September 18, 2014

REPORT ON

Electromagnetic and Ground Penetrating Radar Reconnaissance, New Westminster Secondary School, 835 8th Street, New Westminster, B.C.

Submitted to:
School District 40 (New Westminster)
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New Westminster, B.C.
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Table of Contents

1.0 INTRODUCTION AND SCOPE OF WORK

As part of a broader strategy for evaluating and managing cultural resources in connection with planned renewal and redevelopment of New Westminster Secondary School, District Lots 2055 and 5678 (the Project), non-invasive geophysical reconnaissance has been undertaken to assess the potential existence of unmarked graves related to prior historic land use as a public cemetery (Golder 2008).

Geophysical investigations reported herein represent a second phase of work that has focused on three specific areas of the Project as identified in Figure 1. An earlier phase of work undertaken in 2007 (Golder 2009) investigated two areas within the northwest portion of the Project (within the teacher's parking lot). Survey areas were selected and prioritized on the basis of a historic land use review (Golder 2008).

Consistent with prior work in 2007, current geophysical investigations employed a combination of electromagnetic (EM) conductivity and ground penetrating radar (GPR) methods to detect and identify potential grave-related signatures in three locations (herein referred to as Areas 1, 3 and 4). Area 1 measures 20 metres (m) by 40 m, covers 0.08 hectares (ha) and is located in the south section of the New Westminster Secondary School property, near the intersection of Eighth Avenue and Eighth Street (Figure 1). Area 3 is located approximately 35 m northwest of Area 1, and runs parallel to, and adjacent to Eighth Street. This area measures 20 m by 60 m and covers 0.12 ha. Area 4 is located between the Douglas Cemetery and the school running track in an area previously recorded as a Chinese Cemetery. Area 4 measures 30 m by 50 m and covers 0.15 ha (Figure 1).

Fieldwork was carried out during the period from 29 August – 19 September, 2012. The following is a factual report of methodology and findings.

2.0 METHODS

The following two sections provide a brief description of the geophysical methods applied in this geophysical investigation. Additionally, the methodology for addressing some EM noise issues that were encountered in Areas 1 and 3 are also discussed in the EM section.

2.1 Electromagnetic Terrain Conductivity

Basic principles of electromagnetic conductivity mapping are illustrated in Figure 2. An alternating current is fed through a wire transmitter coil, producing a time-varying magnetic field B_p that penetrates the ground and induces secondary electrical currents J_e within subsurface materials. These so-called eddy currents, in turn, give rise to a secondary magnetic field B_s that is sensed together with the primary field by the receiver coil. Under natural conditions, induced current flow and, consequently, the strength of the secondary magnetic field are approximately proportional to subsurface electrical conductivity, which is controlled principally by porosity, soil moisture content and mobile ion concentrations. In addition, clays and silts are relatively conductive compared with coarser grained sediments.

The Geonics EM-38 is calibrated such that for measurements acquired over a homogeneous ground, the quadrature phase component of the secondary field yields a direct reading of apparent electrical conductivity in mS/m. In near proximity to a localized subsurface feature, the EM-38 registers anomalous readings with characteristics depending on measurement geometry and the electromagnetic contrast between the target feature and host soil. In particular, the apparent conductivity signature of a grave depends upon the type of grave, material properties of the coffin (if any), and the time elapsed since burial. Typically, where excavated host soil is replaced as back-fill, a significant increase in effective porosity results. Related contrast in electrical properties depends on host soil composition and prevailing moisture conditions. Inclusion of substantial metal content within the grave would significantly enhance the response.

The EM-38 has a fixed intercoil separation of 1.0 metre and can be operated in vertical or horizontal mode, meaning that transmitter and receiver coils are oriented such that their axes are vertical or horizontal relative to ground surface. Depth sensitivity is significantly different for the two modes as displayed in Figure 3. In particular, when operated in vertical mode, per the current survey, the EM-38 has maximum sensitivity at a depth of approximately 0.4 m and a corresponding investigation depth (70% cumulative response) of approximately 1.5 m.

EM conductivity readings were acquired in vertical mode at 0.5 m intervals along south-north gridlines separated by 0.5 m intervals with the instrument oriented parallel to transect. Measurements were digitally recorded and subsequently downloaded to a computer for processing and analysis.

Notably, in connection with subject conductivity investigations, it was observed that the level of ambient electromagnetic noise (random measurement fluctuation) was considerably higher within Areas 1 and 3 than in Area 4 (or encountered during the prior 2007 investigation). To assess the associated impact on measurement precision, 250 repeat readings were acquired (0.1 s interval) at a fixed location within each survey area. Readings were also acquired within areas previously investigated in 2007, and within the parking lot east of the Massey Wing (Area 2). Resulting measurements are displayed in Figure 4 with mean value subtracted in each case to permit consistent comparison.

Note in comparison with Area 4, where readings are consistently within approximately ±0.5 mS/m of the mean value (and comparable with areas previously investigated in 2007), corresponding deviation in Areas 1 and 3 are substantially greater, exceeding ±2.0 mS/m.

Although the origin of electromagnetic interference is unknown (potentially, nearby power transmission infrastructure), the influence is clearly localized, as conditions are "quiet" within adjacent Area 2. Independent of origin, however, resulting influence on electromagnetic surveys in Areas 1 and 3 reduces confidence in the identification of potentially significant signatures.

2.2 Ground Penetrating Radar

Ground penetrating radar (GPR) operates on the principle that electromagnetic waves, emitted into the ground by a transmitter (Tx) antenna, are partially reflected at subsurface interfaces and subsequently detected by a receiver (Rx) antenna as illustrated in Figure 5a.

Radar reflections arise due to subsurface contrasts in electrical conductivity and dielectric constant, which is largely controlled by relative moisture content. Graves are imaged by delineating contrasts between the electrical properties of the burial, including backfill, and the surrounding host soil.

Radar velocity and maximum subsurface penetration also depend on the electrical properties of the subsurface. In particular, radar range or maximum penetration is controlled by the effective electrical conductivity of subsurface materials, which increases with elevated moisture levels, clay content and the concentration of mobile ions. Increased conductivity results in inefficient signal coupling and relatively rapid attenuation or absorption of the radar pulse, reducing effective range. In addition, because effective conductivity increases with frequency and because correspondingly shorter wavelengths are preferentially scattered by soil heterogeneities, radar range decreases at higher frequencies. Consequently, selection of appropriate GPR instrumentation involves a trade-off between investigation depth and resolution.

The radar system incorporates precise timing electronics to measure the reflection transit-time, from transmitter to receiver, which depends on reflector range and radar velocity. Given an estimate of radar velocity, corresponding reflector depths may be determined. A radar scan is acquired by moving transmitter and receiver antennas along an established transect and, concurrently, recording a series of oscilloscope-like traces having amplitude proportional to reflection strength as illustrated in Figure 5b. Notice that while GPR effectively delineates continuous reflecting interfaces, localized anomalous zones, including graves, produce a characteristic hyperbolic signature.

Radar soundings were acquired using a GSSI SIR-2000 digital radar system with 400 MHz transducer. Continuous radar scans were acquired by towing the active antenna package at an approximately constant rate along specified transects. Location along transect was constrained by fiducial marks recorded digitally in conjunction with data acquisition for subsequent processing and analysis.

3.0 RESULTS

Results of electromagnetic conductivity reconnaissance and subsequent ground radar investigations are displayed in Figures 6 to 12.

Raw EM data were digitally filtered to remove the influence of larger-scale soil conductivity variation and to enhance localized anomalies. In addition to well-defined features attributed to subsurface infrastructure, resulting residual conductivity plans also display considerable smaller-scale variability.

Although there is generally no clear or regular spatial pattern indicative of a planned cemetery, the scale and character of localized electromagnetic signatures are in many cases comparable with those expected for graves. Consequently, as per the approach pursued in 2007, a representative sample of these smaller-scale features has been further investigated via coincident ground radar scans to better assess their potential significance.

Notably, as discussed in Section 2.1, considerable electromagnetic interference in Areas 1 and 3 produced random measurement fluctuations exceeding ±2 mS/m and this is reflected in the scale of conductivity variation in Figures 6 and 8, compared with a lesser range in Figure 10 for Area 4. Although it is anticipated that elevated noise levels have largely limited identification of more subtle signatures associated with rudimentary graves (incorporating simple wooden coffins or without coffins), it is expected that more elaborate graves (including significant stone and/or metal content) remained detectable.

A further complication is the variable thickness of recent fills (post cemetery closure), particularly in Areas 1 and 4, where prior topographic surveys and geotechnical investigations indicate fills extending as deep as 2 m below present grade. Given a nominal investigation depth of approximately 1.5 m for the Geonics EM-38 (Section 2.1), it is conceivable that in some locations existing graves could be located beyond the range of EM reconnaissance.

In view of foregoing limitations, greater emphasis has been placed on ground radar investigations for detection of more subtle features, and to provide extended depth of investigation and continuous delineation of variable thickness fills. For the most part, radar scans appear to confirm geotechnical information and have generally provided sufficient range (approximately 2 m to 3 m) to investigate underlying natural soils for potential graves.

