



Report on Drainage Strategy in Support of Application WSCC/063/13/BA

Site Location: Lower Stumble Hydrocarbon Exploration Site, Off London Road, Balcombe, West Sussex, RH17 6JH

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Appendix 1 – Design Check Report From West Sussex County Council

Appendix 2 – Cuadrilla Method Statement for HSE

1.0 Purpose of Strategy Report

This report has been prepared following a request from the West Sussex County Council for additional information on drainage and flood risk in association with a planning application for a revision of the current planning consent for exploratory operations providing details of a new flare stack (WSSCC/063/13/BA).

The details of the additional information sought have been set out in a “Design Check Report” received from the West Sussex County Council dated 30th July 2013 (see Appendix 1).

This strategy report confirms the studies undertaken by the applicant in association with Method Statement and HSE requirements (see Appendix 2) and further that liaison has taken place with the Environment Agency concerning site preparation, drainage and flood risk matters relevant to the proposed site operations. It also provides an assessment of the site specific flood risk and surface water drainage conditions.

The total site area for the pad, including all lay down areas, administration areas and car parking, occupies approximately 0.55 hectares with the site access roadway extending to approximately 0.1 hectares. This is shown verged red on the application “Red Line Plan” which accompanied the planning application.

2.0 Flood Risk Assessment

An assessment of the site specific flood risk has been made and this is based on a review of the Environment Agency flood risk maps and the Strategic Flood Risk Assessment (SFRA) for West Sussex County Council (January 2010). These data sources have been supplemented by information obtained during a walk over survey and the site specific topographical survey.

There is no known history of flooding within the area and the SFRA for the area also has no historical record of flooding at, or within the immediate vicinity of, the site.

2.1 Flooding to the site

The site of the pad and the access track from London Road are located within the Environment Agency Flood Zone 1. This is the low risk flood zone considered to have a less than 1 in 1000 year (i.e. a probability of less than 0.1%) chance of flooding from rivers or streams and/or from tidal flooding.

The pad site is located within an area considered by the SFRA (see Map L) to have a Low to Medium risk of flooding from **surface water** flows (pluvial flooding). As the site is on locally raised ground with levels falling gently to the south, and given the presence of the railway line on a raised embankment to the north forming an effective control on flows from higher ground, the site is concluded to be at a low risk from surface water flooding.

The site is located within an area that is considered to be potentially at medium risk of flooding from **ground water** (SFRA, Flood map G). As the site is on ground that is locally elevated above the valley floor and outside of the fluvial floodplain (considered indicative of potentially worst case groundwater flooding potential), it is concluded to be at low risk from this source.

There are no records of historical **sewer flooding** in the area (see SFRA map S) and given the rural location of the site, with a lack of sewer infrastructure considered to be present, it is concluded that the site is at low risk of flooding from this potential source of flooding.

The only potential **artificial source** of flooding in the area is the Ardingly Reservoir which is located some 1.5km to the east of the site (see SFRA map R). The reservoir is in the neighbouring catchment to that of the site and separated from it by significantly higher ground that forms the watershed. The site is concluded to be at negligible risk from this source of potential flood risk.

It is concluded that the site and the access track are at **low risk of flooding** from all sources.

It is recognised that the Environment Agency flood maps indicate that a small length of London Road to the southwest of the site as being within Flood Zone 3 (High Risk). However, given the small change in elevation along the section of the road indicated as being at risk, it is concluded that flood depths will be shallow and safe access/egress could be maintained at all times.

The proposed scheme is not specifically categorised under the 'Flood Risk Vulnerability Classification' in the National Planning Policy Framework (*NPPF*). However, based on a review of the other uses listed within the classes provided, this proposal is considered to best fit within the 'less vulnerable' category.

The 'Flood Risk Vulnerability and Flood Zone Compatibility' matrix (*NPPF*) indicates that 'less vulnerable' development is appropriate in Flood Zone 1.

2.2 Flooding from the site

The proposed works involve a change (increase) in the existing impermeable area and therefore may detrimentally impact on surface water generation. The area that is proposed to be lined and bunded to form the pad (see Figure 1 and Section 3.0 below) will effectively represent a new impermeable area of 0.11 hectares which will increase the amount of surface run off from the site.

