Environmental Impact Assessment Report

Appendix C7 Biodiversity

Grangemouth Flood Protection Scheme 2024
Falkirk Council

GRANGEMOUTH
Flood Protection Scheme
Protecting the heart of our communities

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On behalf of Falkirk Council

GRANGEMOUTH FLOOD ALLEVIATION SCHEME

Ornithology Survey Report 2015-2017

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Falkirk Council is developing flood risk management measures for the Grangemouth area. Works as part of the Grangemouth Flood Protection Scheme (FPS) are likely to be carried out on the shoreline of the Forth Estuary, within the tidal reaches of the River Carron, Grange Burn and River Avon, and upstream reaches. It is anticipated that an Environmental Impact Assessment (EIA) will be required, and that the Competent Authority will be required to complete a Habitats Regulations Appraisal (HRA) due to the proximity of the schemes to the Firth of Forth Special Protection Area (SPA).

Falkirk Council engaged Halcrow Group Ltd (part of the CH2M family of companies) to provide the engineering and environmental related services for the development of the FPS. They commissioned a series of ornithology surveys of the Forth Estuary between Dunmore and Blackness which were carried out from August 2015 to April 2017, for the purposes of assessing the potential effects of the proposed Grangemouth FPS on ornithological receptors in the area. The aims of the surveys, carried out by MacArthur Green, were to observe and record the following:

- Abundance and spatial distribution of target species at different stages of the tidal cycle;
- Temporal distribution and abundance of target species between years, seasons, months, and time of day;
- Behaviour of birds at different stages of the tidal cycle (e.g. feeding, roosting);
- Baseline human activity levels and types of activity within the survey area;
- Any evidence of anthropogenic or other disturbance within the survey area, and reactions of birds to such disturbance; and
- Breeding bird distribution and abundance (to be reported separately).

This report provides a summary of the work undertaken and results obtained from the two non-breeding seasons (2015-16 and 2016-17), and 2016 breeding season.

A total of 87 target species were recorded during the survey period. Of these, 25 are SPA qualifying interests (out of a total of 27 SPA qualifying interests). Species recorded, and reference populations within the context of the Firth of Forth, are shown in Table 3-1.

Monthly peak counts for each target species are presented for each of the 16 sectors surveyed between Dunmore and Blackness Castle. Potentially important counts at an SPA, estuary and national level have been highlighted, and a discussion provided for each sector's bird assemblage, focussing on key populations and distribution, particularly those at high tide.

Seven species were recorded in numbers within a particular sector reaching importance within a national context: shelduck, dunlin, redshank, bar-tailed godwit, black-tailed godwit, greenshank and red-breasted merganser. Additionally, other species such as curlew, lapwing, pink-footed goose and Sandwich tern were recorded within sectors in populations significant within an SPA context, and further non-SPA species were also found in numbers of estuary level importance.

Distribution of species was relatively consistent between years. Largest numbers of roosting waders were recorded between December and March, with particularly high numbers in January 2017 in Sectors 9 to 11. The key roost sites identified within the survey area appear to be in the vicinity of Grangemouth Port and Petrochemical works (Sectors 6-11) where despite there being high levels of background noise and activities, access to the foreshore is limited, disturbance is infrequent, and man-made and natural structures are suitable for high tide roost locations. Particularly important roost locations identified are:

- Adjacent to the downstream side of the Kincardine Bridge in Sector 3;
- The breakwater adjacent to Grangemouth Port in Sector 6;
- The sheltered bay adjacent to Grangemouth Petrochemical works in Sector 9;
- Mudflats and creeks at the mouth of the River Avon (Sector 10);
- The lagoon at Kinneil (Sector 11); and
- The sheltered bay adjacent to Kinneil Island (Sector 12).

Large areas of mudflats exist adjacent at Skinflats and Kinneil which are also used by large numbers of birds for roosting and feeding at certain parts of the tidal cycle. Any incursions relating to the FPS works close to the foreshore at higher tides in these areas are likely to result in disturbance to numbers of birds that are important at an SPA/ estuary level.

Upstream, in Sectors 1-5, numbers of birds are generally lower, despite infrequent human activity. Roosting locations are more limited and the extent of mudflat is smaller, although inland fields provide roost and feeding opportunities for species such as pink-footed goose, curlew and lapwing. Because of low levels of baseline activity, it was observable that a greater proportion of human activities in these Sectors result in disturbance to birds present, particularly when close to the shore at high tide.

Downstream between Bo'ness and Blackness Castle human activity is frequent and likely to have already influenced bird distribution and behaviour. Birds are present in smaller numbers than further upstream (although gulls and ducks that roost further offshore can be numerous), but are potentially more tolerant of human activities. Disturbance events were still observable when birds were forced closer to the coastal path towards high tide. Coastal works are therefore likely to prevent high tide usage in local areas.

Small numbers of SPA species were recorded through the breeding season across the survey area. In a number of cases, birds present were non-breeders, with the Firth of Forth being outside of the breeding range of such species (e.g. godwits, dunlin). In other examples (e.g. curlew, lapwing, redshank, shelduck), a mixture of non-breeders and a small number of breeding birds may have been present, with breeding habitat within the survey area limited. The larger mudflats appear to be favoured by birds during the breeding season.

1 INTRODUCTION

1.1 Purpose

Falkirk Council is developing flood risk management measures for the Grangemouth area. Works as part of the Grangemouth Flood Protection Scheme (FPS) are likely to be carried out on the shoreline of the Forth Estuary, within the tidal reaches of the River Carron, Grange Burn and River Avon, and upstream.

It is anticipated that an Environmental Impact Assessment (EIA) will be required, and that the Competent Authority will be required to complete a Habitats Regulations Appraisal (HRA) due to the proximity of the schemes to the Firth of Forth Special Protection Area (SPA).

The FPS is currently going through an appraisal of options, with the selection of a preferred solution and submission of the EIA Scoping Report anticipated by late 2017/early 2018. The options currently under consideration include direct defences (flood walls and embankments), upstream flood storage areas, property level protection and a tidal barrier in the Grange Burn.

A detailed consideration of option selection will be necessary, to establish the likely mitigation required and implications for the HRA (SPA / Ramsar) and Conservation Act (Site of Special Scientific Interest, SSSI) consenting processes, with the aim to avoid likely significant effects upon the sites or the qualifying features thereof and adverse effects on their integrity.

Submission of the application for consent is planned for summer 2019, with construction starting 2021, taking 5-10 years to complete.

Falkirk Council engaged Halcrow Group Ltd (part of the CH2M family of companies) to provide the engineering and environmental related services for the development of the FPS. They commissioned a series of ornithology surveys of the Forth Estuary between Dunmore and Blackness (Figure 1) which began in August 2015 (carried out by MacArthur Green), for the purposes of assessing the potential effects of the proposed Grangemouth FPS on ornithological receptors in the area. Falkirk Council requested that the study area was expanded to include a wider area than the immediate surrounds of the Grangemouth Flood Alleviation Scheme due to other potential flood risk management activities or developments in the estuary. Much of the required survey area forms part of the Firth of Forth SPA, Ramsar site and Site of Special Scientific Interest (SSSI) which supports a variety of species' populations of European importance during the migratory and winter periods.

This report provides a summary of the bird survey work undertaken from August 2015 to April 2017, and associated results. It follows on from the interim report on survey work carried out during winter 2015-16, published by MacArthur Green in September 2016[1].

1.2 Aims of Surveys

The proximity of the schemes to the Firth of Forth SPA means they have the potential to have a significant impact on the qualifying features of the SPA (and SSSI and Ramsar site), as well as other

[1] MacArthur Green (2016). Grangemouth Flood Alleviation Scheme: Ornithology Survey Report: Winter 2015-16.

"target species", which for the purposes of this study, are considered to be the same wetland/estuarine species that are included in the British Trust for Ornithology's (BTO) Wetland Birds Survey (WeBS) annual reports[2]. Also included are raptor species that may cause disturbance and influence the distribution and abundance of other target species.

The data collected during the survey programme will be used to inform an EIA and HRA. The aims of the surveys are to observe and record the following:

- Abundance and spatial distribution of target species at different stages of the tidal cycle;
- Temporal distribution and abundance of target species between years, seasons, months, and time of day;
- Behaviour of birds at different stages of the tidal cycle (e.g. feeding, roosting);
- Baseline human activity levels and types of activity within the survey area;
- Any evidence of anthropogenic or other disturbance within the survey area, and reactions of birds to such disturbance; and
- Breeding bird distribution and abundance.

The data collected will be used to establish the potential significance of effects on SPA qualifying interests and other species, as well as inform decisions about the timing, nature and extent of construction activities, including any mitigation measures that may be required. This report provides a summary of results from the surveys, and does not make any assessment of potential impacts at this preliminary stage.

1.3 Firth of Forth SPA, Ramsar and SSSI

The Firth of Forth SPA is a complex of estuarine and coastal habitats stretching from Alloa in the west to the coasts of Fife and East Lothian in the east. The site includes extensive areas of invertebrate-rich intertidal mudflats, rocky shores, saltmarsh, lagoons and sand dunes.

The qualifying features of the SPA are listed below.

Wintering populations (1993/94-97/98 winter peak means) of Habitats Directive Annex 1 species:

- Red-throated diver;
- Slavonian grebe;
- Golden plover; and,
- Bar-tailed godwit.

Wintering populations of migratory species:

- Pink-footed goose;
- Shelduck;

[2] https://www.bto.org/volunteer-surveys/webs/publications/webs-annual-report

- Knot;
- Redshank; and,
- Turnstone.

A passage population of:

- Sandwich tern.

A wintering waterfowl assemblage (1992/93-96/97 winter peak mean of 95,000 waterfowl) of European importance including:

- Great crested grebe;
- Cormorant;
- Scaup;
- Eider;
- Long-tailed duck;
- Common scoter;
- Velvet scoter;
- Goldeneye;
- Red-breasted merganser;
- Oystercatcher;
- Ringed plover;
- Grey plover;
- Dunlin;
- Curlew;
- Wigeon;
- Mallard; and,
- Lapwing.

In addition to the above list, the overlapping Firth of Forth Site of Special Scientific Interest (SSSI) lists breeding eider, ringed plover and shelduck as notified interests.

The Firth of Forth Ramsar site citation lists pink-footed goose, shelduck, redshank, turnstone, Slavonian grebe, goldeneye, knot and bar-tailed godwit as qualifying species.

2 METHODOLOGY

Detailed survey methodology was previously presented in the *Grangemouth Flood Alleviation Scheme: Ornithology Survey Desk Study and Proposed Scope* report, prepared by MacArthur Green and CH2M in April 2015, and agreed with SNH.

2.1 Survey Area

To achieve the survey aims detailed above, a series of surveys of target species has been carried out at specified locations covering:

- The upper shore and intertidal area of the Firth of Forth SPA between Dunmore and Blackness;
- The tidal ranges of the Carron and Avon Rivers and the Grange Burn (where access allows);
- Any suitable terrestrial habitat adjacent to the SPA between Dunmore and Blackness which may at times be used by estuarine birds; and
- The estuary and intertidal/foreshore between Bo'ness harbour and Carriden which, whilst not part of the SPA or SSSI, comprises part of the available habitat for the SPA qualifying species in the area.

The survey area extent is shown in Figure 1. A total of 16 vantage points have been used, each covering a "sector". This sectorial approach is similar to that used for WeBS core count and low-tide count schemes within the Forth Estuary, but provides a more detailed overview by plotting distribution of birds within each sector. The survey area overlaps with six of these existing WeBS core count sectors, and around 12 of the WeBS low-tide count sectors.

2.2 Survey Methodology

2.2.1 Wintering and migration surveys

The surveys involve a programme of monthly counts from 16 individual sectors within the study area. The foreshore and adjacent inland area are checked for birds, for the purposes of:

- estimating flock sizes (for obtaining peak counts within each sector);
- assessing behaviour (e.g. whether birds use the site for feeding and/or roosting);
- obtaining information on local distribution of birds through the tidal cycle;
- recording baseline human activity levels; and
- recording any disturbance events, either human or otherwise (e.g. raptors).

It is anticipated that the impacts of the proposed development are generally likely to be limited to birds that utilise the upper shore, since there will be no loss of lower shore habitat. The distance between upper shore and lower shore, particularly at low tide, also means that disturbance impacts are unlikely on birds on the lower shore.

The primary focus of the surveys is to record presence and activity of SPA species, although non-SPA species of conservation concern are also recorded, unless the level of activity prevents the surveyor from accurately recording SPA species. If so, this is noted by the surveyor.

It is not necessary to conduct all surveys simultaneously on a pre-designated date, as is the case for the WeBS core count scheme[3], on which the methods for these surveys were based. Instead, similar to the WeBS low-tide count scheme, the main purpose of the surveys is to investigate local distribution and abundance, and not necessarily to determine overall population sizes within the whole survey area. An example provided in the WeBS low-tide count methodology is that if a sector is important for birds at low water, it does not matter if a flock of dunlin recorded there was also recorded elsewhere - the outcome is that it is established that both areas are important.

Each survey lasts for six hours, enabling a range of tidal states to be surveyed. Emphasis has been placed on covering the period around high tide, in order to establish roost (or feeding) distribution closest to the shoreline, when birds may be at their most sensitive to disturbance.

- The survey effectively comprises six independent hourly counts. The observer surveys from a predefined vantage point, recording the location and abundance of target species utilising the upper shore, intertidal and adjacent inland habitat. Notes are made on survey sheets of species, flock size, behaviour (feeding, roosting, loafing or movements), time recorded, time birds left sector (if applicable) and any other relevant information.
- The location of individual birds or flocks is recorded on field maps to provide accurate distribution. Flock ID on the map can be cross-referenced with an associated record in the survey sheets. Three distribution maps are used for each survey: one at high tide, and two spaced evenly throughout the remainder of the survey.
- Generally, birds that fly through the sector and do utilise the area are not recorded, as they will not be subject to disturbance pressures or habitat loss. However, species such as Sandwich tern which do not tend to land, but may forage within the Sector are recorded when in flight.
- Any disturbance displacement distances and directions are noted, and (where apparent) possible return times once disturbance has ceased.
- Baseline activity levels, by humans, traffic, boats or other sources such as raptors are also recorded using a combination of spot counts and total activity tallies.
- In some sectors it was considered to be beneficial to move a short distance from vantage points during the survey so that obscured areas within the sector can be viewed, only if it can be ensured that such movements do not cause disturbance to birds within the sector.
- Weather conditions (wind speed using the Beaufort scale, cloud cover estimated as eighths or oktas of the sky, visibility and temperature) are recorded. Weather conditions can affect the ease of carrying out any bird monitoring, and conditions of fog, rain or strong winds can

[3] https://www.bto.org/volunteer-surveys/webs/taking-part/core-counts-methods

make the counting of birds on distant mudflats particularly difficult. Such adverse conditions are therefore avoided wherever possible.

- During surveys, surveyors should behave as inconspicuously as possible to minimise disturbance, for example by not breaking the horizon.
- If a flock leaves the sector between counts, the time of this event is noted in the appropriate column.
- If a flock arrives and leaves the sector between hourly counts, it should still be included in the appropriate hourly count.

Examples of survey sheets are shown in Appendix 1.

2.2.2 Breeding season surveys

Surveys during the breeding season (May to July 2016) involved a combination of walkovers and short vantage point surveys along the upper shore and suitable inland habitat[4], within each sector. The aim of the surveys was to record any breeding evidence of target species (primarily SPA or SSSI qualifying interests). Non-breeding target species were also recorded during each survey.

2.3 Survey Programme

Survey effort (hours per sector per month) is shown in Table 2-1 and Table 2-2. Hours lost to poor visibility have been excluded from survey effort.

Table 2-1 Grangemouth survey effort – August 2015 to April 2016.

Sector	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	TOTAL
1	6	6	6	6	6	6	6	6	6	54
2	6	6	6	6	6	6	6	5	6	53
3	6	6	6	6	6	6	6	6	6	54
4	6	6	6	6	6	6	6	6	6	54
5	6	6	6	6	6	6	6	6	6	54
6	6	6	6	6	6	6	6	12	0	48
7	6	6	6	6	6	6	6	6	6	54
8	6	6	6	6	6	6	6	6	6	54
9	6	6	6	6	6	6	6	6	6	54
10	6	6	3.5	6	6	6	6	12	0	51.5
11	6	6	5	6	6	6	6	6	6	53
12	6	6	6	6	6	6	6	0	6	48
13	6	6	6	6	6	6	6	6	6	54
14	6	6	6	5.5	6	6	6	6	6	53.5
15	6	6	6	5.5	6	6	6	6	6	53.5
16	6	6	6	5.5	6	6	6	6	6	53.5

[4] The definition of "suitable inland habitat" for this purpose is flexible and dependent on site-specific characteristics, but in general can be considered to be habitat potentially utilised by SPA species, within approximately 250m of the shoreline. In practice this buffer distance is not fixed and may be more, or less, depending on habitat type, visibility and access at a particular location.

Table 2-2 Grangemouth survey effort – August 2016 to April 2017.

Sector	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	TOTAL
1	6	6	6	6	6	6	6	6	6	54
2	6	6	6	6	6	6	6	6	6	54
3	6	6	6	6	6	6	6	6	6	54
4	6	6	6	6	6	6	6	6	6	54
5	6	6	6	6	6	6	6	6	6	54
6	6	6	6	6	6	6	6	12	0	54
7	6	6	6	6	6	6	6	6	6	54
8	6	6	6	6	6	6	6	6	6	54
9	6	6	6	6	6	6	6	6	6	54
10	6	6	6	6	6	6	6	6	6	54
11	6	6	6	6	6	6	6	6	6	54
12	6	6	6	6	6	6	6	6	6	54
13	6	6	6	6	6	6	6	6	6	54
14	6	6	6	6	6	6	6	6	6	54
15	6	6	6	6	6	6	6	6	6	54
16	6	6	6	6	6	6	6	6	6	54

Table 2-3 Grangemouth survey effort – May to Jul 2016.

Visit	Month	Dates
1	May	19-21
2	June	17,18,20
3	July	21-22

2.4 Survey Limitations

2.4.1 Survey Gaps

Because of the complex nature of the estuarine habitat to be surveyed, and the human activities along the shoreline and access restrictions, coverage is less than 100% across the survey area. The following bullet points list the gaps in coverage and explain the reasons behind such omissions (refer to Figure 1 for survey sector coverage).

- Sector 5: some inland pools are not observable from one static vantage point covering the River Carron and immediate inland area. These pools have however been covered during surveys. Most birds that fly to and from these pools and the shore are observable by surveyors from the vantage point.
- Sector 6: the northwest part of Grangemouth docks is inaccessible for security reasons, as it forms part of the BP oil terminal. Although not observable from the vantage point within sector 6, it is viewable, albeit from a distance from sector 4.
- Sector 7: the northernmost part of Grangemouth port is only partially viewable due to no access at the BP oil terminal.

- Sector 9: Accessibility from the INEOS refinery at Grangemouth is very limited at a perimeter fence gate, and there is no access to the area of reclaimed land to the north.
- Between Sectors 11 and 12: there is a small inlet in a wooded area where no extensive vantage point coverage is possible. High tide roost habitat is limited here but the area is walked prior to and after surveys of sectors 11 and 12.
- Between Sectors 12 and 13: follows the John Muir Coastal Path – the sector is gently curved with woodland to path edge, making a suitable vantage point difficult to locate. High tide roost habitat is very limited. It is walked prior to and after survey of sectors 12 and 13.
- Between Sectors 13 and 14: follows the John Muir Coastal Path – sector is gently curved with industrial buildings inland. No suitable vantage point exists. High tide roost habitat is very limited. It is walked prior to and after survey of sectors 13 and 14.
- Between Sectors 14 and 15: gently curved sector within woodland – no suitable vantage point, but habitat suggests high tide roost habitat is very limited. It is walked prior to and after survey of sectors 14 and 15.

Overall, these constraints were minor, and we consider that they had very little impact on the collection of survey data. Therefore, the data are considered to be fully representative of the situation throughout the study area as a whole.

2.4.2 Survey Effort

Where possible, surveys comprised a standard length six hour survey, to cover most phases of the tidal cycle. In a small number of cases during the first winter period (see Table 2-1) valid survey hours were less due to periods of poor visibility. Despite the loss of some survey time, at least four hourly counts were made during each survey in 2015-16, and so overall results are unlikely to be significantly affected by the reduction due to adverse weather conditions, particularly as full survey coverage was achieved in 2016-17.

No survey was conducted in Sector 12 in March 2016. Whilst it is unlikely that this will influence results, survey results in March 2017 have provide increased confidence of results obtained for this sector.

2.4.3 Changes in Recording Style

The methodology employed at the start of the survey programme was agreed with SNH prior to commencement. A review of the suitability and ease of recording took place in October 2015, and some refinements to recording style were made, commencing November 2015 (methods of survey, and human activity level recording remained unchanged). Results obtained from August to October 2015 were subsequently converted into the format of the updated style, to allow consistency of analysis. Thus the change in survey style does not pose a limitation to analysis or assessment.

The key changes were:

- Instead of constant counts and recording of movements and behaviours through the six hour survey period, a series of six separate hourly counts are made to estimate total numbers per species within the sector at different tidal states.
- Three separate distribution maps are produced per six hour survey, instead of one map that is continuously added to. One of these distribution maps is completed at high tide, and the other two are spread through the remainder of the survey to cover different tidal states. The information in each map (e.g. Flock ID #, species) corresponds with the associated hourly count information, e.g. if a map is produced in hour 4, then it ties-in with the records for count 4.
- Movements of birds within sectors are no longer recorded, but instead should be picked up by the three distribution maps. The exceptions to this are when flocks leave/enter the sector, where it is important to know directionality. Birds' reactions to any disturbance event continue to be noted throughout the six hour period, whether they remain within the sector or leave the sector.

For the second winter period from August 2016 onwards, an electronic GIS mobile data capture system (on a tablet) was used by each surveyor to record information on birds, background activity, disturbance and weather, using forms and maps with similar content to paper versions used previously. Surveyors were able to plot bird distribution via a series of points on an hourly basis using this technology (i.e. six hourly counts with six distribution maps).

2.4.4 Breeding Bird Surveys

During the breeding season, no surveys were undertaken within Sector 9 (Grangemouth refinery). Access is very limited at a perimeter fence gate, and there is no access to the area of reclaimed land to the north. Visibility is also limited during summer months because of the high *Phragmites* reeds in front of the access point, so that surveys during the breeding season were impractical.

2.5 Analysis Methodology

The methods of analysis have been designed to highlight particular locations within the survey area which host important numbers of target species within the context of the SPA and Firth of Forth as a whole, and where birds may be sensitive to disturbance, for example because of high tide roosts or because background levels of human activity are currently low. The following information is provided:

1. **Species present:** a list of all species recorded during surveys, their conservation status, wider reference populations and whether a WeBS alert exists due to a decline in numbers. The BTO WeBS Alerts system provides a method of identifying changes in numbers of waterbirds at a variety of spatial and temporal scales. Species that have undergone major changes in numbers are flagged, by the issuing of an Alert.
2. **Monthly sector peak counts** for each species, equating to the total abundance at any point during an hourly count over the six hour monthly survey period. This may involve the summation of counts of more than one flock, as long as the flock ID number is not referenced more than once within the hour (i.e. to avoid double counting).

3. **Important sector peak counts** have been highlighted in Sector summary tables when they exceed the following criteria:
    a. >10% of its associated cited SPA population (highlighted green in Sector tables);
    b. >10% of its associated 5 year mean for the Firth of Forth WeBS core counts (highlighted blue);
    c. 10% of its associated cited SPA population and 5 year mean for the Firth of Forth WeBS core counts (highlighted orange);
    d. Over the threshold for national importance (GB population) in the WeBS core counts report (highlighted red).
4. **Distribution of SPA species within the survey area.** Figures show spatial distribution of birds of each SPA species and whether birds are using the sector for roosting, feeding or loafing. The relative flock size of each species is represented by appropriately sized dots on the figure.
5. **Distribution of high tide roosts for SPA species**. Figures show distribution of roosting SPA species at high tide. The relative flock size of each species is represented by appropriately sized dots on the figure.
6. **Background human activity levels**. To assess the risk of disturbance, the relative levels of current human background activity were quantified, to identify potentially sensitive areas, and where areas of ongoing disturbance may already exist.

    The overall human activity level was represented by an index that is a simple average of those produced per survey, corrected for sector length (e.g. X events[5] per hour per km).

7. **Disturbance events:** any human, or other (e.g. raptor presence) activity that elicits a response from birds (increased vigilance, calling, movement along the shore, or taking flight) is noted by the surveyor, and source and reactions described. These are summarised qualitatively.

3 RESULTS

3.1 Wintering and Migration Surveys: Species Present

A total of 87 target species were recorded during the wintering and migration surveys. Of these, 25 are SPA qualifying interests (out of a total of 27 SPA qualifying interests, with long-tailed duck and velvet scoter absent). Seven species were recorded in numbers within a particular sector reaching importance within a national context: shelduck, dunlin, redshank, bar-tailed godwit, black-tailed godwit, greenshank and red-breasted merganser. Species and their reference populations within the context of the Firth of Forth are shown in Table 3-1.

For the Firth of Forth SPA (surveyed in 2009/10), WeBS Alerts were triggered for 17 out of the 26 species assessed[6]. Declines of between 25% and 50% trigger Medium Alerts (amber) and declines of

[5] Events are for example, a single person, a group of people or a vehicle appearing within the Sector.

greater than 50% trigger High Alerts (red). For three of the species recorded during surveys (goldeneye, red-breasted merganser and golden plover), comparison of site trends with broad scale trends suggests that the declines underpinning Alerts status may be driven by site-specific pressures, rather than broader population patterns.

[6] http://app.bto.org/webs-reporting/?tab=alerts

Table 3-1 Target species recorded during wintering and migration surveys

Species	SPA Qualifying Interest	WeBS Core Count GB Threshold	Cited SPA population (individuals)	Forth Estuary Complex WeBS core count[7]		2009/10 WeBS Alert (SPA) and period of concern
				5 year average	Month of peak count	
Arctic skua		-	-	-	-	-
Arctic tern		-	-	19	Sep	-
Barnacle goose		580	-	301	Oct	-
Barn owl		-	-	-	-	-
Bar-tailed godwit	✓	380	1,974	1,341	Jan	ST, MT, MC
Black-headed gull		22,000	-	3,412	Sep	-
Black-tailed godwit		430	-	636	Oct	-
Black-throated diver		6	-	4	Apr	-
Brent goose		-		10	Sep	-
Buzzard		-	-	-	-	-
Canada goose		-	-	300	Aug	-
Common gull		7,000		941	Oct	-
Common sandpiper		1	-	16	Jul	-
Common scoter	✓	1,000	2,880	2,130	Apr	ST, MT, SC
Common tern		-	-	543	May	-
Coot		1,800	-	15	Feb	-
Cormorant	✓	350	682	496	Sep	MT (ST, LT, SC medium)
Curlew	✓	1,400	1,928	3,132	Feb	-
Curlew sandpiper		-	-	6	Sep	-
Dunlin	✓	3,500	9,514	5,302	Dec	MT, SC (ST, medium)

[7] Frost, T.M., Austin, G.E., Calbrade, N.A., Holt, C.A., Mellan, H.J., Hearn, R.D., Stroud, D.A., Wotton, S.R. and Balmer, D.E. 2016. Waterbirds in the UK 2014/15: The Wetland Bird Survey. BTO/RSPB/JNCC. Thetford. http://www.bto.org/volunteer-surveys/webs/publications/webs-annual-report

Species	SPA Qualifying Interest	WeBS Core Count GB Threshold	Cited SPA population (individuals)	Forth Estuary Complex WeBS core count[7]		2009/10 WeBS Alert (SPA) and period of concern
				5 year average	Month of peak count	
Eider	✓	550	9,400	4,787	Jan	MT, SC
Feral/hybrid goose		-	-	-	-	
Fulmar		-	-	-	-	
Gadwall		250	-	12	Mar	-
Gannet		-	-	-	-	-
Glaucous gull		-	-	-	-	-
Golden plover	✓	4,000	2,949	1,419	Oct	ST,MT,SC
Goldeneye	✓	200	3,004	1,794	Jan	MT, LT, SC
Goosander		120	-	200	Aug	-
Great black-backed gull		760	-	414	Oct	-
Great crested grebe	✓	190	720	87	Sep	ST,MT,LT,SC
Green sandpiper		9	-	1	-	-
Greenshank		6	-	47	Dec	-
Green-winged teal		4	-	1	-	-
Grey heron		610	-	86	Oct	-
Grey plover	✓	430	724	278	Feb	MT, SC (ST, medium)
Greylag goose		850	-	1,993	Sep	-
Herring gull		7,300	-	2,820	Jan	-
Kestrel		-	-	-	-	-
Kingfisher		-	-	2	Nov	-
Kittiwake		-	-	127	May	-
Knot	✓	3,200	9,258	4,405	Jan	MT, SC (ST, LT medium)
Lapwing	✓	6,200	4,148	2,711	Oct	MT, SC (ST, medium)
Lesser black-backed gull		1,200	-	490	Aug	-
Little auk		-	-	-	-	-

Species	SPA Qualifying Interest	WeBS Core Count GB Threshold	Cited SPA population (individuals)	Forth Estuary Complex WeBS core count[7]		2009/10 WeBS Alert (SPA) and period of concern
				5 year average	Month of peak count	
Little egret		45	-	5	Feb	-
Little grebe		160	-	18	Jan	-
Little gull		-	-	11	Aug	-
Little stint		1	-	1	Aug	-
Mallard	✓	6,800	2,564	1,397	Dec	MT,LT,SC
Marsh harrier		-	-	-	-	-
Mediterranean gull		18	-	1	Oct	-
Merlin		-	-	-	-	-
Moorhen		3,200	-	23	Nov	-
Mute swan		740	-	200	Jul	-
Oystercatcher	✓	3,200	7,846	6,425	Nov	-
Peregrine		-	-	-	-	-
Pink-footed goose	✓	3,600	10,852	17,204	Oct	-
Pintail		290	-	111	Jan	-
Pochard		380	-	3	Jan	-
Purple sandpiper		130	-	118	Nov	-
Razorbill		-	-	-	-	-
Red-breasted merganser	✓	84	670	299	Dec	MT, LT, SC (ST amber)
Red-necked grebe		1	-	6	Aug	-
Redshank	✓	1,200	4,341	3,816	Oct	-
Red-throated diver	✓	170	90	53	Oct	-
Ringed plover	✓	340	328	503	Dec	-
Rock pipit		-	-	-	-	-
Ruff		8	-	14	Aug	-
Sanderling		160	-	353	Mar	-
Sandwich tern	✓	-	1,617	1,254	Aug	-

Species	SPA Qualifying Interest	WeBS Core Count GB Threshold	Cited SPA population (individuals)	Forth Estuary Complex WeBS core count[7]		2009/10 WeBS Alert (SPA) and period of concern
				5 year average	Month of peak count	
Scaup	✓	52	437	13	Oct	MT, LT (SC amber)
Shag		1,100	-	395	Oct	-
Shelduck	✓	610	4,509	3,577	Oct	-
Short-eared owl		-	-	-	-	-
Shoveler		180	-	8	Jan	-
Slavonian grebe	✓	11	84	36	Mar	-
Snipe		10,000		92	Oct	-
Sparrowhawk		-	-	-	-	-
Spotted redshank		1	-	1	Dec	-
Teal		2,100	-	3,077	Dec	-
Tufted duck		1,100	-	26	Mar	-
Turnstone	✓	480	860	694	Nov	-
Water rail		-	-	2	Feb	-
Whimbrel		1	-	26	Jul	-
Whooper swan		110	-	34	Nov	-
Wigeon	✓	4,400	2,139	1,905	Jan	ST, SC
Wood sandpiper		-	-	1	-	-

WeBS Alerts: ST: short-term (5 years) MT: medium-term (10 years) LT: long-term (up to 25 years) AT: all-time SC: since classification.

3.2 Monthly Sector Peak Counts

3.2.1 Sector 1: Dunmore

The monthly peak counts for each species recorded within Sector 1 are shown in Table 3-2. The top line for each species (pink) represents the peak counts during the 2015-16 period, and the second line (white) represents the 2016-17 period. Highlighted are counts that are seen to represent aggregations of potential importance within a regional (in this case the Forth Estuary) or national (based on WeBS GB threshold populations of importance) context (see Table 3-1 for reference values[8]). The key for this, and all other subsequent sector tables is:

	>10% of WeBS 5-year mean peak count but not achieving any of the other criteria
	>10% of cited SPA population but not >10% of WeBS count and not of national importance
	>10% of WeBS count and cited SPA population
	Above WeBS GB threshold population for national importance

Table 3-2. Sector 1 species monthly peak counts, 2015/16 and 2016/17

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Barnacle goose			20			46			
Bar-tailed godwit			1	1		1	17		
	1								
Black-headed gull	170	300	230	200		1			
	116		89	54	33	9	12	4	
Black-tailed godwit				1			210	17	
		4		20		6	65	23	2
Black-throated diver						1			
Buzzard	1								
Canada goose		345	120						
Common gull	2		50	15					7
						5	11		
Common sandpiper	1								
	2								
Common tern	17								
	2								
Cormorant	11	1	10	24					
	2		4	4	5	1	4	7	2
Curlew	105	4	70	140	270	240	188	108	1
	34	168		3	93	8	36	44	3
Dunlin	26				25		16		
		2							

[8] Note that values exceeding thresholds have only been highlighted where 5 year average for Forth Estuary WeBS count, or Firth of Forth SPA citation population is greater than 10 birds, or where WeBS Core Count GB threshold is greater than one bird.

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Gannet			1			1			
Goldeneye						35			
					1				
Golden plover			1	2					
Great black-backed gull			5	3					
	2		1			2		2	
Greenshank				1					
Grey heron	15	5	10	10					3
	6	30	1	9	8	16	3	2	
Grey plover			8						
Greylag goose		370	60	1					
Herring gull	8	5,000	80	35					8
	29		66	2	7	4	1	10	
Kestrel	1		1	1		1			
		1			1				
Kittiwake						1			
Lapwing	4	200	180	270					1
					98				
Lesser black-backed gull	1		40	8					
			1						
Little auk						3			
Little egret		1		2					
		3	2	2	2	5		3	
Mallard	82	17	65	25		60	35	26	8
	13	25	150	51	58	39	35	28	6
Marsh harrier				1					
Merlin				1					
Mute swan									
					1				
Oystercatcher						35		4	
	25						27	6	10
Peregrine				2					
Pink-footed goose		3,000	640	450					
								233	
Pintail									
				12					
Red-breasted merganser			1	7		16			
				4	8	2	2	4	

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Redshank	14	33	13	40	50		80	12	2
	4	4	2	3	65	11	37	64	3
Ringed plover									
									6
Sandwich tern	2								
Shag						1			
Shelduck	6	4	8	18			6	15	
		1	1	4	12	11	9	2	6
Short-eared owl									
	1								
Snipe		1							
Sparrowhawk	1		2						
Spotted redshank			1				1	1	
Teal	6	11	80	30	50	15	170	55	
		18	14	78	35	35	137	13	2
Tufted duck			2						
Whimbrel	2								
									7
Wigeon		20	100	40	90		200	74	
			1	71	38	95	62	136	19
TOTAL COUNTS 2015-16	475	9,312	1,799	1,328	485	457	923	312	30
TOTAL COUNTS 2016-17	237	256	332	317	465	249	441	581	66

Target species found in nationally-important numbers:

- None.

SPA qualifying interests found in potentially important numbers:

- Curlew, pink-footed goose.

Other target species not in the previous two lists but found in potentially important numbers in relation to the Forth Estuary:

- Barnacle goose, black-tailed godwit, Canada goose, common sandpiper, grey heron, greylag goose, herring gull, lapwing, little egret, mallard, pintail, whimbrel and wigeon.

Section 1 is within an area of relatively undisturbed arable farmland between Dunmore and Airth. The river edge comprises an earth bund to protect fields from flooding, with partially-exposed marshland on the estuary side.

In general, peak monthly counts for most of the 46 target species in Sector 1 were relatively low in comparison with their overall 5-year peak mean population for the Forth Estuary, or cited SPA population, where applicable. Pink-footed goose and curlew were the only SPA qualifying interests with peak monthly counts >10% of the cited populations.

Curlews were recorded feeding and roosting, including at high tide, throughout the non-breeding survey period, albeit in higher numbers in 2015-16. A count of 3,000 pink-footed geese was obtained in September 2015. Birds were feeding on an adjacent field alongside a flock of Canada geese, and there was a lot of movement to and from the flock during the survey. In 2015-16, pink-footed geese were present during the autumn migration period, but were absent during subsequent months, whereas the only record in 2016-17 was during the spring migration period.

A number of species' counts did exceed 10% of current 5-year peak mean estuary populations, and the Sector does appear to be relatively important for geese, likely because of the adjacent agricultural land, which is relatively undisturbed, and can be used for feeding and roosting. Other notable aggregations included black-tailed godwits in February 2016 and 2017, approximately 5,000 herring gulls in September 2015, 270 lapwings in November 2015, and 200 wigeons in February 2016.

3.2.2 Sector 2: Airth

The monthly peak counts for each species recorded within Sector 2 are shown in Table 3-3.

Table 3-3. Sector 2 species monthly peak counts, 2015/16 and 2016/17

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Arctic tern	1								
Bar-tailed godwit								10	
		4		2		1			
Black-headed gull	20	2,500	53		5		76		
	167	120	590	560	766	1	1		
Black-tailed godwit			2						
		1	43	2	30	2			8
Canada goose		236	27						
		20							
Common gull			1		3		6	1	1
		75		240		2	3	1	19
Common tern	3								
Common sandpiper	2		1						1
Cormorant	3	5	2		4		5		
	6	3	5	8	8	2	8	6	1
Curlew	13	233	5	27	47	240	18	22	2
	36	60	20	184	98	124	56	5	78
Dunlin									
				54	10				
Goldeneye						2	2		
					1				
Goosander					4				
Great black-backed gull	2		1		1		1		
	2	3	1	7	2	1	2	2	

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Greenshank			1						
	1		1						
Grey heron	1	4					1		1
	2	1	1	5	2		1	2	1
Greylag goose		292	2						
	103	200			33				
Herring gull	10	3,000	41		2		7	2	16
	163	1,700	41	130	9	2	17	2	20
Kestrel						1			
				1					
Lapwing			15						
					20				
Lesser black-backed gull									3
			2	15	2				4
Little egret				2			1		
								2	
Mallard		2				2	4	2	3
	10	2	2	7	17	3	2	2	22
Mediterranean gull									
				1					
Oystercatcher	2		5	32	15	2	6	2	50
		11		14	32	13	8	1	110
Peregrine									2
			2						
Pink-footed goose	3	50				53	3	8	
		4	4	2	610	1	1	12	17
Pintail									
		1							
Red-breasted merganser			1			2			
			3	9	2		4	1	4
Redshank			3	41	13	14	7	44	1
	1	2	27	65	144	67	45	65	14
Ringed plover									
									1
Shelduck	25	28	14	14	4		8	21	15
		4	5	35	7	17	10	7	34
Spotted redshank			1						
Teal		1	13	9		3	18	54	
	2	20	18	80	170	143	91	45	7
Whimbrel									4
		1							
Wigeon				20		3	9	19	
		12		78	6	66	40	28	33
TOTAL COUNTS 2015-16	82	6,351	188	145	98	322	172	185	99
TOTAL COUNTS 2016-17	496	2,244	765	1,499	1,969	445	289	181	373

Target species found in nationally-important numbers:

- None.

SPA qualifying interests found in potentially important numbers:

- Curlew.

Other target species not in the previous two lists but found in potentially important numbers in relation to the Forth Estuary:

- Black-headed gull, Canada goose, common gull, common sandpiper, greylag goose, herring gull, little egret, whimbrel.

