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**Rolls-Royce**

**Rolls-Royce Submarines Limited**

**Neptune and Nuclear Fuel Production Plant –  
Consequence Report**

**The Radiation (Emergency Preparedness & Public Information)  
Regulations 2019, Regulation 7**

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## Record of Change

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<b>Date</b>	<b>Version Number</b>	<b>Reason for Change</b>
September 2019	1.0	Initial Issue

# Contents

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	<b>Page No</b>
<b>1 Introduction</b>	<b>4</b>
1.1 Purpose of the Report	4
1.2 Background	4
1.3 The Raynesway Site	5
<b>2 Schedule 4 Items for Inclusion in Consequence Report</b>	<b>6</b>
2.1 Part 1 – Factual Information	6
2.2 Part 2 – Recommendations	6
2.3 Part 3 - Rationale	7
<b>3 Conclusion</b>	<b>9</b>
<b>4 Acronyms and Abbreviations</b>	<b>14</b>
<b>5 References</b>	<b>15</b>

## Illustrations

Figure 1 Location of the Raynesway Site	10
Figure 2 Proposed Minimum DEPZ Distance and Urgent Protection Action Zones for an Off Site Emergency Plan for the Raynesway Site	11
Figure 3 Proposed Minimum OPZ Distance as Determined by the Secretary of State for Defence	12
Figure 4 Comparison of Calculated Minimum DEPZ Within Current DEPZ Boundary	13

# 1 Introduction

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## 1.1 Purpose of the Report

- 1.1.1 This report is the first submission made by Rolls-Royce Submarines Limited (RRSL) in response to the new Radiation (Emergency Preparedness and Public Information) Regulations (REPPiR) 2019, Reference 1.
- 1.1.2 This submission is the Consequence Report to the Local Authority for RRSL's two Nuclear Licensed Sites at Raynesway, as required under regulation 7 of REPPiR 2019.
- 1.1.3 Regulation 4 of REPPiR requires a Hazards Evaluation to be undertaken for any premises holding more than specified quantities of radioactive materials. The quantity of radiological material held on each of the RRSL operated Nuclear Licensed Sites at Raynesway is sufficiently high to require a Hazard Evaluation to be performed.
- 1.1.4 Regulation 4 and 5 of REPPiR require that if a radiation emergency can occur on the site that can present a dose greater than 1 millisievert (mSv) to a member of the public, or the perception of risk from radiation, then a Consequence Assessment is required of the events identified by the Hazard Evaluation to establish the long and short term impacts from those identified events.
- 1.1.5 The output from these assessments will determine whether formal off-site emergency plans are required for the Raynesway site and to what extent it is recommended that they should apply. That output is presented in this report.
- 1.1.6 Local Authorities (in consultation with site operators) are required under REPPiR 2019 to determine what the Detailed Emergency Planning Zone (DEPZ) should be for the site based on the recommendations in this report and produce formal off-site emergency plans in order to restrict radiation doses to individuals and secure their health and safety, Reference 1.
- 1.1.7 These assessments and this report have been produced taking due cognisance of the draft REPPiR 2019 Approved Code of Practice (Reference 2), as advised by the Office for Nuclear Regulation (ONR). The assessments have been through RRSL appropriate due process and governance and submitted to the ONR as the lead regulator for REPPiR 2019 for nuclear Operators.

## 1.2 Background

- 1.2.1 There are two RRSL operated Nuclear Licensed Sites on the Raynesway estate, the Neptune Site and the Nuclear Fuel Production Plant (NFPP) site. Both have operated safely for over 50 years with no incidents causing any significant off-site doses.

- 1.2.2 The update to REPPiR in 2019 has prompted a review of RRSL's nuclear operations and extant safety assessments to satisfy the demands of the new regulations. There have been many changes to the regulations in this 2019 update, including changes to key definitions and the duties placed on Operators and Local Authorities. There have been no significant changes to RRSL's operations or nuclear risks since the previous REPPiR submission in March 2016 produced in line with the requirements of REPPiR 2001.
- 1.2.3 In considering the potential for radiation emergencies following accidents associated with the Raynesway Licensed Sites, the hazard assessment information produced in support of their site safety cases has been subject to a systematic review to identify those hazards that could give rise to a radiation dose greater than 1 mSv to a member of the public outside the Raynesway Site boundary.