In contrast with 2007 investigations, however, combined electromagnetic and ground radar investigation of Areas 1, 3 and 4 (Figure 1) suggests that there is relatively limited potential for intact graves. Only within the northwestern portion of Area 3 have ground radar scans (Figure 9) revealed signatures that are comparable with those previously identified near the intersection of Eighth Street and Tenth Avenue. Although a number of less convincing signatures have also been identified in Area 1, no signatures have been identified for subsequent testing in Area 4 since GPR profiles (Figures 11 and 12) indicate that Area 4 EM targets (Figure 10) are located within the fill layers emplaced after the cemetery was closed.

Note that the potential grave-related signatures marked on the EM maps and GPR profiles are some of the more convincing anomalies; however, this set of marked signatures is not an exhaustive account of potential graves. Should some of these signatures be excavated then the geophysical images could be assessed further, if necessary.

Following sections provide brief assessments of area-specific results.

3.1 Area 1

The residual conductivity plan in Figure 6 gives clear indication of several underground utilities, including an interpreted service conduit beneath a paved walkway (along approximately 15E) that presumably provides power to the existing electronic signboard as indicated. Another, parallel utility is observed along roughly 4E. There is also indication of additional connecting services and localized features that are tentatively attributed to irrigation infrastructure as identified.

Representative ground radar scans on transects GPR-2 (31N) and GPR-8 (8E) are displayed in Figure 7. Notably, the scan on transect GPR-8 indicates as many as four significant stratigraphic interfaces, with both scans suggesting considerable undulation (and possible prior topography). While it is impossible to differentiate between fills and natural soil units on the basis of radar reflectivity alone, it appears reasonable to infer that the uppermost unit (by including the majority of subsurface infrastructure), is likely fill. Previous placement of a monitoring well (MW07-04) approximately 30 m east of Area 1 encountered "topsoil" to a depth of 0.3 m, underlain by fill to roughly 2.0 m depth, then underlain by a sequence of natural sediment units.

In general, comparison between electromagnetic and ground radar data suggests that target conductivity signatures identified in Figure 6 are largely attributable to sources located within the upper fill unit (< 0.5 m depth) and, consequently, unlikely to be graves. Four potentially significant radar signatures (Figure 7), however, have been identified in relation to deeper stratigraphic interfaces (at depths between 1.0 and 2.0 m) that may represent potential areas for future archaeological investigation.

3.2 Area 3

Results of electromagnetic reconnaissance of Area 3 are displayed in Figure 8. Again, the residual conductivity plan provides clear indication of subsurface infrastructure, including a north-south striking feature through the midsection of Area 3 along approximately 11W, and apparently connecting with an east-west structure at roughly 14N that is presumably associated with at-grade water service infrastructure (fire hydrants). There are also several localized features distributed at regular interval (approximately 15 m / 50 ft) along two north-south alignments at roughly 2.5W and 12.5W that are tentatively attributed to local irrigation infrastructure. Finally, there is a complicated pattern of anomalies south of approximately 14N that is also tentatively attributed to underground infrastructure.

More significantly, however, there are also numerous smaller-scale signatures with nominally grave-like characteristics that have been subsequently investigated via multiple ground radar scans on 15 transects as indicated in Figure 8. Representative results are presented in Figure 9 for transects GPR-3 (18.5W) and GPR-12 (20.5N).

In general, correspondence between identified conductivity target signatures and radar reflectivity is less certain than observed for Area 1. Notably, while the majority of target features again appear to be attributable to near-surface sources, a number of features are potentially associated with deeper radar signatures.

Ground radar scans again reveal a number of significant stratigraphic interfaces. In particular, the scan on transect GPR-3 gives clear indication of a relatively thin surface fill deposit within the northwest portion of Area 3, overlying what is potentially an earlier and more extensive fill unit.

While foregoing assessment is locally consistent with prior geotechnical investigations (BH07-03), indicating a combined topsoil/fill thickness of approximately 0.5 m at the north end of Area 3, ground radar investigations further indicate that both of these units thicken substantially to the south and that the lateral extent of surface fill (topsoil) is relatively limited. The underlying fill unit appears to extend over much of Area 3 with maximum thickness in the western midsection of the area and generally thinning both to the east and south.

The potential is that this lower fill unit was placed in connection with construction of the Massey Wing (Massey Junior High School) in 1949 and that the basal interface delineated by ground radar represents a pre-existing surface topography that could well have been little modified since prior cemetery use.

Indeed, it is at variable depths beneath the interpreted fill-base interface that ground radar scans (Figure 9) provide evident indication of potential grave signatures comparable with those identified in 2007 near the intersection of Eighth Street (former Douglas Road) and Tenth Avenue. Moreover, the character of radar reflectivity (irregular and discontinuous) associated with the fill-base interface itself, is similar to that observed in connection with previous investigations (e.g., Golder 2009 – Figure 5).

Finally, it may be significant that potential grave signatures identified in Figure 9 (yellow outline) are in several instances located in close proximity to the fill-base interface (consistent with graves identified in 2007), suggesting a shallow depth of burial, while others suggest considerably deeper interments.

3.3 Area 4

As observed in Figure 10, results of electromagnetic reconnaissance in Area 4 display a marked contrast from west to east. As expected, extreme variations in residual conductivity within the western portion of the area reflect the presence of known subsurface infrastructure beneath, and immediately adjacent to, the existing service road. In contrast, the recreational field on the eastern side of Area 4 appears to be relatively free of underground utilities, with exception of a number of prominent localized features as identified in Figure 10.

In fact, ground radar scans (Figures 11 and 12) also suggest the presence of a network of plastic irrigation/drainage conduits beneath the recreation field. However, the apparent lack of extensive metallic infrastructure, coupled with low electromagnetic noise levels, suggests that conductivity mapping should have been effective within the eastern portion of Area 4.

Nonetheless, radar assessment of numerous grave-scale conductivity signatures yields no compelling indication of intact graves. Rather, identified target signatures appear (in the majority of instances) to be correlated with radar signatures having sources within near-surface fills, apparently placed in connection with development of the recreational field.

In particular, radar scans GPR-1 (2W) and GPR-4 (7W) in Figures 11 and 12, respectively, indicate that fills comprise a thin topsoil (turf) layer overlying a roughly uniform-thickness sub-grade fill extending to a depth of approximately 1 m. Notably, while this finding is generally consistent with prior geotechnical investigations (e.g., BH07-15, BH07-16A, BH07-16B, BH07-47 and BH07-57), borehole log BH07-57 records fills extending more than 2.0 m below current grade. Consequently, it is emphasized that potential graves within Area 4 could in some locations be out of range of both electromagnetic and ground radar investigations.

4.0 SUMMARY AND RECOMMENDATIONS

Combined electromagnetic and ground penetrating radar investigations have been conducted within three areas of the subject property at New Westminster Secondary School as identified in Figure 1. The aim of subject investigations has been to assess the potential for intact graves remaining from prior land use as a cemetery between approximately 1860 and 1920 (Golder 2008).

The present study represents a second phase of geophysical investigations, with a previous phase in 2007 that focused on two areas within the teacher's parking lot in the northwest portion of the site (Figure 1). As previously reported (Golder 2009), 2007 investigations detected numerous geophysical signatures, having characteristics nominally consistent with those expected for graves, particularly in close proximity to Eighth Street (former Douglas Road) near the intersection with Tenth Avenue.

Significantly, only in the case of Area 3 has the present investigation detected similarly convincing evidence of intact graves (Figure 9). Again, the majority of identified signatures are located in close proximity to Eighth Street as detected on transect GPR-3 at 18.5W, approximately 4 m east of the existing sidewalk.

Although a number of potential grave-related signatures have also been identified in Area 1 (Figure 7), the probability that these signatures are attributable to unmarked graves is judged to be substantially lower. No potential grave signatures have been identified in Area 4.

In general, it is emphasized that geophysical anomalies that are tentatively attributed to unmarked graves could as well be due to other unidentified natural or cultural sources. Identification as potential graves is largely based on historic cemetery context and previous related experience. In addition, it is possible that there are existing intact graves within investigated areas that have not been detected or identified.

Two factors, in particular, have potentially limited the present investigation to an uncertain degree. First, as discussed in Section 2.1, conductivity measurements in Areas 1 and 3 were subject to significant ambient electromagnetic interference, potentially masking and preventing detection of more subtle signatures. Secondly, prior geotechnical investigations imply that fills of substantial thickness overlie native soils in Areas 1 and 4, potentially placing existing unmarked graves at depths beyond the investigation range of electromagnetic and ground radar methods.

In view of foregoing limitations and the indirect nature of geophysical investigations, it is emphasized that findings reported herein should be confirmed by direct archaeological investigations. In particular, it is recommended that a representative sample of potential grave signatures be directly investigated through archaeological excavations or other direct testing. Moreover, it is recommended that testing should include an appropriate level of random/systematic sampling, beyond assessment of identified signatures, to confirm the lack of intact graves elsewhere.

