

## **A3 - Building damage classification drawings - December 2012 Stage C Drawing Issue**

Drawing numbers:

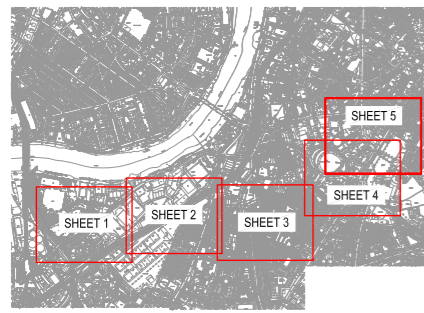
GRNLEB-BHD-TU-XX-DR-GEO-14605-05-01

GRNLEB-BHD-TU-XX-DR-GEO-14606-05-01

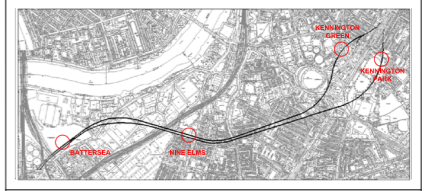
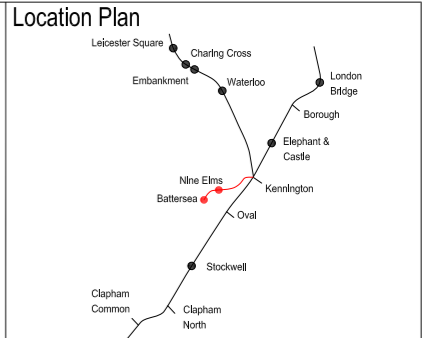
GRNLEB-BHD-TU-XX-DR-GEO-14607-05-01

GRNLEB-BHD-TU-XX-DR-GEO-14608-05-01

GRNLEB-BHD-TU-XX-DR-GEO-14609-06-01



- BUILDING DAMAGE CLASSIFICATION**
- NEGLIGIBLE
  - VERY SLIGHT
  - SLIGHT
  - MODERATE
  - SEVERE
- LOW RISK**
- ASSETS REQUIRING CONSULTATION WITH NETWORK RAIL
- 5MM SETTLEMENT CONTOUR
- 10MM SETTLEMENT CONTOUR
11. EDF CABLE TUNNEL: CRITICAL ASSET THAT WILL REQUIRE MONITORING. SEE SECTION 7 IN THE SETTLEMENT REPORT



**Notes:**

1. ALL CONTOURS SHOWN ARE IN MM
2. THE BUILDING DAMAGE CLASSIFICATION IS BASED ON 'ASSESSMENT METHODS USED IN DESIGN FOR CROSSRAIL, (BURLAND ET AL., 1977)
3. ANALYSIS HAS BEEN BASED ON THE INFORMATION AVAILABLE AT THE TIME OF DESIGN.
4. MODELLING ONLY TAKES ACCOUNT OF THE IMPACT OF THE NORTHERN LINE EXTENSION AND ASSOCIATED INFRASTRUCTURE E.G. STATION BOXES. THE EFFECTS OF BATTERSEA POWER STATION REDEVELOPMENT HAVE NOT BEEN INCORPORATED.
5. TUNNEL ALIGNMENT IS BASED ON DRAWING GRNLEB-HGL-00-XX-M2-PHY-00010-02-01.
6. CROSS PASSAGE LOCATION IS BASED ON DRAWING GRNLEB-HGL-00-XX-DR-TUN-20402-03-01.
7. SUBSTATION AT KENNINGTON PARK IS BASED ON DRAWING GRNLEB-BHD-00-XX-STR-3320-01-01. ADIT BETWEEN SHAFT AND HEADHOUSE AT KENNINGTON GREEN IS BASED ON DRAWING GRNLEB-HGL-00-XX-DR-TUN-23000-03-01.
8. SETTLEMENT DUE TO RUNNING TUNNELS ARE BASED ON A 1.5% VOLUME LOSS. SEE SETTLEMENT REPORT FOR FULL DETAILS ON OTHER TUNNEL TYPES.
9. SETTLEMENT DUE TO STATION EXCAVATIONS ARE BASED ON CURVES FROM CIRIA CS80 FIGURE 2.9(B). EXCEPT THE ADIT AT KENNINGTON GREEN WHICH IS BASED ON CIRIA CS80 FIGURE 2.12. THE GROUND MOVEMENT CURVES ARE CONSIDERED TO REPRESENT 100% GROUND MOVEMENT PROFILE. HOWEVER THE STATION EXCAVATIONS WILL HAVE AN INCREASED STIFFNESS AT THE CORNERS, THEREFORE THE SETTLEMENT CONTOURS AND BUILDING DAMAGE CLASSIFICATIONS AROUND THE EXCAVATIONS ARE CONSERVATIVE.
10. SETTLEMENT DUE TO EXCAVATIONS OF SHAFTS IS BASED ON THE LONDON UNDERGROUND MANUAL OF GOOD PRACTICE USING G-058 NEW AND BOWERS (1914).
11. THE MAP IS BASED ON ORDNANCE SURVEY, REPRODUCED FROM LANDRANGER 1:50,000 MAP BY PERMISSION OF ORDNANCE SURVEY © ON BEHALF OF THE CONTROLLER OF HER MAJESTY'S STATIONARY OFFICE. © CROWN COPYRIGHT 1988. ALL RIGHTS RESERVED. LICENSE NUMBER: AL 10005517. THE ORDNANCE SURVEY DATA USED WAS THAT AVAILABLE AT THE TIME OF 2012 REFERENCE DESIGN, AND THUS ANY RECENT CHANGES WILL NOT BE REFLECTED IN THE MAPS USED FOR ANALYSIS.
12. ALL BUILDINGS WITHIN CATEGORY 3 (MODERATE) OR ABOVE ARE SUBJECT TO A FURTHER PHASE OF ASSESSMENT.
13. ALL LISTED BUILDINGS WILL BE SUBJECT TO A FURTHER PHASE OF ASSESSMENT.
14. DEFECTS SURVEYS WILL BE REQUIRED ON ALL BUILDINGS PREDICTED TO EXPERIENCE 10MM OR MORE OF MOVEMENT.
15. DEFECTS SURVEYS WILL BE REQUIRED ON ALL LISTED BUILDING PREDICTED TO EXPERIENCE 1MM OR MORE OF MOVEMENT.
16. RECOMMENDED MONITORING FOR CRITICAL ASSETS IS GIVEN IN SECTION 7 OF THE SETTLEMENT REPORT. (GRNLEB-BHD-00-XX-TNT-GEO-00049)
17. ANY MONITORING PROCEDURE IS TO FOLLOW RELEVANT GUIDANCE PROVIDED BY THE BRITISH TUNNELLING SOCIETY (2004).