### **1.3 The Raynesway Site**

- 1.3.1 The Rolls-Royce Raynesway site is located on the outskirts of Derby, to the south-east, see Figure 1. The whole site is surrounded by a security fence and access is controlled via a manned gatehouse. Further security fences surround the two nuclear licensed sites situated on the premises; the NFPP (historically referred to as the 'Operations Site') and the Neptune test facility.

## 2 Schedule 4 Items for Inclusion in Consequence Report

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### 2.1 Part 1 – Factual Information

1. *Clause 1(a) - Name and address of the operator:*

Rolls-Royce Submarines Limited (Registered Office),  
Atlantic House Raynesway,  
Derby,  
Derbyshire,  
DE21 7BE.

2. *Clause 1(b) - Postal address of the premises where the radioactive substance will be processed, manufactured, used or stored, or where the facilities for processing, manufacture, use of storage exist:*

Rolls-Royce Submarines Limited,  
Raynesway,  
PO Box 2000,  
Derby,  
DE21 7XX.

NOTE: The site address is the same for both of the Licensed Sites.

3. *Clause 1(c) - The date on which it is anticipated that the work with ionising radiation will commence or, if it has already commenced, a statement to that effect:*

The company has been involved in work with ionising radiation at the site, in the form of radioactive materials, since 1961.

### 2.2 Part 2 – Recommendations

1. *Clause 2(a) - The proposed minimum geographical extent from the premises to be covered by the local authority's off-site emergency plan:*

- a. The proposed minimum geographical extent from the premises to be covered by the Local Authority's off-site emergency plan is an area extending to a distance of not less than 360 m from the locations shown on the map at Figure 2. This is depicted by the outer line of the red-shaded zone on the map at Figure 2. This is a lobe-shaped zone as, for conservatism, it is based on a number of scenarios. This area extends approximately 150 m from the Raynesway estate fence to the north, 50 m to the east from the northern part of the site, 250 m to the south and 270 m to the west.
- b. In addition to the detailed emergency planning zone recommended above, an Outline Planning Zone (OPZ) of 1km has been determined for the Rolls-Royce Raynesway site by the Secretary of State for Defence in accordance with regulation 9(1)(c), see Figure 3.

*2. Clause 2(b) – The minimum distances to which urgent protective actions may need to be taken, marking against each distance the timescale for implementation of the relevant action; and Clause 3(a) – The recommended urgent protective actions to be taken within that zone, if any, together with timescales for the implementation of those actions:*

There are two Urgent Protective Action Zones within the recommended minimum emergency planning distance.

- a. Evacuation - 220 m from the source of the incident in all directions - controlled evacuation of the immediate area around the incident within the first few hours. This area is shown shaded in purple on the map in Figure 2. The closest member of the public would be more than 70m from the incident. The only area accessible to the public within this 220 m zone is along the river bank and certain areas of Alvaston Park.
- b. Sheltering - 220 m to 360 m from the source of the incident in all directions - personnel to shelter indoors within the first few hours. This area is shown shaded in red on the map in Figure 2. It includes a number of local businesses, a section of Alvaston Park and a section of the ground to the north of the railway line.

The declaration of an Off-Site Nuclear Emergency by the operator to the Local Authority will provide the trigger for implementing the off-site emergency plan and initiating all of the above recommended urgent protective actions.

*3. Clause 3(b) – Details of the environmental pathways at risk in order to support the determination of food and water restrictions in the event of a radiation emergency:*

- a. A radiation emergency on the Raynesway site could release some short-lived radioactive material in the form of an airborne release of small volumes of radioactive gas and volatiles.
- b. An airborne release will be dispersed downwind. A proportion of this material will fall to the ground but will only be at detectable levels within close proximity to the site. This volume of material released is very small and its radioactivity is very short lived – less than 24 hours. This material will not be available for uptake into the terrestrial food chain via ingestion of contaminated foodstuffs or extracted water from surface or groundwater. Therefore, no food or water restrictions are required in the event of a radiation emergency.

