

University of Wales Trinity Saint David

Ordnance, Munitions and Explosives



Scientific Principles of OME Design

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Natalie Coplin - 2113351

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Contents

Table of Figures	4
Table of Tables.....	4
Abstract	5
1 Introduction.....	6
1.1 Context.....	6
2 Technical Assessment.....	7
2.1 General Comments	7
2.2 NEQ and Compatibility Groups	8
2.3 Zones	9
2.3.1 Vulnerable Building Distance (VBD).....	9
2.3.2 Inhabited Building Distances (IBD)	9
2.3.3 Public Traffic Route Distances (PTRD)	9
2.4 Quantity Distances	9
2.5 Blast Damage Estimation	12
2.6 Additional Safety Considerations.....	13
2.6.1 Flood Risk.....	13
2.6.2 Earthquakes	14
2.6.3 Control of Major Accident Hazard (COMAH) sites.....	15
2.7 Site Transport.....	15
2.8 Site Plan.....	15
2.9 Site Survey.....	15
2.10 Safety and Security.....	16
2.11 Advice for Maritime Users	16
3 Discussion	17
4 Conclusion	18
References.....	19
Appendix 1 – Definitions	20
Appendix 2 – Site Survey Requirements	22
Appendix 3 – Port site map	23
Appendix 4 – Safety Questions for Risk Reduction	24
Scope and standards	24
Licensing, explosive limits, quantity distances	24
Siting	24
Engagement with interested parties.....	24
Buildings and controls	24
Vehicles and mechanical handling equipment.....	25

Control, Security and Safety	25
Storage, Handling and Transport of Explosives	26
Accidents and Investigations	26
Training	27

Table of Figures

Figure 1 Quantity Distance map with safeguarding zones.....	10
Figure 2 QD map with key structures	12
Figure 3 UK seismic activity [8].....	14
Figure 4 Swansea port map [1].....	23

Table of Tables

Table 1 Requested quantities of explosives	8
Table 2 ESH explosive storage limits	8
Table 3 Comparison of quantity distances	11
Table 4 Example buildings/areas within each zone	11
Table 5 Blast damage effects from 3000kg of TNT.....	13

Abstract

This report presents an in-depth evaluation on the feasibility of a proposed explosive storage site on the D Shed Wharf in Swansea (latitude 51.61818, longitude -3.91886). The assessment, based on the International Ammunition Technical Guidelines (IATG), examines quantity distances and safeguarding measures based on the explosive limits requested by BigBang Storage Solutions. The proposal itself has insufficient technical detail, and assumptions were applied to enable a preliminary assessment. Based on these assumptions the site is deemed unsuitable for the explosives store due to the unacceptable risk it would place on the local infrastructure and population.

1 Introduction

The City and County of Swansea Council (hereafter known as “the Council”) received a planning application for the construction of an explosive facility to be erected at latitude 51.61818 and longitude -3.91886. Located at D Shed Wharf between Prince of Wales and King’s Dock. King’s dock is commercially active, Prince of Wales Dock borders residential zones. The site handles material such as forest products and steel, and there is also capacity for cruise ships to visit. D shed wharf is currently used for storage of cargo and contains several cranes and handling equipment [1].

1.1 Context

The purpose of this report is an independent assessment under International Ammunition Technical Guidelines (IATG) of a proposed ammunition storage facility.

The proposal, from BigBang Storage Solutions (BBSS), is for five explosive store houses (ESH) without traverses. BBSS have informed the Council that each ESH would be earth covered with directional effects for blast described as “side of magazine perpendicular to the direction of the exposed site (ES)”. This means the three sides of the building and its roof will be covered by earth, and side walls of the magazine are orientated so its strongest sides point to an area which needs to be shielded. The design minimises directional effects of blast, however it does not affect quantity distances (QD).

BBSS have stated the storage facility must accommodate the following net explosive quantity (NEQ):

- HD 1.1 – 5000 kg
- HD 1.2 – 500 kg
- HD 1.3 – 1000 kg
- HD 1.4 – 1000 kg

The IATG will be used to support this report. Any design must satisfy technical standards and UK statutory requirements. A list of definitions has been provided in Appendix 1 – Definitions.

2 Technical Assessment

2.1 General Comments

The proposed site is located at the end of King's Dock and has four minor roads linking the site to the major road network – King's Road past University of Wales Trinity Saint David, Langdon Road from two directions and Baldwin Crescent. Each of these stem off Fabian Way – the main route in and out of Swansea. IATG recommends the site should have multiple access routes, reducing dependency on a single access route [2]. There appears to be two access points for the site, a site survey would be necessary to determine if these were appropriate and suitably secure. Routes through densely populated areas should be avoided, reducing risks from accidents [2]. Fabian Way and the surround area is densely populated.

Given the dense residential area around the site, the local population would need consulting on the proposal, providing information on the reasons for the siting, safety standards imposed on the site, hazards to the local area and emergency plans.

Any new facility must be isolated from the local area. Each ESH should not be located closer than 25m from the storage area fence, increasing to 50m if there is an external road where vehicles can approach. It should be noted there is a publicly accessible road to the Driving Test Centre on the east of the site requiring any ESH siting at least 50m from the dividing fence [2].

Where possible overhead power supplies and associated infrastructure should be avoided. Using Google Maps, there does not appear to be any in the vicinity. Mains water, gas and any oil systems should be avoided. The site is not within an airfield circuit therefore there is no associated risk. Cranes are sited around the port, which, in the case of an unplanned event may collapse and result in death for the operator and those below.

The site is located at an active port which is likely to have mobile and fixed transmitters, the nature of these must be determined to assess their risk to the explosive stores. The main transmitter in the area is Kilvey Hill station located at 51.629167° N, -3.920278°. It must be determined if this would be a risk for the explosive store. A full Radio Frequency (RF) survey must be conducted to determine what electromagnetic radiation hazards exist, including that from ships using the port. BBSS could assist by providing the nature of explosive they intend to store to establish where risks may lie. It is advisable to liaise with the port authority for the survey [2].