Sector two comprises low-lying farmland similar to Sector 1, and peak monthly counts for most of the target species in Sector 2 were again relatively low, and the number of species recorded (36) was also relatively low. Curlew was the only SPA qualifying interest with peak monthly counts >10% of the cited population, in September and January 2015. Curlews used the Sector both for feeding, and as a high tide roost.

Herring gull and black-headed gull were recorded in relatively high numbers in autumn, and the Sector is also used intermittently by greylag and Canada geese, particularly in autumn (pink-footed geese were also present in numbers in December 2016). By contrast, the Sector appears to be unimportant for waders, with little habitat suitable for high tide roosts. Many gulls and oystercatchers were observed on the exposed mud bank in the middle of the Forth, outside of the sector, at lower tides, but did not remain within this Sector as tide rose.

3.2.3 Sector 3: RSPB Skinflats

The monthly peak counts for each species recorded within Sector 3 are shown in Table 3-4.

Table 3-4. Sector 3 species monthly peak counts, 2015/16 and 2016/17

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Barnacle goose		17							
			1						
Bar-tailed godwit	5						8		
		47							
Black-headed gull	110		30	15			248	3	1
		116	100	340	55	129	116	10	
Black-tailed godwit			4					1	
	1			152	7	3			
Black-throated diver						1			
Buzzard						1			
Common gull			4	6			34	6	
		71	5	90	42	20	6	7	
Common tern	10								
Coot						1			
Cormorant		1	1	2					1

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
		3	4	4	2	1	1		
Curlew	86	234	34	100	306	340	248	12	25
	180	45	133	178	96	7	44	266	11
Dunlin	10	110	16	120					3
		15	2	660	48	1			
Eider									
								2	4
Gadwall								3	
Gannet			3						
		4							
Golden plover				1		14			
			7		5				
Goldeneye				2		1			
				2	2				
Goosander	20								
	17								
Great black-backed gull	2			2					
		4	1	4		1	2	4	2
Great crested grebe						1			
					1	1			
Greenshank	5	1	1						
	1	1		1					
Grey heron	12		1	4		6	1		1
		7	2	5	3	4	1	2	1
Grey plover		23	10						
				8					
Greylag goose		1							
	360	1							
Herring gull	6	80	16	6			28	2	4
		21	2	100	5	7	11	11	7
Kestrel									
				1					
Kingfisher		1							
		1	1						
Knot	8			5					
				2					
Lapwing			7		3	1			2
		5		77				3	4
Lesser black-backed gull	6								
		1		15				2	1
Little egret	2	2		1			1	1	
		1						1	
Mallard	49	2		10		1		2	2
	10	4		4	5	18	13	26	16
Merlin						1			
Mute swan				3					

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
		2							
Oystercatcher	16	33	23	70	42	170	10	31	100
	30	2		76	120	40	60	83	62
Peregrine									
							1		
Pink-footed goose			120	200		350		76	9
			2,700	6	39	1		1,268	366
Pintail									1
		11	3	42	1	4	1		
Pochard									
	5								
Red-breasted merganser		4	2	11		3	17	14	
	10		1	11	15	4	2	2	4
Redshank	35	175	2	230		110		2	11
		3	84	723	89			1	16
Red-throated diver						1			
Ringed plover								2	14
Sandwich tern									
	3								
Scaup									
								2	1
Shelduck	148	280	104	16	4	80	5	31	9
	200	59	21	43	9	30	47	44	72
Snipe									
				3					
Teal	49	8	39	125	236	470	121	120	
	6	10	200	105	47	210	195	148	88
Tufted duck		1						1	
	1								1
Whimbrel	1								1
		1	4						
Whooper swan									
				2					
Wigeon		100	62	50		1		3	
		18	17	94	75	35	35	34	16
TOTAL COUNTS 2015-16	570	1,073	479	979	591	1,553	721	310	184
TOTAL COUNTS 2016-17	834	453	3,288	2,748	666	516	535	1,916	672

Target species found in nationally-important numbers:

- None.

SPA qualifying interests found in potentially important numbers:

- Curlew, pink-footed goose, redshank.

Other target species not in the previous two lists but found in potentially important numbers in relation to the Forth Estuary:

- Black-tailed godwit, dunlin, gadwall, goosander, greenshank, grey heron, greylag goose, little egret, pintail, pochard, scaup, teal and whimbrel.

A total of 52 species were recorded within Sector 3. Flock sizes were generally relatively low throughout the winter, although curlew, pink-footed goose and redshank were recorded in important numbers compared to their SPA populations. Curlews used the sector for feeding, and a high tide roost. Dunlin and redshank were also regularly present but numbers of most other waders were low. Teal was consistently present, with numbers exceeding 10% of the estuary population in January 2016, at lowering tide.

It was observed on at least one occasion that as the tide rose, geese moved into fields, and ducks and waders moved to Sector 4, or some flew up river. When the mud was not fully covered at high tide, some birds were able to stay on shore.

3.2.4 Sector 4: Skinflats Bay

The monthly peak counts for each species recorded within Sector 4 are shown in Table 3-5.

Table 3-5. Sector 4 species monthly peak counts, 2015/16 and 2016/17

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Barnacle goose			3						
Barn owl									
						1			
Bar-tailed godwit		6				1			
		4	55	3	45	12			
Black-headed gull		4,000		6		200	78		3
		30	260	300	100	330	100	360	
Black-tailed godwit		2	5						
	12	6	12	147	33				
Buzzard		1							
Canada goose									
									4
Common gull		1,500		1		20	11	23	9
		10	160	76	35	35	2	139	
Common tern									
		19							
Coot		45							
Cormorant			17	7				10	1
		12					8		8
Curlew	132	470	115	190	110	200	182	295	42
	188	330	240	76	574	496	35	100	57
Dunlin	5	10	30			100			4
	4	670	1,500	770	6,440	90		720	
Gannet		1	4						

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Golden plover		8							
		8	230				7		
Goosander	15	18		6					
	4	7							1
Great black-backed gull		20		3					1
		6	20	15	5	6		4	5
Greenshank									
				1					
Grey heron		25	1	1			1		
		2		1				1	
Grey plover						5	1		
					9	6		6	
Herring gull		2,500	93	5		75	1	3	85
		25	19	134	30	45	60	34	9
Kestrel		1							
Knot									
		30	240	82					
Lapwing		10			5	50			3
		75	370		168				2
Lesser black-backed gull		300				2			3
			45	35	5	25		15	1
Little egret									
					2	4			
Mallard		15	4	8		8		2	2
	6		4		4	4			
Mute swan				3					
Oystercatcher	170	15	47	2	30	50	82	10	67
	44	220	170	8	75	15	40	213	139
Pink-footed goose			70	28				600	
		22	2				8	96	790
Pintail						74		2	
		30	64	124	35	123	50	220	53
Red-breasted merganser		10						2	
		18		6				22	
Redshank	30	330	45	126		80	46	302	16
	50	300	490	1,008	1,100	70	6	524	187
Sandwich tern		2							
Scaup									
		2		14				6	
Shelduck	449	2,140	580	69	25	45	25	474	38
	1,460	480	370	78	138	246	90	311	283
Short-eared owl									1

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Shoveler									
			2						
Sparrowhawk		3							
Teal		20				20	48	256	30
		16	140	250	340	36		58	74
Tufted duck									
		1							
Whooper swan							4		
Wigeon		5	54					13	
		30	45	2	16	12			4
TOTAL COUNTS 2015-16	801	11,457	1,068	455	170	930	479	1,992	305
TOTAL COUNTS 2016-17	1,768	2,353	4,438	3,130	9,154	1,556	406	2,829	1,617

Target species found in nationally-important numbers:

- Shelduck and dunlin.

SPA qualifying interests found in potentially important numbers:

- Shelduck, curlew, redshank.

Other target species not in the previous two lists but found in potentially important numbers in relation to the Forth Estuary:

- Black headed gull, black-tailed godwit, common gull, golden plover, grey heron, herring gull, lapwing, lesser black-backed gull, little egret, pintail, scaup, teal and whooper swan.

Sector 4 comprises a large mudflat bay area, with adjacent agricultural land which is relatively undisturbed. A total of 43 species were recorded in Sector 4 during winter months. In year 1, numbers were particularly high during the September 2015 survey when nationally-important numbers of shelduck were recorded, alongside large gull flocks, important at an estuary level. The Sector appears to be important for shelduck through the autumn, with high peak counts in August to October in both years. Counts were highest during lower tidal states when individuals were recorded feeding extensively across the mudlfats. It was repeatedly observed that shelducks moved in large numbers from Sector 4 to Sectors 3 and 5 as the tide rose, so they could continue feeding for longer by moving to where the incoming tide proceeded more slowly, and occurred at a later time. Curlews were also recorded feeding extensively across the mudflats throughout winter months.

In December 2015, it was noted that curlews and oystercatchers were spread widely across mudflats at low tide at dawn. After sunrise, most curlews headed to arable land (winter cereal) to roost for 1-2 hours. Some curlews and oystercatchers remained on mudflats until near high tide. No high tide roosts were observed within the sector, and generally there were few birds at high tide, with some shelducks on water.

During year 2 there were increased numbers of dunlin, reaching national importance in December 2016. Birds were mainly recorded feeding within the Sector, throughout the tidal cycle. This was

also the situation for redshank which was recorded throughout the winter, and pintails were commonly present on the water in important numbers in relation to the estuary population.

3.2.5 Sector 5: River Carron

The monthly peak counts for each species recorded within Sector 5 are shown in Table 3-6.

Table 3-6. Sector 5 species monthly peak counts, 2015/16 and 2016/17

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Bar-tailed godwit		15		3		1			
	1	31			3				
Black-headed gull	718	400	200		20		150		20
		150	75	700	2,300	2,200	30	120	
Black-tailed godwit	380	17	1	4		1			9
	2		34		33		3	7	24
Buzzard	3	3	1	1					
			3					2	
Canada goose	29	18		24	22	24			
		9							
Common gull	13	1,100	300	5	40	5	20		6
		18	15	95	120	120	6	29	2
Common sandpiper	8	1							
	1								
Common scoter				1					
Common tern	12								
Coot	9	6		18	20	5	30		4
	5	9	21	24	26	18	1	7	12
Cormorant	1	60	10	2		6	2		1
		1							
Curlew	57	370	270	216	10	150	48	32	1
	88	10	88	69	178	88	101	66	24
Curlew sandpiper		1							
Dunlin	1	280	85	730		240	1		
	32					55			
Eider			1						
Gadwall					8		2		
Gannet		1	3						
Golden plover	26		1	2					
	1								
Goldeneye		4	1	6	6	8	14		1
						2			
Goosander		3	1	12		3	2		2
	37		5						

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Great black-backed gull		15	10						20
					2	8			2
Great crested grebe				1		1			
									1
Green sandpiper	2								
	1								
Greenshank	4						1	1	
					1			1	1
Greylag goose	42		66	16		16			1
Grey heron		45	5	2	2	2			1
		1					4	1	2
Grey plover		1	64			8			
	1								
Greylag goose									
				1			1	2	
Herring gull	77	1,600	180				6		10
		37	12	50	55	60	2	53	6
Kestrel		1	1	1		1			
	1		1	1	1			2	
Kingfisher		1		1					
Kittiwake				27					
Knot		2							
	1								
Lapwing	200	360	130	6			6		
	188	171			310	8			
Lesser black-backed gull	25	160	60		2				40
		6	6	4	27	25		38	2
Little grebe	3								
	2		4	6	4	2		3	
Little stint		1							
Mallard	58	6	1		25	20	44		4
	11		5	22	8	40	13	6	6
Mediterranean gull		1		1					
Moorhen	10	4	2	25	3	1	6		1
	4	1	13	8	12	8		5	6
Mute swan	7	8	6	33	75	29	16		5
	9	4	27	27	56	22	4	10	7
Oystercatcher	80	8	65		15	18			6
	106	3	1						
Peregrine		1							
Pink-footed goose			341				600	70	
				1,370			180	111	

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Pintail				37	11	22			
				1					
Pochard							1		2
Red-breasted merganser	22	18	13	1		35	2		
						1	1	3	
Red-necked grebe						1			
Redshank	11	190	35	460	20	870	106	40	42
	310	3	6	28	72	45	1	60	12
Red-throated diver			1						
Ringed plover		1							
Ruff	5								
Sandwich tern		17							
Scaup			1						
Shag						60			
Shelduck	26	2,880	1,100	140	90	60	1	5	56
	740	8		8	8	17	2	2	2
Shoveler			6		2				3
	2		2						
Snipe			1	3					
	3								
Sparrowhawk		1	1	2		1			
			2						
Teal	53	340	80	71	55	65	250	55	35
	6	26	124	133	91	127	30	109	19
Tufted duck	2	2	6		15	8	18		12
	3		1	9	11	33	7	36	47
Water rail			1	1					
	1							1	2
Whooper swan				6	5		4		
				5	4				
Wigeon	5		24	56	45	25	80	30	
	1	1	160	90	77	52	14	27	
Wood sandpiper		1							
TOTAL COUNTS 2015-16	1,889	7,943	3,074	1,914	491	1,686	1,410	233	282
TOTAL COUNTS 2016-17	1,557	489	605	2,651	3,399	2,931	400	701	177

Target species found in nationally-important numbers:

- Shelduck

SPA qualifying interests found in potentially important numbers:

- Shelduck, curlew, redshank and pink-footed gooses.

Other target species not in the previous two lists but found in potentially important numbers in relation to the Forth Estuary:

- Black headed gull, black-tailed godwit, common gull, common sandpiper, coot, cormorant, dunlin, gadwall, goosander, grey heron, golden plover, herring gull, kittiwake, lapwing, lesser black-backed gull, moorhen, mute swan, pintail, red-breasted merganser, ruff, shag, shoveler, teal, tufted duck, whooper swan.

Sector 5 takes in a variety of habitats, including the tidal stretch of the River Carron, inland lagoons, and where the Carron meets the Forth. As such, a large number of species (65) were recorded. As reported for Sector 4, shelduck was recorded in particularly high numbers in autumn, and it is likely that birds move between these sectors, avoiding the rising tide to maximise time feeding. Numbers of shelducks reduced within the Sector as winter progressed.

Curlew was present throughout the survey period, although numbers were highest between September and November in year 1, with the Sector being used for feeding and roosting through the tidal cycle. Redshank numbers reached potential importance within an estuary and SPA context in November and January 2016 but not 2017, with birds recorded feeding and roosting through the tidal cycle, although birds did depart in January on the incoming tide.

A number of other target species were recorded in potentially important peak counts, including gulls, pintail and teal. Pink-footed goose were recorded in large numbers in November 2016, feeding inland at high tide.

A potentially important roost site in Sector 5 is the two freshwater pools inland from the shore north of the River Carron. These pools provide a roosting site for geese, ducks and shorebirds but can be subject to human disturbance, including shooting activity.

3.2.6 Sector 6: Grangemouth Port

The monthly peak counts for each species recorded within Sector 6 are shown in Table 3-7.

Table 3-7. Sector 6 species monthly peak counts, 2015/16 and 2016/17

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Black-headed gull			8				42	6	14
	52	70	32	40	2	6	15	15	
Black-tailed godwit	43	2							
		6			4				
Common gull									
		20	2	25	2			1	
Common sandpiper	10								
		6							
Common tern	4								2
Cormorant	7	8	14	2			6	1	1

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
	6	60	9	12	4	2	6	7	8
Curlew	39	24	10	86	13	9	16	6	4
	37	80	17	35	105	5	1	2	7
Curlew sandpiper									
		2							
Dunlin	109				650	800	2,800	100	4
	1,020	235	20	3,300	1,200	100	100	720	17
Eider									
						2			5
Glaucous gull									
							1		
Golden plover									
				6					
Goldeneye									
				2					
Goosander	20						2		
	8	35	6	3	2	1			
Great black-backed gull			4				1	1	3
	5	40	7	14	8	7	13	7	12
Green sandpiper									
Greenshank		1	1	1					
				1					
Grey heron			6				1		
	8	14	5	10	9	6		2	
Herring gull	3	21	11				95	46	
	260	370	49	60	48	388	291	120	48
Kingfisher									
			1						
Knot			85						
					1				
Lapwing	76	92	160	195	61	150	40		
			20	314	450	110	100	2	
Lesser black-backed gull			1				3	9	
	18	15	6	26			1	4	13
Mallard				13				4	1
		18	6	31	11	7	3	1	1
Oystercatcher	21	3	20	14	2		7	11	11
	15	12	20	38	25	24	36	13	10
Peregrine		1							
Pink-footed goose				13					
									95
Pintail				5	18	96	111	122	
		2		35	8	19	40	2	
Red-breasted merganser			3			2		2	
				4	4		2	1	
Redshank	477	365	420	530	500	440	1,200	400	15

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
	499	570	730	1,515	1,050	1,185	710	944	321
Ringed plover	7								
	8	6		8					
Shelduck	750	363	380	270	43	72	51	21	26
	488	570	125	175	15	55	25	15	4
Spotted redshank									
					1				
Teal	3	3	24	103	83	194	80	47	
		24	4	60	26	83	65	67	
Turnstone									
	3	1		4	1	1	3	1	2
Whimbrel	1								
		2	1		1				
Wigeon	2		1	5	150	75	2		
		45		58	24	27	30	20	
TOTAL COUNTS 2015-16	1,572	883	1,148	1,237	1,520	1,838	4,457	776	81
TOTAL COUNTS 2016-17	2,427	2,203	1,060	5,776	3,001	2,028	1,442	1,944	543

Target species found in nationally-important numbers:

- Redshank, shelduck.

SPA qualifying interests found in potentially important numbers:

- Dunlin, redshank, shelduck and lapwing.

Other target species not in the previous two lists but found in potentially important numbers in relation to the Forth Estuary:

- Common sandpiper, cormorant, curlew sandpiper, goosander, grey heron, herring gull, pintail.

In Sector 6, the breakwater alongside Grangemouth Port provides a roosting and feeding opportunity for a number of species, in particular redshank and dunlin, which were recorded in high numbers during the winter in both years. Other wader species such as lapwing, curlew and oystercatcher also frequent the area in large numbers. Peak counts often occur just before high tide, as large high tides limit the amount of roosting habitat available.

The Sector is also widely used by shelduck, particularly for feeding extensively across the mudflats upstream of the breakwater in Skinflats Bay in autumn.

Redshanks usually roost at high tide behind the breakwater and upstream along the River Carron, and feed along the tideline across mudflats behind the breakwater. Shelduck, teal and curlew are also abundant at high tide roosting/feeding along the tideline. Birds move to mudflats within the sector to feed as tide recedes, widely within Skinflats Bay. Curlews and shelducks feed widespread across the outer mudflats at low tide.

3.2.7 Sector 7: Grangemouth Port Locks

The monthly peak counts for each species recorded within Sector 7 are shown in Table 3-8.

Table 3-8. Sector 7 species monthly peak counts, 2015/16 and 2016/17

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Bar-tailed godwit									
		69	4						
Black-headed gull				6	13	50	11	19	300
	42	130	77	60	141	145	48	2	2
Black-tailed godwit	15	3		113					
		14	6		11				
Common gull						54	6		
		15	6	40		1	1		
Common sandpiper	1	40							
Common tern	12								
	8								
Coot									
				34				1	
Cormorant	7		4		2	2	2	3	1
	12	12	9	8	4	5	3	4	4
Curlew	39	6	68		16	54	1	9	7
	11	230	140	108	16	1	1	2	7
Curlew sandpiper									
			1						
Dunlin	27	180		180	1				
	35	500	110	2,300		9	7	1	
Eider									
				3					1
Goldeneye									
				3					
Goosander									
		8							
Great crested grebe						2			
	1	6	4	13					
Great black-backed gull				2					2
	4	28	5	4	1				1
Green sandpiper		2							
Greenshank		2							
Grey heron	1					3		1	
		4	6	2	2				
Herring gull						8	1	14	58
	15	15	8	19	2	2	1	1	10
Kestrel			1	1					
			1						
Kingfisher				1		1			

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
			1	2					
Knot								42	
	1	20							
Lesser black-backed gull									
	6	6	19	6					
Little egret						1		1	
Mallard		21	8		17	80	9	6	
	8	160	45	14	36	8	16		4
Moorhen									
								1	
Oystercatcher	5		41	15	44	66	2	12	12
	4	170	70	160	8		1	6	96
Pink-footed goose									
			1						
Pintail						70		2	
				22	17				
Purple sandpiper	2								
Red-breasted merganser		22	7		2	5	6		
	6	36	28	20	4	5	2	11	2
Redshank	121	186	88	259	71	400	41	371	
	74	540	410	553	338	137	233	49	
Red-throated diver									
				2					
Ringed plover									
	2								
Sanderling		18							
Sandwich tern	4								
		4							
Scaup									
		2							
Shag									
			1						
Shelduck	681	144	232	10	24	27	2	4	9
	178	230	360	48	52	5	3	4	64
Snipe			3			11		5	
		1	1					1	
Sparrowhawk	2								
						1			
Spotted redshank									
				1			1	1	
Teal	20	22	75	136	370	300	25	28	34
		410	140	94	130	1	36	13	103
Turnstone									
								1	
Water rail									

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
		1	2		1				1
Whimbrel	1								
							1		
Wigeon	21		4		70	6	1		10
			30	22	8				
TOTAL COUNTS 2015-16	959	646	531	723	630	1140	107	517	433
TOTAL COUNTS 2016-17	407	2611	1485	3538	771	320	354	98	295

Target species found in nationally-important numbers:

- Shelduck.

SPA qualifying interests found in potentially important numbers:

- Curlew, dunlin, redshank, shelduck.

Other target species not in the previous two lists but found in potentially important numbers in relation to the Forth Estuary:

- Black-tailed godwit, common sandpiper, coot, great-crested grebe, green sandpiper, kingfisher, mallard, pintail, red-breasted merganser, scaup, snipe, teal.

This Sector comprises a relatively small area of habitat beside the mid-estuary side of Grangemouth Port, and where the Grange Burn flows into the Forth. Two small lagoons are present.

The Sector provides little habitat for high tide roosting, but in August 2015 over 600 shelducks were recorded roosting on the water. Increased numbers of waders (curlew, dunlin and redshank being recorded in important numbers) were recorded in year 2. The area of reclaimed land to the southwest provides early feeding opportunity for curlew, oystercatcher and shelduck on mudflats soon after high tide. During lower tidal states mudflats are exposed, and this provides feeding opportunities for redshank and teal in particular, which exit high tide roosts along the Grange Burn (Sector 8) as the tide recedes.

Large numbers of birds feeding on mudflats become more concentrated around the area to the south east of Grange Burn as tide rises. Redshanks and teals move into Grange Burn as tide rises above mudflats. Teals feed right up to the bankside south of the east jetty before high tide.

3.2.8 Sector 8: Grange Burn

The monthly peak counts for each species recorded within Sector 8 are shown in Table 3-9.

Table 3-9. Sector 8 species monthly peak counts, 2015/16 and 2016/17

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Bar-tailed godwit	1								
Black-headed gull	6	8		4					2
	5	19	14					1	
Black-tailed godwit				47					
	3		7						

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Common gull		1							
Common sandpiper	3								
Cormorant			1	3	1		1	1	
				1					
Curlew	28	9	17	131			1	2	1
	3		10	12	3		1	1	2
Dunlin	2	18		27	2			1	
	12	2	6	10	1	10	65	8	
Goosander									
			1						
Great black-backed gull				1					
Greenshank							1		
Grey heron	5	5		15			1		2
	13	3	4	1		1		1	
Herring gull	3			7				1	1
	1	2						9	2
Kestrel	1								
Kingfisher			1						
		1	2						
Knot				530					
				7					
Lapwing	1	3							
									1
Lesser black-backed gull									2
	1								
Mallard	12	29	6	65	11		4		
	21	98	38	10	4	6	8	3	1
Oystercatcher	1			14					5
								1	2
Pintail									
				2					
Red-breasted merganser		6		1					
	3								
Redshank	161	88	135	189	235	75	149	210	6
	206	994	160	134	128	209	280	245	107
Ringed plover									
		2	4						
Shelduck	126	11	5	104	1	1	6	4	12
	39	9	18	2	1	1	8	4	7
Sparrowhawk					1				
Spotted redshank									
			1			1			

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Teal	129	89	103	337	532	63	68	25	19
	8	45	118	92	59	105	108	70	67
Whimbrel									
			7						
Wigeon	2		9		5	15	12	4	
			33	33	15		21	29	
TOTAL COUNTS 2015-16	481	267	277	1,475	788	154	243	248	50
TOTAL COUNTS 2016-17	315	1,175	423	304	211	333	491	372	189

Target species found in nationally-important numbers:

- None.

SPA qualifying interests found in potentially important numbers:

- Redshank.

Other target species not in the previous two lists but found in potentially important numbers in relation to the Forth Estuary:

- Common sandpiper, grey heron, kingfisher, knot, teal, whimbrel.

Sector 8 follows the length of the tidal stretch of Grange Burn, between Grangemouth Port and reclaimed land at the refinery, to where it meets the Forth Estuary.

Redshanks roost on the mud bank within the river and feed in shallow water downstream, reaching SPA importance in flock size in September 2016. Teals mainly feed in shallow water next to the bridge, and roost at high tide. Redshanks roost in revealed creeks at lower tide. Some redshanks and teals leave before low tide to feed in Forth Estuary. Redshanks and teals likely roost in relatively large numbers along Grange Burn during the night.

3.2.9 Sector 9: Grangemouth Refinery

The monthly peak counts for each species recorded within Sector 9 are shown in Table 3-10.

Table 3-10. Sector 9 species monthly peak counts, 2015/16 and 2016/17

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Bar-tailed godwit							14	12	9
	14	7	73	110	117	480	244	68	
Black-headed gull	50						62	91	20
		35	21	490	50	400	260	130	
Black-tailed godwit	5	1		20	50	45			
	32	8	2		26	467	10	44	
Common gull									4
				35	60	600	28	60	
Cormorant				3					
		6		2			3		
Curlew	239	300	385	290	165	210	271	198	64
	275	370	360	755	345	244	500	153	100
Curlew sandpiper									

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
	15								
Dunlin	80	220	472		400	2,500			
	330	260	640	5,660	5,700	11,000	870	3,730	
Gannet		5							
Golden plover			140			12			
			94	73		49			
Goldeneye									
		8						1	
Goosander									
	12								
Great black-backed gull				6			2		2
	1	6	3	5	4	10	5	8	
Great crested grebe				5					
	28	20	3	5	6	2	6	4	3
Greenshank							4		
Grey heron				1					
		2	2	2		2			
Grey plover									
				2					
Herring gull							2	12	12
		45	5	85	45	400	35	28	4
Kingfisher									
			1				1		1
Knot		1		326		1,500	250	550	
	80		172	845	2	3,600	12	33	
Lapwing	20		10	55					
	34		4			55			
Lesser black-backed gull								2	2
				40		100	8	24	8
Little stint									
	1								
Mallard	41	65	16	23		2	20	3	2
	115	18	14	10	26	25	36	4	4
Mute swan				2					
Oystercatcher	27	230	342	41	115	360	230	265	139
	290	35	630	460	379	44	590	384	262
Peregrine	1	1							
Pintail		2	14	17	4	11	3		58
	30	34	13	17	68	112	189	191	74
Red-breasted merganser									
	15	25	5	5	5	6	6	9	6
Redshank	75	44	34	170	280	175	187	303	165
	540	220	109	630	480	600	398	259	13
Ringed plover	12		18						

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
	250		2	37		78	22		
Ruff									
	1								
Sanderling		1	2						
Sandwich tern									
	5								
Scaup									
		3			1	15	4		30
Shelduck	400	560	355	292	90	39	18	59	26
	1,400	396	160	352	388	210	230	214	280
Shoveler									
		1							
Spotted redshank	2								
	1								
Teal	18	144	350	350	250	70	69	17	201
	110	270	450	75	270	138	310	22	198
Whimbrel									
	2								
Wigeon			2	16	20	9	27		
	10	53	18	6	25	110	45	66	
TOTAL COUNTS 2015-16	970	1,574	2,140	1,617	1,374	4,933	1,159	1,512	704
TOTAL COUNTS 2016-17	3,591	1,822	2,781	9,701	7,997	18,747	3,812	5,432	983

Target species found in nationally-important numbers:

- Bar-tailed godwit, black-tailed godwit, dunlin, knot, shelduck.

SPA qualifying interests found in potentially important numbers:

- Bar-tailed godwit, curlew, dunlin, knot, redshank, ringed plover, shelduck.

Other target species not in the previous two lists but found in potentially important numbers in relation to the Forth Estuary:

- Black-headed gull, common gull, curlew sandpiper, great crested grebe, herring gull, lesser black-backed gull, oystercatcher, pintail, scaup, teal.

This Sector borders the Grangemouth petrochemical works, and very limited access is available to the foreshore. Upstream is an undisturbed area of wooded reclaimed land, and in the middle of the sector an outflow of heated water provides feeding and roosting opportunities for many birds.

At mid to high tide the sheltered, western part of the Sector is used as a roost by curlew, lapwing, golden plover, dunlin, shelduck, knot, redshank and black tailed godwit. Curlew numbers appear to be consistently important within an estuary context. In general, numbers of waders were higher in year 2, reaching national significance for bar-tailed godwit, black-tailed godwit, dunlin and knot. January 2017 counts were particularly high, with birds roosting at high tide.

Shelducks feed in large numbers and move from low tide to around the hot water outflow and mallards and oystercatchers also congregate around the outflow. Dunlins and redshanks also feed along the tideline.

Many birds were observed heading southeast out of the sector after high tide. Dunlins generally only feed in the sector and leave before high tide.

3.2.10 Sector 10: Kinneil Kerse

The monthly peak counts for each species recorded within Sector 10 are shown in Table 3-11.

Table 3-11. Sector 10 species monthly peak counts, 2015/16 and 2016/17

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Bar-tailed godwit					75	80	270	360	2
		15	20	76	43	360	340	47	31
Black-headed gull	448	250	258		150	180			350
		175	680	2,000	400	4,000	240	240	118
Black-tailed godwit	38		17	60	2	1	70	80	20
	560		32	403	384	660	728	702	1,242
Common gull					4				
			4	240	50	2,000	500	30	15
Common sandpiper	3								
	1	1							
Cormorant		2			2	5			1
		6		3	3		4	6	3
Curlew	84	1	10	13	10	60	290	210	6
	110	24	45	105	102	490	76	43	245
Dunlin	5	150		415	650	200	9,000	6,300	80
	140	150	120	760	8,000	9,200	7,450	1,310	95
Eider									
			5			2			
Gannet									
			2						
Golden plover			185	39	25	4	34		
			230	112		44			
Goldeneye						7			
			1		1	23	19		
Goosander	10								2
		1	8			1	4		
Great black-backed gull			3						2
		3	6	6	6	12	8	3	
Great crested grebe					1	1			6
		1	6	6	8	4			4
Greenshank								2	
	3		2	2	1		2		1
Grey heron					1	2			
		4	3	1	4		1	1	
Grey plover									

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
							1		
Herring gull	17	150	80						50
		120	25	200	50	270	65	65	35
Kingfisher									
		1	2	2					
Knot	3		325		220	30	1,900	1,300	20
	1		30	170	270	7,300	1,100	578	74
Lapwing	180	550	284	75	280	480	268	76	6
	55	26	255	424	333	430	37		
Lesser black-backed gull	7		5						15
		2	12	28	15	70	30	15	8
Little egret									
	1								
Mallard	23	37	188		30	30	20	20	8
	15	23	16	35	45	65	23	9	12
Oystercatcher	64	3	2	67		85	380	490	8
	60	4	12	118	66	120	66	176	378
Pintail					2				22
					28	98	97	66	54
Red-breasted merganser		2		1					7
			16	4	6	10	6	7	6
Redshank	490	1,050	591	381	270	250	460	435	350
	880	640	260	160	576	560	1,000	555	1,240
Ringed plover	15			30	1	19	17	6	
			45		9				
Ruff									
		1							
Sanderling			18						
Scaup								3	6
			9			22	3	21	28
Shelduck	330	21	555	12	2	40	80	175	20
	4,735	350	248	234	236	490	290	178	260
Shoveler									
									1
Snipe									
			2						
Teal	30	30	45	85	80	150	240	470	120
	32	22	225	590	598	1,120	670	405	468
Whimbrel									
	2			8				56	
Whooper swan									
					7				
Wigeon			20	24	8	20	170	135	25
		6	44	80	134	660	78	151	3
TOTAL COUNTS 2015-16	1,747	2,246	2,586	1,202	1,813	1,644	13,199	10,064	1,126
TOTAL COUNTS 206-17	6,595	1,575	2,365	5,767	11,375	28,011	12,838	4,662	4,321

Target species found in nationally-important numbers:

- Black-tailed godwit, dunlin, knot, redshank, shelduck.

SPA qualifying interests found in potentially important numbers:

- Bar-tailed godwit, curlew, dunlin, knot, lapwing, redshank, shelduck, wigeon.

Other target species not in the previous two lists but found in potentially important numbers in relation to the Forth Estuary:

- Black-headed gull, common gull, common sandpiper, golden plover, kingfisher, lesser black-backed gull, mallard, pintail, scaup, teal, whimbrel, whooper swan.

Sector 10 covers the mudflats around Kinneil Kerse and the Grangemouth Petrochemical works, where the River Avon meets the Forth. The area appears to be important for waders, particularly black-tailed godwit, dunlin, knot and redshank. Peak counts were recorded between December and March, particularly in year 2. As with Sector 9, there was a very high count in January 2017, although unlike in Sector 9 which was predominantly a high tide roost, birds in Sector 10 were present feeding and roosting in large numbers through the tidal cycle.

Shelduck was recorded in large numbers in October 2015, and in nationally-important numbers in August 2016.

As the tide rises, many birds move towards Sector 9 which still has exposed mudflats. Limited mudflats remain exposed in the river channel.

Teal use the bay at the mouth of the river around high tide to continue feeding (some roosting). As the tide starts receding they drift down the river channel and out of the sector.

3.2.11 Sector 11: Kinneil Reserve

The monthly peak counts for each species recorded within Sector 11 are shown in Table 3-12.

Table 3-12. Sector 11 species monthly peak counts, 2015/16 and 2016/17

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Bar-tailed godwit				1	178	230	30	48	2
		630	130		276	410	402	77	170
Black-headed gull	700		40	200	100				150
	657	200	270	119	260	450	173	200	1
Black-tailed godwit	400	1,000	102	470	460	670	300	32	144
	635	1,120	900	374	980	897	340	877	220
Black-throated diver									
						1			
Buzzard				1	3				
		2		1					
Canada goose					6				
Common gull	12			170	20				
		45	50		80	60		25	

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Common sandpiper									
		2							
Common scoter									
					1				
Common tern	3								
	8								
Cormorant	6		7	40					
	2	6	4	1					1
Curlew	139	42	20	85	15	150	170	200	2
	96	70	320	122	430	363	17	46	4
Dunlin	2	13	400	2,600	5,800	5,000	9,000		2
	6	660	1,400	208	9,000	4,650	600	2,640	50
Eider			2		2				
			2			2		22	
Gannet									
		1							
Golden plover			100	210	68	60			
		18	436		15	83			
Goldeneye			1	15	4				
						2			
Goosander				4	1	1			
		18	10						
Great black-backed gull	1		7	35	8				
	8	6	6	2	4	2		2	2
Great crested grebe	1		15	28	17	1			
		30	18	16	12	7		18	
Greenshank	6	3	2	2		1			1
		6	5	1	2	2	3	4	1
Green-winged teal									1
Grey heron	16	7	1	15	8				
		12	6	1	3	7	1		1
Herring gull	20		15	150	30				5
	138	570	71	46	65	578	101	8	38
Kestrel				1	1	1			
Kingfisher				1					
						1			
Knot	30		180	260	380	1,000	2,200	260	
	1	100	540	276	530	3,370	500	930	150
Lapwing	430	350	150	330	190	750			
	57	244	370		548	648	10		1
Lesser black-backed gull	6			50	15				3
	42	40	24		6	15		15	2
Little egret		1	1						
Mallard									

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
	2	20	15	39	40	36	3	34	2
Mediterranean gull									
Moorhen	5			1	1				
	1								
Mute swan									
						2			
Oystercatcher	30	3	12	80	12	80	50	220	14
	14	6	270	213	260	180	10	104	103
Pink-footed goose				8					
Pintail						100		44	
								88	43
Red-breasted merganser	30	2	15	130	55	1			2
	4	60	36	9	10	6	1	14	
Redshank	200	730	450	835	600	660	1,000		200
	65	460	920	626	1,200	390	110	768	330
Red-throated diver					5	1			
								1	
Ringed plover		48	30	12				8	
		7							
Sandwich tern	15								
Scaup									
						14		18	7
Shelduck	536	642	150	280	170	200	50	247	90
	406	760	1,040	349	570	648	363	444	67
Short-eared owl						1			
Shoveler									
		2							
Snipe			1		4				
					1	8			
Spotted redshank									1
					1				
Teal	28	190	90	240	90	100	50	208	45
	17	80	210	133	670	600	700	961	136
Turnstone	2	1		12					
Water rail									
		1							
Wigeon			1	35	35		40	80	
		22	168		26		28	10	
Wood sandpiper	1								
TOTAL COUNTS 2015-16	2,635	3,044	1,818	6,351	8,328	9,008	12,900	1,347	664
TOTAL COUNTS 2016-17	2,143	5,186	7,195	2,486	14,940	13,431	3,352	7,306	1,327

Target species found in nationally-important numbers:

- Bar-tailed godwit, black-tailed godwit, dunlin, greenshank, knot, red-breasted merganser, redshank, shelduck.

SPA qualifying interests found in potentially important numbers:

- Bar-tailed godwit, curlew, dunlin, golden plover, knot, lapwing, redshank, red-breasted merganser, ringed plover, shelduck.

Other target species not in the previous two lists but found in potentially important numbers in relation to the Forth Estuary:

- Black-headed gull, common gull, common sandpiper, great crested grebe, grey heron, herring gull, lesser black-backed gull, moorhen, pintail, scaup, teal.

Sector 11 comprises the Kinneil Local Nature Reserve, and reclaimed land of a former colliery site. Extensive mudflats exist along the Forth and an inland lagoon is present, which is an important roost for a variety of species, including dunlin, redshank, golden plover, black-tailed godwit, and knot. Numbers recorded within the Sector were particularly high between December and February in both years, with a number of wader species reaching national importance. As with Sectors 9 and 10, January 2017 provided highest numbers of roosting waders recorded in the Sector, at high tide. Numbers of black-tailed godwit, lapwing, knot, redshank and shelduck were consistently high through the winter period.

3.2.12 Sector 12: Bo'ness

The monthly peak counts for each species recorded within Sector 12 are shown in Table 3-13. Note that no survey was undertaken in March 2016.

