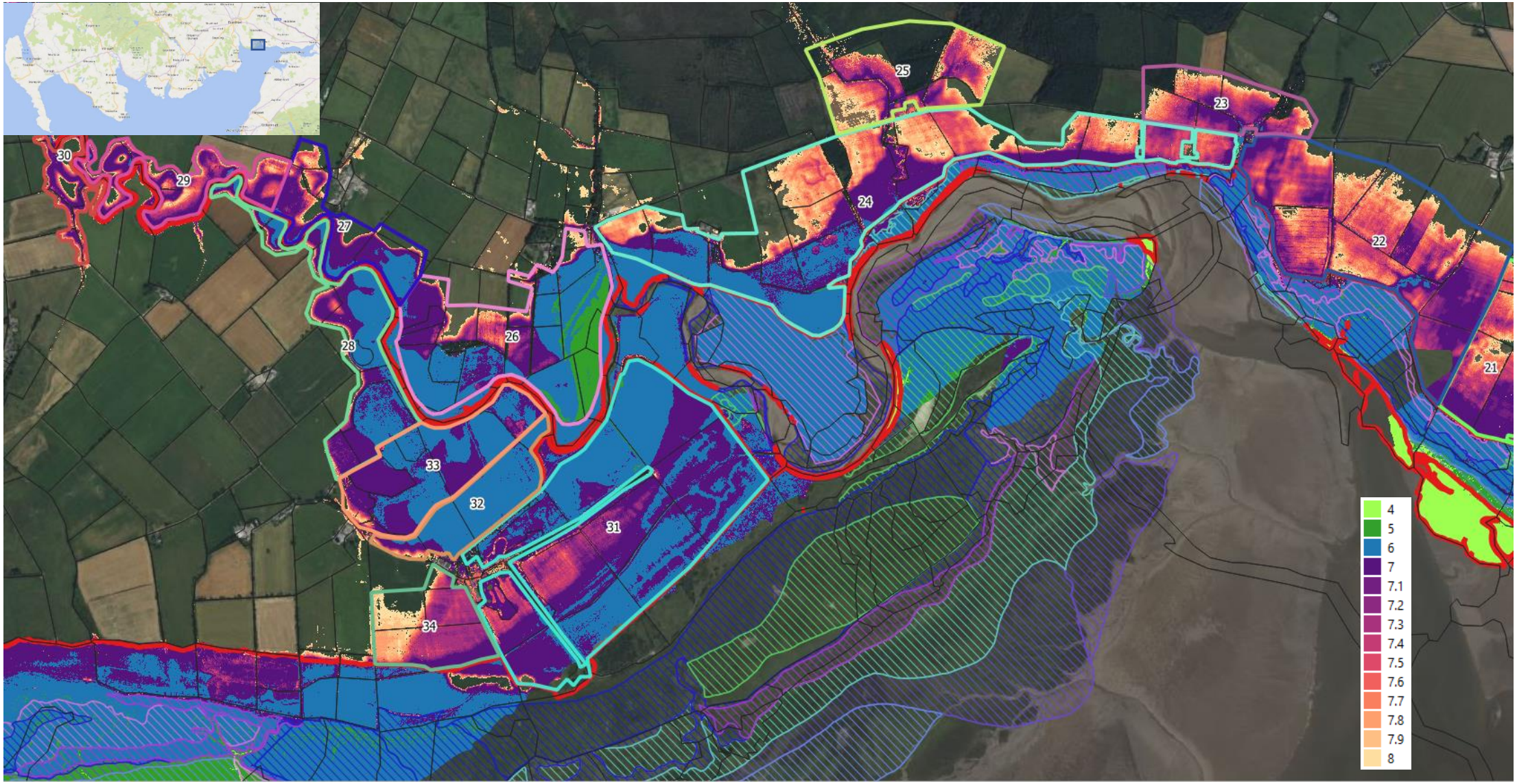


Saltmarsh opportunity mapping from east to west for D&G for sites 5-7 spanning the north Solway from Baurch to Eastriggs. Coloured site polygon boundaries shown alongside hatched areas of NVC “SM-prefix” habitat types. Red lines denote mean high water springs and its “buffer” to 1.5km inland. Field boundaries overlaid onto BING imagery.

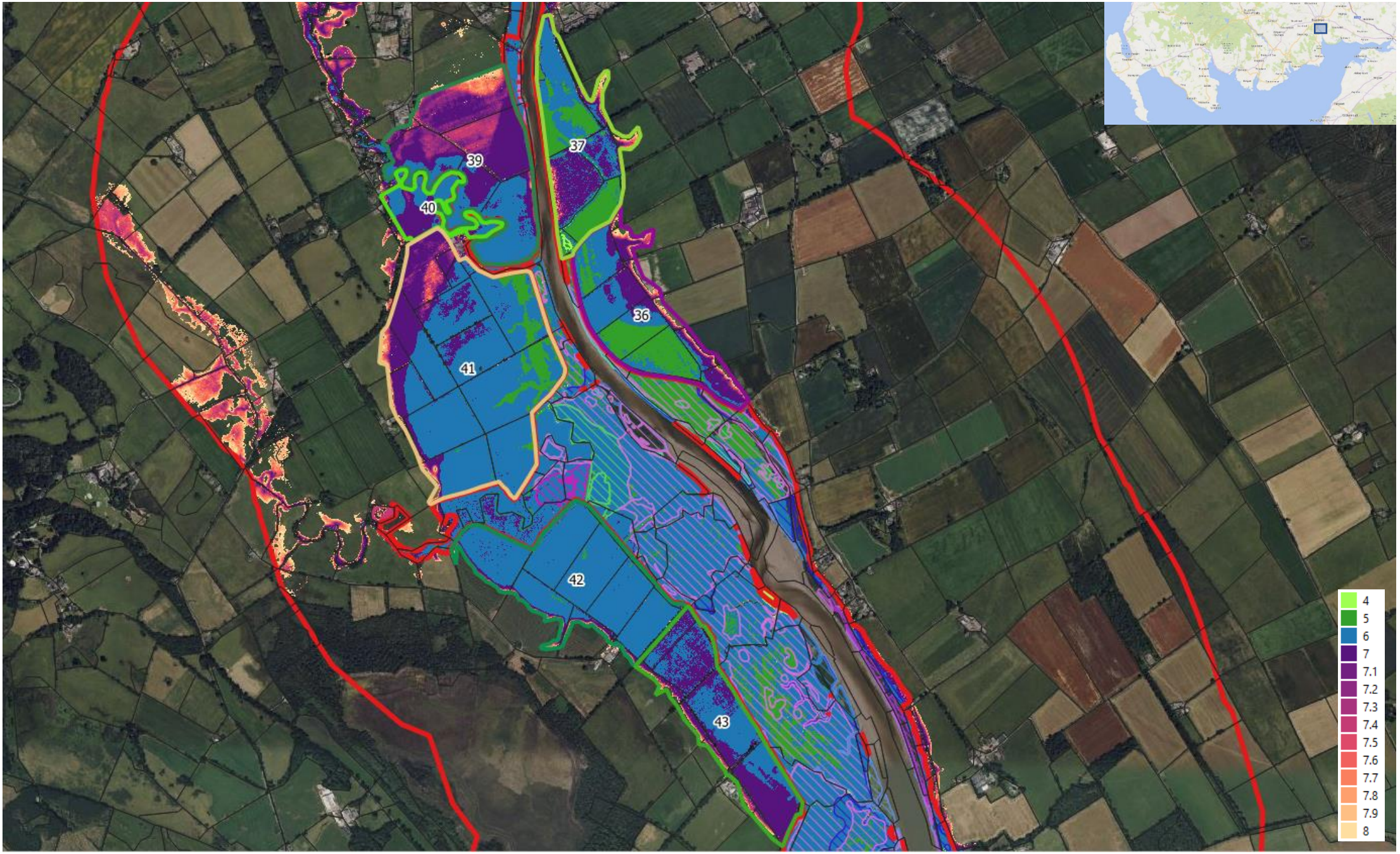
Saltmarsh opportunity mapping from east to west for D&G for sites 8-13 spanning the north Solway at Annan. Coloured site polygon boundaries shown alongside hatched areas of NVC "SM-prefix" habitat types. Red lines denote mean high water springs and its "buffer" to 1.5km inland. Field boundaries overlaid onto BING imagery.



Saltmarsh opportunity mapping from east to west for D&G for sites 14-22 spanning the north Solway from Powfoot to Thwaite. Coloured site polygon boundaries shown alongside hatched areas of NVC “SM-prefix” habitat types. Red lines denote mean high water springs and its “buffer” to 1.5km inland. Field boundaries overlaid onto BING imagery.



Saltmarsh opportunity mapping from east to west for D&G for sites 22-34 spanning the north Solway from Thwaite to Bankend (sites 24, 26 & 31 = WWT reserve). Coloured site polygon boundaries shown alongside hatched areas of NVC "SM-prefix" habitat types. Red lines denote mean high water springs and its "buffer" to 1.5km inland. Field boundaries overlaid onto BING imagery.