The maritime location and its environmental impact of the buildings and explosives is a consideration. Higher salt content in often moist air can accelerate the deterioration of structures. Explosives may be more susceptible to moisture ingress and corrosion in this environment – affecting safety. This is easy to manage by using appropriate building materials, and environmental controls with suitable inspection regimes for the facilities and explosives [3].

2.2 NEQ and Compatibility Groups

The proposal states the site requires five ESH to store the quantities of explosives in Table 1.

Table 1 Requested quantities of explosives

Hazard Division	Compatibility Group	Quantity (kg)
1.1	B	50
	D	3200
	E	1250
	F	500
1.2	C	350
	D	100
	F	50
1.3	C	1000
1.4	S	1000

Information provided is ambiguous therefore a judgement on the intention has been made. It is unclear if BBSS intend to store up to 1000kg of a single hazard division (HD) in each store, therefore a total of 5000kg for the site. Or if each ESH will be licenced for up to 1000kg of each HD at any one time, therefore a total of 20000kg for the site. This report will presume the intention is the latter, however, in either case, five ESH is insufficient based on compatibility groups.

Following the assumption above, each ESH will need to be licenced to hold 3000kg of HD 1.1 and 1000kg of HD 1.4. HD 1.2 and 1.3 are aggregated together, treated as HD 1.1 for the purpose of NEQ calculations for storage [3]. HD 1.4 does not contribute to the aggregated NEQ of an ESH and can therefore be stored in any ESH which has capacity within its licence limit [3].

Table 2 ESH explosive storage limits

ESH	Explosive	Quantity (kg)	Explosive	Quantity (kg)	Explosive	Quantity (kg)	NEQ (kg)
1	1.1B	50	1.4S	1000			1050
2	1.1D	1000	1.2C	350			1350
3	1.1D	1000	1.2D	100			1100
4	1.1D	1000	1.2F	50			1050
5	1.1D	200	1.1E	250	1.1F	500	950
6	1.1E	1000	1.3C	1000			2000

Table 2 provides a breakdown of how the explosives could be stored to ensure compliance with the mixing rules for compatibility groups [4]. Six ESH with appropriate segregation will be needed to store the explosives. However, if 1.1B items are fuzes, these could be stored with the articles to which they will be assembled, reducing the number of ESH to five, if the 1.4S is also moved into another ESH. At this stage it is not possible to determine if the number stated by BBSS is correct as no information is given on the nature of the explosives, but based solely on what is known, the minimum required is six.

2.3 Zones

2.3.1 Vulnerable Building Distance (VBD)

The VBD is the minimum separation required between a potential explosive site (PES) and exposed sites (ES).

Under IATG guidelines examples of vulnerable buildings include:

- Hospitals
- Schools
- Multi-story offices
- Apartments
- Buildings with glass facades

These may be buildings of special importance, vulnerable construction or where high concentrations of people congregate such as places of work [3]. Examples are provided for Council guidance and advice framed around this, noting the Council will be better informed regarding the use of buildings. As the port falls largely within the VBD, vessels berthed with crew onboard are also considered to be vulnerable buildings. No vulnerable buildings may lie within the VBD.

2.3.2 Inhabited Building Distances (IBD)

The IBD is the minimum separation required between a potential explosion site (PES) and buildings where the public – or anyone not involved in explosives-related activities – either live, work or congregate [3]. Additionally, the Council must consider temporary high-occupancy sites during time-limited events. Residential buildings are not permitted in the IBD [5].

2.3.3 Public Traffic Route Distances (PTRD)

This is the minimum separation required between a PES and a route (road, rail, footpath, train) where the public may be exposed to an increased risk [3]. Again, it is not permitted for PTRDs of each density to lie within the zone without further mitigation.

2.4 Quantity Distances (QD)

While the licence request is for five ESH, with a total site NEQ of 20000kg, a ‘best case’ scenario has been examined in subsequent sections. It was not deemed necessary to assess the six ESH, as a single ESH licenced for 3000kg of HD 1.1 and 1000kg of 1.4 placed in the centre of the site is grossly beyond what is feasible, any more than this is only making the situation worse and increase required safeguarding distances.

BBSS have provided values for several distances which must be considered to safeguard the public and those working within or around the facility. Figure 1 illustrates the potential extent of blast wave damage should there be an unplanned event on the proposed site from one ESH.

The centre point for the safeguarding zones in Figure 1 is the coordinates provided in the proposal. No building location information is given; therefore, it is not possible to measure from the site of any ESH and

the assessment is conducted from the coordinates. Whilst this is not the most appropriate method, it is not the responsibility of the assessor to design the facility.

The map delineates three critical safety zones showing the VBD in purple, the IBD in yellow, and the PTRD (low) in green. Note that while these distances are intended to reduce the risk to the public from the blast wave, they do not eliminate a potential risk from fragmentation and projections [3]. If there is any encroachment within the yellow line, the storage facility cannot be approved without additional mitigation or change in design. The site boundary is indicated by the red line.

