

NV/09/3857NL01
13 August 2009

Declan Burke
Project Manager
Bord Gais Networks
Gasworks Road
Cork

Dear Declan,

RE: BORD GAIS DOCK ROAD SITE PRELIMINARY VIBRATION MONITORING – 18th MAY to 24th JUNE 2009

We are pleased to forward our comments in relation to the preliminary vibration monitoring carried out on the Bord Gais Dock Road development project in Limerick

1.0 BACKGROUND

AWN Consulting Limited was commissioned by Bord Gais to carry out preliminary vibration monitoring at two locations on their site on the Dock Road, Limerick. The vibration monitoring was carried out to ascertain the current ambient levels of vibration that are experienced at the site in advance of construction work that is due to take place on this site.

This survey has been conducted with a view to logging typical vibration levels at sensitive locations. The results of the vibration monitoring are reviewed and commented on in the following sections.

Dublin Office

The Tecpro Building,
Clonsaugh Business & Technology Park,
Dublin 17, Ireland.
T: + 353 1 847 4220
F: + 353 1 847 4257

AWN Consulting Limited
Registered in Ireland No. 319812
Directors: F Callaghan, C Dilworth,
T Donnelly, E Porter
Associate Director: D Kelly

2.0 VIBRATION SURVEY DETAILS

Specific details of the vibration monitoring are set out below.

2.1 Measurement Locations

Location 1

Location 1 is at the entrance to the site from the Dock Road (N69). The Dock Road is a national primary route which experiences a high volume of daily traffic. This location is also in close proximity to Limerick Port which caters for a large volume of HGV traffic. The geophone was hard mounted to the entrance wall. This wall is connected to an adjacent public house.

Location 2

Location 2 is the now redundant Bord Gais administration office. This building is located approximately 30m south east of the Dock Road entrance. The geophone was hard mounted onto the gable wall on the east side of the building.

2.2 Survey Period

Continual monitoring was carried out from 16th May to 24th June 2009.

2.3 Personnel and Instrumentation

Niall Vaughan (AWN) conducted the vibration survey.

The vibration measurements were conducted using an InstanTel Blastmate Type III Vibration Analyser with attached tri-axial geophone. This unit performs the measurement of vibration velocity in the three orthogonal axes (vertical, longitudinal and transverse). The unit stores the greatest peak particle velocity (ppv) measured in each axis during each measurement period. The period selected here was 5 minutes. As well as storing the greatest peak particle velocity during each measurement period, the unit also stores the frequency (in hertz) at which the greatest velocity occurred.

3.0 RESULTS / DISCUSSION

Tables 1 & 2 below review the measured levels at Locations 1 & 2 respectively and summarise the maximum vibration levels monitored during the current survey period in various frequency bands.

| Frequency of vibration | Tran PPV mm/s | Vert PPV mm/s | Long PPV mm/s |
|-----------------------------------|----------------------|----------------------|----------------------|
| <i>Threshold Vibration Values</i> | <i>0.127 – 0.254</i> | <i>0.127 – 0.254</i> | <i>0.127 – 0.254</i> |
| Less than 10Hz | 0.127 | 0.127 | 0.127 |
| 10 to 50Hz | 0.762 | 0.254 | 0.127 |
| 50 to 100Hz (and above) | 0.889 | 0.762 | 0.762 |

Table 1 Maximum Levels Monitored in Frequency Bands at Location 1

| Frequency of vibration | Tran PPV mm/s | Vert PPV mm/s | Long PPV mm/s |
|-----------------------------------|----------------------|----------------------|----------------------|
| <i>Threshold Vibration Values</i> | <i>0.127 – 0.254</i> | <i>0.127 – 0.254</i> | <i>0.127 – 0.254</i> |
| Less than 10Hz | 0.254 | 0.254 | 0.254 |
| 10 to 50Hz | 28.4 | 0.254 | 0.254 |
| 50 to 100Hz (and above) | 0.381 | 43.1 | 37.2 |

Table 2 Maximum Levels Monitored in Frequency Bands at Location 2

Vibration standards come in two varieties: those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

Guidance relevant to acceptable vibration within buildings is contained in the following documents:

- British Standard BS 7385-2 (1993): *Evaluation and measurement vibration in buildings Part 2: Guide to damage levels from ground borne vibration;*
- British Standard BS 5228-2 (2009): *Code of practice for noise and vibration control on construction and open sites Part 2:Vibration;*
- BRE – 403 (1995) – Damage to structures from ground-borne vibration 1995.