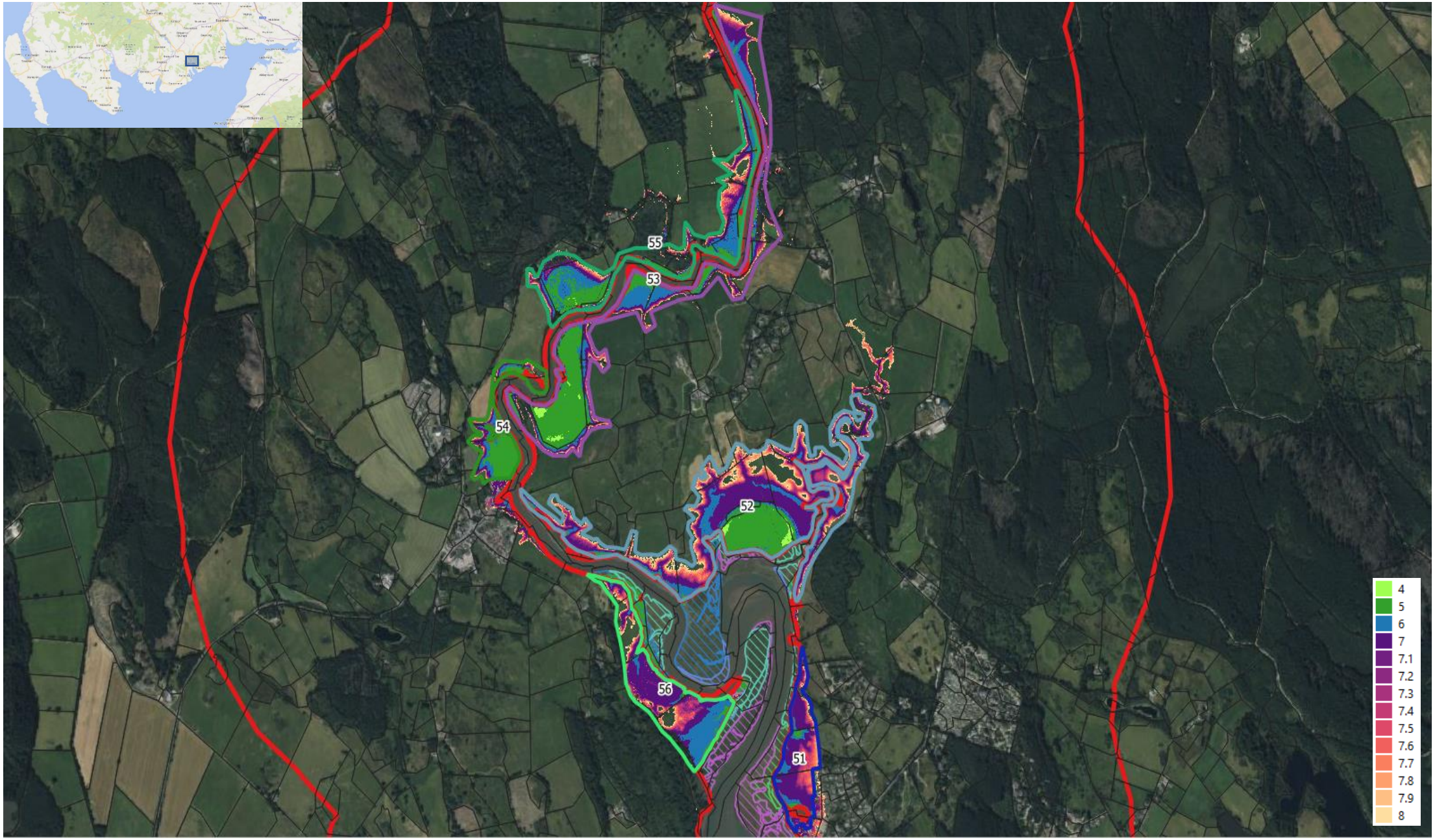
Saltmarsh opportunity mapping from east to west for D&G for sites 36-37 & 39-43 spanning the north Solway from Kelton to Islesteps. Coloured site polygon boundaries shown alongside hatched areas of NVC “SM-prefix” habitat types. Red lines denote mean high water springs and its “buffer” to 1.5km inland. Field boundaries overlaid onto BING imagery.

Saltmarsh opportunity mapping from east to west for D&G for site 38 at Troqueer, Dumfries. Coloured site polygon boundaries shown alongside hatched areas of NVC "SM-prefix" habitat types. Red lines denote mean high water springs and its "buffer" to 1.5km inland. Field boundaries overlaid onto BING imagery.

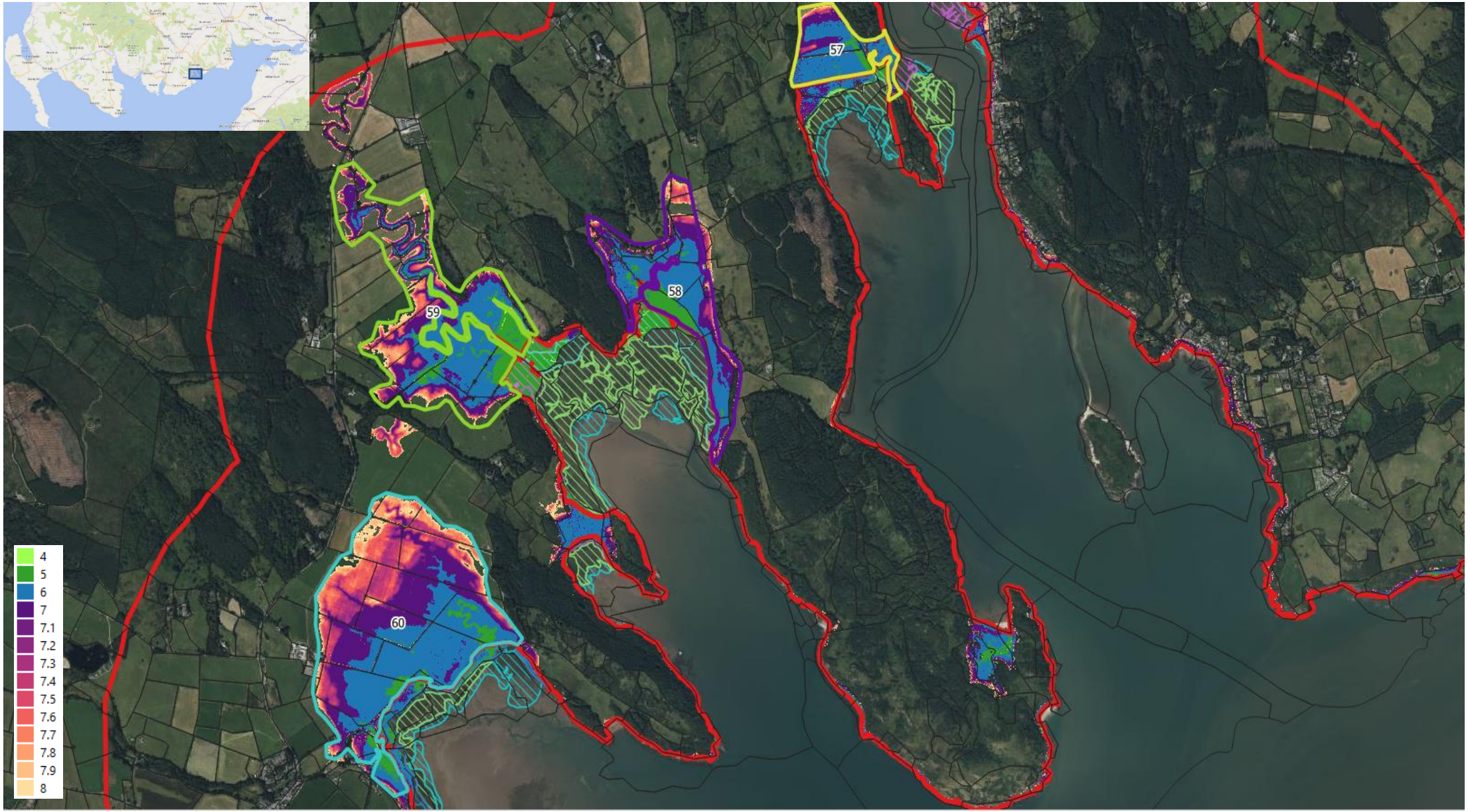
Saltmarsh opportunity mapping from east to west for D&G for sites 35 & 44-45 spanning the north Solway at Lantonside & New Abbey. Coloured site polygon boundaries shown alongside hatched areas of NVC “SM-prefix” habitat types. Red lines denote mean high water springs and its “buffer” to 1.5km inland. Field boundaries overlaid onto BING imagery.

Saltmarsh opportunity mapping from east to west for D&G for sites 46-47 spanning the north Solway from Drumburn to Carsethorn. Coloured site polygon boundaries shown alongside hatched areas of NVC “SM-prefix” habitat types. Red lines denote mean high water springs and its “buffer” to 1.5km inland. Field boundaries overlaid onto BING imagery.