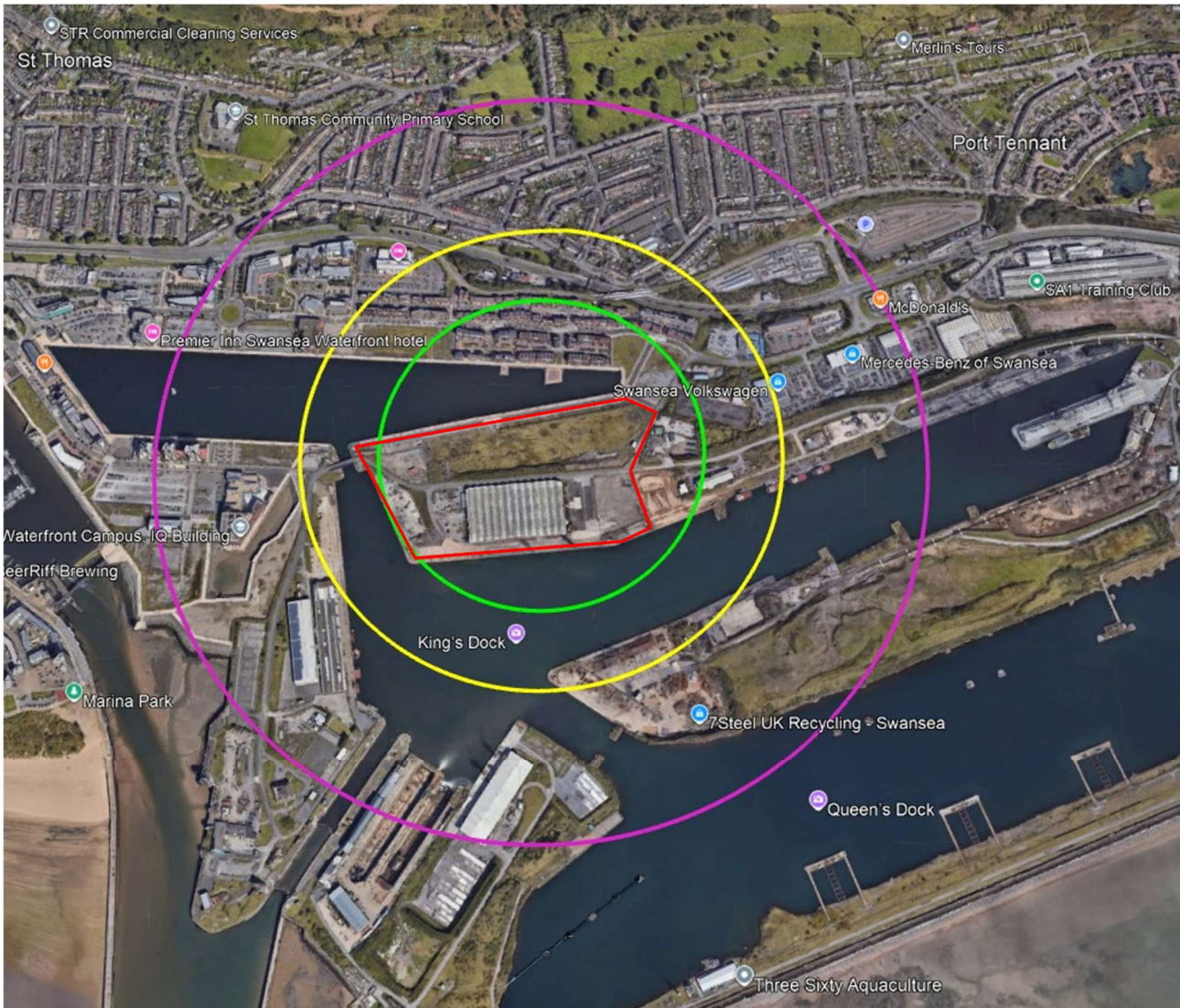


Figure 1 Quantity Distance map with safeguarding zones

The zones in Figure 1 are based on distances in IATG 02.20 Annex E Hazard Division 1.1 QD tables [3]. Table 3 provides a comparison between distances from BBSS and IATG. The distances from IATG are for a standard construction 7-bar earth covered magazine, presuming BBSS intend to build ESH to this standard. If this is not the case, safeguarding distances may increase. Note, there is considerable difference between the values, bearing in mind this assessment is based on a single ESH and not the six that would be required to store the

explosives requested. BBSS seem to have underestimated distances except for the PTRD but given the ambiguous proposals, this is not surprising. Clarification on the requirements may clear the discrepancy.

Table 3 Comparison of quantity distances

	BBSS distance (m)	Actual required distance (m)
VBD	300	650
IBD	125	400
PTRD Low	-	163
PTRD Med	270	270
PTRD High	-	400
Office (<20 workers)	-	270

Table 4 Example buildings/areas within each zone

	Building/Feature	Distance (m)
Within VBD	Sancta Maria Hospital	550
	UWTSD (University)	470
	Village Hotel	380
	WB Power Services	400
	Swansea Steel	440
Within IBD/high PTRD	WB Power Services	400
	Swansea VW	380
Within Med PTRD	Langdon Road Residential	150

Table 4 shows the distances of some buildings that fall within each zone and highlights the lack of suitability of the proposed site. These structures are shown on Figure 2.