| Rev   | By  | Chkd | Apprvd | Date     | Description                     |
|-------|-----|------|--------|----------|---------------------------------|
| 05-01 | JMB | JD   | JMB    | 09/02/13 | REFINED ANALYSIS                |
| 04-01 | JMB | JD   | SL     | 01/02/13 | INCLUSION OF ADITS & SUBSTATION |
| 03-01 | JMB | JD   | SL     | 18/01/13 | CROSS PASSAGES ADDED            |
| 02-01 | JMB | JP   | JP     | 02/11/12 | CHANGE IN ALIGNMENT             |
| 01-01 | JMB | JD   | JP     | 19/10/12 | FOR INFORMATION                 |

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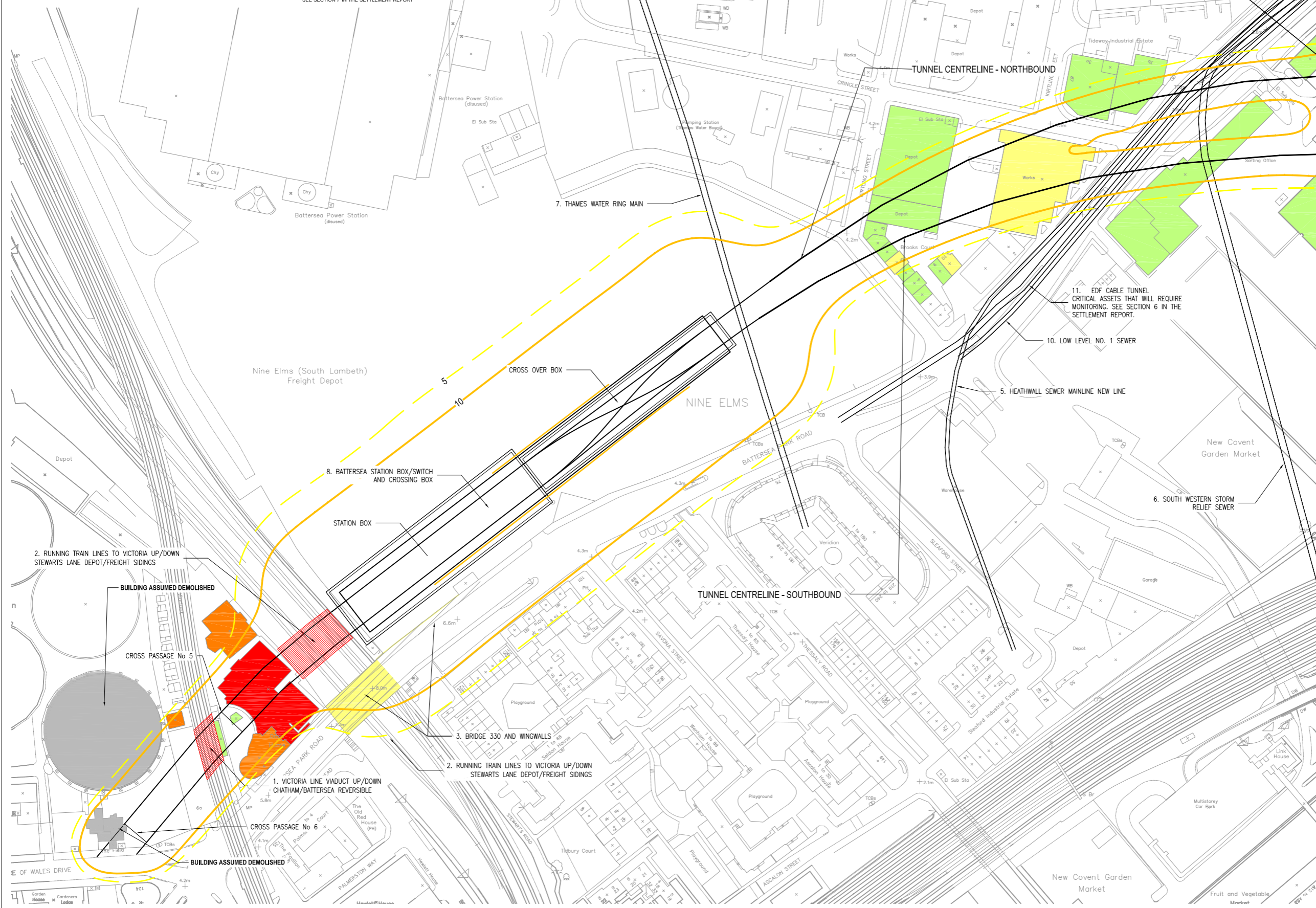
Project: **NORTHERN LINE EXTENSION TO BATTERSEA TWAO FOR TIL**