Potential grave-related signatures marked on the GPR profiles are some of the more convincing signatures; however, this set of marked signatures is not an exhaustive account of potential graves. Should some of these signatures be excavated, then the undersigned should be informed of the results and, if necessary, the geophysical images could be assessed further.

5.0 CLOSURE

We trust that the foregoing report satisfies your current requirements. Should you require addition information or clarification, please contact the undersigned.

GOLDER ASSOCIATES LTD.

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REVIEWED BY:

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RL/MM/AM/ja/np/jlj

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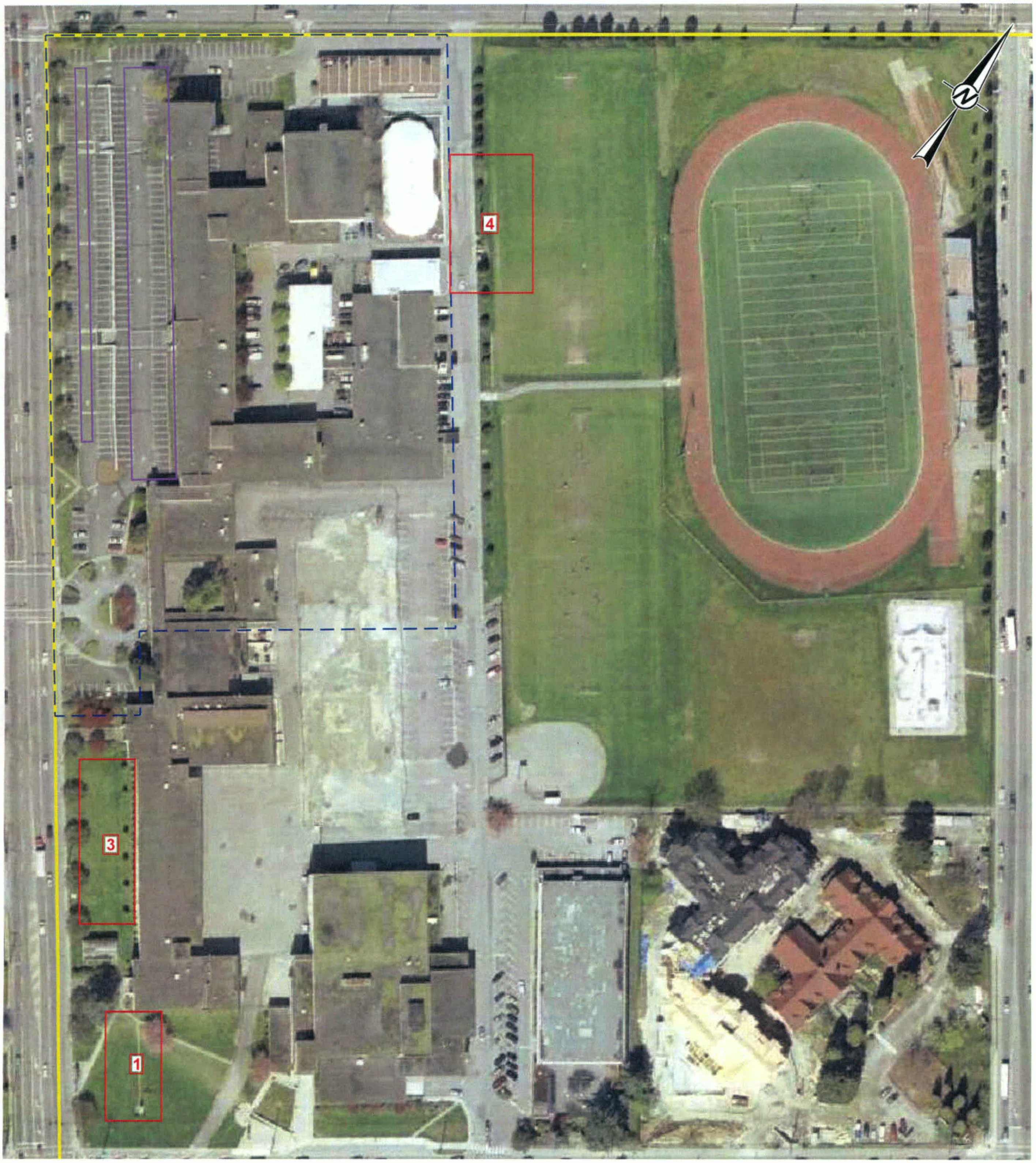

LEGEND

Site Boundary

Inferred Area of Historic Cemetery Grounds

EM & GPR Reconnaissance

Areas Investigated in 2007

REFERENCE

Image obtained from Google Earth Pro, used under license. Image Date 3-18-2006. Google Earth Image is not to scale.

0 50 100

1:2,000 (APPROX.) METRES

CLIENT NEW WESTMINSTER SCHOOL DISTRICT 40	PROJECT GROUND PENETRATING RADAR NEW WESTMINSTER, BC

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-04-16
PREPARED	J. FARAH
DESIGN	S. HUCULAK
REVIEW	S. HUCULAK
APPROVED	A. MASON

TITLE

ELECTROMAGNETIC AND GROUND PENETRATING RADAR RECONNAISSANCE

PROJECT No.	PHASE	Rev.	FIGURE
07-1412-0151	5000	C	1

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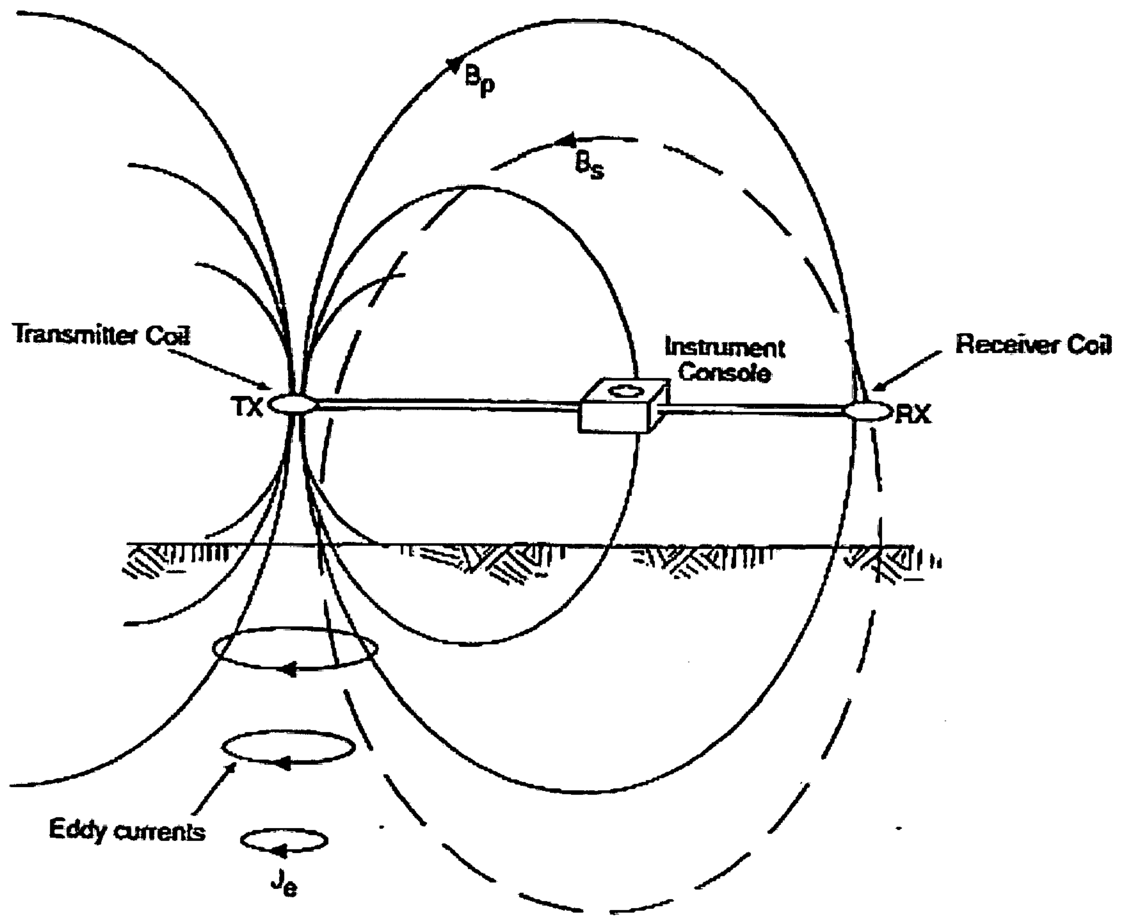

NOT TO SCALE

CLIENT	NEW WESTMINSTER SCHOOL DISTRICT 40
PROJECT	GROUND PENETRATING RADAR NEW WESTMINSTER, BC
CONSULTANT	Golder Associates
YYYY-MM-DD	2014-04-16
PREPARED	L. LOVE
DESIGN	S. HUCULAK
REVIEW	S. HUCULAK
APPROVED	A. MASON
TITLE	ELECTROMAGNETIC CONDUCTIVITY MEASUREMENT