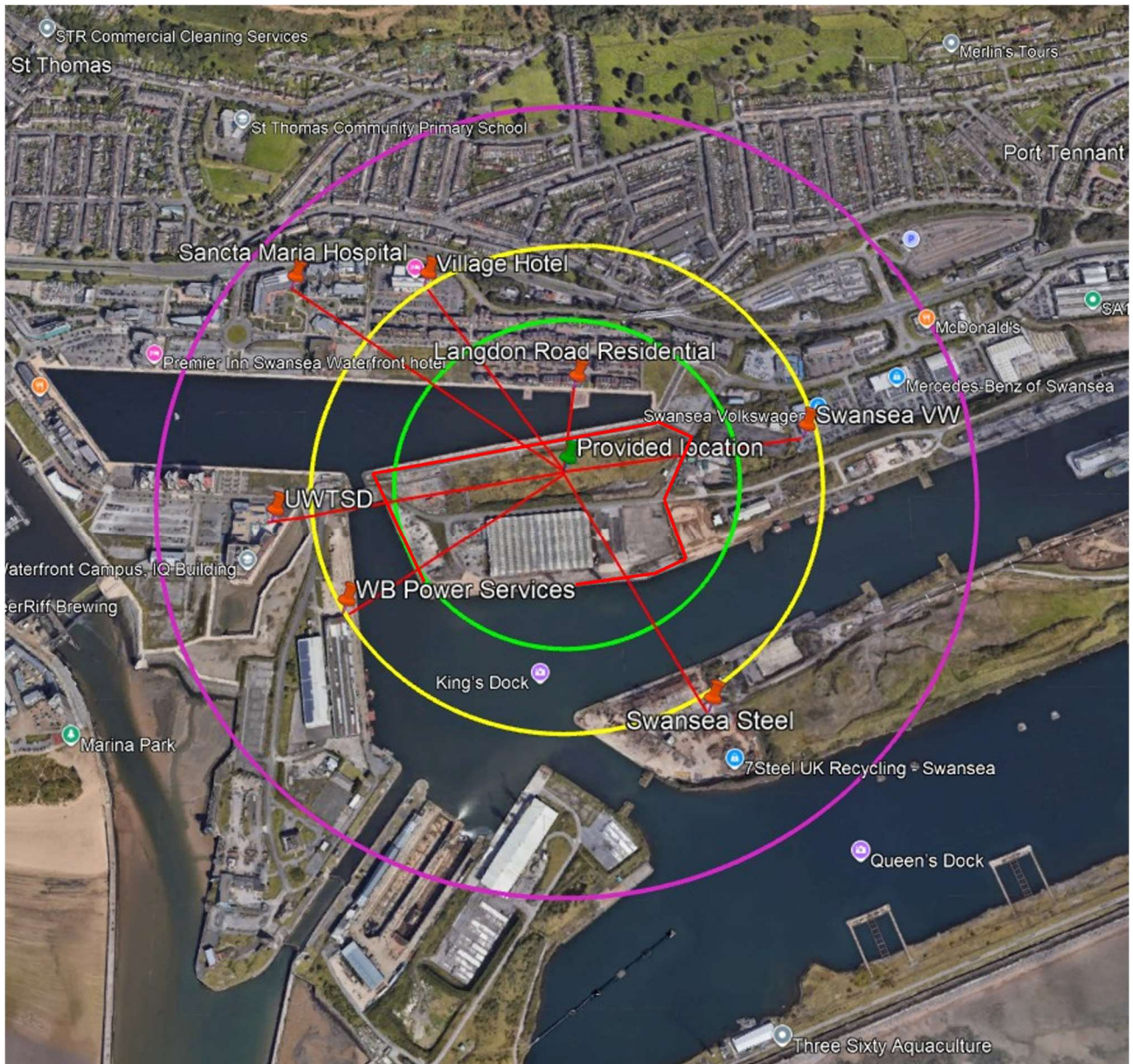


Figure 2 QD map with key structures

2.5 Blast Damage Estimation

The IATG has an explosive consequence analysis tool which provides information of the potential risk to people and property from the effect of blast [6]. Combining the data in Table 5 with the known distances of buildings from the PES, it is possible to more comprehensively understand the level of damage which may occur.

Of interest – any house within 157.79m of the blast site will be rendered uninhabitable and require extensive repair work. Langdon Road residential properties lie within this distance. Swansea VW car dealership is 380m from the site, the building has large panes of glazing which would be expected to shatter. Dock workers are at considerable risk of ear and lung damage, with fatalities expected with 33.29m. This data does not consider fragmentation or collapsing structures.

Table 5 Blast damage effects from 3000kg of TNT

Explosive Type: TNT

Charge Size (kg):

3000

Range from Munition to Structure (m):

Calculate

Damage to Windows of 4mm Thick Annealed Glass

Small Window 0.55m by 0.55m	High Hazard
Medium Window 1.25m by 0.55m	High Hazard
Large Window 1.25m by 1.55m	High Hazard

Minimum Range to No Break (m)

Small Window	374.98
Medium Window	605.74
Large Window	1355.71

Ground Vibration (m)

Maximum Effected Range	1752.71
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Injury/Fatality to Personnel Range (m)

Fatal Distance	33.29
Lung Damage	52.76
Eardrum Rupture	135.66

Damage to Brick Structures (m)

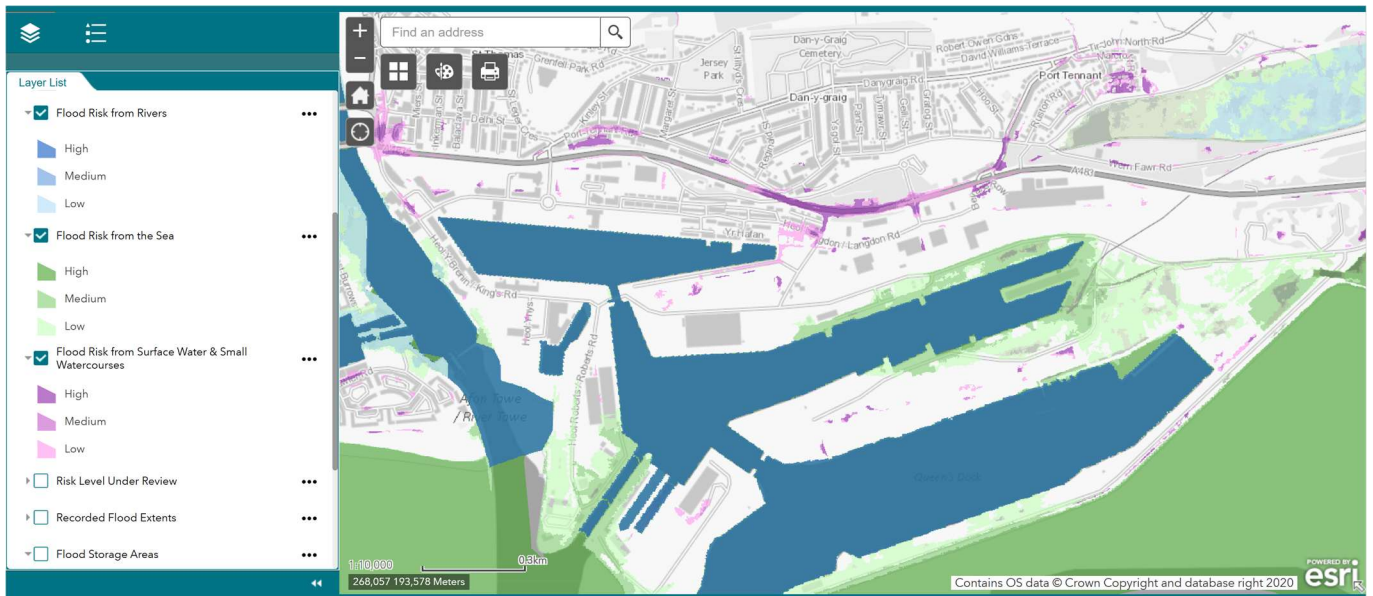
Houses completely demolished	61.08
Houses badly damaged, beyond repair, require demolition	90.35
Houses rendered uninhabitable, can be repaired with extensive work	157.79
Houses rendered uninhabitable, can be repaired reasonably quickly	271.04
Houses require repairs, serious inconvenience but remain habitable	542.07

