Defence Infrastructure Organisation

Future Defence Storage and Redistribution Programme,

Redevelopment of MOD Bicester

Graven Hill: Utility Baseline Review

BIC/OPA/DOC/16

September 2011

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Report for

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Future Defence Storage and Distribution Programme - Redevelopment of MOD Bicester

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AMEC Environment & Infrastructure UK Limited

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1. Introduction

1.1 Purpose and Aim

1.1.1 AMEC Environment and Infrastructure UK Ltd (AMEC E&I)[1] has been commissioned by Defence Infrastructure Organisation (DIO)[2] to undertake a Utility Baseline Review of a prospective mixed use development at Bicester Garrison, Oxfordshire. The area of the Baseline Review covers two distinct sites; C Site and Graven Hill Site. This Baseline Review is for Graven Hill Site only. Reference should be made to the C Site Utility Baseline Review ref. BIC/OPA/DOC/18 for information on C Site.

1.1.2 The Baseline Review will set out to determine whether or not the existing infrastructure serving the existing site is adequate to accommodate the proposed development needs or if any modifications/reinforcement works are required.

1.1.3 Information gained from this Baseline Review has informed the Masterplan of any key constraints.

1.1.4 The Baseline Review considers utilities infrastructure associated with the following:

- electricity;
- gas;
- water supply; and
- telecoms.

1.1.5 The Baseline Review excludes the foul water and surface water assessment. This has been considered separately and as such reference should be made to C Site Drainage Strategy ref. BIC/OPA/DOC/17 and Graven Hill Drainage Strategy ref. BIC/OPA/DOC/15 for further details.

1.2 Format of the Assessment

1.2.1 The following sections of this assessment are structured to comply with the initial aims and objectives and are set out in Table 1.1, overleaf.

[1] Following its acquisition by AMEC, Entec UK Ltd was integrated into AMEC Environment and Infrastructure in July 2011, all references are now to AMEC E&I.

[2] The Defence Infrastructure Organisation was formed on 1 April 2011 when the former Defence Estates was brought together with other property and infrastructure functions in the MOD to form a single organisation.

Table 1.1 Format of the Assessment

Section in this Study	Description
Chapter 2: Background of the site	This section provides general background information on the existing and proposed development.
Chapter 3: Understanding the existing utility Infrastructure	This section describes the existing infrastructure across the site and details the current demands and performance.
Chapter 4: Accommodating the Proposed Development	This section identifies what changes are needed to the existing drainage regime to accommodate the proposed development.

2. Background

2.1 Context

2.1.1 The Ministry of Defence (MOD) currently occupies some 600ha of space around Graven Hill and Arncott Hill in Bicester. The opportunity provided by the Bicester Garrison Estate became the focus of the Treasury (HMT) Operational Efficiency Programme (OEP) in late 2008, which charged MOD with looking at its storage and distribution function, run by Defence Logistics Commodities & Services (LCS), (formerly the Defence Storage and Distribution Agency), along with the estate it occupies to determine whether there are any opportunities to release funds back to HMT. The OEP has explored a range of options for the future of LCS and the associated estate implications, including the strategic location and opportunities provided at Bicester as a core site.

2.1.2 Two sites within the Bicester Estate, known as C Site and Graven Hill Site have been identified as being viable for redevelopment for storage intensification, mixed use development, employment and civilian housing. Graven Hill site has been identified for disposal but C Site would still remain under MOD control/ownership and be solely used as part of the LCS operations.

2.1.3 The Graven Hill site is the closest in proximity to Bicester and has been identified as being the most sustainable for disposal in terms of future redevelopment for commercial and residential development.

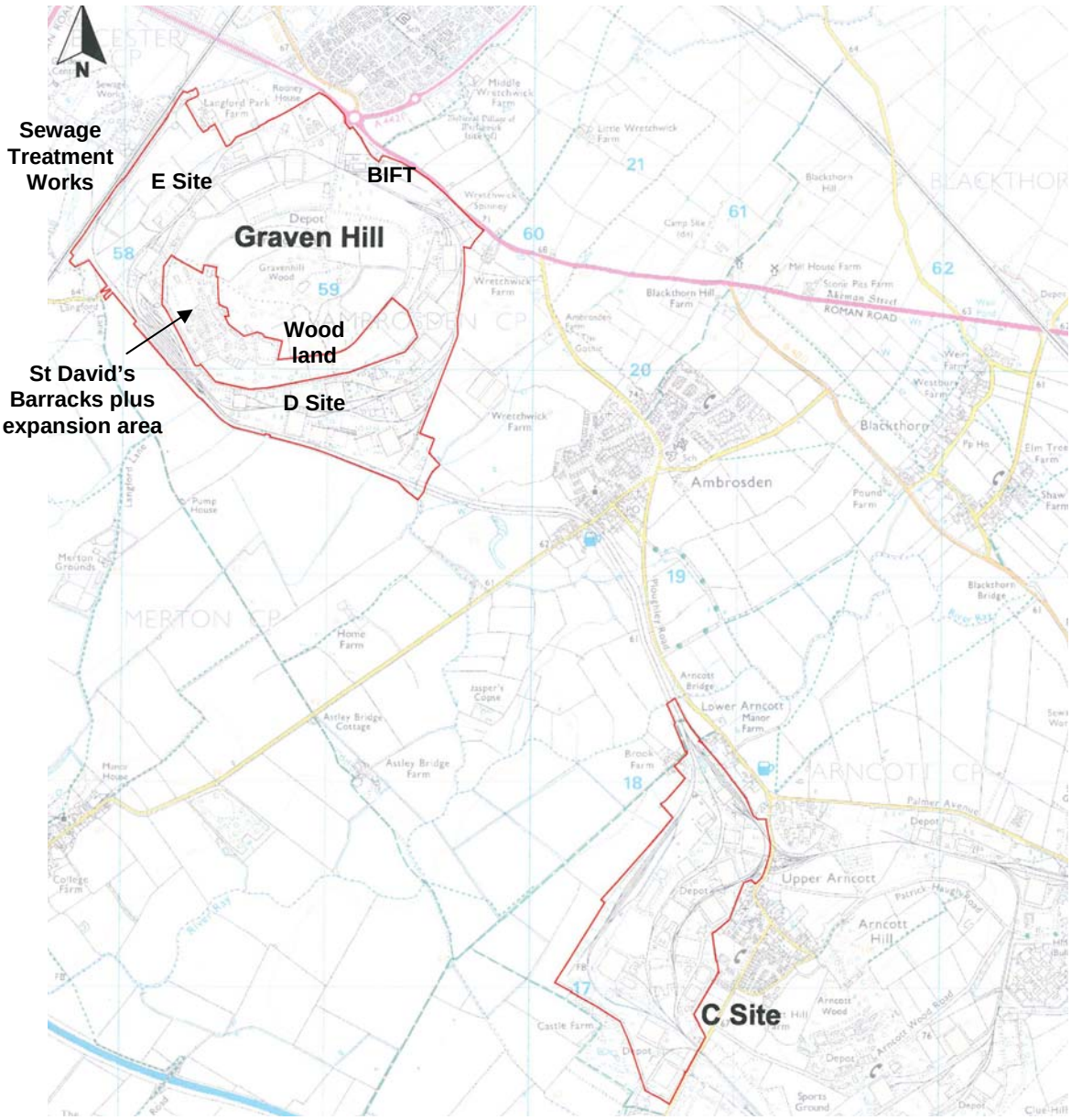
2.2 The MOD Bicester Sites

2.2.1 The two sites under consideration as part of this development study consist of two distinct and separate areas of the larger MOD Bicester area. Details of both sites are given in Table 2.1 and Figure 2.1, overleaf:

Table 2.1 Bicester Garrison Sites

Site Name	Details
C Site	C Site is located to the west of Arncott Hill. C Site is rectangular orientated in a northeast to southwest direction. C Site covers a total area of approximately 83ha but only 35ha of this (i.e. the northern section) is affected by the new development. The site slopes downwards from the east side of the site to the west and lies at an elevation of between 65m and 75m AOD.
Graven Hill Site (consisting of D Site, E Site, Woodland area and St David's Barracks	D Site, together with E Site, forms a continuous 'ring' of land surrounding St David's Barracks on Graven Hill. D Site covers a total area of approximately 59ha on the north-west side of the ring. E Site covers a total area of approximately 79ha on the south- east side of the 'ring' and lies at an elevation of between 65m and 75m AOD. The woodland covers an area in the order of 26ha and lies at an elevation of between 85m and 113m. St David's Barracks incorporates single living accommodation and associated facilities, stores and administrative buildings as well as a secured area for future expansion. The total area is approximately 30ha and also incorporates a wooded area. St David's Barracks is outside of the planning application boundary. The Bicester International Freight Terminal (BIFT) provides hardstanding storage for shipping containers, served by rail and heavy goods vehicles.

Figure 2.1 Location Plan



2.3 Existing Development on Graven Hill Site

2.3.1 The area of the entire Graven Hill site contains 12 large storage warehouses, most with road and rail access intermittently spaced around D Site and E Site.

2.3.2 Vehicular access to the site is in the north east corner off the Aylesbury Road/ Wretchwick Way (A41/A4421) roundabout. There is a circulatory route surrounding D Site and E Site known as Circular Road.

