



Health & Safety Executive  
Nuclear Safety Directorate  
HM Nuclear Installations Inspectorate  
Director and HM Chief Inspector, Laurence Williams

Copy for info  
in letter file

07/03/2003 P1/E6

Mr G Haywood  
Chief Executive  
Sefton Council  
Town Hall  
Lord Street  
Southport PR8 1DA

File: NIN 354/345/5/1/1 P1 E6

Master Copy 13

Unique No: NON 8315R

Date: 4 March 2003

Dear Sir,

**RADIATION EMERGENCY PREPAREDNESS AND PUBLIC INFORMATION  
REGULATIONS (REPPIR) 2001, REGULATION 9(1), 9(8)a**

Thank you for your letter dated 7 November 2002 ref PNC/DW. We acknowledge the matters you raise in your letter in relation to the time for preparation of an off-site emergency plan under Regulation 9(8). Would you please confirm the progress made on the issues raised in your letter and proposed dates for completion of an off-site emergency plan.

Yours sincerely

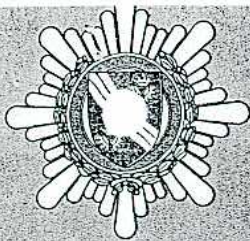
[Redacted signature] (E38)

[Redacted signature] (E38)

Head of Emergency Planning Group

A person authorised to act on  
behalf of the Executive

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# Merseyside Fire Service

min 223 / 316 / 6 / 1 / 1 / 1 / P1 / E7

Mr **E38**  
Health and Safety Executive  
Nuclear Installations Inspectorate  
2<sup>nd</sup> Floor Podium Level  
Daniel House  
Bootle  
Merseyside  
L20 3TW

Emergency Planning Unit  
Fire Service Headquarters  
Bridle Road  
Bootle  
Merseyside  
L30 4YD

Tel: 0151 296  
Fax: 0151 296  
Email: **E38** @merseyfire.gov.uk

Your ref:

Our ref : BB4368

Date: 23 May 2003

Dear **E38**

Further to our recent telephone conversation, I would like to clarify some of the points that we discussed.

1. The Royal Navy has submitted to the Health and Safety Executive a full risk assessment relating to the use of the Berth at Seaforth Dock by their Nuclear Submarines.
2. The Health and Safety Executive are satisfied that this risk assessment complies fully with regulations four and five of the REPPIR regulations.
3. The risk assessment cannot be passed to Sefton MBC or any independent assessor that they might employ because of the classified nature of the information contained within the document.
4. You will ask the Royal Navy to supply to Merseyside Emergency Planning Department a copy of the on-site plan for dealing with emergencies that might arise when such vessels are in port.
5. You indicated that you believe that the plan is a generic plan and or is based upon the Liverpool Special Safety Scheme. An initial discussion between myself and a colleague of Phil Noble confirms that belief.

In this regard I would point out that the Liverpool Special Safety Scheme does not reflect the integrated Emergency and Local Authority response that is currently the practice on Merseyside. Additionally, it is my understanding that the last two LiverPort exercises that were conducted on Merseyside identified that the plan, as it stood, was not a workable document.





If the on-site plan to be submitted by the Royal Navy is merely an updated version of the Liverpool Special Safety Scheme, I would have to say for those reasons stated, that that submission would not be regarded by myself as satisfactory.

I think it is clear then that the lack of access to the risk assessment places the Local Authority in considerable difficulty. Further, that issue combined with the lack of a meaningful on-site plan makes the production of an off-site plan extremely difficult.

We are very keen to comply with the requirement to complete an off-site plan, however for these reasons I do not consider that at this time it is appropriate to determine that the off-site plan clock has started ticking. In any case the plan will involve a multi-agency response that will require time to formulate, practice and adjust. I therefore believe that six months cannot be an achievable time frame for this work to be completed.

I would be grateful if you would respond to the points raised above. In particular that you are fully satisfied with the risk assessment that has been provided by the Royal Navy.

Yours sincerely

(E38)

(E38)



Health & Safety Executive Direct Dial: 0151-951-  
Nuclear Safety Directorate  
HM Nuclear Installations Inspectorate  
Director and HM Chief Inspector, Laurence Williams

E38

Bx  
spn  
E38

NIN/223/316/6/1/1-1/1/E4

E38

CNNRP  
Ministry of Defence  
Birch 3c #3333  
Abbeywood  
Bristol  
BS34 8JH

Our Ref: NIN/223/316/6/1/1  
Part 1 E19  
NIN/354/355/5/1/1  
Part 1 E19

Date: 4 March 2003

Dear

E38

# REPPIR 2001 – OFF SITE PLANS FOR 'Z' BERTHS AT SOUTHAMPTON AND LIVERPOOL

Further to our recent discussions regarding the use of 'Z' Berths at Southampton and Liverpool I write to confirm that HSE has received requests from both Southampton City Council and Sefton Council to extend the period in which they are required to prepare the off-site emergency plan in accordance with the requirements of Regulation 9(8).

Before responding I would be grateful if you could advise me whether in agreeing to such requests HSE would potentially be prejudicing MoD's operational requirements for submarine deployment. Southampton have requested an extension until 21 July 2003 and we are in discussion with Sefton Council to establish their requirement.

Copies of their letters have already been faxed to you.