BS 7385 states there should typically be no cosmetic damage if transient vibration does not exceed 15mm/s at low frequencies rising to 20mm/s at 15Hz and 50mm/s at 40Hz and above. These guidelines relate to relatively modern buildings and should be reduced to 50% or less for more critical buildings or structures that are regarded to be compromised..

BS 5228 recommends that, for soundly constructed residential property, light commercial buildings and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak particle velocity of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and increasing to 50mm/s at 40Hz and above for intermittent vibration. For reinforced or framed structures or industrial and heavy commercial buildings and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak particle velocity of 50mm/s at 40Hz and above again for intermittent vibration. In the case of continuous vibration it states that these figures may need to be reduced by up to 50%. Below these vibration magnitudes minor damage is unlikely, although where there is existing damage these limits may be reduced by up to 50%.

The BRE403 document references guidance limits from the previous BS 5228: Part 4 (1992) which has been superseded by BS 5228: Part 2 (2009). It is understood that BRE403 is due to be revised.

The guidance limits from BS 7385 and BS 5228 are set out in Table 3 below.

| Type of structure | Frequency of vibration | |
|---|--|---|
| | 4 to 15Hz | 15Hz (and above) |
| Reinforced or framed structures Industrial and heavy commercial buildings | 50mm/s | 50mm/s |
| Unreinforced and light framed structures Residential or light commercial buildings | 15mm/s at 4Hz increasing to 20mm/s at 15Hz | 20mm/s at 15Hz increasing to 50mm/s at 40Hz and above |

Table 3 Peak Particle Velocities (ppv in mm/s) Below Which Transient Vibration Should Not Cause Cosmetic Building Damage

4.0 CONCLUSION

It is evident that the levels monitored from both locations during this period do not exceed the levels prescribed in Table 3.

The vibration levels recorded from Location 1 are regarded as being consistent as to what would be expected from vibration associated with traffic movements. These levels would be considered as "slight" and would reflect the levels of vibration emanating from traffic movements at a location such as this.

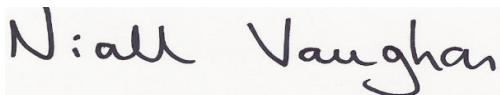
The vibration levels from Location 2 were generally consistent for this location. There was one occurrence on the 5th June at 13:19hrs when the recorded vibration levels experienced a rise relative to the former and latter readings. The levels and frequencies recorded in the transverse, vertical and longitudinal components were 28.4mm/s at 43Hz, 43.1mm/s above 100Hz and 37.2mm/s above 100Hz respectively. It is understood that there is a dancing and band practice studio to the rear of this location. It is possible that the source of this vibration may have emanated from this facility however it could also be attributed to a different source.

Notwithstanding the levels recorded on 5th June at Location 2, there were no noticeable sources of vibration which is borne out by the values recorded. These values were generally at threshold levels.

It would be expected that vibration levels from demolition events or similar occurrences and similar distances from the structures of interest would result in similar levels of vibration assuming similar ground composition.