## **2.3 Part 3 - Rationale**

*1. Clause 4 – The rationale supporting each recommendation made:*

- a. Controlled evacuation of the immediate area around the incident to 220 m in all directions is to protect against the direct neutron and gamma radiation hazards from the incident, in accordance with the lower Emergency Reference Level (ERL) for evacuation of 30 mSv.
- b. Sheltering indoors up to 360 m in all directions from the incident is to protect against the direct neutron and gamma radiation hazards from the incident, in accordance with the lower ERL for shelter of 3 mSv.

- c. Consumption of Stable Iodine Tablets is not required.
- d. A detailed emergency planning zone of a minimum of 360 m has been recommended to align with the lower ERL for shelter based on the most recent consequence assessments for the site, produced in accordance with regulation 5(1) and schedule 3. This distance also aligns with the previous determination made by the ONR. A comparison of which is shown at Figure 4.
- e. The Secretary of State for Defence has determined an outline planning zone distance of 1 km. This distance is considered proportionate when compared to the results of the Hazard Evaluation and Consequence Assessments made under REPPiR 2019, and is considered to be sufficiently conservative to address all unforeseen events.

*2. Clause 5(a) – The rationale for its recommendation on the minimum distances for which urgent protective action may need to be taken:*

- a. The minimum distances recommended are based on the full range of possible consequences of the identified radiation emergencies evaluated in the consequence assessment made in accordance with regulation 5(1). This includes site-specific postulated initiating events, as identified within the Nuclear Site Safety Cases. These consequences were subsequently compared with the ERLs listed in National Radiological Protection Board (now Public Health England) Vol 1 No 4 1990 (Reference 3).

*3. Clause 5(b) – The rationale for agreement that no off-site planning is required.*

- a. This clause does not apply to Rolls-Royce Raynesway.



### 3 Conclusion

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- 3.1.1 This document is the Consequence Report to the Local Authority for the RRSL's two Nuclear Licensed Sites at Raynesway, as required under regulation 7 of REPPiR 2019 (Reference 1).
- 3.1.2 A hazard evaluation and consequence assessment has been produced to determine the potential extent of a radiation emergency on the Raynesway site and the impact to the public. Those assessments recommend the planning distances detailed in this report which in summary are:
- a. Proposed minimum geographical extent of the DEPZ is an area extending to a distance of not less than 360 m from the locations shown on the map at Figure 2;
  - b. Proposed area for sheltering indoors for the first few hours following the incident – up to 360 m from the location shown on the map at Figure 2.
  - c. Proposed area for controlled evacuation following the incident – up to 220 m from the location shown on the map at Figure 2;
  - d. OPZ of 1km from the location shown on the map in Figure 3.
- 3.1.3 These distances, with the exception of the OPZ, all fall within the current DEPZ for the Raynesway site and therefore RRSL proposes that the geographical extent of the DEPZ should effectively remain the same, taking into account any changes in land use and occupancy of the local area.

