

**Former Tollgate Hotel,
Watling Street, Gravesend**

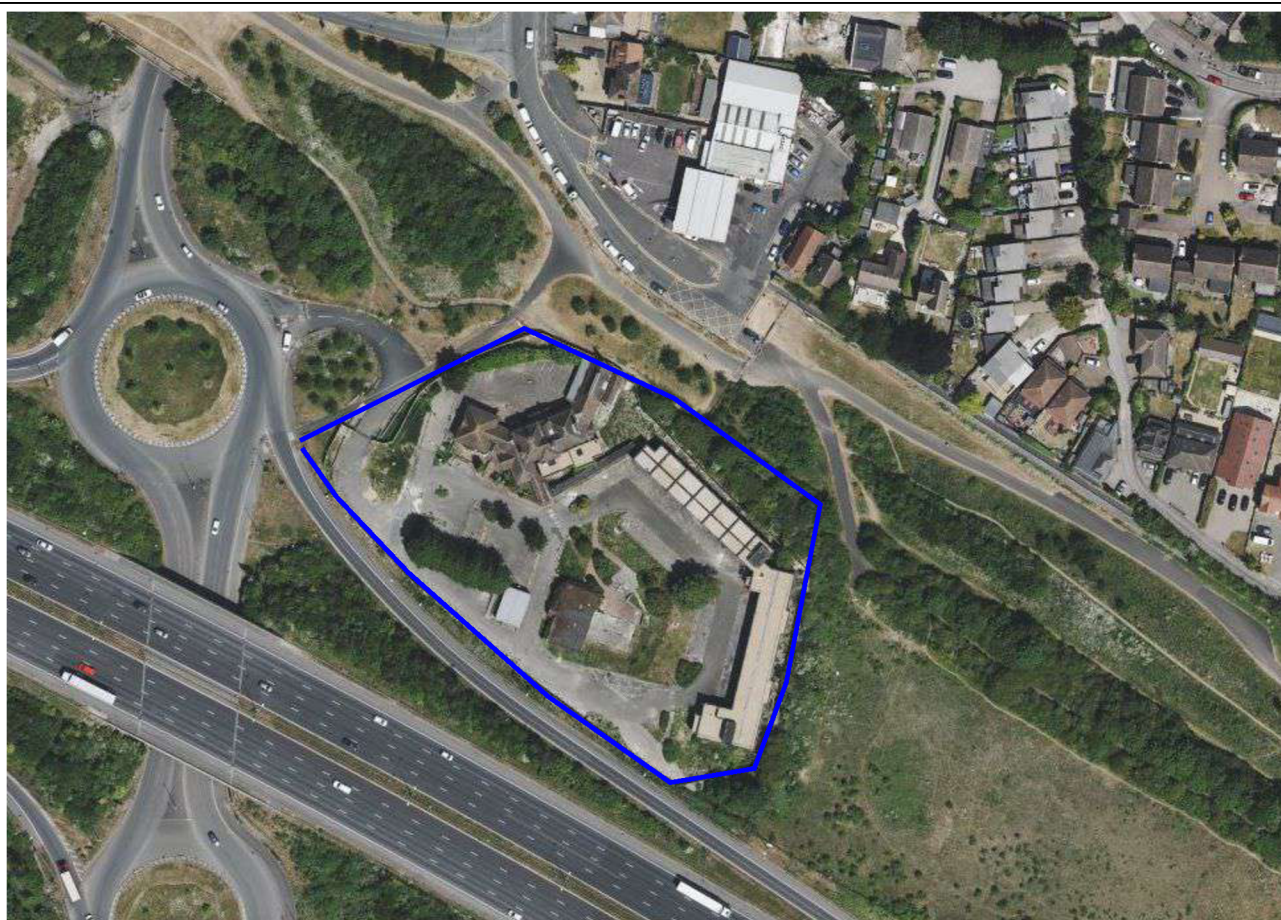
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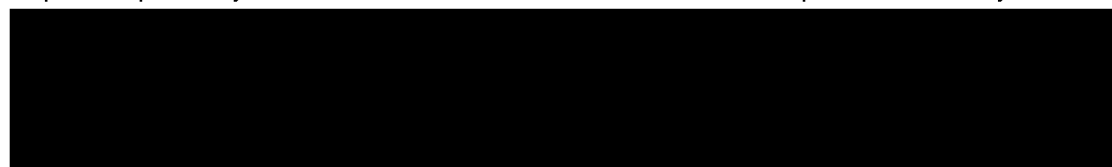
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APPRAISAL OF RISK ASSOCIATED WITH NEW FUEL TANK INSTALLATION



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Client: BP Pulse,
Chertsey Road, Sunbury On
Thames, TW16 7BP

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Report

BP12945 CL 008a

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May 2024

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1 Introduction

1.1 Background Information and The Purpose of This Appraisal

The site is located on Watling Street, near the eastbound A2, south of Gravesend and currently comprises the derelict Tollgate Motel. We understand that BP Oil UK Ltd (BP) proposes to redevelop the site for commercial use, comprising the construction of a sales building, surrounded by Electric Vehicle (EV) charging bays, a canopy-covered petrol and diesel forecourt, a below ground tank farm and associated petroleum infrastructure. We understand that a planning application for the proposed development is currently being prepared and will then be submitted to Gravesham Borough Council.

The installation of underground fuel storage tanks, particularly at environmentally sensitive locations, is contrary to the requirements of The Environment Agency's Approach to Groundwater Protection ('GP 2018', 2018 v1.2) position statements D1, D2 and D3. Due to the inclusion of fuel storage in the proposed development plans (i.e. storage of hazardous substances) and the environmental sensitivity of the site's location, overlying a Principal Chalk Aquifer and located within a Source Protection Zone (II), we therefore anticipate that the Environment Agency, as consultee to the local planning authority, will require a risk appraisal for the installation of below ground fuel tanks.

We have been commissioned by BP, to prepare a below ground tank risk assessment (this document), which can be included as part of the planning application supporting information.

Your attention is drawn to the Notice to Interested Parties included as Attachment One.

1.2 Scope of Our Appraisal

We have completed the following as part of our appraisal of the use of below ground tanks at the subject site:

- A summary review of relevant guidance relating to the storage of potential pollutants in environmentally sensitive locations;
- A review of geological, hydrogeological and hydrological information to establish environmental sensitivities at the site and in its vicinity;
- A review of environmental data from previous environmental works, predominantly in order to provide an indication on ground conditions (i.e. Nature of shallow soils and the presence/depth of groundwater beneath the site);
- A review of the proposed petroleum installation, including an appraisal on how any engineering controls will reduce or potentially wholly mitigate risk to the environment;
- Based on the results of our review of relevant information, carry out an appraisal on whether the inherent risks associated with the storage of potential pollutants at the site will be suitably managed;

The findings and opinions in this review are based upon information obtained from the sources outlined above. Information obtained from third parties has been accepted at face value however we do not guarantee its authenticity. Where practicable the information provided was confirmed from a secondary source such as the review of available municipal records.

All the activities comprising this assessment were carried out in accordance with the procedures set out in our Quality Manual.

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1.3 Summary of Environment Agency Position and Required Information

1.3.1 Environment Agency Position Statements

Environment Agency guidance 'The Environment Agency's Approach to Groundwater Protection' ('GP 2018 v1.2') was published in February 2018. This sets out the Environment Agency's pragmatic risk-based approach to the protection of groundwater resources in the UK. This guidance sets out the necessary processes that must be undertaken when determining the risk posed to the water environment when considering the development of site's where hazardous substances (such as petrol) are to be stored. The guidance takes the form of a series of Position Statements; those that relate to petroleum storage sites are summarised below.

Position Statement	Summary of Requirements
D1	General Principles of Pollutant Storage and Transmission The guidance states that fuel storage and transmission facilities, such as tanks and pipework, must be designed in such a way that hazardous substances are prevented from being released to the environment and the input of non-hazardous substances to groundwater is limited so as not to cause pollution. The Environment Agency will normally oppose any such storage facilities, where they judge there to be an unacceptable risk to groundwater. Where other material planning considerations indicate that the development should proceed, the Environment Agency will expect that best available techniques (BAT) will be applied to the facility.
D2	Underground Storage (and associated pipework) The guidance states, where underground storage already exists, the risk of storing potential pollutants underground should be mitigated by adopting above ground storage where possible. The Environment Agency will normally object to new and increased underground storage of hazardous substances in SPZ1. The Environment Agency will agree to such storage in principal and secondary aquifers outside SPZ1 only if there is evidence of overriding reasons why the: a) the activity cannot take place on unproductive strata, and b) The storage must be underground (for example public safety), in which case the risks should be appropriately mitigated. Confirmation should be provided that there are no other available sites on unproductive strata and a feasibility study submitted to confirm the need for below-ground tanks. If this can be provided, the recommendation is that tanks be set above the watertable in line with Position Statement D3 (see overleaf).