PROJECT No.	PHASE	Rev.	FIGURE
07-1412-0151	5000	C	2

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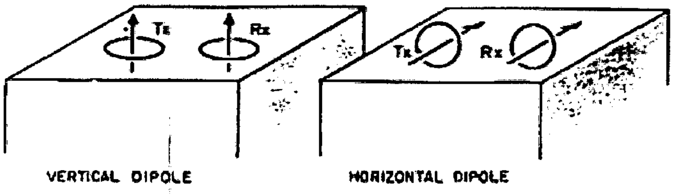
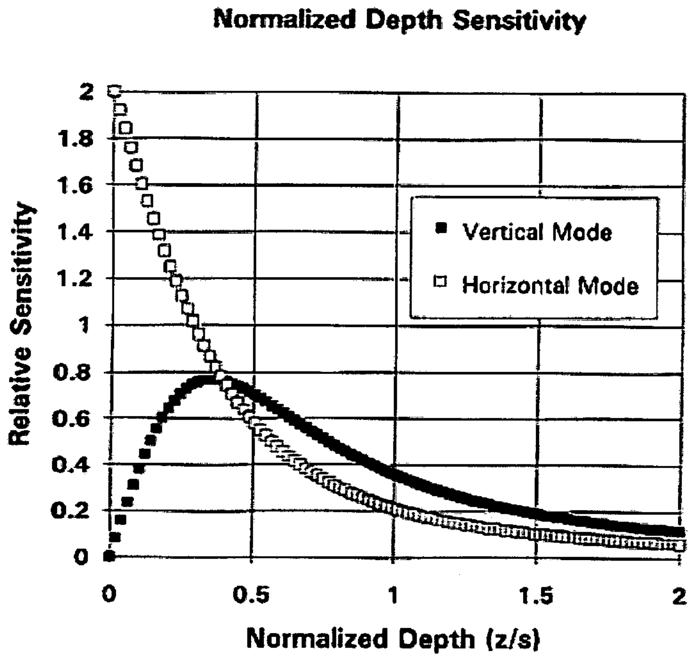


Instrument	Intercoil Separation (m)	Peak Sensitivity (m)		Effective Range (m)	
		Horizontal (z=0.0)	Vertical (z=0.35s)	Horizontal (z=0.75s)	Vertical (z=1.5s)
EM-38	s=1.0	0.0	0.35	0.75	1.5
EM-31	s=3.7	0.0	1.3	2.8	5.6
EM-34	s=10.0	0.0	3.5	7.5	15.0
	s=20.0	0.0	7.0	15.0	30.0
	s=40.0	0.0	14.0	30.0	60.0

NOTE: Effective range refers to 70% cumulative response.



NOT TO SCALE

CLIENT NEW WESTMINSTER SCHOOL DISTRICT 40		PROJECT GROUND PENETRATING RADAR NEW WESTMINSTER, BC	
CONSULTANT Golder Associates	YYYY-MM-DD: 2014-05-28	TITLE **GEONICS EM38 RESPONSE CHARACTERISTICS**	
	PREPARED: L. LOVE		
	DESIGN: S. HUCULAK		
	REVIEW: S. HUCULAK	PROJECT No. 07-1412-0151	PHASE 5000
	APPROVED: A. MASON	Rev. C	FIGURE 3

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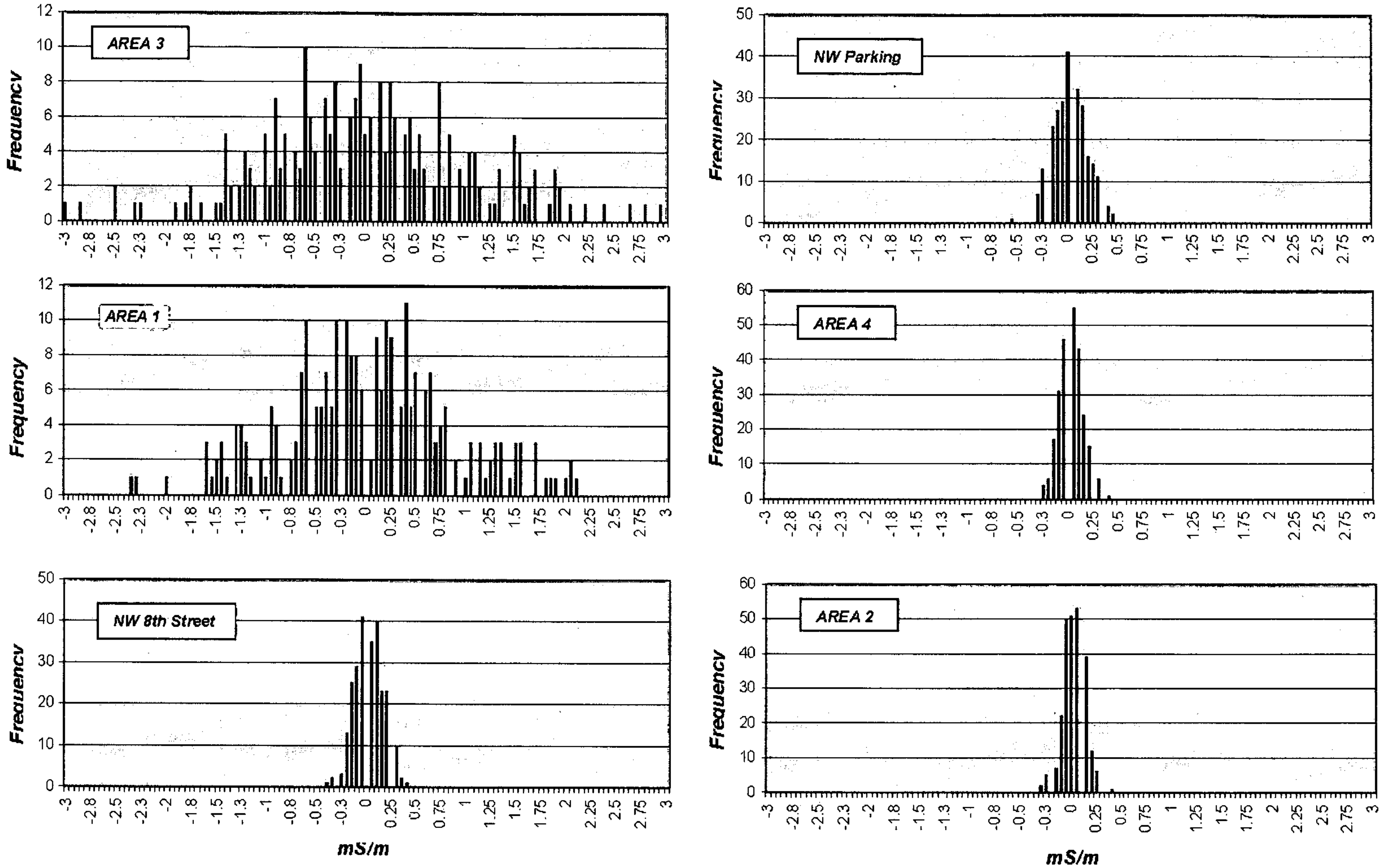

Note: Distributions based on 250 repeat readings acquired at stationary location within identified areas (mean value subtracted for consistent comparison).