Table 3-13. Sector 12 species monthly peak counts, 2015/16 and 2016/17

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Arctic skua			4						
Bar-tailed godwit			75	68	55		50		
	84	150	78			15			
Black-headed gull	100	68		8	40	50	20		45
		96	66	27	224	90	260		
Black-tailed godwit	180	2	610						
	588		6	14		12			1
Common gull				46	15	40	55		1
		2	15	26		10	6		
Common tern	30								
	15								
Cormorant		1		2	1				
		1						1	
Curlew	35	28	50	12	12	50	70		1
	32	13	23	61	2	77	6	5	3
Dunlin				12	50	30	500		

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
	5	14	305	2		6			
Eider			6						5
	5							6	2
Gannet			2						
Goldeneye					5		5		
			1			2	5		
Goosander			6						
			4						
Great black-backed gull		2		1	2	1			
		3	4	1	2	3	5	3	
Great crested grebe			1			1			
			8				3	1	
Grey heron									
		2	2	5	1	4			
Greylag goose			1						
Grey plover	2								
Herring gull	13	2		4	20	12	15		12
		12	35	15	6	40	15	12	17
Kingfisher									
			2						
Knot			71	101	120		50		
	55		8						
Lapwing	90	3	12						
	10	155							
Lesser black-backed gull							6		6
		9	8						5
Mallard	19	29	30	6	5	20	10		4
	10	4	10	14			3	2	2
Mute swan									
			1			2			
Oystercatcher	6	2		120	150	130	115		26
	10	12	44	60	201	122	33	61	53
Pink-footed goose			50						
Red-breasted merganser	50	4	90	6	6	5			
	5	47	33			9	11	6	3
Redshank	94	79		283	65	20	122		40
	28	200	68	60	96	94	36	22	17
Ringed plover									
	4			1					
Sandwich tern	75	26							
	39							1	
Scaup			2						
Shelduck	80	229		5	8	10	16		12

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
	33	47	36	1	19	52	48	78	7
Teal				81	10	60	50		2
	4	5	25	139	6	19	16	1	4
Turnstone				2		8	1		2
	1	2		1	1	2	1	6	7
Whimbrel									
		1						1	
Wigeon									
							6		
TOTAL COUNTS 2015-16	774	475	1,010	757	564	437	1,085	-	156
TOTAL COUNTS 2016-17	928	775	782	427	558	559	454	206	121

Target species found in nationally-important numbers:

- Black-tailed godwit, red-breasted merganser.

SPA qualifying interests found in potentially important numbers:

- Red-breasted merganser.

Other target species not in the previous two lists but found in potentially important numbers in relation to the Forth Estuary:

- Bar-tailed godwit, kingfisher, scaup.

In contrast to the adjacent Sector 12, this Sector is close to Bo'ness town and the John Muir coastal path, meaning that human activities are relatively frequent, and suitable roosting (and feeding) habitats are limited. This may be reflected in the relatively low peak monthly counts within Sector 12, with the exception of high counts of black-tailed godwits in October 2015 and August 2016. Large numbers of red-breasted merganser were also recorded offshore in October 2015, likely to be distant from possible disturbance. Birds were recorded feeding and loafing on mudflats close to Kinneil Island.

Birds were observed moving up the foreshore on the tide, then roosting on the point of Kinneil Island.

3.2.13 Sector 13: Grangepans

The monthly peak counts for each species recorded within Sector 13 are shown in Table 3-14.

Table 3-14. Sector 13 species monthly peak counts, 2015/16 and 2016/17

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Bar-tailed godwit									
	76				9	1			
Black-headed gull			150	12	60	90	65	10	4
	9	111	233	66	126	318	115		
Black-tailed godwit	2	49	4						
		144	41	3		3	1		
Common gull			30	1	10	6	8	3	1
		6	24	10	1	111	25		

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Cormorant		1	60						
	1		1		2	1	3		
Curlew	4	7	10	1	1	6	1	1	
	3	15	10	4		5	14	10	1
Dunlin			5	25	21	500			
		88	18	238	5		1		
Eider	5		5					3	
		6					16		2
Gannet									
		1							
Goldeneye			12				7		
							2		
Goosander									
		1							
Great black-backed gull			14		2	3	1	1	
		4	5	2	3	1	4		
Great crested grebe			1			1			
		2	2			5			
Grey heron	1	1	12						
				2					
Herring gull	10	12	80	2	6	6	15	5	4
	2		6	8	4	3	20	4	24
Knot						40			
		4	1						
Lesser black-backed gull			25					2	4
		2	12				6		
Mallard	16	21	10	12	18	3	30	5	
	3	4	4	14	2	7		3	1
Oystercatcher	1		6	3	7	1	4	5	
		4			1	10	14	11	2
Red-breasted merganser		2	90	11	8	10	3		
			6		11	7	16	5	3
Red-necked grebe			1						
Redshank	220	221	8	92	65	30	60	21	14
	40	81	70	78	54	39	57	20	
Red-throated diver									
		1							
Ringed plover			4						
Sandwich tern		2							
	6								3
Scaup							5		
Shelduck	7	61	15	12				3	6
	27	55	12		1	5	80	6	2
Slavonian grebe			1						

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Teal			10				24		
				19	3				
Turnstone	3			9	36	11	14	8	
		15	3	6	6	2	2		
TOTAL COUNTS 2015-16	269	377	553	180	234	707	237	67	33
TOTAL COUNTS 2016-17	167	544	448	450	228	518	376	59	38

Target species found in nationally-important numbers:

- Red-breasted merganser.

SPA qualifying interests found in potentially important numbers:

- Red-breasted merganser.

Other target species not in the previous two lists but found in potentially important numbers in relation to the Forth Estuary:

- Black-tailed godwit, common gull, cormorant, grey heron, scaup.

Sector 13 is characterised by its proximity to industrial sites at Grangepans, and also the John Muir coastal path. The coastline is heavily modified, and few opportunities for extensive feeding or roosting exist within the Sector. This is reflected in the relatively low peak counts recorded for all species, with the exception of red-breasted merganser which can be found further offshore on the water. The Sector appears to be used by feeding redshank, dunlin and shelduck. Some redshanks were recorded roosting, but as the tide rises, the area for roosting is likely to be too close to the coastal path, which is used regularly by walkers and their dogs. Very little activity at high tide occurs except for species such as red-breasted merganser and mallard on the water.

3.2.14 Sector 14: Carriden

The monthly peak counts for each species recorded within Sector 14 are shown in Table 3-15.

Table 3-15. Sector 14 species monthly peak counts, 2015/16 and 2016/17

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Arctic skua									
			2						
Arctic tern									
	1								
Bar-tailed godwit									
		12							
Black-headed gull	120				40		31		6
		65	125	56		87	78		35
Black-tailed godwit	2	9	181		1				
			102						
Brent goose									
				2					
Common gull	1						15		5
			14	170		20	18		30
Common scoter						1			

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Common tern	2								
	18								
Cormorant	1								
				1			2		
Curlew	9	36		2	12	40	11	8	
	28	8	33	10	18	21	14	15	6
Dunlin			405		27	4			
			98		21				
Eider						6	2		
							6		
Goldeneye						3			
Great black-backed gull	2								
			4	2		1	3		3
Great crested grebe						1			
							5		
Grey heron							2		
				3					
Herring gull	420	212			30		11		
		80	40	151		9	46		76
Knot									
	1		13						
Lesser black-backed gull					5		4		
		3	10			2	24		27
Mallard	3	3			6	12	5		
	12	7	26	40		3	2		3
Oystercatcher	2	33	1	6	11	60	10	15	
	12	3	5	22	10	21	21	1	9
Pink-footed goose						1			
Red-breasted merganser	14		31	1	6	1	1		
					10		8		
Red-necked grebe						1			
Redshank	2		7	60	65	55	23		
	38	6	52	20	33	30	28		19
Ringed plover	5					26	1	1	
	8			1					
Sandwich tern	600	160							
	1	97							
Scaup				1					
Shelduck	30	106	176	58	65	12	21	21	
	38	91	120	72	19	24	43	16	4
Teal						90			
			70	93					
Tufted duck									

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
	1								
Turnstone					9				
	1		8	2		1		7	
Whimbrel			1						
		3				1			
Wigeon			75	250	39	55	4	22	
			182	89	83	20			
TOTAL COUNTS 2015-16	1,213	559	877	378	316	368	141	67	11
TOTAL COUNTS 2016-17	159	375	904	734	194	240	298	39	212

Target species found in nationally-important numbers:

- None.

SPA qualifying interests found in potentially important numbers:

- Sandwich tern, wigeon.

Other target species not in the previous two lists but found in potentially important numbers in relation to the Forth Estuary:

- Black-tailed godwit, Brent goose, common gull, herring gull, whimbrel.

This Sector is partially in close proximity to industrial areas and the John Muir coastal walk, but further downstream the habitat becomes more wooded. Numbers of waders recorded were generally low, reflecting the lack of roosting and feeding opportunities within the Sector, and probably also the level of human activity and adjacent terrestrial habitat.

A large Sandwich tern roost was recorded in August 2015, across an exposed sandbank in the middle of the bay, but was not present in autumn 2016. Large numbers of herring gulls roosted in the area. Wigeon are also common in the Sector, reaching importance within an SPA context in November 2015.

3.2.15 Sector 15: Stacks

The monthly peak counts for each species recorded within Sector 15 are shown in Table 3-16.

Table 3-16. Sector 15 species monthly peak counts, 2015/16 and 2016/17

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Bar-tailed godwit					1				
		8	4						
Black-headed gull	28	117	452	11	15		13		
		470	38			240	45	8	2
Black-tailed godwit			71						
		65	3		1	12			
Buzzard						1			
Common gull		4	2		4		5		
		78	15			34	15		
Common scoter						1			

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Common tern	17								
Cormorant	1		2	1	1		1		
Curlew	20	66	46	73	132	220	6	110	1
	31	12	6	4	114	222	19	96	
Dunlin						1			
						50			
Eider	3					6	3		2
		22						2	
Feral/hybrid goose									
				1					
Fulmar									
	1								
Great black-backed gull	1		1	2	3		2		
		7	4	1	2	4	3		1
Great crested grebe					2	2	1		3
	1	4		2	1	6	16		
Grey heron	1		5				1		1
	1	3		1					
Greylag goose									
		65							
Herring gull	15		386		1		2		3
	180	860	18	2	49	66	8	9	10
Kittiwake						1			
Knot									
						45			
Lapwing						4			
				1		16			
Lesser black-backed gull		1	1						
		30				5	12		
Little gull									
						20			
Mallard				4		1	4		2
		5	4		2	4	2	4	
Oystercatcher	9	8	3	2	21	25	3		
	3	8	12	4	4	36	24	15	3
Pink-footed goose			19			66			
			1						
Razorbill									
				1					
Red-breasted merganser	5			17	4	13	1		2
	2	16		5	6	6	14	1	
Red-necked grebe						1			
Redshank	1		1		23	29	13	6	

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
	23	68		8	8	18	37	2	
Red-throated diver						1			
Sandwich tern	7					1			
	4	38							
Scaup				1					
Shelduck	19	4	83	38	40	73	21	17	2
	33	105	24	19		59	33	4	10
Slavonian grebe						1			
Teal									
	4				26	6			
Turnstone									
						3			
Whimbrel				70					
Whooper swan						12			
Wigeon						45		12	
		40	18	6	27	46			
TOTAL COUNTS 2015-16	127	200	1,072	219	247	504	76	145	16
TOTAL COUNTS 2016-17	283	1,904	147	55	240	898	228	141	26

Target species found in nationally-important numbers:

- None.

SPA qualifying interests found in potentially important numbers:

- Curlew.

Other target species not in the previous two lists but found in potentially important numbers in relation to the Forth Estuary:

- Black-headed gull, black-tailed godwit, great crested grebe, herring gull, little gull, whimbrel, whooper swan.

Sector 15 lies adjacent to the John Muir coastal path, and the shoreline has been modified to allow for the recent upgrade and construction of this. It is bordered by improved agricultural fields. Numbers of all species were generally low with only curlew consistently recorded in relatively larger numbers, reaching SPA importance in January 2016 and 2017. Large numbers of herring gulls, black-headed gulls and black-tailed godwits were recorded feeding in October 2015 and September 2016, following the tide, before moving away in batches as the tide rose. Little roosting habitat exists at high tide.

3.2.16 Sector 16: Blackness

The monthly peak counts for each species recorded within Sector 16 are shown in Table 3-17.

Table 3-17. Sector 16 species monthly peak counts, 2015/16 and 2016/17

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Arctic skua									
		1							
Bar-tailed godwit									
		14					1		
Black-headed gull	270		75	25	40	80	35	4	25
	31	460	140	31	215	340	18	12	1
Black-tailed godwit									2
		14	22		1				
Brent goose									
				2					
Common gull	70		75	6	20	13	25	39	6
	14	230	35	10	282	35	4	22	
Common scoter									
		1							
Common tern									
	6								
Cormorant	14		4	2		1			1
	2	8	3		1			1	
Curlew	160	60	70	80	130	2	20	37	2
	8	30	34	2	74	106	1	51	
Dunlin	3		2		206				
		44	2	24	33		2		
Eider	10						3	13	5
		10						2	
Goldeneye									1
Goosander									
		4							
Great black-backed gull				1	3	2	2	1	2
		6	2	1	3	3	1		
Great crested grebe	10		4		1	1	1		7
			2			8			
Greylag goose			1						
		40							
Grey heron			4						
		1			1	1			
Herring gull	82	7	170	10	6	6	15	14	12
	180	570	20	3	4	180	3	11	11
Knot					1				
Lesser black-backed gull									
		28	6			6	1	2	2
Mallard				2			4	2	
							3		
Mute swan									
			1						
Oystercatcher	29	7	25	10	30	20	18	5	3
	5	12	34	3	8	16	11	15	

Species	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Pink-footed goose			15						
Red-breasted merganser			20	7	5	2		2	6
		36	10	1	2	15			
Redshank	32		70	9	75	30	22	5	21
	42	76	110	40	32	103	32	60	23
Red-throated diver									
		14							
Ringed plover	1								
Sandwich tern	4								
	2								
Shelduck	16	1	50	75	89	35	15	4	6
	1	45	34	7	5	36	5		3
Snipe									
			1						
Teal									
		2	4			2			
Turnstone									
	1								
Whimbrel									
					28	122			
Whooper swan			2						
Wigeon			40	110	35	63	4	8	2
		14	94	86	60	88	2		
TOTAL COUNTS 2015-16	704	15	627	337	641	255	164	134	101
TOTAL COUNTS 2016-17	289	1,720	554	210	749	1,061	84	176	40

Target species found in nationally-important numbers:

- None.

SPA qualifying interests found in potentially important numbers:

- Red-throated diver.

Other target species not in the previous two lists but found in potentially important numbers in relation to the Forth Estuary:

- Black-headed gull, Brent goose, common gull, great crested grebe, herring gull, red-breasted merganser, whimbrel.

Sector 16 is adjacent to Blackness village, pier and castle, as well as the John Muir coastal path, and so human activity is relatively high. Species such as redshank, oystercatcher and shelduck were regularly recorded but in small numbers. Relatively large numbers of red-throated divers were present on the water in September 2016, and notable feeding whimbrel flocks were present in December and January 2017.

3.3 Distribution and Behaviour of SPA species within the survey area

This section summarises the spatial distributions and associated behaviours of all birds, and specific key species (SPA qualifying interests and any other species found in nationally-important numbers – see Section 3.2) recorded during surveys, particularly in relation to high tide.

It should be noted that in relation to distribution Figures 1.1 to 12.2, the change in data capture from paper to digital (see Section 2.4.3) meant that more records were collected from August 2016 onwards compared to the first non-breeding season, as hourly distribution maps, instead of bi-hourly maps were collated. The larger number of records in 2016-17 therefore should be attributed to increased data collection rather than any obvious increase in numbers of birds within each Sector. The main purpose of the figures was to record the distribution of birds (and flock size) rather than frequency of records within each Sector.

3.3.1 General bird distributions

Figures 1.1 and 1.2 show the distribution of all species recorded roosting at high tide. In general there are key roosting locations where a number of wader species aggregate in large flock sizes. These are:

- Adjacent to the downstream side of the Kincardine Bridge in Sector 3;
- The breakwater adjacent to Grangemouth Port in Sector 6;
- The sheltered bay adjacent to Grangemouth Petrochemical works in Sector 9;
- Mudflats and creeks at the mouth of the River Avon (Sector 10);
- The lagoon at Kinneil (Sector 11); and
- The sheltered bay adjacent to Kinneil Island (Sector 12).

In other Sectors, particularly downstream in Sectors 13-16, numbers of roosting birds are lower, although large aggregations of ducks are commonly present on the water at high tide. Further upstream in Sectors 1-5, large aggregations of gulls are common.

It was evident that distribution of birds was relatively similar in year 1 (2015-16) and year 2 (2016-17).

3.3.2 Bar-tailed godwit

Bar-tailed godwits were recorded mainly in Sectors 9-12, although were recorded in smaller numbers in the sectors further upstream (Figures 2.1 and 2.2). The main roosting areas were in the sheltered bay at the Grangemouth petrochemical works, along the mouth of the River Avon, and in the lagoon at Kinneil in Sector 11 (Figure 2.1). Birds were also recorded roosting in Skinflats Bay (including onshore lagoons in Sector 5) and at Kinneil Island in Sector 12.

3.3.3 Black-tailed godwit

Black-tailed godwits were recorded in nearly all sectors, but were observed roosting in highest numbers within the lagoon at Kinneil in Sector 11, in the sheltered bay in Sector 9, in Skinflats Bay in Sector 5, as well as feeding along the shore in most other sectors (Figures 3.1 and 3.2, and 12.1 and

12.2). Birds were recorded roosting upstream in Sectors 1 and 2 in 2016-17. They were also observed feeding far out on mudflats at lower tides.

3.3.4 Curlew

Curlew was recorded feeding and roosting in large numbers throughout the survey area, being regularly recorded in all sectors. High tide roosts were encountered across all sectors from Dunmore, downstream to Bo'ness, in both years (Figures 4.1 and 4.2). No regular high tide roosts were observed in Sectors 13-16 in year 1, although there were small numbers present in year 2. Birds fed extensively on the mudflats around Skinflats, near the Kincardine Bridge, and near Grangemouth petrochemical works in Sector 9 (Figures 12.1 and 12.2). Birds also fed further downstream in all other sectors.

3.3.5 Dunlin

Dunlin distribution was largely restricted to Sectors between the Kincardine Bridge and Bo'ness. Highest numbers were recorded along the breakwater in Sector 6, in the sheltered bay in Sector 9, at the mouth of the River Avon in Sector 10 and in the Kinneil lagoon in Sector 11, and at Kinneil Island in Sector 12, where birds roosted at high tide (Figures 5.1 and 5.2). Birds also fed extensively across mudflats in Sectors 4, 9 and 11 in particular (Figures 12.1 and 12.2).

3.3.6 Golden plover

Golden plover distribution within the survey area was mainly restricted to a small number of locations – within Skinfats Bay (Sectors 5 and 6), in the sheltered bay in Sector 9 (Grangemouth petrochemical works), in the mouth of the River Avon (Sector 10) and in the lagoon in Sector 11 (Kinneil) where birds roosted at high tide (Figures 6.1 and 6.2). There were no records further downstream, and few, sporadic observations in Sectors 1-4.

3.3.7 Knot

Knot was mainly recorded within Sectors that have large areas of mudflats, particularly between Grangemouth Port (Sector 7) and Bo'ness (Sector 12). Birds were recorded roosting on mudflats near the shore (e.g. within the sheltered bay in Sector 9), and also within the lagoon in Sector 11, in particularly high numbers (Figures 7.1 and 7.2). The species was largely absent from other sectors downstream of Sector 11 and upstream of Sector 4.

3.3.8 Pink-footed goose

Pink-footed goose was recorded mainly in the upstream parts of the survey area, within Sectors 1-5, characterised by agricultural land use and lower human activity rates. They used the survey area both for feeding (e.g. on fields in Sectors 1-3, Figure 12.1), and roosting (on the mud in Skinflats Bay and within the adjacent lagoon (Sectors 4 and 5), and at high tide on marsh beside the Kincardine Bridge in Sector 3 (Figures 8.1 and 8.2).

3.3.9 Red-breasted merganser

Large numbers of red-breasted mergansers were recorded in a number of sectors, but in most cases birds were loafing, roosting or feeding on the water at a distance from the shore. Figure 9.1 shows that in year 1, roosting birds were often recorded in Sectors 13 and 15 towards Blackness, and in

general were more common in the downstream half of the site. In year 2 (Figure 9.2), there was a wider distribution, with larger numbers of birds recorded at high tide between Sectors 7 and 11 in particular.

3.3.10 Redshank

Redshank was distributed widely across the survey area, being recorded in all sectors in both survey years. Largest flock sizes were recorded around Grangemouth port and petrochemical works, particularly along the breakwater at Sector 6, along the sheltered bay in Sector 9, at the mouth of the River Avon in Sector 10, and in the lagoon at Kinneil in Sector 11 (Figures 10.1 and 10.2). These locations formed important high tide roost sites for the species. Birds did also frequent sheltered bays further downstream, albeit in lower numbers.

3.3.11 Shelduck

Shelduck was distributed widely across the survey area, being recorded feeding and roosting in all Sectors (Figures 11.1 and 11.2). Particularly high numbers were recorded feeding within Skinflats Bay (Sector 4/5) and across the mudflats at Kinneil (Sector 11) (Figures 12.1 and 12.2). Large numbers of roosting birds were recorded around Grangemouth Port and petrochemical works (Sectors 7 and 9) and on the mudflats at Kinneil (Sectors 10 and 11). Birds were recorded roosting in most Sectors, mainly on land, but occasionally also on the water, depending on the availability of roost sites, for example in Sectors furthest downstream where suitable habitat is most limited.

3.3.12 Sandwich tern

Sandwich terns were recorded roosting in August and September 2015 in Sectors 11-14, with highest numbers along a sandbank in Sector 14 (all birds left before high tide). Birds were also recorded occasionally in flight, and feeding in low numbers further up and downstream during the autumn migration period.

In year 2, birds were recorded roosting again in August and September, within Sectors 9, 12 and 14 (five, four and 12 birds respectively). Birds were recorded feeding within Sectors 12-14 in August.

3.4 Baseline Human Activity Levels

Human activities observed or heard within the sector during surveys were noted on the Activity survey sheet (Appendix 1) in year 1, and in a similar electronic form using mobile data capture in year 2. Human activities were categorised into various types, and the numbers of “events” (e.g. number of dog walkers, cars or industrial/farm machinery) were tallied at the end of the survey. The total numbers of activities across all surveys can then be averaged to produce an overall baseline activity index for each sector, based on hourly rates of activity per km (Table 3-18). The main human activities recorded within each sector are also listed.

Table 3-18 Baseline Activity Levels

Sector ID	Name	Length	Overall Baseline Activity Index*		Main Human Activities
			2015-16	2016-17	
1	Dunmore	1.86 km	0.25	0.67	Gas guns, walkers

Sector ID	Name	Length	Overall Baseline Activity Index*		Main Human Activities
			2015-16	2016-17	
2	Airth	1.95 km	0.19	0.53	Farm vehicles, walkers, dogs
3	RSPB Skinflats	1.85 km	0.31	0.12	Farm vehicles, walkers, dogs
4	Skinflats Bay	1.73 km	0.24	1.13	Gas guns, walkers, dogs
5	River Carron	3.35 km	0.36	0.08	Walkers, dogs
6†	Grangemouth Port	1.75 km	0.14	0.07	Vehicles, industry
7	Grangemouth Port Locks	0.65 km	0.54	0.71	Ships, boats
8†	Grange Burn	1.20 km	0.58	1.05	Vehicles, industry
9	Grangemouth Refinery	1.35 km	2.79	0.00	Industry personnel, machinery
10	Kinneil Kerse	2.10 km	0.57	0.12	Walkers, dogs
11	Kinneil Reserve	2.45 km	0.62	0.36	Walkers, dogs
12	Bo'ness	1.87 km	4.73	1.91	Walkers, dogs
13	Grangepans	1.25 km	4.85	0.90	Walkers, dogs
14	Carriden	1.40 km	1.99	0.44	Walkers, dogs
15	Stacks	1.21 km	5.21	3.69	Walkers, dogs
16	Blackness	1.06 km	7.16	5.24	Walkers, dogs

* measured as average number of total activities per km per hour

† Index does not include frequent traffic movement along port roads adjacent to sector. Surveyors were unable to estimate number of movements per hour due to large numbers present, which would have distracted from survey. This regular activity did not appear to have any effect on bird distribution.

Results show a large range of baseline activity levels, with some sectors having little human activity (a number of surveys having no noted activities) and others where there is regular activity throughout the day. In general it is apparent that the survey area can be broadly split into three separate areas:

- Dunmore to River Carron (Sectors 1-5): characterised by low activity rates, particularly furthest upstream. Human activity mainly consists of walkers, sometimes with dogs. Occasional farming activities take place, and at times regular audible bird deterrents in the form of gas guns are deployed in fields close to the survey area.
- Grangemouth Port and Petrochemical Works (Sectors 6-9): characterised by regular, sometimes intensive activity, either vehicle movements along shore roads (not specifically counted by surveyors due to high frequency), or industry activity – personnel or machinery, within restricted areas away from the shore. Some shipping activity also occurs. During year 1, construction activities were consistent beside Sector 9, but this work was completed by year 2, hence the difference in activity rates.
- Kinneil to Blackness (Sectors 10-16): characterised by walkers and sometimes dogs and cyclists. Activity levels vary, and are likely to be related to ease of access (e.g. Bo'ness and Blackness sectors have relatively high activity rates, reflective of proximity to settlements and car parking). Activity is generally restricted to the John Muir Coastal Path.

Baseline activity levels are likely to provide an indication of the sensitivity of birds present within a particular sector, in relation to any potential construction work associated with the project. If work for example were to take place in Sectors 1-3, it is possible that birds may exhibit greater disturbance reactions, since such activity would be a significant change from baseline activity levels.

Other sectors such as those alongside built-up areas may host birds that are more tolerant of human activities (or birds are already distributed away from disturbance), and so are less likely to be significantly affected by increased levels of activity.

3.5 Disturbance Events

Disturbance events are considered to be those events that result in a change in behaviour and/or distribution and abundance of birds within a sector. Only a small number of baseline human activity levels outlined in Section 3.4 may result in observable disturbance to birds, as in many circumstances birds may have already adapted their behaviour to avoid human activity, are habituated to the presence of humans, or are at sufficient distance from the disturbance source (e.g. feeding on the lower shore).

Table 3-19 and Table 3-20 provide a summary of disturbance events recorded during surveys from August 2015 to April 2017. This includes any predator presence within each sector, which may also lead to disturbance (gannet appears to elicit a threat response by shorebirds so has been included as a "predator").

	Sector														
Disturbance Type	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Boat						5	2					1			
Dog walker		3		1	1					9	6	3	5	6	14
Farm machinery	1	1		1											
Farm vehicle	1			1											
Helicopter/aeroplane	1		1	1	1									1	
Industry machinery	1					1	3	2			2				
Industry personnel					1		1				2				1
Predator	2	1					1	1	1		1		1	1	1
Surveyor presence	4	3	3		1		2	2		1	2	1			1
Unknown	2				1		1					1		2	2
Walker		2			1					1	5	2	1	5	4
Wildfowling	1	2	3		1	1									
Total	**13**	**12**	**7**	**4**	**7**	**7**	**10**	**5**	**1**	**11**	**18**	**8**	**7**	**15**	**23**

Table 3-19. Disturbance Events during the 2015/16 Non-breeding Season

Sector	Date	Disturbance Event	Predator presence
1	25/08/2015	Diggers at 1100 dumping soil onto flood defence W of VP. Disturbed all waders out of area 1 and gulls from 1 to 2. Herons disturbed but returned to 1	Buzzard Kestrel
1	25/08/2015	Buzzard over saltmarsh briefly disturbed waders and moved gulls from mud to water.	Peregrine
1	28/09/2015	Farmer drove through field and flushed geese (1025). Settle on mid-channel mud.	Sparrowhawk Marsh harrier Merlin Gannet
2	25/08/2015	1102 - dogs heard barking quickly followed by curlew alarm calling. No sign of any of them	Kestrel Peregrine
3	-	-	Buzzard Merlin Gannet Sparrowhawk
4	25/11/2015	1112 - Light aircraft flew over, shelduck moved within zone, returned at 1117. 1232 - manoeuvres disturbed around 125 pink footed geese in fields behind VP	Buzzard Kestrel
4	27/04/2016	Tractor works in field south of VP throughout survey. Presumably activity forced lapwings from field to saltmarsh/mudflats	Sparrowhawk Gannet Short-eared owl
5	16/02/2016	Pink-footed goose disturbed by wildfowler during hour 3	Buzzard Kestrel Peregrine Sparrowhawk Gannet
6	25/08/2015	1109 - Speedboat. Most shelduck disturbed to other side of bay. Half of redshank on bank disturbed - 1117 boat back - no disturbance	Peregrine
6	28/04/2016	at 0950 loud bang, flushed most of gulls off breakwater/mud and out of sector	
7	16/09/2015	Uncontrolled roe deer fawns - playing, flushing redshank and dunlin off ponds but resettled.	Kestrel
7	21/10/2015	Hammering by workmen - disturbed c.30 feeding shelduck - took off and left sector	Sparrowhawk

Sector	Date	Disturbance Event	Predator presence
7	08/01/2016	Industrial noise may have disturbed curlew at 12:20	
8	22/02/2016	Siren alarm test at 1145, some birds disturbed. Most settled quickly.	Kestrel Sparrowhawk
9	24/09/2015	birds disturbed by gannets, buzzard and peregrine	Buzzard Peregrine Gannet
10	-	-	-
11	27/08/2015	0810 - man walking along track disturbed 80 lapwings and 50 shelduck.	Buzzard Kestrel Short-eared owl
11	27/08/2015	Two sets of people walking 2 dogs. First set disturbed 30 redshanks. Second set disturbed 20 redshanks.	
11	23/09/2015	Dogs with walkers, flushed around 50 feeding shelduck in south-east corner of sector	
12	27/08/2015	Sandwich terns flushed off roost due to steam train whistle and smoke at 10.50. Flew around bay.	Gannet
12	10/09/2015	1145: Dog walker flushed all birds at roost and high tide mark. Curlew and redshank flew off.	-
12	24/12/2015	In 1300-1320 period 2 people walked out on to the West Pier, disturbed roosting Oystercatcher and gulls. Oystercatcher flew and some landed at West end of sector, rest continued off west.	
12	22/01/2016	One walker in hour 6 disturbed roosting waders etc at West end of sector, birds resettled again.	
12	22/02/2016	In hour 4 people on piers at East end of the sector preventing the waders from roosting/ settling there.	
13	13/09/2015	3 boys on beach flushed redshank 1248	
13	24/11/2015	Pedestrian moved slightly off path, new roost area - disturbed some redshank at 1130.	-
14	10/12/2015	Pedestrian disturbed redshank - moved within sector - quickly resumed feeding. At higher tide disturbance resulted in redshank leaving sector	-
14	10/12/2015	Dog walker on path - made redshank take flight and shelduck walk further offshore	
15	10/11/2015	two persons walking on beach and a couple with dog – disturbed mallard flock offshore	Buzzard
15	13/10/2015	Two small children on bikes disturbed gulls off strand but not out of zone.	
15	17/02/2016	Two men searching along strand line, birds moved offshore to '14'. 1120 another man walking along shore, birds all off.	
16	31/08/2015	1200 - 2 yachtsman digging mooring into shore. Disturbed 6 black headed gulls, 20 metres down beach. 1400 - 160 curlew pushed off shore by human disturbance.	-

Sector	Date	Disturbance Event	Predator presence
16	31/08/2015	1210 - loose dog only disturbed 10 black headed gulls. 1255 - loose dog scared 50 gulls. 1315 - dog and two walkers scare 100 gulls all redshanks and about 10 oystercatchers. 1410 - 2 dogs running loose, scared last few gulls off shore.	
16	31/03/2016	Dog on the beach, most birds moved out	

Table 3-20. Disturbance Events during the 2016/17 Non-breeding Season

Sector	Date	Source	Description/ Species affected	Predator presence
1	13/10/2016	Unknown	Mallard	Short-eared owl
	23/11/2016	Surveyor presence Unknown	Wigeon, mallard Curlew	Kestrel
	23/11/2016	Seal	common seal surfaced just off sector, put up a lot of gulls who had been floating nearby.	
	23/11/2016	Helicopter	Low flying helicopter approached from south and crossed forth, following pylons. Many birds in sector took flight from bank, most returned and landed mostly on water	
	27/01/2017	Surveyor presence	Little egret	
	24/02/2017	Surveyor presence	Grey heron, mallard, teal	
	23/03/2017	Surveyor presence	Mallard, teal, wigeon	
		Gas gun	Pink-footed goose, oystercatcher	
		Wildfowling shots	Pink-footed goose, wigeon	
2	09/08/2016	Person	Jogger put up gulls and curlews along roadside	Peregrine
	10/10/2016	Dog walker	Dog with man on bund, gulls up.	Kestrel
		Dog walker	Man and dog walking through saltmarsh, birds moved off exit gulls.	
	12/12/2016	Person	2 men walked along bund from west, birds moved off a little	
	12/12/2016	Person/Raptor	Rentokill van man flying Eagle near Airth behind VP seen on way out from VP	
	23/01/2017	Surveyor presence	Curlew, teal, wigeon	

Sector	Date	Source	Description/ Species affected	Predator presence
	23/01/2017	Wildfowling	Wildfowler fired two shots as feeding flocks of teal and wigeon. Many birds in sector took flight	
	23/01/2017	Wildfowling	After taking shots, Wildfowler stood up and walked to meet another who had a dog. both walked from sector.	
	10/02/2017	Surveyor presence	Curlew, redshank	
	23/03/2017	Surveyor presence	Curlew, redshank, teal	
	23/03/2017	Gas gun	Number of shots, put off redshanks	
3	23/09/2016	Surveyor presence	Kingfisher	Gannet
	10/10/2016	Wildfowling	Wildfowler taking shots at pink-footed geese as they fly from sector. Continuous, with intervals of around seven minutes during hour	Kestrel Peregrine
	10/10/2016	Wildfowling	Black Labrador retriever occasionally making forays onto edge of sector as shots fired.	
	12/12/2016	Surveyor presence	Redshank	
	12/12/2016	Wildfowling	Gunshot in fields behind vp, put up geese there, put up heron too	
	22/02/2017	Helicopter	Helicopter flew S to N over sector, put up teal	
	22/02/2017	Surveyor presence	Curlew	
4	03/04/2017	Gas gun	Gas gun in arable field behind vp firing all day some disturbance but mostly ignored by birds	Barn owl
	03/04/2017	Dog walker	Man and dog , geese up	
5	20/02/2017	Unknown	Curlew, pink-footed goose	Kestrel
	20/02/2017	Helicopter	Helicopter, put curlew off	Buzzard
	04/04/2017	Dog walkers	Couple with dog off lead cycle track. Note dog walkers on path all morning just out of sight. Little disturbance.	Sparrowhawk
	04/04/2017	Personnel/Machinery	Fencing contractor in a tractor arrived working near lagoons. Birds moved to N end lagoon, workers in hi vis at edge of lagoons lots noise etc. Black-tailed godwit, grey heron, mute swan, tufted duck	
	04/04/2017	Surveyor presence	Redshank	
	04/04/2017	Uncontrolled person	Redshank	
6	03/10/2016	Small yacht	Shelduck	-

Sector	Date	Source	Description/ Species affected	Predator presence
	03/10/2016	Yacht	Small yacht travelled down river on near side of breakwater heading out into forth estuary. Most birds roosting on breakwater moved off, some returned shortly after	
	03/10/2016	Yacht	A second, noisier small yacht followed after first. Birds reacted similarly. This yacht produced a more powerful wake, washing birds off from breakwater	
	09/12/2016	Wildfowling shots	Teal, lapwing	
	09/12/2016	Boat	Small boat headed downstream in channel. Some birds moved out. Turned and headed back the way it came, up channel again	
7	26/08/2016	Boat	Port authority boat surveying mouth of dock; going back and forth across edge of zone, birds avoiding area (except terns)	Kestrel Sparrowhawk
	09/12/2016	Unknown	Red-breasted merganser	
	09/12/2016	Industry machinery	Drain cleaner emptied tank into reed bed. Black-headed gulls and redshank flew off	
	10/01/2017	Surveyor presence	Curlew, redshank	
	08/02/2017	Surveyor presence	Curlew, snipe	
	08/02/2017	Ship	Black-headed gull	
	06/04/2017	Industry machinery	Drain cleaning lorry present a number of times. Shelduck, water rail, cormorant, eider, mallard, teal affected.	
8	25/08/2016	Industry machinery	Excavator working just inside fence at port; birds wary - two shelduck flew	-
	25/08/2016	Predator	Fox moved Wigeon across inlet 1231	
	09/02/2017	Surveyor presence	Redshank	
	06/03/2017	Surveyor presence	Redshank, teal	
10	-	-	-	Gannet
11	08/08/2016	Dog walker	Most birds, all waders, disturbed by dog walker, dog at heel on path on bund	Buzzard
	08/08/2016	Dog walkers	Man & child + 2 dogs off lead along bund path, all gulls up but resettled	Gannet
	24/11/2016	Dog walker	Man and dog off lead -birds all moved away from path. 2nd disturbance 1221-1237 couple and dog off lead walking round lagoon. Birds moved well away for extended time. Black-headed gull, cormorant, grey heron, mallard, redshank, teal	

Sector	Date	Source	Description/ Species affected	Predator presence
	24/11/2016	Surveyor presence	Teal	
	21/02/2017	Dog walker	Woman with two dogs E along path	
	21/02/2017	Dog walker	Dog walker heading W along path, throwing stick for dogs	
	21/02/2017	Dog walker	Two women, 9 dogs	
	07/04/2017	Dog walkers	Family with dog walking W along path, some birds moved further out onto mud	
12	25/08/2016	Industry personnel	Contractors; working on west pier; area disturbed as mud appeared	-
	24/11/2016	Person	Person walked out onto pier, put oystercatcher flock up. Birds crossed bay to join curlew/wildfowl flock at river mouth	
	24/11/2016	Predator	Female sparrowhawk in sector; several curlew took flight	
	24/11/2016	Surveyor presence	Redshank	
	24/11/2016	Industry personnel	Two men in hi vis walked along path by water. Most feeding redshank took flight	
	23/12/2016	Surveyor presence	Oystercatcher, redshank, teal	
	23/12/2016	Industry machinery	Digger working on shore path, birds moved off when it started then settled down again.	
	23/12/2016	Dog walker		
	23/12/2016	Dog walker	Person jogging and loose dogs x2	
	23/12/2016	Dog walker	Woman and two dogs	
	23/12/2016	Dog walker	Woman and dog. Redshank flew off	
	07/04/2017	Dog walker	Flocks of oystercatcher and redshank flushed by dog. Some returned to similar area within minute but a number of oystercatchers left sector to go upstream	
	07/04/2017	Person	Flock of 13 redshank disturbed by walker. Moved to mudflats within sector and continued to forage	
13	29/08/2016	Ship	Wake of chemical oil transporter reached edge of mudflat and put off flock of bar-tailed godwits who were feeding there. Birds left sector	Gannet
	23/12/2016	Unknown	Turnstone	
	23/12/2016	Dog walker	Man in hi vis walking German shepherd, gulls moved to water	
	23/12/2016	Dog walkers	Small group of people with dog on path	
	23/12/2016	Dog walker	Dog walker with 2 dogs	
	25/01/2017	Surveyor presence	Redshank	

Sector	Date	Source	Description/ Species affected	Predator presence
14	25/11/2016	Dog walker	Dog walker on beach, put up roosting birds	Arctic skua
	25/11/2016	Dog walker	Dog walker on beach, birds moved to water	
	25/11/2016	Dog walker	Man and three dogs on beach	
	26/01/2017	Dog walkers	Five people and two dogs on each, put redshank off	
	28/03/2017	Seal	Curlew flushed by grey seal	
15	28/11/2016	Unknown	Grey heron, curlew, oystercatcher, redshank, shelduck, wigeon, great-crested grebe	-
	13/12/2016	Predator	Buzzard low over shore, curlew moved	
	13/12/2016	Dog walkers	4 dogs off lead on path with 2 men, curlew flew off	
	13/12/2016	Person	Curlew flew off	
	24/03/2017	Unknown	Shelduck, curlew	
	24/03/2017	Dog walker	Man and dog off lead walked along shore from NW birds flew off	
	24/03/2017	Person	Person walking on path, curlew flew off	
	24/03/2017	Dog walker	Person walking 3 dogs off lead on path CU up and away	
	24/03/2017	Dog walker	Man and 3 dogs run along path again , all birds off	
	24/04/2017	Blimp	Large blimp in sky over Grangemouth all day	
	24/04/2017	Persons	Couple walking on shore path	
	24/04/2017	Dog walker	Man and dog off lead walking shore path	
16	13/12/2016	Unknown	Wigeon	Arctic skua
	24/03/2017	Surveyor presence	Curlew, redshank	
	24/03/2017	Unknown	Redshank	
	26/08/2016	Dog walker	Dog walker put up black-headed gull flock	
	28/11/2016	Dog walker	Dog walker with two dogs along John Muir way. Wildfowl moved out onto water	
	28/11/2016	Dog walkers	Couple with two dogs on beach, wigeon moved out	
	28/11/2016	Person	Cyclist on John Muir way, wigeon out to water	
	28/11/2016	Dog walker	Dog on beach, chased wigeon into water	
	13/12/2016	Persons	Three people walked out onto pier, put off gulls who were hanging around there	
	13/12/2016	Dog walkers	Two dog walkers on path by beach. Some gulls moved out onto mud.	
	13/12/2016	Dog walker	Man with active dog on beach. Feeding wigeon moved to deeper water	

Sector	Date	Source	Description/ Species affected	Predator presence
	13/12/2016	Persons	Five people on path, wigeon swam out to deeper water	
	13/12/2016	Person	Person walked to end of pier, put gulls off	
	13/12/2016	Dog walkers	Dog walkers with very excited dog onto beach, wigeon moving out	
	13/12/2016	Predator	Two peregrines, one male one female, actively hunting Dunlin in sector.	
	23/02/2017	Dog walker	Dog walker E along path	
	23/02/2017	Uncontrolled dog	Dog wandering around beach	
	23/02/2017	Dog walker	Dog walker W along beach	
	24/03/2017	Dog walkers	Couple with dog chasing ball and any birds.	
	24/04/2017	Dog walker	Man walking dog throwing ball around on beach. Redshanks moved away.	