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D3

Position Statement D3 - Sub-Watertable Storage

For all storage of pollutants underground, EA expect operators to adopt appropriate engineering standards and have effective management systems in place. These should account for the nature of material stored and sensitivity of groundwater.

EA will normally object to any redevelopment scheme involving retention of sub-watertable storage unless it can be demonstrated that the risks to groundwater can be adequately mitigated.

A risk assessment should be submitted that demonstrates the depth of the tanks in relation to the underlying groundwater. If the proposed redevelopment includes sub-watertable storage, the applicant must 'demonstrate substantial mitigating factors to help minimise impact upon groundwater.' The assessment of potential site design should include:

1. Legislative and EA constraints on storing hazardous substances sub-watertable.
2. Options appraisal, including:
 - (i) Detailed designs of tank systems with assessment on preferred option.
 - (ii) Health and safety issues associated with the chosen option.
 - (iii) Compliance with appropriate engineering standards and environmental guidance.
 - (iv) Hydrogeological impact assessment – particular reference should be made to near surface piezometric surface of the aquifer, the site's location to watercourses, and any abstractors in the locality.
 - (v) Details of how the issue of tank buoyancy under sub-watertable conditions will be dealt with during installation and operation (when fuel volumes are low)
 - (vi) Potential for accidental discharge and corresponding pollution prevention control measures for tanks, pipework, fuel dispensers, tank access chambers, oil/water separators and drainage, fuel delivery, site operation and maintenance
 - (vii) Sustainability – in terms of the potential impacts on the groundwater resource and the possible loss and cost of replacement of public water supply sources which could be affected by a release event.
 - (viii) Details of Effective Management Systems including maintenance, inspections, wetstock reconciliation & monitoring
 - (ix) Planning considerations including details of any discussion and preliminary decisions.
 - (x) Petroleum Licensing Authority considerations including details of discussions and preliminary decisions.
3. Final report detailing all the above with conclusions and recommendation on the tank system option.

Table One: Review of Environment Agency Position Statements

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1.4 Previous Environmental Reports Relating to the Site

As part of our appraisal we have reviewed the reports and communications listed in the following table.

Our Ref.	Report Title	Prepared By	Prepared on Behalf of	Date of Issue	Report Reference
Ref.1	Geo-Environmental Investigation Report	Subadra Consulting Ltd	BP Oil UK Ltd (BP)	September 2012	BP12954
Ref.2	Phase I Environmental Assessment Report			November 2022	BP12945 CL006b
Ref.3	Infiltration Test Report			December 2022	BP12954 CL 007

Our detailed review of these documents is provided in Table Two below and we have used information from these documents, where relevant, in other sections of this report.

Table Two: Previous Environmental Reports Relating to the Site

In addition. We have reviewed the following documents as part of our appraisal:

- Proposed site planning layout (13979-22 rev A), which indicates the proposed below ground tank position (reproduced on the following page);
- BP Fuel system specification (generic) – to demonstrate that any risk to groundwater is mitigated as required by the Environment Agency comments, by design and effective management systems.

1.5 Proposed Development Plans

Proposed Developments	We understand that BP Oil UK Ltd propose to redevelop the site, with a petrol filling station and EV charging bays. The scheme will include a large sales building, car parking. A plan for the proposed layout is provided below.
Active Planning Applications	We understand this report, which comprises a Phase I Land Contamination Assessment, will be submitted in support of a planning application for the site's redevelopment. Whilst that report is likely to assist in satisfying any such requirements, further works may be required.

Table Three: Proposed Development Scheme

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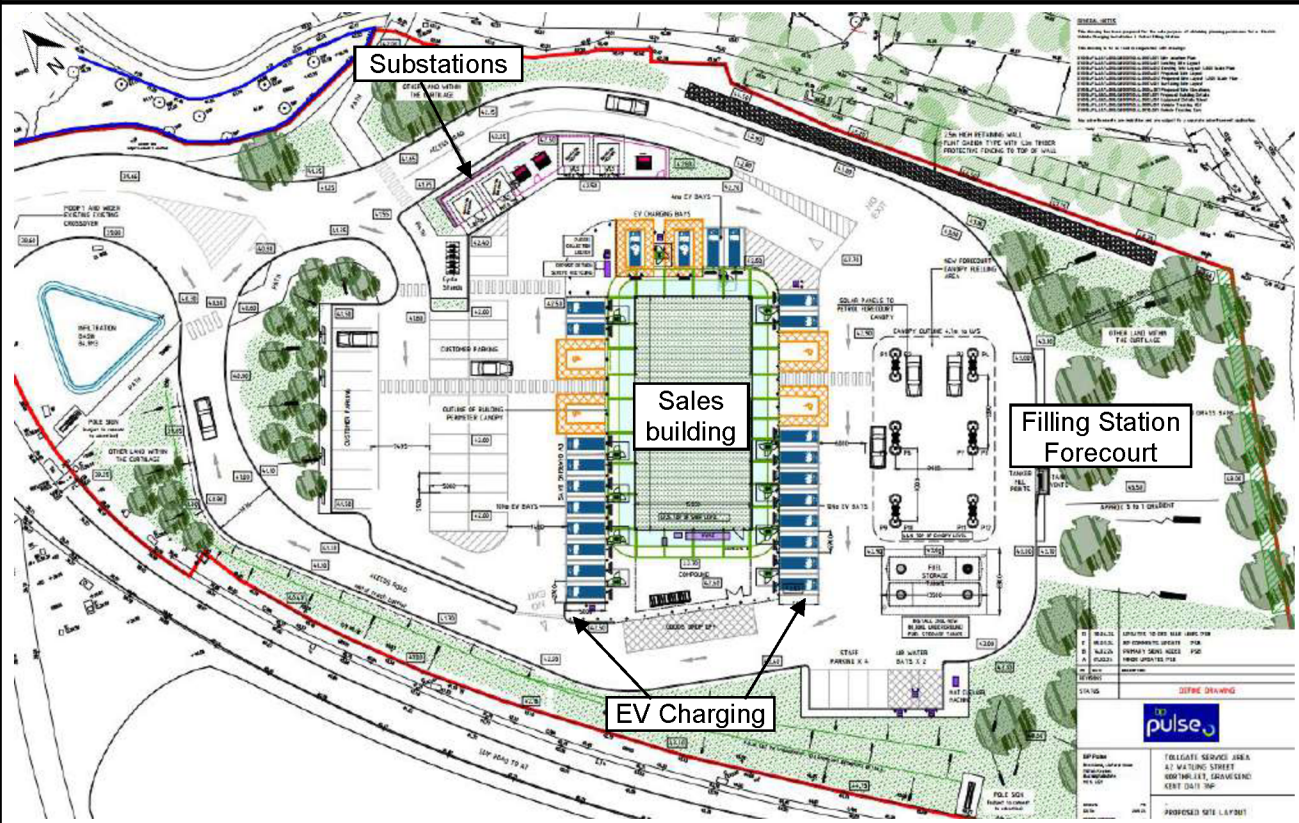


Figure One: Proposed Development Plans - Scheme Layout

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2 Environmental Site Setting

2.1 Site Description, Location and Setting

Site Description	The site occupies approximately 1.2ha and comprises a former Motel, consisting of a complex of three buildings, and one temporary building (all of which are derelict), with associated car parking and access routes around the site. The largest building, which formerly was used as the accommodation for the motel, forms an L-shape along the eastern and northern site boundaries. A second building was used for the motel restaurant, which is located on the north-western corner of the site. The third permanent building is located in the centre of the site and is surrounded by the access road for the main building. Car parking is on the western side of the site, closest to the site's entranceway. The temporary structure is located to the north of a site access road that runs along the southern boundary.		
Grid Reference	564250 171220	Location	The site is located off the eastbound Watling Street (A2), to the immediate south, near the Wrotham Road roundabout. The site is located ~2.5km south of Gravesend.
Elevation	~20m AOD		
Size (approx)	~1.2ha		

Table Four: Site Location and Setting

2.2 Review of Desk-based information

Item	Data	
Surrounding Land use	North	Roman Road (adjacent) followed by Retail Filling Station (~30m) and residential housing beyond (~70m)
	East	Agricultural land (~20m) with residential housing beyond
	South	Access road and A2 dual carriageway, followed by agricultural land
	West	Access road from the A2 followed by agricultural land
Geology and Hydrogeology	Drift	No drift deposits recorded on geology maps.
	Solid	Seaford Chalk Formation and Newhaven Chalk Formation Undifferentiated (Upper Chalk), described as White cream chalk with flints and some sandy horizons, weathered near surface. Classified by the Environment Agency as a Principal Aquifer. We anticipate that groundwater is likely to be present at depths of ~45m below ground level.