2.3.3 A high level summary of the typical existing land use on each site is shown in Table 2.2, below.

Table 2.2 Summary of Existing Use

Site	Total Area	Office	Workshops	Storage	Emergency Services	Amenity Facilities
Graven Hill	59ha for D Site and 79ha for E Site	✓	✓	✓	✓	✓

2.4 Proposed Development on Graven Hill Site

2.4.1 The proposed development at Graven Hill will comprise a mix of commercial and residential development plus associated community facilities. Public open space is also to be provided in line with Cherwell District Council requirements, including existing woodland areas that will form part of an integrated landscape and open space network.

2.4.2 A breakdown of the proposed development is summarised in Table 2.3, below.

Table 2.3 Proposed Development Build Area

Development Type	No of or Size
B8 Storage	18.6ha
B2 employment 40% of area is floor space	5.7ha
Office	0.6ha
Housing	1,900 homes
Primary school	3.4ha
Hotel pub	1.5ha
Community facility	0.4ha
Retail	1.4ha
Energy Centre	0.9ha

2.4.3 Figure 2.2 shows the proposed development.

Figure 2.2 Proposed Development

2.5 Available Data

2.5.1 Utility information has been obtained from a number of sources. The key sources are:

- a Utility Search;
- the Establishment Development Plan dated 15 August 2008;
- available data obtained from the Site Estate Team at Bicester Garrison;
- available data from Kelda Water (Aquatrine Service Provider); and

- available data from Pride (Regional Prime Contractor).

Findings from the Utility Search

2.5.2 The findings from the utility search are provided in Table 2.4, below.

Table 2.4 Utility Search Results

Utility	Utility Provider Contacted	Underground/above ground apparatus present in or near to the site boundary	Service likely to be physically affected by any proposed development
Electricity	National Grid Transmission Electricity	×	×
	Scottish and Southern Energy	✓	✓
	Scottish Power Generation Ltd	×	×
Gas	National Grid Transmission Gas	×	×
	Southern Gas Networks	✓	✓
Water and Drainage	Thames Water	✓	✓
Multi-utility	Centrica Energy*	×	×
Telecoms	BT Openreach	✓	✓
	Gamma Telecom*	×	×
Pipeline (oil/fuel)	British Pipeline Agency Ltd*	×	×
	E-on Operated Pipeline*	×	×
	Esso*	×	×
	Geo Networks Ltd*	×	×
	GPSS Pipelines*	×	×
	NPower CHP Pipelines*	×	×
	Serco Total UK*	×	×

Notes:

1. AMEC is aware that there may be other mobile phone companies and television operators that own equipment within the area. These secondary service providers have not been contacted at this stage as it is unlikely that their apparatus will prevent the project from being taken forward.
2. As and when details of the preferred development layout is finalised, further service providers may need to be contacted to confirm the extent of their existing apparatus in the area.
3. * confirmation received from Linesearch.org.
4. Key correspondence has been included in Appendix A.

Review of the Establishment Development Plan

2.5.3 An Establishment Development Plan was completed for Bicester Garrison in August 2008. Relevant information from this document which can be confirmed has been incorporated into this report.

Information from the Site Estate Team at Bicester Garrison

2.5.4 Contacts have been made with a number of personnel at Bicester Garrison. A meeting was held with Ian McLaughlin (LCS General Manager) and Harvey Connor (formerly Defence Estates now DIO) on 23 June, 2010. All utilities were discussed and some anecdotal knowledge was disclosed. Although limited records have been made available, some information has been obtained with respect to:

- consumption data for fossil fuels and electricity;
- schematic drawing of 11kV distribution circuit for Bicester Garrison; and
- quotes for removal of district heating infrastructure.

2.5.5 Key correspondence and minutes to meetings have been included in Appendix A.

Information from Kelda Water

2.5.6 Kelda Water Services (KWS) provided AutoCAD drawings of known water, foul and surface water drainage infrastructure throughout the site. This constitutes their full understanding of the water related infrastructure on the site and dates from the start of their contract. KWS confirmed that there has been little updating of the records since and some of it is known to be inaccurate or ambiguous.

2.5.7 A meeting was held with KWS on 07 July, 2010 and some of the main issues relating to the water network on Bicester Garrison were clarified. Subsequent telephone conversations have taken place and further information has been provided relating to the consumption data for the site.

Information from Pride

2.5.8 Discussions have taken place with a number of Pride personnel and their related contractors to confirm the extent and location of non water related infrastructure on site These discussions have indicated that some of the published utility drawings may not be totally accurate. This mainly relates to the electrical and gas network around the site.

2.6 Limitations of Study

2.6.1 Although this Utility Baseline Review is for Graven Hill Site only, it should be read in conjunction with the Utility Baseline Review for C Site in order to obtain a full understanding of the overall utility issues (i.e. this Baseline Review should not be read in isolation). As such reference should be made to ref. BIC/OPA/DOC/18 for details on C Site. In particular, the loading calculations for the future developed estate need to take into account the proposed development at C Site.

2.6.2 Foul and Surface Water drainage issues have been excluded from this review. Instead, reference should be made to the C Site Drainage Strategy report ref. BIC/OPA/DOC/17 and Graven Hill Drainage Strategy report ref. BIC/OPA/DOC/15 for further details.

3. Understanding the Existing Utility Infrastructure Situation

3.1 Electricity

3.1.1 The on site electricity infrastructure for Bicester Garrison is maintained by Pride, the Regional Prime Contractor.

3.1.2 Scottish and Southern Energy (SSE) owns the electricity infrastructure in the vicinity of Graven Hill Site and provides electricity connections for Bicester Garrison. The main SSE owned substation in Arncott, which provides a connection to the local Estate, is located opposite Brook Farm at the northern end of C Site and transforms the supply from 33kV to 11kV.

3.1.3 There is no National Grid electricity infrastructure within the Graven Hill Site.

3.1.4 The main MOD intake substation (C20) is located in a small building adjacent to the SSE Arncott substation in C Site. The cabling laid between the two substations is sized for 5.2MVA permitted maximum demand and, if this were to increase, the cabling would need to be upgraded. The circuit breakers within the SSE substation would also need to be modified if the demand increases.

3.1.5 SSE has provided plans of the HV and LV infrastructure in the vicinity of Graven Hill Site. These show a 33kV supply running to the west of D Site and a number of 11kV connections to smallholdings around E Site. There is one 11kV connection within the site boundary adjacent to Building D7 in the south of D Site which is understood to be a standby substation (D20).

3.1.6 The Site Estate Team has supplied schematic drawings of the 11kV distribution system dating from 1999. The accuracy of these drawings is not certain and it is understood that there are some additional substations at St David's Barracks which have not been included on these drawings. The schematic shows a ring main distribution to D Site and E Site from the main MOD intake substation (C20) north of C Site. There are ten distribution transformers within D Site, five distribution transformers within E Site and three to St David's Barracks.

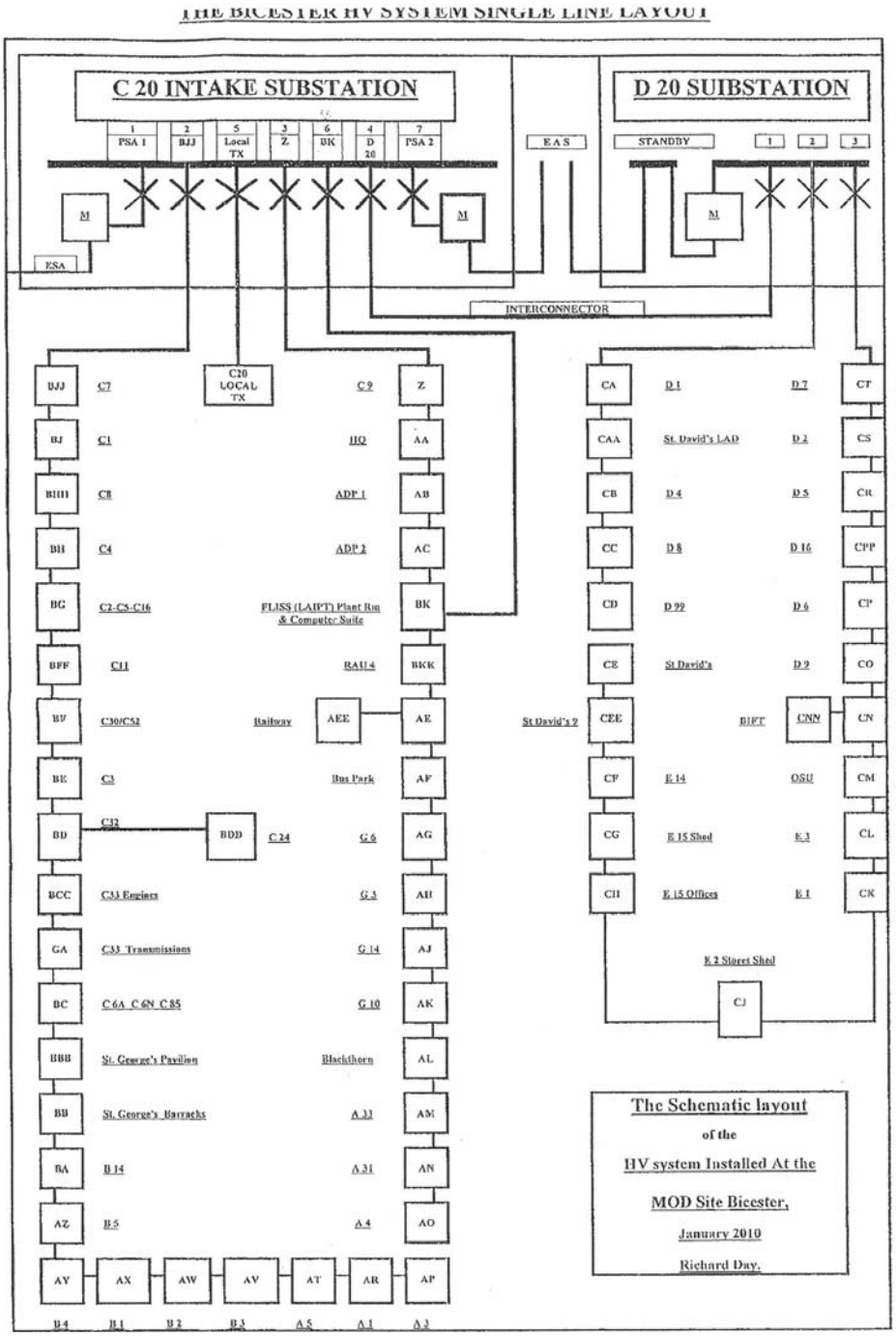
3.1.7 The ring main supplies a number of 11kV/433V transformers of various ratings (typically 200 to 500kVA). The transformers are mounted externally with their associated HV switch adjacent to the larger buildings. Smaller buildings are served via feeder pillars from the transformers with underground cabling. Most of the warehouses are reported to be running at capacity.