Drawing: **BUILDING DAMAGE CLASSIFICATION & CRITICAL ASSETS SHEET 1 OF 5**

Subtality: **S4 - FORMAL ISSUE TO CLIENT**

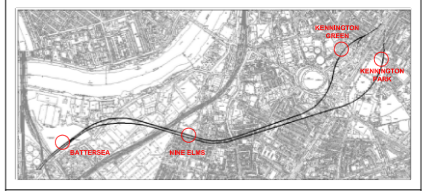
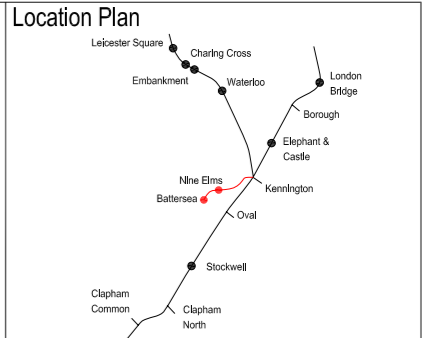
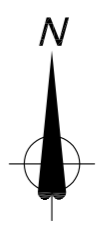
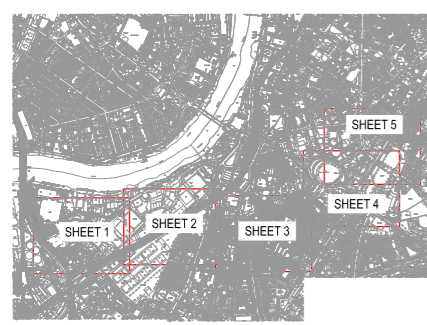
Drawn by: JMB Date: 19/02/13  
 Checked by: JD Date: 19/02/13  
 Approved by: SL Date: 19/02/13  
 Drawing Scale: 1:1000

Drawing No.: **GRNLEB-BHD-TU-XX-DR-GEO-14605** Revision: **05-01**



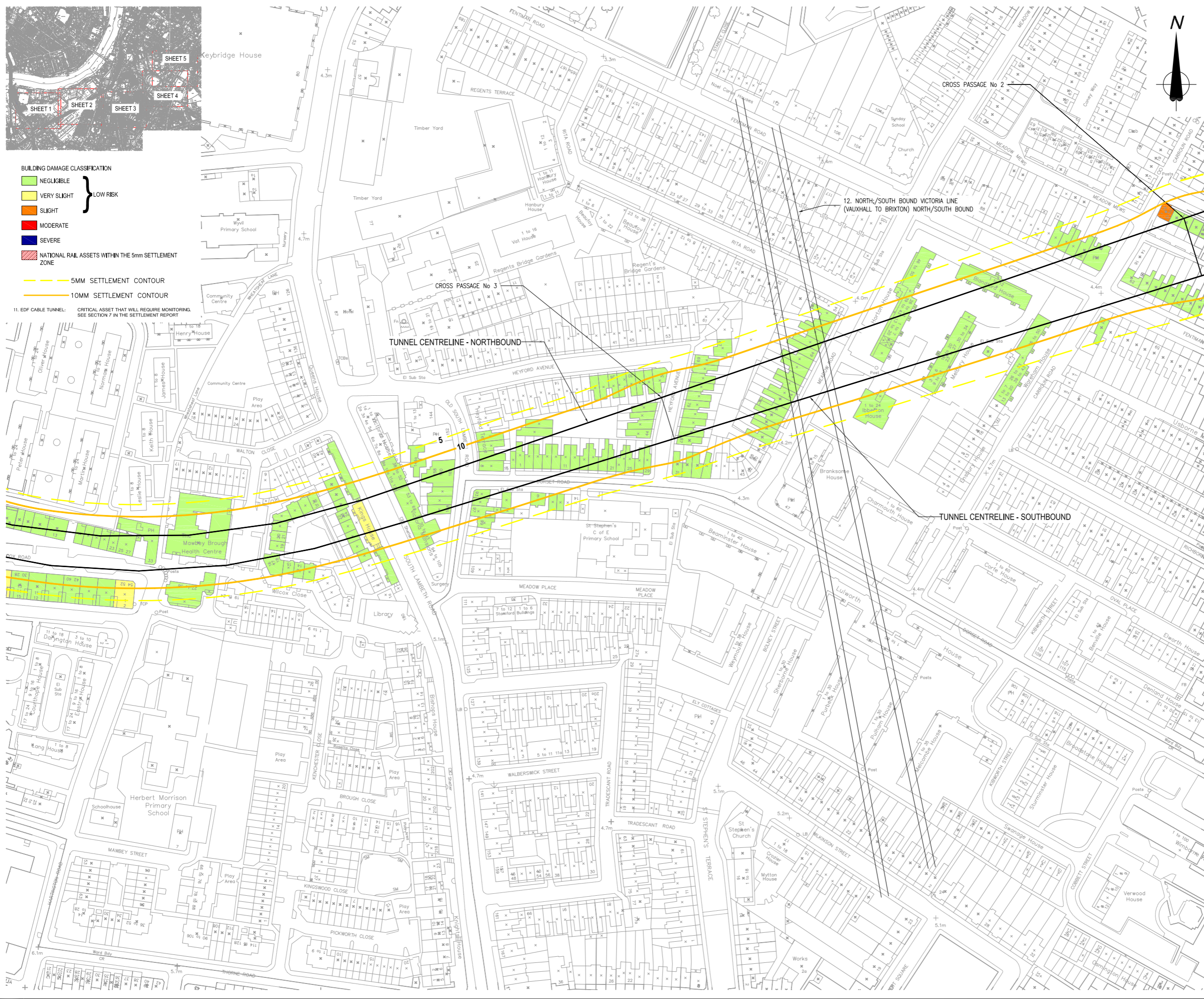
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- BUILDING DAMAGE CLASSIFICATION**
- NEGLIGIBLE
  - VERY SLIGHT
  - SLIGHT
  - MODERATE
  - SEVERE
- LOW RISK**
- NEGLIGIBLE
  - VERY SLIGHT
- 5MM SETTLEMENT CONTOUR**
- 10MM SETTLEMENT CONTOUR**