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Hydrology	➤ Balancing ponds (80m / W) ➤ Ornamental pond (golf course) (125m / NW) ➤ Drainage ditch (170m / SW)	
Water Abstractions	Surface	➤ Public Water Supply abstraction (1.2km / W).
	Groundwater	➤ Nearest - commercial abstraction for dust suppression (280m / W). ➤ Public Water Supply abstraction (1.2km / W).
Site history	Historical maps	The site is shown to have been predominantly occupied by a pub restaurant since the 1920s, and the building remains present. Various other buildings have been constructed at the site including a (presumed) recreation centre (1930s) and a motel complex (1960s). The surrounding area has been comprised of a mixture of residential and commercial properties since the 1900s. Most notably, there have been two filling station/garage sites (one remains in operation) located within 200m of the site.
	Planning Records	Planning records confirm that the site was in use as a hotel complex from the early 1970s to the mid-2000s. From circa. 2006 the hotel closed and the site was used as an office / compound for a nearby major road construction project.
	Site records / anecdotal	The site is currently not in use, and we understand it has not been in use since 2010.
Flood Risk Zone	The site is considered to be at low risk of flooding.	
Ground Gas	Based on our previous preliminary ground gas risk assessment, we consider the site is unlikely to be at significant risk of impact from hazardous ground gasses	

Table Five: Summary of Site Sensitivity

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2.3 Review of Environmental Investigation Data

2.3.1 Geology and Hydrogeology

Item	Data
Geology	During our previous investigation at the site we recorded Made Ground comprising of loose brown rounded gravel (<1.0m in thickness) over Head Deposits, and then the Chalk Formation. The Head was recorded as a brown grey slightly clayey SAND or slightly sandy CLAY Frequent sub-angular flints throughout. The chalk was described as a moderately weak white rubbly to blocky CHALK (Grade V to Grade III), with some flint and occasional sand in places. We proved the chalk extended beyond our maximum drilling depth of ~18m bgl (ref.1).
Hydrogeology	We did not encounter any groundwater during our previous investigation, which included boreholes extending to 18m bgl (ref.1).

Table Six: Summary of Investigation Results

2.3.2 Contaminants of Concern, Concentrations and Distribution

Potentially Contaminative Activities	No potentially contaminative activities have been observed during any of our site inspections, carried out during August 2012, February 2020 and June 2022.
Identified Contaminants	During our previous investigations in 2012 (ref.1), no olfactory or visual evidence of contamination was encountered. The results of the chemical analysis carried out on soil samples identified low levels of Total Petroleum Hydrocarbons (range C₁₂-C₃₅), indicative of mineral oils or greases, in shallow soil samples (just below ground surface). These contaminants were limited to shallow Made Ground and were not identified within the deeper natural soils. Our subsequent qualitative risk assessment concluded that these compounds do not pose an unacceptable risk to either future site users and/or environmental receptors associated with the site.

Table Seven: Summary of Investigation Findings

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2.4 Site Specific Relevance Under GP 2018

Item	Details	Relevance to EA Guidance
Aquifer Classification	The site is located within an area classified as a Principal Aquifer. This refers to the underlying chalk formations. The activity cannot take place on an Unproductive Strata.	We consider that this report provides the assessment necessary to comply with Position Statement DS1. Position Statement DS2 allows for underground storage of hazardous substances outside SPZ1 provided risks are fully considered and where necessary appropriately mitigated against. Position statement D2 is therefore relevant to this site. Position statement D3 is relevant to this site and should be considered when designing and implementing the proposed filling station development.
Source Protection Zone Designation	The lies within a Designated Source Protection Zone (Zone II).	
Tanks to be installed above or below the water table?	Our desk-based study and previous ground investigation has confirmed that geology underlying the site comprises a thin layer of Made Ground (generally <1m) over moderately weak white rubbly to blocky chalk to >18m. No groundwater has been recorded in boreholes, indicating groundwater lies below this depth. [Note: BGS records indicates groundwater is likely to be present at depths of ~45m.] The base of the below ground tank farm is not likely to exceed 5m; as such the tank farm installation will not extend into, or beneath the water table.	

Table Eight: Site Specific Relevance Under GP 2018

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3 Proposed Engineering Controls

This section of our assessment summarises the various engineering controls to be employed as part of the specification for new tank and fuel line installation. No detailed site-specific drawings have been prepared for the at this stage, so the information below relates to BP's standard design specification for new petrol station installations.

3.1 Petroleum Infrastructure Design

Work Element	Summary of Engineering Control
Underground Storage Tanks	The proposed new fuel tanks at the site comprise two 80,000litre, double skinned steel, dual compartment tanks. The double skinned tanks will provide a high level of protection against leaks due to their ability to contain any release of fuel from the primary tank shell. The interstitial space will be monitored to provide a warning in the unlikely event of a failure to either inner or outer skin. All leak detection systems will be connected to the site's Automatic Tank Gauging system (Class 1 System in accordance with EN 13160), which makes it clearly visible and audible in real time if an alarm condition is detected. We understand that an alarm message is also sent to the site's third-party wet-stock management company, providing a 3rd level of protection for the site against potential leaks. All tanks will be supplied with a certificate of conformity from the manufacturer, in accordance with BS EN 12285-1:2003 (EN 12285-1) 'Workshop fabricated steel tanks. Horizontal cylindrical single skin and double skin tanks for the underground storage of flammable and non-flammable water polluting liquids'. The tanks will be constructed from steel; considered appropriate for the design life of the installation. Steel is a robust material, of low permeability even at elevated pressures and resistant to brittle fracture under normal operating conditions. Degradation by corrosion is minimised by 1) lack of shallow groundwater; and 2) application of epoxy anti-corrosion coating. The anti-corrosion coating will comply with BS EN 12285-1:2003 (EN 12285-1). The method of tank installation ensures that during installation, the tanks will not be dropped, dragged or handled with sharp objects. Before and during positioning of the tank in the excavation, the tank will be subject to continued examination for any defects or damage, including in the coating. Damaged tanks will not be installed. Tanks are fitted with an overfill prevention valve to prevent overtopping during the re-fuelling process.
Tank Surround	Tanks are installed onto a concrete base slab and then tank cradles concreted in place. Due to the sensitivity of the site's environment the tanks will be fully encased in concrete in this case.
Access Chambers	Each tank will have a liquid tight access chamber that are fixed and sealed to the top of the tanks and contain all duct and pipework connections to the tank. All chamber entries are sealed and the finished chamber is vacuum tested on completion. The access chamber is designed to prevent the ingress of surface water or perched groundwater (albeit none is expected on this site) and also to retain any potential spilt fuel from within the chamber.

