

# **Overview of Past Dumping at Sea of Chemical Weapons and Munitions in the OSPAR Maritime Area**



**OSPAR Commission  
2005 (Revised)**

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the “OSPAR Convention”) was opened for signature at the Ministerial Meeting of the former Oslo and Paris Commissions in Paris on 22 September 1992. The Convention entered into force on 25 March 1998. It has been ratified by Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, Netherlands, Norway, Portugal, Sweden, Switzerland and the United Kingdom and approved by the European Community and Spain.

*La Convention pour la protection du milieu marin de l'Atlantique du Nord-Est, dite Convention OSPAR, a été ouverte à la signature à la réunion ministérielle des anciennes Commissions d'Oslo et de Paris, à Paris le 22 septembre 1992. La Convention est entrée en vigueur le 25 mars 1998. La Convention a été ratifiée par l'Allemagne, la Belgique, le Danemark, la Finlande, la France, l'Irlande, l'Islande, le Luxembourg, la Norvège, les Pays-Bas, le Portugal, le Royaume-Uni de Grande Bretagne et d'Irlande du Nord, la Suède et la Suisse et approuvée par la Communauté européenne et l'Espagne.*

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# contents

- 1 Introduction
2. Work carried out by other international organisations
3. Locations of Marine Dumped Chemical Weapons and Munitions within the OSPAR Convention Area

Figure 1: Location of Marine Munitions Dumpsites

Table 1: Summary of information supplied by Contracting Parties on Marine Munitions Dumpsites

References



## 1. Introduction

Since the end of the First World War, dumping of chemical weapons and munitions at sea has taken place and is the subject of considerable concern in a number of international fora. Dumping of these materials have been reportedly carried out in every ocean with considerable amounts in the OSPAR Convention area. The full extent of this dumping will never be known due mainly to inadequate documentation of operations at the time of dumping and the subsequent loss or destruction of records that may have been taken. Remediation of marine chemical weapons and munitions dumpsites is technically challenging because of the nature of the material dumped and the uncertainty surrounding the quantities, type, locations and the present condition or stability of these materials.

Marine dumped chemical munitions react differently in water depending on the agent they contain. The munition shell may break open during the dumping operation or may corrode over time, allowing the agent to leak out. Nerve agents and many other agents hydrolyze, or break down and dissolve once they come into contact with water, and are therefore rendered harmless in a relatively short amount of time. **Mustard gas**, however, is insoluble in water and most injuries that have occurred when fishermen come into contact with marine dumped chemical munitions have resulted from **mustard gas**.

Phosphorous devices also present long term problems. Advice to date has been that if left undisturbed on the seabed they pose no risk. If disturbed, as was the case in the Irish Sea's Beaufort's Dyke dumpsite during pipe laying, these positively buoyant devices may float to the surface and represent a real risk to the seafarers and to the general public should they be washed ashore. Without adequate records being maintained on encounters with dumped munitions and chemical weapons it is not possible to monitor the risk posed by such munitions and weapons.

Dumped munitions, and in particular the disturbance of dumped munitions by seabed activities, e.g. fishing, sand and gravel extraction, dredging and dumping operations and the placement of cables and pipelines, is an important issue and should be addressed. It is essential that details of the locations of all munitions dumpsite, and areas where munitions are detected on the seabed be maintained. Any seabed activities to be undertaken within or close to these locations should be subject to a full assessment of the potential risk prior to the approval of these activities by national authorities.

It is a widely held view that recovery of dumped munitions is not technically feasible at present. There are also serious concerns over the safety of personnel who may be involved in any such operations. While this is a pragmatic approach, there is an urgent need for a review of available information into management and recovery techniques so as to be in a better position to intervene and possibly recover dumped materials, should natural or human processes make this necessary in the future.