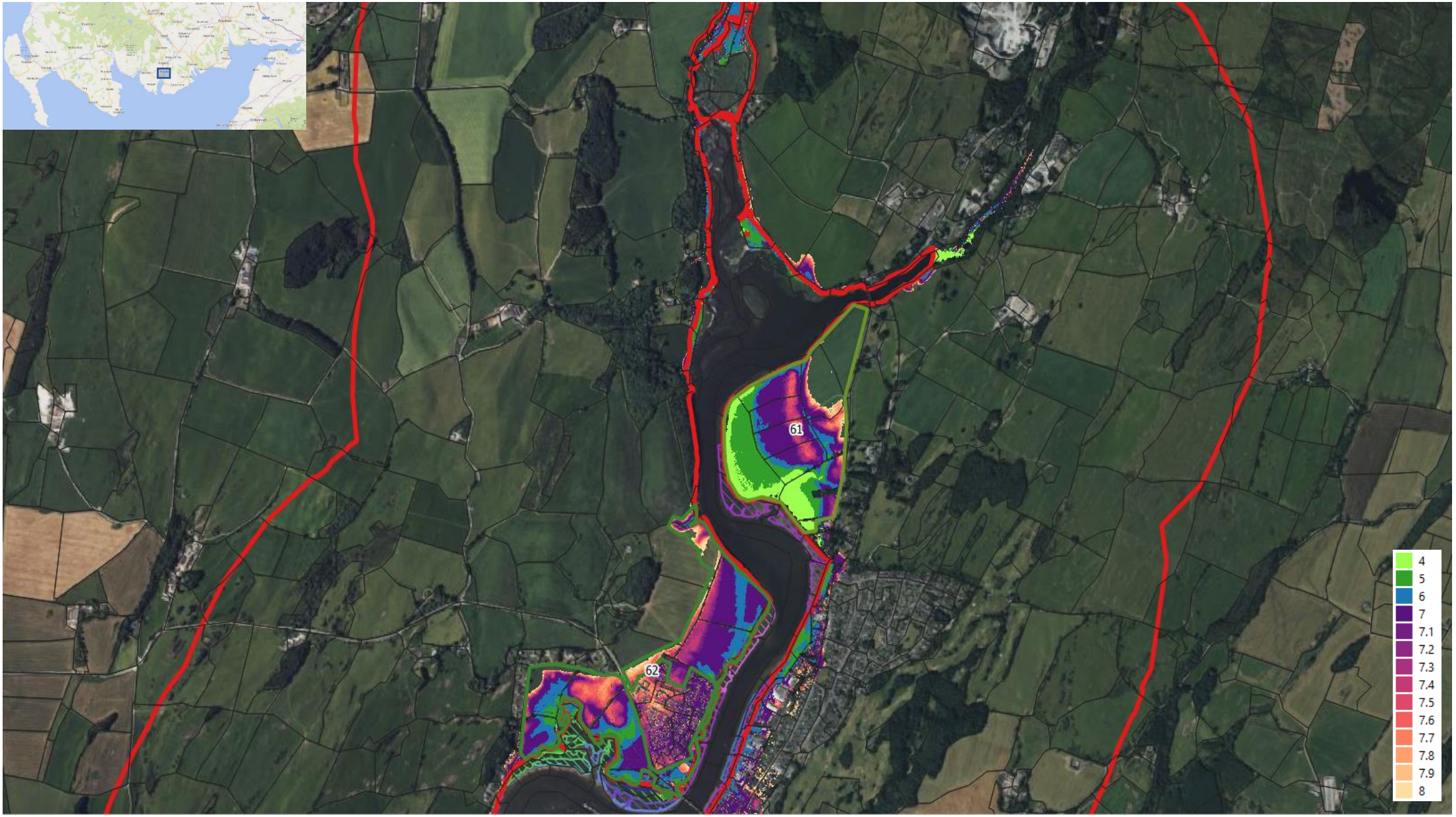
Saltmarsh opportunity mapping from east to west for D&G for sites 48-50 spanning the north Solway from Southerness to Southwick (site 49 = RSPB Mersehead/West Preston reserve). Coloured site polygon boundaries shown alongside hatched areas of NVC "SM-prefix" habitat types. Red lines denote mean high water springs and its "buffer" to 1.5km inland. Field boundaries overlaid onto BING imagery.



Saltmarsh opportunity mapping from east to west for D&G for sites 51-56 spanning the north Solway from Kippford to Palnackie on the Urr Water. Coloured site polygon boundaries shown alongside hatched areas of NVC "SM-prefix" habitat types. Red lines denote mean high water springs and its "buffer" to 1.5km inland. Field boundaries overlaid onto BING imagery.

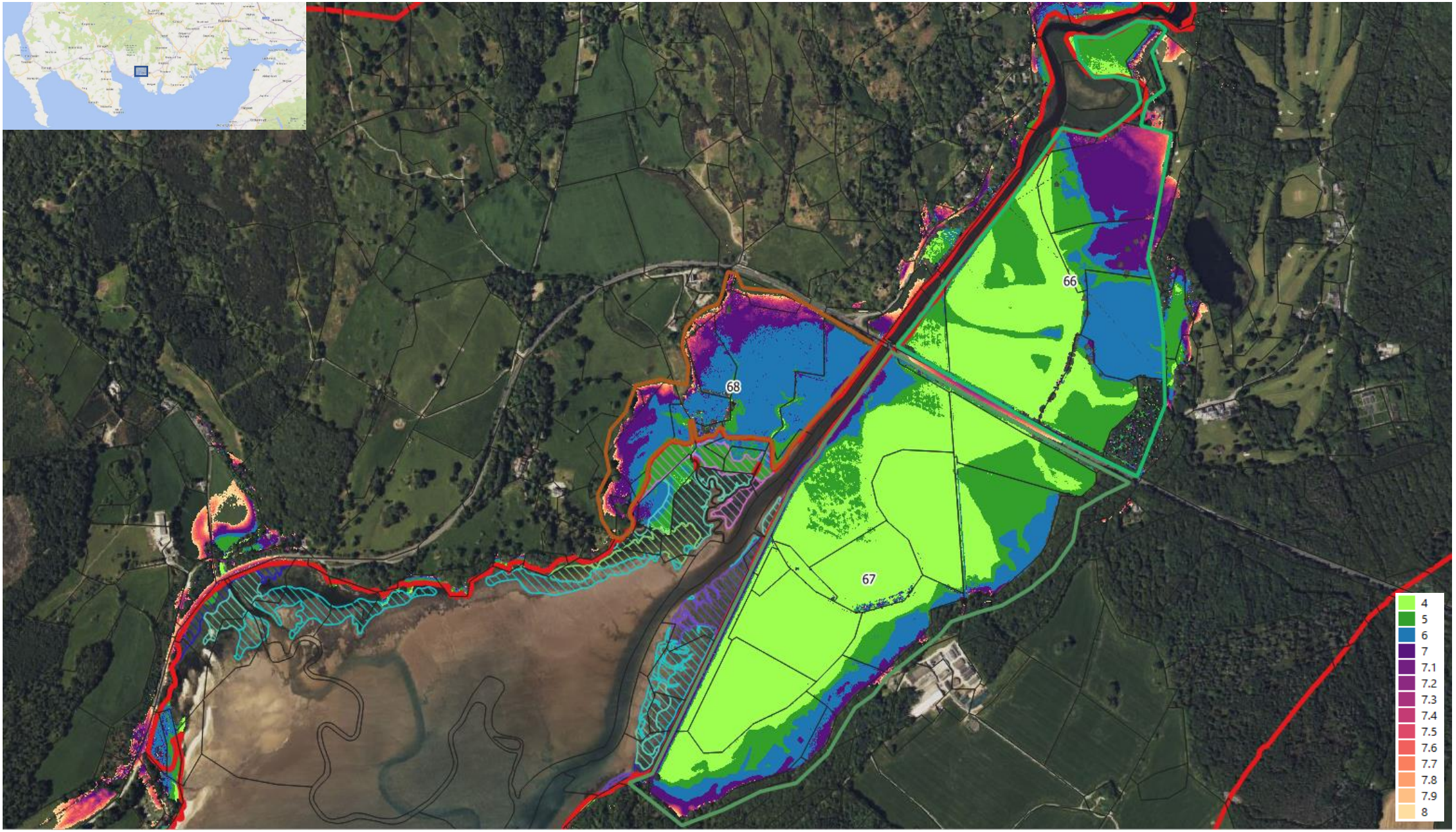


Saltmarsh opportunity mapping from east to west for D&G for sites 57-60 spanning the north Solway from Palnackie to Auchencairn. Coloured site polygon boundaries shown alongside hatched areas of NVC “SM-prefix” habitat types. Red lines denote mean high water springs and its “buffer” to 1.5km inland. Field boundaries overlaid onto BING imagery.