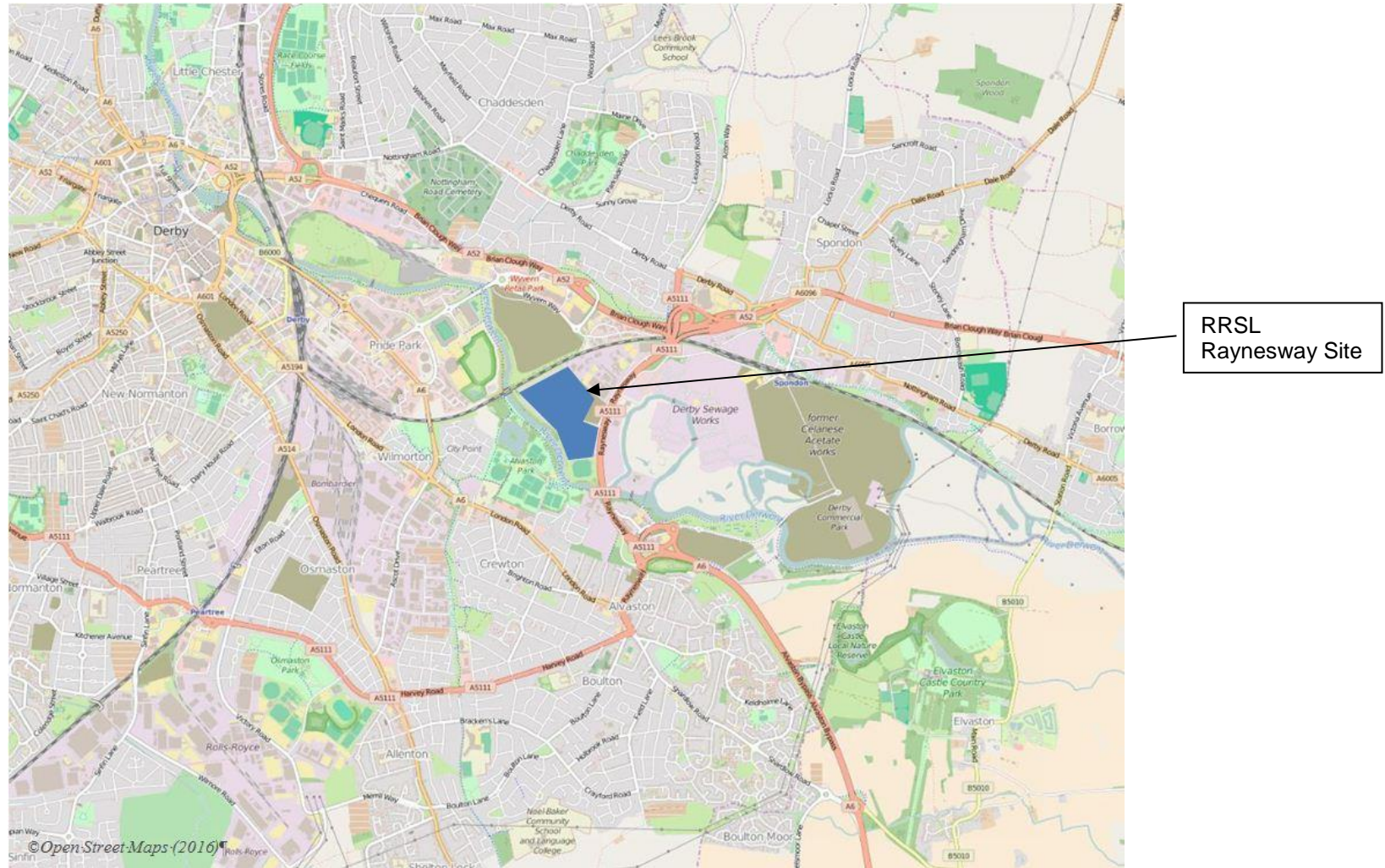


Figure 1 Location of the Raynesway Site

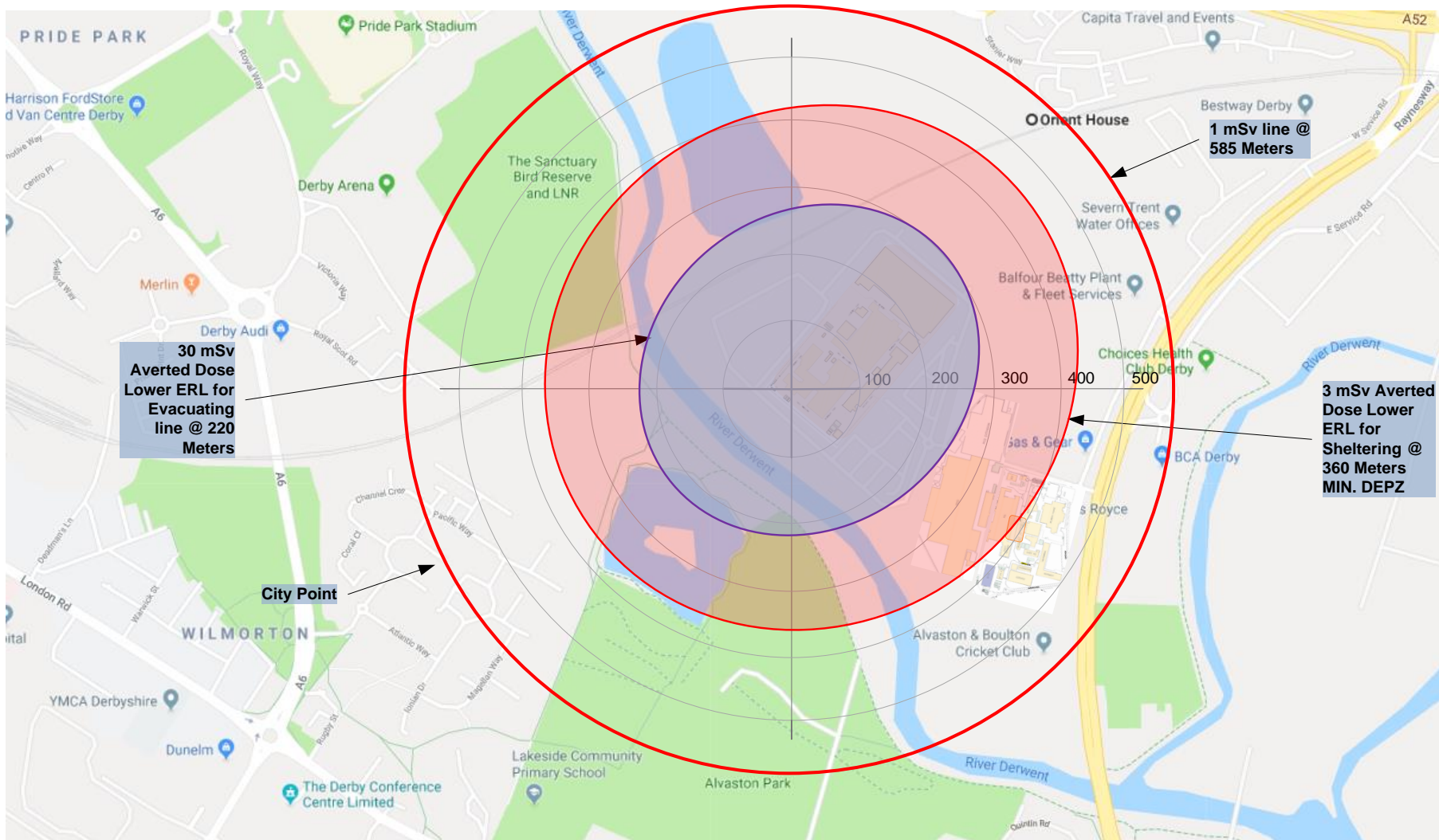


Figure 2 Proposed Minimum DEPZ Distance and Urgent Protection Action Zones for an Off Site Emergency Plan for the Raynesway Site