## 2. Work carried out by other international organisations

The Baltic Marine Environment Protection Commission (Helsinki Commission) addressed the issue of chemical weapons dumped in the Baltic Sea by forming an *ad hoc* Working Group on Dumped Chemical Munitions (HELCOM CHEMU). In its report to the 16<sup>th</sup> Meeting of Helsinki Commission (HELCOM CHEMU 1994) it is concluded that around 40,000 tonnes of chemical munitions, containing no more than 13,000 tonnes of **chemical** warfare agents, were dumped in the Helsinki Convention Area. CHEMU found that munitions may have been short-dumped or may have drifted outside the dumpsite at the time of dumping. In addition, munitions may also be relocated by fishing activities but are unlikely to be relocated as a result natural processes. The report also concluded that it was not possible to estimate the extent of corrosion of munition casings and that very little is known on the chemical behaviour of **chemical** warfare agents in the marine environment. With regard to the marine environment and the risk to the consumer of marine foods, CHEMU concludes that, based on the knowledge at the time, widespread risk to the

environment or to the consumer is negligible. However, the group did recognise that crews of fishing vessels operating in and close to dumpsites could be in danger of chemical munitions and **chemical** warfare agents.

CHEMU presented its final report to the Helsinki Commission in March 1995 (HELCOM, 1995). As a result of the findings of CHEMU, Contracting Parties within HELCOM report to Denmark relevant national information on dumped chemical munitions. The number of incidents notified by Denmark to HELCOM dropped significantly from 25 in 2003 to 4 small case incidents of World War II chemical munitions caught by fishermen in 2005. CHEMU also identified the following topics for further investigations and development within the HELCOM context:

- the locations of dumped munitions, this could be undertaken by individual Contracting Parties or bilaterally.
- the ecological and ecotoxicological effects of **chemical** warfare agents containing arsenic compounds and mustard **gas**.
- the presence of **chemical** warfare agents in the various marine compartments and in particular the presence of the more persistent and poorly soluble **chemical** warfare agents in sediments and biota.
- the elaboration of national guidelines for fishermen on how to deal with chemical munitions. HELCOM Guidelines were provided to Contracting Parties as an aid in developing such Guidelines.
- Contracting Parties should agree the financial aspects of denomination of fishing vessels. It was noted that some Contracting Parties considered that prohibiting bottom trawling within dumpsites was a useful risk management strategy.
- the preparation of guidelines on how authorities should deal with incidences where chemical munitions are caught by fishermen
- compile information on the state of corrosion of munitions, experience had shown that this state ranged from intact to completely corroded.

The recommendations and conclusions of HELCOM are referred to by a number of international organisations such as the International Maritime Organisation (IMO), the North Atlantic Treaty Organisation (NATO) and the Organisation for the Prohibition of Chemical Weapons (OPCW).

NATO (1996) in their report “NATO and Partner Countries Study Defence-Related Radioactive and Chemical Contamination” state that the most outstanding example of cross-border contamination is the dumping of large quantities of chemical warfare (CW) agents into the Baltic Sea, Skagerrak and possibly the Arctic Seas. These chemical weapons were mainly of German origin and they were captured and dumped in the years following World War II. The United Kingdom, the United States and the former East Germany dumped munitions at great depths in the Atlantic Ocean. In the Baltic Sea, chemical weapons, which were often deposited at depths of less than 120 metres, were mainly dumped east of Bornholm and south-east of Gotland (south-west of Liepaja). Over the years, they have become covered by several metres of sediment. Some of the dumping occurred near commercial fishing sites, and this has led to several incidents in which fishermen have been contaminated. Information on the amount of CW munitions actually dumped varies somewhat from one source to another.

Article 2 (b) of the Decision 2850/2000/EC of the European Parliament setting up a Community framework for cooperation in the field of accidental or deliberate marine pollution (Council of the European Union, 1999) requires cooperation with a view to improving the “capabilities of the Member States for response in the case of incidents involving spills or imminent treats of spills of oils or other harmful substances at sea and also to contribute to the prevention of the risk. In accordance with the internal division of competencies within the Member States, Member States will exchange information on dumped munitions with a view to facilitating risk identification and preparedness measures.” HELCOM (1995) also refers to a decision taken

by the European Commission on 15 June 1994 to provide financial support for the procurement of cartographic documentation concerning objects laying of the seabed or other obstacles endangering fisheries.