2.6 Additional Safety Considerations

BBSS have provided no indication they have undertaken safety assessments. To assist the Council in their decision-making, additional information has been provided on several relevant matters – the list is not exhaustive, further assessments may be necessary.

2.6.1 Flood Risk

The Flood and Coastal Erosion Risk Map shows there is minimal risk of flooding from rivers or from the sea. The main route to the storage site is at high risk of flooding from surface water/small water courses, potentially impacting emergency services and general access to the site. This must be considered in the overall feasibility of the location and by BBSS in a fire safety plan.



2.6.2 Earthquakes

Swansea's seismic risk is low; however, it is the UK's second highest active region [7]. The probability of a damaging earthquake is minimal, but it would be prudent to build storage facilities with the ability to withstand moderate ground shaking.

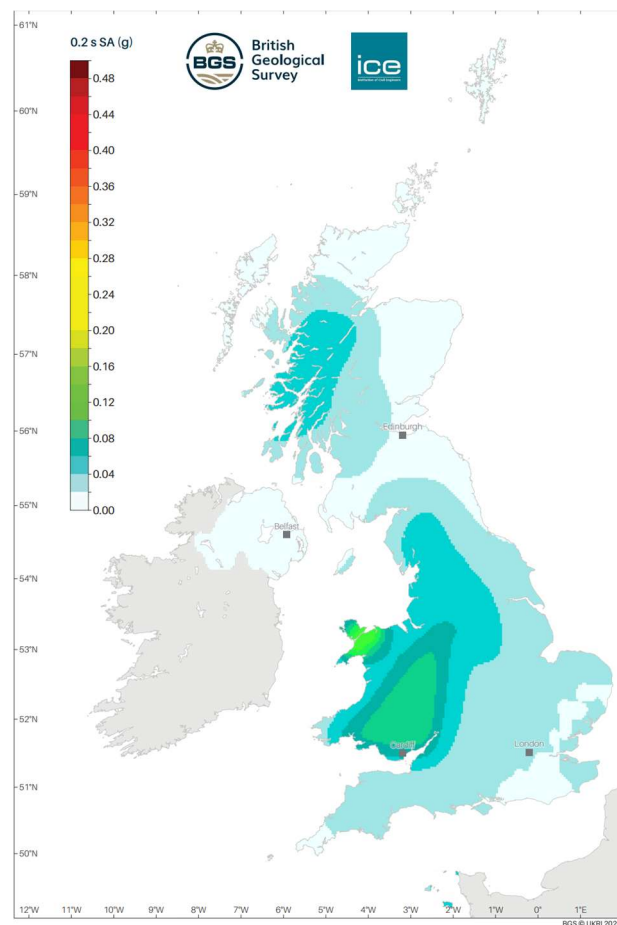


Figure 3 UK seismic activity [8]

2.6.3 Control of Major Accident Hazard (COMAH) sites

Gower Chemicals Ltd, located approximately 1.5 miles from the proposed site, outside of the VBD, processes chemicals such as sulphuric acid. It is considered a lower tier COMAH site [9]. It is within close proximity to Fabian Way – the major route into Swansea from the East and it should be expected that explosives will be transported past this site. The Council should consider the proximity of these sites to each other and the transportation of explosives close to Gower Chemicals, which could result in a larger hazardous event should there be an accident. Emergency responses will need reviewing prior to the plan being approved and all relevant parties must be involved. Again, consult residents.

Flogas Britain Ltd is an upper tier COMAH site, storing and distributing fuel. It is located next to junction 42 of the M4 and it is likely vehicles transporting explosives will pass this location. Consideration to this needs to be given as above.

2.7 Site Transport

To reduce risk while transporting explosives around site, a one-way traffic system with appropriate speed limits should exist. Suitable lay-bys and stabling should be provided; reversing should be avoided. Each ESH should have clear entry and exit routes, with the facility layout designed to eliminate the need for vehicles to retrace their route – reducing the risk of vehicles colliding [2].

The site is located on what appears to be suitable flat ground, but no gradient on site must exceed 1:20 – or 1:100 around buildings where trolleys without brakes will be used. Normal road vehicles will require the inside corner radius to be no less than 9m, increasing this further if trailers will be used on site [2]. According to the South Wales Ports website, the port has direct links to the national rail network [1]. It is unclear from satellite maps if this extends to the proposed site. Ideally, the site would have a direct connection to the rail network. Alternatively, Port Talbot is the nearest freight station, approximately 10 miles away. It would be for the Council to decide whether to consider this suitable rail access.