The proposals are to drain all surface water from this new impermeable pad to a 3m x 3m cellar and for all water collected to be and be disposed of off-site via a suction tanker to a waste water treatment works. As any increased runoff resulting from this area is to be contained and recycled (rather than drained from the site), there is no anticipated increase in runoff and therefore no detrimental impact on surface water flow generation as a result of the proposed works.

3.0 Site Set Up/ Impermeable Membrane

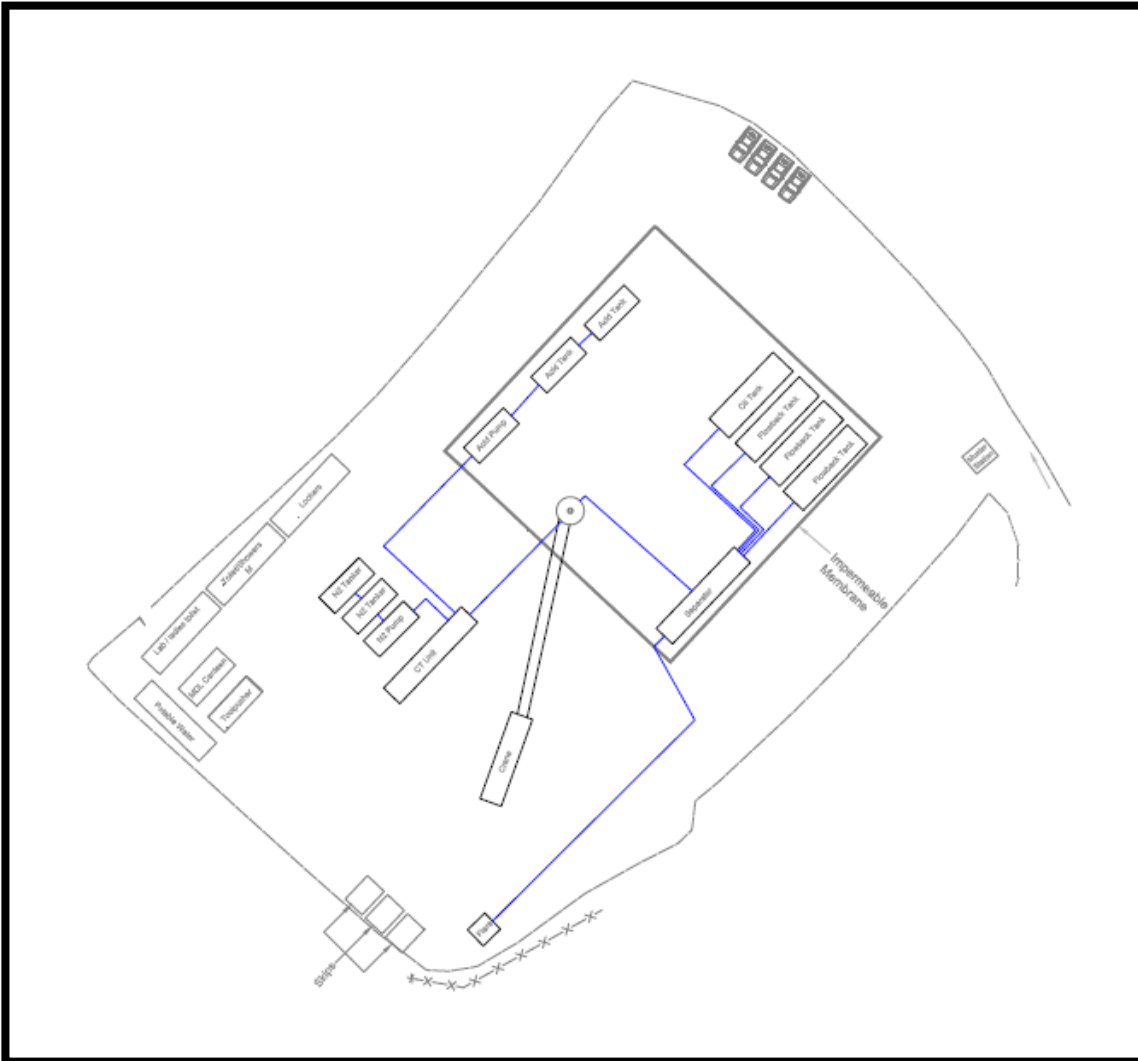
A topographic view of the proposed well testing site set up is shown in figure 1 below. The blue line indicates the area where an impermeable membrane has been installed prior to mobilisation on site.