11. EDF CABLE TUNNEL: CRITICAL ASSET THAT WILL REQUIRE MONITORING. SEE SECTION 7 IN THE SETTLEMENT REPORT



- Notes:**
1. ALL CONTOURS SHOWN ARE IN MM
  2. THE BUILDING DAMAGE CLASSIFICATION IS BASED ON ASSESSMENT METHODS USED IN DESIGN FOR CROSSRAIL (BURLAND ET AL., 1977)
  3. ANALYSIS HAS BEEN BASED ON THE INFORMATION AVAILABLE AT THE TIME OF DESIGN.
  4. MODELLING ONLY TAKES ACCOUNT OF THE IMPACT OF THE NORTHERN LINE EXTENSION AND ASSOCIATED INFRASTRUCTURE E.G. STATION BOXES. THE EFFECTS OF BATTERSEA POWER STATION REDEVELOPMENT HAVE NOT BEEN INCORPORATED.
  5. TUNNEL ALIGNMENT IS BASED ON DRAWING GRNLEB-HGL-00-XX-M2-PWY-00010-02-01.
  6. CROSS PASSAGE LOCATION IS BASED ON DRAWING GRNLEB-HGL-00-XX-DR-TUN-20402-03-01.
  7. SUBSTATION AT KENNINGTON PARK IS BASED ON DRAWING GRNLEB-BHD-ST-XX-DR-STRE-3120-01-01. ADIT BETWEEN SHAFT AND HEADHOUSE AT KENNINGTON GREEN IS BASED ON DRAWING GRNLEB-HGL-00-XX-DR-TUN-23000-03-01.
  8. SETTLEMENT DUE TO RUNNING TUNNELS ARE BASED ON A 1.5% VOLUME LOSS. SEE SETTLEMENT REPORT FOR FULL DETAILS ON OTHER TUNNEL TYPES.
  9. SETTLEMENT DUE TO STATION EXCAVATIONS ARE BASED ON CURVES FROM CIRIA C550 FIGURE 2.9(B). EXCEPT THE ADIT AT KENNINGTON GREEN WHICH IS BASED ON CIRIA C550 FIGURE 2.12. THE GROUND MOVEMENT CURVES ARE CONSIDERED TO REPRESENT 100% GROUND MOVEMENT PROFILE. HOWEVER THE STATION EXCAVATIONS WILL HAVE AN INCREASED STIFFNESS AT THE CORNERS. THEREFORE THE SETTLEMENT CONTOURS AND BUILDING DAMAGE CLASSIFICATIONS AROUND THE EXCAVATIONS ARE CONSERVATIVE.
  10. SETTLEMENT DUE TO EXCAVATIONS OF SHAFTS IS BASED ON THE LONDON UNDERGROUND MANUAL OF GOOD PRACTICE USING G-058 NEW AND BOWERS (1994).
  11. THE MAP IS BASED ON ORDNANCE SURVEY, REPRODUCED FROM LANDRANGER 1:50,000 MAP BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF THE CONTROLLER OF HER MAJESTY'S STATIONARY OFFICE. © CROWN COPYRIGHT 1988. ALL RIGHTS RESERVED. LICENSE NUMBER: AL 10005517. THE ORDNANCE SURVEY DATA USED WAS THAT AVAILABLE AT THE TIME OF 2012 REFERENCE DESIGN. AND THUS ANY RECENT CHANGES WILL NOT BE REFLECTED IN THE MAPS USED FOR ANALYSIS.
  12. ALL BUILDINGS WITHIN CATEGORY 3 (MODERATE) OR ABOVE ARE SUBJECT TO A FURTHER PHASE OF ASSESSMENT.
  13. ALL LISTED BUILDINGS WILL BE SUBJECT TO A FURTHER PHASE OF ASSESSMENT.
  14. DEFECTS SURVEYS WILL BE REQUIRED ON ALL BUILDINGS PREDICTED TO EXPERIENCE 10MM OR MORE OF MOVEMENT.
  15. DEFECTS SURVEYS WILL BE REQUIRED ON ALL LISTED BUILDING PREDICTED TO EXPERIENCE 1MM OR MORE OF MOVEMENT.
  16. RECOMMENDED MONITORING FOR CRITICAL ASSETS IS GIVEN IN SECTION 7 OF THE SETTLEMENT REPORT. (GRNLEB-BHD-00-XX-TNT-GEN-00049)
  17. ANY MONITORING PROCEDURE IS TO FOLLOW RELEVANT GUIDANCE PROVIDED BY THE BRITISH TUNNELLING SOCIETY (2004).