2.8 Site Plan

No information on a site plan has been provided – without this it is not clear if BBSS have suitably considered the area required for the site. As well as ESH, the site requires additional infrastructure such as process buildings, offices, and non-explosives stores. These must be constructed to offer a suitable level of protection from the explosives to be stored, ensuring that the requirements and distances outlined in IATG 02.20 and 05.20 are met [3].

2.9 Site Survey

Throughout this assessment, reference has been made to a site visit - IATG requests this for all new facilities and it would establish key details missing from the proposal, including understanding the NEQ of explosives to be stored by HD, CG and nature - and to fully understand the layout, type, quantity and size of required buildings and other facilities. A survey would assist the Council in understanding the needs, requirements

and suitability of the proposed site, and in doing so would better manage risk. A full list of the requirements for smaller explosive facilities is provided in Appendix 2 – Site Survey Requirements.

2.10 Safety and Security

A brief site perimeter visit was conducted – there is currently a basic perimeter fence with manned entry/exit points. A conversation with a guard determined entry is not permitted without written permission from the port authority. Whilst public access is not permitted to the port, the storage site itself would need additional levels of security. A suitable safeguarding system for the explosives needs to be developed and implemented [5].

A coordinated emergency response plan is essential, involving the local authority and emergency services. This has not been provided, and it is presumed BBSS have not created one.

2.11 Advice for Maritime Users

Swansea port is an active commercial dockland. The area immediately surrounding the proposed site is used commercially. Maritime users must be consulted on the proposed site and advice provided if permission is granted. Port employees and vessel crews must be informed that explosives are stored close by. Emergency procedures must be clearly communicated. While users won't have direct access to the storage site, they are considered vulnerable building users under IATG. Vessels entering the port should be notified of exclusion zones, and in the event of an emergency, be able to depart easily. Emergency drills and clear muster points must be clearly communicated. For reference a port facility map is provided in Appendix 3 – Port site map. Further maritime guidance can be found in the Dangerous Goods in Harbour Areas Regulations 2016 (DGHAR) [10].

3 Discussion

An assessment on the proposal of an explosive storage facility has been made, basing advice firmly within the IATG. Whilst there are minor points in favour of the site such as the direct rail link and no airport in the vicinity, there are a vast number of concerns highlighted throughout the report which clearly indicate the unsuitability of this site. The siting of even a single ESH with 100kg of HD 1.1 at the furthest point on the site, there would still be significant risk to local populations.

BBSS lacks essential details suggesting a poor preparation and understanding of the requirements for ammunition sites. This raises serious concerns around their safety, security and management abilities. With no information provided on these matters a full assessment of the viability cannot take place. BBSS are missing essential details from their proposal, based on this alone, the Council should proceed with caution.

Relocating to a more appropriate location would provide better protection for the public, better access to main traffic routes, potentially reduce the impact on maritime traffic and allow for a suitable emergency service response. The suitability of this site is questionable at best and certainly does not allow for any future expansion in operations. BBSS may want to consider additional mitigation beyond the standard requirements and present these to the Council for consideration.

The Council should also consider the effects of fragmentation, fire, thermal radiation and ground shock, not just the effect of blast. Different HDs can produce a different effect. For example, HD 1.1 will produce a short-lived fireball while HD 1.3 will produce a much longer fireball with its energy released over seconds rather than milliseconds increasing the thermal risk. The flame radius may increase by as much as 50% if there are strong winds. Given the site is on the coast, this must be assessed fully and could be supported by modelling. A hazards evaluation would be necessary to look at the maximum credible event that is likely to occur.

Finally, the requested risk reduction questions have been provided in Appendix 4 – Safety Questions for Risk Reduction.

4 Conclusion

A critical review of the explosive storage site proposal has been provided, linking throughout to the IATG. Relevant maps and tables have been included to help illustrate the lack of suitability of the site. Information has been provided on additional considerations, and answers provided to questions raised by the Council.

The assessment demonstrates the proposed facility does not meet required safety standards and presents a significant hazard to structures and people in the area. It is recommended the Council request a revised site design with clear explosive storage requirements before taking the proposal further. This will remove the current ambiguity allowing a precise assessment on the feasibility of the request and comply with IATG part 05.10 section 8.1 [2].

References

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Appendix 1 – Definitions

Definitions for terms used in this report have been provided directly from the IATG [11].

Explosive store house - a building or structure designed and erected for the sole purpose of storing explosives or a building modified, adopted or appropriated for that purpose and approved by a competent authority.

Exposed site - a magazine, cell, stack, truck or trailer loaded with ammunition, explosives workshop, inhabited building, assembly place or public traffic route which is exposed to the effects of an explosion (or fire) at the potential explosion site under consideration.

Hazard divisions (HD) - the UN classification system that identifies hazardous substances.

Inhabited building - a building or structure occupied in whole or in part by people (usually civilian). Used synonymously with occupied building.

Inhabited building distance (IBD) - the minimum permissible distance between potential explosive sites (PES) and non-associated exposed sites (ES) that requires a high degree of protection from an explosion.

Maximum credible event (MCE) in hazards evaluation, the MCE from a hypothesized accidental explosion, fire, or toxic chemical agent release (with explosives contribution) is the worst single event that is likely to occur from a given quantity and disposition of AE. The event must be realistic with a reasonable probability of occurrence considering the explosion propagation, burning rate characteristics, and physical protection given to the items involved. The MCE evaluated on this basis may then be used as a basis for effects calculations and casualty predictions.

Nature - the specific types of ammunition. a means of categorising ammunition or munitions by their function (e.g. anti-tank ammunition, or riot control ammunition).

Net explosive quantity (NEQ) - the total explosive content present in a container, ammunition, building etc, unless it has been determined that the effective quantity is significantly different from the actual quantity. It does not include such substances as white phosphorous, smoke or incendiary compositions unless these substances contribute significantly to the dominant hazard of the hazard division concerned.

Potential explosion site (PES) - the location of a quantity of explosives that will create a blast, fragment, thermal or debris hazard in the event of an explosion of its content.