3.1.8 The MOD substation contains a main switchboard with oil circuit breaker type switchgear. The equipment and cabling is either replaced as faults occur or replaced as part of a pre planned maintenance regime especially equipment which is over 30 years old.

3.1.9 Some of the critical buildings do have dedicated generators in case of a power failure. These are connected to the plant or buildings via automatic changeover.

3.1.10 Figure 3.1 provides a high level schematic of the HV layout/substations.

Figure 3.1 Schematic Layout of HV Substations



3.1.11 All electrical infrastructure has been summarised in drawing 27808-CVD-011 contained in Appendix B**.**

3.1.12 Some electrical consumption data has been made available to identify the actual demand to the affected area. However, this information has been found to be incomplete and as such further loading survey work would be required. Therefore, in order to obtain a high level understanding of the theoretical existing demand estimated loadings have been calculated based on building area and typical bench mark energy ratings per square metre as indicated in TM46:2008 published by CIBSE. As these calculations are indicative and preliminary, further detailed analysis is needed prior to entering the detailed design stage. A summary of the calculations is shown in Table 3.1, below.

Table 3.1 Estimated Existing Theoretical Loadings

Development Type	Electricity Loadings	
	Average (kVA)	Peak (kVA)
Offices	26	77
Workshops	5	14
Storage	567	1,701
Emergency Services	4	11
Amenity Facilities	14	42
St David's Barracks Accommodation	97	292
Total	**712**	**2,137**

Notes

1. Refer to Annex C for a breakdown of the loading calculations.
2. Loadings shown are indicative and preliminary only and are based on theoretical energy benchmarks from TM46:2008 published by CIBSE. As such further analysis required.
3. Diversification has not been considered in the above peak figures.
4. St David's Barracks is an estimate only. No consumption data was made available.

3.1.13 Over the last four years, the peak load for the entire Bicester MOD estate was measured as 4.468MVA in winter 2009/10. It is not known how this demand is distributed around the different sites.

3.2 Gas and Heating

3.2.1 The on site gas infrastructure for Bicester Garrison is maintained by Pride, the Regional Prime Contractor.

3.2.2 Southern Gas Networks (SGN) owns the gas infrastructure in the vicinity of the Graven Hill Site and has provided plans of their assets within the area. There is a Medium Pressure main (180mm diameter, polyethylene pipe) running along the A41 Aylesbury Road, which passes the entrance to D Site.

3.2.3 There is a medium pressure main (125mm diameter, polyethylene pipe) which enters the Garrison at Graven Hill Road in E Site just off the A41 Aylesbury Road. Once it enters the site, the main runs along Westacott Road before turning east along Circular Road. The medium pressure main ends at St David's Barracks but a low pressure main (180mm diameter, polyethylene pipe) continues to run along Circular Road. There are a number of connections to buildings within St David's Barracks from the low pressure main.

3.2.4 There are not believed to be any SGN connections serving D Site and E Site itself and there is no National Grid high pressure infrastructure in the area. A direct connection to the SGN network is not considered to exist.

3.2.5 The condition of the gas infrastructure is understood to be in good working order with no reported problems.

3.2.6 Buildings within the D Site and E Site used to be heated by a District Heating system. The district heating system is now redundant and has been replaced with individual fuel fired modular boilers. However, the pipelines and infrastructure associated with the District Heating System is still in place throughout the site.

3.2.7 Further details of the former District Heating system are provided below.

- The former boiler house for the district heating system is Building E14.
- From Building E14, pipelines run in a northerly direction to the rear of Building E3 and in an east/south east direction towards D Site. The pipeline which heads north has branches coming off the main route to buildings E1, E2, E3, E6 and E15 and continues beyond the boundary fence to the Old Garrison Briefing Centre. The pipeline which heads to D Site follows the line of the access road terminating near Building D9. There are branches off this route to Building D1 to D10 and also some isolated concrete plinths where pipes have already been removed.
- The pipelines typically run approximately 1m above the ground and are supported on in situ concrete plinths at approximate 30m centres with precast concrete posts and metal brackets providing intermediate support. At road or rail crossings the pipelines either pass underground in pipe ducts or rise up on taller posts at about 6m. There have been reports of damage caused by vehicles to the over ground pipes and insulation.

3.2.8 With respect to the individual boiler units, the fuel originates from local LPG and oil tanks located next to or near to the buildings. As such, fuel pipe lines are present connecting the fuel tanks to the building. This system is understood to be working satisfactorily.

3.2.9 All known gas infrastructure has been summarised in drawing 27808-CVD-011 contained in Appendix B.

3.3 Water Supply

3.3.1 The on site water supply infrastructure for Bicester Garrison is operated and maintained by Kelda Water Services (Defence) (KWS) as part of the Aquatrine project.

3.3.2 All MOD assets are leased to KWS under a 25 year PFI with approximately 16 years remaining. KWS has made their records of pipe work on site available but the accuracy of this information is known to be incomplete. It is based on the historic records that were passed to KWS by the MOD at the start of the contract and the records are updated when site work or maintenance is carried out.

3.3.3 The public water supply network in the area is maintained and operated by Thames Water (TW). TW has provided associated plans and records of their infrastructure in the area.

3.3.4 The local TW network is supplied by a 12" PVC strategic main which runs from the A41 down Ploughley Road through Ambrosden. In Ambrosden this strategic main continues along Merton Road to a TW booster station just before the railway, where the MOD network connects. KWS buy the water from TW as a bulk supply from this connection. There is a KWS operated Water Pumping Station (WPS01) and Water Treatment Works (WTS01) at this location. The treatment is a secondary chlorination process which is required due to the distance that the water has travelled from the TW treatment works resulting in a low level of free chlorine. From here the water is pumped via a 6" pipe to the reservoir at the top of Graven Hill, typically for 1.5 hours every 24 hour period. This normally occurs in the late evening or early morning but can be varied by TW.

3.3.5 The KWS operated reservoir on Graven Hill (SVR06) was replaced in 2004 with a concrete tank which has two halves, each with a capacity of 1,250m^3. This reservoir supplies D and E Sites as well as St David's Barracks. The married quarters at Ambrosden are supplied direct from the connection at Merton Road. Supply around the sites is via 6" pipes and smaller. The material and condition of these pipes is unknown and maintenance is carried out as faults occur.

3.3.6 There are a number of Emergency Water Supplies located around the site. These can take the form of open water tanks at ground level, enclosed tanks at ground level or a small number of high level water towers. The open water tanks are kept topped up manually from nearby hydrant points and would be used in an emergency by the Fire Defence Service. The enclosed tanks and the high level water towers are understood to be supplied and linked on the fire mains system which is separate to the potable water system. The high level towers also supply the sprinkler fire main. This system is known to have significant leakage and the supply valve is generally kept closed so the main reservoir is not drained down, but the EWS are kept topped up as necessary.

3.3.7 All water supply infrastructures has been summarised in drawing 27808-CVD-011 contained in Appendix B.

3.3.8 Some water supply consumption data has been made available to identify the actual demand to the affected area. However, this information has been found to be

incomplete and as such further loading survey work would be required. Therefore, in order to obtain a high level understanding of the theoretical existing demand estimated loadings have been calculated based on building area and published data. As these calculations are indicative and preliminary, further detailed analysis is needed prior to entering the detailed design stage. A summary of the calculations is shown in Table 3.2, below.

Table 3.2 Estimated Existing Theoretical Loadings

Development Type	Water Supply Loadings	
	Average (litres per second)	Peak (litres per second)
Offices	0.10	0.30
Workshops	0.04	0.11
Storage	2.19	6.58
Emergency Services	0.04	0.12
Amenity Facilities	0.18	0.55
St David's Barracks Accommodation	1.75	5.24
Total	**4.30**	**12.90**

Notes

1. Refer to Annex C for a breakdown of the loading calculations.
2. Loadings shown are indicative and preliminary only and are based on published data. As such further analysis required.
3. Existing loadings based on a fully functioning site.
4. St David's Barracks is an estimate only. No consumption data was made available.