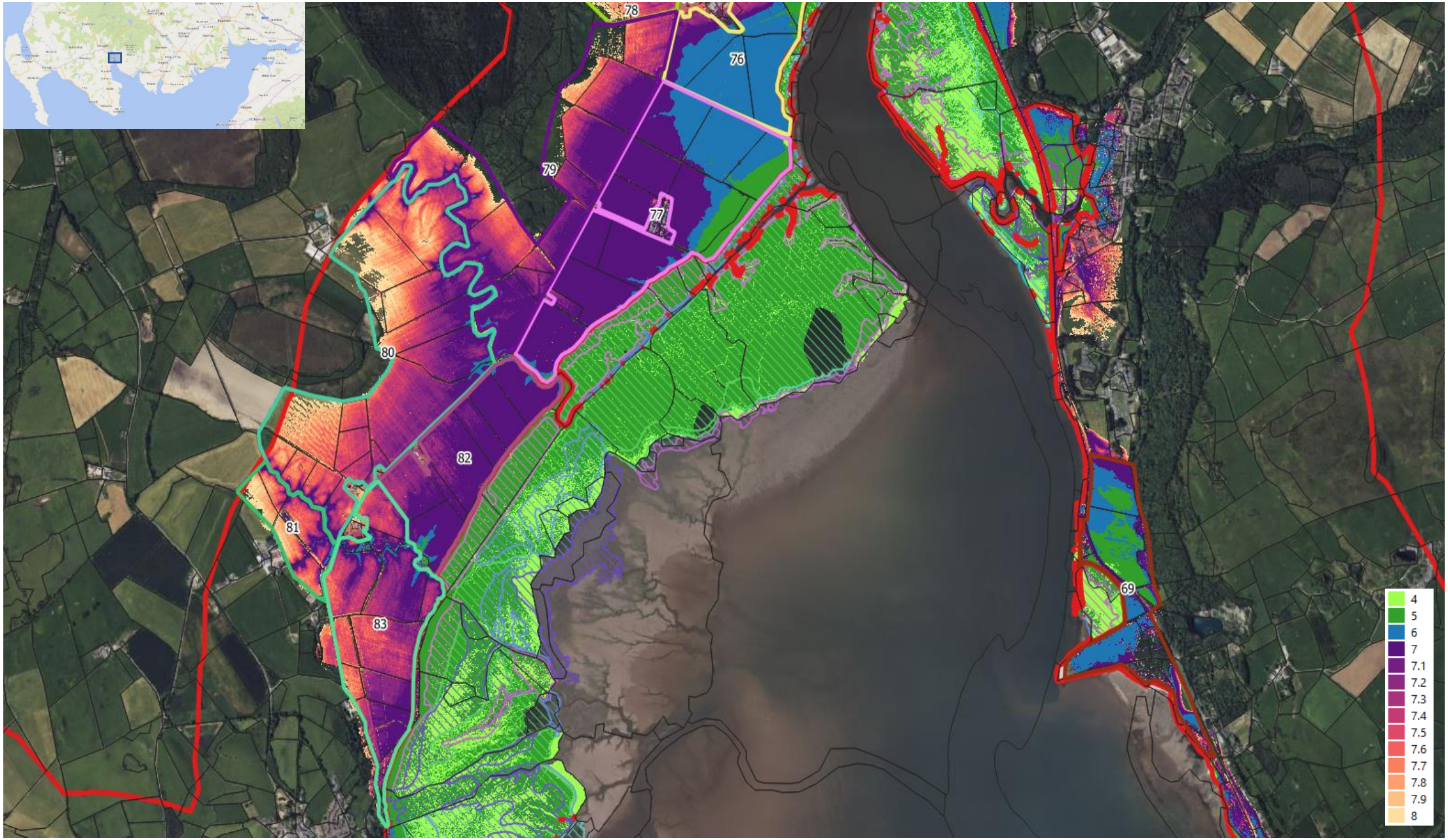


Saltmarsh opportunity mapping from east to west for D&G for sites 61-62 spanning the north Solway for Kirkcudbright (north) on the River Dee. Coloured site polygon boundaries shown alongside hatched areas of NVC “SM-prefix” habitat types. Red lines denote mean high water springs and its “buffer” to 1.5km inland. Field boundaries overlaid onto BING imagery.

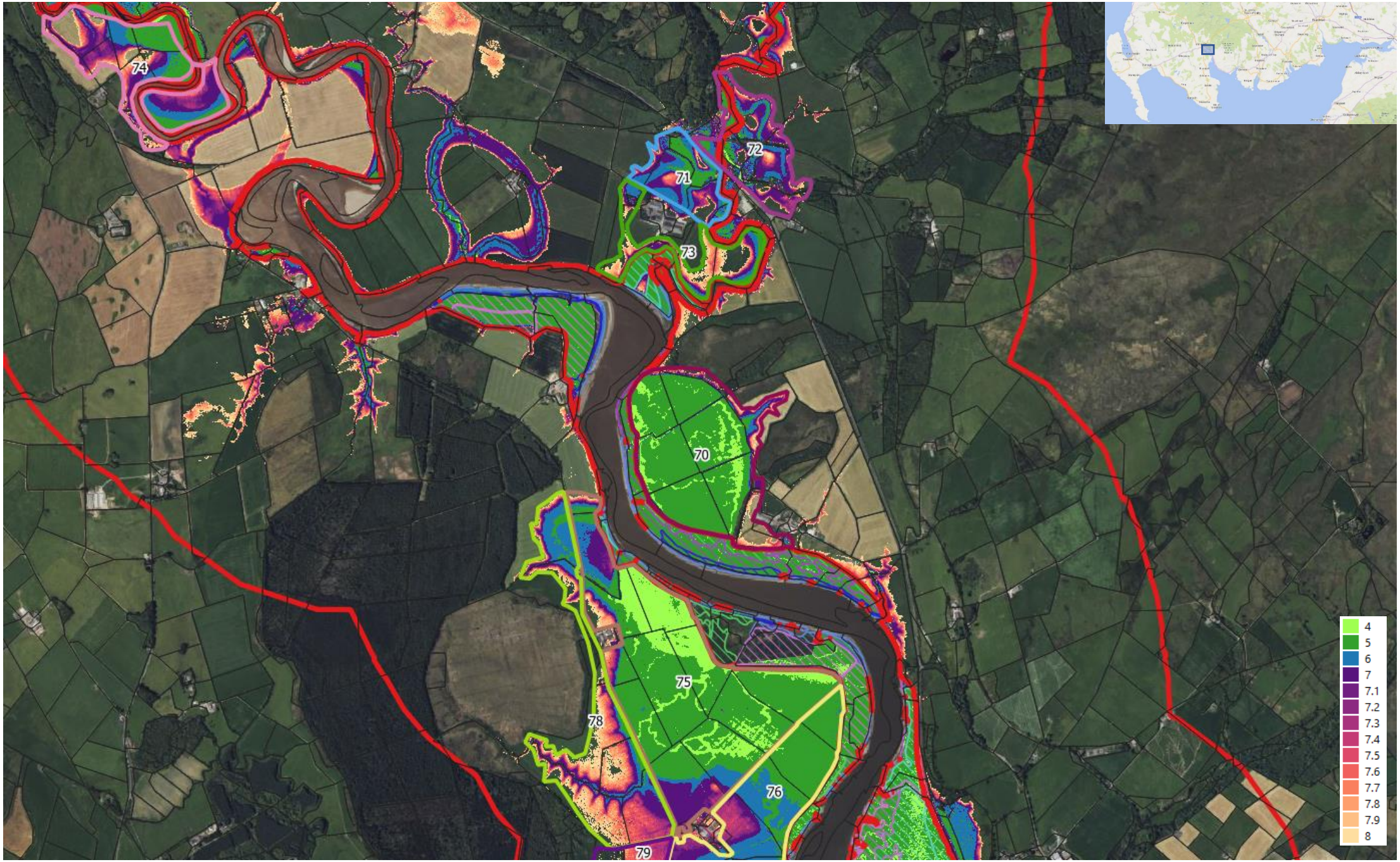
Saltmarsh opportunity mapping from east to west for D&G for sites 63-65 spanning the north Solway for Kirkcudbright (south) and Manxman's Lake. Coloured site polygon boundaries shown alongside hatched areas of NVC "SM-prefix" habitat types. Red lines denote mean high water springs and its "buffer" to 1.5km inland. Field boundaries overlaid onto BING imagery.