Yours sincerely

E38

HM Superintending Inspector  
(Nuclear Installations)

Head of Division 3, Mr B. J. Furness, HM Deputy Chief Inspector  
St Peter's House, Stanley Precinct, Bootle, Merseyside L20 3LZ  
Tel: 0151 951 4000 Fax: 0151 951 3942

RCGUOB9.03.03

Reducing risks - protecting people

010 223/316/6/1/1/1/1/E5



# CHAIRMAN NAVAL NUCLEAR REGULATORY PANEL

FROM

(E38)

JOBE BSC CENG FIMECHE ROYAL NAVY

CoN/CNNRP/509/6 (2229)

Mr (E38)  
HM Superintending Inspector  
HM Nuclear Installations Inspectorate  
St Peter's House, Stanley Precinct  
Balliol Road  
Bootle  
Liverpool L20 3LZ

Birch 3c #3333  
Abbey Wood  
Bristol, BS34 8JH  
Direct line: 0117 91  
Fax 0117 91  
e-mail: (E38)

18 Mar 03

## DEFERMENT OF LOCAL AUTHORITY EMERGENCY PLANS

Reference:

- A. NII letter NIN/223/316/6/1/1 dated 4 Mar 03.
- B. Letter from the office of Flag Officer Submarines D/FOSM/4/2683 dated 6 Nov 01

Thank you for forwarding me letters from Sefton Council and Southampton City Council requesting extensions of the time permitted under REPPIR for completion of the emergency plans, or at least implying that an extension is required. I can confirm that the MoD would have no objection to HSE granting such extensions, as it is in all our interests that agreed and workable plans are drawn up. The Royal Navy has no intention of using these ports for nuclear submarines until the emergency planning process has satisfactorily completed, and a deferment would not prejudice MoD's operational requirements for submarine deployment.

(E38)

SITE MOO		DATE 24/3/03
FILE NIN	223/316/6/1/1/1/1/E20	
DISTRIBUTION:	LETTER	DOCUMENT
(E38)	✓	
	✓	
H/AREF.		

Information:

(E38), Head of emergency planning group, HSE, NSD, St Peter's House, Stanley Precinct, Bootle, Liverpool L20 3LZ

MINISTRY OF DEFENCE



**'Z' BERTH CONTACT REPORT**

MISC 2002/70

**BERTH:** Liverpool

File Ref: NIN 354/355/5/1/1  
Pt1 E16

**PLACE OF MEETING:**

Sefton Council, Balliol  
House, Bootle

**DATE OF MEETING:**

8 November 2002

**PRESENT:**

(E38) (Sefton Council  
Environmental Protection  
Director)

(E38) (Sefton Council  
Emergency Planning  
Officer)

(E38) (NII, Head of Unit (E38))

(E38) (NII, Unit 4b)

**PURPOSE OF MEETING:**

Discussions on REPPIR and Off-Site Emergency Plan for Liverpool Z  
Berth

**Summary of Discussion**

Following receipt of the HSE notification to prepare an off-site plan as required by REPPIR, Sefton had asked for a meeting to discuss the regulatory requirements. Sefton were concerned as previous tests of the Liverpool Public Safety Plan had shown that the provisions for distribution of potassium iodate tablets were unworkable. MoD had agreed to review how this could be resourced and had recently provided the Council with proposals for distribution by MoD personnel who would be provided to support any future visits/use of the Z Berth.

(E38) was concerned at the lack of contact and liaison with MoD. He indicated that Sefton would be responding to HSE advising that as they had not received a Report of Assessment from the operator and hence they were not in a position to prepare an off-site plan. In any event, as Sefton had an extremely limited resource (only (E38)) and as they had no COMAH sites they would not only be seeking an extension, if they had to prepare a plan, but would also have to engage consultants and would be looking at charging the operator for these services.

(E38) advised that in common with Southampton, Sefton would be pressing MoD for a "Statement of need" as they were of the view that there was too much potential risk for any benefit to Sefton.

A number of detailed points on REPIR and general risk assessment issues such as the foreseeability of terrorist threats and other potential hazards such as fire and armament/weapon explosion were discussed. Sefton were advised that terrorist threats were not considered to be reasonably foreseeable in the context of REPIR Planning. Furthermore planning for radiation emergencies was not novel and the general provision of detailed plans for the "DEPZ" supplemented by extendibility was a common UK approach.

(E38) was advised that HSE had approved the withholding of classified information from the Report of Assessment but had nonetheless independently evaluated the operators submission before coming to its opinion on detailed emergency planning zones. In response to a query on exercising/testing plans HSE indicated that in view of the previous history of problems with potassium iodate distribution it would expect to see a demonstration of the off-site plan arrangements prior to any use of the Z Berth at Liverpool.

Finally (E38) indicated that if Sefton were required to produce an off-site plan they would first of all want to see the operators on site plan. Further, while they would be happy to be advised they will not be told by MoD what the off-site plan should be.

### Conclusions

It would appear that MoD is not meeting its obligations to provide Sefton with the information required by REPIR.

### Proposed Actions

Advise MoD of the outcome of the meeting and remind them of their obligations under REPIR.

(E38)

### Circulation

(E38)

File NIN 354/355/1/1 Pt 1 E (E38)





Health & Safety Executive  
Nuclear Safety Directorate  
HM Nuclear Installations Inspectorate  
Director and HM Chief Inspector, Laurence Williams

The Chief Executive  
Sefton Borough Council  
270 Marsh Lane  
Bootle  
L20 5BW

Our Ref: NIN 354/345/5/1/1P1  
Unique No: NON 8136 N  
Date: 14 October 2002

For the attention of Mr **E38**, the Emergency Planning Officer.

Dear Sir

**RADIATION (EMERGENCY PREPAREDNESS AND PUBLIC INFORMATION)  
REGULATIONS 2001 - REGULATION 9(1) AND 9(8(a))**

In accordance with Regulation 9(1) I have considered the assessments made by the operator of the 'Z' Berth at Seaforth Dock, Liverpool under Regulation 4(1). In my opinion the 2km detailed emergency planning zone proposed in their assessment report is considered appropriate.

I therefore notify you under Regulation 9(8)(a) of the requirement for your Local Authority to prepare an off site emergency plan for the 2km detailed emergency planning zone.

I am also copying this letter to the operator of the 'Z' Berth at Seaforth Dock, Liverpool.

Yours faithfully

**E38**

**Head of Emergency Preparedness Section**

A person authorised to act on  
behalf of the Executive





# **MINISTRY OF DEFENCE**



## **LIVERPOOL Z BERTH**

### **REPORT of ASSESSMENT** **of the** **HAZARD IDENTIFICATION & RISK EVALUATION**

Radiation (Emergency Preparedness & Public Information) Regulations  
Regulation 6 & Schedule 5

## 1. INTRODUCTION

The Radiation (Emergency Preparedness and Public Information) Regulations 2001 require a Hazard Identification and Risk Evaluation (HIRE) to be undertaken for any premises containing more than the quantity of radioactive material specified in the Regulations. This document is the Report of Assessment of the HIRE for the nuclear submarines, defined as premises under the Regulations, at the Liverpool Z berth. The Report of Assessment, together with such supporting information as deemed necessary by the Health and Safety Executive (HSE), is provided to enable the HSE to assess the risk to the health or safety of persons who could be affected by the work with ionising radiation undertaken at Rothsay.