3.4 Telecoms

3.4.1 British Telecommunications (BT) currently own, operate and maintain a telecoms network within the proposed development boundary. The records have been summarised in drawing 27808-CVD-011 contained in Appendix B.

3.4.2 There have been no reported operational problems associated with the network.

3.4.3 The MOD has provided telecom records for A, B, C and G Sites, but to date no records have been provided for D Site and E Site and as such, it is not known what the layout of the telecom ducting arrangement is likely to be.

4. Understanding the Initial Issues of Accommodating the Proposed Development

4.1 General

4.1.1 Utility drawing 27808-CVD-011 shows the impact that the draft masterplan will have on the existing known utility infrastructure within the Graven Hill site. As a result, it is expected that a number of services will require diversions or protection works in order to accommodate the proposed development.

4.1.2 At Reserved Matters stage, further discussions will need to be carried out with the main Utility Providers and the MOD to ascertain the true extent of any diversion/protection works together with costs. Such discussions will also help to establish a suitable sequence/phasing programme to ensure minimal disruption to retained estate or any phased releasing of estate.

4.1.3 Where MOD land is to be disposed of, as is the case at Graven Hill rather than being redeveloped as part of the MOD retained estate, utilities should be separated from the MOD network, unless there are significant cost or commercial advantages in maintaining the connection.

4.2 Electricity

4.2.1 It is assumed that new electrical connection to the existing SSE network will be required to serve the proposed development.

4.2.2 Table 4.1, overleaf, summarises the anticipated loadings that may be required to accommodate the proposed development and are based on development usages contained in Section 1 and typical bench mark energy ratings per square metre as indicated in TM46:2008 published by CIBSE. As these calculations are indicative and preliminary, further detailed analysis is needed prior to entering detailed design.

Table 4.1 Anticipated Electrical Loadings

Development Type	Electricity Loadings	
	Average (kVA)	**Peak (kVA)**
Residential	954	2,863
B1 offices	26	78
B2 employment	90	271
B8 Storage	383	1,148
Energy Centre	72	217
Primary School	137	410
Hotel pub	158	475
Community facility	64	193
Retail	116	348
St David's Barracks	97	292
Total	**2,098**	**6,294**

Notes

1. Refer to Annex C for a breakdown of the loading calculations.
2. Loadings shown are indicative and preliminary only and are based on theoretical energy benchmarks from TM46:2008 published by CIBSE. As such further analysis required.
3. The above figures are not the increase in loadings, but the overall anticipated loadings for the developed site. Loadings will need to be offset against the existing demand to determine the true increase/decrease in loadings.
4. None of the loadings account for diversification as these are preliminary estimates.
5. St David's Barracks is an estimate only. No consumption data was made available. Also it is assumed that this development will not change.

4.2.3 The Arncott substation has recently been upgraded with switchgear to accommodate a maximum supply capacity of 6.7MW (approximately equivalent to 6.7MVA). According to anecdotal information received via Pride, it is understood that this capacity is not solely dedicated to the MOD and could potentially be used by other developments in the area. Further information received via Pride has indicated that the current permitted maximum demand for electricity supply to the whole of the garrison is 5.2MVA. This value was agreed between the MOD and SSE although there are no loading capacity calculations or correspondence with SSE to confirm this. Instead, there are minutes from MOD meetings where this value has been accepted by the MOD. A copy of these minutes is contained in Annex A.

4.2.4 This leaves a theoretical spare capacity of 1.5MVA to accommodate any new development in the area. However, it is possible that other new development in or near the estate may have already applied for this spare capacity. This in turn could

mean that there is limited spare capacity to accommodate any proposed development on C Site and Graven Hill Site.

4.2.5 If new development means that the 6.7MVA will be exceeded, additional reinforcement to the existing network may be required. At this time, the exact solution is unknown as it will be dependent on a number of factors such as:

- The confirmation of the existing consumption loadings. This may require an electrical load survey to ascertain what the true consumption rates of all the affected buildings are. To date, some information has been made available, however the data received does not provide sufficient information on all the affected buildings and as such it is deemed incomplete and unusable.
- The outcome of ongoing discussions between the MOD, Pride and SSE with respect to supplying the proposed development on the RSME site known as B Site. B Site development is expected to require an additional 0.3MVA taking the total demand for MOD Bicester to 5.5MVA. The reserve capacity reduces to 1.2MVA which is potentially available for the Master Plan under consideration but is not contracted. The MOD is currently investigating methods of reducing power inefficiencies as well as considering diversity issues to ensure the impact on the reserve capacity is minimised as much as possible. Once the RSME development needs have been finalised, SSE will be in a better position to identify the implications on accommodating other development in the area, including C Site.
- Commissioning SSE to carry out a high level network analysis. A quote of £1,200 has already been received to carry this out and would cover all sites.

4.2.6 The assessment of the loadings indicates that there is insufficient spare capacity in the network to cater for the increase in demand for both C Site and Graven Hill Site (non-peak and peak). For example, it is estimated that the total average demand will increase by approximately 1.6MVA for both sites (i.e. 2.5MVA-0.9MVA) which exceeds the available spare capacity of 1.2MVA. Even if Graven Hill Site is considered separately, the available spare capacity is still expected to be exceeded under peak conditions.

4.2.7 If through further investigation, SSE confirms that there is limited spare capacity to serve the proposed development then anecdotal information received suggests that a typical solution may involve installing a new 33kV cable from Oxford. It is also considered likely that SSE may require a fee to secure a supply to serve any of the proposed development. To date no potential solutions have been identified by SSE.

4.3 Gas and Heating

4.3.1 SGN has indicated that a possible gas connection could be made into their network along the A41 Aylesbury Road. A 180mm PE medium pressure pipeline is located here and some reinforcement works may be anticipated, based on the indicative loadings that have been calculated.

4.3.2 The potential loadings of serving the proposed development have been estimated in the Table 4.2, overleaf. These loadings are based on development usages contained in

Section 1 and typical bench mark energy ratings per square metre as indicated in TM46:2008 published by CIBSE. As these calculations are indicative and preliminary, further detailed analysis is needed prior to entering the detailed design stage.

Table 4.2 Anticipated Gas Loadings

Development Type	Gas Loadings	
	Average (kW)	Peak (kW)
Residential	4,915	14,745
B1 offices	33	99
B2 employment	464	1,391
B8 Storage	1,345	4,036
Energy Centre	81	244
Primary School	342	1,025
Hotel pub	497	1,492
Community facility	169	506
Retail	120	359
St David's Barracks	487	1,462
Total	**8,453**	**25,358**

Notes

1. Refer to Appendix C for a breakdown of the loading calculations.
2. Loadings shown are indicative and preliminary only and are based on theoretical energy benchmarks from TM46:2008 published by CIBSE. As such further analysis required.
3. Loadings will need to be off set against the existing demand to determine the true increase/decrease in loadings.
4. St David's Barracks is an estimate only. No consumption data was made available. Also it is assumed that this development will not change.

4.3.3 A search for oil and fuel pipelines has been undertaken using Linesearch.org. The results confirm that there are no oil and fuel pipelines within or near to the site boundary.

4.4 Water Supply

4.4.1 Although it is assumed that a new water supply connection will be made to the existing strategic network to serve the proposed development (i.e. a new main from the existing tanks as well as the feeder mains), any existing side connections that remain are expected to be unusable due to their poor condition and age. As such, any new connections are expected to involve the need to install new water mains.

4.4.2 The potential loadings of serving the proposed development have been estimated in Table 4.3. These loadings are based on development usages contained in Section 1 and published data. As these calculations are indicative and preliminary, further detailed analysis is needed prior to entering the detailed design stage.

Table 4.3 Anticipated Water Supply Loadings

Development Type	Water Supply Loadings	
	Average (litres per second)	Peak (litres per second)
Residential	13.3	39.9
B1 offices	0.5	1.4
B2 employment	0.3	1.0
B8 Storage	1.1	3.4
Energy Centre	0.1	0.2
Primary School	2.4	7.3
Hotel pub	0.6	1.9
Community facility	0.1	0.4
Retail	0.5	1.6
St David's Barracks	1.75	5.2
Total	**20.8**	**62.4**

Notes

1. Refer to Appendix C for a breakdown of the loading calculations.
2. Loadings shown are indicative and preliminary only and are based on published data. As such further analysis required.
3. Loadings will need to be off set against the existing demand to determine the true increase/decrease in loadings.
4. St David's Barracks is an estimate only. No consumption data was made available. Also it is assumed that this development will not change.

4.4.3 KWS has confirmed that there would not be a problem with reusing the main water infrastructure already in place and in fact KWS would be happy to supply any new development as well as installing new tanking if that was required (provided it was commercially viable).

4.4.4 However, KWS does have concerns regarding the operation of the TW network in that it may not be able to support any additional infrastructure and as such additional reinforcement may be required. As the network is prone to leakage, KWS often need to undertake extra pumping which in turn can cause problems on the wider TW network.

4.4.5 KWS's view is that although there may be opportunity to supply the proposed development at Graven Hill, further modelling would be required to ascertain the true

impact on the network on site. Any such modelling would also take into account the fact any benefit from removing parts of the on site sprinkler system which experiences significant leakage. The commercial implications of this need to be considered in further detail as there may be more benefit in identifying a direct connection to the TW network.