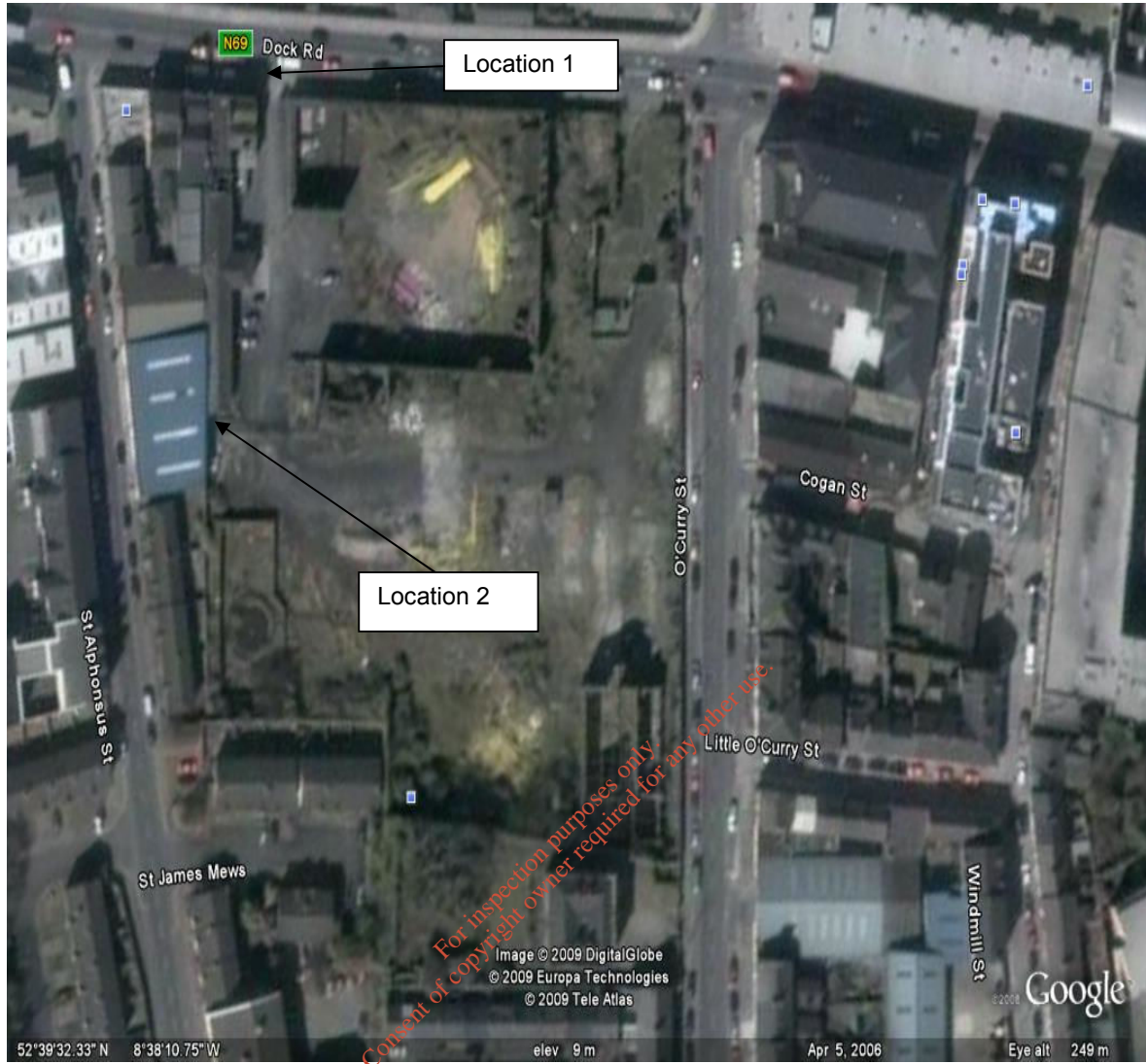
Please do not hesitate to contact this office if you have any comments in relation to the content of this document.

Yours sincerely,



NIALL VAUGHAN
Senior Acoustic Consultant

encl. raw measurement data (Excel spreadsheet)



Limerick Gasworks

Traffic Impact Assessment

Scoping Report

September 2010



St John's House
Queen Street
Manchester
M2 5JB
UK

T 0161 8324542
F 0161 8352038

*For inspection purposes only.
Consent of copyright owner required for any other use.*

Document Control Sheet

Project Title Scoping Report

Report Title Limerick Gasworks

Revision 1st Issue

Status For Issue

Control Date September 2010

Record of Issue

| Issue | Status | Author | Date | Check | Date | Authorised | Date |
|-----------------------|--------|-----------|-----------|--------|-----------|------------|-----------|
| 1 st Issue | issue | E Sweeney | Sept 2010 | J Lyon | Sept 2010 | T Brown | Sept 2010 |
| | | | | | | | |

Distribution

| Organisation | Contact | Copies |
|--------------|---------|--------|
| | | |
| | | |

Contents

| | |
|--|-----------|
| Limerick Gasworks | 1 |
| 1 Introduction | 1 |
| 2 Local Highway Network | 2 |
| 3 Predicted Traffic Movements | 4 |
| 4 Access Arrangements | 6 |
| 5 Traffic Routes | 7 |
| 6 Special Traffic Movements | 8 |
| 7 Road Permits | 9 |
| 8 Protected Structures | 10 |
| 9 Summary | 11 |

For inspection purposes only
Consent of copyright owner required for any other use.