CLIENT
NEW WESTMINSTER SCHOOL DISTRICT 40

PROJECT
GROUND PENETRATING RADAR
NEW WESTMINSTER, BC

CONSULTANT
Golder Associates

YYYY-MM-DD	2014-05-28
PREPARED	L. LOVE
DESIGN	S. HUCULAK
REVIEW	S. HUCULAK
APPROVED	A. MASON

TITLE
ELECTROMAGNETIC NOISE DISTRIBUTIONS

PROJECT No.	PHASE	Rev.	FIGURE
07-1412-0151	5000	C	4

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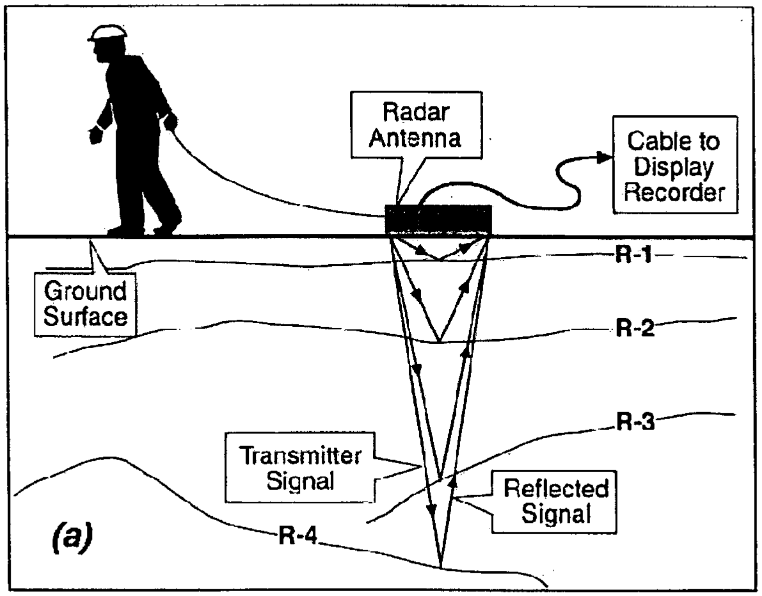
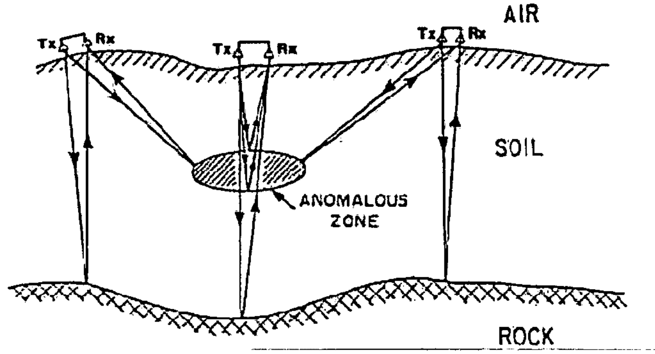
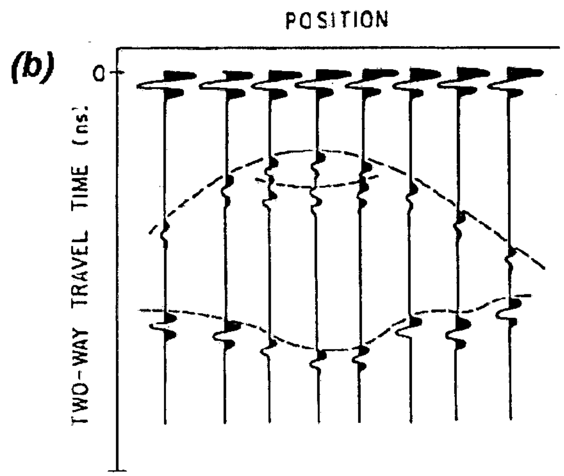




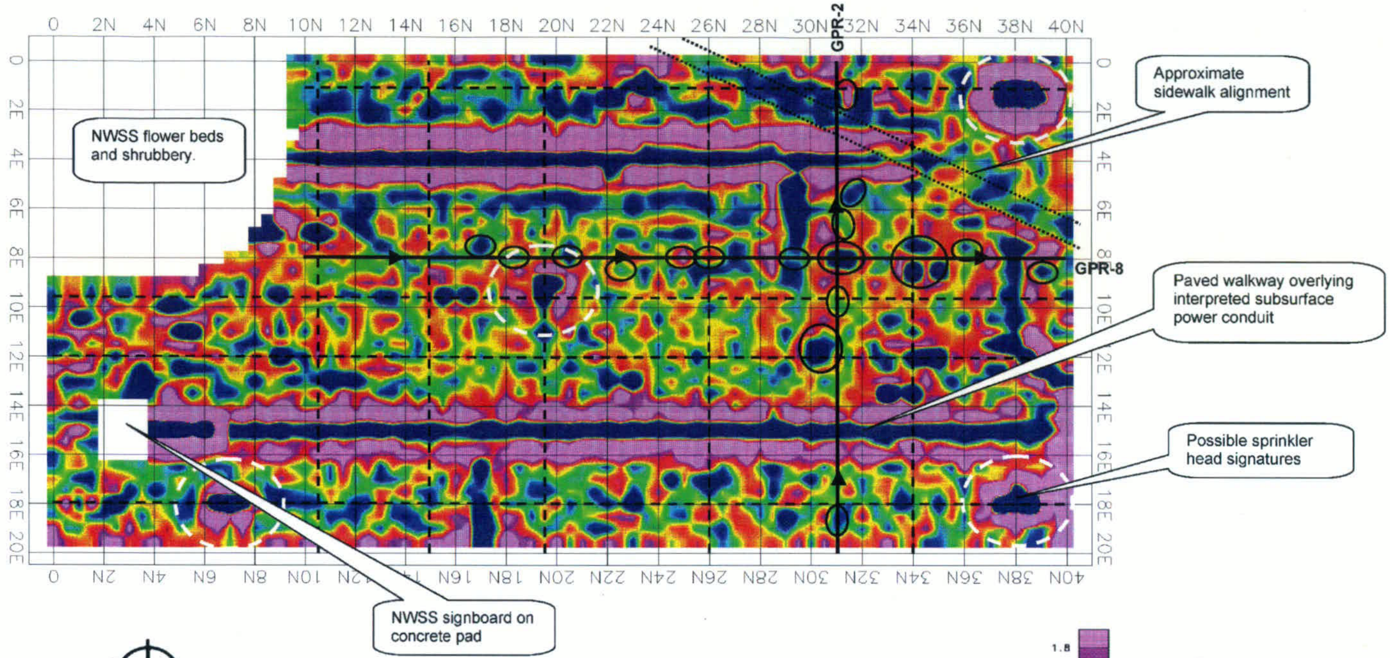
Conceptual illustration of the radar being used in the reflection profiling mode on soil over bedrock.

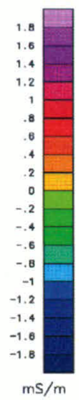


Resulting radar record obtained over the idealized situation

NOT TO SCALE

CLIENT NEW WESTMINSTER SCHOOL DISTRICT 40			PROJECT GROUND PENETRATING RADAR NEW WESTMINSTER, BC
CONSULTANT Golder Associates	YYYY-MM-DD	2014-04-16	TITLE **GROUND PENETRATING RADAR**
	PREPARED	J. FARAH	
	DESIGN	S. HUCULAK	
	REVIEW	S. HUCULAK	PROJECT No. 07-1412-0151 / PHASE 5000 / Rev. C / FIGURE 5
	APPROVED	A. MASON	





NOTES: ***Data acquired via Geonics EM-38 at 0.5 m x 0.5 m interval. Measurements acquired on grid-south to grid-north transects (vertical dipole mode).***

Residual conductivity obtained via digital filtering of raw soil conductivity readings.

Colour scale distribution is approximate and based on interpolation-extrapolation from discrete data at 0.5 m x 0.5 m grid nodes.

Target signature

GPR transect

Selected GPR scans presented in Figure 7

NEW WESTMINSTER SECONDARY SCHOOL
MASSEY WING – SOUTHWEST (AREA 1)
Residual Electromagnetic Conductivity (mS/m)

CLIENT
NEW WESTMINSTER SCHOOL DISTRICT 40

PROJECT
GROUND PENETRATING RADAR
NEW WESTMINSTER, BC

CONSULTANT
Golder Associates

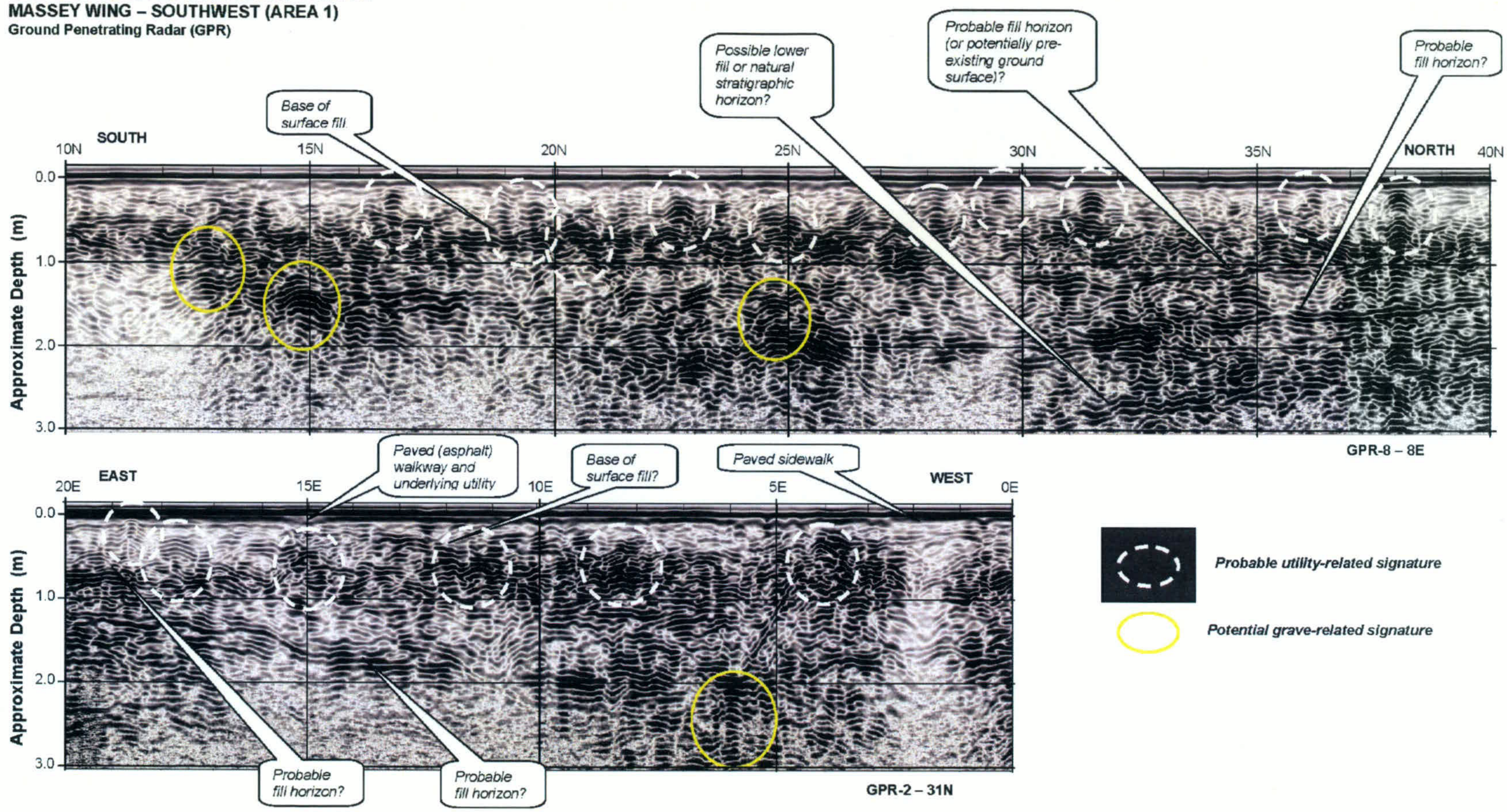
YYYY-MM-DD	2014-04-16
PREPARED	L. LOVE
DESIGN	S. HUCULAK
REVIEW	S. HUCULAK
APPROVED	A. MASON