| Rev   | By  | Chkd | Apprvd | Date     | Description                     |
|-------|-----|------|--------|----------|---------------------------------|
| 05-01 | JMB | JD   | SL     | 19/02/13 | NOTES AMENDED                   |
| 04-01 | JMB | JD   | SL     | 01/02/13 | INCLUSION OF ADITS & SUBSTATION |
| 03-01 | JMB | JD   | SL     | 18/01/13 | CROSS PASSAGES ADDED            |
| 02-01 | JMB | JP   | JP     | 02/11/12 | CHANGE IN ALIGNMENT             |
| 01-01 | JMB | JD   | JP     | 19/10/12 | FOR INFORMATION                 |

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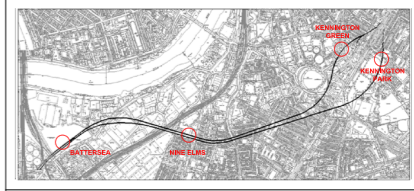
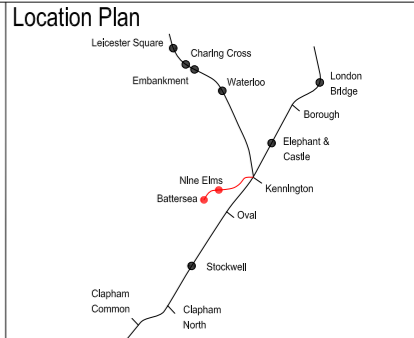
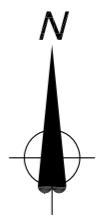
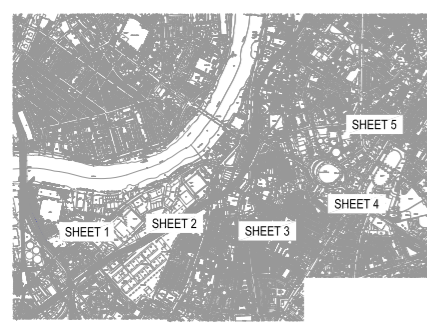
Project: **NORTHERN LINE EXTENSION TO BATTERSEA TWAO FOR T1L**

Drawing: **BUILDING DAMAGE CLASSIFICATION & CRITICAL ASSETS SHEET 3 OF 5**

Suitability: **S4 - FORMAL ISSUE TO CLIENT**

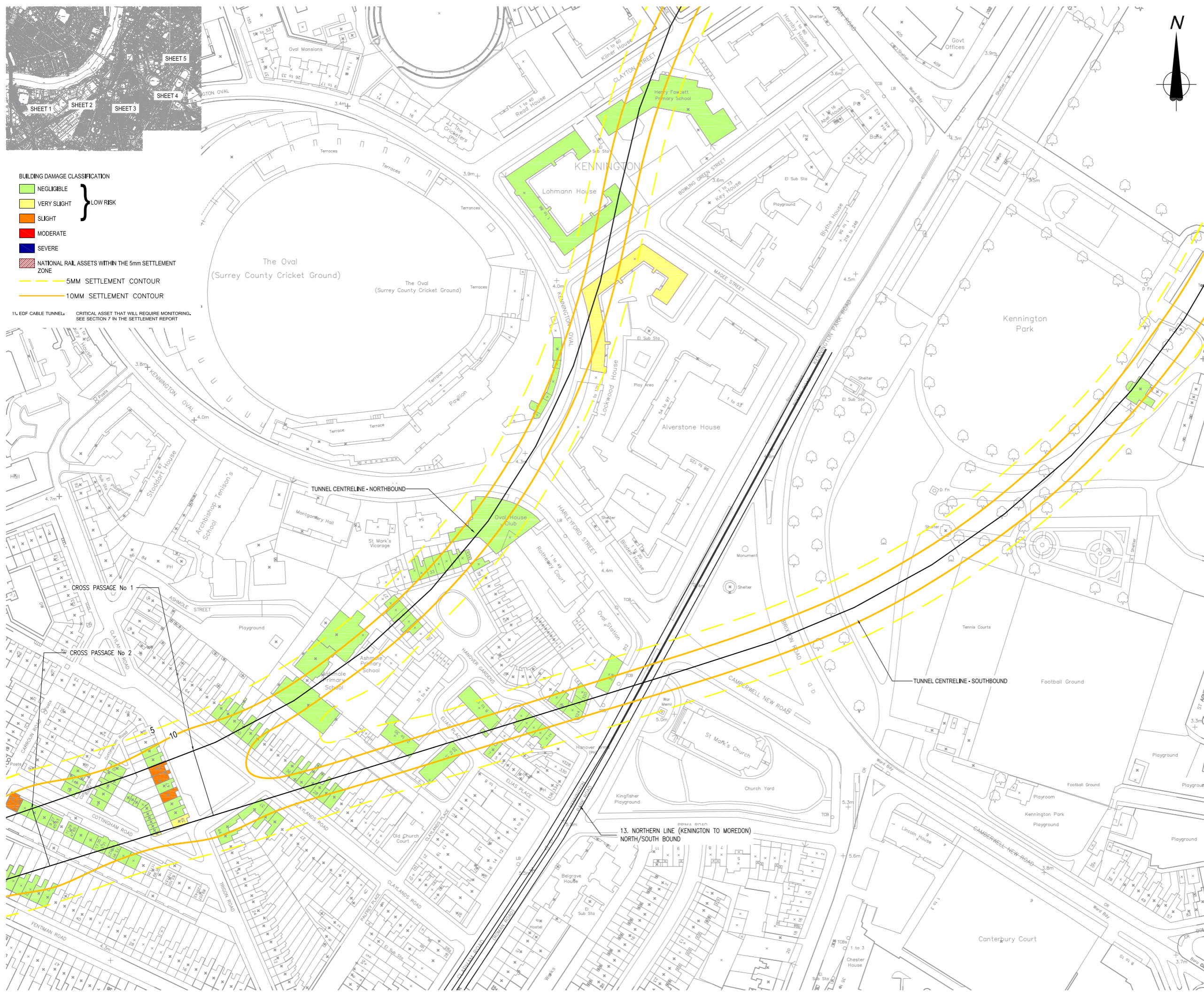
Drawn by: JMB Date: 19/02/13  
Checked by: JD Date: 19/02/13  
Approved by: SL Date: 19/02/13  
Drawing Scale: 1:1000