4.5 Telecoms

4.5.1 It is considered that there will be no problems with supplying connections for the potential development as any existing telecom ducting will be redundant and BT network can easily be modified.

4.5.2 It is common practise for BT to supply the ducting to serve the new development and in some cases pay the developer for the right to connect residential properties.

4.5.3 Further discussion is recommended with the service providers to identify if there is any opportunity to incorporate Communication Technology Initiatives such as broadband and WiFi together with possible funding mechanisms. However, for the purposes of this study, this is deemed to be outside this scope.

5. Conclusions

5.1.1 AMEC has been commissioned by Defence Infrastructure Organisation (DIO) to undertake a Utility Baseline Review of a prospective mixed use development at Bicester Garrison, Oxfordshire. The area of the Baseline Review covers two distinct sites; C Site and Graven hill Site. Graven Hill Site has been identified for disposal but C Site would still remain under MOD control/ownership and be solely used as part of the LCS operations. This Baseline Review is for Graven Hill Site only.

5.1.2 The Baseline Review sets out to determine whether or not the existing infrastructure serving the existing site is adequate to accommodate the proposed development needs or if any modifications/reinforcement works are required.

5.1.3 Information gained from this Baseline Review has been used to inform the Master Plan of any key constraints. However, this Baseline Review should be read in conjunction with the utility Baseline Review associated with C Site in order to understand the overall impact with respect to the utilities and as such should not be read in isolation. Report ref. BIC/OPA/DOC/18 provides further details with respect to C Site utility issues.

5.1.4 The Baseline Review considers utilities infrastructure associated with the following:

- electricity;
- gas;
- water supply; and
- telecoms.

5.1.5 Foul Water and Surface Water issues have been considered separately and can be found in C Site Drainage Strategy ref. BIC/OPA/DOC/17 and Graven Hill Drainage Strategy ref. BIC/OPA/DOC/15.

5.1.6 A high level summary of the change in loadings as a result of the new development together with an understanding on what needs to be done to accommodate these requirements is summarised in Table 5.1, overleaf.

Table 5.1 Utility Summary for Graven Hill Site Only

Utility	Is utility present on site?	Change in average load anticipated	Change in peak load anticipated	Available spare capacity	Can the new development be served?
Electricity	Yes	1,386 kVA	4,157 kVA	1.2 MVA[$]	Yes but as both the average and peak change in loading exceeds the available spare capacity reinforcement in the network is expected. Recommended that further assessment and detailed discussions with SSE is undertaken to determine the extent of any necessary reinforcement of wider network
Gas	Yes but see note 1	8,453 kW[#]	25,358 kW[#]	Previous correspondence with SGN indicates there is sufficient capacity to accommodate an additional av load of 6,217kW without reinforcement. As 8,453KW is now needed then some additional reinforcement is anticipated	Yes but some reinforcement is anticipated due to increase in loadings. SGN have identified a possible connection point but this was based on there being no B8 storage loading at the time of communication which is now the case. Exact requirements to be confirmed at detailed design stage.
Water Supply	Yes	16.5 l/s	49.5 l/s	Unknown	Yes but reinforcement is expected. Although the solution is expected to involve the re-use of local storage tanks, the fact that the network experiences leakage and pumping issues means that some upgrading and reinforcement work is anticipated.
Telecoms	Yes	Unknown	Unknown	Unknown	Yes. Expected that any modifications will be easily incorporated into the development

Notes

1. Existing gas supply provided by LPG/oil tanks i.e. no direct connection to public SGN supply present. Therefore the change in loads is the total anticipated new demand.
2. # gas increase assumes connection to SGN network is now required.
3. All above figures exclude impact of loadings from the other sites.
4. [$] This reserved loading has not been secured by the MOD and as such there is a risk that this can be used by other developers.

Appendix A
Key Correspondence

Defence
Infrastructure
Organisation

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Defence
Infrastructure
Organisation

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Minutes of Meeting

Client	Defence Estates	**Client Reference**	
Our Reference	27808-	**Issued By**	Phill Clay
Issue Number		**Issue Date**	25-06-10
Meeting Date	24-06-10	**Location**	Bicester Garrison - Site E
Present at Meeting (Distribution Copies)	Phill Clay (Entec) Katherine Snell (Entec) Ian McLaughlin (DSDA Head of Establishment) Harvey Connor (DE Estates Management)		
Apologies for Absence (Distribution Copies)			
Additional Distribution (Distribution Copies)			
Project Name	Bicester Garrison Planning Support		
Subject	**INFRASTRUCTURE DATA COLLECTION**		

Actions

1.0 GENERAL

1.1 All utility costs for whole garrison paid by DSDA Bicester. Oil is dealt with directly by Bicester, but all other utilities through Army.

1.2 Meter readings for oil, gas, and electric read by Katie Falconer (DE). Penny Martin is Energy Manager. She can provide information on meter positions.

1.3 FFO and Electricity consumption records provided for 2006-2010

1.4 Pride is the Regional Prime Contractor for Bicester. All communications to go through Harvey Connor.

2.0 AQUATRINE (POTABLE AND DRAINAGE)

2.1 Caroline Thomas was the Aquatrine Liaison Representative (ALR) but Harvey Connor has recently taken on this role. Viv Owen works with Harvey and focuses on water issues. Brey are the Aquatrine Service Provider for Bicester and Kelda Water are the contractor/partner.

2.2 All drainage issues / plans to be directed to Kelda. KS to make initial contact but PC to chase also **KS/PC**

2.3 Water is pumped up Graven Hill (24hrs) to feed high level tanks. Sometimes experience low pressure across site. Some pipework recently replaced.

		Actions
2.4	Water pumping main taken from prison. KS to find out condition	**KS**
2.5	Flooding experienced in many warehouses. Ditches are present around the majority of buildings to catch runoff from the roads. Thought to be constructed when the site was built. Storm ditches generally fill up quickly.	
2.6	D Site drainage was cleaned out to alleviate a blockage. System now working better. Whole of E site prone to flooding as ditches fill quickly and overflow.	
2.7	At E1 warehouse blocked drains have been cleared and flooding alleviated. New drain agreed between E1 and E2 – KS to check with Kelda.	**KS**
2.8	At D8 building heavy rainfall runs directly into building off road. No storm ditches present.	
2.9	No known problems with foul drainage.	

3.0 GAS

3.1	Gas has been maintained with no major problems over last 4 years. Penny Martin can provide details of meter locations.	**KS**

4.0 DISTRICT HEATING

4.1	Largely redundant as oil fired modular boilers have been fitted to warehouses. However, where these could not be located close enough, the existing DH pipework has been used. All pipework remains in place. Plans should be available as DE is currently assessing the Health & Safety issues associated with lorries clashing with pipes that cross the roads. Pride provides the maintenance to the system and is in the process of fitting Environmental Management Systems to some buildings – list of buildings to be supplied by Harvey. KS to chase.	**KS**

5.0 ELECTRICITY

5.1	Electricity supply has no spare capacity. Site often suffers from power outages. KS to contact Approved Person (AP) when returns from leave – HC to provide details, KS to find out if there are any plans to reinforce the system	**KS**

6.0 TELECOMS

6.1	Everard Hypolite: 01869 259711 (everard.hypolite986@mod.uk) deals with voice data. 4 Exchanges on site in C Site, D/St David's, St George's and E Site – BT own and maintain these. Ducting routes should be available either hard copy or electronic – Harvey to find out. KS to chase	**KS**

Actions

DII(F) being introduced across all sites. Atlas maintain this system. Fire system also on fibre optics from Fire Station, looped around all sites and back again. Al Parry (x3831) may be able to provide further info. KS to follow up. **KS**

7.0 OTHER

7.1 Weigh bridge on site at building E15.

7.2 MoD Fire Station at Ploughly Road

7.3 Server room in C16, but has back-up generators.

7.4 All security issues (i.e. contractors on site) must go through Bob Cubitt: 01869 259354. Passport or driving license and proof of address required for all contractors. Where sewer CCTV or photographs are being taken, camera pass is required from Bob. BC will require method statements, incl. risk assessments and copies of insurance certificates. Permit required for any laptops taken onto site. Pride will need to provide written approval before start.

Minutes of Meeting

Client	Defence Estates	**Client Reference**	
Our Reference	27808/GL043	**Issued By**	Phill Clay
Issue Number		**Issue Date**	08-07-10
Meeting Date	07-07-10	**Location**	Entec FF Meeting Room
Present at Meeting (Distribution Copies)	Phill Clay (Entec) Katherine Snell (Entec) Karen Derry (Kelda)		
Apologies for Absence (Distribution Copies)			
Additional Distribution (Distribution Copies)			
Project Name	Bicester Garrison Planning Support		
Subject	**KELDA WATER SERVICES INFORMATION GATHERING**		

Actions

1.0 SURFACE WATER

1.1 KD confirmed that any surface water outfall below 6" diameter is not classed as an outfall, as agreed under the Kelda contract?

1.2 EA discharge consent data provided (current and revoked). Full copies to be sent – KS to follow up. PC recorded reference, grid position and outfall name **KS**

1.3 The entire site has a high water table and is prone to flooding under most storm events.

1.4 Many of the ditches on site are not connected to an overall surface water system. Therefore once the ditches are full, the water overflows. The ditches are also positioned in poor locations, so are not being utilised as efficiently as possible. Ditches are only in Kelda scope if receive run-off from road or other impermeable surface.