Public traffic route distance (PTRD) - the minimum permissible distance between a potential explosion site (PES) and public traffic routes which is such that the ignition or explosion of explosives at the PES will not cause intolerable danger to the occupants of vehicles at an exposed site (ES).

Purple line - a continuous line drawn on a map or plan of an explosives storage location which encompasses the explosives area and defines the minimum permissible distance between a potential explosion site and inhabited buildings which are by definition of vulnerable construction. It is usually at twice the yellow line or

normal inhabited building distance determined by blast considerations. Additionally, the construction of new inhabited buildings of curtain-wall construction or high rise buildings is restricted. The area within the Purple Line is known as the Purple Zone.

Quantity distance (QD) - the minimum permissible distance required between a potential explosion site (PES) and an exposed site (ES).

Vulnerable building - the term 'vulnerable building' refers to an exposed site (ES) deemed to be vulnerable by nature of its construction or function and therefore sited at greater than IBD.

Vulnerable building distance (VBD) - the minimum permissible distance between a potential explosion site (PES) and a vulnerable building.

Yellow line - a continuous line drawn on the map or plan of an explosives area which encompasses the explosives area and defines the minimum permissible distance between a potential explosion site and inhabited buildings, caravan sites or assembly places. a line at IBD within which the construction of new inhabited buildings, caravan sites and public traffic routes are restricted. The area within the Yellow Line is known as the Yellow Zone.

Appendix 2 – Site Survey Requirements

IATG part 05.10 section 7 states a site survey should be conducted of all new facilities to help establish the factors below - these have been reproduced directly from the guidelines to assist the Council [2]:

- the need to identify the Net Explosives Quantity (NEQ) by nature(s), HD and CG to be stored; identification of the type, number and size of facilities required (including administrative buildings) and associated area and layout;
- the suitability of any existing buildings for their current task; the suitability of the planned facilities for their future task;
- the cost of the buildings when compared to the task both short-term and long-term;
- the technical specifications required for safe storage e.g. construction, barricades, heating, lighting, security features etc;
- the proximity of any protected areas such as UNESCO sites, sites of special scientific interest etc;
- the proximity of any structures which will affect storage such as hospitals, schools, churches, public roads etc; and
- the suitability of existing construction and buildings at sited IQDs.

Appendix 3 – Port site map

This map is provided for reference, showing site access, transport links and port facilities.

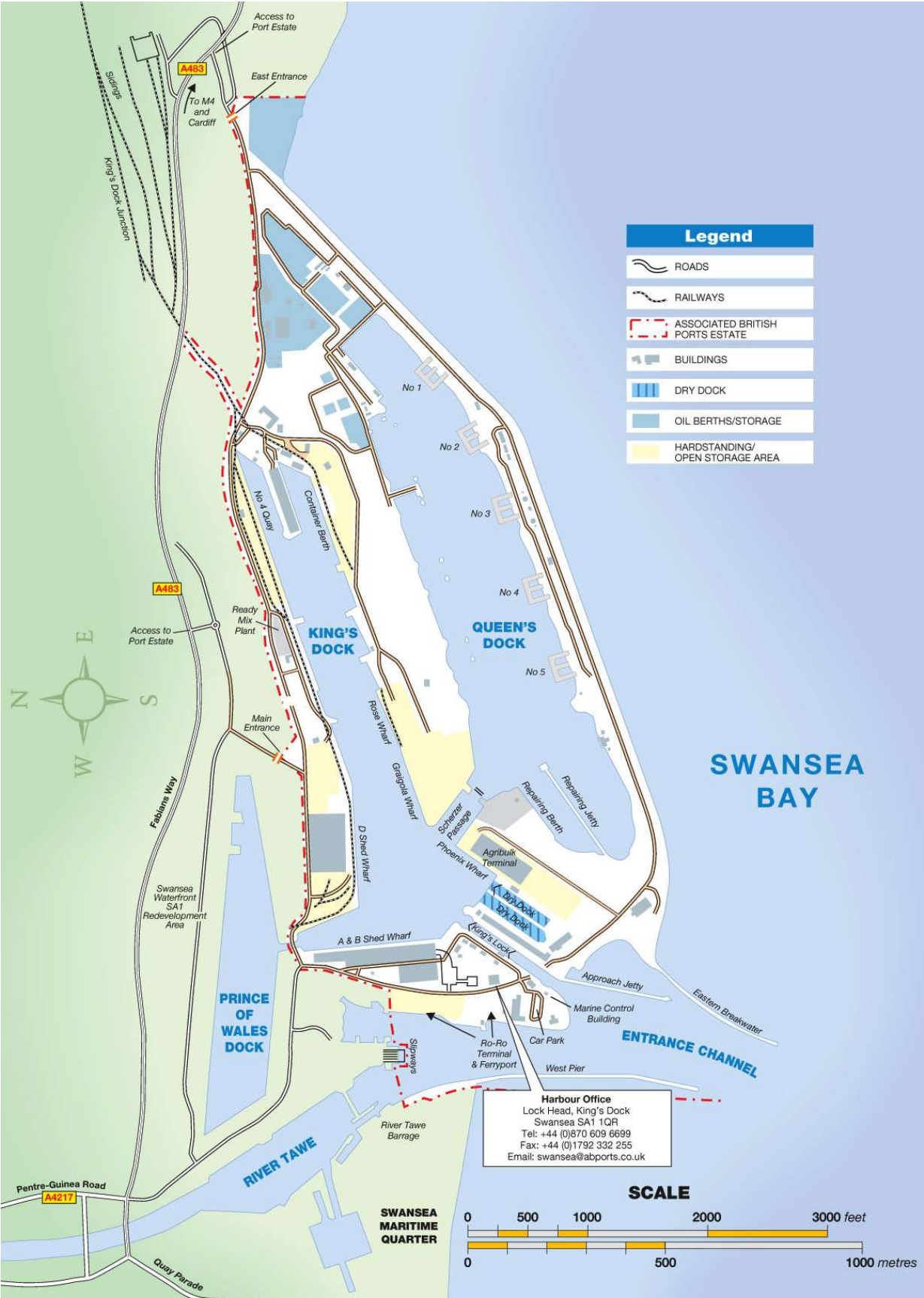


Figure 4 Swansea port map [1]

Appendix 4 – Safety Questions for Risk Reduction

The council have requested questions they can present to BBSS to improve their understanding the request.