TITLE
NEW WEST SECONDARY AREA 1 RESIDUAL CONDUCTIVITY

PROJECT No.	PHASE	Rev.	FIGURE
07-1412-0151	5000	C	6

NOT TO SCALE

NEW WESTMINSTER SECONDARY SCHOOL
MASSEY WING – SOUTHWEST (AREA 1)
Ground Penetrating Radar (GPR)



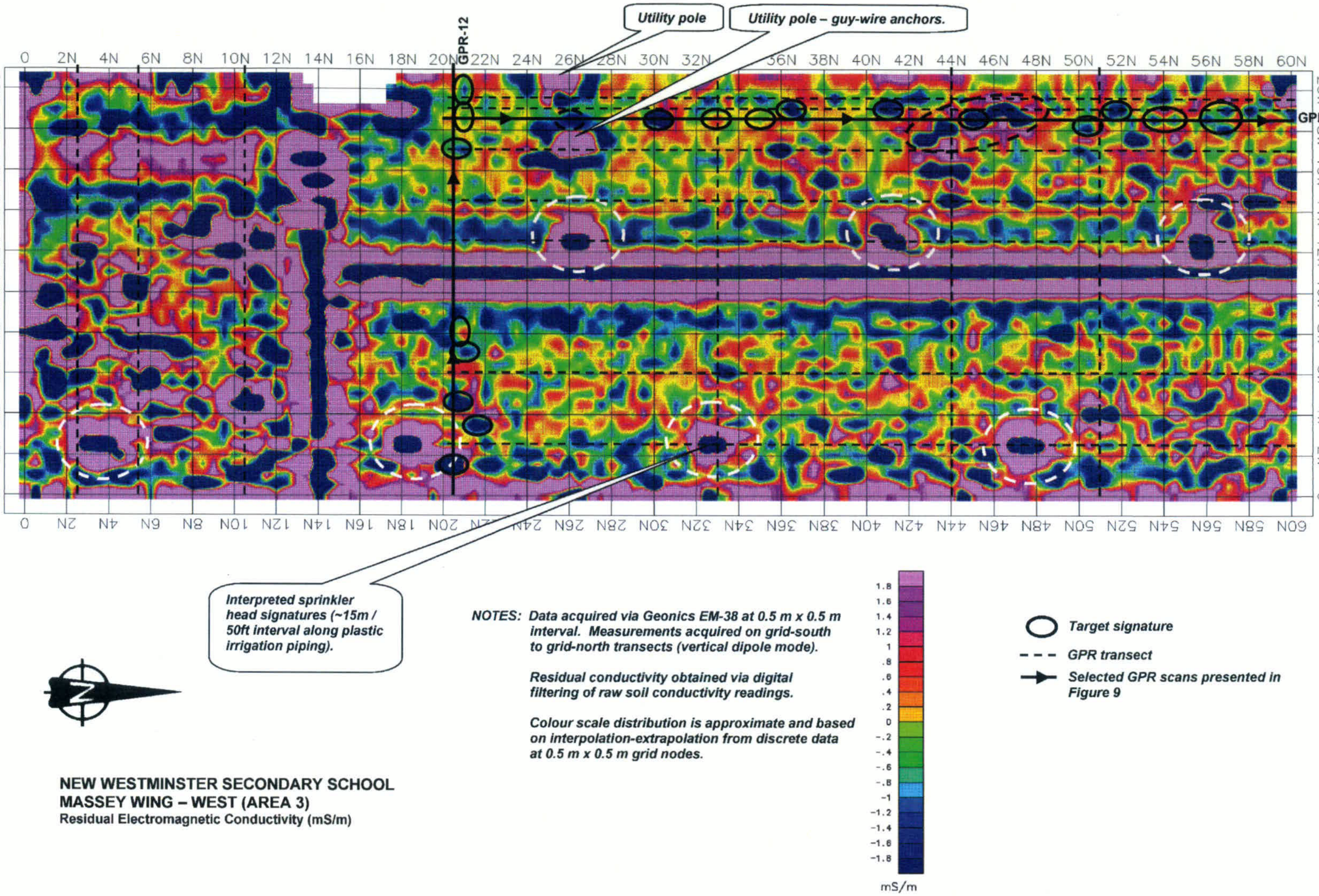
NOTES:

1. ***Representative radar scans acquired on 8E and 31N gridlines.***
2. ***Two-way transit time Δt=80 ns.***
3. ***Approximate GPR depth scale based on estimated radar velocity v=0.08 m/ns.***

NOT TO SCALE

CLIENT	NEW WESTMINSTER SCHOOL DISTRICT 40	
PROJECT	GROUND PENETRATING RADAR NEW WESTMINSTER, BC	
CONSULTANT	Golder Associates	
YYYY-MM-DD	2014-04-16	
PREPARED	L. LOVE	
DESIGN	S. HUCULAK	
REVIEW	S. HUCULAK	
APPROVED	A. MASON	
TITLE	**NEW WEST SECONDARY AREA 1 GROUND RADAR SCANS**	
PROJECT No.	07-1412-0151	
PHASE	5000	
Rev.	C	
FIGURE	7	

Path: ---- | File Name: 0714120151-5000-02.dwg



NOTES: Data acquired via Geonics EM-38 at 0.5 m x 0.5 m interval. Measurements acquired on grid-south to grid-north transects (vertical dipole mode).

Residual conductivity obtained via digital filtering of raw soil conductivity readings.

Colour scale distribution is approximate and based on interpolation-extrapolation from discrete data at 0.5 m x 0.5 m grid nodes.

NEW WESTMINSTER SECONDARY SCHOOL
MASSEY WING – WEST (AREA 3)
Residual Electromagnetic Conductivity (mS/m)