1 Introduction

- 1.1. This scoping note has been prepared in advance of a planning application being made to remediate the land at the now vacant Limerick Gasworks on behalf of Bord Gáis.
- 1.2. A meeting was held on-site between Mouchel and Rory McDermot, Highway Officer, of Limerick City Council (LCC) on 10.08.10, during which the Council's requirements for Traffic Impact Assessment were discussed.
- 1.3. This Report is presented to Bord Gáis in respect of Limerick Gasworks and may not be used or relied on by any other person or by the client in relation to any other matters not covered specifically by the scope of this Report.
- 1.4. Notwithstanding anything to the contrary contained in the Report, Mouchel Limited is obliged to exercise reasonable skill, care and diligence in the performance of the services required by Bord Gáis and Mouchel Limited shall not be liable except to the extent that it has failed to exercise reasonable skill, care and diligence, and this report shall be read and construed accordingly.
- 1.5. This Report has been prepared by Mouchel Limited. No individual is personally liable in connection with the preparation of this Report. By receiving this Report and acting on it, the client or any other person accepts that no individual is personally liable whether in contract, tort, for breach of statutory duty or otherwise.

For inspection purposes only
Consent of copyright owner required for any other use

2 Local Highway Network

- 2.1. The site (shown on Figures 1 & 2 attached) lies to the south west of Limerick City Centre on Dock Road (N69), on the opposite side of Dock Road from Limerick Docks, as seen on the aerial photograph below.
- 2.2. LCC have advised that Average Annual Daily Traffic levels (AADT) on Dock Road and O'Curry Street are 19,000 and 3,500 vehicles respectively.
- 2.3. Peak traffic periods in the area are considered by LCC to be between the hours of 0700-0930 and 1630-1830 Monday to Friday. Quiet periods are considered to be Monday, Tuesday and Wednesday evenings and weekends.
- 2.4. Each of the surrounding roads meet with give-way junctions. Right turns are prohibited from O'Curry Street at the junction O'Curry Street/Dock Road junction, and pedestrians are catered for with a pedestrian refuge island. We understand, that this junction is to be upgraded to signal control in the coming months.
- 2.5. The site is bound to the north by Dock Road to the east by O'Curry Street, a former An Garda Síochána training building and residential properties lie to the south and a Public House and residential properties to the west.
- 2.6. Dock Road is a National Secondary Road with two westbound lanes and one eastbound in the vicinity of the site; it is subject to the national speed limit of 100km/h (62.5 mph). Double yellow lines are present on both sides of the road.
- 2.7. The remaining three roads that bound the site are all single lane two-way roads. Each of these roads have painted parking bays on each side of the carriageway between the hours of 0930-1730 Monday to Friday with a 2 hour stay for the most part.
- 2.8. The Limerick Tunnel has recently been opened, the link road associated with this tunnel links the Dock Road to the N7 which leads east, the route map for the tunnel is shown on Figure 3.
- 2.9. The Tunnel consists of:
 - 9.75km of two lane dual carriageway
 - 2.3km of single lane dual carriageway
 - 675m long tunnel under the River Shannon
 - 750m causeway across Bunlicky Lake
 - 11 Bridges
 - 6 Underpasses and 8 Culverts

- 2 Toll Plazas

2.10. The Limerick South Ring Road Project consisted of two phases.

Phase I

- A connection of the Dublin Road N7 to the Cork Road N20/21, this was completed in May 2004.

Phase II

- The Limerick Tunnel connecting the Dublin Road, N7 to the Ennis Road N18. This is now completed and forms the final part of the bypass around Limerick City this links all national routes converging on the city.