NOTE: Some sections of this report of assessment necessarily contain information in an abbreviated form and with limited technical detail. This has been done in the interest of national defence and public security and is in accordance with the agreement of the Health and Safety Executive (HSE) who have exercised their powers under regulation 16 (6) of REPPIR. The HSE have access to fuller and more detailed information to enable them to satisfy themselves on the acceptability of this assessment.

## 2. LOCATION AND ENVIRONMENT

- 2.1 **Operator Name:** Commander-in Chief Fleet, Ministry of Defence,
- 2.2 **Operator Address:** Ministry of Defence  
(Sponsor. Director HM Naval Base Clyde, Helensburgh, Dunbartonshire, G84 8HL).
- 2.3 **Address of Premises:** Seaforth Docks, Sefton, Merseyside, Liverpool.  
OS Grid References  
a. S7 berth: 3319 3961  
b. S10 berth: 3315 3966  
c. Holding berth: 3110 4070
- 2.4 **History:** The Z Berth has been used since 1973.
- 2.5 **General Description:**
- 2.5.1. The Liverpool Z berth comprises two alongside berths in the Seaforth Dock complex on Merseyside and a 'Holding berth' 20 km offshore in the approaches to the River Mersey. The meteorological conditions are typical for the North west of England. The prevailing wind is westerly. The rainfall for the area is typical for the region.
- 2.5.2 The local authority for the area surrounding the Seaforth Docks is Sefton Borough Council .
- 2.5.3 The population distribution extending 2km from the berth at Liverpool is detailed in Table 1.

LOCATION	POPULATION DATA
S7 berth	18018
S 10 berth	15540
Holding berth	0

Table 1 Population Data 2km from Submarine Berth



### 3. ACTIVITIES ON THE PREMISES

- 3.1 The Z berth provides berthing facilities for nuclear submarines to visit this location for operational or recreational purposes.
- 3.2 The nuclear submarine visiting the Liverpool berths contains more than the quantity of radioactive material specified in Schedule 2 of the Regulations. A HIRE has been conducted for visiting nuclear submarines. A brief description of the premises (ie submarine) and the containment arrangements for the radioactive substances are described below.

Facility	Description	Containment
Submarine Reactor	Pressurised Water Reactor (PWR). Fission of uranium, contained in fuel elements, takes place in the reactor core. The resulting fission products, including radioactive isotopes of iodine, caesium and krypton, are contained within the fuel cladding. The heat generated by the fission process is removed from the core by water contained in a sealed circuit. This water is pumped through steam generators where the heat is transferred to a separate, secondary circuit.	The fuel elements are contained within a high integrity cladding, designed to prevent the release of radioactive fission products. Should the cladding fail, the primary coolant system, a pressurised, sealed circuit, would contain the fission products. Beyond the primary coolant system, a third containment boundary exists which is designed and constructed to meet the rise in pressure that could result from a failure of the primary coolant system. The final containment boundary is the submarine pressure hull.

**Table 2      Radioactive Substances with a Hazard Identification and Risk Evaluation**

### 4. SAFETY ASSESSMENT PROCESS

#### 4.1 Internal Regulation

A nuclear submarine visiting the Liverpool Z berth is not subject to licensing under the Nuclear Installations Act. However, the MoD operates an internal regulatory and approval system for the operation of submarine nuclear reactors.

#### 4.2 Naval Pressurised Water Reactor (PWR)

The Design Authority for the Naval PWR, Rolls Royce Naval Marine, is charged with producing a Reactor Plant Safety Justification (RPSJ) covering all classes. This safety case is based on deterministic and probabilistic safety assessment of the PWR and its associated systems. The RPSJ is independently peer reviewed and then subjected to Independent Nuclear Safety Assessment (INSA) by Serco Assurance (formerly part of AEA Technology). They produce a Nuclear Safety Clearance Document for each submarine with a class review, which is formally reviewed by the Chairman of the Naval Nuclear Regulatory Panel. When satisfied, CNNRP issues a Safety Clearance Letter to MoD's Central Plant Control Authority who authorises the operation of each submarine.



### 4.3 Safety Controls and Engineering Design

The containment arrangements for a nuclear submarine are described in Table 2. In addition, there are engineered and procedural safeguards to prevent and mitigate any accident scenario. All equipment is designed and constructed to a high specification, and undergoes thorough examination, testing and regular planned maintenance. Operation of all equipment is conducted according to operating procedures, by suitably qualified and experienced staff.

### 4.4 Safety Management, Staffing and Training

The safety responsibilities of all personnel are defined in Submarine Operating Documentation. All submarine personnel and those MoD personnel that support the visit of a nuclear submarine to Liverpool are suitably qualified and experienced for the work that they are expected to perform. A continuous process of audit and review is used to ensure that procedures remain current and effective. Minimum manning levels have been assessed and are documented in Submarine Operating Procedures. This ensures that there are adequate staff and resources available at all times to enable safe plant operation and provide a robust emergency response capability.

## 5. HAZARD IDENTIFICATION AND RISK EVALUATION

### 5.1 Introduction

The Radiation (Emergency Preparedness and Public Information) Regulations define the terms “radiation accident” and “radiation emergency”. A radiation accident requires immediate action to prevent or reduce the exposure to ionising radiation of employees or other persons; a radiation emergency is an event which is likely to result in a member of the public being exposed to ionising radiation, as defined in the Regulations. Hence a radiation accident may, but will not necessarily, result in a radiation emergency.