NOT TO SCALE

CLIENT
NEW WESTMINSTER SCHOOL DISTRICT 40

PROJECT
GROUND PENETRATING RADAR
NEW WESTMINSTER, BC

CONSULTANT
Golder Associates

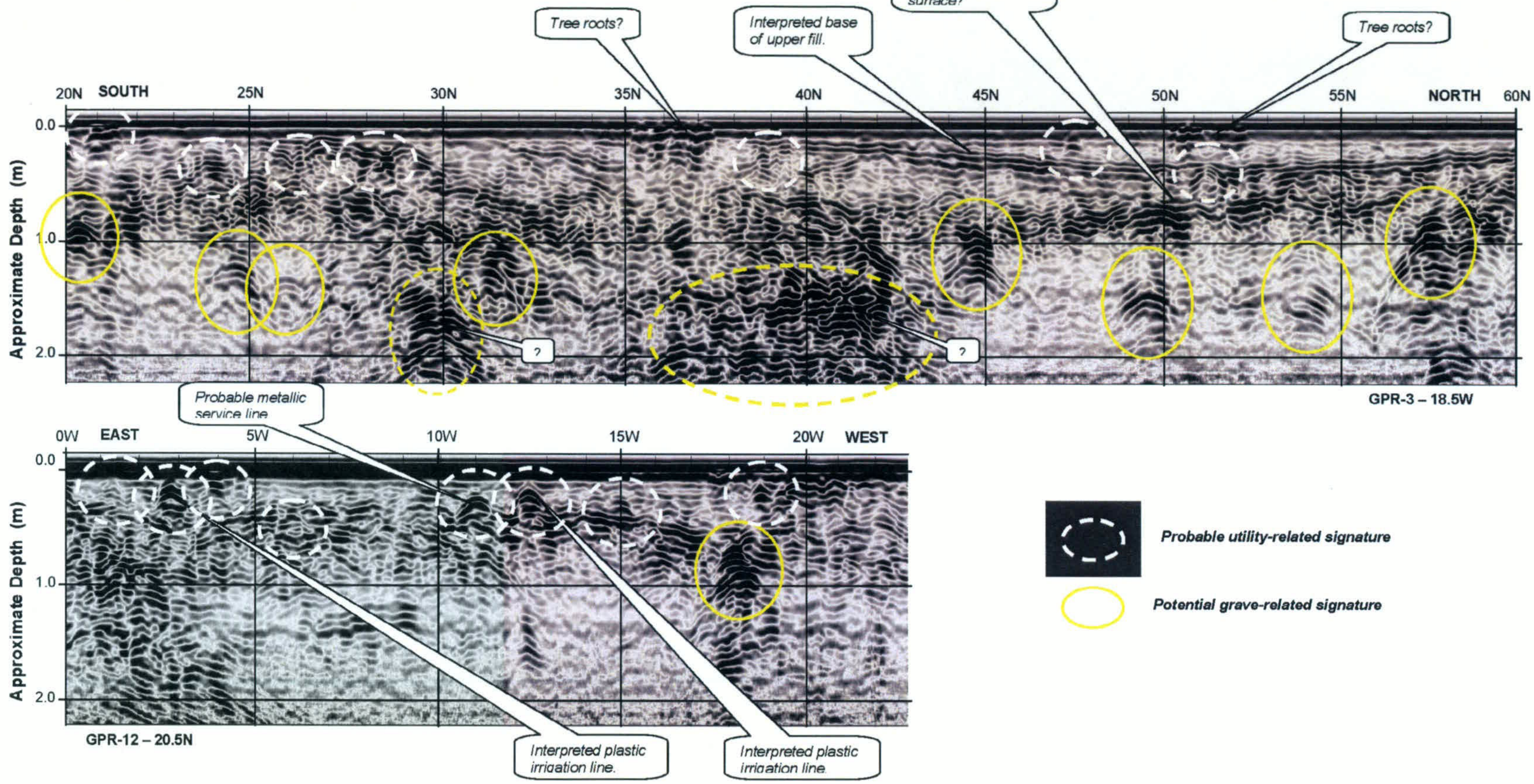
YYYY-MM-DD	2014-04-16
PREPARED	L. LOVE
DESIGN	S. HUCULAK
REVIEW	S. HUCULAK
APPROVED	A. MASON

TITLE
NEW WEST SECONDARY AREA 3 RESIDUAL CONDUCTIVITY

PROJECT No.	PHASE	Rev.	FIGURE
07-1412-0151	5000	C	8

Path ---- | File Name: 0714120151-5000-02.dwg

NEW WESTMINSTER SECONDARY SCHOOL
MASSEY WING – WEST (AREA 3)
Ground Penetrating Radar (GPR)



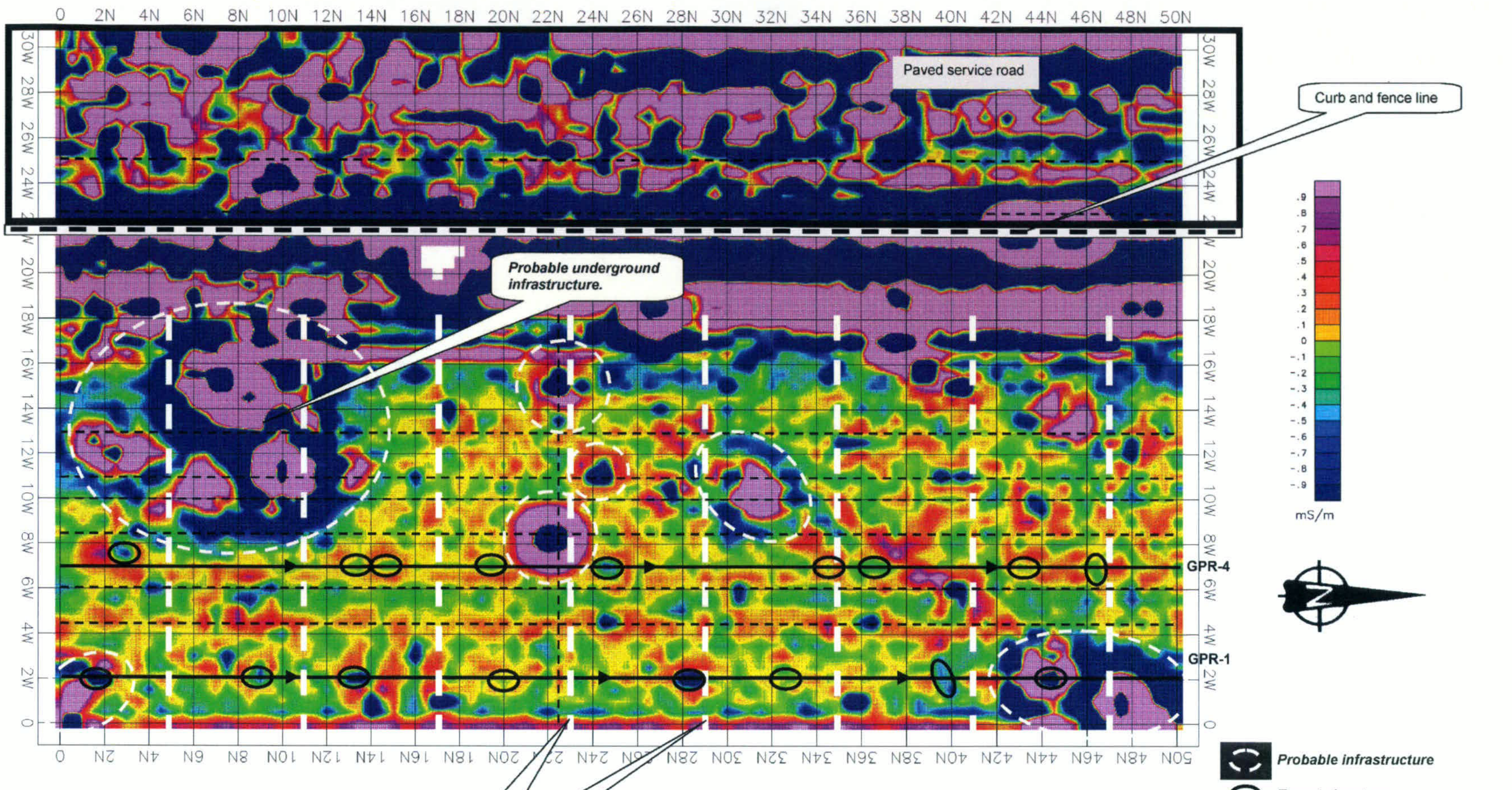
NOTES:

1. *Representative radar scans acquired on 18.5W and 20.5N gridlines.*
2. *Two-way transit time Δt=60 ns.*
3. *Approximate GPR depth scale based on estimated radar velocity v=0.08 m/ns.*

CLIENT NEW WESTMINSTER SCHOOL DISTRICT 40			PROJECT GROUND PENETRATING RADAR NEW WESTMINSTER, BC
CONSULTANT Golder Associates	YYYY-MM-DD	2014-04-16	TITLE **NEW WEST SECONDARY AREA 3 GROUND RADAR SCANS**
	PREPARED	L. LOVE	
	DESIGN	S. HUCULAK	
	REVIEW	S. HUCULAK	PROJECT No. 07-1412-0151 · PHASE 5000 · Rev. C · FIGURE 9
	APPROVED	A. MASON	

NOT TO SCALE

Path ---- | File Name: 0714120151-5000-02.dwg



NEW WESTMINSTER SECONDARY SCHOOL
PEARSON WING – EAST (AREA 4)
Residual Electromagnetic Conductivity (mS/m)

Interpreted Irrigation conduits? (approximately 6m interval)

NOTES: ***Data acquired via Geonics EM-38 at 0.5 m x 0.5 m interval. Measurements acquired on grid-south to grid-north transects (vertical dipole mode).***

Residual conductivity obtained via digital filtering of raw soil conductivity readings.

Colour scale distribution is approximate and based on interpolation-extrapolation from discrete data at 0.5 m x 0.5 m grid nodes.