Results in the above tables show that relative to baseline activity levels outlined in Section 3.4, a higher proportion of disturbance events are more likely to result when human activity occurs in the normally quiet sectors north of the River Carron. In contrast, a relatively small proportion of disturbance events occurred around the Grangemouth Port and Petrochemical works, likely because access to the shore is restricted, and birds may be habituated to most regular industrial activities. Disturbance events did happen along the coastal path Sectors 10-16, commonly when dogs were present, although disturbance rates were low in comparison with the amount of background activity. Most disturbance occurred to birds closest to the path.

3.6 Breeding Season Surveys

A total of 70 species were recorded during the breeding season surveys. Of these, 18 are SPA qualifying interests.

Table 3-21 to Table 3-23 show the results of monthly breeding season surveys in 2016. In each table the total counts of each SPA/SSSI target species within the 16 sectors is shown. Highlighted in orange is the sector within which a probable or confirmed breeding attempt by a particular species was recorded (the value within the highlighted cell does not reflect the number of breeding behaviour observations – in practice only single pairs, or small numbers of pairs are likely to have attempted to breed in each Sector). Breeding evidence was observed for lapwing, redshank, oystercatcher and shelduck.

A full list of all species observed is presented in Appendix 1.

Table 3-21 Breeding Season Results – SPA Species: Visit 1 May 2016

	Sector														
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Bar-tailed godwit									5						
Black-tailed godwit									1	8					
Common tern					7	24	1				15	4			
Cormorant	4	1	3			2									
Curlew			13	6	1		2		1					11	2
Dunlin				55											
Eider														3	
Lapwing			8	6											
Mallard	8	4		3	1	2	1		5	3					
Oystercatcher		4	2	105	1			5	74	15	2		2	1	
Redshank	3		4	1	2										
Shelduck		4	16	35	3	9		6	70	24	2	2		8	
TOTALS	15	13	46	211	15	37	4	11	156	50	19	6	2	23	2

Table 3-22 Breeding Season Results – SPA Species: Visit 2 June 2016

	Sector

Species	1	2	3	4	5	6	7	8	10	11	12	13	14	15	16
Bar-tailed godwit									1	2					
Black-tailed godwit					13										
Common tern	1	10	4		3	69	6						1		
Cormorant				3		2	1				1	2	1		
Curlew		5	5	22	1	1	1		5	1			1	6	
Eider														6	
Great crested grebe					2					1					
Lapwing	1		3	23	15			5	93						
Mallard	13	4		1	22	3	4								
Oystercatcher	2	6	4	14	2		4	3	12	21	2	2		2	
Pink-footed goose		6													
Red-breasted merganser		1								8				1	
Redshank	2		6						20	1					
Ringed plover									1						
Sandwich tern		1											1		
Shelduck		1	11	136	41	51	30	7	23	58	36	4	2	1	
TOTALS	**19**	**34**	**33**	**199**	**99**	**126**	**46**	**15**	**155**	**92**	**39**	**8**	**6**	**16**	**0**

Table 3-23 Breeding Season Results – SPA Species: Visit 3 July 2016

	Sector														
Species	1	2	3	4	5	6	7	8	10	11	12	13	14	15	16
Bar-tailed godwit											95				
Common tern						5						2			
Cormorant	7	1		10		1						1	1		3
Curlew	9	27	52	114		46	262	2	37		5	2	2	15	56
Eider														2	
Goldeneye					1										
Lapwing				4	234				112						
Mallard	30	4	5		4	6									
Oystercatcher		2		10	6	4	11	1	13		1			4	6
Redshank						226	190		299						
Ringed plover									2						
Sandwich tern									3	2		4	1		
Shelduck		1	115	95	33	90	1545	8	590	30	1	27	13	7	
TOTALS	**46**	**35**	**172**	**233**	**278**	**378**	**2008**	**11**	**1056**	**32**	**102**	**36**	**17**	**28**	**65**

In general, peak flock sizes for all SPA species were much smaller during the breeding season compared to both winter periods. It was however evident that SPA species are present throughout the summer period, and this is likely to reflect the presence of non-breeding individuals (e.g. 13 black-tailed godwits in Sector 5 in June), or recently failed or finished breeders (e.g. 299 redshanks in Sector 10 in July). The distribution of records (Figure 13) shows that birds are found widely across the mudlflats in summer, particularly from Sectors 4-11. Usage is also made of the onshore lagoons

in Sectors 5 and 11. Downstream of Sector 11 only a few SPA species were present (mainly shelduck, curlew and oystercatcher), although feeding Sandwich terns were also recorded on a number of occasions.

4 DISCUSSION

4.1 Wintering and Migrating Birds

The key roost sites, and therefore potentially most sensitive locations identified within the survey area appear to be in the vicinity of Grangemouth Port and Petrochemical works, and Kinneil (Sectors 6-11) where despite there being high levels of background noise and activities, human access to the foreshore is limited, disturbance is infrequent, and man-made and natural structures are suitable for high tide roosting. Largest numbers of roosting waders were recorded between December and March, with particularly high numbers in January 2017 in Sectors 9 to 11. Distribution was relatively consistent between years 1 and 2. Particularly important roost locations identified are:

- Adjacent to the downstream side of the Kincardine Bridge in Sector 3;
- The breakwater adjacent to Grangemouth Port in Sector 6;
- The sheltered bay adjacent to Grangemouth Petrochemical works in Sector 9;
- Mudflats and creeks at the mouth of the River Avon (Sector 10);
- The lagoon at Kinneil (Sector 11); and
- The sheltered bay adjacent to Kinneil Island (Sector 12).

Large areas of mudflats exist adjacent at Skinflats and Kinneil which are also used by large numbers of birds for roosting and feeding at certain parts of the tidal cycle. Any incursions relating to the FPS works close to the foreshore at higher tides in these areas are likely to result in disturbance to high numbers of birds, in flock sizes that are important at an SPA/ estuary level.

Upstream in Sectors 1-5 numbers of birds are generally lower, despite infrequent human activity. Roosting locations are more limited and the extent of mudflat is smaller, although inland fields provide roost and feeding opportunities for species such as pink-footed goose, curlew and lapwing. Because of low levels of baseline activity, it was observable that a greater proportion of human activities in these Sectors are likely to result in disturbance to birds present, particularly when close to the shore at high tide.

Downstream between Bo'ness and Blackness Castle human activity is frequent and likely to have already influenced bird distribution and behaviour. Birds are present in smaller numbers than further upstream (although gulls and ducks that roost further offshore can be numerous), but are potentially more tolerant of human activities. Disturbance events were still observable towards high tide, when birds were forced closer to the coastal path. Coastal works are therefore likely to prevent high tide usage in local areas.

4.2 Breeding and Summering Birds

Small numbers of SPA species were recorded through the breeding season across the survey area. In a number of cases, birds present were non-breeders, with the Firth of Forth being outside of the breeding range of such species (e.g. godwits, dunlin). In other examples (e.g. curlew, lapwing, redshank, shelduck), a mixture of non-breeders and a small number of breeding birds may have been present, with breeding habitat within the survey area limited. The large mudflats appear to be favoured by birds during the breeding season.

5 FUTURE REQUIREMENTS

The two year dataset, combined with historic data obtained during the desk-based study (e.g. WeBS count data) and scientific literature available on disturbance, is considered sufficient for a robust assessment of the SPA and estuary populations of birds, to fulfil the requirements of the EIA and HRA processes.

When more detailed plans of the FPS are available, further surveys may be required in areas that are earmarked for possible compensation requirements, due to habitat loss incurred. These should take place monthly throughout the non-breeding season to record presence of SPA species for HRA requirements, and during the breeding season, to record breeding species for EIA requirements.

APPENDIX 1 GRANGEMOUTH FPS: FURTHER SURVEY INFORMATION

Table A.1: Breeding Surveys Species by Sector – Visit 1 May 2016

NB – Sector 9 was not surveyed due to access restrictions.

Species	1	2	3	4	5	6	7	8	10	11	12	13	14	15	16
Bar-tailed godwit									5						
Blackbird		3			1										
Blackcap					1										
Black-headed gull					11				36	1	54	38	1	1	1
Black-tailed godwit									1	8					
Blue tit					1										
Buzzard					1										
Chaffinch					1										
Chiffchaff					1										
Common gull		1			3				2	7	6	2	23	14	18
Common tern					7	24	1				15	4			
Coot					1										
Cormorant	4	1	3			2									
Curlew			13	6	1		2		1					11	2
Dunlin				55											
Eider														3	
Goldcrest					1										
Great black-backed gull				3									2	3	
Grey heron	3	1			2		1								
Greylag goose					1										
Herring gull	13	26	1	8		11	2		10	22	16	3	17	74	27
Jackdaw		8			1										
Lapwing			8	6											

Species	1	2	3	4	5	6	7	8	10	11	12	13	14	15	16
Lesser black-backed gull					15	6			1	2	1		1		
Linnet		1													
Magpie					1										
Mallard	8	4		3	1	2	1		5	3					
Meadow pipit		1	2	3											
Mistle thrush					4										
Mute swan					1										
Oystercatcher		4	2	105	1			5	74	15	2		2	1	
Pied wagtail	2														
Redshank	3		4	1	2										
Reed bunting	1			4	3										
Robin					1										
Sand martin					1										
Sedge warbler	4	3		3	3										
Shelduck		4	16	35	3	9		6	70	24	2	2		8	
Short-eared owl		1													
Skylark	2	3	4	4											
Starling		1			1										
Swallow		1			1										
Tufted duck					1										
Whitethroat		1		1	1										
Willow warbler					1										
Woodpigeon	1				1										
Wren	2				1										
Yellowhammer	3	2													

Table A.2: Breeding Surveys Species by Sector – Visit 2 June 2016

Species	1	2	3	4	5	6	7	8	10	11	12	13	14	15	16
Bar-tailed godwit									1	2					
Blackbird	1				1										
Blackcap					1										
Black-headed gull	4	8	11	18	1	5	2	38	179	148	38	3	14	12	
Black-tailed godwit					13										
Blue tit					1										
Chaffinch	1				1										
Common gull		3							1	4				23	
Common tern	1	10	4		3	9	6						1		
Coot					12										
Cormorant				3		2	1				1	2	1		
Curlew		5	5	22	1	1	1		5	1			1	6	
Eider														6	
Gadwall					2										
Goldfinch	1				2										
Great black-backed gull		1		1			1					1	2		
Great crested grebe					2					1					
Great tit					1										
Grey heron	5	3	2		2	2		2						1	
Greylag goose					1										
Gull-billed tern									1	1					
Herring gull	6	16	5	27	3	13	17	6	4	4	31	13	41	82	
Kestrel			1												
Lapwing	1		3	23	15			5	93						
Lesser black-backed gull	3	1	2	1	15	3	3	1	1	2	3		1	1	
Linnet	2		3		1										
Mallard	13	4		1	22	3	4								

Species	1	2	3	4	5	6	7	8	10	11	12	13	14	15	16
Meadow pipit		1													
Moorhen					1										
Mute swan					10										
Oystercatcher	2	6	4	14	2		4	3	12	21	2	2		2	
Peregrine falcon			1												
Pink-footed goose		6													
Red-breasted merganser		1								8				1	
Redshank	2		6						20	1					
Reed bunting	4	1													
Ringed plover									1						
Robin	1				1										
Sand martin		2													
Sandwich tern		1											1		
Sedge warbler	4		1												
Shelduck		1	11	136	41	51	30	1	23	58	36	4	2	1	
Skylark	1	5	2		1										
Swallow	1				3										
Swift					2										
Teal							9								
Tree sparrow	1														
Tufted duck					2										
Whimbrel														1	
Whitethroat		1			2										
Willow warbler					2										
Wren	1				5										
Yellowhammer	2														

Table A.3: Breeding Surveys Species by Sector – Visit 3 July 2016

Species	1	2	3	4	5	6	7	8	10	11	12	13	14	15	16
Bar-tailed godwit											0				
Blackcap					1										
Black-headed gull	52	44	12	28	22	26	32	17	72		39	43	116	14	26
Buzzard				3											
Canada goose	1														
Carrion crow				5											
Common gull	4	2	2						10		1		24		18
Common sandpiper		1	2												
Common tern						5						2			
Coot					4										
Cormorant	7	1		10		1						1	1		3
Curlew	9	27	25	114		46	262	2	37		5	2	2	15	56
Eider														2	
Goldeneye					1										
Goldfinch							12								
Great black-backed gull	2				2				2					1	
Great-spotted woodpecker								1							
Grey heron	8	2	2		1	2	1		1						1
Greylag goose		9		9	8										
Herring gull	1	12	12		12	72			22		1	9	23	30	31
Jackdaw													8		
Lapwing				1	234				112						
Lesser black-backed gull	3	1			12						1				
Linnet							6								
Little grebe			1												
Mallard	30	4	5		4	6									
Moorhen			1				1								

Species	1	2	3	4	5	6	7	8	10	11	12	13	14	15	16
Mute swan					9										
Oystercatcher		2		10	6	4	11	1	13		1			4	6
Peregrine falcon		2													
Redshank						226	190		299						
Reed bunting				1	2				1						
Ringed plover									2						
Sandwich tern									3		2		4	1	
Sedge warbler				1	2				3						
Shelduck		1	5	95	33	90	1545	8	590		30	1	27	13	7
Skylark				2											
Starling				10											
Teal			10				87		17						
Tufted duck					7										
Whitethroat				1					2						
Yellowhammer				1											

Example Survey Sheets: Species Counts and Disturbance

Sheet number
_____ / _____

Office use only: (initials and date)			
Entered:	Entered QA:	Digitised:	Digitised QA:

GRANGEMOUTH VANTAGE POINT SURVEY: SPECIES COUNTS

Sector	**Date**	**Surveyor**	**Tidal State(s)**	**Start Time**	**End Time**

6 hourly counts required

F = foraging; R = roosting; L = loafing; M = movement (flight, walk)

Time of Hourly Count	Flock ID No.	Species	Flock size	Time left sector	Behaviour (F,R,L,M)	Notes (e.g. Disturbance response, distance)

Sheet number
_____ / _____

Office use only: (initials and date)			
Entered:	Entered QA:	Digitised:	Digitised QA:

GRANGEMOUTH VANTAGE POINT SURVEY: DISTURBANCE EVENTS

Sector	**Date**	**Surveyor**	**Tidal State(s)**	**Start Time**	**End Time**

Spot Counts (every 20 min)	Hour 1			Hour 2			Hour 3			Hour 4			Hour 5			Hour 6		
	0	20	40	0	20	40	0	20	40	0	20	40	0	20	40	0	20	40
Number of people																		
Number of vehicles																		
Number of boats																		

Specific activities (total)	Number	Notes
Uncontrolled person		
Uncontrolled dog		
Shots / gas guns		
Bait digger		
Industry/farm personnel		
Other		
Car / van		
Lorry / digger		
Ship / large boat		
Speedboat / jet-ski		
Kite / wind-surfer		
Helicopter/Aeroplane		
Industry/farm vehicle/machinery		
Other		

289000 290000 291000 292000 293000 294000

689000 688000 687000 686000 685000

Sector: 1

Sector: 2

Sector: 3

N

Legend:

Sectors

Flock Size

1

2-10

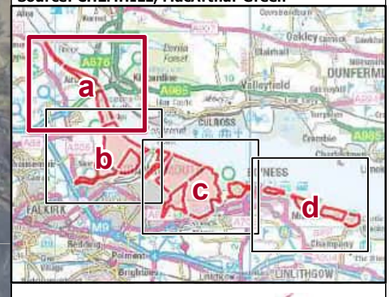
11-100

101-500

501 - 2000

2001 - 6300

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 1.1a

High Tidal State Flock Size (Roosting) 2015 - 2016

0 0.5 1

km

MAP SCALE: 1:17,500 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2M\GrangemouthIO_R_Fig1.1_ALLSpecies_HT_R_Flock_2015_2016_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

290000 291000 292000 293000 294000 295000

685000 684000 683000 682000

Sector: 3

Sector: 4

Sector: 5

Sector: 6

Sector: 8

Legend:

Sectors

Flock Size

1

2-10

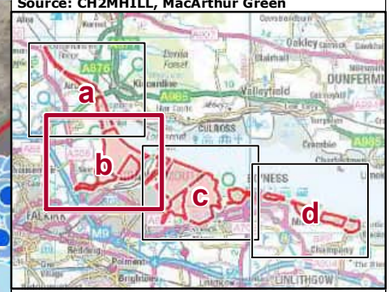
11-100

101-500

501 - 2000

2001 - 6300

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 1.1b

High Tidal State Flock Size (Roosting) 2015 - 2016

N

0 0.5 1

km

MAP SCALE: 1:17,500 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

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Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

295000 296000 297000 298000 299000 300000

684000 683000 682000 681000 680000

Sector: 7

Sector: 9

Sector: 8

Sector: 12

Sector: 11

Sector: 10

ch2m.

Legend:

Sectors

Flock Size

1

2-10

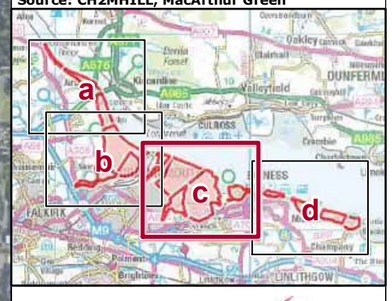
11-100

101-500

501 - 2000

2001 - 6300

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 1.1c

High Tidal State Flock Size (Roosting) 2015 - 2016

N

0 0.5 1

km

MAP SCALE: 1:17,500 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2MGrangemouth\O_R_Fig1.1_ALLSpecies_HT_R_Flock_2015_2016_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

301000 302000 303000 304000 305000 306000

683000 682000 681000 680000 679000

Sector: 13

Sector: 14

Sector: 15

Sector: 16

N

ch2m.

Legend:

Sectors

Flock Size

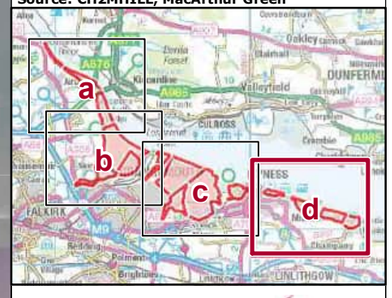
1

2-10

11-100

101-500

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 1.1d

High Tidal State Flock Size (Roosting) 2015 - 2016

0 0.5 1

km

MAP SCALE: 1:17,500 @ A3

Status: Rev0

Approved: RD

Checked: BJF

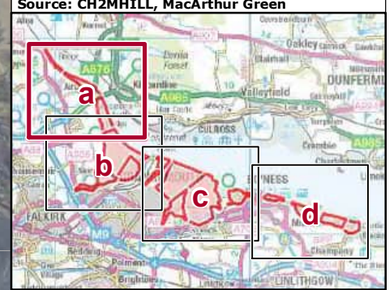
GIS TM: BJF

Document Path: S:\Project GIS\CH2M\GrangemouthIO_R_Fig1.1_ALLSpecies_HT_R_Flock_2015_2016_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017



Legend:

🟥 Sectors

Flock Size

●	1
●	2-10
●	11-100
●	101-500
●	501 - 2000
●	2001 - 11000

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 1.2a

High Tidal State Flock Size (Roosting) 2016 - 2017

0 0.5 1
km

MAP SCALE: 1:17,500 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig1.2_ALLSpecies_HT_R_Flock_2016_2017_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community
Contains Ordnance Survey data © Crown copyright and database right 2017

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

290000 291000 292000 293000 294000 295000

685000 684000 683000 682000

Sector: 3

Sector: 4

Sector: 5

Sector: 6

Sector: 8

Legend:

Sectors

Flock Size

1

2-10

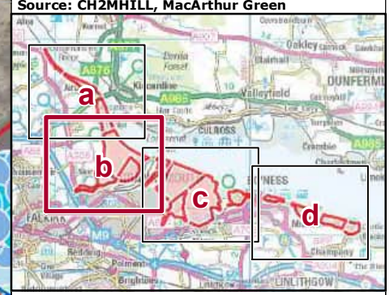
11-100

101-500

501 - 2000

2001 - 11000

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 1.2b

High Tidal State Flock Size (Roosting) 2016 - 2017

0 0.5 1

km

MAP SCALE: 1:17,500 @ A3

N

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig1.2_ALLSpecies_HT_R_Flock_2016_2017_GFS.mxd

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Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

295000 296000 297000 298000 299000 300000

684000 683000 682000 681000 680000

Sector: 7

Sector: 9

Sector: 8

Sector: 12

Sector: 11

Sector: 10

ch2m.

Legend:

Sectors

Flock Size

1

2-10

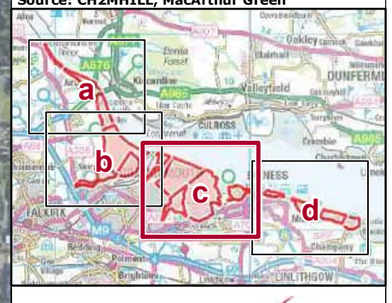
11-100

101-500

501 - 2000

2001 - 11000

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 1.2c

High Tidal State Flock Size (Roosting) 2016 - 2017

N

0 0.5 1

km

MAP SCALE: 1:17,500 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2MGrangemouth\O_R_Fig1.2_ALLSpecies_HT_R_Flock_2016_2017_GFS.mxd

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Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

301000 302000 303000 304000 305000 306000

683000 682000 681000 680000 679000

Sector: 13

Sector: 14

Sector: 15

Sector: 16

N

ch2m.

Legend:

Sectors

Flock Size

1

2-10

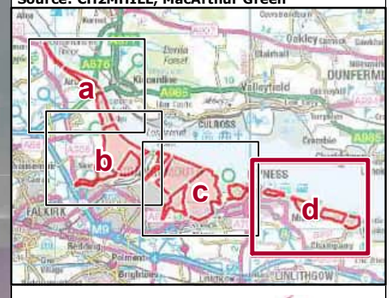
11-100

101-500

501 - 2000

2001 - 11000

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 1.2d

High Tidal State Flock Size (Roosting) 2016 - 2017

0 0.5 1

km

MAP SCALE: 1:17,500 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2M\GrangemouthIO_R_Fig1.2_ALLSpecies_HT_R_Flock_2016_2017_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

295000

300000

685000

680000

Sector: 2

Sector: 3

Sector: 4

Sector: 5

Sector: 6

Sector: 7

Sector: 8

Sector: 9

Sector: 10

Sector: 11

Sector: 12

N

Legend:

Sectors

SPA Species: Bar-tailed Godwit - Flock Size

2-10

11-100

101-500

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 2.1

High Tidal State SPA Species: Bar-tailed Godwit Flock Size (Roosting) 2015 - 2016

0 0.5 1

km

MAP SCALE: 1:30,000 @ A3

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

Status: Rev0
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295000

300000

685000

680000

Sector: 2

Sector: 3

Sector: 4

Sector: 7

Sector: 5

Sector: 6

Sector: 8

Sector: 9

Sector: 12

Sector: 11

Sector: 10

N

Legend:

Sectors

SPA Species: Bar-tailed Godwit - Flock Size

1

2-10

11-100

101-500

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 2.2

High Tidal State SPA Species: Bar-tailed Godwit Flock Size (Roosting) 2016 - 2017

0 0.5 1

km

MAP SCALE: 1:30,000 @ A3

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

Status: Rev0

Approved: RD

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Document Path: S:\Project GIS\CH2M\GrangemouthIO_R_Fig2.2_SPA_BA_HT_R_Flock_2016_2017_GFS.mxd

290000

295000

685000

Sector: 1

Sector: 2

Sector: 3

Sector: 4

Sector: 7

Sector: 5

Sector: 6

Sector: 8

Sector: 9

N

Legend:

Sectors

SPA Species: Black-tailed Godwit - Flock Size

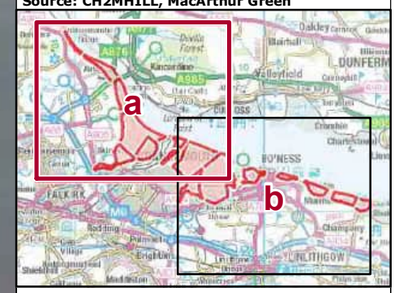
1

2-10

11-100

501 - 2000

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 3.1a

High Tidal State
SPA Species: Black-tailed Godwit Flock Size (Roosting) 2015 - 2016

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig3.1_SPA_BW_HT_R_Flock_2015_2016_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

300000

305000

680000

Sector: 7

Sector: 9

Sector: 12

Sector: 13

Sector: 14

Sector: 15

Sector: 16

Sector: 11

Sector: 10

N

Legend:

Sectors

SPA Species: Black-tailed Godwit - Flock Size

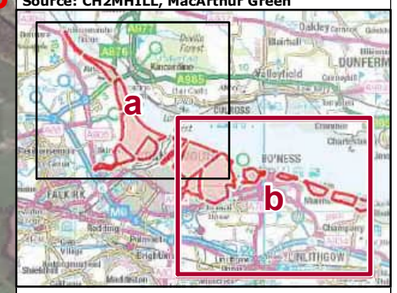
1

2-10

11-100

501 - 2000

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 3.1b

High Tidal State
SPA Species: Black-tailed Godwit
Flock Size (Roosting) 2015 - 2016

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

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290000

295000

685000

Sector: 1

Sector: 2

Sector: 3

Sector: 4

Sector: 5

Sector: 6

Sector: 7

Sector: 8

Sector: 9

N

Legend:

Sectors

SPA Species: Black-tailed Godwit - Flock Size

1

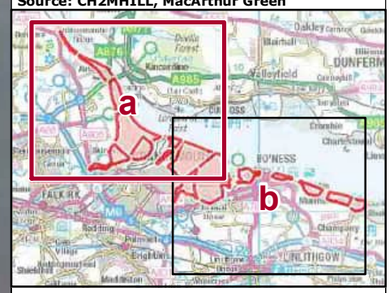
2-10

11-100

101-500

501 - 2000

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 3.2a

High Tidal State
SPA Species: Black-tailed Godwit Flock Size (Roosting) 2016 - 2017

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Status: Rev0
Approved: RD
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Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

300000

305000

680000

Sector: 7

Sector: 9

Sector: 12

Sector: 13

Sector: 14

Sector: 15

Sector: 16

Sector: 11

Sector: 10

Legend:

Sectors

SPA Species: Black-tailed Godwit - Flock Size

1

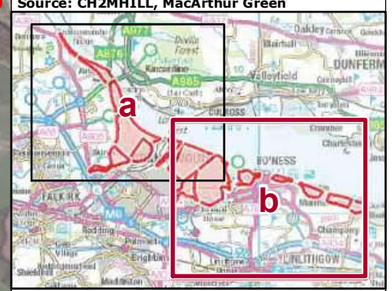
2-10

11-100

101-500

501 - 2000

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 3.2b

High Tidal State
SPA Species: Black-tailed Godwit
Flock Size (Roosting) 2016 - 2017

N

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

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Date: 18/08/2017

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290000

295000

685000

Sector: 1

Sector: 2

Sector: 3

Sector: 4

Sector: 5

Sector: 6

Sector: 7

Sector: 8

Sector: 9

N

Legend:

Sectors

SPA Species: Curlew - Flock Size

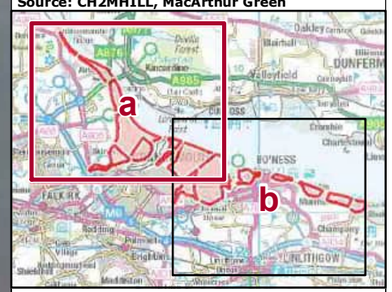
1

2-10

11-100

101-500

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 4.1a

High Tidal State
SPA Species: Curlew Flock Size (Roosting) 2015 - 2016

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Status: Rev0

Approved: RD

Checked: BJF

GIS TM: BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig4.1_SPA_CU_HT_R_Flock_2015_2016_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

300000

305000

680000

Sector: 7

Sector: 9

Sector: 12

Sector: 13

Sector: 14

Sector: 15

Sector: 16

Sector: 11

Sector: 10

Legend:

Sectors

SPA Species: Curlew - Flock Size

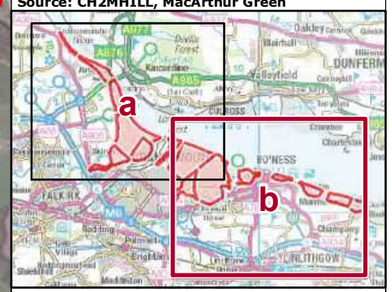
1

2-10

11-100

101-500

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 4.1b

High Tidal State
SPA Species: Curlew Flock Size (Roosting) 2015 - 2016

N

0 0.5 1

km

MAP SCALE: 1:30,000 @ A3

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

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290000

295000

685000

Sector: 1

Sector: 2

Sector: 3

Sector: 4

Sector: 5

Sector: 6

Sector: 7

Sector: 8

Sector: 9

N

Legend:

Sectors

SPA Species: Curlew - Flock Size

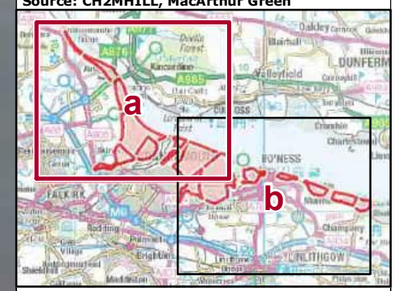
1

2-10

11-100

101-500

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 4.2a

High Tidal State
SPA Species: Curlew Flock Size (Roosting) 2015 - 2016

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Status: Rev0

Approved: RD

Checked: BJF

GIS TM: BJF

Document Path: S:\Project GIS\CH2MGrangemouthIO_R_Fig4.2_SPA_CU_HT_R_Flock_2016_2017_GFS.mxd

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Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

300000

305000

680000

Sector: 7

Sector: 9

Sector: 12

Sector: 13

Sector: 14

Sector: 15

Sector: 16

Sector: 11

Sector: 10

Legend:

Sectors

SPA Species: Curlew - Flock Size

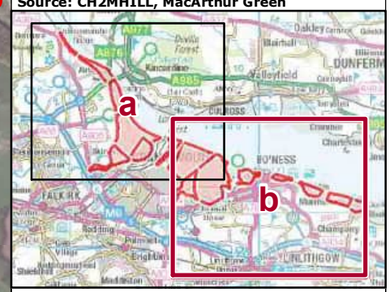
1

2-10

11-100

101-500

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 4.2b

High Tidal State
SPA Species: Curlew Flock Size (Roosting) 2015 - 2016

N

0 0.5 1

km

MAP SCALE: 1:30,000 @ A3

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

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Date: 18/08/2017

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290000

295000

685000

Sector: 1

Sector: 2

Sector: 3

Sector: 4

Sector: 5

Sector: 6

Sector: 7

Sector: 8

Sector: 9

N

Legend:

Sectors

SPA Species: Dunlin - Flock Size

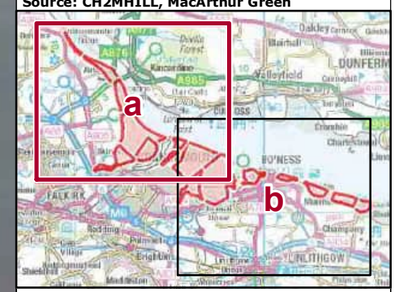
11-100

101-500

501 - 2000

2001 - 6300

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 5.1a

High Tidal State
SPA Species: Dunlin Flock Size (Roosting) 2015 - 2016

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Status: Rev0

Approved: RD

Checked: BJF

GIS TM: BJF

Document Path: S:\Project GIS\CH2MGrangemouthIO_R_Fig5.1_SPA_DN_HT_R_Flock_2015_2016_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

300000

305000

680000

Sector: 7

Sector: 9

Sector: 12

Sector: 13

Sector: 14

Sector: 15

Sector: 16

Sector: 11

Sector: 10

Legend:

Sectors

SPA Species: Dunlin - Flock Size

1

2-10

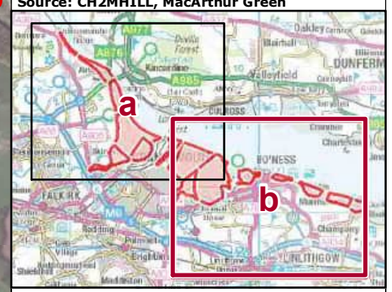
11-100

101-500

501 - 2000

2001 - 6300

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 5.1b

High Tidal State
SPA Species: Dunlin Flock Size (Roosting) 2015 - 2016

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

N

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2MGrangemouthIO_R_Fig5.1_SPA_DN_HT_R_Flock_2015_2016_GFS.mxd

290000

295000

685000

Sector: 1

Sector: 2

Sector: 3

Sector: 4

Sector: 5

Sector: 6

Sector: 7

Sector: 8

Sector: 9

N

Legend:

Sectors

SPA Species: Dunlin - Flock Size

1

2-10

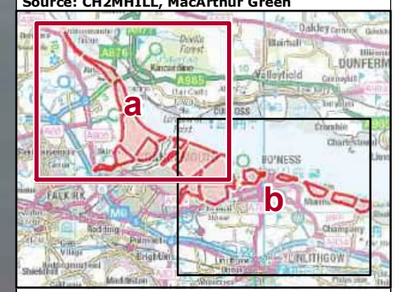
11-100

101-500

501 - 2000

2001 - 11000

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 5.2a

High Tidal State
SPA Species: Dunlin Flock Size (Roosting) 2016 - 2017

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: LNF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig5.2_SPA_DN_HT_R_Flock_2016_2017_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

300000

305000

680000

Sector: 7

Sector: 9

Sector: 12

Sector: 13

Sector: 14

Sector: 15

Sector: 16

Sector: 11

Sector: 10

Legend:

Sectors

SPA Species: Dunlin - Flock Size

1

2-10

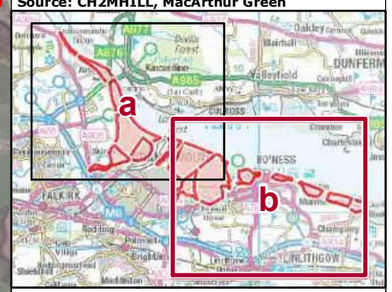
11-100

101-500

501 - 2000

2001 - 11000

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 5.2b

High Tidal State
SPA Species: Dunlin Flock Size (Roosting) 2016 - 2017

N

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

Status: Rev0 Approved: RD Checked: BJF GIS TM: LNF

Document Path: S:\Project GIS\CH2MGrangemouthIO_R_Fig5.2_SPA_DN_HT_R_Flock_2016_2017_GFS.mxd

290000 291000 292000 293000 294000 295000 296000 297000 298000 299000

687000 686000 685000 684000 683000 682000 681000 680000

Sector: 3

Sector: 4

Sector: 7

Sector: 5

Sector: 6

Sector: 8

Sector: 9

Sector: 10

Sector: 11

N

Legend:

Sectors

SPA Species: Golden Plover - Flock Size

11-100

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 6.1

High Tidal State
SPA Species: Golden Plover
Flock Size (Roosting) 2015 - 2016

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2M\GrangemouthO_R_Fig6.1_SPA_GP_HT_R_Flock_2015_2016_GFS.mxd

290000 291000 292000 293000 294000 295000 296000 297000 298000 299000

687000 686000 685000 684000 683000 682000 681000 680000

Sector: 3

Sector: 4

Sector: 7

Sector: 5

Sector: 6

Sector: 8

Sector: 9

Sec

Sector: 10

Sector: 11

N

Legend:

Sectors

SPA Species: Golden Plover - Flock Size

2-10

11-100

101-500

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 6.2

High Tidal State
SPA Species: Golden Plover
Flock Size (Roosting) 2016 - 2017

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig6.2_SPA_GP_HT_R_Flock_2016_2017_GFS.mxd

290000

295000

685000

Sector: 1

Sector: 2

Sector: 3

Sector: 4

Sector: 5

Sector: 6

Sector: 7

Sector: 8

Sector: 9

N

Legend:

Sectors

SPA Species: Knot - Flock Size

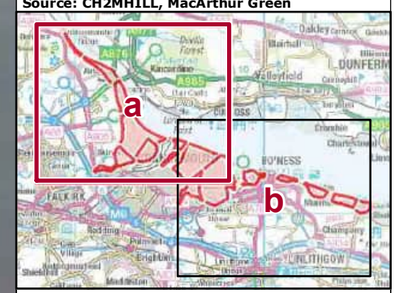
1

11-100

101-500

501 - 2000

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 7.1a

High Tidal State
SPA Species: Knot Flock Size (Roosting) 2015 - 2016

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Status: Rev0

Approved: RD

Checked: BJF

GIS TM: BJF

Document Path: S:\Project GIS\CH2M\GrangemouthIO_R_Fig7.1_SPA_KN_HT_R_Flock_2015_2016_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

300000

305000

680000

Sector: 7

Sector: 9

Sector: 12

Sector: 13

Sector: 14

Sector: 15

Sector: 16

Sector: 11

Sector: 10

Legend:

Sectors

SPA Species: Knot - Flock Size

1

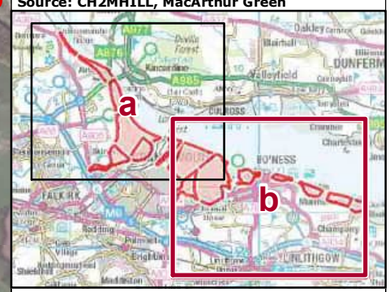
11-100

101-500

501 - 2000

2001 - 6300

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 7.1b

High Tidal State
SPA Species: Knot Flock Size (Roosting) 2015 - 2016

N

0 0.5 1

km

MAP SCALE: 1:30,000 @ A3

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

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290000

295000

685000

Sector: 1

Sector: 2

Sector: 3

Sector: 4

Sector: 5

Sector: 6

Sector: 7

Sector: 8

Sector: 9

N

Legend:

Sectors

SPA Species: Knot - Flock Size

1

2-10

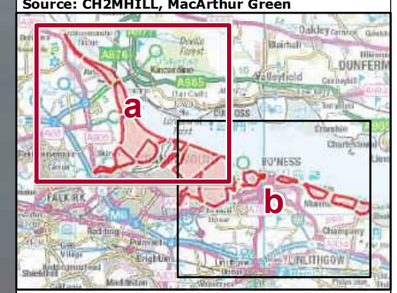
11-100

101-500

501 - 2000

2001 - 11000

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 7.2a

High Tidal State
SPA Species: Knot Flock Size (Roosting) 2016 - 2017

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Status: Rev0

Approved: RD

Checked: BJF

GIS TM: BJF

Document Path: S:\Project GIS\CH2M\GrangemouthIO_R_Fig7.2_SPA_KN_HT_R_Flock_2016_2017_GFS.mxd

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Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

300000

305000

680000

Sector: 7

Sector: 9

Sector: 12

Sector: 13

Sector: 14

Sector: 15

Sector: 10

Sector: 11

Sector: 16

N

Legend:

Sectors

SPA Species: Knot - Flock Size

1

2-10

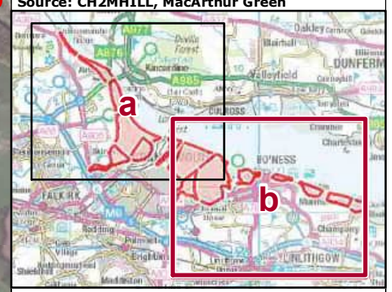
11-100

101-500

501 - 2000

2001 - 11000

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 7.2b

High Tidal State
SPA Species: Knot Flock Size (Roosting) 2016 - 2017

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2MGrangemouthIO_R_Fig7.2_SPA_KN_HT_R_Flock_2016_2017_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

290000

295000

685000

Sector: 2

Sector: 3

Sector: 4

Sector: 7

Sector: 5

Sector: 6

Sector: 8

Sector: 9

Sector: 10

Sector: 11

N

Legend:

Sectors

SPA Species: Pink-footed Goose - Flock Size

2-10

11-100

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 8.1

High Tidal State
SPA Species: Pink-footed Goose Flock Size (Roosting) 2015 - 2016

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

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Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig8.1_SPA_PG_HT_R_Flock_2015_2016_GFS.mxd

290000

295000

685000

Sector: 2

Sector: 3

Sector: 4

Sector: 5

Sector: 6

Sector: 7

Sector: 8

Sector: 9

Sector: 10

Sector: 11

N

Legend:

Sectors

SPA Species: Pink-footed Goose - Flock Size

2-10

11-100

101-500

501 - 2000

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 8.2

High Tidal State
SPA Species: Pink-footed Goose Flock Size (Roosting) 2016 - 2017

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Status: Rev0

Approved: RD

Checked: BJF

GIS TM: BJF

Document Path: S:\Project GIS\CH2MGrangemouthIO_R_Fig8.2_SPA_PG_HT_R_Flock_2016_2017_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

290000

295000

685000

Sector: 1

Sector: 2

Sector: 3

Sector: 4

Sector: 5

Sector: 6

Sector: 7

Sector: 8

Sector: 9

N

Legend:

Sectors

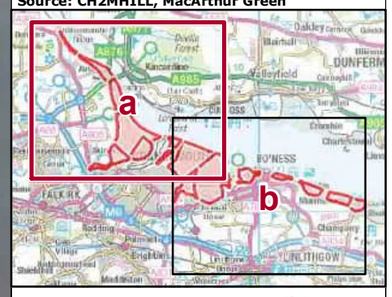
SPA Species: Red-breasted Merganser - Flock Size

1

2-10

11-100

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 9.1a

High Tidal State SPA Species: Red-breasted Merganser Flock Size (Roosting) 2016 - 2017

0 0.5 1

km

MAP SCALE: 1:30,000 @ A3

Status: Rev0

Approved: RD

Checked: BJF

GIS TM: BJF

Document Path: S:\Project GIS\CH2M\GrangemouthO_R_Fig9.2_SPA_RM_HT_R_Flock_2016_2017_GFS.mxd

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Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

300000

305000

680000

Sector: 7

Sector: 9

Sector: 10

Sector: 11

Sector: 12

Sector: 13

Sector: 14

Sector: 15

Sector: 16

N

Legend:

Sectors

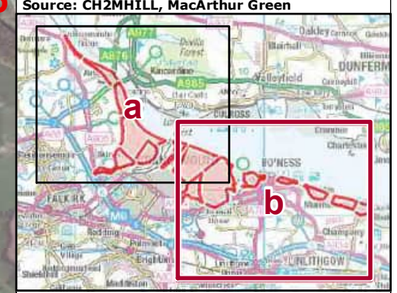
SPA Species: Red-breasted Merganser - Flock Size

1

2-10

11-100

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 9.1b

High Tidal State SPA Species: Red-breasted Merganser Flock Size (Roosting) 2016 - 2017

0 0.5 1

km

MAP SCALE: 1:30,000 @ A3

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

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290000

295000

685000

Sector: 1

Sector: 2

Sector: 3

Sector: 4

Sector: 5

Sector: 6

Sector: 7

Sector: 8

Sector: 9

N

Legend:

Sectors

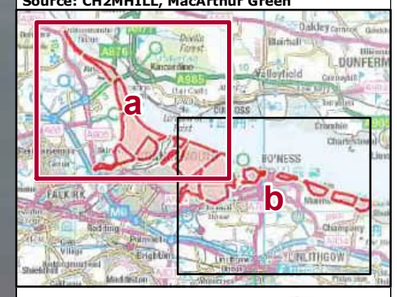
SPA Species: Red-breasted Merganser - Flock Size

1

2-10

11-100

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 9.2a

High Tidal State SPA Species: Red-breasted Merganser Flock Size (Roosting) 2016 - 2017

0 0.5 1

km

MAP SCALE: 1:30,000 @ A3

Status: Rev0

Approved: RD

Checked: BJF

GIS TM: BJF

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Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

300000

305000

680000

Sector: 7

Sector: 9

Sector: 10

Sector: 11

Sector: 12

Sector: 13

Sector: 14

Sector: 15

Sector: 16

Legend:

Sectors

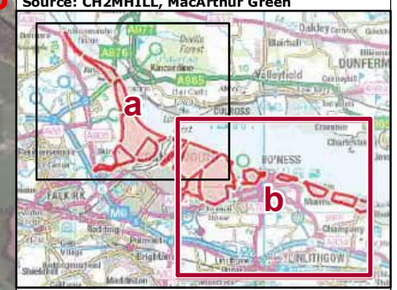
SPA Species: Red-breasted Merganser - Flock Size

1

2-10

11-100

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 9.2b

High Tidal State SPA Species: Red-breasted Merganser Flock Size (Roosting) 2016 - 2017

N

0 0.5 1

km

MAP SCALE: 1:30,000 @ A3

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

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290000

295000

685000

Sector: 1

Sector: 2

Sector: 3

Sector: 4

Sector: 5

Sector: 6

Sector: 7

Sector: 8

Sector: 9

N

Legend:

Sectors

SPA Species: Redshank - Flock Size

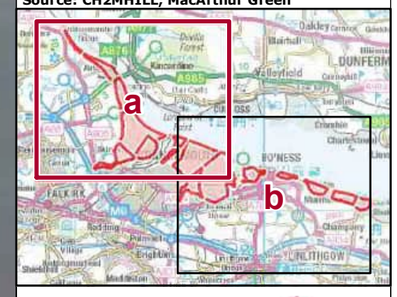
1

2-10

11-100

101-500

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 10.1a

High Tidal State SPA Species: Redshank Flock Size (Roosting) 2015 - 2016

0 0.5 1

km

MAP SCALE: 1:30,000 @ A3

Status: Rev0

Approved: RD

Checked: BJF

GIS TM: BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig10.1_SPA_RK_HT_R_Flock_2015_2016_GFS.mxd

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Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

300000

305000

680000

Sector: 7

Sector: 9

Sector: 12

Sector: 13

Sector: 14

Sector: 15

Sector: 16

Sector: 11

Sector: 10

N

Legend:

Sectors

SPA Species: Redshank - Flock Size

1

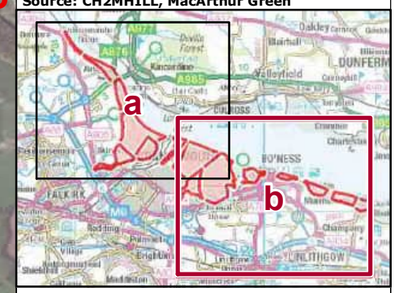
2-10

11-100

101-500

501 - 2000

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 10.1b

High Tidal State SPA Species: Redshank Flock Size (Roosting) 2015 - 2016

0 0.5 1

km

MAP SCALE: 1:30,000 @ A3

Status: Rev0

Approved: RD

Checked: BJF

GIS TM: BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig10.1_SPA_RK_HT_R_Flock_2015_2016_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

290000

295000

685000

Sector: 1

Sector: 2

Sector: 3

Sector: 4

Sector: 5

Sector: 6

Sector: 7

Sector: 8

Sector: 9

N

Legend:

Sectors

SPA Species: Redshank - Flock Size

1

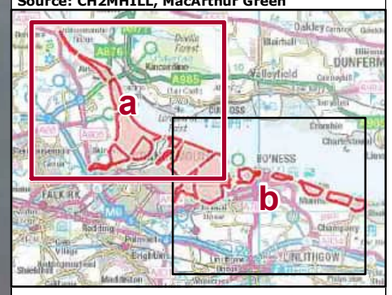
2-10

11-100

101-500

501 - 2000

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 10.2a

High Tidal State SPA Species: Redshank Flock Size (Roosting) 2016 - 2017

0 0.5 1

km

MAP SCALE: 1:30,000 @ A3

Status: Rev0

Approved: RD

Checked: BJF

GIS TM: BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig10.2_SPA_RK_HT_R_Flock_2016_2017_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

300000

305000

680000

Sector: 7

Sector: 9

Sector: 12

Sector: 13

Sector: 14

Sector: 15

Sector: 16

Sector: 10

Sector: 11

Legend:

Sectors

SPA Species: Redshank - Flock Size

1

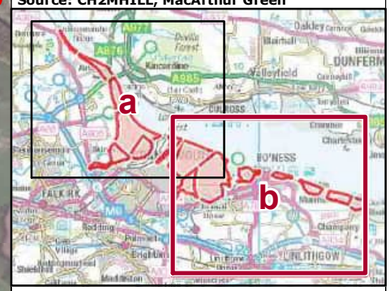
2-10

11-100

101-500

501 - 2000

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 10.2b

High Tidal State SPA Species: Redshank Flock Size (Roosting) 2016 - 2017

N

0 0.5 1

km

MAP SCALE: 1:30,000 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2MGrangemouthIO_R_Fig10.2_SPA_RK_HT_R_Flock_2016_2017_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

290000

295000

685000

Sector: 1

Sector: 2

Sector: 3

Sector: 4

Sector: 5

Sector: 6

Sector: 7

Sector: 8

Sector: 9

N

Legend:

Sectors

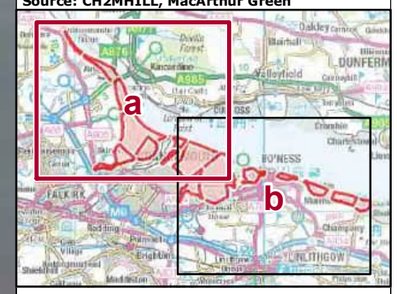
SPA Species: Shelduck - Flock Size

2-10

11-100

101-500

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 11.1a

High Tidal State
SPA Species: Shelduck
Flock Size (Roosting) 2015 - 2016

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Status: Rev0

Approved: RD

Checked: BJF

GIS TM: BJF

Document Path: S:\Project GIS\CH2M\GrangemouthO_R_Fig11.1_SPA_SU_HT_R_Flock_2015_2016_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

300000

305000

680000

Sector: 7

Sector: 9

Sector: 12

Sector: 13

Sector: 14

Sector: 15

Sector: 16

Sector: 11

Sector: 10

Legend:

Sectors

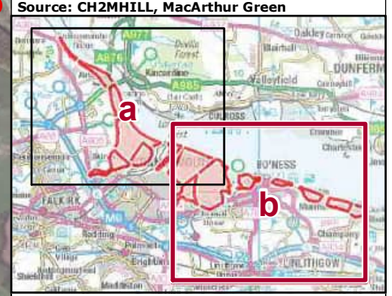
SPA Species: Shelduck - Flock Size

2-10

11-100

101-500

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 11.1b

High Tidal State
SPA Species: Shelduck
Flock Size (Roosting) 2015 - 2016

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

N

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

Status: Rev0

Approved: RD

Checked: BJF

GIS TM: BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig11.1_SPA_SU_HT_R_Flock_2015_2016_GFS.mxd

290000

295000

685000

Sector: 1

Sector: 2

Sector: 3

Sector: 4

Sector: 5

Sector: 6

Sector: 7

Sector: 8

Sector: 9

N

Legend:

Sectors

SPA Species: Shelduck - Flock Size

1

2-10

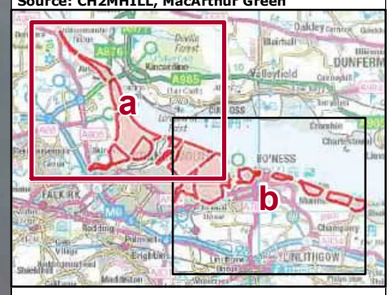
11-100

101-500

501 - 2000

2001 - 11000

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 11.2a

High Tidal State
SPA Species: Shelduck
Flock Size (Roosting) 2016 - 2017

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

Status: Rev0

Approved: RD

Checked: BJF

GIS TM: BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig11.2_SPA_SU_HT_R_Flock_2016_2017_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

300000

305000

680000

Sector: 7

Sector: 9

Sector: 12

Sector: 13

Sector: 14

Sector: 15

Sector: 10

Sector: 11

Sector: 16

Legend:

Sectors

SPA Species: Shelduck - Flock Size

1

2-10

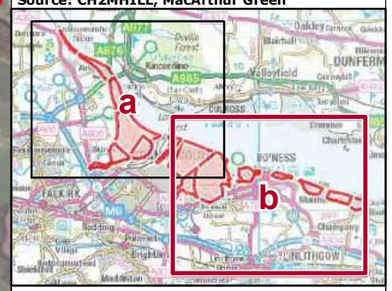
11-100

101-500

501 - 2000

2001 - 11000

Source: CH2MHILL, MacArthur Green



MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 11.2b

High Tidal State
SPA Species: Shelduck
Flock Size (Roosting) 2016 - 2017

0 0.5 1
km

MAP SCALE: 1:30,000 @ A3

N

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2MGrangemouthIO_R_Fig11.2_SPA_SU_HT_R_Flock_2016_2017_GFS.mxd

290000

291000

292000

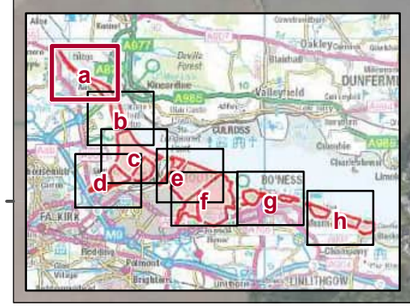
689000

688000

687000

Sector: 1

Sector: 2



Legend:

Sectors

SPA Species: All records

- Bar-tailed Godwit
- Black-tailed Godwit
- Curlew
- Dunlin
- Golden Plover
- Knot
- Pink-footed Goose
- Red-breasted Merganser
- Redshank
- Sandwich Tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 2000
- 2001 - 9000

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 12.1a

SPA Species Flock Size (Feeding) 2015 - 2016

N

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

Status: Rev0

Approved: RD

Checked: BJF

GIS TM: BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig12.1_AllSpecies_SPA_Flock_2015_2016_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

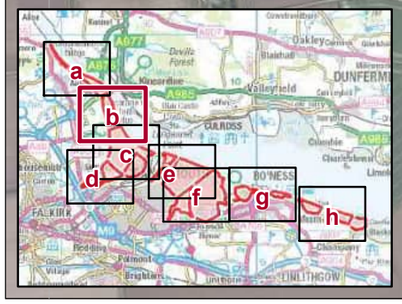
291000 292000 293000 294000

687000

686000

685000

Sector: 3



N

Legend:

- Sectors

SPA Species: All records

- Bar-tailed Godwit
- Black-tailed Godwit
- Curlew
- Dunlin
- Golden Plover
- Knot
- Pink-footed Goose
- Red-breasted Merganser
- Redshank
- Sandwich Tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 2000
- 2001 - 9000

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 12.1b

SPA Species Flock Size (Feeding) 2015 - 2016

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig12.1_AllSpecies_SPA_Flock_2015_2016_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

292000 293000 294000 295000

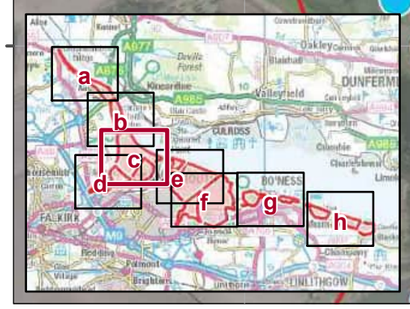
685000

684000

683000

Sector: 4

Sector: 6



N

Legend:

Sectors

SPA Species: All records

- Bar-tailed Godwit
- Black-tailed Godwit
- Curlew
- Dunlin
- Golden Plover
- Knot
- Pink-footed Goose
- Red-breasted Merganser
- Redshank
- Sandwich Tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 2000
- 2001 - 9000

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 12.1c

SPA Species Flock Size (Feeding) 2015 - 2016

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig12.1_AllSpecies_SPA_Flock_2015_2016_GFS.mxd

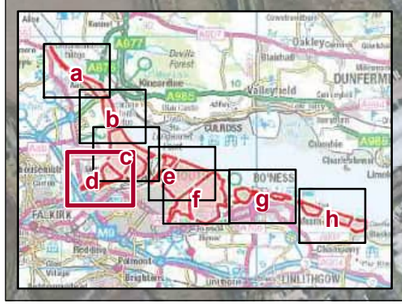
Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

291000
292000
293000
684000
683000
682000

Sector: 5



Legend:

Sectors

SPA Species: All records

- Bar-tailed Godwit
- Black-tailed Godwit
- Curlew
- Dunlin
- Golden Plover
- Knot
- Pink-footed Goose
- Red-breasted Merganser
- Redshank
- Sandwich Tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 2000
- 2001 - 9000

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 12.1d

SPA Species Flock Size (Feeding) 2015 - 2016

0 250 500
Metres
MAP SCALE: 1:10,000 @ A3

N

Status: Rev0
Approved: RD
Checked: BJF
GIS TM: BJF
Document Path: S:\Project GIS\CH2M\GrangemouthIO_R_Fig12.1_AllSpecies_SPA_Flock_2015_2016_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

295000 296000 297000

684000

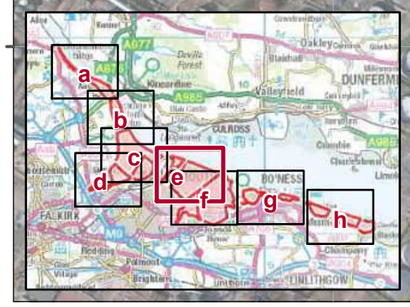
683000

682000

Sector: 7

Sector: 8

Sector: 9



N

ch2m.

Legend:

Sectors

SPA Species: All records

- Bar-tailed Godwit
- Black-tailed Godwit
- Curlew
- Dunlin
- Golden Plover
- Knot
- Pink-footed Goose
- Red-breasted Merganser
- Redshank
- Sandwich Tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 2000
- 2001 - 9000

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 12.1e

SPA Species Flock Size (Feeding) 2015 - 2016

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig12.1_AllSpecies_SPA_Flock_2015_2016_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

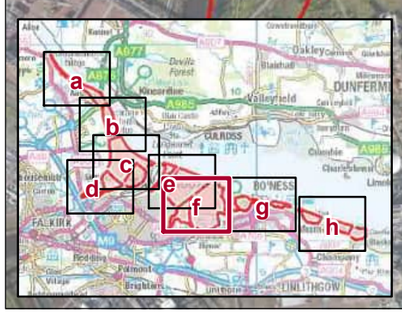
296000 297000 298000

683000 682000 681000

Sector: 9

Sector: 10

Sector: 11



ch2m.

Legend:

Sectors

SPA Species: All records

- Bar-tailed Godwit
- Black-tailed Godwit
- Curlew
- Dunlin
- Golden Plover
- Knot
- Pink-footed Goose
- Red-breasted Merganser
- Redshank
- Sandwich Tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 2000
- 2001 - 9000

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 12.1f

SPA Species Flock Size (Feeding) 2015 - 2016

N

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig12.1_AllSpecies_SPA_Flock_2015_2016_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

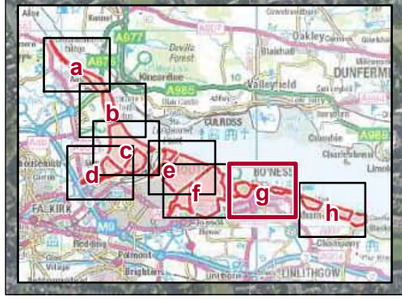
Date: 18/08/2017

299000 300000 301000

683000 682000 681000

Sector: 12

Sector: 13



N

Legend:

Sectors

SPA Species: All records

- Bar-tailed Godwit
- Black-tailed Godwit
- Curlew
- Dunlin
- Golden Plover
- Knot
- Pink-footed Goose
- Red-breasted Merganser
- Redshank
- Sandwich Tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 2000
- 2001 - 9000

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 12.1g

SPA Species Flock Size (Feeding) 2015 - 2016

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2M\GrangemouthIO_R_Fig12.1_AllSpecies_SPA_Flock_2015_2016_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

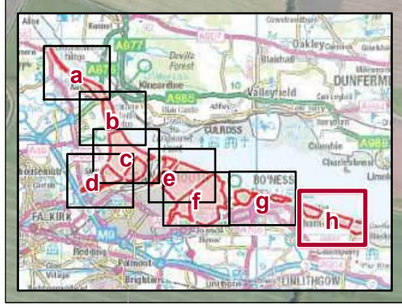
302000 303000 304000 305000

682000 681000 680000

Sector: 14

Sector: 15

Sector: 16



N

Legend:

Sectors

SPA Species: All records

- Bar-tailed Godwit
- Black-tailed Godwit
- Curlew
- Dunlin
- Golden Plover
- Knot
- Pink-footed Goose
- Red-breasted Merganser
- Redshank
- Sandwich Tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 2000
- 2001 - 9000

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 12.1h

SPA Species Flock Size (Feeding) 2015 - 2016

0 250 500

Metres

MAP SCALE: 1:12,500 @A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig12.1_AllSpecies_SPA_Flock_2015_2016_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

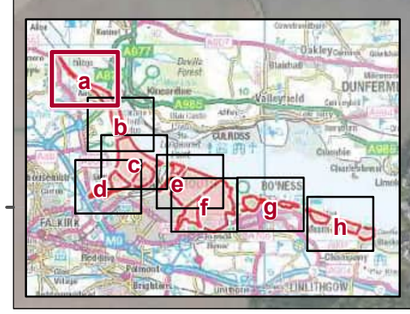
Date: 18/08/2017

290000 291000 292000

689000 688000 687000

Sector: 1

Sector: 2



ch2m.

Legend:

Sectors

SPA Species: All records

- Bar-tailed Godwit
- Black-tailed Godwit
- Curlew
- Dunlin
- Golden Plover
- Knot
- Pink-footed Goose
- Red-breasted Merganser
- Redshank
- Sandwich Tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 2000
- 2001 - 9700

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 12.2a

SPA Species Flock Size (Feeding) 2016 - 2017

N

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM:BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig12.2_AllSpecies_SPA_Flock_2016_2017_GFS.mxd

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

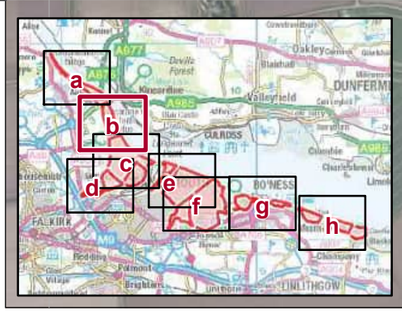
291000 292000 293000 294000

687000

686000

685000

Sector: 3



N

Legend:

Sectors

SPA Species: All records

- Bar-tailed Godwit
- Black-tailed Godwit
- Curlew
- Dunlin
- Golden Plover
- Knot
- Pink-footed Goose
- Red-breasted Merganser
- Redshank
- Sandwich Tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 2000
- 2001 - 9700

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 12.2b

SPA Species Flock Size (Feeding) 2016 - 2017

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM:BJF

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Date: 18/08/2017

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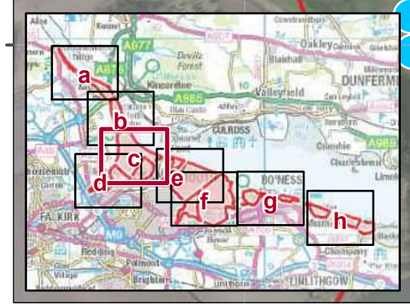
685000

684000

683000

Sector: 4

Sector: 6



ch2m.

Legend:

Sectors

SPA Species: All records

- Bar-tailed Godwit
- Black-tailed Godwit
- Curlew
- Dunlin
- Golden Plover
- Knot
- Pink-footed Goose
- Red-breasted Merganser
- Redshank
- Sandwich Tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 2000
- 2001 - 9700

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 12.2c

SPA Species Flock Size (Feeding) 2016 - 2017

N

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM:BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig12.2_AllSpecies_SPA_Flock_2016_2017_GFS.mxd

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

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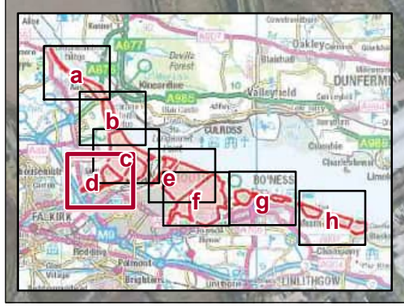
Sector: 5



N

ch2m.

Legend:

Sectors

SPA Species: All records

- Bar-tailed Godwit
- Black-tailed Godwit
- Curlew
- Dunlin
- Golden Plover
- Knot
- Pink-footed Goose
- Red-breasted Merganser
- Redshank
- Sandwich Tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 2000
- 2001 - 9700

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 12.2d

SPA Species Flock Size (Feeding) 2016 - 2017

0 250 500
Metres
MAP SCALE: 1:10,000 @ A3

Status: Rev0
Approved: RD
Checked: BJF
GIS TM:BJF
Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig12.2_AllSpecies_SPA_Flock_2016_2017_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

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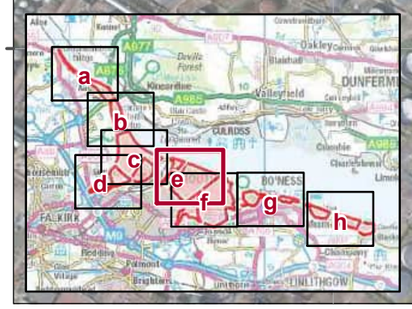
684000 683000 682000

Sector: 7

Sector: 8

Sector: 9



ch2m.

Legend:

Sectors

SPA Species: All records

- Bar-tailed Godwit
- Black-tailed Godwit
- Curlew
- Dunlin
- Golden Plover
- Knot
- Pink-footed Goose
- Red-breasted Merganser
- Redshank
- Sandwich Tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 2000
- 2001 - 9700

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 12.2e

SPA Species Flock Size (Feeding) 2016 - 2017

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM:BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig12.2_AllSpecies_SPA_Flock_2016_2017_GFS.mxd

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Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

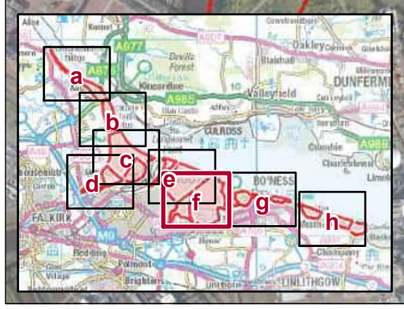
296000 297000 298000

683000 682000 681000

Sector: 9

Sector: 10

Sector: 11



ch2m.

Legend:

Sectors

SPA Species: All records

- Bar-tailed Godwit
- Black-tailed Godwit
- Curlew
- Dunlin
- Golden Plover
- Knot
- Pink-footed Goose
- Red-breasted Merganser
- Redshank
- Sandwich Tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 2000
- 2001 - 9700

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 12.2f

SPA Species Flock Size (Feeding) 2016 - 2017

N

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM:BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig12.2_AllSpecies_SPA_Flock_2016_2017_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

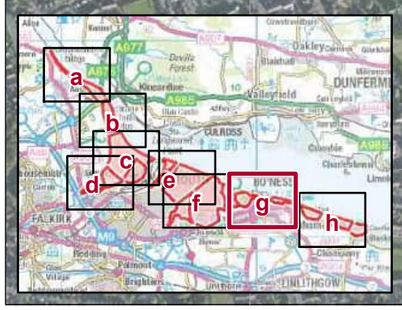
Date: 18/08/2017

299000 300000 301000

683000 682000 681000

Sector: 12

Sector: 13



Legend:

Sectors

SPA Species: All records

- Bar-tailed Godwit
- Black-tailed Godwit
- Curlew
- Dunlin
- Golden Plover
- Knot
- Pink-footed Goose
- Red-breasted Merganser
- Redshank
- Sandwich Tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 2000
- 2001 - 9700

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 12.2g

SPA Species Flock Size (Feeding) 2016 - 2017

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

N

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

Status: Rev0 Approved: RD Checked: BJF GIS TM:BJF

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682000

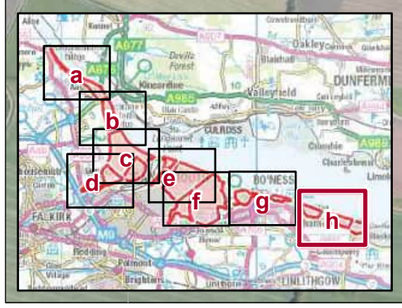
681000

680000

Sector: 14

Sector: 15

Sector: 16



N

ch2m.

Legend:

Sectors

SPA Species: All records

- Bar-tailed Godwit
- Black-tailed Godwit
- Curlew
- Dunlin
- Golden Plover
- Knot
- Pink-footed Goose
- Red-breasted Merganser
- Redshank
- Sandwich Tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 2000
- 2001 - 9700

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 12.2h

SPA Species Flock Size (Feeding) 2016 - 2017

0 250 500

Metres

MAP SCALE: 1:12,500 @ A3

Status: Rev0

Approved: RD

Checked: BJF

GIS TM:BJF

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig12.2_AllSpecies_SPA_Flock_2016_2017_GFS.mxd

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Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

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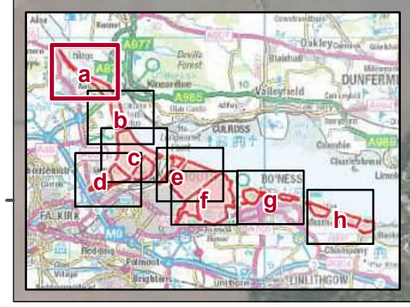
689000 688000 687000

Sector: 1

Sector: 2



N

Legend:

Sectors

SPA Species: All Records

- Bar-tailed godwit
- Curlew
- Dunlin
- Eider
- Great crested grebe
- Lapwing
- Oystercatcher
- Red-breasted merganser
- Redshank
- Ringed plover
- Sandwich tern
- Shelduck

Sandwich tern

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 900

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 13a

2016 Breeding Season: SPA Records

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

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Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

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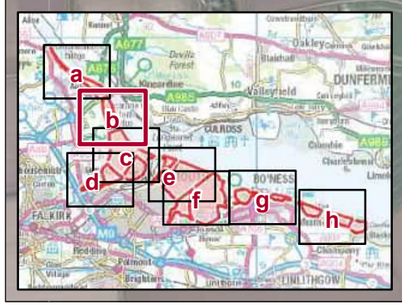
687000

686000

685000

Sector: 3



N

ch2m.

Legend:

Sectors

SPA Species: All Records

- Bar-tailed godwit
- Curlew
- Dunlin
- Eider
- Great crested grebe
- Lapwing
- Oystercatcher
- Red-breasted merganser
- Redshank
- Ringed plover
- Sandwich tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 900

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 13b

2016 Breeding Season: SPA Records

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

Status: Rev0

Approved: RD

Checked: BJF

GIS TM: BJF

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Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

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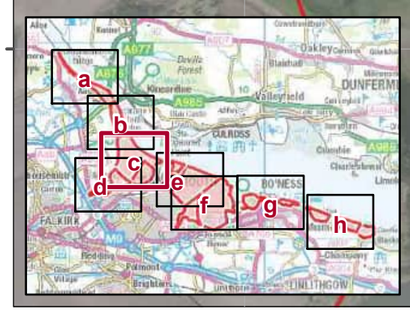
685000

684000

683000

Sector: 4

Sector: 6



N

ch2m.

Legend:

Sectors

SPA Species: All Records

- Bar-tailed godwit
- Curlew
- Dunlin
- Eider
- Great crested grebe
- Lapwing
- Oystercatcher
- Red-breasted merganser
- Redshank
- Ringed plover
- Sandwich tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 900

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 13c

2016 Breeding Season: SPA Records

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

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Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

291000
292000
293000
684000
683000
682000
Sector: 5
a
b
c
d
e
f
g
h
N
Legend:
Sectors
SPA Species: All Records
Bar-tailed godwit
Curlew
Dunlin
Eider
Great crested grebe
Lapwing
Oystercatcher
Red-breasted merganser
Redshank
Ringed plover
Sandwich tern
Shelduck
Flock Size
1
2 - 10
11 - 100
101 - 500
501 - 900
Source: CH2MHILL, MacArthur Green
MacArthur Green
Grangemouth Flood Alleviation Scheme
Figure 13d
2016 Breeding Season: SPA Records
0
250
500
Metres
MAP SCALE: 1:10,000 @ A3
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Checked: BJF
Approved: RD
Status: Rev0
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Datum: OSGB 1936, Projection: British National Grid
Date: 18/08/2017

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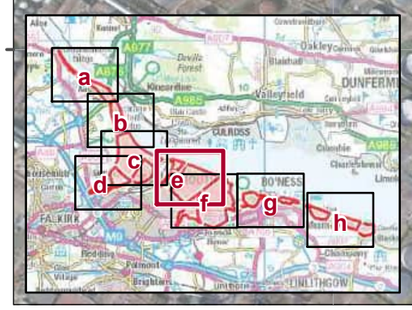
684000 683000 682000

Sector: 7

Sector: 8

Sector: 9



Legend:

Sectors

SPA Species: All Records

- Bar-tailed godwit
- Curlew
- Dunlin
- Eider
- Great crested grebe
- Lapwing
- Oystercatcher
- Red-breasted merganser
- Redshank
- Ringed plover
- Sandwich tern
- Shelduck

Sandwich tern

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 900

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 13e

2016 Breeding Season: SPA Records

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

N

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

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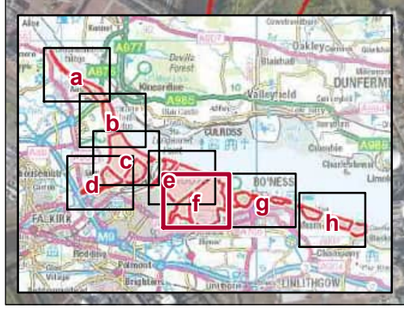
297000
298000
683000
682000
681000

Sector: 9

Sector: 10

Sector: 11



ch2m.

Legend:

Sectors

SPA Species: All Records

- Bar-tailed godwit
- Curlew
- Dunlin
- Eider
- Great crested grebe
- Lapwing
- Oystercatcher
- Red-breasted merganser
- Redshank
- Ringed plover
- Sandwich tern
- Shelduck

Sandwich tern

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 900

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 13f

2016 Breeding Season: SPA Records

N

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

Status: Rev0
Approved: RD
Checked: BJF
GIS TM: BJF

Document Path: S:\Project GIS\CH2MGrangemouth\O_R_Fig13_BreedingSeason_BBS_GFS.mxd

Datum: OSGB 1936, Projection: British National Grid

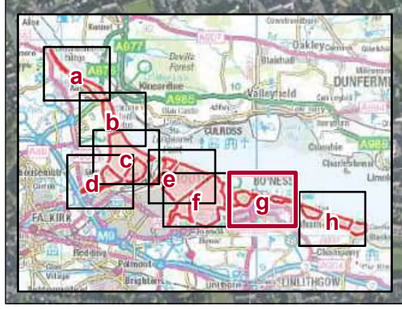
Date: 18/08/2017

299000 300000 301000

683000 682000 681000

Sector: 12

Sector: 13



N

ch2m.

Legend:

Sectors

SPA Species: All Records

- Bar-tailed godwit
- Curlew
- Dunlin
- Eider
- Great crested grebe
- Lapwing
- Oystercatcher
- Red-breasted merganser
- Redshank
- Ringed plover
- Sandwich tern
- Shelduck

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 900

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 13g

2016 Breeding Season: SPA Records

0 250 500

Metres

MAP SCALE: 1:10,000 @ A3

Status: Rev0 Approved: RD Checked: BJF GIS TM: BJF

Document Path: S:\Project GIS\CH2M\GrangemouthIO_R_Fig13_BreedingSeason_BBS_GFS.mxd

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Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

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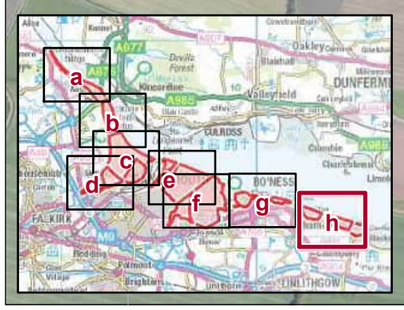
682000 681000 680000

Sector: 14

Sector: 15

Sector: 16



N

ch2m.

Legend:

Sectors

SPA Species: All Records

- Bar-tailed godwit
- Curlew
- Dunlin
- Eider
- Great crested grebe
- Lapwing
- Oystercatcher
- Red-breasted merganser
- Redshank
- Ringed plover
- Sandwich tern
- Shelduck

Sandwich tern

Flock Size

- 1
- 2 - 10
- 11 - 100
- 101 - 500
- 501 - 900

Source: CH2MHILL, MacArthur Green

MacArthur Green

Grangemouth Flood Alleviation Scheme

Figure 13h

2016 Breeding Season: SPA Records

0 250 500
Metres
MAP SCALE: 1:12,500 @ A3

GIS TM: BJF Checked: BJF Approved: RD Status: Rev0

Document Path: S:\Project GIS\CH2M\Grangemouth\O_R_Fig13_BreedingSeason_BBS_GFS.mxd

Source: ESRI, DigitalGlobe, GeoEye, I-Cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Areogrid, IGN, IGP, swisstopo, and the GIS Community

Datum: OSGB 1936, Projection: British National Grid

Date: 18/08/2017

Environmental Impact Assessment Report

Appendix C7.2: Breeding Bird Survey (2018)

Grangemouth Flood Protection Scheme 2024
Falkirk Council

GRANGEMOUTH
Flood Protection Scheme
Protecting the heart of our communities

Echoes Ecology Ltd
www.echoesecology.co.uk

BREEDING BIRD SURVEY

GRANGEMOUTH FLOOD PROTECTION SCHEME

DATE: 17 SEPTEMBER 2018

CONTRACT REF: HAL04.18.1657

SITE LOCATION: GRANGEMOUTH

OS GRID REF: NS 926 799

CLIENT: JACOBS

ECHOES ECOLOGY LTD

UNIT 39 HAYPARK BUSINESS CENTRE

MARCHMONT AVENUE

POLMONT

FK2 0NZ

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Marchmont Avenue
Polmont
Falkirk
FK2 0NZ

Tel: 0870 234 0002

Email: heather.simpson@echoesecology.co.uk
Website: www.echoesecology.co.uk

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Document Control

Version	Date	Prepared By	Approved By
1	17 September 2018	 Heather Simpson MCIEEM Principal Ecologist	 Neil Middleton ACIEEM Co-owner

Contents of Report

Executive Summary

The proposed Grangemouth Flood Protection Scheme (FPS) aims to reduce flood risk in the Grangemouth area. It includes sections of the River Carron, River Avon, Grange Burn, a drainage ditch connecting the Grange Burn and River Avon, Polmont Burn and the River Forth Estuary shoreline.