### 5.2 Submarine Reactor

A range of potential accident scenarios have been analysed, the majority of which would not result in a release of radioactivity by virtue of the engineering and procedural safeguards described previously. The analysis considered those factors that could lead to a loss of cooling capability, as well as those that could give rise to an unintended self-sustaining nuclear chain reaction or the loss of control of an intended self-sustaining chain reaction. For a significant release to occur it is necessary for there to be a plant failure followed by breach of the multiple containment barriers between the radioactive fission products contained within the fuel and the outside environment. These barriers include the high integrity fuel cladding, the primary coolant sealed circuit, the containment structure and the submarine hull.

The HIRE for the submarine reactor has identified a number of scenarios, which could lead to an off-site release of radioactive material. A radiation emergency, as defined within the Regulations, can result from a submarine reactor accident.

Accidental releases from the site could occur over periods of several hours, depending on the circumstances and the level of damage.



In order to develop an accident response strategy, the analysis has considered the probability of each accident sequence occurring and the consequences of the fission product release resulting from that sequence. A two stranded approach has then been used to determine an appropriate strategy: an analysis of the probability and magnitude of any radiation exposure given that a radiation accident has been declared; and an analysis of the optimum countermeasure strategy for protection of individuals from any potential radiation exposure. Both analyses have considered all of the identified accident sequences. The appropriateness of introducing countermeasures has been determined on the basis of published advice from the National Radiological Protection Board. This approach has resulted in a recommended accident response strategy based on a range of accident scenarios and analyses.

## 6. IMPLICATIONS FOR RADIATION EMERGENCIES

In the event of a radiation emergency, the likely exposures to those members of the public within the zone extending approximately 2 km from the location of the plant could exceed 5 mSv. It is very unlikely that exposures in excess of 5 mSv could be received beyond this zone, however a small number of low probability scenarios have been identified with more significant consequences. In addition, personnel on the premises and intervention workers could exceed the current statutory dose limits for radiation workers as a result of a radiation emergency.

In deriving the recommended countermeasures strategy, due account has been taken of all identified accident scenarios.

The recommended response strategy to a radiation emergency would be implemented in two stages. Immediate countermeasures are set out in the submarine Emergency Operating Procedures (forming an Operator's Emergency Plan), affecting only those personnel within the 550m automatic countermeasure zone. Implementation of the recommended off-site response would affect individuals in the pre-planned countermeasure zone out to approximately 2km downwind from the accident site. These individuals would be advised to shelter to reduce any potential radiation exposure and to take stable iodine tablets to minimise the radiation exposure received as a result of inhalation of any radioactive iodine released. Both the on-site and off-site plans would be implemented as precautionary measures prior to the detection of any release of radioactivity.

The basis for food controls applied by the Food Standards Agency (FSA) will be against food intervention levels required by EC Regulations.

These arrangements were developed and agreed in consultation with local authorities, and are articulated within the Off Site Emergency Plan for Liverpool Z berth.

## 7. CONCLUSIONS

A hazard identification and risk evaluation has been conducted for premises at Liverpool Z berth holding radioactive materials as required by the Regulations. These assessments have indicated that a submarine reactor accident could lead to a radiation emergency.

The probabilities and consequences of the full range of potential accidents have been analysed and a response strategy developed to address them. To cope with the unlikely event of a radiation emergency, the nuclear submarine has Emergency Operating Procedures (forming an Operator's Emergency Plan) in place detailing the on-site response. The appropriateness of implementing countermeasures off-site has been assessed in the light of

national legislation and guidance, and a precautionary strategy has been recommended to a distance of approximately 2km downwind from the site. The recommended pre-planned countermeasure zone is shown on the maps at Appendix 1. The planning for a submarine reactor accident is valid in outline for a nuclear weapon accident even though it is not reasonably foreseeable.

Emergency planning for the Liverpool Z berth is addressed by the multi-agency Emergency Planning Co-ordination Sub-Committee. This enables the co-ordinated response strategy to be regularly reviewed and updated as required.

MoD has established engineered and procedural safeguards to prevent a radiation accident from occurring, and to limit the consequences of any accident that could occur. The safety management systems to ensure effective control of radioactive substances are regularly reviewed and audited.