1.5 Major flooding issues associated with buildings E1 and E2. KD believes that the land drain from Graven Hill is a major factor to this as there is a large diameter drain entering a small ditch. Also the flows from this drain are restricted by the rail track, where the track acts as a dam.

1.6 KD considers that soakaways will not work on the sites due to the high water table. They have never even attempted testing as they do not see the point.

Actions

1.7 There is no scheduled maintenance on surface water systems unless areas are known to flood. Generally deal with problems reactively.

2.0 POTABLE WATER

2.1 Sprinkler system main is in poor condition as it leaks all over – this is not in the Kelda scope.

2.2 Fire main system is present across the sites. This is in Kelda scope and is considered to be in good condition. If required, water is pumped from the EWS tanks by dropping a hose directly into the water – issue with pumping newts out of water.

2.3 Where two assets are shown on the drawing together, this means that one would be for the fire system and the other would be for the sprinkler system.

2.4 Water consumption data (taken from readings) available from Scott Dexter (07790 616642). Meter readings and DMA zone drawings to be requested. Alternative contacts (Mark Chalkley – Water Supply Manager (07790 616158) or Paul Bramhall – Meter and Measurement (07790 616723) **KS**

2.5 There is a live database that is monitored – this shows any sudden changes in water usage which may indicate a problem.

2.6 WTW01 and WPS01 are located at Ambrosden. Connection from Thames Water. Undergoes secondary chlorination as water has been pumped a long distance and free chlorine is low. WPS used to pump to Graven Hill and Arncott Hill service reservoirs, but the supply to Arncott Hill has been cut as pipe in very poor condition.

2.7 WPS01 now pumps to SVR06 (concrete reservoir at Graven Hill) for 1.5hrs either in late evening or early morning, once every 24hrs. Sometimes this is varied by Thames Water due to circumstances. It is always agreed beforehand.SVR06 supplies D&E sites and St Davids Barracks and married quarters in Ambrosden.

2.8 Arncott Hill is now supplied from a new WPS02 and WTW02 with a new connection from Thames Water. TW installed new WPS but this was not adequate for pumping water up hill so Kelda also constructed new WPS. Secondary chlorination treatment here also. Water is pumped up to SVR 01, 02, 03, & 04 on demand (when level drops to 70%). There are 4 service reservoirs, balanced in pairs, but only 2 in use at any one time – the other 2 being mothballed as not required. However these are sometimes used during maintenance / cleaning. There is spare capacity here.

2.9 There have been 2 TW bursts on supply into Ambrosden in last 2 months so condition of TW network is uncertain.

Actions

3.0 FOUL WATER

3.1 GT = Grease Trap. Not all shown on drawing but should be 6No. in total across all sites.

3.2 OWI discharge to surface water system under guidance from PPG3

3.3 DE looking to resize OWI near to fuel depot, as the fuel tank is far larger than the OWI. If ever a breach of the bund took place, the OWI couldn't handle the volume.

3.4 SLAM building maintained by DE. They should be able to provide information on the OWI and other assets around this building

3.5 Foul outfalls assumed to be to Thames Water treatment works. KD suggested there may be some cess pit outfalls but this disregarded as they would be in their contract

3.6 Foul pumping stations on regular maintenance programme. Checked 1-2 times per week during general look around. All parties appreciate that the foul system is critical and should not be neglected in any way. Larger pump stations have back-up pumps. The locations of these are to be forwarded – KS to follow up. These pumps are ATEX compliant and have been signed off. **KS**

3.7 There is no trade effluent on the sites and no significant problems with particular buildings with regard to foul.

4.0 ASSETS

4.1 KS to contact John Tew – Asset Manager (07790 616661) for information on assets and condition. Info is limited although a condition survey at Bicester has recently been commenced. **KS**

Network Quotation Ref: L11127186
Requester Reference: BICESTER GARRISON

FAO: Nick Wood,
Entec UK Ltd
Gables House
Kenilworth Road
Leamington Spa
CV32 6JX

St Lawrence House
Station Approach, Horley
Surrey
RH6 9HJ

Date: 23 August 2011
Network Contact: Michael Driver
Tel: 01293 818 830
Fax: 0845 070 1640

Dear Nick Wood,

Re: SITE C & GRAVEN HILL SITE, ., BICESTER GARRISON, BICESTER, OXFORDSHIRE, OX25 2LD

Thank you for your enquiry dated 23 August 2011, which we received on 23 August 2011.

The nearest relevant main is Medium Pressure and 33 metre(s) from the site boundary.

Plan Attached: Yes

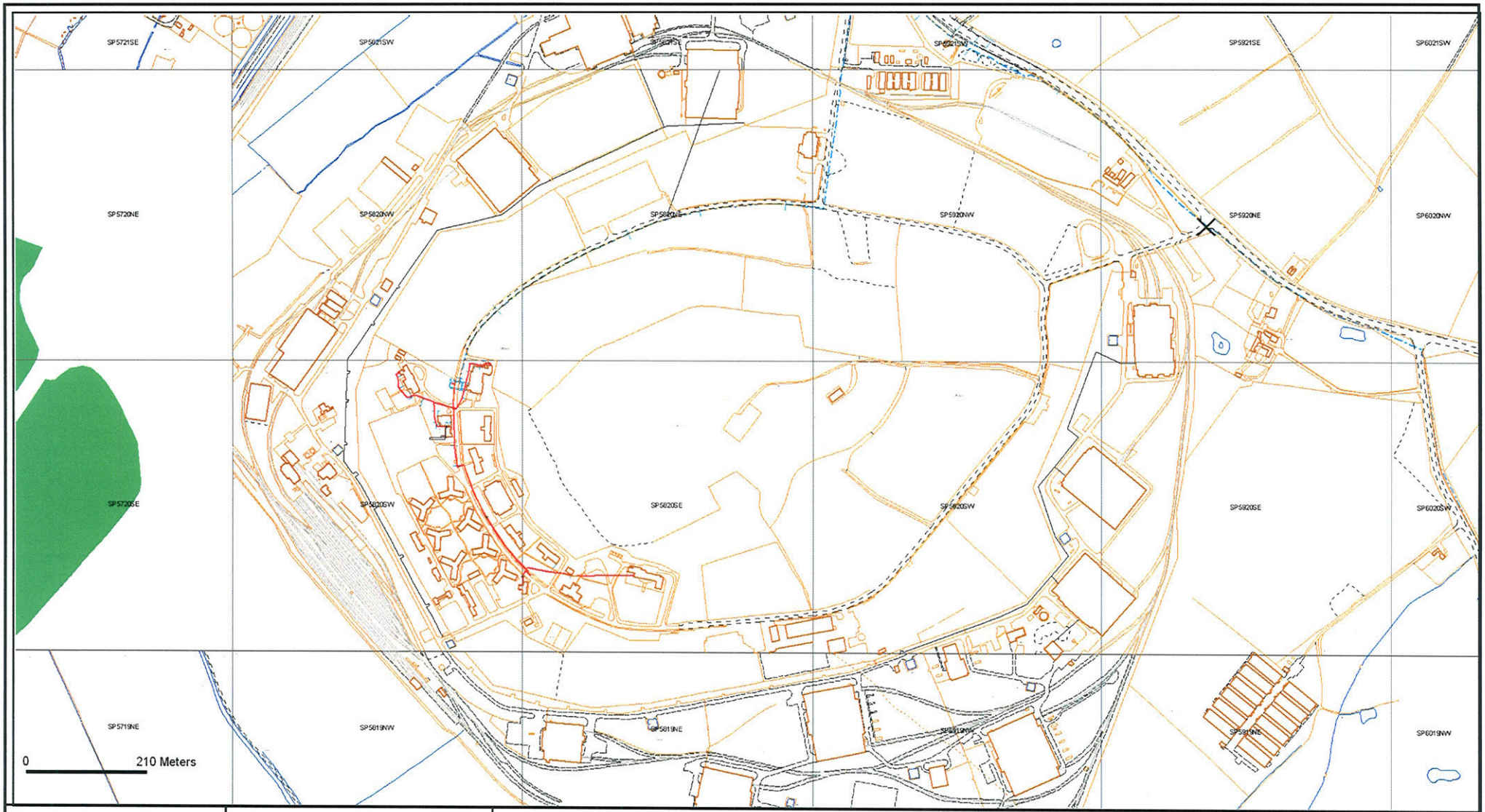
Gas Diversionary or abandonment works may be required. For Further details please write to SGN at the above address. Reinforcement of SGN network to support the proposed load may be required. The nearest relevant main is a 180mm PE Medium Pressure. Please see map attached.

For new supply/alteration/disconnection quotations please refer to www.scotiagasnetworks.co.uk. Go to Related Links to download relevant request form.

If you have any queries, please contact Michael Driver on the number above.