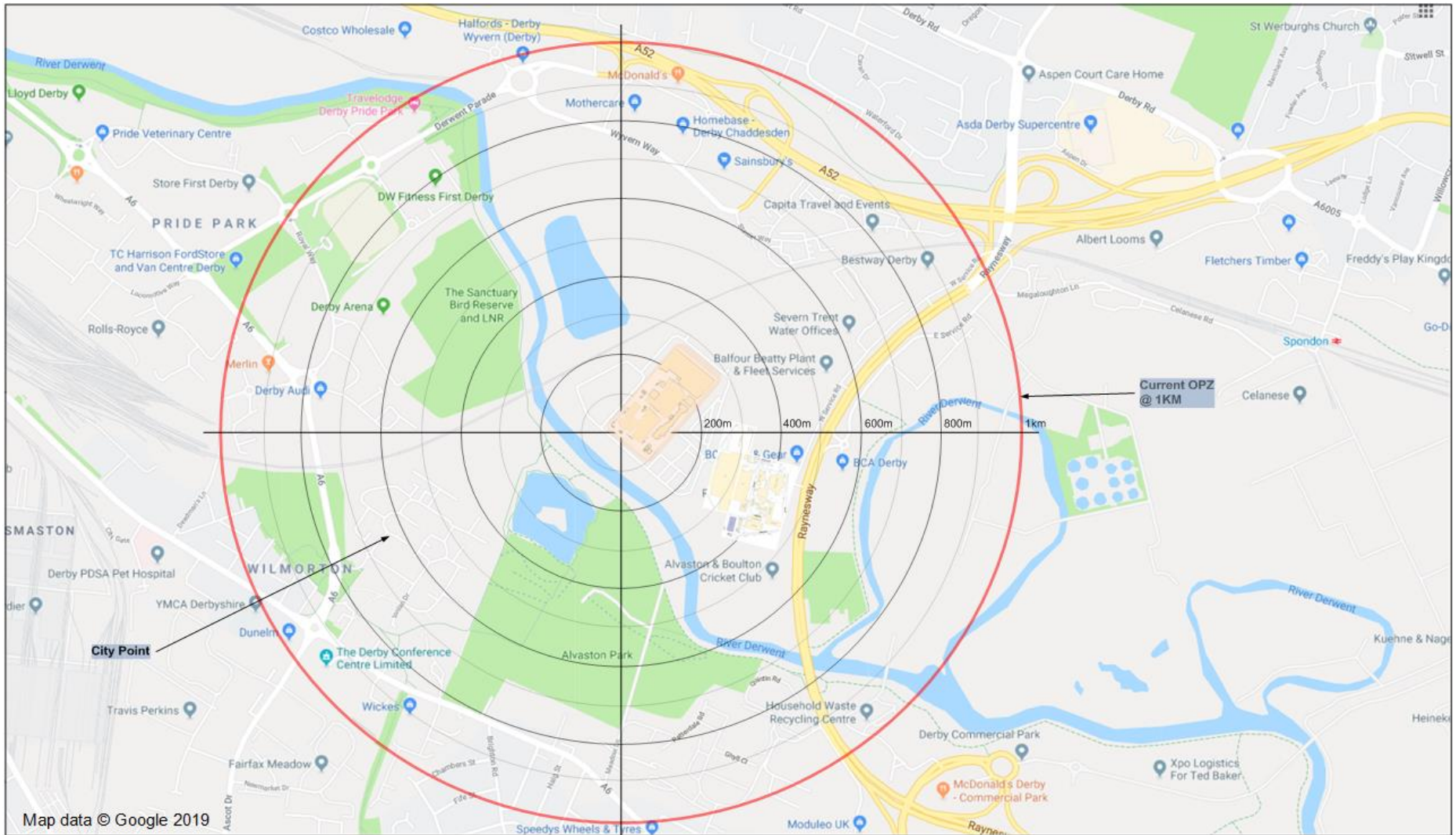


Figure 3 Proposed Minimum OPZ Distance as Determined by the Secretary of State for Defence