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Fuel Pipework	The proposed pipework uses a suction system for the delivery of fuel from the tanks to the pumps. The pipework material will be double walled non-corrosive flexible piping surrounded by pea shingle. Tertiary containment is not considered necessary. The pipework will be above groundwater level. Conductive continuity is ensured through the whole pipework system, generally installed using one continuous run and only containing joints, tees or elbows where strictly necessary. Joints within the pipework run will be electro fusion welded and the whole system will be pressure tested for an extended period to confirm that they are properly sealed. Non return valve below pumps maintains pressure below atmospheric within pipe ensuring fail safe operation in that the line will drain in air or water and drain back to the tank in the event of any failure. Drain backs are identified by tank gauge systems and Wet Stock Management procedures by 3rd party monitoring service typically provided by Fairbanks Environmental. The fill point pipework material will be double walled non-corrosive flexible piping surrounded by pea shingle and includes overfill prevention devices in the riser pipes, which close when the tank is full, preventing any further fluid from entering. Connections to the road tanker hose are visible above ground adjacent to the tanker stand. The tanker unloading area is constructed in concrete to allow collection and direction of any spills to drainage channels and on to an oil water separator.
Dispensers	Fuel pumps on the forecourt are ATEX certified and built in accordance with EN 13617. Suction system dispensers incorporate liquid tight drip trays set at island level to prevent accidental maintenance spills getting into ground below. Pumps are all located on raised islands to reduce the risk of accidental damage from vehicle impacts and any spills that might result from this.
Monitoring Wells	The underground tank installation will be installed with two tank farm monitoring wells. The tank farm monitoring wells will be installed within the structural tank base (but not penetrating beyond) in order to ensure the standpipe retains its correct position during concrete backfilling and also to ensure that any leak could not pass undetected through a gap beneath the standpipe base. Head works for these wells will be cast into the forecourt hard standing and will be fully watertight. Permanent monitoring wells with bolted down, sealed forecourt lids are installed at the corners of the tank farm excavation for possible future monitoring from a shingled sump below the encasement and from the engineered fill above the encasement.

Table Nine: Summary of Proposed Engineering Controls - Petroleum Infrastructure

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3.2 Construction Phase

Contractor	The installation will be undertaken by a specialist retail petroleum construction company, (and their approved sub-contractors), all with relevant extensive experience installing petroleum infrastructure.
Excavation of Tank Vault	The new tank farm is located mid-way along the site's eastern boundary. Our previous investigation works have confirmed groundwater is presence at depths exceeding 18m (and more likely ~45m). The proposed tank farm excavation will extend to 4.8m below ground level with the top of the base slab ~4.5m below ground level. On this basis it is not envisaged that dewatering of the excavation is likely to be required. The proposed tank farm excavation will generate a void approximately 5m deep, 8m wide by 15m long. In order to manage hazards associated with excavation stability, sheet piles will be installed to a depth not anticipated to exceed 10m, by a specialist contractor, to support the excavation sides during excavation of the new tank vault. A reinforced concrete base will be constructed in the bottom of the excavation. The tanks ill be delivered and lifted into the excavation by crane. The tank is then strapped down to the concrete to prevent buoyant uplift and may be partially filled with clean water (removed later and disposed offsite) to assist with the installation of the backfill material
Integrity Testing	Before the tanks and pipework are brought into service, they will be checked for integrity by a suitably qualified and competent person.

Table Ten: Summary of Proposed Engineering Controls - Construction

3.3 Forecourt Management

Monitoring and control systems	Third party real time wet stock monitoring, provides constant reconciliation of sales vs tank contents vs deliveries allowing identification of losses to better than 9 litres per day with a 95% confidence. Real time data is collected from tanks and dispensers and sent via on-line data connection for off-site analysis. Tank contents are measured and recorded by an electronic reconciling tank gauge system (e.g. VeederRoot TLS 350R) providing short term reconciliation of tank level movements vs product sales. The tank gauge also provides high and low level alarms and water ingress detection. The Gauge acts as a collection hub for all site containment monitoring equipment and generates local alarms and maintains a 30 day record of on site data. Alarms are also transmitted real time to the off site wet stock monitoring provider who links to BP's maintenance systems and coordinates first response.
Staff Training	All site staff are trained on general forecourt operations and safety procedures; this includes training on the risk to the environment. Staff working with fuel systems are also trained on actions to be taken in the event of an incident and all relevant alarm response procedures.

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**Forecourt
Drainage**

The forecourt area where fuel delivery (offset fills and tanker stand) and dispensing (pump islands and surrounding area) occurs will have liquid tight concrete as a surface finish, with drainage to intercept any run-off.

Drainage channels will lead to a Class 1 10,000 litre capacity full retention petrol interceptor, which is fitted with electronic monitoring and alarm system. Discharge will then be to public foul sewer (subject to drainage authority approval).

Table Eleven: Summary of Proposed Engineering Controls - Forecourt Management

4 Appraisal of the Proposed Petroleum Installation

A review of the various UK legislation and guidance documents for the storage of fuels and operation of petrol stations indicates a commonality in their primary objectives, principally:

- The safe operation of refuelling facilities;
- Prevention of pollution to groundwater or surface waters; and
- Elimination or reduction of risks to human health and the environment associated with the operation of re-fuelling stations.

We have reviewed the various lines of evidence available to us and made an appraisal of the advantages and disadvantages of the use of above and below ground tanks, specific to the subject site.

4.1 Appraisal of the Use of Above Ground Storage Tanks

The client has reviewed the potential for above ground storage and has rejected this option because there is no identifiable beneficial reduction in the risk of loss of product through leakage but there are additional safety and environmental risks introduced. Above ground storage is not considered viable at the site for a number of reasons, as summarised in the table below:

**Practicalities
and Planning**

Space constraints. The site area does not provide sufficient space for the installation of above ground tanks with the necessary protection and security measures that would be required. An above ground tank installation would also significantly reduce forecourt area, restricting vehicle access/parking and reducing the viability of the proposed redevelopment.

They are considered visually unattractive from a planning permission perspective.

**Petroleum
Infrastructure**

All fuel lines under higher pressure, leading to increased risk of tanks emptying to surface by hydrostatic head or syphoning effect in the event of a leak.

Filling pipes and joints subjected to hydraulic shock and increased pressures as a result of the need for pump off-loading of the tanker.

Above ground fill lines and hoses need to be drained to additional small tanks with associated pipework, pumps and control systems.

**Environmental
Risk**

Increased risk of pollution in the event of damage to the fuel supply lines (vehicle strike on forecourt) leading to fuels siphoning from above ground tanks.

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Health and Safety and Interference from Public	Increased area of 'hazardous zones' on the forecourt; Increased risks to staff, customers and neighbours of fire and explosion resulting from any form of accidental or malicious loss of fuel from containment. Above ground tanks may become a target for vandalism and/or malicious attacks (fuel theft - particularly diesel in rural areas - is a significant risk); Increased exposure of fuel containment system to external fires - vehicles, trucks, neighbouring, facilities and consequent escalation. Increased risk of pollution/impact of neighbours (residential properties) following potential fuel theft incidents; Pipework and tanks are exposed to external accidental and malicious damage. Fire brigade response to a bund fire could exacerbate potential loss to ground. Single tank failure and fire can lead to loss of entire tank farm. Access to bund areas required with risk of confined spaces, and contained hazardous atmospheres Working at height required for maintenance and inspection
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Table Twelve: Additional Risks Introduced with Above Ground Storage

4.2 Appraisal of the Use of Below Ground Storage Tanks

4.2.1 Environmental Setting

Summary of Environmental Setting	➤ Whilst the site lies over a Principal Chalk Aquifer, groundwater is likely to be at depths of ~45m. ➤ The below ground tanks will therefore not extend below the water table. ➤ Due to the sensitivity of modern wet-stock controls and alarms, any fuels leaks would be identified (and rectified) before a substantial volume of fuel was lost. It is highly unlikely that low volume uncontrolled fuel releases would migrate into groundwater. ➤ No surface water features located within the immediate vicinity of the site.
Locating Tanks within an Unproductive Strata	There are no areas of Unproductive Strata available beneath the site for the installation of the new tanks.

Table Thirteen: Environmental Considerations Relevant to Below Ground Storage

Client: BP Pulse, Chertsey Road, Sunbury On Thames, TW16 7BP	Appraisal of Environmental Risks Associated with the New Fuel Tank Installation.	Report	BP12945 CL 008a
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**Former Tollgate Hotel,
Watling Street, Gravesend**

4.2.2 Proposed Engineering Controls to Mitigate Environmental Risk

The environmental control engineering measures discussed in Section 3 above are considered to be the best available techniques in accordance with 'Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations', APEA/EI, 4th Edition, April 2018. They will minimise the likelihood of release and contain and identify a potential release as soon as it occurs.