### **3. Locations of Marine Dumped Chemical Weapons and Munitions within the OSPAR Convention Area**

Information supplied to Ireland by Contracting Parties on the location of marine dumped chemical weapons and munitions shows that there are in excess of 140 known dumping locations throughout the Convention Area. Munitions dumped in these sites range from conventional munitions, phosphorous devices to mustard gases. Dumping operations included dumping overboard from vessels and by sinking ships containing chemical weapons and munitions. Figure 1 shows the locations of these reported dumpsites (the map shows what is believed to be the best available information. Portugal has not yet reported to OSPAR) and further information, supplied by Contracting Parties or obtained from the literature, is presented in Table 1 (dumpsite No. 13 (Table 1) is not shown in Figure 1 as co-ordinates were unconfirmed). One of the major difficulties in managing the risk associated with these dumpsites is the uncertainty associated with their location. This is highlighted in a number of reports (HELCOM, 1994; SOAEFD, 1996; Hart, 2000; Tørnes, Norwegian Defence Research Establishment). HELCOM (1994) concluded that the relocation of munitions by natural processes is unlikely and therefore the threat to coastal areas from residues of **chemical** warfare agents or chemical munitions washed ashore is unlikely.

One of the most heavily used areas for dumping of conventional and chemical warfare munitions is the Beaufort's Dyke, a 200 to 300 meters deep trench located between Scotland and Northern Ireland. It has been estimated that over 1 million tons of munitions have been dumped in the Beaufort's Dyke since the early 1920s (Hart, 2000). During the 1990s reports of large number of phosphorous devices stranded on Scottish and Irish coasts were commonplace. While these devices may have been dislodged as a result of pipe laying activities, once they escape from their cases they will, as a result of their positive buoyancy, float to the surface. On the surface these devices are at the mercy of wind and currents and represent a real risk to the seafarers and to the general public should they be washed ashore. One of the concerns relating to phosphorous devices is that the containers they were dumped in may now be in an advanced state of decay.

A detailed survey of the Beaufort's Dyke disposal site was undertaken by the Marine Laboratory, Aberdeen (SOAEFD, 1996). This report showed that fish, shellfish and sediment samples collected adjacent to, and from the general area of the Beaufort's Dyke, did not contain **chemical** warfare agents or contaminants associated with the dumped munitions. It also clearly showed munitions and munitions-related materials at high densities outside the **charted** dumpsite.

Very large quantities of munitions were also dumped in the Skagerrak. It is reported that some 168 000 tonnes of ammunition were dumped in water depths of 600 to 700 meters (Tørnes, Norwegian Defence Research Establishment). These munitions were dumped by sinking vessels loaded with the munitions and some 26 such vessels were dumped in the Skagerrak, south east of Arendal (Surikov and Duursma, 1999). Using side scan sonar, the Norwegian Defence Research Establishment, identified 15 possible shipwrecks in the Skagerrak. Of these, 5 were selected for further investigation and conclusive evidence of the presence of munitions was uncovered for 3 of the 5 wrecks. Water samples, taken as close as possible to the munitions found on these wrecks, showed no traces of **chemical** warfare agents (Tørnes, Norwegian Defence Research Establishment). Tørnes concluded that disturbance of these munitions could release massive quantities of chemical agents. The environmental consequences of such a release will depend on the type of chemical warfare agent. For example, the water soluble nerve agent Tabun would be rapidly mixed with sea water and diluted, thus having a very short-term effect. However, certain types of thickened mustard gas could remain on the seabed for a very long time. He also suggests that as these areas are closed to fishing and other commercial activities, the presence of munitions has had no practical consequence.