APPENDIX 1

**MAPS OF THE AREA EXTENDING  
2KM FROM THE SUBMARINE BERTHS  
AT LIVERPOOL**

LIVERPOOL

MAGHULL

CROSBY

LITHERLAND

BOOTLE

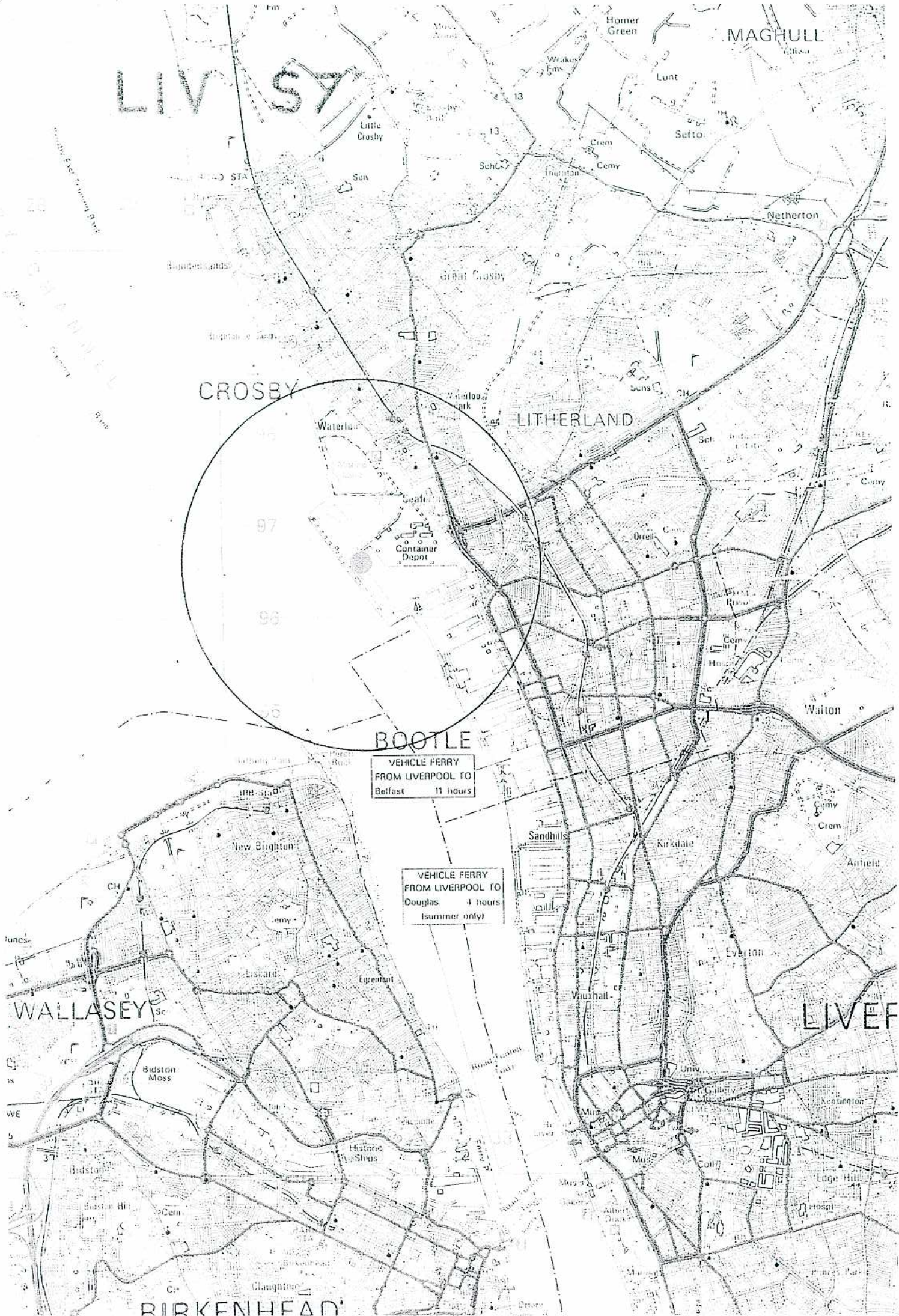
VEHICLE FERRY  
FROM LIVERPOOL TO  
Belfast 11 hours

VEHICLE FERRY  
FROM LIVERPOOL TO  
Douglas 4 hours  
(summer only)

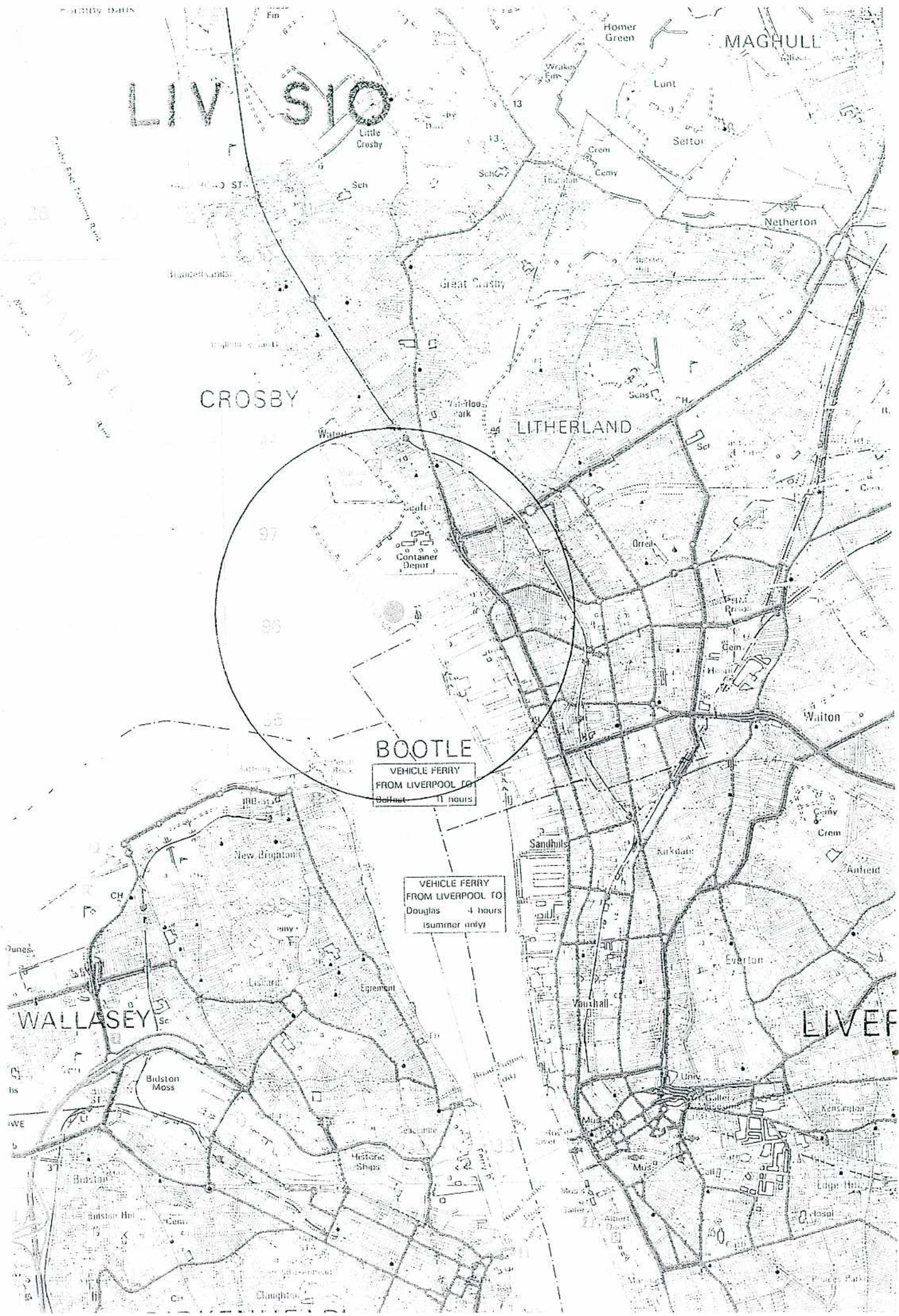
WALLASEY

LIVERPOOL

BIRKENHEAD







LIV SIO

MAGHULL

CROSBY

LITHERLAND

BOOTLE

VEHICLE FERRY  
FROM LIVERPOOL TO  
Bootle 11 hours

VEHICLE FERRY  
FROM LIVERPOOL TO  
Douglas 4 hours  
(summer only)