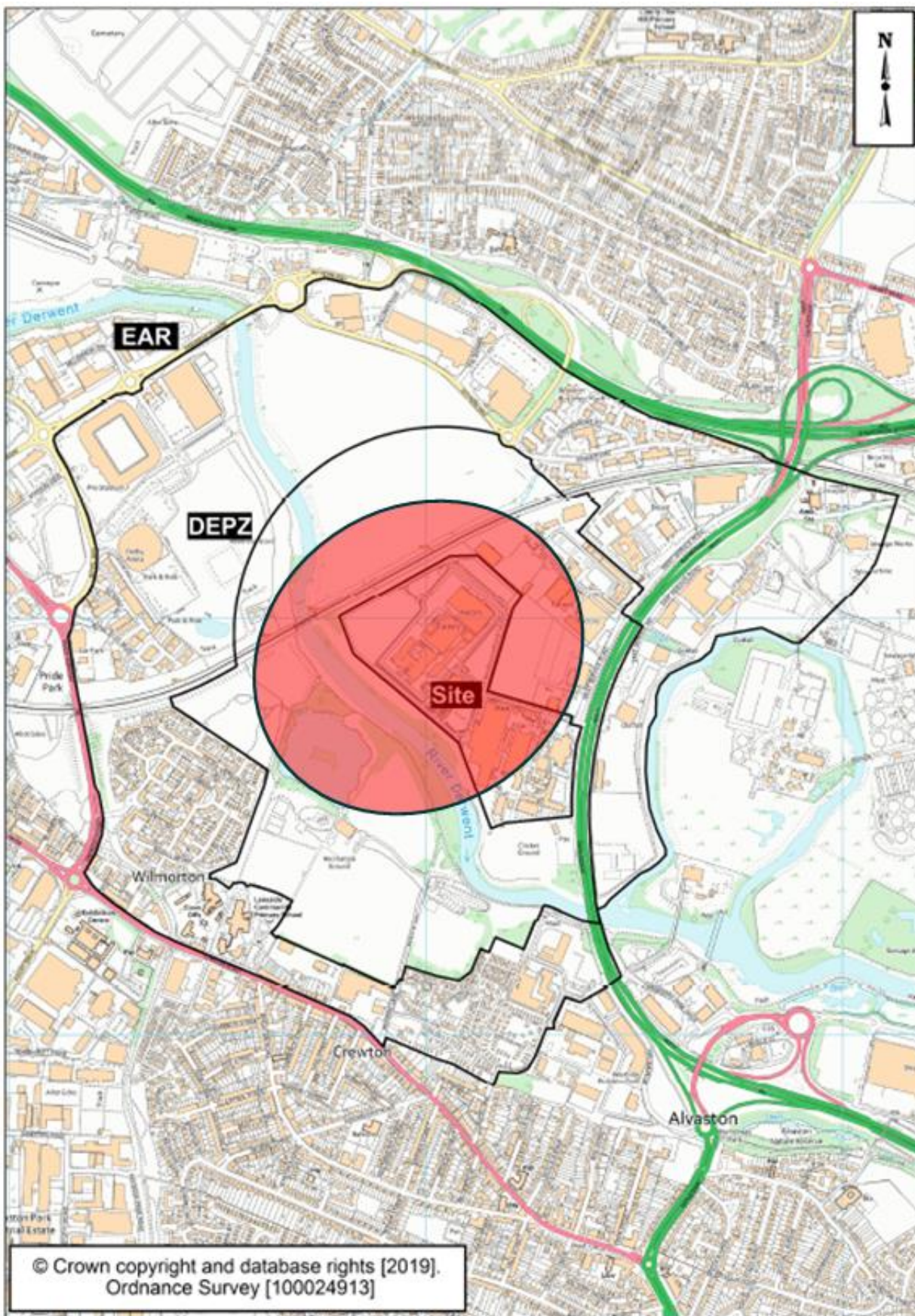


Figure 4 Comparison of Calculated Minimum DEPZ Within Current DEPZ Boundary

## 4 Acronyms and Abbreviations

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DEPZ	Detailed Emergency Planning Zone
ERL	Emergency Reference Level
mSv	Millisievert
NFPP	Nuclear Fuel Production Plant
ONR	Office of Nuclear Regulation
OPZ	Outline Planning Zone
REPIR	Radiation Emergency Preparedness and Public Information Regulations
RRSL	Rolls-Royce Submarines Limited

## 5 References

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1. 2019 No. 703, Health and Safety, The Radiation (Emergency Preparedness and Public Information) Regulations 2019.
2. Work with Ionising Radiation. The Radiation (Emergency Preparedness and Public Information) Regulations 2019 Approved Code of Practice and Guidance, Version 4.0 (Draft). 10<sup>th</sup> April 2019.
3. National Radiological Protection Board (now Public Health England). Vol 1 No 4 1990, Board Statement on Emergency Reference Levels.

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