Echoes Ecology Ltd were contracted by Jacobs to carry out breeding bird surveys on the sections of the Grangemouth FPS that lie outwith the boundary of the Firth of Forth Special Protection Area (SPA). This included sections of the River Carron, River Avon, Grange Burn, Polmont Burn and a drainage channel running alongside the A905.

A total of 48 species were recorded during the breeding bird surveys. Of the species recorded, seven were red-listed Birds of Conservation Concern (BoCC), 14 were amber-listed BoCC, and three were green-listed BoCC but highlighted as local priority species on the Falkirk Local Biodiversity Action Plan (Eaton *et al*., 2015; Falkirk Council, 2011). Included within those listed as an amber BoCC is Kingfisher (*Alcedo atthis*), which is also listed on Schedule 1 of the Wildlife and Countryside Act 1981 and so is afforded a higher level of protection during the breeding season.

The loss of any trees, grassland and bank side vegetation will have an impact upon birds, both directly and indirectly through loss of nest sites and foraging opportunities. Disturbance caused during operation will also potentially render any retained habitat in the vicinity of works unsuitable for foraging and nesting. However, it should be noted that disturbance from public, including dog walkers, and industrial machinery is already present around the water courses.

The potential breeders that are closely associated with the riparian corridor include grey wagtail (*Motacilla cinereal*), dipper (*Cinclus cinclus*), mute swan (*Cygnus olor*) mallard (*Anas platyrhynchos*), red-breasted merganser (*Mergus serrator*) and kingfisher. These species are more susceptible to the habitat loss and associated disturbance and may be significantly impacted upon by the works.

The impacts upon breeding birds and appropriate mitigation will be better understood once the final details of the works are decided. However, the following mitigation is still relevant as it applies to all types of work around the water courses.

Works should be micro-sited in order to minimise any vegetation clearance. If vegetation clearance is unavoidable then it should be reinstated post works with appropriate monitoring to ensure the pre-existing habitats are restored successfully. Vegetation removal should be timed so that it takes place outside the nesting season. The nesting season for the species recorded within the site is March to September inclusive.

If works to any structures or vegetation clearance are to take place within the nesting season (March to September), a nesting bird check must be completed by a suitably qualified ecologist. The results of nesting bird checks should only be regarded as valid for three days, after which further checks will be required to ensure that the situation with regards to nesting birds has not changed.

Although kingfishers are unlikely to nest within the survey area, as a precaution a nesting bird check tailored to kingfishers should be completed prior to any works on the River Avon, Polmont Burn and the upstream section of the River Carron. The nesting bird check should involve a vantage point survey over the area of works, commencing at sunrise and lasting for at least 2 hours.

All works should be undertaken in accordance with the relevant Pollution Prevention Guidelines (NetRegs, 2018) to prevent pollution of the water courses.

Section 1 - Introduction

1.1 Contract Overview

1.1.1 The proposed Grangemouth Flood Protection Scheme (FPS) aims to reduce flood risk in the Grangemouth area. It includes sections of the River Carron, River Avon, Grange Burn, a drainage ditch connecting the Grange Burn and River Avon, Polmont Burn and the River Forth Estuary shoreline.

1.1.2 An extended Phase 1 habitat survey was completed by Echoes Ecology Ltd on behalf of CH2M in 2016 (Echoes Ecology Ltd, 2016). The survey highlighted the potential for breeding birds around the scheme alignment. Ornithological studies are currently underway in order to assess the impact upon the Firth of Forth Special Protection Area (SPA); these include both winter and breeding bird surveys.

1.1.3 Echoes Ecology Ltd were contracted by Jacobs to carry out breeding bird surveys on the sections of the Grangemouth FPS that lie outwith the boundary of the SPA. This included sections of the River Carron, River Avon, Grange Burn, Polmont Burn and a drainage channel that runs alongside the A905. A plan of the scheme extent and survey area is presented in Appendix I.

1.1.4 The following documents have been provided to Echoes Ecology Ltd in order to assist in carrying out this contract:

- Grangemouth FPS extent, as of January 2018

1.2 Survey Aims

1.2.1 The aims of the survey were:

- To carry out breeding bird surveys to determine the species and location of breeding birds along the scheme alignment and the surrounding area
- To assess the likely impact of the development on breeding birds
- If necessary, to suggest mitigation and compensation to minimise the predicted impacts upon breeding birds.

Section 2 - Relevant Legislation and Policy

2.1 Legal Considerations

2.1.1 In Scotland birds are protected under the Wildlife and Countryside Act 1981, as amended.

2.1.2 All wild birds (defined as 'any species which is ordinarily resident in or is a visitor to the European Territory of any member state (of the EU)'), their nests and their eggs are protected by law unless an exception is specified in the legislation.

2.1.3 Basic protection afforded to wild birds makes it an offence, unless specifically excluded, to:

- Intentionally or recklessly kill, injure or take a wild bird
- Intentionally or recklessly take, damage or destroy a nest whilst being built or in use
- Intentionally or recklessly take or destroy an egg of a wild bird
- Have in possession or control any wild bird, dead or alive, or any part of a wild bird taken in contravention to the Wildlife and Countryside Act 1981, as amended, or whilst the Protection of Wild Birds Act 1954 was in force
- Have in possession any live bird of prey of any species in the world unless it is registered and ringed
- Have in possession or control any bird of a species occurring on Schedule 4 of the Wildlife and Countryside Act 1981, as amended, unless registered and in most cases ringed (in accordance with the Secretary of State's regulations)
- Intentionally or recklessly disturb any wild bird listed on Schedule 1 while it is nest building, or at a nest containing eggs or young, or disturb the dependent young of such a bird.
- Use traps to kill, injure or take wild birds.

2.1.4 The 'Birds Directive' (Directive 2009/147/EC on the conservation of wild birds (codified version)) codifies the conservation of wild birds and their habitats across member states. Annex I of this Directive lists a number of species which are required to be the subject of special conservation measures concerning their habitat, and as such is the basis of the designation of UK Special Protection Areas (SPAs) for birds.

2.1 UK Birds of Conservation Concern (BoCC) lists

2.1.1 The Birds of Conservation Concern review (Eaton *et al.*, 2015) assesses the populations of British birds against a set of objective criteria (e.g., known population declines across the UK and/or EU). As a result, each species is placed on one of three lists – Green, Amber and Red – indicating an increasing level of conservation concern.

2.2 Local Biodiversity Action Plan

2.2.1 Local Biodiversity Action Plan Partnerships were established in the UK following the ratification of the Convention on Biological Diversity in 1992. Each local partnership publishes biodiversity action plans which identify the habitats or species selected as priorities for targeted conservation work. The survey area lies within Falkirk, for which the Falkirk Area Biodiversity Action Plan 2011-2014 (FBAP) has been published (Falkirk Council, 2011). The plan is being revised, with an updated document due for publication in 2018.

Section 3 - Survey Methodology

3.1 Survey Methodology

3.1.1 The survey methods employed are taken/adapted from the following:

- BTO Common Birds Census Instructions (Marchant, 1983)
- Birds Census Techniques. 2nd Edition (Bibby *et al*., 2000)
- Bird Monitoring Methods (Gilbert *et al*., 1998).

3.2 Field Survey Methods

3.2.1 Three visits were made between 22.05.18 and 29.06.18 following an adapted Common Bird Census (CBC) technique. Due to the size of the site, each visit was completed over four separate dates; details of the site visits including weather conditions are presented in Appendix II, Table II.1. The survey method involved walking a pre-plotted transect route, during which all species detected were noted and their behaviour mapped in line with BTO symbology. The surveys were completed by Heather Simpson MCIEEM. Equipment used during the surveys included a GPS (Garmin eTrex 10) and binoculars (magnification 8x42). Field recording maps were analysed according to CBC methodology (Bibby *et al.*, 2000).

3.3 Limitations to Survey Work

3.3.1 To map the territories (as opposed to the presence and behaviours) of bird species accurately, at least 10 visits is usually considered adequate. However, for a standard breeding bird survey it would not normally be deemed necessary to carry out this number of visits, as is demonstrated by the breeding bird surveys undertaken by the BTO which only involve two survey visits (Gregory *et al*., 2004). Therefore, as the amended CBC methodology carried out here involves three visits, the number of species recorded at the site and their behaviour would be regarded as an accurate account, but the territories devised within this report are only indicative.

3.3.2 Due to access restrictions, the stretches of the River Avon and Grange Burn that fell within the Petrochemical works were always surveyed later on in the morning between 08:00 and 10:30. This may have led to an under-recording of singing birds, which peak in the couple of hours after sunrise, and so the number of potential territories within these sections of the survey area may have been underestimated for some species.

3.3.3 Due to the late commission of the survey work, all visits were carried out in the latter half of the breeding season and therefore no visit was completed in April. Therefore, early breeding bird activity could have been missed and some species may have gone undetected.

Section 4 - Results

4.1 Overview of Field Survey Results

4.1.1 A total of 48 species were recorded during the breeding bird surveys. Of the species recorded, seven were red-listed Birds of Conservation Concern (BoCC), 14 were amber-listed BoCC, and three were green-listed BoCC but highlighted as local priority species on the FBAP (Eaton *et al*., 2015; Falkirk Council, 2011). Kingfisher (*Alcedo atthis*), one of the species included within the amber-listed BoCC, is also listed on Schedule 1 of the Wildlife and Countryside Act 1981, and as such is afforded a higher level of protection during the breeding season.

4.1.2 In total, 18 species were confirmed as breeding (including three red-listed BoCC, four amber-listed BoCC and one green-listed BoCC highlighted as a local priority species on the FBAP), 12 were concluded as probable breeders (including two red-listed BoCC, four amber-listed BoCC and one green-listed BoCC highlighted as a local priority species on the FBAP) and 14 as possible breeders (including one red-listed BoCC, four amber-listed BoCC (including Kingfisher, Schedule 1) and one green-listed BoCC highlighted as a local priority species on the FBAP).

4.1.3 An overall list of species recorded during the surveys and their activity is presented below in Table 4.1; species have been ordered alphabetically within each BoCC category. Territories were estimated for red-listed and amber-listed BoCC and green-listed birds which were highlighted as local priority species on FBAP; the territory numbers represent the maximum number of potential territories, rather than confirmed permanent territories. Territories were not calculated for species that are not strictly territorial. The remaining green-listed species recorded during the survey are considered sufficiently common and unthreatened that the development would not impact upon these local populations and they are not discussed further in this report. Table 4.2, below, lists the bird species based on their conservation and breeding status.

4.2 Red-listed Birds of Conservation Concern

4.2.1 Figures III.1 to III.10 in Appendix III presents the results recorded during the surveys for red-listed BoCC.

4.2.2 A single grasshopper warbler was heard singing from the marshy grassland to the south and east of the A905 on a single visit. As it was only heard during one visit a permanent territory cannot be confirmed, but the presence of a singing bird in suitable nesting habitat still indicates possible breeding. The potential territory was located outwith the area of works.

4.2.3 A grey wagtail was observed alarm calling on the Polmont Burn, and an adult with fledged young was observed foraging in the drainage channel which connects the Grange Burn to the River Avon. The presence of fledged young confirms this species as a breeder within the survey area. A total of two potential territories were located within the survey area, both of which overlap with the scheme alignment.

4.2.4 House sparrows and starlings were observed around the residential developments located alongside the River Carron and Grange Burn. The observations of a house sparrow nest under the end tile of a roof and fledged young for both house sparrow and starling confirms these species as breeders within the survey area. Although the residential developments were located within the survey area, they are outwith the scheme alignment and will not be impacted upon by the works. A number of starlings were observed foraging in the amenity grassland alongside the Grange Burn with up to 40 individuals recorded at any one time.

Table 4.1 - List of all species recorded during the survey

Species	Activity Recorded Within Survey Area	Number of Potential Breeding Territories Within Survey Area
Grasshopper warbler *(Locustella naevia*)	Possible breeding (S)	1
Grey wagtail (*Motacilla cinereal*)	Confirmed breeding (FL)	2
Herring gull (*Larus argentatus*)	Non-breeding (F)	N/A
House sparrow (*Passer domesticus*)	Confirmed breeding (ON)	N/A
Song thrush (*Turdus philomelos*)	Probable breeding (T)	12
Starling (*Sturnus vulgaris*)	Confirmed breeding (FL)	N/A
Yellowhammer (*Emberiza citrinella*)	Probable breeding (T)	3
Black headed gull (*Chroicocephalus ridibundus*)	Non-breeding (F)	N/A
Bullfinch (*Pyrrhula pyrrhula*)	Confirmed breeding (FL)	7
Dipper (*Cinclus cinclus*)	Probable breeding (T)	4
Dunnock (*Prunella modularis*)	Confirmed breeding (FL)	29
House martin (*Delichon urbicum*)	Possible breeding (H)	N/A
Kingfisher (*Alcedo atthis*)	Possible breeding (H)	2
Lesser black-backed gull (*Larus fuscus*)	Confirmed breeding (ON)	N/A
Mallard (*Anas platyrhynchos*)	Confirmed breeding (FL)	Multiple
Mute swan (*Cygnus olor*)	Probable breeding (P)	1
Oystercatcher (*Haematopus ostralegus*)	Possible breeding (H)	N/A
Reed bunting (*Emberiza schoeniclus*)	Probable breeding (T)	7
Shelduck (*Tadorna tadorna*)	Non-breeding (F)	N/A
Swift (*Apus apus*)	Possible breeding (H)	N/A
Willow warbler (*Phylloscopus trochilus*)	Probable breeding (T)	17
Red-breasted merganser (*Mergus serrator*)	Possible breeding (H)	1
Sedge warbler (*Acrocephalus schoenobaenus*)	Probable breeding (T)	10
Swallow (*Hirundo rustica*)	Confirmed breeding (ON)	N/A
Blackbird (*Turdus merula*)	Confirmed breeding (FL)	
Blackcap (*Sylvia atricapilla*)	Confirmed breeding (FL)	
Blue tit (*Cyanistes caeruleus*)	Confirmed breeding (FL)	
Buzzard (*Buteo buteo*)	Possible breeding (H)	
Carrion crow (*Corvus corone*)	Confirmed breeding (FL)	
Chaffinch (*Fringilla coelebs*)	Confirmed breeding (FL)	
Chiffchaff (*Phylloscopus collybita*)	Probable breeding (T)	
Coot (*Fulica atra*)	Possible breeding (H)	
Goldcrest (*Regulus regulus*)	Probable breeding (T)	
Goldfinch (*Carduelis carduelis*)	Confirmed breeding (FL)	
Goosander (*Mergus merganser*)	Possible breeding (H)	
Great spotted woodpecker (*Dendrocopos major*)	Possible breeding (H)	
Great tit (*Parus major*)	Confirmed breeding (FL)	
Greenfinch (*Carduelis chloris*)	Possible breeding (S)	
Grey heron (*Ardea cinereal*)	Possible breeding (H)	
Jackdaw (*Corvus monedula*)	Possible breeding (H)	
Magpie (*Pica pica*)	Possible breeding (H)	

Species	Activity Recorded Within Survey Area	Number of Potential Breeding Territories Within Survey Area
Pheasant (*Phasianus colchicus*)	Non-breeding (F)	
Pied wagtail (*Motacilla alba*)	Confirmed breeding (FL)	
Robin (*Erithacus rubecula*)	Probable breeding (T)	
Treecreeper (*Certhia familiaris*)	Confirmed breeding (FF)	
Whitethroat (*Sylvia communis*)	Probable breeding (T)	
Woodpigeon (*Columba palumbus*)	Confirmed breeding (ON)	
Wren (*Troglodytes troglodytes*)	Probable breeding (T & B)	

Key
Confirmed breeding (ON) = Adults entering or leaving nest-site in circumstances indicating **O**ccupied **N**est (including high nests or nest holes, the contents of which cannot be seen) or adults seen incubating
Confirmed breeding (FL) = Recently **FL**edged young
Confirmed breeding (FF) = Adult carrying **F**aecal sac or **F**ood for young
Probable breeding (T) = Permanent **T**erritory or many territorial birds on one day
Probable breeding (P) = **P**air observed in suitable nesting habitat in breeding season
Probably breeding (B) = Nest **B**uilding or excavating nest-hole
Possible breeding (S) = **S**inging male present (or breeding calls heard) in breeding season in suitable breeding habitat
Possible breeding (H) = Species observed in breeding season in suitable nesting **H**abitat
Non-breeding (U) = Species observed but suspected to be Summering non-breeder
Non-breeding (F) = **F**lying over or **F**eeding

	= Red-Listed Birds of Conservation Concern
	= Amber-Listed Birds of Conservation Concern
	= Green-listed birds highlighted as local priority species on the FBAP

Table 4.2 - Summary of bird species based on conservation status and breeding status

Conservation Status	Total	Breeding Status			
		Confirmed Breeding	Probable Breeding	Possible Breeding	Non-breeding
Red-listed	7	3	2	1	1
Amber-listed	14	4	4	4	2
FBAP priority species	3	1	1	1	0
Green-listed	24	10	5	8	1

4.2.5 Song thrushes were heard singing on multiple visits from the scattered trees and woodland along the River Avon, drainage channel between the River Avon and Grange Burn, Polmont Burn and River Carron, from similar locations. Therefore, permanent territories were confirmed, which indicates probable breeding. A total of 12 territories were identified within the survey area, with four territories overlapping the scheme alignment, one each along the River Carron, Polmont Burn, drainage ditch and River Avon.

4.2.6 Yellowhammers were heard singing on multiple visits from the scrub and broad-leaved trees that border the most upstream section of the River Carron, from similar locations each time. Therefore, permanent territories were confirmed, which indicates probable breeding. Three yellowhammer territories were identified within the survey area, but none of them overlap with the scheme alignment.

4.2.7 Herring gulls were observed either flying over or foraging within the River Avon, Grange Burn and River Carron. Around 100 Herring gulls were observed within the River Carron at low tide, which included a mixture of adults and immature birds. As no further observations of this species

that would indicate breeder were made during the survey visits, they are considered a non-breeder.

4.3 Amber-listed Birds of Conservation Concern

4.3.1 Figures III.11 to III.20 in Appendix III presents the results recorded during the surveys for amber-listed BoCC.

4.3.2 Bullfinches were heard singing on multiple visits from similar locations along the River Carron, Polmont Burn, drainage channel and River Avon. An adult with fledged young was also observed in the trees beside the River Carron. The presence of fledged young confirms this species as a breeder within the survey area. A total of seven potential territories were located within the survey area, four of which overlap with the scheme alignment.

4.3.3 Dunnocks were heard singing on multiple visits from similar locations along the River Carron, Grange Burn, drainage channel, Millhall Burn and River Avon. An adult with fledged young was also observed in the trees beside the Grange Burn. The presence of fledged young confirms this species as a breeder within the survey area. A total of 29 potential territories were located within the survey area, 21 of which overlap with the scheme alignment.

4.3.4 Dippers were observed calling whilst flying along sections of the River Carron, Polmont Burn, and Grange Burn. This behaviour would indicate a permanent territory and so this species is considered a probable breeder. A total of four potential territories were identified, two along the River Carron and one along the Polmont Burn and Grange Burn, all of which overlap with the scheme alignment.

4.3.5 House martins were identified within the survey area flying around residential properties to the south of the River Avon. As they were recorded around suitable nesting habitat they are considered a possible breeder, but the area where they were recorded will not be impacted upon by the works.

4.3.6 A single kingfisher was observed on the River Avon during the mammal surveys being conducted by Echoes Ecology Ltd, and on the Polmont Burn during the third breeding bird survey. They are also known to have been sighted on the Grange Burn and River Carron in recent years (pers. obs.). Therefore, they are considered a possible breeder within the survey area with two potential territories recorded during the surveys, both of which overlap with the scheme alignment.

4.3.7 Lesser black-backed gulls were observed foraging in the River Avon and River Carron and in the grassland alongside the Grange Burn. They were also observed nesting on the residential buildings adjacent to the Grange Burn. As nests with chicks were observed they are a confirmed breeder within the survey area. However, the residential properties where nesting occurred will not be impacted upon by the works.

4.3.8 Mallards were observed in high numbers and with juveniles along the River Carron, River Avon, Grange Burn, Polmont Burn and the drainage channel. As there is suitable nesting habitat alongside all of the water courses the presence of juveniles confirms this as a breeder within the survey area. The highest numbers were recorded along the Grange Burn and River Carron, where 46 adults were observed along the Grange Burn during one visit, and five females with juveniles were observed along the stretch of the River Carron, south of Carronshore, during another visit.

4.3.9 A pair of mute swans was observed on the River Avon over multiple visits and so this species is considered a probable breeder. They were observed within the section of the River Avon where works are due to take place.

4.3.10 Oystercatchers were observed flying over the River Avon and the Grange Burn, and a single bird was observed within the River Avon. As there is suitable nesting habitat provided by the gravel in the adjacent Petrochemical works, they are considered a possible breeder. However, it should be noted that the works will not impact upon this suitable nesting habitat.

4.3.11 Reed buntings were heard singing on multiple visits from the common reeds (*Phragmites australis*), reed canary-grass (*Phalaris arundinacea*) and great reedmace (*Typha latifolia*), all of which border the River Carron, drainage channel, Polmont Burn and River Avon. These birds were recorded at similar locations each time. Therefore, permanent territories were confirmed, which indicates probable breeding. Seven reed bunting territories were identified within the survey area, and five of them overlap with the scheme alignment.

4.3.12 Swifts were observed around the residential developments located alongside the Grange Burn. As they were recorded around suitable nesting habitat they are considered a possible breeder within the survey area, but the residential developments are outwith the scheme alignment and will not be impacted upon by the works.

4.3.13 Willow warbler were heard singing on multiple visits from the scattered trees and scrub that border the River Carron, drainage channel, Polmont Burn, Grange Burn and River Avon. These birds were recorded at similar locations each time. Therefore, permanent territories were confirmed, which indicates probable breeding. Seventeen willow warbler territories were identified within the survey area, and seven of them overlap with the scheme alignment.

4.3.14 Black headed gulls were observed foraging and flying around the River Carron, Grange Burn and River Avon. As no further observations of this species that would indicate breeding were made during the survey visits, they are considered a non-breeder.

4.3.15 A female shelduck and juveniles were observed on the River Avon at the downstream end of the survey area. As this species tends to breed around coastal and estuarine mudflats and can travel significant distances from their breeding grounds with juveniles, they are not considered a breeder within the survey area.

4.4 Green-Listed Local Priority Species

4.4.1 Figures III.21 to III.27 in Appendix III presents the results recorded during the surveys for green-listed BoCC listed as local priority species on the FBAP.

4.4.2 A single female red-breasted merganser was observed on the River Carron with juveniles. This species tends to breed in coastal waters and estuaries but can nest inland on the lower reaches of rivers. However, as they can travel significant distances from their breeding grounds with juveniles, they are only considered a possible breeder with the survey area.

4.4.3 Sedge warblers were heard singing on multiple visits from the common reeds and reed canary grass that border the River Carron, Grange Burn, drainage channel and River Avon. These birds were noted at similar locations each time. Therefore, permanent territories were confirmed, which indicates probable breeding. Ten sedge warbler territories were identified within the survey area, and six of them overlap with the scheme alignment.

4.4.4 Swallows were observed flying around the bus depot adjacent to the upstream section of the River Carron and were confirmed to be nesting within the stables alongside the downstream section of the River Carron. They were also observed flying around the residential properties beside the Grange Burn. As active nests were observed they are a confirmed breeder within the survey area. The stable buildings are located directly adjacent to the scheme alignment and so may be impacted upon by the works.

Section 5 - Discussion

5.1 Potential Impacts on Breeding Birds

5.1.1 The loss of any trees, grassland and bankside vegetation will impact on birds, both directly and indirectly through loss of nest sites and foraging opportunities. Disturbance caused during operations will also potentially render any retained habitat in the vicinity of works unsuitable for foraging and nesting. However, it should be noted that disturbance from public, including dog walkers, and industrial machinery is already present around the water courses.

5.1.2 The majority of the species recorded are associated with the broad-leaved trees, scrub, swamp and grasslands located in proximity to the water courses and it is likely that the majority of this suitable breeding and foraging habitat will be retained. However, the potential breeders that are closely associated with the riparian corridor, including grey wagtail, dipper, mallard, mute swan, red breasted merganser and kingfisher, are more susceptible to the habitat loss and associated disturbance, and may therefore be significantly impacted upon by the works. Grey wagtail is red-listed BoCC, kingfisher, dipper, mute swan and mallard are amber-listed BoCC and red-breasted merganser is a local priority species on the FBAP. Kingfisher is also a Schedule 1 species (see para 5.1.4 below).

5.1.3 All six species, as described within para 5.1.2 above, are vulnerable to the pollution of the water courses, which are an important source of food. Without mitigation, the works would increase the risk of pollution incidents. The works are likely to lead to temporary habitat loss of nesting and foraging habitat through disturbance and the removal of riparian vegetation, which without mitigation could lead to nest destruction. This includes any works to structures in proximity to the water courses such as walls and bridges, as they provide suitable nesting habitat for dipper and grey wagtail. Dipper and kingfisher breed and feed exclusively alongside watercourses and so any habitat loss or disturbance could also fragment their long linear territories. Kingfisher are susceptible to summer spates which can destroy nesting sites. Therefore, conversely, in the long-term the works may have a positive impact upon this species by reducing the flood risk within the catchments.

5.1.4 Kingfisher is a Schedule 1 bird and therefore afforded a higher level of protection during the breeding season. Ideal nesting habitat for kingfisher is slow flowing water with high vertical banks of easily excavated substrate (Wood, 2007). The only habitat of this description within the survey area was a small section of the River Avon, just upstream of the A905 road crossing. However, they have been known to nest in holes in walls, tree roots and mammal burrows (Birdguides, 2006), which are present along both the River Avon and Polmont Burn. Although kingfishers are known to have been sighted on the River Carron and Grange Burn (pers. obs.), given the tidal nature of these water courses, they do not provide suitable nesting habitat, except the most upstream section of the River Carron. Kingfishers also tend to prefer smaller streams, so if present on larger rivers such as the River Avon and River Carron they are more likely to nest in adjacent tributaries (Wood, 2007). Therefore, kingfishers are unlikely to nest within the survey area.

5.2 Mitigation

5.2.1 The impacts upon breeding birds and appropriate mitigation will be better understood once the final details of the works are decided. However, the following mitigation is still relevant as it applies to all types of work around the water courses.

5.2.2 Works should be micro-sited in order to minimise any vegetation clearance. If vegetation clearance is unavoidable then it should be reinstated post works with appropriate monitoring to ensure the pre-existing habitats are restored successfully. Vegetation removal should be timed so that it takes place outside the nesting season. The nesting season for the species recorded within the site is March to September inclusive.

5.2.3 If works to any structures or vegetation clearance are to take place within the nesting season (March to September), a nesting bird check must be completed by a suitably qualified ecologist.

If an active nest is identified a suitable buffer must be installed within which no works can take place until the chicks have fledged and the nest is confirmed as inactive. The results of nesting bird checks should only be regarded as valid for three days, after which further checks will be required to ensure that the situation with regards to nesting birds has not changed.

5.2.4 Although kingfishers are unlikely to nest within the survey area, as a precaution a nesting bird check tailored to kingfishers should be carried out prior to any works on the River Avon, Polmont Burn and the upstream section of the River Carron. Given that the species is easily disturbed, the nesting bird check should involve a vantage point survey over the area of works, commencing at sunrise and lasting for at least 2 hours. The results of kingfisher nesting bird checks should only be regarded as valid for three days, after which further checks will be required to ensure that the situation with regards to nesting birds has not changed. If an active nest is located during the survey, an appropriate buffer must be installed to ensure the nest site remains undisturbed; this may also involve a watching brief for any works in the area.

5.2.5 All works should be undertaken in accordance with the relevant Pollution Prevention Guidelines (NetRegs, 2018) to prevent pollution of the water courses.

Section 6 - Requirements and Recommendations

6.1 Requirements and Recommendations

6.1.1 Table 6.1 summarises the requirements and recommendations relating to breeding birds and future developments at the site, for which Falkirk Council and appointed contractors are responsible.

Table 6.1 – Requirements and recommendations

Ref No	Action	Target Date
AP1	If the works do not commence prior to 31.03.21 further surveys may be required in order to confirm that the situation regarding breeding birds at the site has not changed since this report was produced.	31.03.21
AP2	Works should be micro-sited in order to minimise any vegetation clearance. If vegetation clearance is unavoidable then it should be reinstated post works with appropriate monitoring to ensure the pre-existing habitats are restored successfully. Vegetation removal should be timed so that it takes place outside the nesting season. The nesting season for the species recorded within the site is March to September inclusive.	During and post works
AP3	If works to any structures or vegetation clearance are to take place within the nesting season (March to September), a nesting bird check must be completed by a suitably qualified ecologist. The results of nesting bird checks should only be regarded as valid for three days, after which further checks will be required to ensure that the situation with regards to nesting birds has not changed.	During works
AP4	Although kingfishers are unlikely to nest within the survey area, as a precaution a nesting bird checks tailored to kingfishers should be carried out prior to any works on the River Avon, Polmont Burn and the upstream section of the River Carron. Given that the species is easily disturbed, the nesting bird check should involve a vantage point survey over the area of works, commencing at sunrise and lasting for at least 2 hours. The results of kingfisher nesting bird checks should only be regarded as valid for three days, after which further checks will be required to ensure that the situation with regards to nesting birds has not changed.	During works
AP5	All works should be undertaken in accordance with the relevant Pollution Prevention Guidelines (NetRegs, 2018) to prevent pollution of the water courses.	During works

6.2 Disclaimer

6.2.1 By deeming a structure/tree/feature unsuitable or suitable for any proposed work or alteration or addition thereto, due to the possibility of use by protected species and/or making suggestions as to how species friendly features could be created, retained or enhanced, Echoes Ecology Ltd are not responsible for any damage caused thereafter to others if the structure/tree/feature or any part thereof remains in place in an unstable/unsafe manner. If a structure/tree/feature possibly could be utilised by protected species Echoes Ecology Ltd may at times make recommendations as to what aspect/portion of the structure/tree/feature should be retained or enhanced. If this is not practical or safe or legal, for whatever reason, then further advice should always be sought.

The ultimate decision to do/not do any work on any structure/tree/feature and any legal consequences of any action taken/not taken lies solely with yourselves and/or your employees/sub-contractors. Echoes Ecology Ltd accepts no liability or responsibility in any way

for any actions taken/not taken by you and/or your employees and/or any other person/organisation engaged in carrying out/not carrying out any of the proposed work.

Section 7 - References

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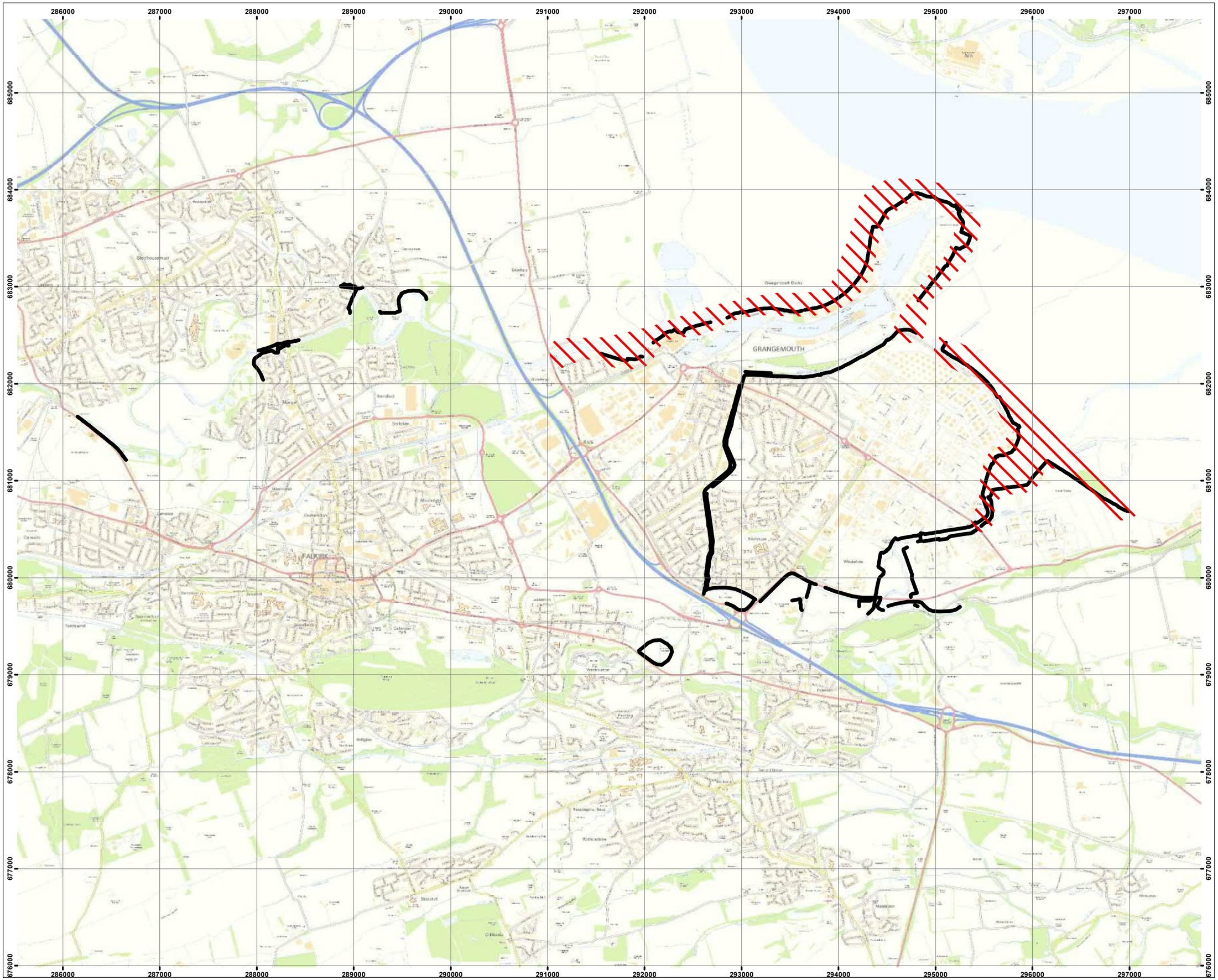
Appendix I: Site Plan



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Key

- Area covered by SPA surveys
- Scheme extent

1:35,000@ A3

0 350 700 Metres

N

Produced: HS
Reviewed: NM

Ref: HAL04.18.1657	Revision: A
Date: 12/09/2018	

Survey Area

Grangemouth FPS

Appendix II: Weather Data

Table II.1: Details of survey visits

Visit	Date	Survey Times	Area Covered	Weather Conditions
Visit 1 of 3	22.05.18	05:33 – 10:00	River Avon, Grange Burn and interconnecting drainage channel along A905	Cloud Cover: 100% Wind: F3 Temp: 10°C Visibility: Good > 2km Sunrise: 04:50 Precipitation: Dry
	23.05.18	09:00 – 10:15	Grange Burn within Petrochemical Works	Cloud Cover: 100% Wind: F3 Temp: 10°C Visibility: Good > 2km Sunrise: 04:49 Precipitation: Dry
	30.05.18	05:15 – 09:00	River Carron and Polmont Burn	Cloud Cover: 100% Wind: F1 Temp: 13°C Visibility: Good > 2km Sunrise: 04:39 Precipitation: Dry
	12.06.18	09:15 – 10:30	River Avon within Petrochemical Works	Cloud Cover: 100% Wind: F2 Temp: 14°C Visibility: Good > 2km Sunrise: 04:29 Precipitation: Dry
Visit 2 of 3	15.06.18	05:05 – 09:35	River Carron and Polmont Burn	Cloud Cover: 100% Wind: F3 Temp: 13°C Visibility: Good > 2km Sunrise: 04:28 Precipitation: Dry
	18.06.18	08:00 – 09:30	Grange Burn within Petrochemical Works	Cloud Cover: 100% Wind: F3 Temp: 15°C Visibility: Good > 2km Sunrise: 04:28 Precipitation: Dry
	19.06.18	05:00 – 10:00	River Avon, Grange Burn and interconnecting drainage channel along A905	Cloud Cover: 0 - 100% Wind: F1-3 Temp: 10°C Visibility: Good > 2km Sunrise: 04:38 Precipitation: Dry
	22.06.18	08:45 – 09:45	River Avon within Petrochemical Works	Cloud Cover: 0% Wind: F2 Temp: 11°C Visibility: Good > 2km Sunrise: 04:28 Precipitation: Dry

Visit	Date	Survey Times	Area Covered	Weather Conditions
Visit 3 of 3	26.06.18	05:00 – 09:37	River Avon, Grange Burn and interconnecting drainage channel along A905	Cloud Cover: 100% Wind: F0 Temp: 10°C Visibility: Good > 2km Sunrise: 04:30 Precipitation: Dry
	27.06.18	08:40 – 09:40	River Avon within Petrochemical Works	Cloud Cover: 100% Wind: F2 Temp: 13°C Visibility: Good > 2km Sunrise: 04:30 Precipitation: Dry
	28.06.18	05:05 – 10:15	River Carron and Polmont Burn	Cloud Cover: 0% Wind: F0 Temp: 11-20°C Visibility: Good > 2km Sunrise: 04:31 Precipitation: Dry
	29.06.18	09:00 – 09:30	Grange Burn within Petrochemical Works	Cloud Cover: 100% Wind: F2 Temp: 15°C Visibility: Good > 2km Sunrise: 04:32 Precipitation: Dry

Appendix III: Survey Maps

Figures III.1 to III.10 - Maps showing red-listed BoCC

286000
286500
681500
681000
A9
Nurseries
Mill
Depot
Bus
Depot
Falkirk Golf Course
Car
Pk
Carmuirs East
Junction
Playing Field
HS
ST
Y.
GL

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Key

Scheme extent
100m Buffer

BirdKey

Surveys

SG Visit 1
SG Visit 2
SG Visit 3
SG Mammal survey

Species

GH Grasshopper warbler
GL Grey wagtail
HG Herring gull
HS House sparrow
ST Song thrush
SG Starling
Y. Yellowhammer

Symbology

♂ Pair
✱ Occupied nest
HS Call
GL Alarm
Y. Singing
juv Juvenile
Food Food
Flightline
Territory