The site membrane has been constructed in a central area of the site of approx. 0.11 hectares (33.5m x 33.5m). The method of installation has included a contractor tidying the existing site area and re rolling to a flat surface. A perimeter bund from used railway sleepers has been laid and protective geotextile has been laid on top of the stone surface area within the bund. A fully welded 1.0mm textured HDPE membrane has been installed to the geotextile area, sealed to concrete slab edge with metal battening and fixed to the top of sleepers. The HDPE membrane is textured to prevent slippage. A further 500g/m² protective geotextile over HDPE area has been fixed to the perimeter sleepers. A nominal "pump sump" approx. 2m x 2m x 0.3m deep in the corner of the lined area nearest to existing oil interceptor has been established to pump off liquids contained within the bunded area. An access ramp in/out of the area in timber/stone has been installed. To protect the HDPE membrane further, 70mm thick rig mats (5m x 1m) have been provided to the entire area excluding 3m x 3m for the cellar.

The fuel tank is double skinned (secondary containment) in line with the oil storage regulations. Chemicals are stored in containers containing drip trays. Refuelling activity will be in accordance with the details set out in section 6.2. Any oils, diesels, chemicals in use shall be stored on drip trays.

The concrete slab has Aco drains flowing into the cellar forming a sealed impermeable area. The surface water from the pad will be directed into the cellar and be disposed of off-site via a suction tanker to a waste water treatment works.

Figure 1: Balcombe Flow Test Site Plan



4.0 General Environmental Management

The exploratory site at Balcombe received planning permission from West Sussex County Council in April 2010 (WSCC/027/10/BA). In response to the conditions from the planning permission and the statutory consultee responses, (e.g. Environment Agency, Natural England), the method statement at Appendix 2 has been developed to demonstrate compliance with the planning permission conditions. Surface waters will be contained within the site and removed as necessary by tanker. No discharge to local watercourses will take place and no silting will arise as a result of the on-site exploratory operations. All wastes will be contained and removed from site by appropriate tankers and no discharge of any kind will be made to local sewers/drains. Once the site has been fully developed, and all site exploration operations completed, the all mobile operation equipment will be removed. No drainage features will be offered for adoption as these will be linked directly to an on-site containment system. When the site is restored all such drainage will be removed.

The site is wholly located within flood risk zone 1 (low risk in relation to either tidal or fluvial flooding). In addition, given the site setting within the local topography of the surrounding land, the site is not considered to be at risk from groundwater, surface water (overland flows), or flooding from artificial sources. The site is therefore considered to be at low risk from all potential sources of flooding.

Details of the site water management and associated monitoring, as well as measures to ensure no detrimental impact on flood risk from the site operation, are set out in the followings sections of this report.

4.1 Health and Safety Executive (HSE) Monitoring & Reporting

Cuadrilla's approach to setting high site environmental standards includes a combination of written documentation and setting the right culture. As part of the site HSE organisational structure, a Site HSE Advisor has been assigned to the project for the duration of operations. The Site HSE Advisor will be supported by the HSSE Director, Environmental Engineer and Behavioural Safety Advisor. The Site HSE Advisor is responsible for the method statement communication and continued support. Operations are accountable for complying with the method statement, with the / Site Supervisor taking the lead for day to day accountability. As a minimum, daily tool box talks/morning briefings are held with operational personnel to communicate daily activities, HSE risks, reported incidents, near misses and other key information.

The HSSE Director, Environmental Engineer and Behavioural Safety Advisor will conduct inspections and provide coaching and further support to the Site HSE Advisor; ensuring compliance with environmental best practice is reviewed, achieved or improved upon. Documented inspections, audits and reporting of incidents and near misses via the company Behavioural Safety programme, STAR (Stop Think Act Report), are fundamental to learning lessons and continually improving Cuadrilla's approach to environmental management.

A programme of senior management site inspections will ensure compliance with Cuadrilla's HSE Policies and HSE Risk Management Framework whilst demonstrating the safety leadership culture of the business.