*For inspection purposes only.
Consent of copyright owner required for any other use.*

3 Predicted Traffic Movements

Risk

LCC may consider that the predicted level of vehicular movements may have a detrimental affect on the local road network and therefore require mitigation measures.

Mitigation

Rory McDermot of LCC confirmed during a scoping meeting that any impact was likely to be minimal and therefore no capacity assessments would be required based upon figures provided to date.

- 3.1. At this stage there is estimated to be in the region of 2 or 3 construction vehicles entering and leaving the site each day during the remediation works. Further details of expected traffic numbers are listed below; these numbers are the total for each period stated - not per day (apart from Staff/ general maintenance & deliveries).

Phase 1 (Pump & Treat works)

- Delivery to site (equipment, stores, machinery etc) - 6 construction vehicles (low loaders) in first 2 weeks
- Export of materials (allow 400 tonnes of DNAPL) - 20 construction vehicles (20t wagons) over a period of 12 months
- Removal from site (equipment, stores, machinery etc) - 6 construction vehicles in the last 2 weeks
- Staff/ general maintenance & deliveries - 10 cars, 2 vans and a lorry per day. The busiest periods for this traffic is expected to be at the beginning and end of each day.

Phase 2 (Stabilisation works)

- Delivery to site (equipment, stores, machinery etc) - 6 construction vehicles (low loaders) in first 2 weeks
- Export of materials (allow 6,500 tonnes of heavily contaminated soils, equating to 10% of total volume to be treated) - 325 construction vehicles (20t wagons) over a period of 12 months
- Import of binder (cement, pfa etc) - allow 3,250 tonnes (5% by volume of total volume to be treated) - 163 construction vehicles over a 12 month period
- Removal from site (equipment, stores, machinery etc) - say 6 construction vehicles in the last 2 weeks

- Staff/ general maintenance & deliveries - say 10 cars, 2 vans and a lorry per day. The busiest periods for this traffic is expected to be at the beginning and end of each day.
- 3.2. The impact these vehicles may have on capacity of the local highway network was discussed during the meeting set out in Section 1. It was concluded that any impact was likely to be minimal and therefore no capacity assessments would be required based upon these figures.
- 3.3. Should these figures increase Mouchel will discuss these with LCC to determine whether any capacity assessments are necessary and mitigation measures required.

*For inspection purposes only.
Consent of copyright owner required for any other use.*

4 Access Arrangements

Risk

A risk that existing vehicular access points will not be suitable for construction traffic.

Mitigation

Use of two existing vehicular access points, one on Dock Road and one on O'Curry Street was discussed with Rory McDermot of LCC on site and no objections were raised to using either of these accesses.

- 4.1. There are currently 3 vehicular access points to the site, one on O'Curry Street and the remaining two on Dock Road. The eastern access on Dock Road does not have sufficient width to accommodate the size of vehicles used during the remediation works, so only the westernmost access on Dock Road would be used for access for this purpose.
- 4.2. At this stage, it is proposed that access to the site would be made via the existing access points described above.
- 4.3. There is potential for construction vehicles to wait in the existing parking bays on O'Curry Street if required. This would require further discussion with the Council should the scheme come forward.

For inspection purposes only.
Consent of copyright owner required for any other use.

5 Traffic Routes

Risk

The Local Network may not be suitable for the number and size of construction vehicles predicted.

Mitigation

Rory McDermot of LCC confirmed that all traffic should turn left out of the site along Dock Road and onto the new Tunnel Link Road which leads directly to the N7 to the east. These roads have all been designed to accommodate large vehicles and high traffic levels, as confirmed by LCC on-site.

- 5.1. It is understood at the time of writing that the majority of material removed from the site will travel by road to a central area east of the site.
- 5.2. LCC have stated that they would prefer construction traffic not to enter or leave the site through Limerick City Centre and that the new Limerick Tunnel Link be used to access the N7.
- 5.3. Construction Traffic travelling through Limerick City would add further to traffic congestion in the city and increase CO2 emissions.
- 5.4. At this stage, therefore, it is intended that HGVs would turn left out of the site onto Dock Road (N69), before joining the N7 via the new Limerick Tunnel Link road and onto the motorway network (M7) which leads to the east. Shown in Figure 4.
- 5.5. An alternative route to the east would be via the Tunnel and roads north of the site. This route would be much longer and through lesser quality roads than the route described in 5.4 and is therefore not considered appropriate.