We have reviewed the recommended environmental control engineering measures in relation to groundwater protection zones, as detailed in R&D Technical Report P5 'Guidance Manual on Underground Fuel Storage Tank Installations', Environment Agency 1996. The guidance specifies a number of engineering requirements for Groundwater Source Protection Zones 1-3.

The specification proposed for the site is suitable for installation within a Source Protection Zone II, incorporating the following:

Tanks	➤ Double skinned steel tanks; ➤ Interstitial monitoring fitted; ➤ Tanks inner internal and external surfaces protected by epoxy coatings; ➤ Tank tops finished with water tight manholes; ➤ Overfill protection devices fitted;
Fuel Supply Lines	➤ Suction fuel lines; ➤ Fuel lines with secondary containment capable of being pressure tested and monitored for primary failure; ➤ Non-steel fuel lines;
Fill pipework	➤ Double skin non-steel off-set fills;
Forecourt Management	➤ Continuous monitoring of interstitial space between double skinned tanks; ➤ Monitoring of interstitial space between fuel lines; ➤ Continuous tank gauging; and ➤ Monitoring wells installed around the tank farm.

Table Fourteen: Engineering Controls for Below Ground Storage

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5 Conclusions

Based on our appraisal of the environmental site setting, environmental monitoring data and proposed design for the new petroleum installation at the site, we draw the following conclusions:

- The use of above ground storage tanks at the site is not considered feasible or necessary, based on a range of potential health and safety, viability and possible pollution risk concerns (provided the necessary engineering controls, as specified in Section 3, are adopted).
- We consider the proposed petroleum installation to represent the current best industry standard as described within 'Design, Construction, Modification, Maintenance and Decommissioning of Filling Stations', APEA/EI, 4th Edition, April 2018, and with the appropriate and relevant British and European standards for tanks, monitoring systems, lines and pumps. This type of below ground fuel storage system using double skin monitored tanks has been used for the last 40 years across Europe without any recorded incidence of loss of product.
- The proposed petroleum installation is considered appropriate for a site located within a groundwater Source Protection Zone II in accordance with EA guidance, for the protection of groundwater in the relevant site setting.

Your attention is drawn to the Notice to Interested Parties included as Attachment One.

6 References:

1. Association for Petroleum and Explosives Administration (APEA) and the Energy Institute (EI) entitled 'Design, construction, modification, maintenance and decommissioning of filling stations' (3rd Edition, which is often referred to as the 'blue book'.
2. Energy Institute's 'A comparison of risks related to the storage of hydrocarbons in above-ground and underground tanks at petrol station', July 2014.
3. Environment Agency's 'Approach to Groundwater Protection' (GP 2018, 2018 v1.2) position statements D1, D2 and D3.
4. Environment Agency's 'Guidance Manual on Underground Fuel Storage Tank Installations', January 1996.

Client: BP Pulse, Chertsey Road, Sunbury On Thames, TW16 7BP	Appraisal of Environmental Risks Associated with the New Fuel Tank Installation.	Report	BP12945 CL 008a
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Tollgate, Gravesend

SUBADRA

Environmental - Geotechnical - Laboratory - Foundations

13 Triangle Business Park, Stoke Mandeville, HP22 5BL

Tel: 01296 739400 Email: consultants@subadra.com

**ATTACHMENT ONE:
NOTICE TO INTERESTED PARTIES**

Client: BP Oil UK Limited And BP
Pulse, Chertsey Road, Sunbury On
Thames

Report	BP12954 CL 008a
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NOTICE TO INTERESTED PARTIES

The purpose of our work is to provide general information on the environmental And/OR geotechnical conditions existing at the site And related to soil And/OR groundwater. The Client Or others specified the scope of the investigation And the validity of our conclusions is limited by the scope of work specified. We are Not responsible for any such limitations Or omissions.

Where stated in this report, we have used information supplied by third parties. While we have evaluated As far As possible the validity Of this information, we cannot guarantee its accuracy In any way whatsoever.

No investigation technique is capable Of completely identifying all Of the contaminants that might be present In the soil Or groundwater under a site. Where specified In our report, we have examined the ground by constructing a number Of boreholes And/OR trial pits. We recovered samples Of soil And/OR groundwater from available exposures.

The depth And spacing Of our Sampling locations were selected To ensure With a reasonable probability that they would be representative Of the actual conditions across the whole site. However, safety considerations relating To existing site infrastructure may have restricted our ability To investigate all potential contaminant sources. Specifically, we were unable To investigate the soil And groundwater condition immediately adjacent To the underground structures And/OR buried services. These limitations must be borne In mind When considering the conclusions reached In this report.

Soil is intrinsically variable And the spread Of contaminants within the soil is therefore subject To a degree Of non-uniformity. For these reasons no sampling technique can completely eliminate the possibility Of obtaining samples that are Not representative Of the actual conditions. Our sampling techniques are intended To reduce the possibility To an acceptable level, within the limits imposed by the scope of the investigation.

Groundwater levels And soil vapour levels that we report were accurate at the time of the investigation. Groundwater And soil vapour levels are variable. Long term monitoring may be required to ensure that the levels recorded during our investigation are representative of long term And possible 'worst case' conditions. In accepting our recommendations and/or conclusions the Client acknowledges that further, more detailed investigation would allow a more accurate assessment of site conditions to be made and that this would reduce any consequential risk to the Client.

Our investigation was carried out to assess the significance of contamination resulting from use of the site as identified in this report. Unless we have indicated otherwise, no assessment of the potential impact of any other previous uses has been made. No investigation was carried out to determine whether or not any deleterious or hazardous materials (such as asbestos) have been used in the construction of the buildings present on the site. Unless otherwise stated no investigation or assessment has been made of the presence or otherwise of invasive plant species including but not limited to Japanese Knotweed.

Unless specifically stated otherwise, we have not assessed the effect of any proposed future construction activities on existing structures on or near to the site. Nor, unless stated otherwise, have we assessed the likely effect of trees on existing or proposed structures on or near the site.

We do not accept any responsibility for the cost of remedial works or other costs incurred in whatever way whatsoever as a result of any omissions, errors or other shortcomings in this report unless we have been given reasonable opportunity to verify ourselves that such faults exist and we have been given a reasonable opportunity to carry out works to remedy such faults ourselves using the most practicable means available to us. We do not accept liability for any consequential losses incurred by you while either we or others carry out any remedial works we deem necessary.

This report has been prepared for the Client, as specified on the cover page of this report. In accepting our recommendations and/or conclusions the Client accepts that the terms of our appointment were as detailed in the Proposal, or Proposals, that we provided to the Client before being appointed and that these terms supersede any other terms and/or conditions set out in any contracts agreed between ourselves and the Client, regardless of when such terms and/or conditions were agreed to by us and/or signed by us.

Use of, and reliance on, this report by other third parties will be at such third parties own risk, and we do not accept any liability or responsibility to them.