A monthly environmental report shall be shared with the Environment Agency summarising results from monitoring activities. This shall include but not limited to:

1. Operations update
2. Groundwater report
3. Surface water report
4. Air quality report

4.2 Baseline Information

As a baseline, the following activities have been carried out to inform Cuadrilla's approach to site environmental management:

1. An updated ecological study by Environmental Project Consulting Group, April 2013, identified no ecological concerns.
2. Ground Gas Solutions Ltd (GGS) baseline assessment of groundwater.
3. Data from the Conoco well drilled in 1986 Balcombe 1 well identifies that the Ashdown Beds groundwater has relatively high gas readings Methane 54,000ppm Ethane 1,335ppm₄
4. Notification from the Environment Agency states there are no licensed groundwater (abstraction above 20m³/day) or surface water abstractions within a 2km radius of the site at Stumble Wood, Balcombe
5. The Environment Agency and Local Authority have advised that there are no protected rights (abstraction of water below 20m³/day) within 2km radius of the site
6. The water supply for households and industry etc. in the area is supplied from abstractions taken from Ardingly reservoir and the River Ouse
7. Baseline soil report from Envirochem 28th June 2010
8. Baseline surface water quality sampling sent to Alcontrol laboratory for analysis for "Totals" and benchmarked against Environment Agency EQS standard₅
9. Radiological Monitoring, Counts Per Second
10. Baseline Air Quality Monitoring which includes the following determinants: Methane, Hydrogen Sulphide, BTEX, VOC's, Nitrogen Dioxide, Sulphur Dioxide
11. Seismic monitoring

The site is secured by G4S on a 24 hour basis with a perimeter fence line. All activity will be conducted within the site perimeter fence line.

5.0 Well Integrity & Groundwater Protection

5.1 Groundwater Protection

The groundwater in the vicinity of the well is not used for domestic or industrial water supply. Results from a Conoco well drilled in 1986 identify that high levels of Methane and Ethane are already present in groundwater.

Notwithstanding this any groundwater is protected from the contents of the well during drilling and production operations by a combination of steel casing and cement sheaths, and other mechanical isolation devices installed as a part of the well construction process. The construction of the well is entirely directed to prevent the migration or transport of fluids between subsurface layers of impermeable rock formations that lie between the hydrocarbon producing formations and the groundwater, which themselves have isolated the groundwater over millions of years.

The primary method used for protecting groundwater during drilling operations consists of installing a steel pipe, called casing, immediately after drilling and cementing this steel pipe into place. The cement is pumped in slurry form down the inside of the casing and rises up through the annular space between the drilled hole and the casing, and once in place sets hard. The steel casing protects the zones from material inside the wellbore during drilling operations and, in combination with other steel casing and cement sheaths that are subsequently installed, protects the groundwater with multiple layers of protection for the life of the well.

Details of the method of casing together with a schematic of the steel casings run and cemented in the wellbore is shown in Figure 3 of the Method Statement at Appendix 2.

5.2 Groundwater Monitoring

From the Conoco well drilled in 1986 Methane and Ethane have been identified to be already present in the Ashdown Beds indicating a good seal from the Wadhurst clay with gas levels decreasing rapidly with depth. Ground-gas and groundwater monitoring will be undertaken before, during and after exploratory activities. Monitoring will be undertaken within a monitoring well, recently constructed within a newly drilled borehole specifically for ground-gas and groundwater monitoring. The monitoring well response zone has been installed within the Ashdown Beds (approx. 50mts) in order to monitor groundwater quality within the aquifer.

The monitoring well is situated in the South of the site as this is the predicted direction of groundwater flow in the area of the site. The available geological mapping indicates that the dip of the strata below the site is likely to be between 3-4 degrees to the south.

The well has been drilled and installed using standard rotary drilling techniques. Due to the short term programme of exploration and well testing a single monitoring well is deemed a balanced approach for the programme.

Further groundwater sampling will be undertaken to monitor the quality of groundwater. The determinants selected to monitor groundwater quality are set out within the Method Statement at Appendix 2.

Water sampling of the borehole will be completed using a bladder pump system in order to reduce the chance of 'de-gassing' of the water sample. As a minimum 3 samples have be taken before drilling to establish a pre-drilled baseline and further sampling will continue during drilling/ well testing and after drilling/ well testing.