Drawing No: **GRNLEB-BHD-TU-XX-DR-GEO-14607** Revision: **05-01**



- BUILDING DAMAGE CLASSIFICATION**
- NEGLIGIBLE
  - VERY SLIGHT
  - SLIGHT
  - MODERATE
  - SEVERE
- LOW RISK**
- NEGLIGIBLE
  - VERY SLIGHT
- NATIONAL RAIL ASSETS WITHIN THE 5mm SETTLEMENT ZONE**
- 5MM SETTLEMENT CONTOUR
  - 10MM SETTLEMENT CONTOUR

11. EDF CABLE TUNNELS CRITICAL ASSET THAT WILL REQUIRE MONITORING. SEE SECTION 7 IN THE SETTLEMENT REPORT



**Notes:**

1. ALL CONTOURS SHOWN ARE IN MM
2. THE BUILDING DAMAGE CLASSIFICATION IS BASED ON 'ASSESSMENT METHODS USED IN DESIGN FOR CROSSHAIR (BURLAND ET AL. 1977)
3. ANALYSIS HAS BEEN BASED ON THE INFORMATION AVAILABLE AT THE TIME OF DESIGN.
4. MODELLING ONLY TAKES ACCOUNT OF THE IMPACT OF THE NORTHERN LINE EXTENSION AND ASSOCIATED INFRASTRUCTURE E.G. STATION BOXES. THE EFFECTS OF BATTERSEA POWER STATION REDEVELOPMENT HAVE NOT BEEN INCORPORATED.
5. TUNNEL ALIGNMENT IS BASED ON DRAWING GRNLEB-HGL-00-XX-M2-PHY-00010-02-01.
6. CROSS PASSAGE LOCATION IS BASED ON DRAWING GRNLEB-HGL-00-XX-DR-TUN-20402-03-01.
7. SUBSTATION AT KENNINGTON PARK IS BASED ON DRAWING GRNLEB-BHD-ST-XX-DR-3120-01-01, ADIT BETWEEN SHAFT AND HEADHOUSE AT KENNINGTON GREEN IS BASED ON DRAWING GRNLEB-HGL-00-XX-DR-TUN-23000-03-01.
8. SETTLEMENT DUE TO RUNNING TUNNELS ARE BASED ON A 1.5X VOLUME LOSS. SEE SETTLEMENT REPORT FOR FULL DETAILS ON OTHER TUNNEL TYPES.
9. SETTLEMENT DUE TO STATION EXCAVATIONS ARE BASED ON CURVES FROM CIRIA CS80 FIGURE 2.9(B), EXCEPT THE ADIT AT KENNINGTON GREEN WHICH IS BASED ON CIRIA CS80 FIGURE 2.12. THE GROUND MOVEMENT CURVES ARE CONSIDERED TO REPRESENT 100% GROUND MOVEMENT PROFILE. HOWEVER THE STATION EXCAVATIONS WILL HAVE AN INCREASED STIFFNESS AT THE CORNERS. THEREFORE THE SETTLEMENT CONTOURS AND BUILDING DAMAGE CLASSIFICATIONS AROUND THE EXCAVATIONS ARE CONSERVATIVE.
10. SETTLEMENT DUE TO EXCAVATIONS OF SHAFTS IS BASED ON THE LONDON UNDERGROUND MANUAL OF GOOD PRACTICE USING G-055 NEW AND BOWERS (1994).
11. THE MAP IS BASED ON ORDNANCE SURVEY, REPRODUCED FROM LANDRANGER 1:50,000 MAP BY PERMISSION OF ORDNANCE SURVEY © ON BEHALF OF THE CONTROLLER OF HER MAJESTY'S STATIONARY OFFICE. © CROWN COPYRIGHT 1988. ALL RIGHTS RESERVED. LICENSE NUMBER: AL 100005517. THE ORDNANCE SURVEY DATA USED WAS THAT AVAILABLE AT THE TIME OF 2012 REFERENCE DESIGN. AND THUS ANY RECENT CHANGES WILL NOT BE REFLECTED IN THE MAPS USED FOR ANALYSIS.
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13. ALL LISTED BUILDINGS WILL BE SUBJECT TO A FURTHER PHASE OF ASSESSMENT.
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17. ANY MONITORING PROCEDURE IS TO FOLLOW RELEVANT GUIDANCE PROVIDED BY THE BRITISH TUNNELLING SOCIETY (2004).