WALLASEY

LIVER





**MINISTRY OF DEFENCE**



**LIVERPOOL**

**REPORT of ASSESSMENT**  
**of the**  
**HAZARD IDENTIFICATION & RISK EVALUATION**

**7 FEBRUARY 2005**

**Radiation (Emergency Preparedness & Public Information) Regulations  
Regulation 6 & Schedule 5**



## 1. INTRODUCTION

The Radiation (Emergency Preparedness and Public Information) Regulations (REPPIR) 2001 require Hazard Identification and Risk Evaluation (HIRE) be undertaken for any premises containing more than the quantity of radioactive material specified in the Regulations. This document is the Report of Assessment of the HIRE for the nuclear submarines, defined as premises under the Regulations, at the Liverpool Z berth. The Report of Assessment, together with such supporting information as deemed necessary by the Health and Safety Executive (HSE), is provided to enable the HSE to assess the risk to the health or safety of persons who could be affected by the work with ionising radiation undertaken at Liverpool.

NOTE: Some sections of this report of assessment necessarily contain information in an abbreviated form and with limited technical detail. This has been done in the interest of national defence and public security and is in accordance with the agreement of the Health and Safety Executive (HSE) who have exercised their powers under regulation 16 (6) of REPPIR. The HSE have access to fuller, more detailed and classified information to enable them to satisfy themselves on the acceptability of this assessment.

## 2. LOCATION AND ENVIRONMENT

- 2.1 **Operator Name:** Commander-in-Chief Fleet, Ministry of Defence
- 2.2 **Operator Address:** Ministry of Defence:  
(Sponsor: Naval Base Commander, HMNB Clyde, Helensburgh, Dunbartonshire, G84 8HL)
- 2.3 **Address of Premises:** Seaforth Docks. Sefton, Merseyside, Liverpool  
O/S Grid Ref: S7 berth: SJ 3190 9610
- 2.4 **History:** The Z Berth has been used since 1963
- 2.5 **General Description:**
- 2.5.1 The Liverpool Z berth comprises one alongside berth in the Seaforth Dock complex on Merseyside and a 'Holding Berth' 20km offshore in the approaches to the River Mersey. The meteorological conditions are typical for the North West of England. The prevailing wind is westerly. The rainfall for the area is typical for the region.
- 2.5.2 The local authority responsible for the area surrounding the Seaforth Docks is Sefton Borough Council.

- 2.5.3 The total population distribution extending 2km from the MOD Z berth at Liverpool is detailed in Table 1.

LOCATION	POPULATION DATA
S7 Berth	18018
Holding Berth	0

Table 1 Population Data 2km from Submarine Berth

### 3. ACTIVITIES ON THE PREMISES

- 3.1 The Z berth provides the facility for nuclear submarines to visit this location for operational or recreational purposes.
- 3.2 The nuclear submarine visiting the Liverpool berth contains more than the quantity of radioactive material specified in Schedule 2 of the Regulations. A HIRE has been conducted for visiting nuclear submarines. A brief description of the premises (ie submarine) and the containment arrangements for the radioactive substances are described below.

Facility	Description	Containment
Submarine Reactor	Pressurised Water Reactor (PWR). Fission of Uranium, contained in fuel elements, takes place in the reactor core. The resulting fission products, including radioactive isotopes of iodine, caesium and krypton, are contained within the fuel cladding. The heat generated by the fission process is removed from the core by water contained in a sealed circuit. This water is pumped through steam generators where the heat is transferred to a separate, secondary circuit.	The fuel elements are contained within a high integrity cladding, designed to prevent the release of radioactive fission products. Should the cladding fail, the primary coolant system, a pressurised, sealed circuit, would contain the fission products. Beyond the primary coolant system, a third containment boundary exists which is designed and constructed to meet the rise in pressure that could result from a failure of the primary coolant system. The final containment boundary is the submarine pressure hull.

Table 2 Radioactive Substances with a Hazard Identification and Risk Evaluation



#### 4. SAFETY ASSESSMENT PROCESS

##### 4.1 Internal Regulation

A nuclear powered submarine visiting the MOD Z berth at Liverpool, as a Ministry of Defence facility, is not subject to licensing under the Nuclear Installations Act. For submarine reactor operations and nuclear weapon operations, the MOD operates an internal nuclear regulatory regime that mirrors the standards and procedures required by Nuclear Installations Inspectorate (NII) licensing approach.

##### 4.2 Naval Pressurised Water Reactor (PWR)

The Design Authority for the Naval PWR, Rolls Royce, is charged with producing a Reactor Plant Safety Justification (RPSJ) covering all classes. This safety case is based on deterministic and probabilistic safety assessment of the PWR and its associated systems. The RPSJ is independently peer reviewed and then subjected to Independent Nuclear Safety Assessment (INSA) by Serco Assurance (formerly part of AEA Technology). They produce a Nuclear Safety Clearance Document for each submarine with a class review, which is formally reviewed by the Chairman of the Naval Nuclear Regulatory Panel (CNNRP). When satisfied, CNNRP issues a Safety Clearance Letter to MOD's Central Plant Control Authority who authorises the operation of each submarine.

##### 4.3 Safety Controls and Engineering Design

The containment arrangements for a nuclear submarine are described in Table 2. In addition, there are engineered and procedural safeguards to prevent and mitigate any accident scenario. All equipment is designed and constructed to a high specification, and undergoes thorough examination, testing and regular planned maintenance. Operation of all equipment is conducted according to operating procedures, by suitably qualified and experienced staff.