6.0 Pollution Prevention & Drainage

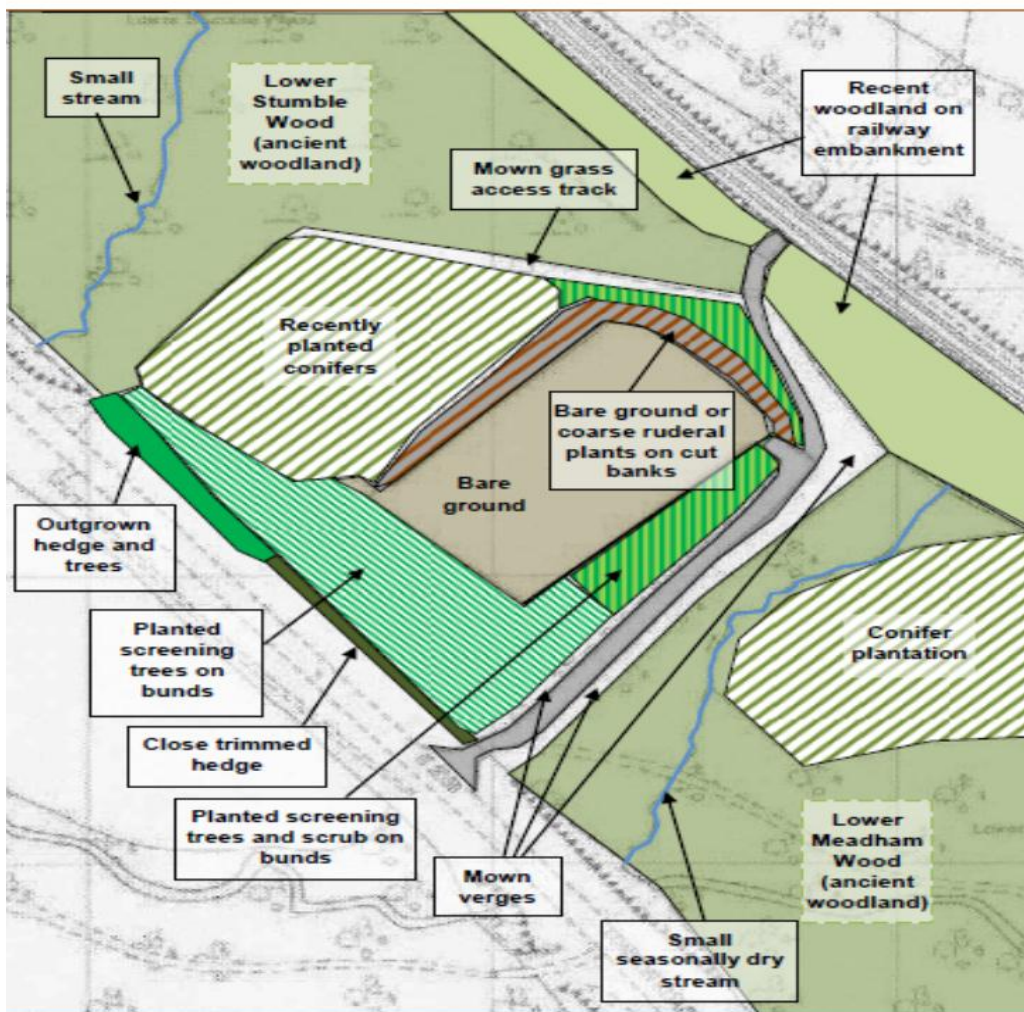
The management of site activities will be conducted in line with pollution prevention guidelines to prevent and manage spillages or other incidents and protect environmental receptors.

6.1 Surface Water Management

Cuadrilla have constructed a self-contained impermeable membrane for the rig area/well testing area which will contain all surface water falling onto the pad. No surface water from the pad will be allowed to enter peripheral surface watercourses. Neither will infiltration of the pad surface or direct discharge to local sewers take place. No silting of local watercourses will occur as no site discharge will be made. As such the site will not have any detrimental impact on surface water runoff rates or volumes.

The site review has identified two surface water streams (both unnamed) located in the Lower Stumble woodland and Lower Beanham woodland respectively. The Lower Stumble woodland stream is located approximately 100 meters to the north-west of the site. The Lower Beanham woodland stream is located approximately 30 meters to the south of the site. The Lower Beanham woodland stream is understood to be seasonally dry, (see Figure 2). Both streams flow in approximately a southerly direction where they enter a larger water course (unnamed) which generally flows in a south-easterly direction towards the River Ouse. This larger water course is located approximately 125m south of the site. The two smaller streams join the larger water course in close proximity to the main road between Balcombe and Cuckfield.