OSPAR 2003 adopted OSPAR Recommendation 2003/2 on an OSPAR Framework for Reporting Encounters with Marine Dumped Conventional and Chemical Munitions. According to this Recommendation, Contracting Parties should present to the OSPAR Commission, by 1 September 2005, a

short description of the system that they have established to meet the aims of this Recommendation, or an explanation why they have not established such a system.

OSPAR 2004 also adopted a framework for developing national guidelines for fishermen on how to deal with encounters with conventional and chemical munitions (Agreement 2004-9).

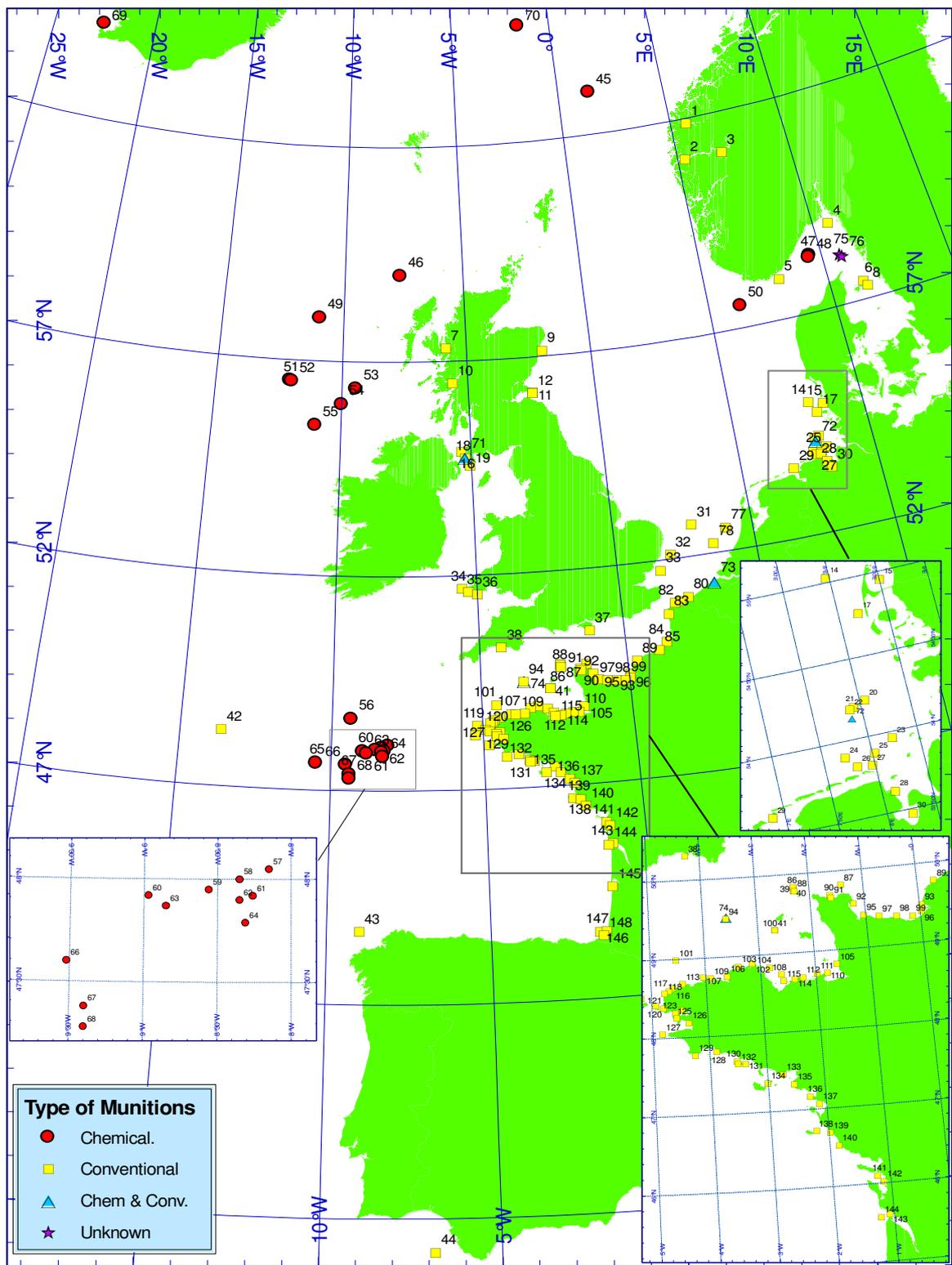


Figure 1: location of Munitions Dumpsites<sup>1</sup>

<sup>1</sup> **Disclaimer:** This map shows what is believed to be the best available information. The sites does not constitute an exhaustive description of the sites that may exist. No liability for the accuracy or completeness of this information is accepted either by the OSPAR Commission or by the Governments of Contracting Parties to the OSPAR Convention.

**Table 1:** Location and known details of conventional and chemical munitions dumpsites.

No. <sup>1</sup>	Long.	Lat.	Depth (m)	Type of Munitions <sup>2</sup>	Details
1	5.71	61.9	550	Conv.	
2	5.32	61.09	1000	Conv.	
3	7	61.09	900	Conv.	
4	10.63	58.92	350	Conv.	
5	8.05	57.95	600	Conv.	
6	11.33	57.44		Conv.	< 50 tonnes