6 Special Traffic Movements

Risk

An increase in traffic movements leading to traffic congestion in the area.

Mitigation

Rory McDermot of LCC confirmed on-site that should this take place a Traffic Management scheme will need to be agreed with them beforehand. This may include a manually controlled "Stop/Go" arrangement. Notice will also be required as the occupiers of the Docks opposite to the site often have large movements of vehicles over a 12 hour period. These events therefore, must not clash.

- 6.1. The possibility of a "one off event" removing material from the site by road to the Docks then by sea to treatment facilities overseas was discussed during the meeting.
- 6.2. It is estimated that the vehicle movements in this scenario may total 100 construction vehicles in a 12 hour period.
- 6.3. LCC have confirmed that should this take place a Traffic Management scheme will need to be agreed with them beforehand. This may include a manually controlled "Stop/Go" arrangement at the site access due to the higher volume of traffic accessing the site.
- 6.4. Additionally, the docks on the opposite side of Dock Road to the site experience occasional large volumes of traffic, with the occupiers of the Docks informing LCC when these movements are due to take place. Therefore, LCC would require notice should movements to the former Gasworks increase above the levels set out in Section 3 so that both sites do not add significantly to traffic levels in the area at the same time.

7 Road Permits

Risk

In order to transport Abnormal Loads, Wide Loads and Contaminated Loads permits are required to be sought by the appointed contractor from each Country travelled through.

Mitigation

Permits are to be sought from each County by the appointed contractor.

- 7.1. As is necessary, permits will be sought with LCC and each of the Counties that construction traffic travel through. These will include Abnormal Loads, Wide Loads and Contaminated Load Permits. The appointed Contractor will be responsible for gaining these permits.

*For inspection purposes only.
Consent of copyright owner required for any other use.*

8 Protected Structures

Risk

Protected structures on site may be damaged during remediation works.