Figure 2 - Surrounding Site Receptors



The sampling strategy has established a baseline of water quality. As a minimum 3 samples have been taken from locations 1, 2, 3, 4 and 5 before drilling. An independent sample shall also be taken by GGS during this period.

Sampling will continue during the well testing programme. A minimum of weekly samples shall be taken during well testing and an independent sample shall be taken by GGS.

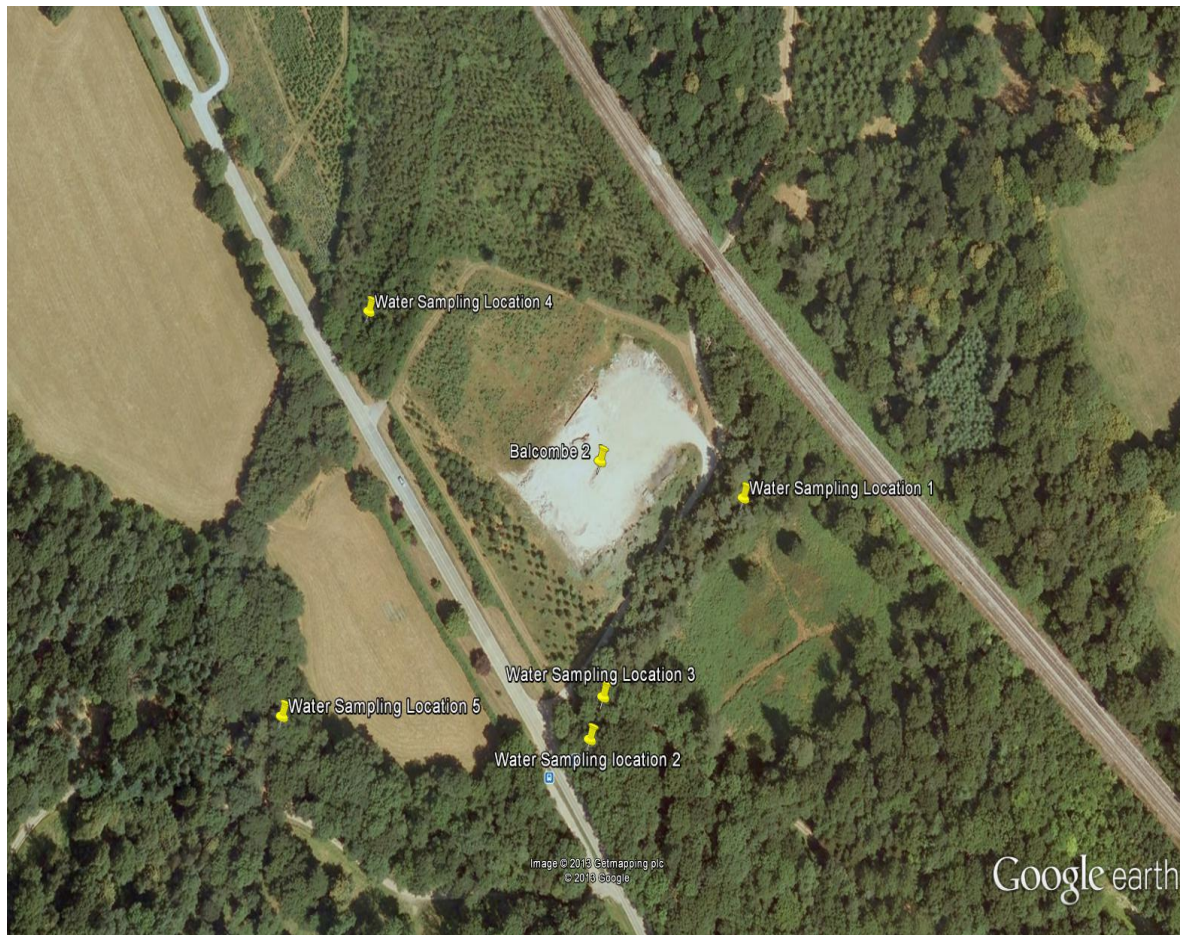
Once the site is demobilised 2 further samples shall be taken from the 5 sampling locations. GGS will also carry out an independent sample.

A daily visual inspection shall be conducted by the Site HSE Advisor to identify any changes in water quality (if flowing) at all of the five location points. In the event of a spill on the site access and egress road there is an emergency response procedure to deal with this, see section 6. To reduce the likelihood of a collision along the access and egress route there will be a strict speed limit of 15mph.