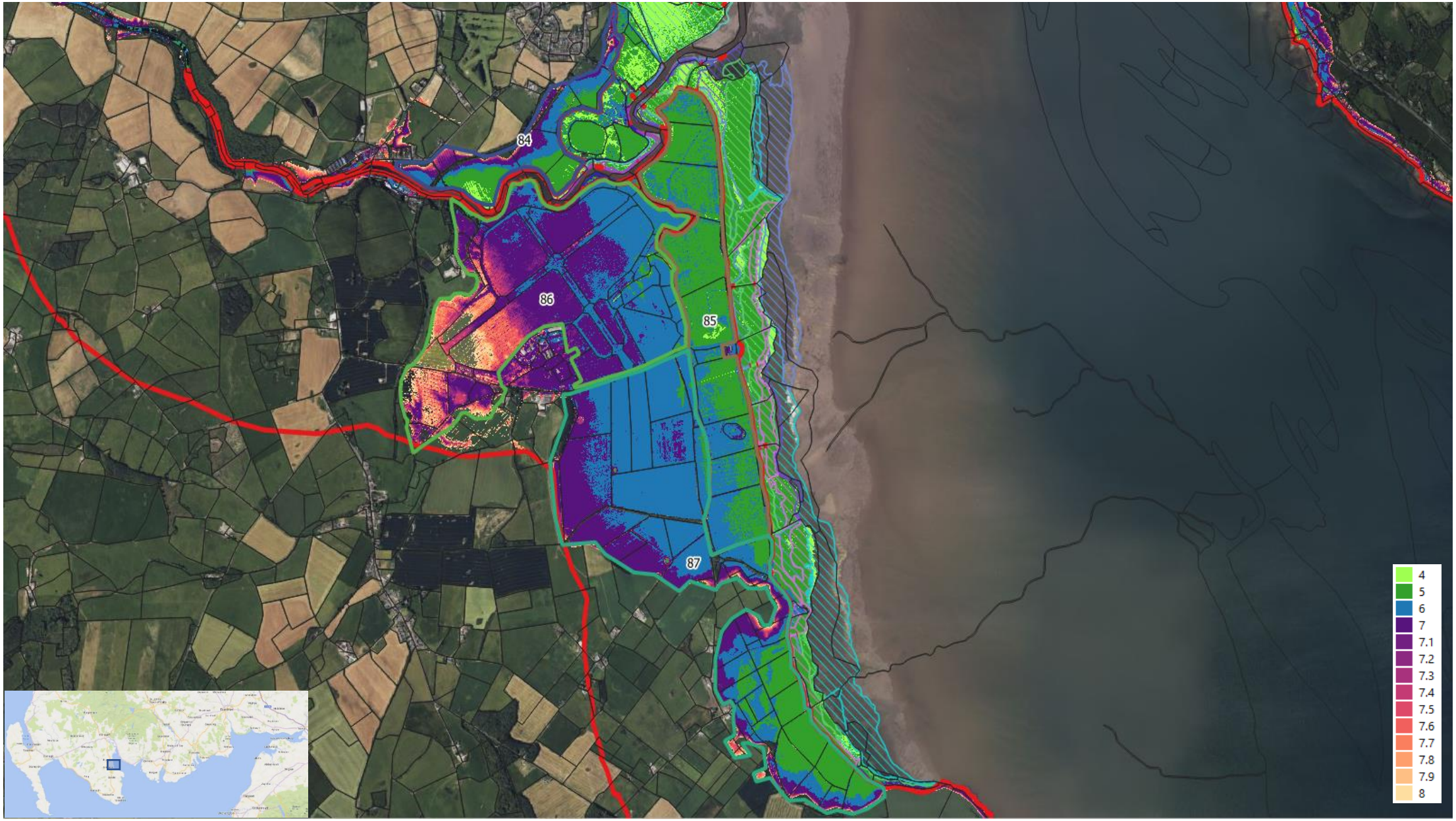
Saltmarsh opportunity mapping from east to west for D&G for sites 66-68 spanning the north Solway for Gatehouse-of-Fleet. Coloured site polygon boundaries shown alongside hatched areas of NVC “SM-prefix” habitat types. Red lines denote mean high water springs and its “buffer” to 1.5km inland. Field boundaries overlaid onto BING imagery.



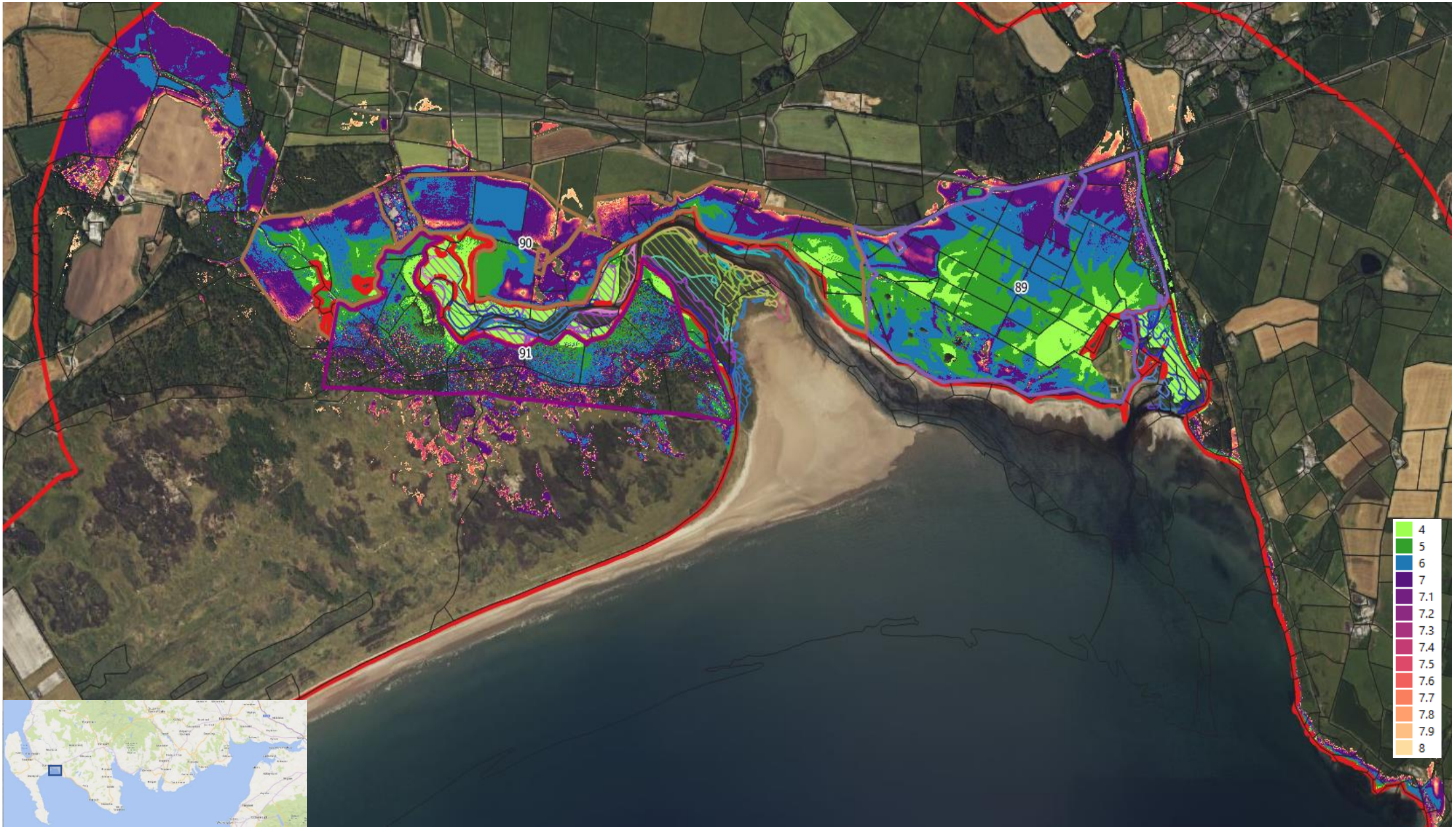
Saltmarsh opportunity mapping from east to west for D&G for sites 69 & 76-83 spanning the north Solway for Creetown & Wigtown (north). Coloured site polygon boundaries shown alongside hatched areas of NVC "SM-prefix" habitat types. Red lines denote mean high water springs and its "buffer" to 1.5km inland. Field boundaries overlaid onto BING imagery.



Saltmarsh opportunity mapping from east to west for D&G for sites 70-78 spanning the north Solway for Newton Stewart to Moss of Cree. Coloured site polygon boundaries shown alongside hatched areas of NVC “SM-prefix” habitat types. Red lines denote mean high water springs and its “buffer” to 1.5km inland. Field boundaries overlaid onto BING imagery.



Saltmarsh opportunity mapping from east to west for D&G for sites 84-87 spanning the north Solway from Wigtown/Bladnoch to RSPB Crook of Baldoon reserve. Coloured site polygon boundaries shown alongside hatched areas of NVC "SM-prefix" habitat types. Red lines denote mean high water springs and its "buffer" to 1.5km inland. Field boundaries overlaid onto BING imagery.



Saltmarsh opportunity mapping from east to west for D&G for sites 89-91 spanning the north Solway from Glenluce to MOD West Freugh, Luce Bay. Coloured site polygon boundaries shown alongside hatched areas of NVC "SM-prefix" habitat types. Red lines denote mean high water springs and its "buffer" to 1.5km inland. Field boundaries overlaid onto BING imagery.

Saltmarsh opportunity mapping from east to west for D&G for site 92 spanning the north Solway for Clayshant, Luce Sands. Coloured site polygon boundaries shown alongside hatched areas of NVC “SM-prefix” habitat types. Red lines denote mean high water springs and its “buffer” to 1.5km inland. Field boundaries overlaid onto BING imagery.