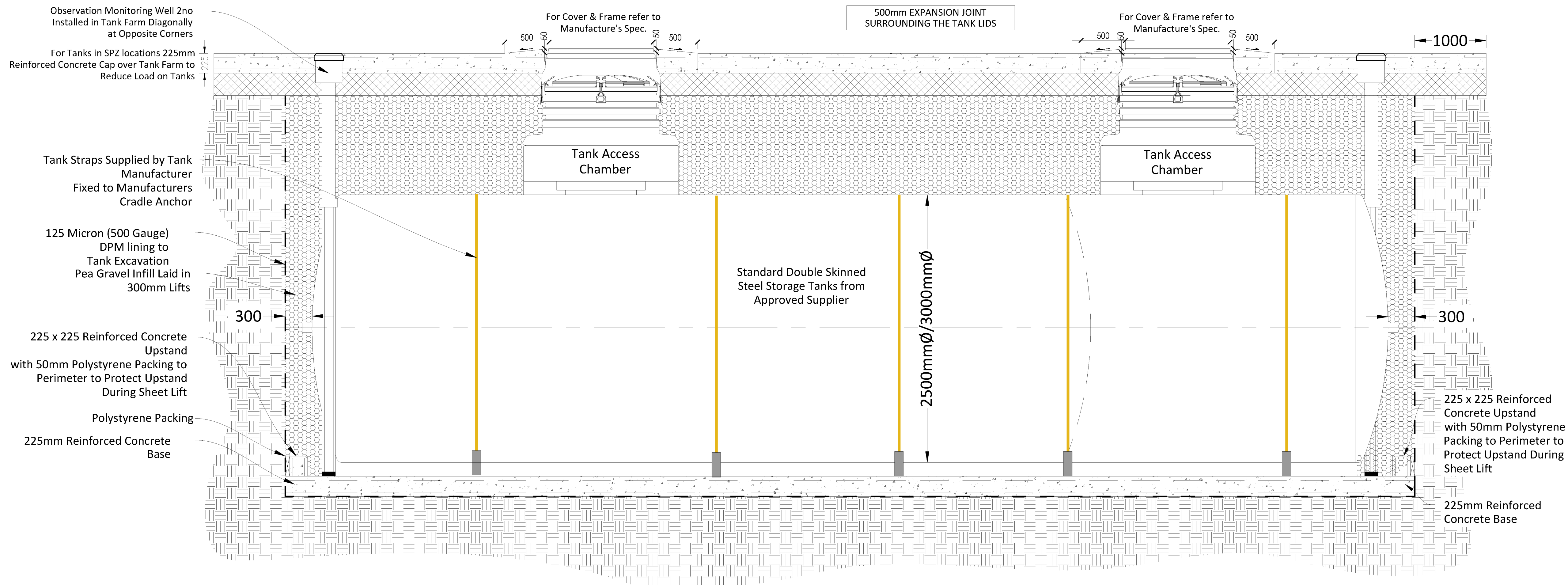
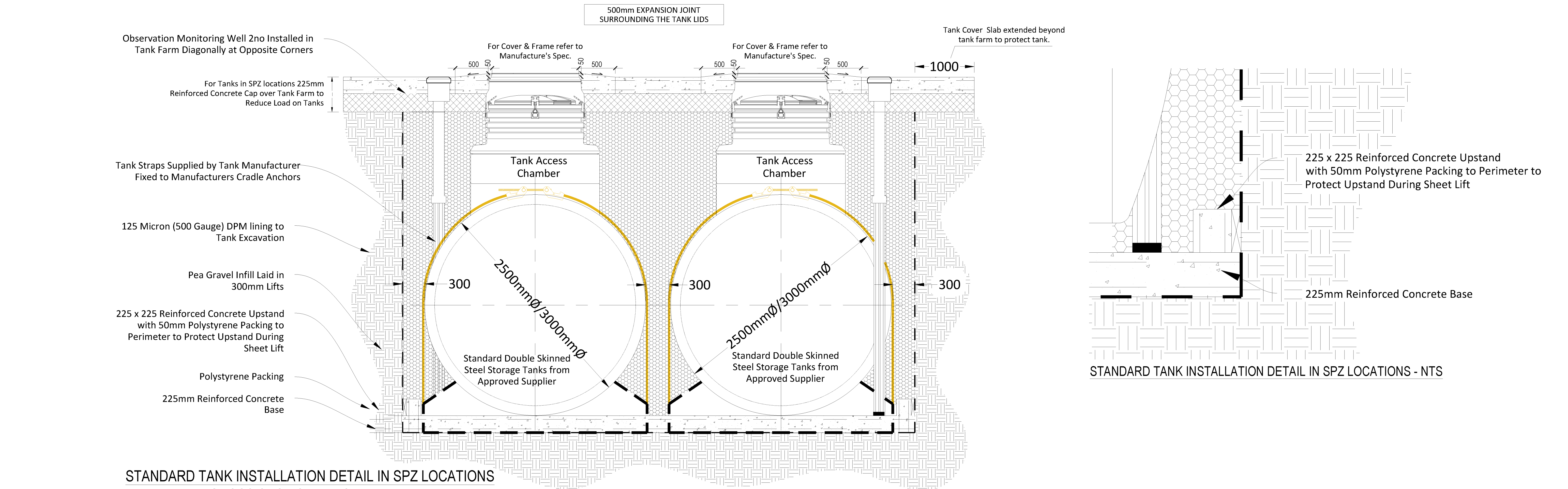
Neither the whole nor any part of this report, or any reference to it, may be included in any published document circular or statement or published in any way without our prior written approval.

This report and its contents, together with any supporting correspondence or other documentation, remain the property of Subadra Consulting Limited until paid for in full. The copyright to this report remains vested in Subadra Consulting Ltd at all times.

Client: BP Oil UK Limited And BP
Pulse, Chertsey Road, Sunbury On
Thames

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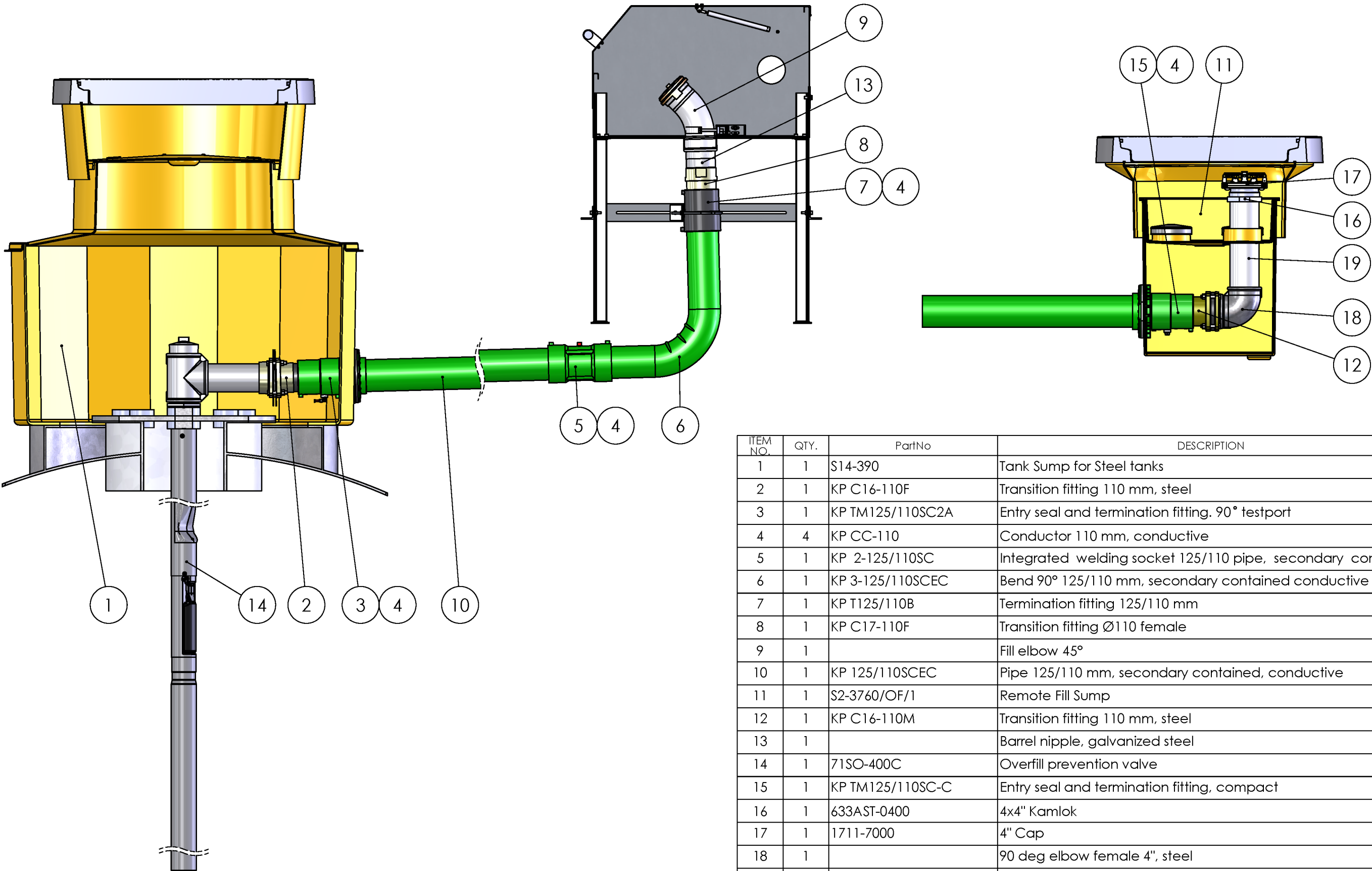
**ATTACHMENT TWO:
PETROLEUM INFRASTRUCTURE DETAILS**