| Rev   | By  | Chkd | Appvd | Date     | Description                     |
|-------|-----|------|-------|----------|---------------------------------|
| 05-01 | JMB | JD   | SL    | 19/02/13 | NOTES AMENDED                   |
| 04-01 | JMB | JD   | SL    | 01/02/13 | INCLUSION OF ADITS & SUBSTATION |
| 03-01 | JMB | JD   | SL    | 18/01/13 | CROSS PASSAGES ADDED            |
| 02-01 | JMB | JP   | JP    | 02/11/12 | CHANGE IN ALIGNMENT             |
| 01-01 | JMB | JD   | JP    | 19/10/12 | FOR INFORMATION                 |

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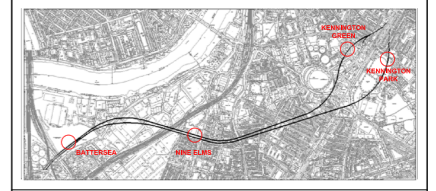
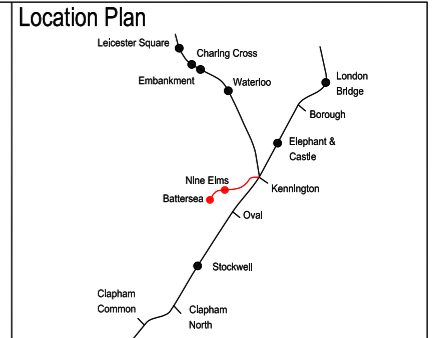
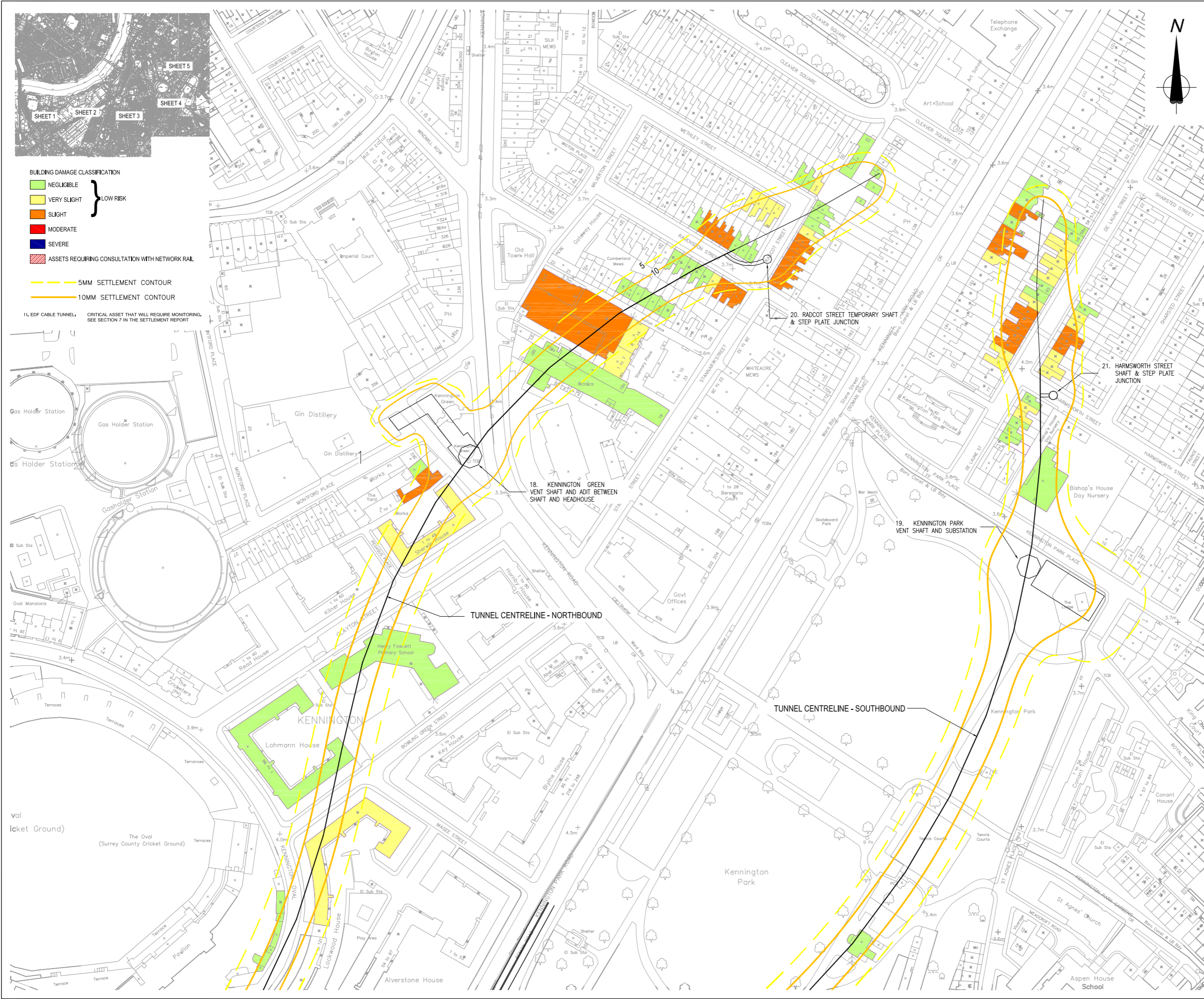
Project: **NORTHERN LINE EXTENSION TO BATTERSEA TWAO FOR TfL**