***Table 2**. The attributes of 92 sites identified across the north Solway Firth in D&G from Gretna to Luce Bay, in terms of possible infrastructure issues or current status and land management and proximity to existing saltmarsh habitat mapped by SSS-2016. The hectares of land in each of the height bands defined in **Table 1** are given including a total area for the 4-8m zonation.*

ID	Site-name	Comments	0m	4m	5m	6m	7m	7.1m	7.2m	7.3m	7.4m	7.5m	7.6m	7.7m	7.8m	7.9m	8m	4-8m
1	Gretna-Sark-east	Pastures abutting saltmarsh to west but mostly in England with area of pasture east of access road & M74 motorway	10	0.01	0.2	10.12	26.4	0.73	0.5	0.49	0.51	0.67	0.84	1.03	0.97	0.78	0.68	43.93
2	Gretna-Sark-west	Pastures abutting saltmarsh to the south with Gretna residential areas bordering the north & farm dwelling to southwest by shore	1	0	0	0.67	3.41	0.87	1.15	1.19	1.18	1.07	0.93	1.03	1.1	1.27	1.17	15.04
3	Redkirk-Kirtle	Pastures & arable abutting saltmarsh to south with sewage works & B road crossing northern part of area	0	0.02	1.26	8.04	22.77	1.97	1.64	1.29	1.06	1	1.12	1.26	1.23	1.27	1.5	45.43
4	Redkirk-Baurch	Pastures & arable crossed by farm tracks to north & most of eastern area does not back saltmarsh as coastline likely eroding	0	0	0	3.7	26.86	3.59	4.1	4.45	4.47	3.79	4.06	4.41	3.99	3.97	4.12	71.51
5	Baurch Holdings	Strip of pastures & arable abutting saltmarsh strip to south with farm buildings to north & dwellings by shore to south & MOD site boundary to west	0	0	0	0.05	1.85	0.75	1.41	1.61	1.52	1.46	1.45	1.35	1.05	0.92	0.91	14.33
6	Eastriggs MOD	Rough scrubby pasture covering potentially hazardous site as former MOD munitions factory with saltmarsh fringe & likely eroding coast to south	54	0	0	0.07	1.31	0.83	0.99	1.17	1.42	1.67	1.92	2.27	2.85	3.64	4.5	22.64
7	Dornock	Small potential area behind narrow saltmarsh strip with some opportunity up river channel with two dwellings on shore front	0	0	0.07	0.57	1	0.11	0.13	0.13	0.16	0.17	0.19	0.24	0.34	0.34	0.46	3.91
8	Dornock Mains	Small area of pasture behind narrow strip of saltmarsh & likely eroding coast	3	0	0.01	0.04	1.56	0.26	0.3	0.43	0.38	0.35	0.37	0.49	0.48	0.49	0.45	5.61
9	Annan-Seafield	Disused railway embankment to west & farm with two dwellings on shore behind strip of saltmarsh to south & some dwellings to east along B road	0	0	0	0	0.65	0.24	0.51	1.28	1.66	2.17	3.07	3.18	2.72	2.5	2.15	20.13
10	Annan-Waterfoot	Pastures with disused railway embankment to east with site becoming complex going west as abuts Annan dwellings & sewage works & two farms with extensive saltmarsh to west & south	0	0	0	4.08	16.32	1.89	2.39	2.38	2	1.31	1.08	0.93	0.73	0.73	0.62	34.46
11	Annan-park	Complex area not abutting saltmarsh & includes area north of main B road & park with amenity pitch & perhaps too influenced by freshwater of Annan River	0	0	0.75	4.86	6.76	0.66	0.42	0.31	0.37	0.41	0.59	0.54	0.5	0.44	0.45	17.06
12	Annan-Welldale	Small area of arable & pasture & partly wooded area abutting saltmarsh to east on west bank of River Annan & may already be mostly available to the sea during high tides - delete?	0	0	0.04	0.29	0.49	0.05	0.05	0.05	0.06	0.07	0.07	0.06	0.06	0.08	0.08	1.45
13	Newbie	Pastures south of the Newbie factory complex with mouth of Annan River & saltmarsh on opposite river bank to east with eroded shoreline to southwest	0	0.35	1.26	6.29	12.11	4.39	2.61	1.18	0.6	0.45	0.44	0.39	0.42	0.42	0.34	31.25
14	Cummertrees-Powfoot	Inland along Pow Water & detached from saltmarsh & behind residential Powfoot village with two farms & part of golf course in the area identified & perhaps freshwater influenced	0	0	0.01	0.03	2.95	1.35	1.42	1.65	1.84	1.77	1.75	1.63	1.36	1.46	1.43	18.65
15	Moss-side & Riddindyke	Narrow area of pasture behind strip of saltmarsh & probably too developed with caravan site & golf course uses - delete?	0	0	0	0	1.45	0.47	0.56	0.61	0.66	0.62	0.71	0.87	0.8	0.69	0.58	8.02
16	Nethertown	Pastures & arable extending across two or three farms abutting saltmarsh to the south	0	0	0	0.03	4.77	0.86	0.92	1.34	1.35	1.4	1.55	1.82	1.97	1.88	1.77	19.66
17	Howcreek-south of road	Three cottages or small holdings close to shore abutting the saltmarsh	0	0	0	0	3.61	0.96	1	0.56	0.37	0.41	0.54	0.6	0.58	0.47	0.43	9.53
18	Priestside-south of road	Pastures & arable abutting saltmarsh with one farm & two cottages or small holdings within the zone though one field back from the shore	0	0	0	1	16.33	3.17	3.46	2.14	1.51	1.22	1.12	1.13	1.35	1.79	1.89	36.11
19	Priestside-north of road	Wet pastures & arable not abutting saltmarsh as north & east of the B road so more complex in terms of infrastructure with some seasonal animal housing erected in northern part	0	0	0	0.02	6.32	1.66	1.65	2.12	2.57	3.04	3.51	3.57	3.29	3.33	3.67	34.75

20	Mid-upper Priestside	Pastures abut saltmarsh to south & surround one property & low ground may extend further into conifer plantation to north with B road to east	0	0	0	0.15	4.28	1.57	2.23	1.46	0.88	0.68	0.41	0.32	0.31	0.33	0.27	12.89
21	Ladyhall	Wet pastures abut saltmarsh & farm with caravans to south with dwellings at northern edge of zone along track & zone may extend further into coniferous forestry to north	0	0	0	0.01	8.07	2.47	2.38	2.7	3.29	3.94	4.22	4.12	3.71	3.27	2.35	40.53
22	Thwaite	Improved pastures abutting large saltmarsh on southern edge & dwellings of Brow Well to northwest & main B road to north	2	0	0	0.45	10.48	4.01	4.51	4.48	4.88	6	5.46	4.4	3.25	2.39	1.92	52.23
23	Brow-well north of road	Small area of pastures to north of B road & Brow Well dwellings not abutting saltmarsh	0	0	0.02	0.13	1.92	0.77	1.15	1.41	1.18	1.04	0.99	0.99	0.84	0.74	0.67	11.85
24	Powhillon-Stanhope	WWT pasture & arable holding abutting Lochar Water saltmarsh to south with B road to north & areas exposed to high tides as flap valve not replaced as policy of managed retreat	0	0	0.06	15.91	17.22	1.12	1.34	1.59	2.33	3.55	4.18	5.14	5.65	5.51	3.55	67.15
25	Cockpool - north of road	Small area of pasture & arable to north of B road & some dwellings not abutting saltmarsh with Comlongon conifer plantation to north with further possible low lying areas	0	0	0	0.03	1.47	0.6	1	1.48	1.63	1.44	1.19	1.22	1.38	1.49	1.72	14.65
26	Nether Locharwoods	WWT pastures & arable & freshwater swamp abutting saltmarsh to north of Lochar Water & dwellings & B road to north	0	0	6.34	18.94	8.89	0.99	0.9	0.75	0.71	0.55	0.49	0.44	0.42	0.53	0.61	40.56
27	Mid Locharwoods	Pastures to east of Lochar Water not abutting saltmarsh & perhaps freshwater flow would be too great for saltmarsh to develop	0	0	0	2.88	5.03	0.53	0.38	0.35	0.37	0.37	0.4	0.4	0.42	0.4	0.33	11.86
28	Newmains-CK	Pasture & arable land to west of Lochar Water not abutting saltmarsh & would perhaps be under influence of its freshwater	0	0	0.03	10.77	8.48	0.61	0.4	0.29	0.28	0.26	0.26	0.22	0.2	0.21	0.21	22.22
29	Upper Locharwoods - north Lochar	Sinuous inland pasture areas to east of Lochar Water & perhaps freshwater flow would be too great for saltmarsh to develop	0	0	0	0.18	4.68	0.79	0.89	0.95	0.92	0.89	0.69	0.53	0.46	0.44	0.35	11.77
30	Upper Locharwoods - west Lochar	Complex of inland pasture & arable in sinuous areas along east bank of Lochar Water & perhaps freshwater flow would be too great for saltmarsh to develop	0	0	0	0.02	1.99	0.42	0.41	0.39	0.38	0.36	0.38	0.37	0.36	0.4	0.41	5.89
31	Eastpark WWT	WWT Eastpark pastures with much infrastructure abutting saltmarsh & already subject to policy of managed retreat as two holes in sea wall not repaired giving access to high tides	1	0	0.35	37.13	36.75	2.17	2.53	2.51	2.72	1.55	0.58	0.31	0.24	0.19	0.14	87.17
32	Newfield-CK	Strip of pasture abutting pseudo-saltmarsh areas west of Lochar Water	0	0	0	12.49	1.4	0.08	0.07	0.07	0.06	0.06	0.07	0.08	0.07	0.08	0.1	14.63
33	Midtown-CK	Strip of pasture & arable land to west of Lochar Water inland of saltmarsh areas & perhaps under freshwater influence of Lochar	0	0	0	12.03	12.22	0.19	0.21	0.19	0.18	0.15	0.11	0.1	0.1	0.11	0.06	25.65
34	Newfield-CK-south of road	Area of pastures abutting low lying marshy ground but not saltmarsh	0	0	0	0	1.98	0.39	1.64	3.63	1.5	0.46	0.3	0.31	1	1.63	1.47	14.31
35	Lantonside - north of road	Wet pasture & arable fields separated from saltmarsh area to south by main B road	0	0	0	0.03	8.31	1.32	1.49	2.12	1.94	1.48	1.18	1	0.82	1.03	1.02	21.74
36	Netherwood Mains - east Nith	Pasture & arable land abutting saltmarsh to west on east bank of River Nith	0	0.01	8.61	10.21	6.8	0.39	0.34	0.3	0.29	0.28	0.29	0.29	0.31	0.32	0.35	28.79
37	SAC Crichton college - east Nith	SAC pastures & arable land abutting some saltmarsh to east of River Nith with Kingholm Quay industrial & residential developments to the north & core footpath on sea wall	0	0.22	7.83	9.46	6.67	0.29	0.25	0.24	0.23	0.23	0.22	0.22	0.22	0.22	0.19	26.49
38	Troqueer - west Nith	Low lying pasture & arable area to west of sewage works with Troqueer residential areas & playing fields to north & perhaps freshwater influence of Nith would be too strong	0	0	0.06	19.65	2.91	0.14	0.13	0.13	0.1	0.1	0.11	0.11	0.11	0.13	0.13	23.81
39	Nethertown - Islesteps	Wet pasture & arable zone to west of Nith abutting thin margin of saltmarsh & Islesteps village & Cargen Pow to west with freshwater influence likely	0	0.01	0.31	12.04	13.57	3.38	3.27	2.21	1.71	0.51	0.53	0.63	0.43	0.34	0.2	39.14
40	Islesteps - west Cargen Pow	Small area of pasture south of Islesteps and west of Cargen Pow & likely freshwater influence & not abutting saltmarsh	0	0	0.05	4.19	3.3	0.09	0.06	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	7.82