##### 4.4 Safety Management, Staffing and Training

The safety responsibilities of all personnel are defined in Submarine Operating Documentation. All submarine personnel and those MOD personnel that support the visit of a nuclear submarine to Liverpool are suitably qualified and experienced for the work that they are expected to perform. A continuous process of audit and review is used to ensure that procedures remain current and effective. Minimum manning levels have been assessed and are documented in Submarine Operating Procedures. This ensures that there are adequate staff and resources available at all times to enable safe plant operation and provide a robust emergency response capability.

## 5. HAZARD IDENTIFICATION AND RISK EVALUATION

### 5.1 Introduction

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The HIRE for the submarine reactor has identified a number of scenarios, which could lead to an off-site release of radioactive material. A radiation emergency, as defined within the Regulations, can result from a submarine reactor accident.

Accidental releases from the site could occur over periods of several hours, depending on the circumstances and the level of damage.

In order to develop an accident response strategy, the analysis has considered the probability of each accident sequence occurring and the consequences of the fission product release resulting from that sequence. A two stranded approach has then been used to determine an appropriate strategy: an analysis of the probability and magnitude of any radiation exposure given that a radiation accident has been declared; and an analysis of the optimum countermeasure strategy for protection of individuals from any potential radiation exposure. Both analyses have considered all of the identified accident sequences. The appropriateness of introducing countermeasures has been determined on the basis of published advice from the National Radiological Protection Board. This approach has resulted in a recommended accident response strategy based on a range of accident scenarios and analyses.



## 6. IMPLICATIONS FOR RADIATION EMERGENCIES

- 6.1 In the event of a radiation emergency, the likely exposures to those members of the public within the zone extending approximately 2 km from the location of the plant could exceed 5 mSv. It is very unlikely that exposures in excess of 5mSv could be received beyond this zone, however, a small number of low probability scenarios have been identified with more significant consequences. In addition, personnel on the premises and intervention workers could exceed the current statutory dose limits for radiation workers as a result of a radiation emergency.

In deriving the recommended countermeasures strategy, due account has been taken of all identified accident scenarios.

The recommended response strategy to a radiation emergency would be implemented in two stages. Immediate countermeasures are set out within the operator's emergency plan, affecting only those personnel within the 550m automatic countermeasure zone. Implementation of the recommended off-site response would affect individuals in the pre-planned countermeasure zone out to approximately 2km downwind from the site. These individuals would be advised to shelter to reduce any potential radiation exposure and to take stable iodine tablets to minimise the radiation exposure received as a result of inhalation of any radioactive iodine released. Both the On-site and Off-site plans would be implemented as precautionary measures prior to the detection of any release of radioactivity.

The basis for food controls applied by the Food Standards Agency (FSA) will be against food intervention levels required by EC Regulations.

These arrangements were developed and agreed in consultation with Local Authorities, and are articulated within the Off Site Emergency Plan for Liverpool Z Berth.

## 7. CONCLUSIONS

A Hazard Identification and Risk Evaluation have been conducted for nuclear powered submarines using the MOD Z Berth Liverpool as required by the Regulations. These assessments have indicated that only a submarine reactor accident could lead to a radiation emergency.

The probabilities and consequences of the full range of potential accidents have been analysed and a response strategy developed to address them. To cope with the unlikely event of a radiation emergency, the nuclear submarine's company have an Operator's Emergency Plan in place detailing the on-site response. The appropriateness of implementing countermeasures off-site has been assessed in the light of national legislation and guidance, and a precautionary strategy has been recommended to a distance of approximately 2km downwind from the site. The recommended pre-planned countermeasure zone is shown on the maps at

Annex A. The planning for a submarine reactor accident is valid in outline for a nuclear weapon accident even though it is not reasonably foreseeable.

Emergency planning for the MOD Z berth at Liverpool is addressed as follows, this ensures a co-ordinated response strategy to be regularly reviewed, monitored and updated as required:

a. On-Site:

- Naval Base Board.
- Clyde Nuclear Safety Committee (CNSC).
- Base Emergency Services Committee (BESC).
- Nuclear Accident Response Organisation Sub-Committee (NAROSC).
- Appropriate sub committees and Working Groups of the CNSC, BESC, NAROSC.
- MOD Nuclear Powered Warship Berthing Co-ordinating Committee.

b. Off-Site:

- Merseyside Emergency Services Joint Planning Committee
- Appropriate sub-committees and Working Groups.
- MOD Nuclear Powered Warship Berthing Co-ordinating Committee.

MOD has established engineering and procedural safeguards to prevent a radiation accident from occurring, and to limit the consequences of any accident that could occur. The safety management systems to ensure effective control of radioactive substances are regularly reviewed and audited.