1:3,000 @ A3
Metres
0 50
N

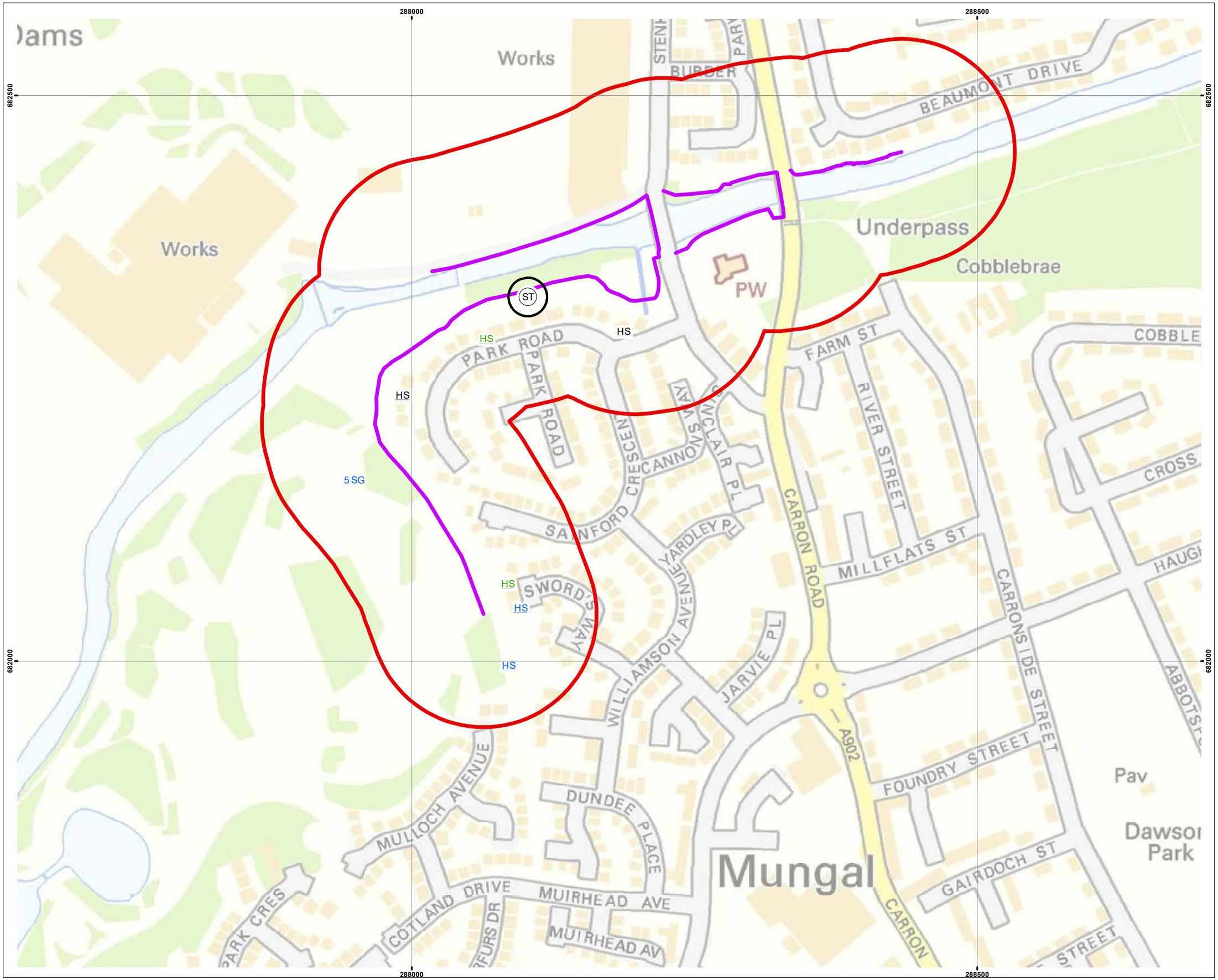
Produced: AM
Reviewed: HS

Ref: HAL04.18.1657 | Revision: A

Date: 17/09/2018

Red-listed BoCC
Figure III.1

Grangemouth FPS



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Key

- Scheme extent
- 100m Buffer

BirdKey

Surveys

- SG Visit 1
- SG Visit 2
- SG Visit 3
- SG Mammal survey

Species

- GH Grasshopper warbler
- GL Grey wagtail
- HG Herring gull
- HS House sparrow
- ST Song thrush
- SG Starling
- Y. Yellowhammer

Symbology

- ♂ Pair
- ✱ Occupied nest
- HS Call
- GL Alarm
- (Y.) Singing
- juv Juvenile
- Food Food
- Flightline
- Territory

1:3,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657	Revision: A
Date: 17/09/2018	

Red-listed BoCC
Figure III.2

Grangemouth FPS

289000
289500
683000
682500

Recn Gd
Pav
FERN LEA
KIRKTON PL
MUIRDYKE AVENUE
BLACKMILL CR
DUNCAN AVENUE
WESTERTON TERRACE
NORTH MAIN STREET
CASTLE AVENUE
MAIN STREET
WATERS END
THE MEADOWS
BRYCE AVENUE
HALKET CRES
DOCK STREET
INGLIS DR
THE AVENUE
Carron House
Carronside Ppg Sta
Riverside Stables
Mean High Water Springs

15 SG
SG
HS
HS
HS
HS*
HS
HS
HS
SG
SG
HS
SG
HS
HS
HS
HS
SG
HS
2 HG
3 HG

Key

Scheme extent
100m Buffer

BirdKey

Surveys

SG Visit 1
SG Visit 2
SG Visit 3
SG Mammal survey

Species

GH Grasshopper warbler
GL Grey wagtail
HG Herring gull
HS House sparrow
ST Song thrush
SG Starling
Y. Yellowhammer

Symbology

♂ Pair
✱ Occupied nest
HS Call
GL Alarm
(Y.) Singing
juv Juvenile
Food Food
Flightline
Territory

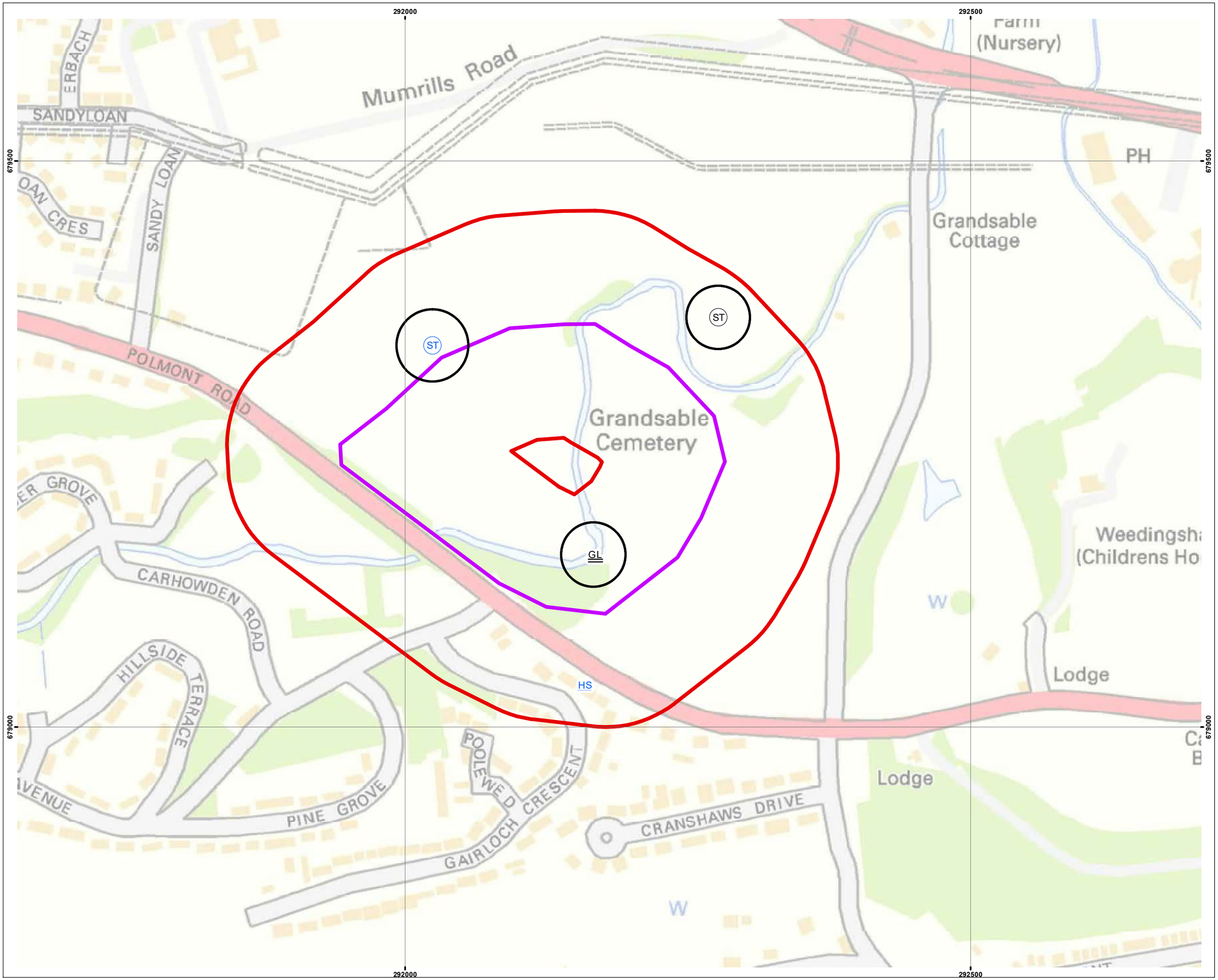
1:3,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657	Revision: A
Date: 17/09/2018	

Red-listed BoCC
Figure III.3

Grangemouth FPS



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Key

- Scheme extent
- 100m Buffer

BirdKey

Surveys

- SG Visit 1
- SG Visit 2
- SG Visit 3
- SG Mammal survey

Species

- GH Grasshopper warbler
- GL Grey wagtail
- HG Herring gull
- HS House sparrow
- ST Song thrush
- SG Starling
- Y. Yellowhammer

Symbology

- ♂ Pair
- ✱ Occupied nest
- HS Call
- GL Alarm
- (Y.) Singing
- juv Juvenile
- Food Food
- Flightline
- Territory

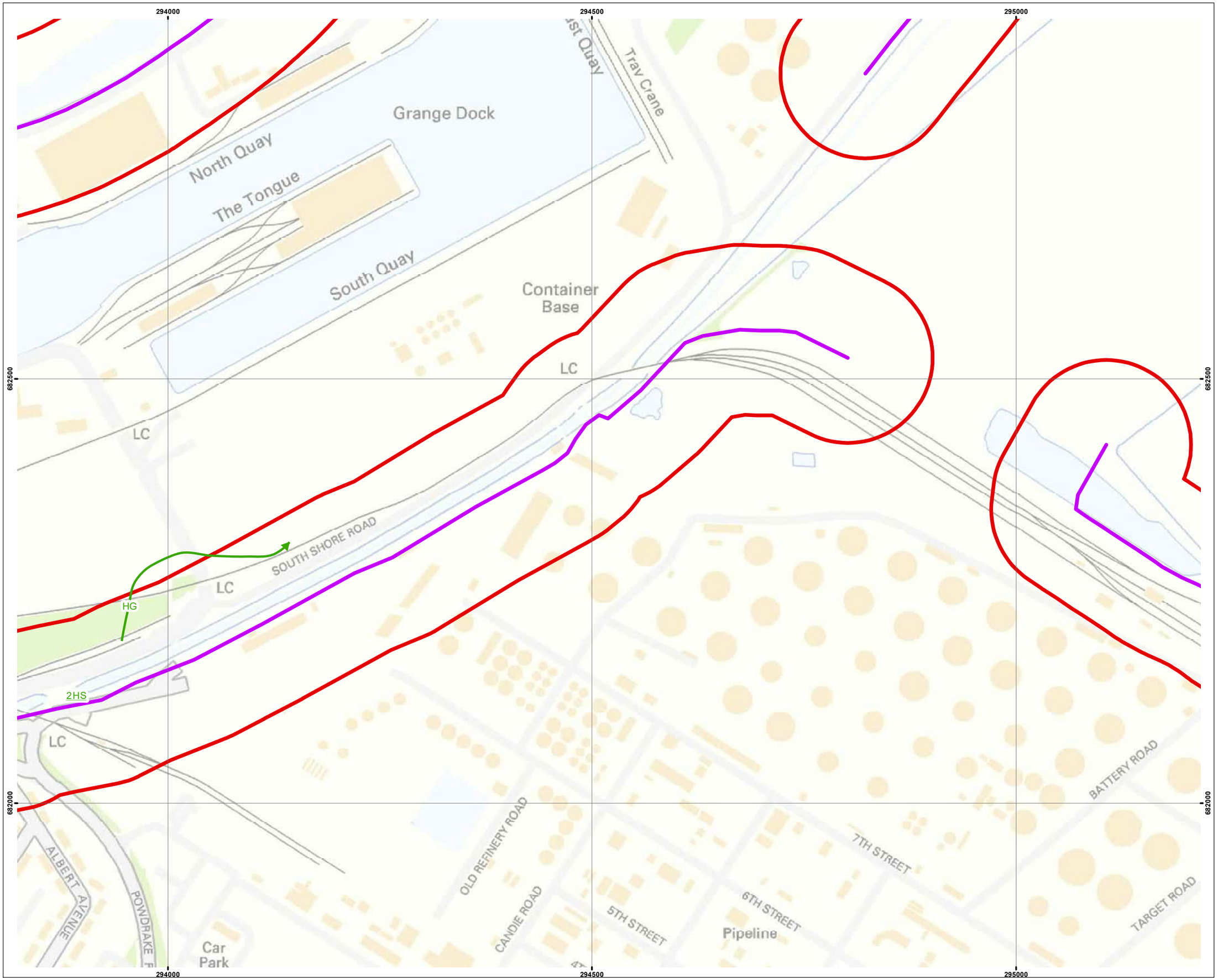
1:3,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657	Revision: A
Date: 17/09/2018	

Red-listed BoCC
Figure III.4

Grangemouth FPS



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Key

Scheme extent

100m Buffer

BirdKey

Surveys

SG Visit 1

SG Visit 2

SG Visit 3

SG Mammal survey

Species

GH Grasshopper warbler

GL Grey wagtail

HG Herring gull

HS House sparrow

ST Song thrush

SG Starling

Y. Yellowhammer

Symbology

♂ Pair

✱ Occupied nest

HS Call

GL Alarm

Y. Singing

juv Juvenile

Food Food

Flightline

Territory

1:4,000 @ A3

Metres

0 50

N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657	Revision: A
Date: 17/09/2018	

Red-listed BoCC
Figure III.5

Grangemouth FPS

Key

- Scheme extent
- 🟥 100m Buffer

BirdKey

Surveys

SG	Visit 1
SG	Visit 2
SG	Visit 3
SG	Mammal survey

Species

GH	Grasshopper warbler
GL	Grey wagtail
HG	Herring gull
HS	House sparrow
ST	Song thrush
SG	Starling
Y.	Yellowhammer

Symbology

⚥	Pair
✱	Occupied nest
HS	Call
GL	Alarm
Ⓨ	Singing
juv	Juvenile
Food	Food
→	Flightline
○	Territory

1:4,000 @ A3
Metres
0 50
N

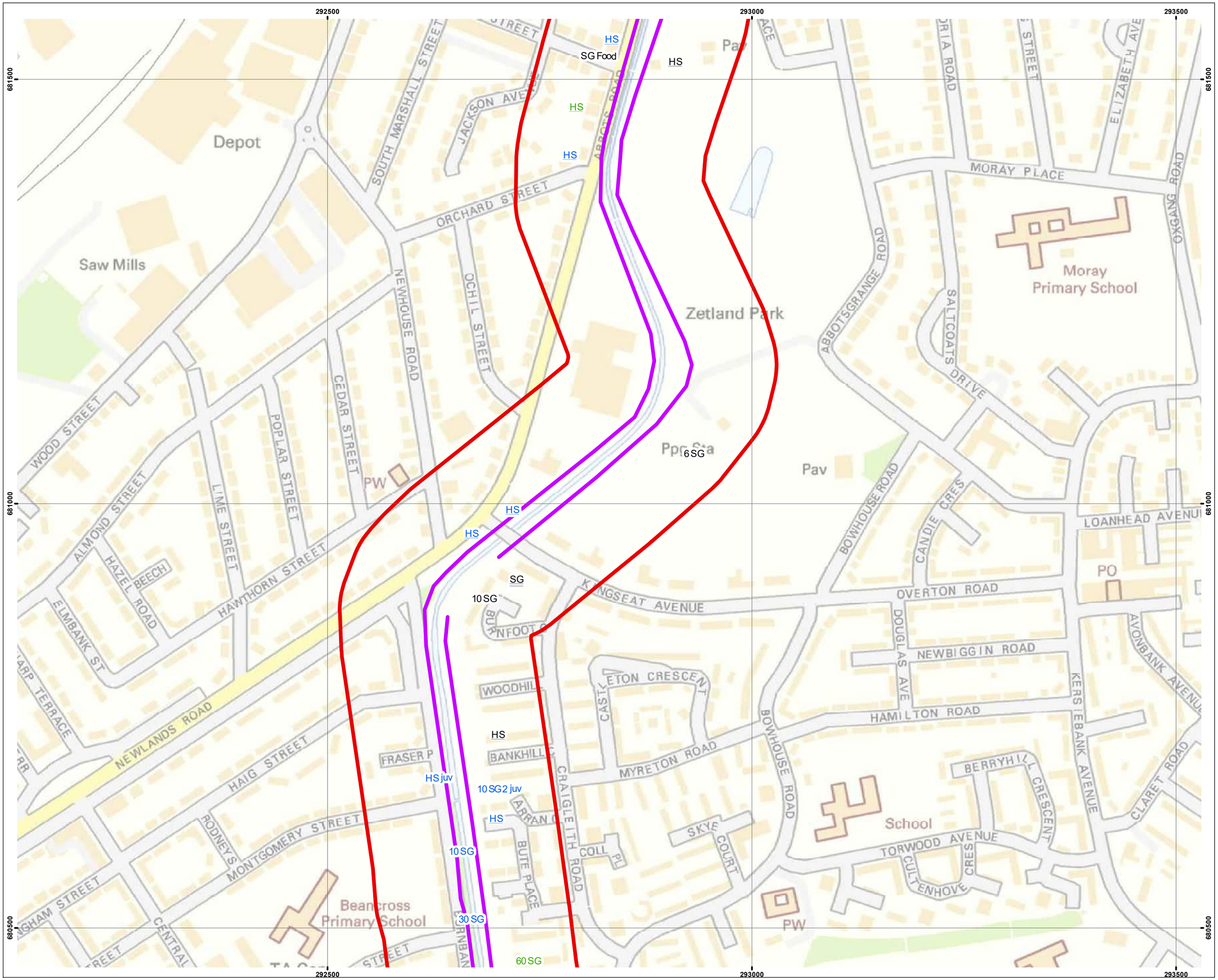
Produced: AM
Reviewed: HS
Contains OS data © Crown copyright and database right (2018)

Ref: HAL04.18.1657 Revision: A

Date: 17/09/2018

Red-listed BoCC Figure III.6

Grangemouth FPS



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Key

- Scheme extent
- 100m Buffer

BirdKey

Surveys

- SG Visit 1
- SG Visit 2
- SG Visit 3
- SG Mammal survey

Species

- GH Grasshopper warbler
- GL Grey wagtail
- HG Herring gull
- HS House sparrow
- ST Song thrush
- SG Starling
- Y. Yellowhammer

Symbology

- ♂ Pair
- ✱ Occupied nest
- HS Call
- GL Alarm
- (Y.) Singing
- juv Juvenile
- Food Food
- Flightline
- Territory

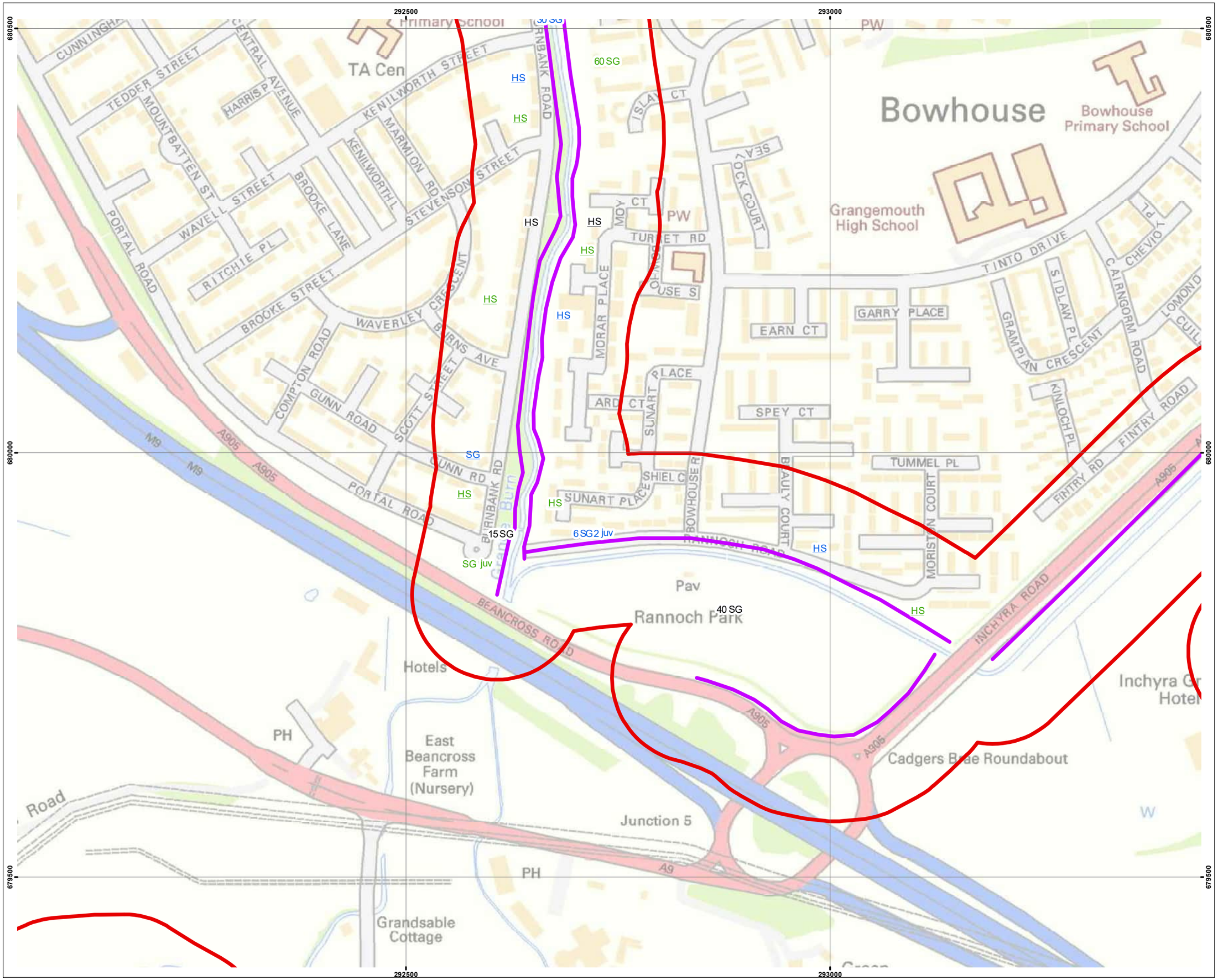
1:4,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657	Revision: A
Date: 17/09/2018	

Red-listed BoCC
Figure III.7

Grangemouth FPS



Key

- Scheme extent
- 100m Buffer

BirdKey

Surveys

- SG Visit 1
- SG Visit 2
- SG Visit 3
- SG Mammal survey

Species

- GH Grasshopper warbler
- GL Grey wagtail
- HG Herring gull
- HS House sparrow
- ST Song thrush
- SG Starling
- Y. Yellowhammer

Symbology

- ♂ Pair
- ✱ Occupied nest
- HS Call
- GL Alarm
- (Y.) Singing
- juv Juvenile
- Food Food
- Flightline
- Territory

1:4,000 @ A3

Metres

0 50

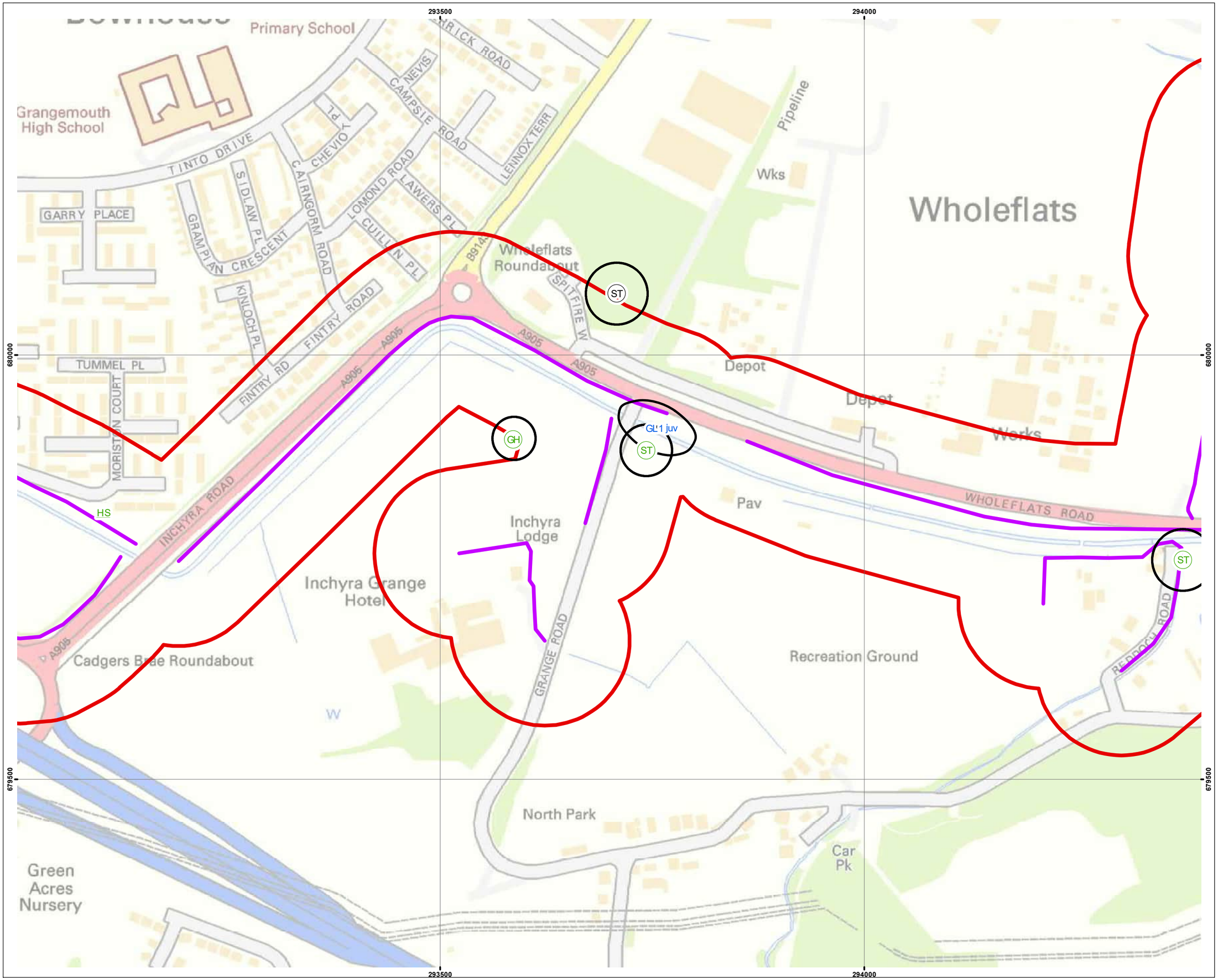
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657	Revision: A
Date: 17/09/2018	

Red-listed BoCC Figure III.8

Grangemouth FPS



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Key

- Scheme extent
- 100m Buffer

BirdKey

Surveys

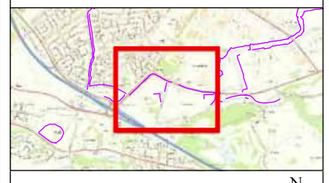
- SG Visit 1
- SG Visit 2
- SG Visit 3
- SG Mammal survey

Species

- GH Grasshopper warbler
- GL Grey wagtail
- HG Herring gull
- HS House sparrow
- ST Song thrush
- SG Starling
- Y. Yellowhammer

Symbology

- ♂ Pair
- ✱ Occupied nest
- HS Call
- GL Alarm
- (Y.) Singing
- juv Juvenile
- Food Food
- Flightline
- Territory



1:4,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657	Revision: A
Date: 17/09/2018	

Red-listed BoCC
Figure III.9

Grangemouth FPS

294500
295000
680500
680000
ROAD 32
ROAD 31
ROAD 33
Fl Sks
Avon Bridge
MHWS
100HG
Electricity Transformer Station
River Avon
RIVERSIDE RD
EAST ROAD
QUEEN ROAD
FLARE ROAD
SOUTH RD
'holeflats
Works
MLWS
WHOLEFLATS ROAD
A905
Carse of Kinneil
Gas Gov
REDDOCH ROAD
AVONDALE ROAD
Polmonthill
Polmonthill Cott
ST

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Key

- Scheme extent
- 100m Buffer

BirdKey

Surveys

- SG Visit 1
- SG Visit 2
- SG Visit 3
- SG Mammal survey

Species

- GH Grasshopper warbler
- GL Grey wagtail
- HG Herring gull
- HS House sparrow
- ST Song thrush
- SG Starling
- Y. Yellowhammer

Symbology

- ♂ Pair
- ✱ Occupied nest
- HS Call
- GL Alarm
- (Y.) Singing
- juv Juvenile
- Food Food
- Flightline
- Territory

1:4,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657 | Revision: A

Date: 17/09/2018

Red-listed BoCC Figure III.10

Grangemouth FPS

Figures III.11 to III.20 - Maps showing amber-listed BoCC

286000
286500
681500
681000
A9
Nurseries
Mill
Depot
Bus
Depot
Falkirk Golf Course
Carmuirs East
Junction
Car
Pk
Playing Field
DI
D.
WW
5 MA♀
MA♂

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Key

Scheme extent
100m Buffer

BirdKey

Surveys

MA Visit 1
MA Visit 2
MA Visit 3
KF Mammal survey

Species

BH Black headed gull
BF Bullfinch
DI Dipper
D. Dunnock
HM House martin
KF Kingfisher
LB Lesser black-backed gull
MA Mallard
MS Mute Swan
OC Oystercatcher
RB Reed bunting
SU Shelduck
SI Swift
WW Willow warbler

Symbology

♂ Male
♀ Female
⚥ Pair
✱ Occupied nest
OC Call
WW Singing
juv Juvenile
Flightline
Singing at same time
Territory

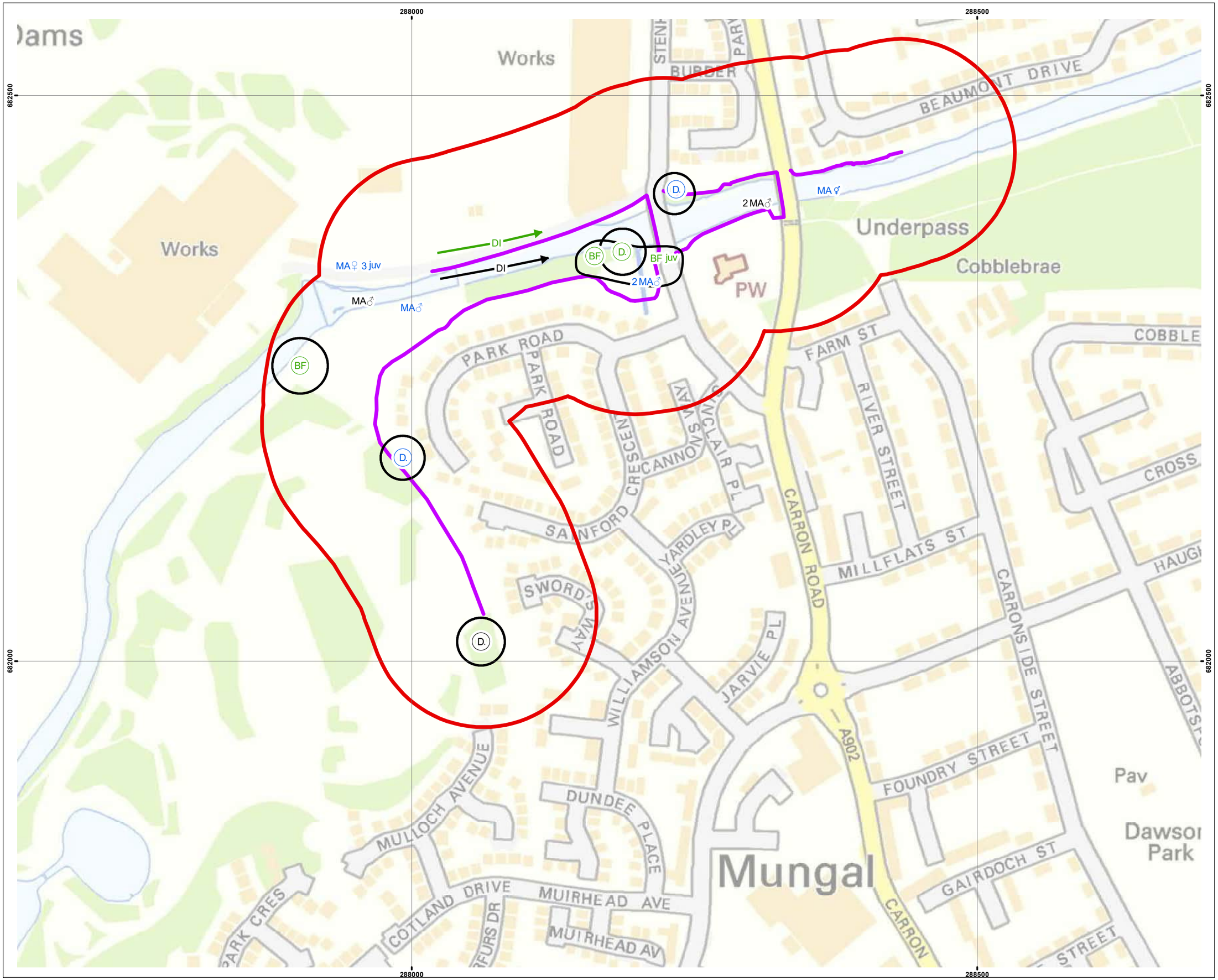
1:3,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657	Revision: A
Date: 17/09/2018	

Amber-listed BoCC
Figure III.11

Grangemouth FPS



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Key

Scheme extent
100m Buffer

BirdKey

Surveys

MA Visit 1
MA Visit 2
MA Visit 3
KF Mammal survey

Species

BH Black headed gull
BF Bullfinch
DI Dipper
D. Dunnock
HM House martin
KF Kingfisher
LB Lesser black-backed gull
MA Mallard
MS Mute Swan
OC Oystercatcher
RB Reed bunting
SU Shelduck
SI Swift
WW Willow warbler

Symbology

♂ Male
♀ Female
⚥ Pair
✱ Occupied nest
OC Call
WW Singing
juv Juvenile
Flightline
Singing at same time
Territory

1:3,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657	Revision: A
Date: 17/09/2018	

Amber-listed BoCC
Figure III.12

Grangemouth FPS

289000
289500
683000
682500

Recn Gd
Pav
FERN LEA
KIRKTON PL
MUIRDYKE AVENUE
WESTERTON TERRACE
NORTH MAIN STREET
BLACKMILL CR
DUNCAN AVENUE
CASTLE AVENUE
MAIN STREET
WATERS END
THE MEADOWS
THE AVENUE
HALKET CRES
DOCK STREET
INGLIS DR
BRYCE AVENUE
Carron House
Carronside Ppg Sta
Riverside Stables
Mean High Water Springs

D.
WW
RB
MA♀ 2 juv
MA♀10 juv
MA♀ 8 juv
MA♀ 3 juv
LB
2 MA♀
7 MA♂
3 MA♂
MA♀ 5 juv 6 MA♀
MA ♂
MA♀ 6 juv
MA♀ 3 juv
6 MA♂
2 MA♂
MA♀ 7 juv
16 LB
2 MA♀
10MA
6 LB
3 BH
BH
5 LB
MA♀ 5 juv
5 MA♂
3 MA♀
2 MA♂
3 LB
MA♀ 3 juv
4 MA♂
MA♀
2 BH

Key

Scheme extent
100m Buffer

BirdKey

Surveys

MA Visit 1
MA Visit 2
MA Visit 3
KF Mammal survey

Species

BH Black headed gull
BF Bullfinch
DI Dipper
D. Dunnock
HM House martin
KF Kingfisher
LB Lesser black-backed gull
MA Mallard
MS Mute Swan
OC Oystercatcher
RB Reed bunting
SU Shelduck
SI Swift
WW Willow warbler

Symbology

♂ Male
♀ Female
⚥ Pair
✱ Occupied nest
OC Call
WW Singing
juv Juvenile
Flightline
Singing at same time
Territory

1:3,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657 | Revision: A
Date: 17/09/2018

Amber-listed BoCC
Figure III.13

Grangemouth FPS

292000
292500
679500
679000
Mumrills Road
SANDYLOAN
ERBACH
SANDY LOAN
OAN CRES
POLMONT ROAD
ER GROVE
CARHOWDEN ROAD
HILLSIDE TERRACE
VENUE
PINE GROVE
POOLEWED
GAIRLOCH CRESCENT
CRANSHAWS DRIVE
Farm (Nursery)
PH
Grandsable Cottage
Grandsable Cemetery
Weedingsha (Childrens Ho
Lodge
Lodge
W
W
WW
2 MA♂
RB
BF
BF
MA♀ 6 juv
DI
KF

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Key

Scheme extent
100m Buffer

BirdKey

Surveys

MA Visit 1
MA Visit 2
MA Visit 3
KF Mammal survey

Species

BH Black headed gull
BF Bullfinch
DI Dipper
D. Dunnock
HM House martin
KF Kingfisher
LB Lesser black-backed gull
MA Mallard
MS Mute Swan
OC Oystercatcher
RB Reed bunting
SU Shelduck
SI Swift
WW Willow warbler

Symbology

♂ Male
♀ Female
⚥ Pair
✱ Occupied nest
OC Call
(WW) Singing
juv Juvenile
Flightline
Singing at same time
Territory

1:3,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657	Revision: A
Date: 17/09/2018	

Amber-listed BoCC
Figure III.14

Grangemouth FPS

294000
294500
295000
682500
682000

Grange Dock
North Quay
The Tongue
South Quay
Container Base
Trav Crane
st Quay
SOUTH SHORE ROAD
OLD REFINERY ROAD
CANDIE ROAD
ALBERT AVENUE
POWDRAKE
BATTERY ROAD
7TH STREET
6TH STREET
5TH STREET
TARGET ROAD
Pipeline
Car Park

LC
LB
BH
OC
WW
MA♀,2 juv

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Key

Scheme extent
100m Buffer

BirdKey

Surveys

MA Visit 1
MA Visit 2
MA Visit 3
KF Mammal survey

Species

BH Black headed gull
BF Bullfinch
DI Dipper
D. Dunnock
HM House martin
KF Kingfisher
LB Lesser black-backed gull
MA Mallard
MS Mute Swan
OC Oystercatcher
RB Reed bunting
SU Shelduck
SI Swift
WW Willow warbler

Symbology

♂ Male
♀ Female
⚥ Pair
✱ Occupied nest
OC Call
(WW) Singing
juvJuvenile
Flightline
Singing at same time
Territory