41	Pleasance - west Nith	Wet pastures & arable zone with one farm & dwelling to north & large areas of saltmarsh abutting east & south sides	0	0	6.05	50.8	14.03	1.18	0.81	0.63	0.59	0.56	0.44	0.33	0.24	0.2	0.17	76.03
42	Greenmerse - west Nith	Wet pastures abutting large saltmarsh area to north & east with Kirkconnell Flow NNR to west	0	0.03	0.81	34.58	1.71	0.19	0.2	0.18	0.16	0.14	0.15	0.15	0.15	0.16	0.17	38.78
43	Gibbonhill - west Nith	Pastures abutting large saltmarsh area to east with Kirkconnell Flow NNR to west	0	0	0.01	11.65	13.29	0.21	0.2	0.2	0.18	0.18	0.17	0.16	0.15	0.15	0.16	26.71
44	New Abbey Pow	Complex & sinuous areas of pasture along New Abbey Pow with saltmarsh development at east end where meets Nith Estuary but perhaps freshwater influence too strong inland	2	0.96	1.31	5.44	4.6	0.6	0.53	0.52	0.56	0.56	0.57	0.59	0.61	0.76	0.77	18.38
45	Ingleston - New Abbey	Small narrow area of pasture & arable abutting thin strip of saltmarsh to east	0	0	0	0.04	0.18	0.18	0.33	0.42	0.52	0.37	0.29	0.28	0.24	0.27	0.27	3.39
46	Corbelly	Narrow strip of pastures extending across many land holdings north to south abutting eroded Drumburn Merse to east	0	0	0	1.43	7.6	0.96	0.9	0.93	0.85	0.81	0.81	0.79	0.78	0.8	0.81	17.47
47	Carse Bay	Small area mostly of wet rough pasture to south of exposed Carsethorn beach front & east of Carse Pow where it abuts some saltmarsh	0	0	0.09	2.31	4.29	0.23	0.26	0.29	0.26	0.21	0.21	0.19	0.18	0.19	0.2	8.91
48	Southerness - golf course	Small area of pasture & golf course rough probably of little potential for saltmarsh development due to high dunes to south - delete?	4	0	0.02	1.02	3.41	0.87	1.05	1.27	1.35	1.35	1.46	1.63	1.66	1.68	1.46	18.23
49	Mersehead-West Preston RSPB	Large low lying area of wet pasture & arable abutting saltmarsh to the west along Southwick Burn & already managed by RSPB with natural barrier of sand dunes to south	164	0.09	5.93	68.93	28.41	1.21	1.05	0.99	0.88	0.83	0.92	1.19	1.5	1.77	1.95	115.65
50	Southwick Home Farm	Wet rough pastures & arable to south of A710 with freshwater influences along south & west border from Beck Burn & Southwick Water abutting swamp but not saltmarsh in west	8	0	1.21	40.38	7.65	0.76	0.82	0.94	1.4	1.63	2.06	1.96	1.74	1.68	1.65	63.88
51	Kippford - east Urr	Pastures abutting saltmarsh on east side of Urr with new build residential area of Kippford on southeast margin	0	0	0.33	1.11	3.57	0.22	0.22	0.25	0.37	0.48	0.37	0.25	0.15	0.11	0.09	7.52
52	Meikle Richorn - Urr Water	Large area of pasture abutting saltmarsh to the south on the north bank of the Urr	0	0.42	6.23	4.94	9.59	0.75	0.87	0.96	0.99	0.97	1.07	1.18	1.27	1.4	1.45	32.09
53	Palnackie - east Urr	Inland sinuous riverside pastures across multiple fields east bank of Urr north of Palnackie with likely freshwater influence not abutting saltmarsh	0	0.41	9.28	4.41	2.54	0.26	0.27	0.27	0.29	0.31	0.31	0.34	0.38	0.44	0.46	19.97
54	Palnackie - west Urr	Small area of riverside pasture with Palnackie village to south on west bank of Urr with likely freshwater influence not abutting saltmarsh	0	0.01	2.83	0.96	0.59	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.08	0.08	5.06
55	Kirkennan-Palnackie - north Urr	Inland riverside pastures across multiple fields west bank of Urr north of Palnackie with likely freshwater influence not abutting saltmarsh	0	0.05	4.28	3.9	1.78	0.26	0.25	0.26	0.29	0.31	0.35	0.34	0.33	0.33	0.36	13.09
56	North Glen-Palnackie - west Urr	Pastures abutting saltmarsh on west side of the Urr	0	0.02	0.42	2.85	4.54	0.38	0.37	0.4	0.41	0.39	0.3	0.25	0.22	0.21	0.22	10.98
57	South Glen-Glen Isle - Urr Water	Small area of pastures abutting saltmarsh to south in a bay area	0	0.02	0.94	8.92	2.43	0.11	0.12	0.14	0.16	0.12	0.11	0.09	0.09	0.09	0.07	13.41
58	Nethertown Cottages - east Orchardton Bay	Area of pastures abutting saltmarsh to the south with Orchardton Burn running through it	0	0	3.56	13.62	5.6	0.31	0.32	0.38	0.44	0.57	0.5	0.45	0.41	0.35	0.3	26.81
59	Orchardton House - west Orchardton Bay	Large area of riverside pastures along Potterland Lane with A711 to west & abutting saltmarsh to the east	0	0.43	6.87	18.26	9.78	0.82	0.89	0.97	1.11	1.09	1.24	1.39	1.37	1.25	1.28	46.75
60	Torrs Farm - Auchencairn Bay	Large area of pastures with some arable abutting saltmarsh to the east and some Auchencairn dwellings to the south	0	0.06	3.67	28.21	20.17	1.66	1.95	3.71	4.66	3.99	4.49	2.92	2.53	2.23	2.29	82.54
61	Ellenbank-Kirkcudbright - east Dee	Mostly a single pasture abutting saltmarsh to west on east bank of Dee	0	4.65	5.96	2.81	6.78	0.64	0.69	0.65	0.76	0.75	0.48	0.29	0.29	0.29	0.24	25.28
62	Mersecroft-Kirkcudbright - west Dee	Pastures abutting saltmarsh to south & east with housing development & derelict or industrial land & main A755 crossing central part of area	0	0.03	1.92	6.21	10.26	1.01	0.97	1.46	1.44	1.08	1.17	0.89	0.68	0.52	0.57	28.21