7	-5.85	57.32		Conv.	Inner Sound of Raasay. Two minelights with torpedoes ex-German U-Boats (1945) plus munitions from HMS Port Napier, which sank nearby in 1940.
8	11.44	57.32		Conv.	< 20 tonnes
9	-1.97	57.15		Conv.	
10	-5.63	56.5		Conv.	
11	-2.48	56.19		Conv.	
12	-2.5	56.17		Conv.	
13				Conv.	30,000 Tonnes Dumped between 1945 and 1967.
14	7.96	55.03		Conv.	
15	8.5	54.95		Conv.	
16	-5.38	54.9		Conv.	Beaufort's Dyke - 1m+ tons dumped by UK. 1,160 tons dumped by Ireland.
17	8.2	54.77		Conv.	
18	-5.25	54.75		Conv.	
19	-5.08	54.58		Conv.	Beaufort's Dyke - ditto
20	8.05	54.23		Conv.	
21	7.92	54.2		Conv.	
22	7.88	54.19		Conv.	
23	8.23	53.96		Conv.	
24	7.72	53.9		Conv.	
25	8.02	53.89		Conv.	
26	7.82	53.83		Conv.	
27	7.97	53.82		Conv.	
28	8.13	53.63		Conv.	
29	6.87	53.62		Conv.	
30	8.25	53.47		Conv.	
31	2.83	52.75		Conv.	
32	1.92	52.12		Conv.	
33	1.5	51.78		Conv.	
34	-5.55	51.72		Conv.	
35	-5.33	51.63		Conv.	
36	-5.02	51.57		Conv.	
37	-1.2	50.57		Conv.	
38	-4.27	50.31		Conv.	
39	-2.3	49.83		Conv.	
40	-2.3	49.78		Conv.	
41	-2.7	49.3		Conv.	
42	-13.66	48.33		Conv.	Only remaining UK dumpsite by 1993
43	-9.02	43.73		Conv.	
44	-6.83	36.23		Conv.	
45	1.46	62.97		Chem.	4,500 tons scuttled vessels
46	-7.67	59		Chem.	
47	9.5	58.29		Chem.	130,000 tons gross scuttled vessels
48	9.46	58.25		Chem.	20,000 tons scuttled vessels
49	-11	58		Chem.	
50	6.26	57.51		Chem.	Sunken ship (Lists) unconfirmed
51	-12.08	56.52		Chem.	
52	-12	56.5		Chem.	
53	-9.45	56.37		Chem.	
54	-10	56		Chem.	
55	-11	55.5		Chem.	