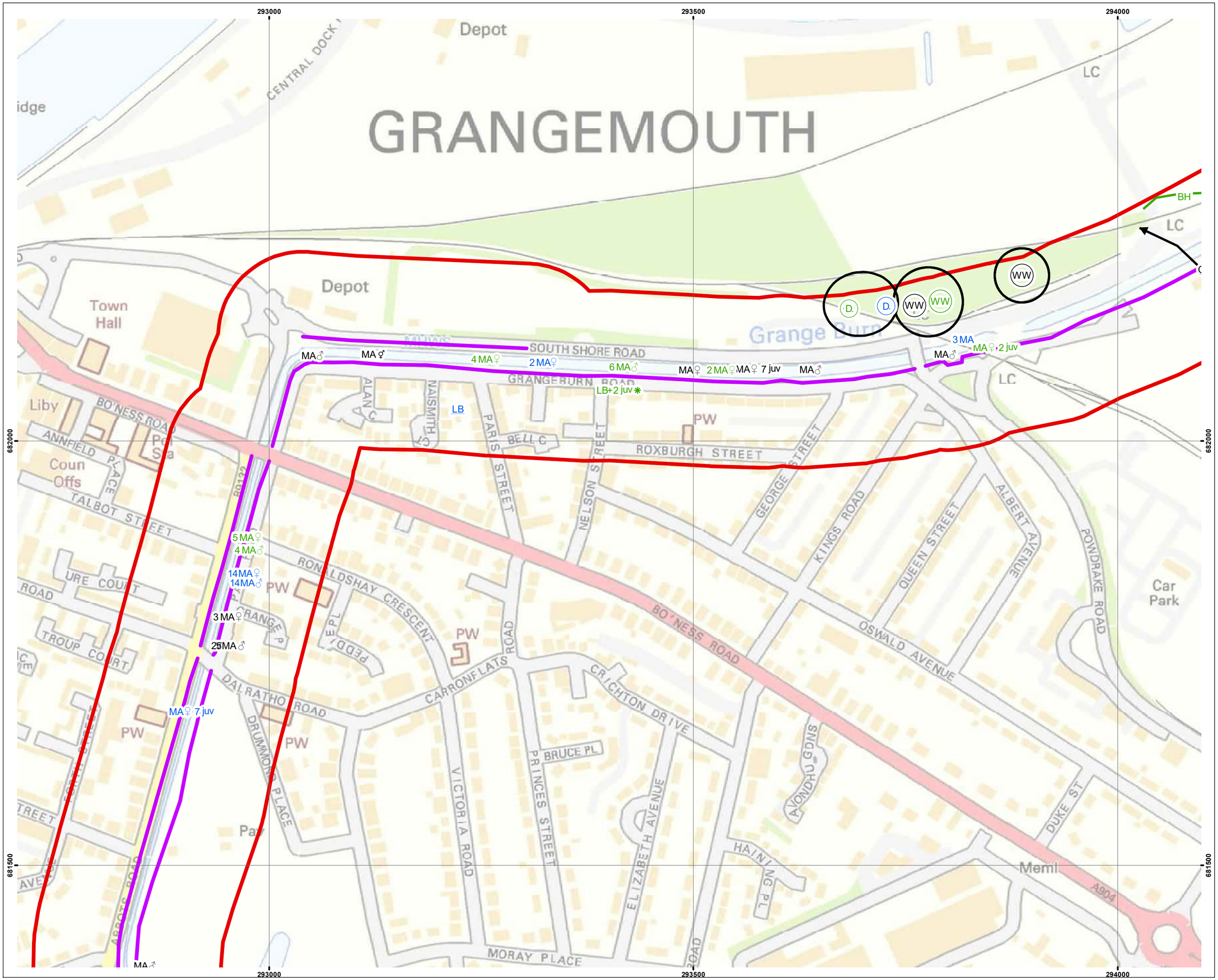
1:4,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657	Revision: A
Date: 17/09/2018	

Amber-listed BoCC
Figure III.15

Grangemouth FPS



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Key

- Scheme extent
- 100m Buffer

BirdKey

Surveys

- MA Visit 1
- MA Visit 2
- MA Visit 3
- KF Mammal survey

Species

- BH Black headed gull
- BF Bullfinch
- DI Dipper
- D. Dunnock
- HM House martin
- KF Kingfisher
- LB Lesser black-backed gull
- MA Mallard
- MS Mute Swan
- OC Oystercatcher
- RB Reed bunting
- SU Shelduck
- SI Swift
- WW Willow warbler

Symbology

- ♂ Male
- ♀ Female
- ⚥ Pair
- ✱ Occupied nest
- OC Call
- (WW) Singing
- juv Juvenile
- Flightline
- Singing at same time
- Territory

1:4,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657	Revision: A
Date: 17/09/2018	

Amber-listed BoCC
Figure III.16

Grangemouth FPS

292500
293000
293500
681500
681000
680500

Depot
Saw Mills
Zetland Park
Ppg Sta
Pav
Moray Primary School
Beancross Primary School
School
PW
PO

SOUTH MARSHALL STREET
JACKSON AVENUE
ABBOTSGRANGE ROAD
ORCHARD STREET
NEWHOUSE ROAD
OCHIL STREET
CEDAR STREET
POPLAR STREET
LIME STREET
WOOD STREET
ALMOND STREET
HAZEL BEECH ROAD
ELMBANK ST
HAWTHORN STREET
NEWLANDS ROAD
HAIG STREET
MONTGOMERY STREET
RODNEY'S
CENTRAL
ARP TERRACE
MORAY PLACE
OXGANG ROAD
ELIZABETH AVE
SALTCOATS DRIVE
BOWHOUSE ROAD
CANDIE CRESCENT
LOANHEAD AVENUE
KINGSEAT AVENUE
OVERTON ROAD
DOUGLAS AVE
NEWBIGGIN ROAD
AVONBANK AVENUE
KERSIEBANK AVENUE
HAMILTON ROAD
CASTLETON CRESCENT
MYRETON ROAD
BANKHILL
WOODHILL
BURNFOOT
CRAIGLEITH ROAD
ARRAN COLL PL
BUTE PLACE
SKYE COURT
TORWOOD AVENUE
CULTENHOVE CRES
BERRYHILL CRESCENT
CLARET ROAD

MA♂
OC
2 MA♀
2 MA♂
D. juv
MA♂
MA♀ 4 juv
MA♀ 5 juv
5 MA♂
5 LB
D.
MA♀ 4 juv

Key

Scheme extent
100m Buffer

BirdKey

Surveys

MA Visit 1
MA Visit 2
MA Visit 3
KF Mammal survey

Species

BH Black headed gull
BF Bullfinch
DI Dipper
D. Dunnock
HM House martin
KF Kingfisher
LB Lesser black-backed gull
MA Mallard
MS Mute Swan
OC Oystercatcher
RB Reed bunting
SU Shelduck
SI Swift
WW Willow warbler

Symbology

♂ Male
♀ Female
⚥ Pair
✱ Occupied nest
OC Call
WW Singing
juv Juvenile
Flightline
Singing at same time
Territory

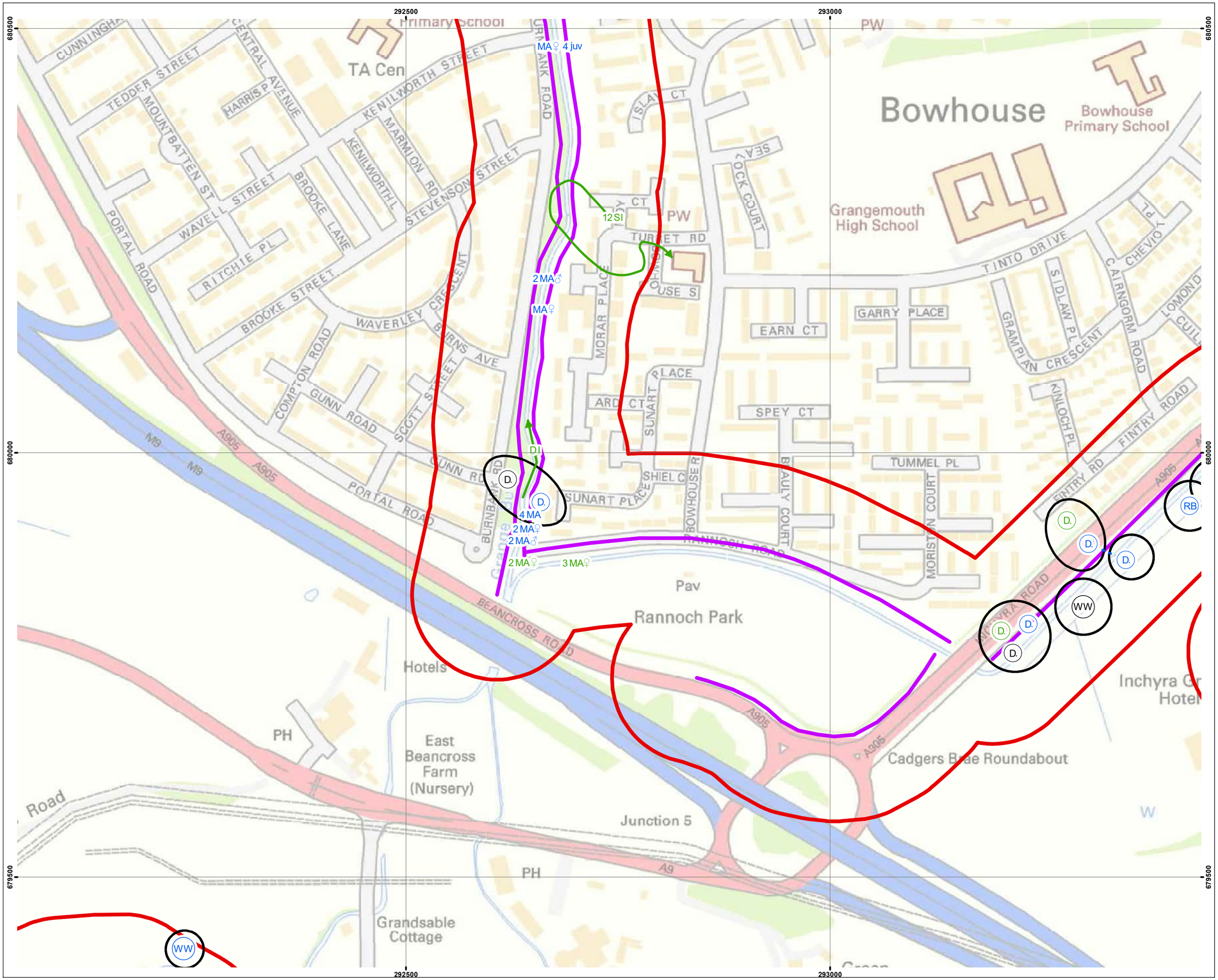
1:4,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657 | Revision: A
Date: 17/09/2018

Amber-listed BoCC
Figure III.17

Grangemouth FPS



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Key

Scheme extent

100m Buffer

BirdKey

Surveys

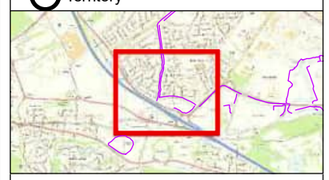
MA Visit 1
MA Visit 2
MA Visit 3
KF Mammal survey

Species

BH Black headed gull
BF Bullfinch
DI Dipper
D. Dunnock
HM House martin
KF Kingfisher
LB Lesser black-backed gull
MA Mallard
MS Mute Swan
OC Oystercatcher
RB Reed bunting
SU Shelduck
SI Swift
WW Willow warbler

Symbology

♂ Male
♀ Female
⚥ Pair
✱ Occupied nest
OC Call
(WW) Singing
juv Juvenile
Flightline
Singing at same time
Territory



1:4,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

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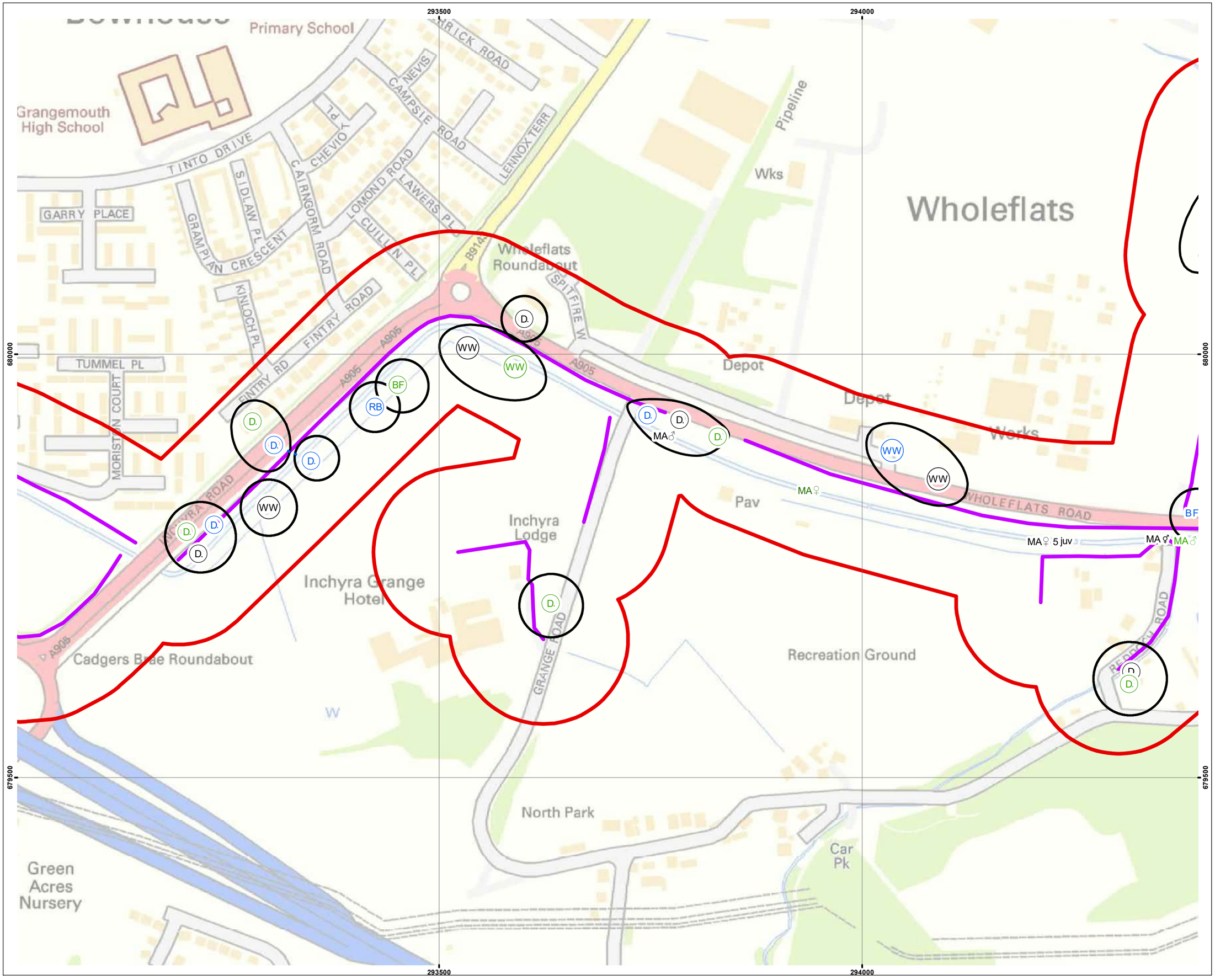
Date: 17/09/2018	

Amber-listed BoCC
Figure III.18

Grangemouth FPS



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Key

- Scheme extent
- 100m Buffer

BirdKey

Surveys

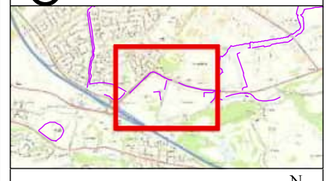
- MA Visit 1
- MA Visit 2
- MA Visit 3
- KF Mammal survey

Species

- BH Black headed gull
- BF Bullfinch
- DI Dipper
- D. Dunnock
- HM House martin
- KF Kingfisher
- LB Lesser black-backed gull
- MA Mallard
- MS Mute Swan
- OC Oystercatcher
- RB Reed bunting
- SU Shelduck
- SI Swift
- WW Willow warbler

Symbology

- ♂ Male
- ♀ Female
- ⚥ Pair
- ✱ Occupied nest
- OC Call
- (WW) Singing
- juv Juvenile
- Flightline
- Singing at same time
- Territory



1:4,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657	Revision: A
Date: 17/09/2018	

Amber-listed BoCC
Figure III.19

Grangemouth FPS

294500
295000
680500
680000
ROAD 32
ROAD 31
ROAD 33
Fl Sks
Avon Bridge
Electricity Transformer Station
River Avon
MHWS
MLWS
RIVERSIDE RD
EAST ROAD
QUEEN ROAD
FLARE ROAD
SOUTH RD
'holeflats
Works
WHOLEFLATS ROAD
A905
Carse of Kinneil
Gas Gov
REDBRAE ROAD
AVONDALE ROAD
Polmonthill
Polmonthill Cott
D.
MA 6♂6♀
10MA
MS
20 LB
OC
2 MA♂
3 LB
2 SU
MA♂
SU♀ 1 juv
BH
20MA
3 OC
BF
MA♂
RB
WW
3 MA♂
2 MS
MA♀ 4 juv
BF♂
MA♀ 5 juv
MA♂ 3 juv
4 LB
5 MA♀
KF
HM

Key

Scheme extent
100m Buffer

BirdKey

Surveys

MA Visit 1
MA Visit 2
MA Visit 3
KF Mammal survey

Species

BH Black headed gull
BF Bullfinch
DI Dipper
D. Dunnock
HM House martin
KF Kingfisher
LB Lesser black-backed gull
MA Mallard
MS Mute Swan
OC Oystercatcher
RB Reed bunting
SU Shelduck
SI Swift
WW Willow warbler

Symbology

♂ Male
♀ Female
⚥ Pair
✱ Occupied nest
OC Call
WW Singing
juv Juvenile
Flightline
Singing at same time
Territory

1:4,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

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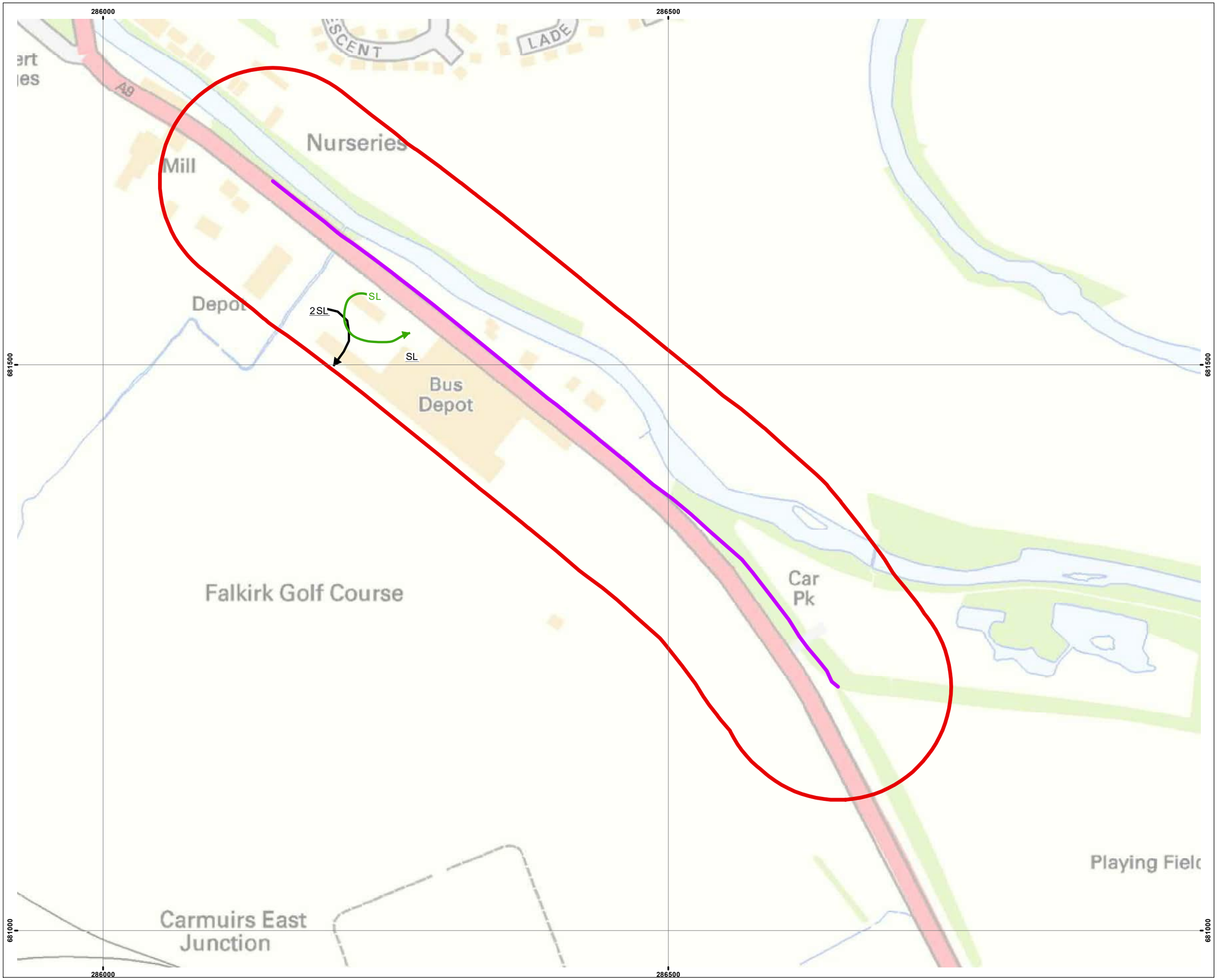
Date: 17/09/2018

Amber-listed BoCC
Figure III.20

Grangemouth FPS

Figures III.21 to III.27 - Maps showing green-listed local priority species



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Key

- Scheme extent
- 100m Buffer

BirdKey

Surveys

- SW Visit 1
- SW Visit 2
- SW Visit 3

Species

- RM Red-breasted merganser
- SW Sedge warbler
- SL Swallow

Symbology

- ♀ Female
- ✱ Occupied nest
- SL Call
- (SW) Singing
- juv Juvenile
- Food Food
- Flightline
- Singing at same time
- Territory

1:3,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657	Revision: A
Date: 17/09/2018	

Local Prioirty Species
Figure III.21

Grangemouth FPS

289000
289500
683000
682500
Recn Gd
Pav
FERN LEA
KIRKTON PL
MUIRDYKE AVENUE
WESTERTON TERRACE
NORTH MAIN STREET
CASTLE AVENUE
MAIN STREET
WATERS END
THE MEADOWS
THE AVENUE
HALKET CRES
DOCK STREET
INGLIS DR
Carron House
Mean High Water Springs
Carronside Ppg Sta
Riverside Stables
SW
SL
SL✱
RM♀ 4 juv

Key

- Scheme extent
- 100m Buffer

BirdKey

Surveys

- SW Visit 1
- SW Visit 2
- SW Visit 3

Species

- RM Red-breasted merganser
- SW Sedge warbler
- SL Swallow

Symbology

- ♀ Female
- ✱ Occupied nest
- SL Call
- (SW) Singing
- juv Juvenile
- Food Food
- Flightline
- Singing at same time
- Territory

1:3,000 @ A3
Metres
0 50
N

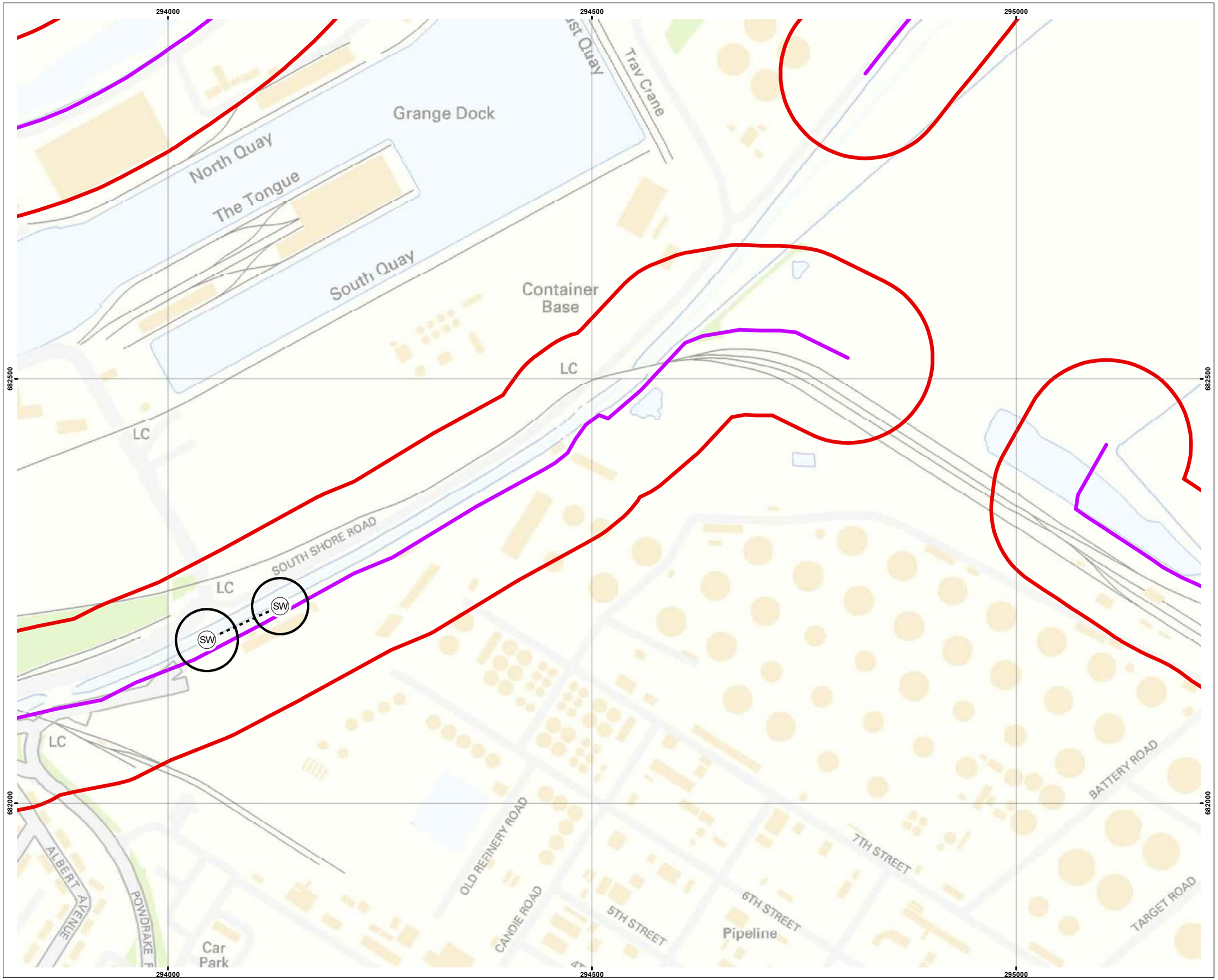
Produced: AM
Reviewed: HS

Ref: HAL04.18.1657 | Revision: A

Date: 17/09/2018

Local Prioirty Species
Figure III.22

Grangemouth FPS



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Key

- Scheme extent
- 100m Buffer

BirdKey

Surveys

- SW Visit 1
- SW Visit 2
- SW Visit 3

Species

- RM Red-breasted merganser
- SW Sedge warbler
- SL Swallow

Symbology

- ♀ Female
- ✱ Occupied nest
- SL Call
- (SW) Singing
- juv Juvenile
- Food Food
- Flightline
- Singing at same time
- Territory

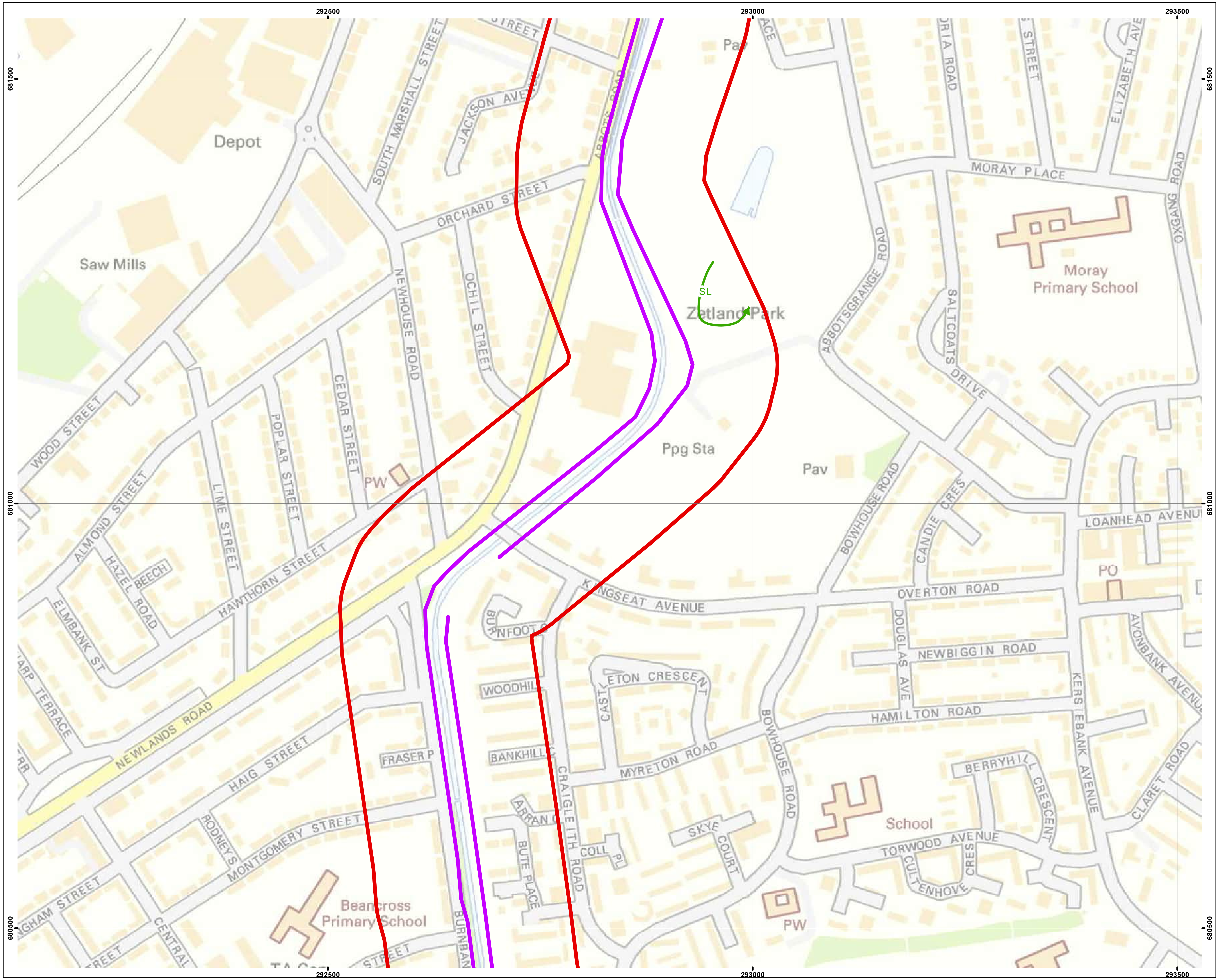
1:4,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657	Revision: A
Date: 17/09/2018	

Local Prioirty Species
Figure III.23

Grangemouth FPS



292500
293000
293500
681500
681000
680500
Depot
Saw Mills
SOUTH MARSHALL STREET
JACKSON AVE
ORCHARD STREET
ABBOTS ROAD
NEWHOUSE ROAD
OCHIL STREET
CEDAR STREET
POPLAR STREET
LIME STREET
WOOD STREET
ALMOND STREET
HAZEL ROAD
BEECH
ELMBANK ST
HAWTHORN STREET
NEWLANDS ROAD
HAIG STREET
FRASER P
RODNEYS
MONTGOMERY STREET
Beancross Primary School
BURNBANK
CENTRAL
PW
Pav
Zetland Park
SL
Ppg Sta
Pav
ABBOTSGRANGE ROAD
BOWHOUSE ROAD
KINGSEAT AVENUE
BURNFOOT
WOODHILL
BANKHILL
ARRAN
BUTE PLACE
CRAIGLEITH ROAD
COLL PL
CASTLE
ETON CRESCENT
MYRETON ROAD
SKYE COURT
School
TORWOOD AVENUE
CULTENHOVE CRES
PW
MORAY PLACE
Moray Primary School
ELIZABETH AVE
OXGANG ROAD
SALTCOATS DRIVE
CANDIE CRES
LOANHEAD AVENUE
PO
OVERTON ROAD
DOUGLAS AVE
NEWBIGGIN ROAD
HAMILTON ROAD
KERSIEBANK AVENUE
AVONBANK AVENUE
BERRYHILL CRESCENT
CLARET ROAD

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Key

- Scheme extent
- 100m Buffer

BirdKey

Surveys

- SW Visit 1
- SW Visit 2
- SW Visit 3

Species

- RM Red-breasted merganser
- SW Sedge warbler
- SL Swallow

Symbology

- ♀ Female
- ⁕ Occupied nest
- SL Call
- (SW) Singing
- juv Juvenile
- Food Food
- Flightline
- Singing at same time
- Territory

1:4,000 @ A3
0 50 Metres
N

Produced: AM
Reviewed: HS

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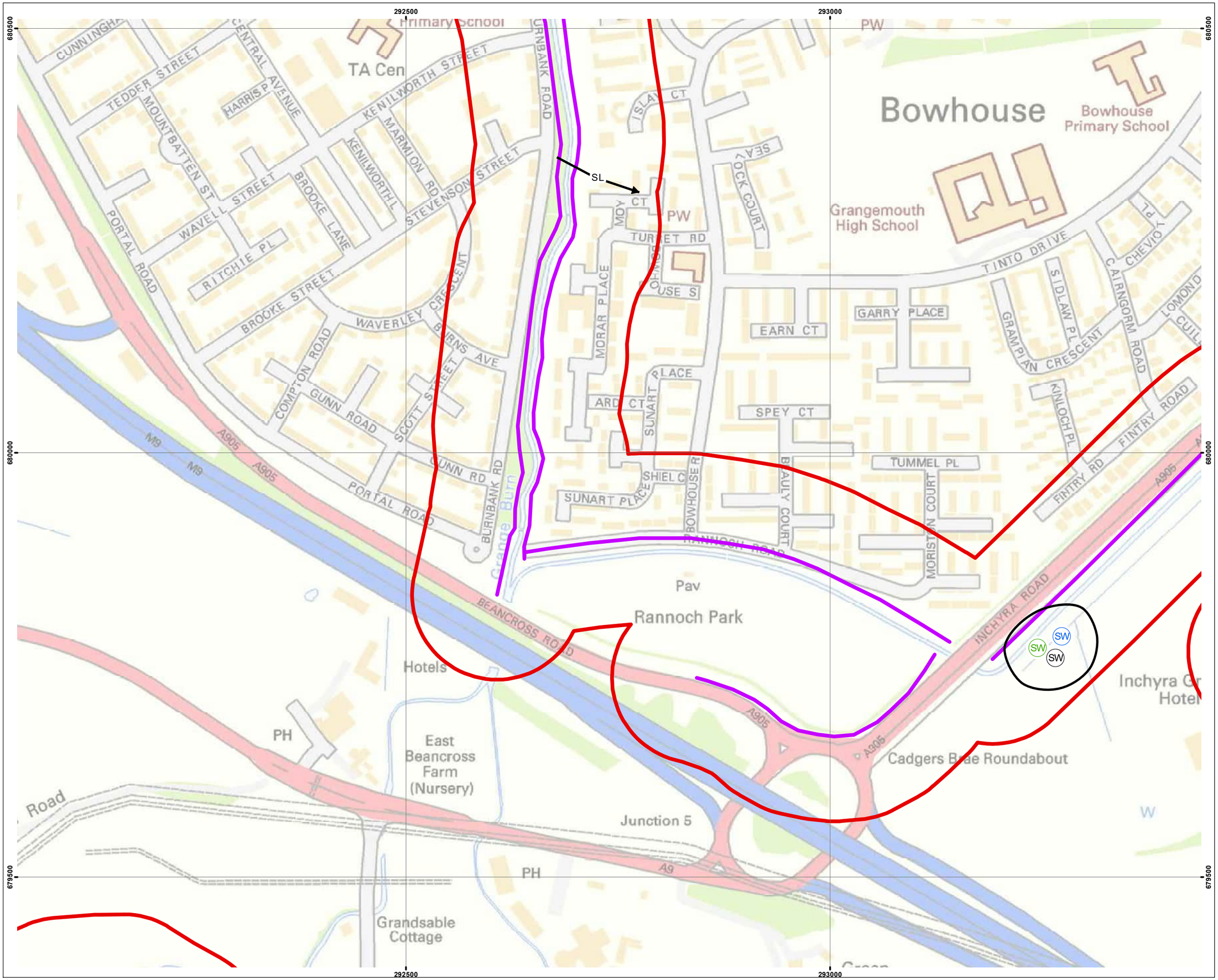
Date: 17/09/2018

Local Prioirty Species Figure III.24

Grangemouth FPS



Key

- Scheme extent
- 100m Buffer

BirdKey

Surveys

- SW Visit 1
- SW Visit 2
- SW Visit 3

Species

- RM Red-breasted merganser
- SW Sedge warbler
- SL Swallow

Symbology

- ♀ Female
- ✱ Occupied nest
- SL Call
- (SW) Singing
- juv Juvenile
- Food Food
- Flightline
- Singing at same time
- Territory

1:4,000 @ A3

Metres

0 50

N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657	Revision: A
Date: 17/09/2018	

Local Prioirty Species
Figure III.25

Grangemouth FPS

293500
294000
680000
679500
Primary School
Grangemouth High School
TINTO DRIVE
GARRY PLACE
GRAMPIAN CRESCENT
SIDLAW PL
CAIRNGORM ROAD
CHEVIOT PL
CAMPSIE ROAD
NEVIS
BRICK ROAD
LENNOX TERR
LOMOND ROAD
LAWERS PL
CUILLIN PL
KINLOCH PL
FINTRY ROAD
FINTRY RD
TUMMEL PL
MORISTON COURT
INCHYRA ROAD
A905
B914
Wholeflats Roundabout
SPITFIRE W
Pipeline
Wks
Wholeflats
Depot
Depot
Works
WHOLEFLATS ROAD
Pav
Inchyra Lodge
Inchyra Grange Hotel
Cadgers Brae Roundabout
GRANGE ROAD
REDBRAE ROAD
Recreation Ground
North Park
Car Pk
Green Acres Nursery
SW
SW
SW
SW
SW
SW

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Key

Scheme extent
100m Buffer

BirdKey

Surveys

SW Visit 1
SW Visit 2
SW Visit 3

Species

RM Red-breasted merganser
SW Sedge warbler
SL Swallow

Symbology

♀ Female
✱ Occupied nest
SL Call
SW Singing
juv Juvenile
Food Food
Flightline
Singing at same time
Territory

1:4,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657 | Revision: A

Date: 17/09/2018

Local Prioirty Species
Figure III.26

Grangemouth FPS

294500
295000
680500
680000
ROAD 32
ROAD 31
ROAD 33
Fl Sks
Avon Bridge
MHWS
MLWS
River Avon
Electricity Transformer Station
RIVERSIDE RD
EAST ROAD
QUEEN ROAD
FLARE ROAD
SOUTH RD
'holeflats
SW
SW Food
Works
Carse of Kinneil
WHOLEFLATS ROAD
A905
REDDOCH ROAD
AVONDALE ROAD
Gas Gov
Polmonthill
Polmonthill Cott

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Key

- Scheme extent
- 100m Buffer

BirdKey

Surveys

- SW Visit 1
- SW Visit 2
- SW Visit 3

Species

- RM Red-breasted merganser
- SW Sedge warbler
- SL Swallow

Symbology

- ♀ Female
- ✱ Occupied nest
- SL Call
- (SW) Singing
- juv Juvenile
- Food Food
- Flightline
- Singing at same time
- Territory

1:4,000 @ A3
Metres
0 50
N

Produced: AM
Reviewed: HS

Ref: HAL04.18.1657	Revision: A
Date: 17/09/2018	

Local Prioirty Species
Figure III.27

Grangemouth FPS