63	St Marys Isle-Kirkcudbright	Area of woodland & pastures abutting saltmarsh to the west & south becoming complex to the north with Kirkcudbright residential area & sewage farm	0	0.62	6.18	11.69	9.79	1.1	1.11	1.08	1.1	1.03	0.99	0.93	0.87	0.82	0.78	38.09
64	Mutehill-Kirkcudbright - Manxmans Lake	Strip of shoreline pastures abutting saltmarsh to west with some dwellings in central area & A711 on east boundary & B road on west boundary between zone & shore	0	0.01	0.28	1.68	8.3	1.01	0.86	0.69	0.61	0.57	0.58	0.46	0.39	0.38	0.37	16.19
65	Gibb Hill-Kirkcudbright - west Dee	Narrow strip of shoreside pasture running north to south with farm at centre abutting to the east a ribbon of saltmarsh on west side of Dee Estuary	0	0.01	0.92	2.02	1.6	0.12	0.12	0.13	0.14	0.16	0.15	0.13	0.12	0.11	0.11	5.84
66	Cally Park-Gatehouse - north A75	Series of intensive pastures to north & inland of A75 on east bank of canalised Fleet with golf course to east	0	15.76	11.34	7.81	5.59	0.6	0.4	0.25	0.29	0.18	0.14	0.09	0.07	0.06	0.05	42.63
67	Cally Mains-Gatehouse - south A75	Large area of intensive pastures abutting saltmarsh to west on part-canalised east bank of Fleet with A75 to north & a farm to the east	0	41.31	13.2	8.08	3.32	0.08	0.07	0.05	0.05	0.04	0.04	0.03	0.03	0.03	0.03	66.36
68	Boreland of Anwoth-Gatehouse - west Fleet	Small area of wet rough wooded pasture abutted by saltmarsh to the south & canalised Fleet to east with A75 to north	0	0.05	1.25	11.46	4.08	0.52	0.5	0.37	0.27	0.22	0.2	0.17	0.16	0.14	0.13	19.52
69	Creetown Old Quay - east Wigtown Bay	Pastures mainly to east of A75 but with areas to west abutting saltmarsh & containing abandoned quarry quayside promontory	0	0.1	6.85	11.54	5.99	0.31	0.27	0.25	0.23	0.21	0.19	0.18	0.16	0.14	0.13	26.55
70	Muirfad Flow-Carsewalloch - east Cree	Large discrete area of pastures abutting saltmarsh to the west on east bank of Cree with farm to southeast	0	6.18	40.07	2.03	2.05	0.17	0.18	0.2	0.28	0.35	0.41	0.42	0.47	0.56	0.82	54.19
71	Meikle Carse-Muirfad - east Cree	Small area of pasture sandwiched between farm to south & A75 to north on west bank of Palnure Burn & possibly a strong freshwater influence	0	0.01	3.45	4.62	3.48	0.29	0.31	0.33	0.31	0.28	0.31	0.29	0.2	0.19	0.23	14.3
72	Muirfield - east Cree	Small area of pastures on Palnure Burn to east of A75 with some dwellings & tracks to east & west & possibly a strong freshwater influence	1	0.33	2.81	3.93	4.78	0.48	0.5	0.47	0.43	0.36	0.35	0.34	0.35	0.38	0.37	15.88
73	Meikle Carse(south) - east Cree	Area of pasture abutting saltmarsh to south with farm to north on west bank of Palnure Burn & north bank of Cree	0	0.01	1.1	1.8	1.85	0.2	0.2	0.19	0.19	0.26	0.42	0.72	1.02	1.29	1.63	10.88
74	Nether Barr-Newton Stewart	Sinuous area of inland pasture on both sides of Cree not abutting saltmarsh & probably with a strong freshwater influence	0	0.04	7.01	5.33	6.19	1.65	1.78	1.34	0.95	0.82	0.75	0.8	0.75	0.75	0.69	28.85
75	Grange of Cree north - west Cree	Large area of pasture & arable abutting saltmarsh to east on west bank of Cree with B road & farm to west	0	24.17	56.01	7.08	8.98	0.8	0.55	0.55	0.44	0.32	0.33	0.33	0.42	0.45	0.52	100.95
76	Grange of Cree south - west Cree	Pastures & arable abutting saltmarsh to east on west bank of Cree with farm & B road to northwest	0	0.05	18.72	28.81	4.29	0.85	1.25	1.45	1.08	0.13	0.01	0.01	0.01	0	0	56.66
77	Barsalloch - west Cree	Pastures abutting saltmarsh to the east on west bank of Cree Estuary with B road to west & farmhouse centrally	0	0.15	8.47	18.41	47.67	0.45	0.25	0.11	0.05	0.04	0.04	0.03	0.03	0.03	0.03	75.76
78	Polwhilly Cottage-Moss of Cree	Wet rough pastures to west of B road & east of Moss of Cree not abutting saltmarsh	0	0	1.91	6.29	5.99	0.83	1.03	1.39	1.95	2.65	2.68	2.52	3.11	3.94	3.84	38.13
79	Woodlands-Moss of Cree - west of road	Pastures to west of B road not abutting saltmarsh with Moss of Cree conifers to north & sinuous Bishop Burn to the west	0	0.01	0.23	0.77	19.89	5.41	4.72	5.16	5.55	6.03	4.82	2.76	2.21	1.59	1.09	60.24
80	Carslae-Borrow Moss - west of road	Pastures west of B road not abutting saltmarsh with sinuous areas extending inland along Bishop Burn & farm dwellings to south	2	0	0.47	1.64	9.73	6.35	9.04	7.41	9.28	7.24	7.54	7.75	7.34	6.01	4.52	84.32
81	West Kirkland - north Wigtown	Small area of pasture to west of B road not abutting saltmarsh with farm & dwellings on west and south side	0	0	0.01	0.25	2.07	0.4	0.53	0.67	0.85	1.12	1.45	1.35	1.36	1.42	1.15	12.63
82	Borrowmoss north - west Wigtown Merse	Pastures extending from B road in west to saltmarsh in east on west side of Cree Estuary with farm on road side	0	0.05	0.54	1.17	26.71	3.8	3.06	1.72	0.24	0.04	0.03	0.03	0.02	0.02	0.02	37.45
83	Borrowmoss south - west Wigtown merse	Pastures extending from B road in west to saltmarsh in east on west side of Cree Estuary with farm on road side	0	0.01	0.16	1.38	8.93	5.08	6.23	5.88	6.31	4.66	3.3	1.47	0.5	0.22	0.15	44.28

84	Bladnoch north - Wigtown	Pastures extending west inland along north side of River Bladnoch abutting saltmarsh to the east with Wigtown & Bladnoch settlements & A714 to north	0	1.45	13.23	10.35	6.28	0.55	0.44	0.45	0.38	0.32	0.3	0.27	0.26	0.24	0.23	34.75
85	RSPB Crook of Baldoon - Wigtown merse	Wet grasslands of RSPB Crook of Baldoon reserve abutting saltmarsh to the east on west side of Cree Estuary	0	0.86	61.86	33.56	0.99	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	97.57
86	Baldoon Airfield - south Wigtown	Large area of arable & pastures in abandoned airfield site with sawmill to south & Bladnoch river & strip of abutting saltmarsh to north & RSPB wet pastures to east	0	0.29	2.93	55.03	64.89	5.4	4.25	4.12	4.15	4.01	5.56	5.21	4.03	3.51	2.93	166.31
87	Mains of Baldoon-Drumroamin - west Wigtown merse	Area of pastures & arable encompassing multiple farms bordered by saltmarsh to east and RSPB Crook of Baldoon to northeast on west side of Cree Estuary	1	0.07	34.34	94.51	45.82	1.21	1.15	0.99	0.88	0.92	0.89	0.79	0.76	0.74	0.68	183.75
88	Garlieston Bay - west Wigtown Bay	Small area of pasture extending north of paved road from Garlieston Bay where narrow strip of saltmarsh noted in northeast shore sector but not as part of SNH 2012 survey	0	0	0.41	5.16	10.66	0.93	0.76	0.68	0.73	0.8	0.77	0.74	0.78	0.82	0.87	24.11
89	Mains of Park-Glenluce - Luce Bay	Area of pastures & arable abutting saltmarsh to southeast & Water of Luce to east & golf course & dunes to south with B road & A75 to north & club house to west	6	12.84	39.77	39.88	20.64	1.21	1.09	0.95	0.76	0.7	0.64	0.49	0.4	0.31	0.26	119.94
90	Droughdull-Whitecrook - Luce Bay	Large area of arable & pasture extending east to west across multiple farms abutting saltmarsh to south & Piltanton Burn channel with B road to north & some farms within the area	1	5.19	22.08	26.68	32.32	2.6	2.24	1.91	1.69	1.56	1.41	1.17	0.96	0.83	0.66	101.3
91	West Freugh MOD-Piltanton Burn - Luce Bay	Large area of scrub & rough pasture probably on sandy soils abutting saltmarsh to north that runs along the south bank of Piltanton Burn possibly MOD land	4	3.45	12.14	15.12	11.61	0.91	0.87	0.82	0.77	0.72	0.68	0.64	0.6	0.57	0.55	49.45
92	Clayshant - Luce Sands	Complex of pastures & arable behind beach & dunes & adjoining saltmarsh to east around Clayshant Burn & B road to west & MOD to north with quarry site centrally & caravan park	33	6.62	5.73	10.96	21.21	2.52	2.74	2.81	2.84	2.5	2.53	2.32	2.23	2.13	1.95	69.09

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