Table 1 (cont.)

No. <sup>1</sup>	Long.	Lat.	Depth (m)	Type of Munitions <sup>2</sup>	Details
56	-9.37	48.67	3,500-4,000	Chem.	Scuttled ship, Dora Oldendorf - February 1947.
57	-8.15	48.05	500	Chem.	Scuttled ship, Empire Nutfield - September 1946.
58	-8.35	48	800-900	Chem.	Scuttled ship, Lanark - November 1946.
59	-8.56	47.95	700-800	Chem.	Scuttled ship, Empire Peacock - August 1946.
60	-8.97	47.92	2,500	Chem.	Scuttled ship, Harm Freitzen - March 1948.
61	-8.26	47.92	750-800	Chem.	Scuttled ship, Empire Lark - July 1947.
62	-8.35	47.9	1,000	Chem.	Scuttled ship, Kindersley - October 1946.
63	-8.85	47.87	2,000	Chem.	Scuttled ship, Empire Connyngham - June 1949.
64	-8.31	47.79	1,500	Chem.	Scuttled ship, Thorpe Bay - September 1947.
65	-10.5	47.63	4,800	Chem.	CW (Approx 70 Tonnes) encased in concrete. Dumped in 1980.
66	-9.52	47.6	4,100	Chem.	Scuttled ship, Margo - November 1947.
67	-9.4	47.38	4,000	Chem.	Scuttled ship, Miervaldis - September 1948.
68	-9.4	47.28	4,200	Chem.	Scuttled ship, Empire Success - August 1948.
69	-22.59	64.17		Chem. - Mustard gas	Two mustard gas bombs located during dredging operations
70	-1.6	64.7		Chem. - Tabun	462 shells recovered in Wolgast Harbour dumped, set in concrete
71	-5.26	54.76		Chem. & Conv.	Dumped loose or in cases. 1367 tons.
72	7.88	54.13		Chem. & Conv.	
73	3.3	51.35		Chem. & Conv.	Total 35,000 tonnes, estimated 100 to 500 tonnes of CW. Recovered during dredging and dumped loose or in cases
74	-3.57	49.5		Chem. & Conv.	
75	10.7	58.16		Unknown	
76	10.78	58.11		Unknown	
77	4.03	52.56		Conv.	
78	3.5	52.25		Conv.	
79	-	-		Unknown	810 tonnes of 'old problem' munitions encased in concrete. Dumped between 1954 and 1972 <sup>3</sup> in the Bay of Biscay.
80	2.33	51.10		Conv.	Dunkerque area
81	2.07	51.03		Conv.	Gravelines area
82	1.85	51.00		Conv.	Calais area
83	1.58	50.77		Conv.	Boulogne area
84	1.38	50.12		Conv.	Le Treport area
85	1.10	49.97		Conv.	Dieppe area
86	-2.30	49.83		Conv.	NNE Casquets – Channel
87	-1.42	49.82		Conv.	NE Cherbourg area
88	-2.28	49.78		Conv.	NW Alderney – Channel
89	0.30	49.77		Conv.	Fecamp area
90	-1.63	49.70		Conv.	Cherbourg area
91	-1.62	49.67		Conv.	Port of Cherbourg
92	-1.22	49.57		Conv.	Saint Vaast La Hougue area
93	0.03	49.48		Conv.	Le Havre area
94	-3.58	49.48		Conv.	Fosse centrale – Channel
95	-1.05	49.42		Conv.	Grancamp area
96	0.02	49.40		Conv.	Deauville/Trouville area
97	-0.77	49.38		Conv.	Port-en-Besin area
98	-0.45	49.37		Conv.	Courseulles/mer area
99	-0.15	49.35		Conv.	Cabourg/Ouistreham
100	-2.70	49.30		Conv.	SSW Guernsey – Channel
101	-4.53	48.98		Conv.	Audierne area
102	-3.15	48.90		Conv.	Treguier area
103	-3.40	48.87		Conv.	Perros-Guirec area
104	-2.83	48.83		Conv.	Paimpol area
105	-1.62	48.82		Conv.	Granville area
106	-3.62	48.75		Conv.	Lannion area
107	-4.05	48.75		Conv.	Ile de Batz area
108	-2.63	48.73		Conv.	Saint-Quay/Saint-Brieuc area
109	-3.92	48.73		Conv.	NW Roscoff area
110	-1.80	48.72		Conv.	Cancale area
111	-1.98	48.72		Conv.	Saint Malo area
112	-2.25	48.68		Conv.	Sint Jacut/Saint Cast area
113	-4.43	48.68		Conv.	Kerlouan area
114	-2.40	48.67		Conv.	Cap Frehel area