Yours sincerely

Leigh Keegan
(Network Support Manager)



SCALE :	1 : 8968
USER ID :	md92835
DATE :	23/08/2011
INTERNAL USE ONLY	
GRID REFERENCE :	E458888, N220414, SP5820

LP MAINS
MP MAINS
IP MAINS
LHP MAINS
HISTORY DATA
LAs
GTs
SSSIs

Some examples of Plant Items

Valve | Syphon | Depth of Cover | Diameter Change | Material Change

This plan shows the location of those pipes owned by Scotia Gas Networks ("SGN") by virtue of being a licensed Gas Transporter (GT). Gas pipes owned by other GTs, or third parties, may also be present in this area and are not shown on this plan. Information with regard to such pipes should be obtained from the relevant owners. No warranties with regard to the accuracy of the information shown on this plan. Service pipes, valves, siphons, sub-connections, etc. are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by SGN or its agents, servants or sub-contractors for any error or omission contained herein. Safe digging practices, in accordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that this information is provided to all persons (whether direct labour or sub-contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

Intranet MAPS Version 1.8

L11127186

Oxfordshire County Area

Scotia Gas Networks

Key Points & Meeting Actions

Our Reference	27938-CL13	**Issued By**	Mark Ramsay
Issue Number	1	**Issue Date**	06/09/10
Meeting Date	01/09/10	**Location**	Bicester

Present at Meeting (Distribution Copies)

Lt Col William Lang (CMT)
Kate Clarke (DE)
Peter May (DE)
Graham Suter (DE)
Kevin Houghton (D Infra)
Barry Porton (PriDE)
Tom Shore (PriDE)
Ray Coey (PriDE)
John Brabner (PriDE)
Al Perry (Dii Est Mgr)
Julian Davies (HQ 4 Div)
Bryan Carter (HQ 145 Bde)
David Cooper (Holdfast)
Tony Levy (Carillion)
Vic Jordan (Carillion)
John Newton (Carillion)
Andrew Mannion (Atkins)
Keith Peters (Interserve)
David Selmes (CMT)
Mark Ramsay (CMT)

Apologies for Absence (Distribution Copies) None

Additional Distribution (Distribution Copies)

Project Name RSME PPP

Subject **BICESTER POWER COORDINATION MEETING**

SER	ITEM	Action	Deadline
1.	**INTRODUCTIONS**		
2.	**RSME POWER SUPPLY REQUIREMENTS AGREED IN 2008.** <u>Key Points.</u> MoD are contracted to provide an extra 700kW to HTS. PriDE has expressed concern that this level of demand is not available. HTS issued a table "**Bicester - Electrical Load Figures 2010"** prior to the meeting that details the current RSME estimate load as 835kVA (668kW) at St Georges & B Site, plus a probable new supply of 140kVA direct from SSE for a new training complex. KC warned that the Data Centre is a critical MoD asset that must not be put at risk. DSDA 'owned' the power input to the site.		

Actions

3.	**RSME CURRENT CALCULATED POWER INCREASE REQUIREMENTS** Key Points. Peak load in last 4 years (winter 09/10) was 4.468MVA. Current contracted maximum load at Bicester is set at 5.2MVA Reserve capacity is understood to be 1.5MVA but this is not contracted. The RSME requires to issue a contract change to HTS to increase EOD and search training which will likely add an extra 150kVA, (TBC) giving a total HTS requirement of circa 985kVA for St Georges & B Site. The HTS table detailing the 835kVA max demand does not allow for diversity between buildings and adopted a low risk Power Factor. HTS can allow appropriate diversification and confirmed that they are confident a good Power Factor can be achieved on their assets. DInfra are proposing to bring additional LF units to St Georges Bks and B Site but the numbers and programme is not known by RSME. The internal network can distribute the additional power required by the RSME. The aggregate of new developments since 2008 may require some minor works at the intake (short lengths of new cable etc). Actions.		
	HTS to revise the table to allow for diversification between buildings and an improved Power Factor allowance for the HTS buildings.	AM	15/9/10
	HTS to add a column to the table to show a commissioning load.	TL	15/9/10
	Investigate the availability of an appropriate uplift in the site's capacity at the intake having given consideration to DInfra future plans. Final size of uplift to be determined on receipt of revised table from HTS.	KH	15/9/10
4.	**FUTURE DEVELOPMENT AT ST GEORGES AND B SITE** No actions		
5.	**PROGRAMME OF CARILLION WORKS** TS of PriDE was content with the Carillion programme of power on requirements as presented by VJ but requested clarity on the commissioning loads. (See above action)		

BICESTER POWER COORDINATION MEETING

Actions

6.	**NETWORK CURTILAGE FOR SUPPLY OF SW STS SITE** KH requires details from Atkins of proposed option to supply remote STSs from a new supply in the public road. TS of PriDE was technically content with this proposed option. HQ 145 Bde ideally require 12-16 weeks notice of a new supply to ensure time for contracting.	 AM VJ	 15/9/10
7.	**ADOPTION OF NEW POWER SUPPLY SERVICES** Ownership of land on the RSME sites to be firmly established so that requests for adoption of services can be directed as appropriate. Potential need for a Virtual Bank Account (VBA) to support PriDE services for connections, Carillion to provide an estimate of support needed. (After note; Estimate to RSME via HTS, copied to PriDE) A joint procedure will need to be agreed for the handover of services from Carillion. RSME preference is for Carillion to self certify on behalf of HTS as it will minimise costs to both parties. RSME/HTS have an Independent Certifier (RBL) who certify Carillion's payments . PriDE should provide an acceptable procedure to DE who will pass onto CMT. Carillion to provide electrical demarcation points to PriDE in advance	 CMT/DE TL PriDE/ DE TL	 10/9/10 15/9/10 15/9/10 15/9/10
8.	**AOB** The RSME PPP should ensure that injections into PriDE's scope of works are not drip fed but should be provided in sizable chunks.		
9.	**DATE OF NEXT MEETING** All the above actions will be tracked through Bicester bi weekly site meeting and the CMT. Meeting in 3 months time if required		

Appendix B
Drawings

Defence
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DESCRIPTION

REV	DATE		DWN	CHK	APP
A	AUG 2011	FIRST ISSUE	LH	NJW	DK

REVISIONS

REV	DATE		DWN	CHK	APP

NOTES

1) DETAILS SHOWN ON THIS DRAWING HAVE BEEN PROVIDED IN GOOD FAITH AND SHOULD BE USED FOR INFORMATION PURPOSES ONLY. NO LIABILITY OF ANY KIND IS ACCEPTED BY THE OPERATOR, ITS AGENTS OR SERVANTS FOR ANY ERROR OR OMISSION. IT IS GIVEN WITHOUT OBLIGATION, OR WARRANTY. THE ACCURACY THEREOF CANNOT BE GUARANTEED.
2) THE LOCATION OF ALL EXISTING SERVICES SHOWN SHOULD BE VERIFIED BEFORE ANY EXCAVATION OR SITE WORKS IS UNDERTAKEN.
3) THE LOCATION OF ALL PROPOSED SERVICES SHOWN NEED TO BE CONFIRMED WITH THE RELEVANT STATUTORY UNDERTAKER PRIOR TO ANY WORKS COMMENCING ON SITE.
4) THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE UTILITY BASELINE REVIEW 27808/CL232

LOCATION KEY

GENERAL KEY

- SITE BOUNDARY
- PROPOSED DEVELOPMENT AREA
- DIRECTION OF OVERLAND SURFACE WATER FLOW
- D7 EXISTING BUILDING REFERENCE

UTILITY PIPEWORK KEY

- ELECTRICITY HV (UNDERGROUND) – SSE
- ELECTRICITY HV (ABOVE GROUND) – NATIONAL GRID
- ELECTRICITY HV (UNDERGROUND) – PRIDE
- GAS LOW PRESSURE – SGN
- GAS MEDIUM PRESSURE – SGN
- GAS LOCALISED HIGH PRESSURE – SGN
- POTABLE WATER – THAMES WATER
- POTABLE WATER – KELDA WATER
- FOUL DRAINAGE (GRAVITY) – THAMES WATER
- FOUL DRAINAGE (PRESSURISED) – THAMES WATER
- TELECOMMUNICATIONS – BT
- FIRE ALARM SYSTEM – PRIDE
- DISTRICT HEATING (ABOVE GROUND) – OS MAPPING
- OTHER TELECOM
- LIKELY GAS CONNECTION AS INDICATED BY SGN

UTILITY ASSET KEY

- MD/TRC DISTRIBUTION SUBSTATION (WITH REF)/TRANSFORMER (WITH REF)
- GSS INTAKE SUBSTATION (WITH REF)
- EWS 39 EMERGENCY WATER SUPPLY (EWS) (WITH REF)
- SVR 01 SERVICE RESERVOIR (SVR)
- SWO 02 OIL/WATER INTERCEPTOR (OW) (WITH REF)

SCALES: 1:2500 @ A0

PROJECT TITLE:
REDEVELOPMENT OF MoD BICESTER

DRAWING TITLE:
GRAVEN HILL
EXISTING UTILITIES

CLIENT:
Defence Infrastructure Organisation

REF:

amec
GABLES HOUSE, KENILWORTH ROAD,
LEAMINGTON SPA, WARWICKSHIRE CV32 6JX.
TEL: (01926) 439000 FAX: (01926) 439010

DRAWING No.
27808–CVD–011

Original Drawing Size – A0

Appendix C
Indicative Loading Calculations

Defence
Infrastructure
Organisation

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Existing Electricity Rule of Thumb Calcs For Bicester Garrison Affected By The Development