Mitigation

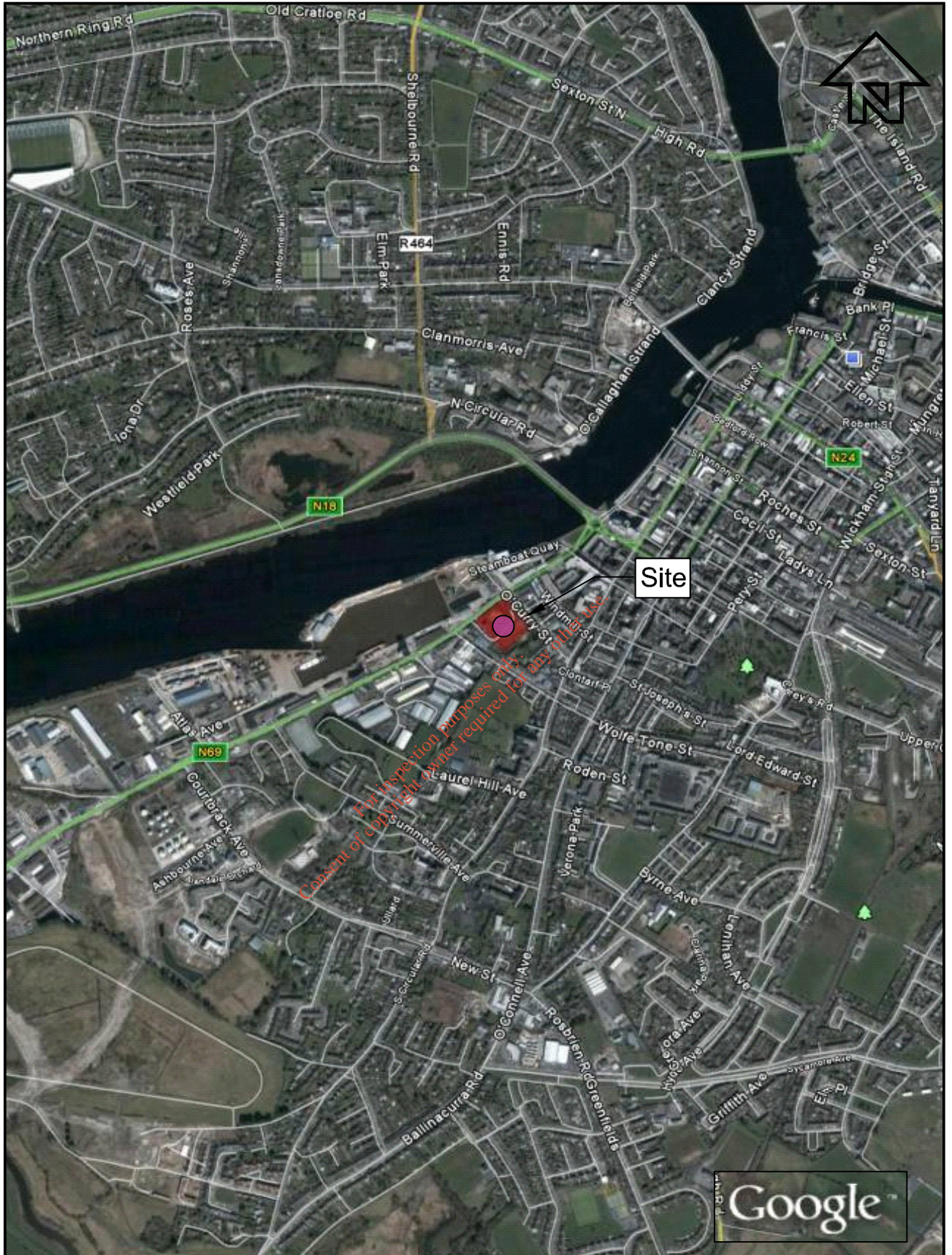
Protected structures to be identified by LCC and a Plan agreed with LCC's Planning, Environmental and Highways Department to ensure that these structures are not affected by construction vehicles.

- 8.1. During a meeting with LCC's Planning Department the protected structures on the site were discussed.
- 8.2. Should the scheme come forward, a Plan will be agreed with LCC's Planning, Environmental and Highways Departments to ensure that these structures are not affected by construction vehicles.

*For inspection purposes only.
Consent of copyright owner required for any other use.*

9 Summary

- 9.1. This note provides a summary of the scoping meeting regarding all traffic required for removal of material from the former Gasworks site, Dock Road Limerick including construction traffic, staff, general maintenance and delivery vehicles.
- 9.2. Material is expected to be removed by road to a central area east of the site. with in the region of 2 or 3 construction vehicles arriving at and leaving the site per day.
- 9.3. The possible impact on highway capacity of this traffic was discussed on site and it was confirmed by LCC due to the minimal impact expected that capacity assessments would not be required.
- 9.4. LCC have stated that they would prefer construction traffic not to enter or leave the site through Limerick City Centre and that the new Limerick Tunnel Link be used to access the N7.
- 9.5. At this stage, therefore, it is intended that HGVs would turn left out of the site onto Dock Road (N69), before joining the N7 via the new Limerick Tunnel Link road and onto the motorway network (M7) which leads to the east. Shown in Figure 4.
- 9.6. The possibility of increasing movements as a “one off event” in order to take material to the Dock for travel by sea were discussed. LCC will require a Traffic Management Plan to be agreed between them and Bord Gáis in order for vehicles to access the site safely and not have a detrimental affect on others using the local highway network.
- 9.7. Road Permits will require to be sought in order to transport Abnormal Loads, Wide Loads and Contaminated Material from LCC and each County which material is being carried through to their destination.
- 9.8. There are Protected Structures on the site, and agreement will be required between LCC’s planning department and Bord Gáis to ensure that these structures are not compromised during the remediation process.
- 9.9. We have used our reasonable endeavours to provide information that is correct and accurate and have discussed above the reasonable conclusions that can be reached on the basis of the information available.