Standard Fuel Tank Installation Details

for

BP Tollgate Hotel Site



ITEM NO.	QTY.	PartNo	DESCRIPTION
1	1	S14-390	Tank Sump for Steel tanks
2	1	KP C16-110F	Transition fitting 110 mm, steel
3	1	KP TM125/110SC2A	Entry seal and termination fitting, 90° testport
4	4	KP CC-110	Conductor 110 mm, conductive
5	1	KP 2-125/110SC	Integrated welding socket 125/110 pipe, secondary contained
6	1	KP 3-125/110SCEC	Bend 90° 125/110 mm, secondary contained conductive
7	1	KP T125/110B	Termination fitting 125/110 mm
8	1	KP C17-110F	Transition fitting Ø110 female
9	1		Fill elbow 45°
10	1	KP 125/110SCEC	Pipe 125/110 mm, secondary contained, conductive
11	1	S2-3760/OF/1	Remote Fill Sump
12	1	KP C16-110M	Transition fitting 110 mm, steel
13	1		Barrel nipple, galvanized steel
14	1	71SO-400C	Overfill prevention valve
15	1	KP TM125/110SC-C	Entry seal and termination fitting, compact
16	1	633AST-0400	4x4" Kamlok
17	1	1711-7000	4" Cap
18	1		90 deg elbow female 4", steel
19	1		4" Steel pipe

OPW

A DOVER COMPANY

PETROL PIPE SYSTEM

KPS

Drawn by
KPS

Approved

General tolerance

First angle projection

Format
A3

Scale
1:15

Title
Fill line OPW

Art.no
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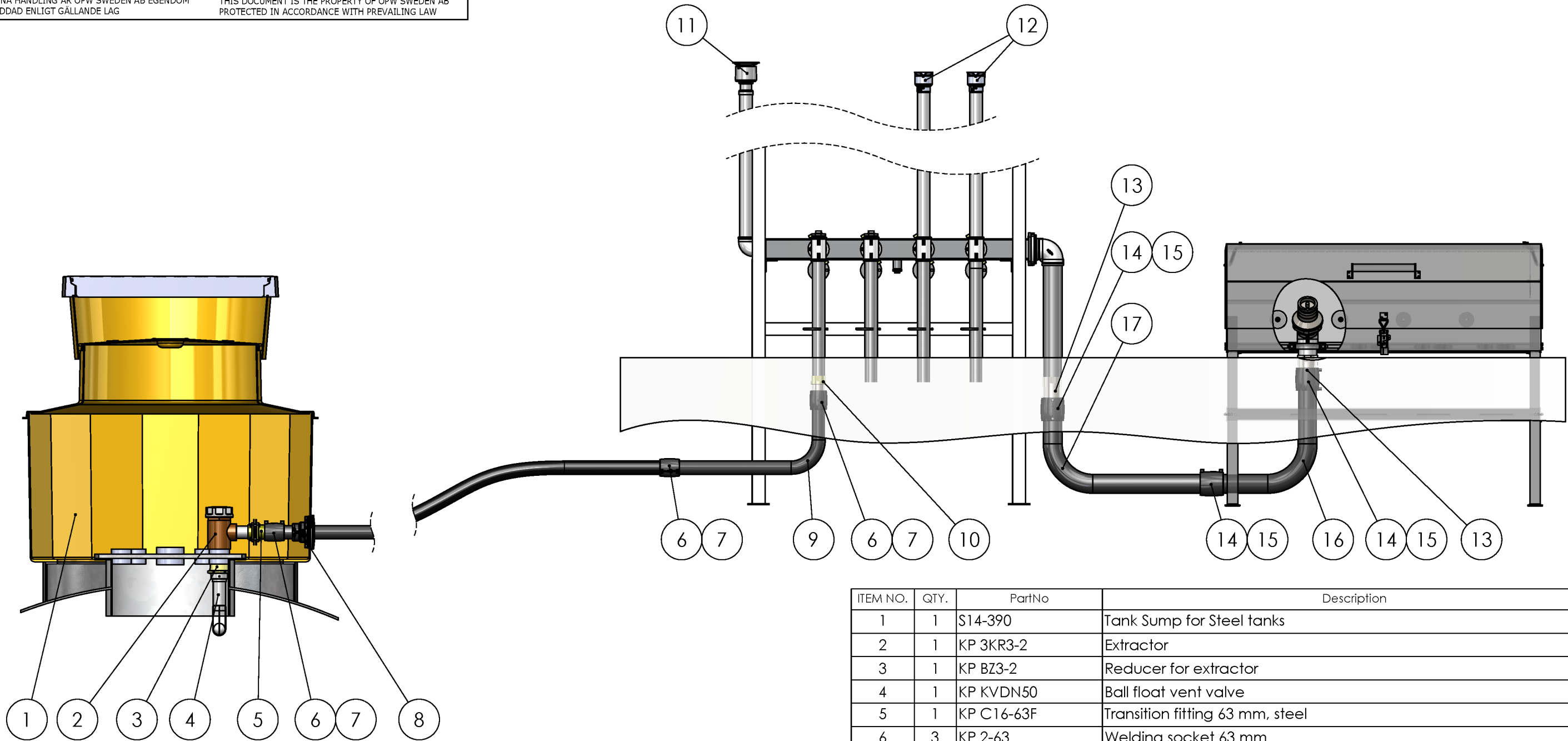
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Project

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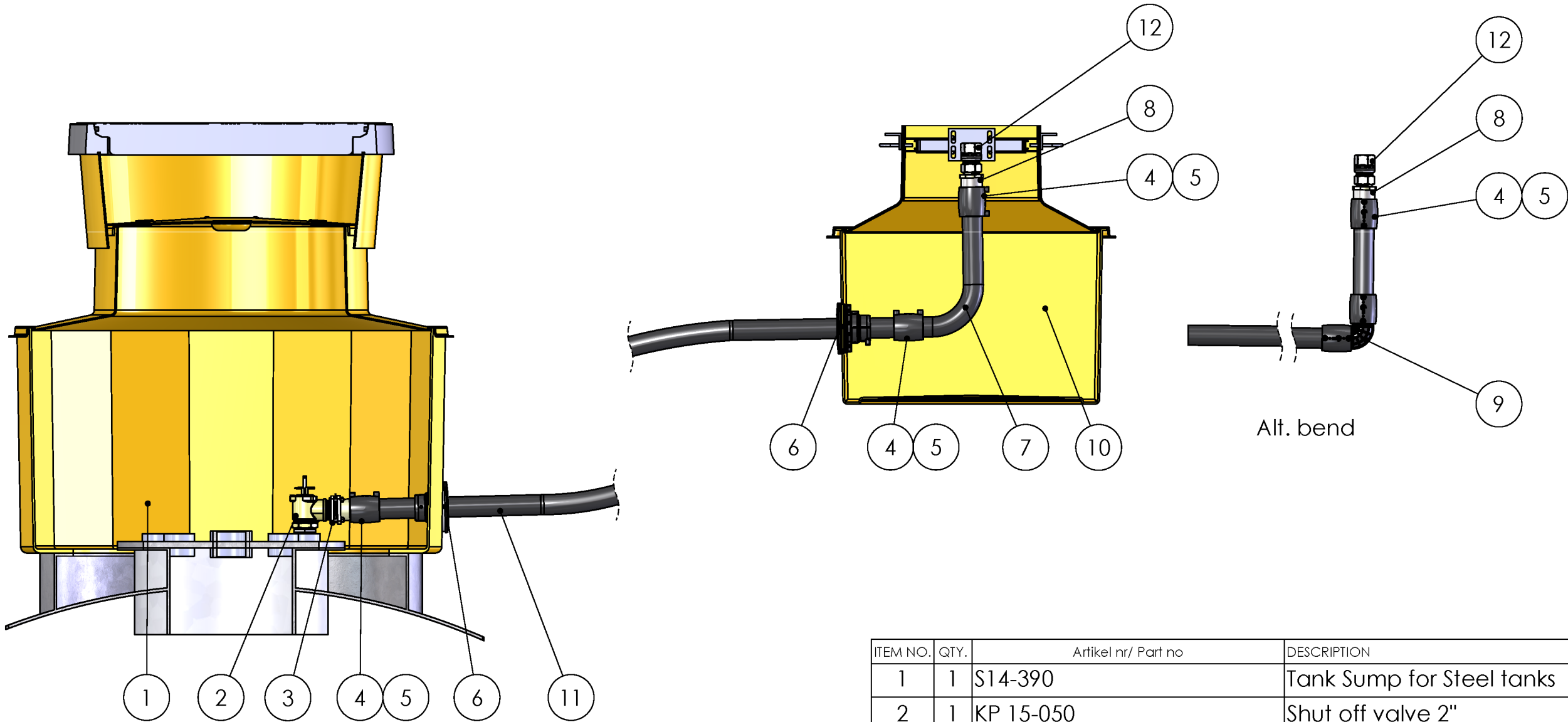
Revision