Site	Type	Area	Loading from TM46	Annual Average Loading	Average Loading	3x for peak Loading	
		m2	KWh/m2/yr	KWh/yr	KVA	KVA	
C	workshop	2,350	35	82,250	10	31	
	storage	32,563	35	1,139,705	143	429	
	Emergency Services	0	70	0	0	0	
	classroom	0	40	0	0	0	
	canteen	100	90	9,000	1	3	
	club	0	130	0	0	0	
		35,013			**155**	**464**	**KVA**
Graven Hill	offices	2,143	95	203,585	26	77	
	workshop	1,094	35	38,290	5	14	
	storage	129,000	35	4,515,000	567	1,701	
	Emergency Services	430	70	30,100	4	11	
	classroom	1,665	40	66,600	8	25	
	canteen	0	90	0	0	0	
	club	340	130	44,200	6	17	
	St Davids Accommodation	12,936	60	776,160	97	292	
					712	**2,137**	**KVA**
Total					**867**	**2,601**	**KVA**

1. Assumes a 24 hour day
2. Excludes RSME which is understood to be in the order of 1.2MVA (see carrillion report)
3. Loadings in the ARN and G sites unknown. Assumed to be in the order of 1.5 MVA
4. Excludes the remaining part of site c
5. Loadings are estimated only. No loading survey has been carried out to confirm loadings
6. No allowance made for providing controlled humidity environment conditions to storage warehouse facilities

Existing Water Supply Calcs For Bicester Garrison Affected By The New Development

Site	Type	Area m2	Water Supply Loading l/s/ha	No of people	Water Supply loading l/s/person	Average Loading l/s	3x for peak Loading l/s	
C	workshop	2,350	0.35			0.08	0.25	
	storage	32,563	0.17			0.55	1.66	
	Emergency Services	0	0.92			0.00	0.00	
	classroom	0	0.92			0.00	0.00	
	canteen	100	0.92			0.01	0.03	
	club	0	0.92			0.00	0.00	
		35,013				**1**	**2**	l/s
Graven Hill	offices	2,143	0.46			0.10	0.30	
	workshop	1,094	0.35			0.04	0.11	
	storage	129,000	0.17			2.19	6.58	
	Emergency Services	430	0.92			0.04	0.12	
	classroom	1,665	0.92			0.15	0.46	
	canteen	0	0.92			0.00	0.00	
	club	340	0.92			0.03	0.09	
	St David's Accommodation	-	-	378	0.00462	1.75	5.24	
						4	**13**	l/s
Total						**5**	**15**	l/s

1. Water supply to offices =0.46 l/s/ha (excluding houses) based on 200 l/d/person and 100 people per ha divided by 12 divided by 3600
2. Water supply to classroom, canteen and club =0.92 l/s/ha (excluding houses) based on 200 l/d/person and 200 people per ha divided by 12 divided by 3600
3. Water supply to Industrial premises =0.35 l/s/ha assuming 300 l/100m2/day divided by 12 divided by 3600
4. Water supply to storage area assume 0.17l/s/ha based on 150 l/d/100m2 divided by 24 hr divided by 3600
5. Domestic water supply for St Davids = 378 people using 200 l/d/person divided by 12 divided by 3600

Proposed Electricity Rule of Thumb Calcs For Bicester Garrison

05/08/2011

Site	Type	Area m2	No of Dwellings	Residential Loading (Est) KWh/dwelling/yr	Loading from TM46 (Est) KWh/m2/yr	Annual Average Loading KWh/yr	Average Loading KVA	3x for peak Loading KVA	
C	B8 - storage/warehouse plus extra 30% for CHE conditions (see note 3)	70,400	-	-	46	3,203,200	402	1,207	
	B1 offices	1,200	-	-	95	114,000	14	43	
							417	**1,250**	KVA
Graven Hill	Residential	-	1,900	4,000	-	7,600,000	954	2,863	
	B1 offices	2,182	-	-	95	207,273	26	78	
	B2 employment	20,520	-	-	35	718,200	90	271	
	B8 - storage/warehouse plus extra 30% for CHE conditions (see note 3)	66,960	-	-	46	3,046,680	383	1,148	
	Energy Centre	3,600	-	-	160	576,000	72	217	
	Primary school	13,600	-	-	80	1,088,000	137	410	
	Hotel Pub	12,000	-	-	105	1,260,000	158	475	
	Community facility	3,200	-	-	160	512,000	64	193	
	Retail	5,600	-	-	165	924,000	116	348	
	St Davids Barracks	12,936	-	-	60	776,160	97	292	
							2,098	**6,294**	KVA
Total							**2,515**	**7,544**	KVA

Notes

1. Assume 24 hour day
2. Residential loading of 4,000 kwh/yr based on 1,200 kwh/yr for refrigeration, 1,200 kwh/yr for lighting, 1,000 kwh/yr for washing and 600 kwh/yr for miscellaneous plugged items
3. Extra 30% of bench mark energy rating assumed for providing controlled humidity environment conditions to storage warehouse facilities only

Proposed Gas Rule of Thumb Calcs For Bicester Garrison

05/08/2011

Site	Type	Area m2	No of Dwellings	Residential Loading (Est) KWh/dwelling/yr	Loading from TM46 (Est) KWh/m2/yr	Annual Average Loading KWh/yr	Average Loading KW	3x for peak Loading KW	
C	B8 - storage/warehouse	70,400	-	-	160	11,264,000	1,414	4,243	
	B1 - offices	1,200	-	-	120	144,000	18	54	
							1,433	**4,298**	KW
Graven Hill	Residential	-	1,900	20,600	-	39,140,000	4,915	14,745	
	B1 - offices	2,182	-	-	120	261,818	33	99	
	B2 employment	20,520	-	-	180	3,693,600	464	1,391	
	B8 - storage/warehouse	66,960	-	-	160	10,713,600	1,345	4,036	
	Energy Centre	3,600	-	-	180	648,000	81	244	
	Primary school	13,600	-	-	200	2,720,000	342	1,025	
	Hotel Pub	12,000	-	-	330	3,960,000	497	1,492	
	Community facility	3,200	-	-	420	1,344,000	169	506	
	Retail	5,600	-	-	170	952,000	120	359	
	St Davids Barracks	12,936	-	-	300	3,880,800	487	1,462	
							8,453	**25,358**	KW
							9,885	**29,655**	KW

Notes

1 Residential loading taken from Scotia Gas recommendations. Assumes an average loading for the year

Proposed Water Supply Calcs For Bicester Garrison

05/08/2011

Site	Type	Area m2	No of Dwellings	No. of people	Residential Loading l/s/dwelling	Domestic (excl houses) Loading l/s/ha	Average Loading l/s	3x for peak Loading l/s	
C	B8 - storage/warehouse	70,400	-		-	0.34	2.4	7.2	
	offices	1,200	-		-	2.08	0.2	0.7	
							2.6	**7.9**	l/s
Graven Hill	Residential	-	1,900		0.007	-	13.3	39.9	
	B1 - offices	2,182	-		-	2.08	0.5	1.4	
	B2 employment	20,520	-		-	0.17	0.3	1.0	
	B8 - storage/warehouse	66,960	-		-	0.17	1.1	3.4	
	Energy Centre	3,600	-		-	0.17	0.1	0.2	
	Primary school	27,200	-		-	0.89	2.4	7.3	
	Hotel Pub	12,000	-		-	0.54	0.6	1.9	
	Community facility	3,200	-		-	0.46	0.1	0.4	
	Retail	5,600	-		-	0.93	0.5	1.6	
	St David's Accommodation	-	-	378	0.00462	-	1.75	5.2	
							20.8	**62.4**	l/s
							23.4	**70.3**	l/s

Notes

1. Domestic flow to warehouses= 0.17 l/s/ha based on 150 l/d/100m2 (as stated in 'foul sewer design flow data file' by Peter Jones Surveyor magazine) divided by 24hr day divided by 3600
2. Domestic flow to schools= 0.89 l/s/ha based on 80 l/head/d (as stated in 'foul sewer design flow data file' by Peter Jones Surveyor magazine) 400 pupils per ha divided by 10hr day divided by 3600
3. Domestic flow to offices and surgery = 2.08 l/s/ha based on 750 l/d/100m2 (as stated in 'foul sewer design flow data file' by Peter Jones Surveyor magazine) divided by 10hr day divided by 3600
4. Domestic flow to leisure centre and community centre = 0.46 l/s/ha based on 50 l/head/d (as stated in 'foul sewer design flow data file' by Peter Jones Surveyor magazine) 400 people per ha divided by 12hr day divided by 3600
5. Domestic flow to retail= 0.93 l/s/ha based on 400 l/d/100m2 (as stated in 'foul sewer design flow data file' by Peter Jones Surveyor magazine) divided by 12hr day divided by 3600
6. Domestic flow to energy centre= 0.17 l/s/ha based on 150 l/d/100m2 (guess based on Peter Jones Magazine) divided by 24hr day divided by 3600
7. Flows compared with no. of employees x 200 l/head/day divided by 12 divided by 3600
8. Flows from site C are higher than expected due to the size of the warehouses
9. Domestic water supply flows to dwellings =0.007l/s/unit based on 4000 l/unit/day divided by peaking factor of 6 divided by 24 divided by 3600
10. hotel loading of 0.54l/s/ha based on 550l/day/room. Assume 100 bed hotel with 20 employees at 50l/day/employee as stated in 'foul sewer design flow data file' by Peter Jones Surveyor magazine=56,000 l/d. Divide this flow by the area/24/3600