These are presented below and have been grouped by topic.

Scope and standards

1. In considering the minimum standards design, construction, use and maintenance of the facility, can you explain which sections of IATG have been referenced, and which risk reduction process levels will be implemented.
2. For each activity to occur on site such as storage and processing, explain the target RRPL.

Licensing, explosive limits, quantity distances

3. Please provide a clearly defined list of explosive nature, HD and CG. What explosive licence limit for each building are you requesting?
4. If there are variations to this how will this be managed?
5. Has a site safety plan showing inside quantity distances, outside quantity distances, PES and ES locations?
6. What guidelines are you applying to manage the risk to the port and its operations, including risk to port employees?
7. How will risk to vessels berthed in the area be managed?
8. Produce a quantity distance map and use the explosive consequence analysis tool to clearly demonstrate the extent of risk to the local area and infrastructure
9. Produce a plan for the site showing the locations of all required buildings and stores with required separation distances identified.

Siting

10. What siting board processes have you followed?

Engagement with interested parties

11. Have plans for the site, and associated risks been communicated to all affected local parties and authorities?
12. Has an opportunity for discussion on the above been provided to these stakeholders?

Buildings and controls

13. What specifications will be used for each type of required building or store – provide details on construction of roofs, walls, floors, doors etc?
14. What blast and fragment mitigation measures will be used?

15. What building facilities have been considered and what will be used – i.e. ventilation, heating, access for personnel and lifting equipment?
16. Provide details on what time of traverses will be used, including materials. Explain how these decisions were made.
17. How will the buildings and traverses be maintained?
18. What lightning protection system will be used?
19. What anti-static regimes will be needed?
20. Provide a RF assessment.
21. What safety standards for electrical installations will be applied?

Vehicles and mechanical handling equipment

22. What vehicles will be permitted in the explosives area?
23. How will explosives be transported around site?
24. Provide a plan showing transit routes around site including speed limits and entry and exit points, and any other information deemed necessary.
25. Provide details of any mechanical handling equipment, where it will be used and stored, and a proposed maintenance regime.

Control, Security and Safety

26. What is the current Risk Reduction Process Levels for the site – provide the completed checklist.
27. Provide detailed security plans for the site and buildings including surveillance and intruder prevention.
28. Will the site have permanent guards and are patrols of the area planned?
29. How will entry to the site be controlled?
30. Who will have access to site keys?
31. What contraband controls will be in place?
32. Provide a detailed site maintenance plan with consideration to the marine environment and standard required controls.
33. How will repairs to the secure area/s be managed? What briefing will be given to those visiting the site to conduct repairs or maintenance? Will permits to work be issued and what will these detail?
34. Will a no-fly zone be requested for the site?
35. Provide a fire safety plan.
36. What engagement has there been with local authorities and emergency response teams?
37. What fire signage will be in place on the site?
38. What fire fighting measures will be in place on the site?
39. For the employment of staff working with explosives, what standard or personnel will be considered suitable, how will people be vetted?

40. What first aid measures are in place? Are staff trained to First Aid at Work standards or First Responder level? Does the first aid training include information on blast injuries?
41. What specialist inspections will take place and for what regimes? Who can perform these?
42. What external inspections should take place – who will perform these – what is the outcome of each inspection?
43. What non-routine inspections will take place and when? Who can perform these?
44. What routine inspections will take place and when? Who can perform these?
45. What informal inspections will take place – what needs to be checked on a daily/weekly basis? Where is this recorded? Who is permitted to perform the inspection?

Storage, Handling and Transport of Explosives

46. Explain how the explosives will be stored in each ESH.
47. What environmental controls will be in place for each ESH?
48. How and where will explosives be packaged or unpackaged?
49. How will damaged, or expired items be handled?
50. What logs of the explosives will be taken? Where will these be stored? How often will they be checked?
51. Where will the explosive licence be displayed?
52. What signage will be displayed on the outside of the stores?
53. What inspections of the explosives and explosive facilities will be conducted and at what frequency explosives?
54. Who will conduct the inspections?
55. What plans have been developed for the temporary storage of explosives, such as those in transit around the site?
56. Explain how explosives should be marked up for identification and for transport, including that stored on pallets.
57. What standards will you work to for the safe transport of explosives? How will these be implemented?

Accidents and Investigations

58. What accident and incident reporting procedures will be follow?
59. How will accidents and incidents be investigated?
60. How will evidence be preserved?
61. Explain what details will be record when taking witness statements?
62. How will investigation findings be used to prevent further incidents?
63. How and to whom will investigation findings communicated?
64. Which authorities will be informed of accidents and incidents and when is it required to inform these parties?

Training

65. What training will be provided to staff working with explosives or in explosive areas – consider all aspects of the role including safety, handling, storage, emergency response, hazard identification, preparing shipments, accident reporting, contraband, explosion consequences, explosive properties – this list is not exhaustive and provided to assist BBSS?
66. What training will be provided to staff not working with explosives?
67. Explain the training plan to ensure knowledge, skills and behaviours remain up to date and to the required standards?
68. How will staff not meeting the required standards be brought up to standard?
69. How often will emergency response drills be conducted? Who will be involved – i.e internal and external personnel?
70. Will the site use a training framework design to build confidence and competence when working with explosives? Provide a copy.
71. How will competence be assessed?