A site walkover indicated no land drains within the vicinity of the site. The original submitted site drainage plan has a French drain running along the perimeter site. An oil interceptor has been built into the drainage system along with a sump. A 150mm butterfly valve system is in place to prevent discharge from the site.

The valve is accessible from a manhole cover situated adjacent to the oil interceptor. The valve will be shut during the operational phase of work. The Site HSE Advisor will visually inspect the butterfly valve on a daily basis during drilling and well testing. No discharges are allowed from the oil interceptor at any time.

Figure 3 - Water Sampling Locations



6.2 Diesel, Chemical Storage & Refuelling

Storage of chemicals will be located on bunds/ drip trays with associated suppliers' Material Safety Data Sheets (MSDS). Each container shall be labelled and stored in accordance with the suppliers' requirements and identified on the Pollution Incident Plan.

Diesel for the work over rig is stored in compliance with the Control of Pollution (Oil Storage) Regulations 2001, double skinned container. The oil storage containers are labelled with contents and capacity. Inspection of the diesel storage container shall form part of the daily HSE inspection tour.

Refuelling activities from the delivery tanker to the main diesel container shall be a supervised operation to prevent overflowing, poor connections and to respond to leaks in a timely manner. To prevent a pathway for diesel spills or leaks, secondary containment shall be located underneath connections and pipes to capture drips or leaks. The site layout shall be constructed to minimise the length of refuelling pipe from the tanker to the container₈. In the event of a spill, see section 7 emergency response.

There is no underground storage of liquids or fuels within the pad.

6.3 Foul Water Storage and Removal

Storage of foul water from the site administration and mess facilities, including the on-site toilets, is by way of integrated storage tanks built into the mess containers and toilet unit. These containers are monitored on a daily basis and emptied, as necessary, by road tankers which remove the waste to approved disposal locations. There are no direct connections into the local sewage system.

7.0 Emergency Preparedness & Response

In the unlikely event of an emergency on site, the Site Supervisor will be the coordinating mind from a site perspective. The emergency response/pollution incident plan shall be tested within the first week of operations.

7.1 Fire Fighter Water

The use of fire fighter water will initially be contained in the rig containment area. A 24 hour spill response contractor (Mantank) shall be contacted and deployed to support the containment of fire fighter water. Contact details of Mantank shall be located on the Pollution Incident Plan. Mantank shall also be briefed on the site Pollution Incident Plan.

The Site Supervisor is responsible for coordinating the site response to any fire in line with the site emergency response plan. The first priority is the health and safety of personnel. The Site Supervisor, or an employee with the delegated authority, shall report the incident to Cuadrilla Senior Management who will in turn notify the authorities (e.g. Environment Agency, Local Authority) of the incident, as required.

7.2 Spill Management

The use and transfer of liquids, e.g. chemicals, oils, fuels, shall be carried out with secondary containment, e.g. drip trays. The site has a minimum of three 200 litre spill kits located around the site to provide easy response to spillages. Before the start of operations, all personnel shall be briefed in the use and location of spill kits.

Each spill shall be cleaned up immediately and reported via Cuadrilla's incident reporting system, regardless of size. As part of the weekly HSE tour, each spill kit shall be examined to ensure it is still fit for purpose.

In the unlikely event of a large scale spill the impermeable membrane shall provide the principal source of containment. In the unlikely event of further support required the Site Supervisor shall coordinate the spill response, which includes notifying the 24 hour spill response contractor (Mantank), to support the clean-up of the spill. Details of the spill response contractor will be located on the Pollution Incident Plan. When contacting the spill response contractor, key information will include: estimated quantity and contents (oil, muds, chemicals). Cuadrilla senior management team shall contact the Environment Agency as outlined in the Method Statement at Appendix 2.

In the unlikely event of a large scale spill which requires the deployment of a spill response contractor, sampling of the local surface water shall be carried out for a minimum of 1 week after the spill or until agreed with the Environment Agency.

7.3 Spill on Access or Egress Road/Off Site

As a minimum, all liquid transfer of fuels, wastes or chemicals are expected to be transferred with spill kits. The 24 hour spill response contractor (Mantank) will be available to manage spillages off site as well as on site.

The Site HSE Advisor will carry out recorded spot checks on vehicles entering and leaving the site for spill kits.