Table 1 (cont.)

No. <sup>1</sup>	Long.	Lat.	Depth (m)	Type of Munitions <sup>2</sup>	Details
115	-2.60	48.65		Conv.	Erquy/Saint-Brieuc area
116	-4.62	48.63		Conv.	L'Aber Wrac'h area
117	-4.68	48.60		Conv.	L'Aber Benoit area
118	-4.77	48.57		Conv.	Portsall area
119	-5.20	48.52		Conv.	NW Ouessant
120	-4.93	48.42		Conv.	Molene/Ouessant
121	-4.80	48.38		Conv.	Le Conquet area
122	-4.47	48.35		Conv.	Rade de Brest
123	-4.58	48.32		Conv.	Camaret area
124	-5.28	48.28		Conv.	SW Ouessant
125	-4.57	48.25		Conv.	Anse de Dinan – Camaret area
126	-4.35	48.18		Conv.	Morgat/Douarnenez
127	-4.83	48.05		Conv.	Ile de Seine
128	-3.88	47.80		Conv.	Concarneau area – South Brittany
129	-4.27	47.77		Conv.	Le Guilvinec area – South Brittany
130	-3.53	47.67		Conv.	NW Ile de Groix
131	-3.38	47.63		Conv.	Lorient/Groix
132	-3.52	47.63		Conv.	SW Ile de Groix
133	-2.73	47.47		Conv.	Vannes/Penerf
134	-3.02	47.37		Conv.	Quiberon/Belle-Ile
135	-2.55	47.33		Conv.	Piriac/Le Croisic
136	-2.28	47.17		Conv.	St Nazaire/Port Giaurd
137	-2.13	47.07		Conv.	Pornic/Noirmoutier
138	-2.22	46.72		Conv.	Ile d'Yeu
139	-1.98	46.68		Conv.	St Gilles Croix de Vie
140	-1.85	46.52		Conv.	Les Sables d'Olonne
141	-1.23	46.10		Conv.	SSE Le Lavardin – La Rochelle area
142	-1.13	46.02		Conv.	East of the Ile d'Aix
143	-1.08	45.60		Conv.	Est Phare de Cordouan – Entrée
144	-1.23	45.57		Conv.	WSW Phare de Cordouan – Entrée
145	-1.22	44.60		Conv.	Arcachon Basin
146	-1.72	43.57		Conv.	Saint Jean de Luz/Hendaye
147	-1.52	43.57		Conv.	Bayonne area
148	-1.62	43.47		Conv.	Biarritz/ Saint Jean de Luz

- Notes: 1. Refer to figure 1.  
 2. Conv.- Conventional; Chem. – Chemical  
 3. No details are available regarding this dumpsite. It is referred to in Zanders, J.P. (1997) The destruction of old chemical munitions in Belgium. In: Stock, T. and Lohs, K. (eds.) *The Challenge of Old Chemical Weapons & Toxic Armament Wastes*. Oxford University Press. p 197-230.

Dumpsite No. 13 (Table 1) is not shown in Figure 1 as co-ordinates were unconfirmed.

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