CLIENT
NEW WESTMINSTER SCHOOL DISTRICT 40

PROJECT
GROUND PENETRATING RADAR
NEW WESTMINSTER, BC

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-04-16
PREPARED	L. LOVE
DESIGN	S. HUCULAK
REVIEW	S. HUCULAK
APPROVED	A. MASON

TITLE
NEW WEST SECONDARY AREA 4 RESIDUAL CONDUCTIVITY

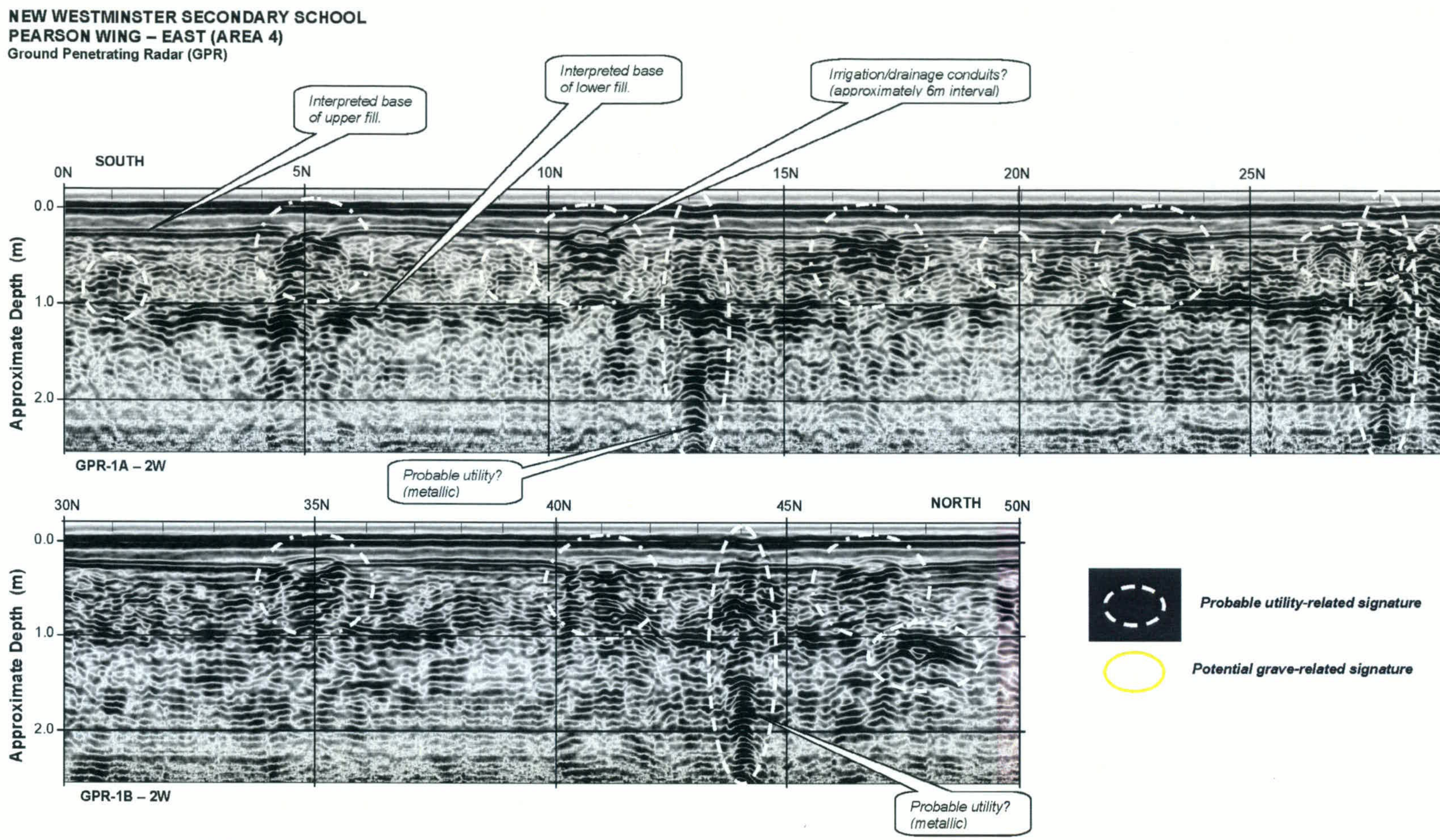
PROJECT No.	PHASE	Rev.	FIGURE
07-1412-0151	5000	C	10

NOT TO SCALE

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

25 mm

Path: ---- | File Name: 0714120151-5000-02.dwg



NOTES:

1. ***Representative radar scan acquired on 2W gridline.***
2. ***Two-way transit time Δt=70 ns.***
3. ***Approximate GPR depth scale based on estimated radar velocity v=0.08 m/ns.***

NOT TO SCALE

CLIENT
NEW WESTMINSTER SCHOOL DISTRICT 40

CONSULTANT
Golder Associates

YYYY-MM-DD	2014-04-16
PREPARED	L. LOVE
DESIGN	S. HUCULAK
REVIEW	S. HUCULAK
APPROVED	A. MASON

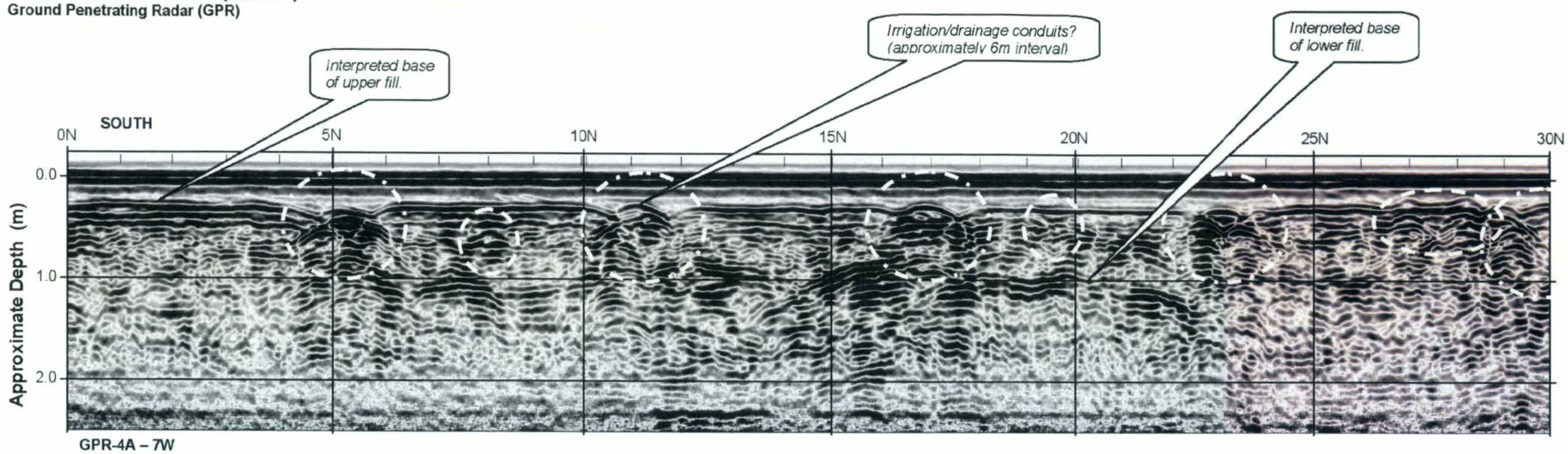
PROJECT
GROUND PENETRATING RADAR
NEW WESTMINSTER, BC

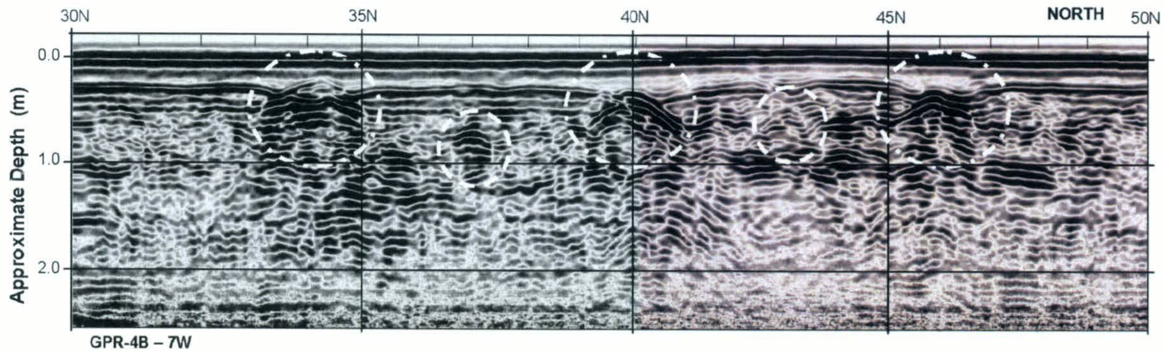
TITLE
NEW WEST SECONDARY AREA 4 GROUND RADAR SCAN GPR-1

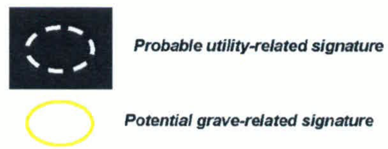
PROJECT No.	PHASE	Rev.	FIGURE
07-1412-0151	5000	C	11

Path: ---- | File Name: 0714120151-5000-02.dwg

NEW WESTMINSTER SECONDARY SCHOOL
PEARSON WING – EAST (AREA 4)
Ground Penetrating Radar (GPR)







NOTES:

1. ***Representative radar scan acquired on 7W gridline.***
2. ***Two-way transit time Δt=70 ns.***
3. ***Approximate GPR depth scale based on estimated radar velocity v=0.08 m/ns.***

CLIENT	PROJECT
NEW WESTMINSTER SCHOOL DISTRICT 40	GROUND PENETRATING RADAR NEW WESTMINSTER, BC

CONSULTANT: Golder Associates

YYYY-MM-DD	2014-04-16
PREPARED	L. LOVE
DESIGN	S. HUCULAK
REVIEW	S. HUCULAK
APPROVED	A. MASON

TITLE
NEW WEST SECONDARY AREA 4 GROUND RADAR SCAN GPR-4

PROJECT No.	PHASE	Rev.	FIGURE
07-1412-0151	5000	C	12

NOT TO SCALE

25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A