Drawing: **BUILDING DAMAGE CLASSIFICATION & CRITICAL ASSETS SHEET 4 OF 5**

Submittal: **S4 - FORMAL ISSUE TO CLIENT**

Drawn by: JMB Date: 19/02/13  
 Checked by: JD Date: 19/02/13  
 Approved by: SL Date: 19/02/13  
 Drawing Scale: 1:1000

Drawing No: **GRNLEB-BHD-TU-XX-DR-GEO-14608** Revision: **05-01**



- Notes:**
- ALL CONTOURS SHOWN ARE IN MM
  - THE BUILDING DAMAGE CLASSIFICATION IS BASED ON 'ASSESSMENT METHODS USED IN DESIGN FOR CROSSPASS (BURLAND ET AL. 1977)
  - ANALYSIS HAS BEEN BASED ON THE INFORMATION AVAILABLE AT THE TIME OF DESIGN.
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  - TUNNEL ALIGNMENT IS BASED ON DRAWING GRNLEB-HGL-00-XX-M2-PWY-00010-02-01.
  - CROSS PASSAGE LOCATION IS BASED ON DRAWING GRNLEB-HGL-00-XX-DR-TUN-20042-03-01.
  - SUBSTATION AT KENNINGTON PARK IS BASED ON DRAWING GRNLEB-BHD-ST-XX-DR-STR-13120-01-01, ADIT BETWEEN SHAFT AND HEADHOUSE AT KENNINGTON GREEN IS BASED ON DRAWING GRNLEB-HGL-00-XX-DR-TUN-23000-03-01.
  - SETTLEMENT DUE TO RUNNING TUNNELS ARE BASED ON A 1.5% VOLUME LOSS. SEE SETTLEMENT REPORT FOR FULL DETAILS ON OTHER TUNNEL TYPES.
  - SETTLEMENT DUE TO STATION EXCAVATIONS ARE BASED ON CURVES FROM CIRIA CS50 FIGURE 2.2(8), EXCEPT THE ADIT AT KENNINGTON GREEN WHICH IS BASED ON CIRIA CS50 FIGURE 2.12. THE GROUND MOVEMENT CURVES ARE CONSIDERED TO REPRESENT 100% GROUND MOVEMENT PROFILES. HOWEVER THE STATION EXCAVATIONS WILL HAVE AN INCREASED STIFFNESS AT THE CORNERS, THEREFORE THE SETTLEMENT CONTOURS AND BUILDING DAMAGE CLASSIFICATIONS AROUND THE EXCAVATIONS ARE CONSERVATIVE.
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| Rev   | By  | Chkd | Appvd | Date     | Description                     |
|-------|-----|------|-------|----------|---------------------------------|
| 06-01 | JMB | JD   | SL    | 15/03/13 | AMENDED CONTOURS                |
| 05-01 | JMB | JD   | SL    | 19/02/13 | NOTES AMENDED                   |
| 04-01 | JMB | JD   | SL    | 01/02/13 | INCLUSION OF ADITS & SUBSTATION |
| 03-01 | JMB | JD   | SL    | 18/01/13 | CROSS PASSAGES ADDED            |
| 02-01 | JMB | JP   | JP    | 02/11/12 | CHANGE IN ALIGNMENT             |
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Project: **NORTHERN LINE EXTENSION TO BATTERSEA TWAO FOR TIL**

Drawing: **BUILDING DAMAGE CLASSIFICATION & CRITICAL ASSETS SHEET 5 OF 5**

Suitability: **S4 - FORMAL ISSUE TO CLIENT**

Drawn by: JMB Date: 15/03/13  
Checked by: JD Date: 15/03/13  
Approved by: SL Date: 15/03/13  
Drawing Scale: 1:1000

Drawing No.: **GRNLEB-BHD-TU-XX-DR-GEO-14609** Revision: **06-01**

**A4 – Listed buildings within 1mm settlement contour –  
December 2012 Stage C Drawing Issue**

Drawing numbers:

GRNLEB-BHD-TU-XX-DR-GEO-15605-01-01

GRNLEB-BHD-TU-XX-DR-GEO-15606-01-01

GRNLEB-BHD-TU-XX-DR-GEO-15607-02-01

GRNLEB-BHD-TU-XX-DR-GEO-15608-01-01

GRNLEB-BHD-TU-XX-DR-GEO-15609-03-01