Drawn date
2016-06-10



ITEM NO.	QTY.	PartNo	Description
1	1	S14-390	Tank Sump for Steel tanks
2	1	KP 3KR3-2	Extractor
3	1	KP BZ3-2	Reducer for extractor
4	1	KP KVDN50	Ball float vent valve
5	1	KP C16-63F	Transition fitting 63 mm, steel
6	3	KP 2-63	Welding socket 63 mm
7	3	KP CC-63	Conductor 63 mm, conductive
8	1	KP TM63-B	Entry seal Ø63 B
9	1	KP 3-63FCL	Bend 90° 63 mm, conductive, long type
10	1	KP C17-63F	Transition fitting Ø63 female
11	1	523V-1100	2" Pressure / Vacuum vent
12	2	23-0044	1-1/2" Open atmospheric vent
13	2	KP C17-90F	Transition fitting Ø90 female
14	3	KP 2-90	Welding socket 90 mm
15	3	KP CC-90	Conductor 90 mm, conductive
16	1	KP 3-90FC	Bend 90° 90 mm, conductive
17	1	KP 3-90FCL	Bend 90° 90 mm, conductive, long type

 A DOVER COMPANY	Drawn by KPS	Approved	General tolerance	First angle projection 	Format A3	Scale 1:20
	Title VR Stage I / Vent line OPW			Art.no		
	Title swe			Project		
	Drawing number Stage_I_Vent_line OPW			Revision		Drawn date 2016-06-10



ITEM NO.	QTY.	Artikel nr/ Part no	DESCRIPTION
1	1	S14-390	Tank Sump for Steel tanks
2	1	KP 15-050	Shut off valve 2"
3	1	KP C16-63M	Transition fitting 63mm
4	4	KP 2-63	Welding socket 63 mm
5	4	KP CC-63	Conductor 63 mm, conductive
6	2	KP TM63-B	Entry seal Ø63 B
7	1	KP 3-63FCL	Bend 90° 63 mm, conductive, long type
8	2	KP C17-63/54M	Transition fitting Ø53/54 steel. 1½"BSPT
9	1	KP 23-63EC	Elbow 90° 63 mm, conductive
10	1	EL/T/Q510-4/8	GRP solid base sump and corbel
11	1	KP 63EC	Pipe 63 mm, conductive
12	2	70-007L	OPW 70 Vertical Check Valve 1-1/2" BSP

OPW A DOVER COMPANY		Drawn by KPS	Approved	General tolerance	First angle projection  ISO 128-1982	Format A3	Scale 1:15
		Title Suction_line single wall OPW			Art.no		
		Title swe			Project		
		Drawing number Suction_line single wall OPW			Revision	Drawn date 2016-06-10	

Leak detection technology

For clean and protected environment



New

Over pressure leak detector DL 330



Leak detection system to detect and indicate leaks in double-walled tanks. The leak detector DL 330 can monitor several underground tanks or one aboveground tank.

Leaks in one of the walls will be detected and indicated by an optical and audible alarm before any stored product can enter the environment.

A class I - leak detection system, with the highest environmental protection level in accordance to the European standard EN 13 160.

Liquids:

- Water polluting liquids
e.g.: petrol/gasoline, heating oil, diesel, lye, acid

For the monitoring of:

- double-walled tanks with a test pressure of the interstitial space of min. 500 mbar (e.g. applicable tanks in accordance to the EN-standard). Maximum pressure of the stored liquid to the bottom of the tank: 300 mbar
- tanks with permeable inner wall only for liquids with flash point above 55°C.

Approvals:

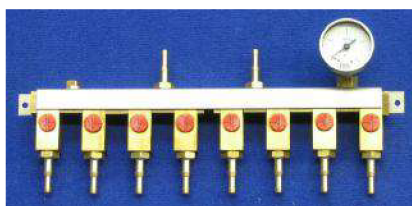
Germany: Z - 65.23 – 409



Two three-way valves made of hit resistant plastic for a quicker and easier function test



Connections for tubing in different type's available e.g. 8 mm ferrule union



Manifolds for a connection up to 8 tanks



Alarm pressure	Operating pressure	max. pressure to bottom of the tank
330 mbar; 4,79 psi	400 mbar; 5,80 psi	300 mbar; 4,35 psi



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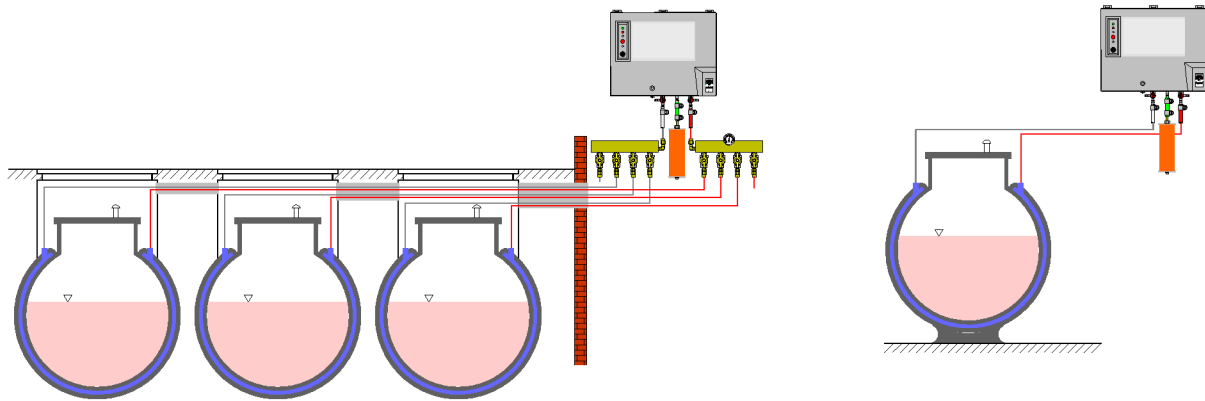
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Fax: + 49 / (0) 271 / 48964-6
http://www.sgb.de
E-mail: sgb@sgb.de

Leak detection technology

For a clean and protected environment



Overpressure leak detector DL 330



Monitoring principle:

The pump in the leak detector creates a fixed operational overpressure in the interstitial space.

In case of a leak, the compressed air will escape through the leak. This prevents product or groundwater entering the interstitial space. Any minor unavoidable untightness is compensated by the system automatically. If the volume flow of air escaping from the interstitial space is higher than the limited volume flow of the pressure pump, the pressure will drop to the alarm pressure. An optical and audible alarm will be released. The compressed air in the interstitial space is dried by the dry filter mounted to the leak detector. Therefore a condensation of water in the interstitial space is prevented.

An overpressure valve avoids the occurrence of an inadmissible overpressure in the interstitial space.

Installation advice:

The leak detector shall not be installed in hazardous classified areas.

Outside closed and dry rooms, the leak detector has to be installed in a suitable protection box.

Coloured, flexible or rigid tubes are to be used as a connection between leak detector and interstitial space. Useful fittings on the leak detector guarantee a quick and safe examination of the functions. Additional alarm signal units can be connected directly to the leak detector. Dry relay contacts for alarm transmitting are included. When operating, installing and commissioning the leak detector DL 330, the conditions laid down in the approvals for the leak detector, tanks and linings are to be observed.

All works shall be carried out by a qualified person.



DL 330 PFCM

P = weatherproof housing

FC = dry filter control

M = digital pressure reading
in the housing's lid

Additional options are available:

- Weatherproof housing
- Dry filter control
- Digital pressure manometer

Please contact us, we are happy to be of assistance.

Subject to changes. Photos and dimensions are not binding for the extend of delivery

SGB Sicherungsgerätebau GmbH
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