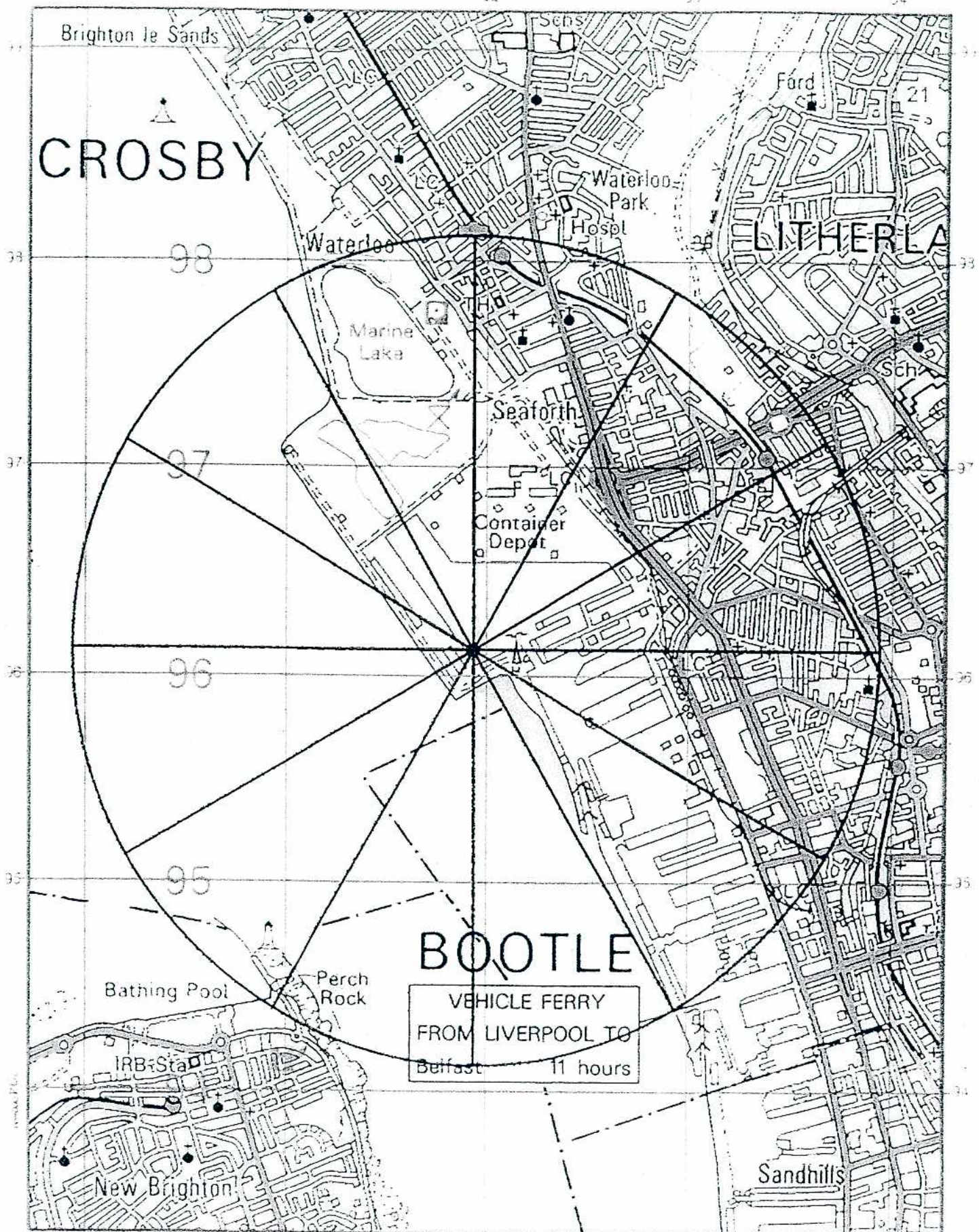




# ROYAL SEAFORTH DOCK - 2KM INCIDENT MANAGEMENT PRODUCT

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As at 6 Nov 03

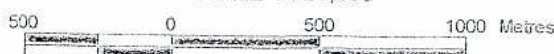


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Your Ref: BB/4368

Our Ref. NIN 223/348/1 P.T. 1 E 17

Date: 9 June 2003

Dear Mr (E 38)

RADIATION (EMERGENCY PREPAREDNESS PUBLIC INFORMATION)  
REGULATIONS 2001 (REPPIR) – OFF SITE PLAN FOR Z BERTH AT  
SEAFORTH DOCK

I refer to our conversation on 14 May 2003 and your subsequent letter of 23 May 2003. I apologise for my slight delay in responding but I have been on leave.

Before responding to the specific points of your letter I would first of all offer a few general comments on the requirements of REPIR which as well as establishing new statutory responsibilities for emergency planning to cater for radiation accidents/emergencies require a number of changes to the previous plans, procedures and arrangements to deal with such events. For example, where a radiation emergency is reasonable foreseeable, REPIR sets out a clear requirement for an 'Operators Plan' (Regulation 7), an 'Off Site Emergency Plan' (Regulation 9) and 'Consultation and Co-operation' (Regulation 11). All of these when implemented effectively ensure an integrated approach to safeguard and protect all persons who might be affected by the radiation emergency.

Turning to the specific issues raised in your letter:

- a) I can confirm that in determining its opinion in respect of the area in which any member of the public is likely to be affected by a radiation emergency due to the presence of a nuclear submarine at the Z Berth at Seaforth Dock, the Health and Safety Executive reviewed the full risk assessment provided by MoD. This review included all the information required by Regulation 4 and Schedule 5. (Items 1 and 2 of your letter). In addition before determining its opinion HSE sought and received clarification and additional information from MoD.
- b) A considerable portion of the information received and reviewed by HSE has a security classification which prevents its inclusion in the general report of assessment provided to Sefton Borough Council

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St Peter's House, Stanley Precinct, Bootle, Merseyside L20 3LZ

Tel: 0151 951 4000 Fax: 0151 951 3942

*Reducing risks - protecting people*

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(Item 3). In this regard HSE has approved the withholding of such information as provided for in Regulation 16(6).

- c) MoD has been asked to provide a copy of the 'Operators Plan'. Although this must be tailored to reflect specific location differences it is based on a generic model. Tests of the 'Operators Plan', albeit at other X berth and Z berth locations have demonstrated that it can be implemented effectively. Hence I can see no reason why an Operators Plan based on such a model would not be satisfactory for the Z Berth at Seaforth (Item 4, 5 and subsequent three paragraphs of your letter).
- d) In relation to the preparation of the off-site plan it is a matter for the local authority to determine its needs and there is no reason why this should not take account of the current integrated Emergency and Local Authority response on Merseyside. Further other local authorities appear to be content that they have sufficient information to prepare off-site plans based on the hazards identified in the Report of Assessment coupled with the stated opinion by HSE of the area in which any member of the public is likely to be affected by a radiation emergency due to the presence of a nuclear submarine.
- e) I note your comments on the time which may be required to prepare an off-site plan and there are clear provisions in Regulation 9(8) to cater for such situations. In order to extend the period beyond six months I would advise that the local authority should formally request an extension with an indication of when they would expect to have prepared such a plan.

Finally I hope I have responded to the issues raised in your letter but recognise that this may be a difficult area for authorities not usually dealing with significant radiation or nuclear related activities. If there are any matters you would like to explore or clarify further, or you would like further assistance on in relation to the application of REPIR, I would be happy to meet and discuss at a mutually convenient date and location.

Yours sincerely

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**HM Superintending Inspector  
(Nuclear Installations)**