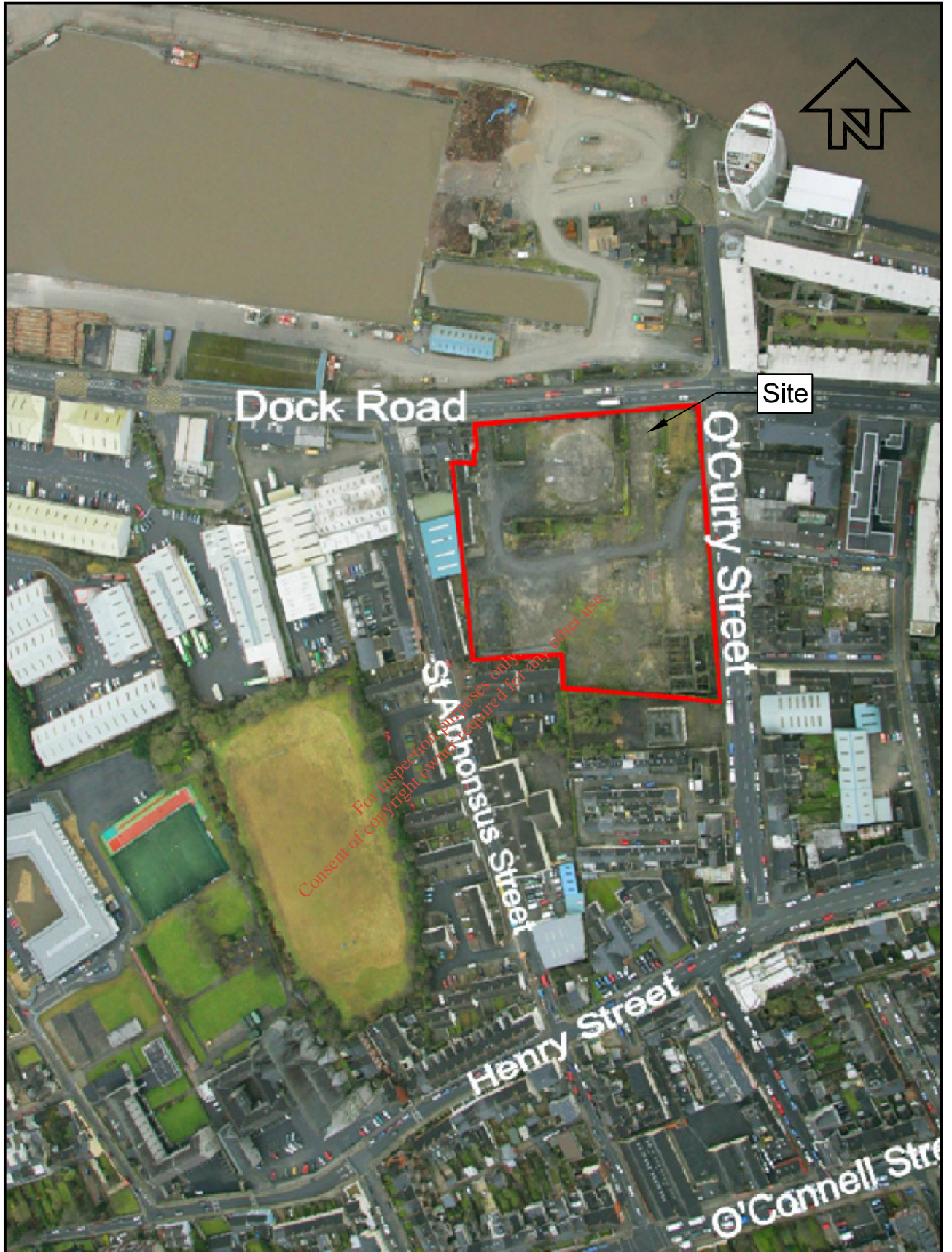
© Mouchel 2006

SCALE: NTS



Site Location Plan A
Limerick Gasworks

FIGURE 1



© Mouchel 2006

SCALE: NTS



Site Location Plan B
Limerick Gasworks

FIGURE 2



© Mouchel 2006

SCALE: NTS



Construction Vehicle Route
Limerick Gasworks

FIGURE 4