Geotechnical Asset Management of Pavement Foundations

Peter Gilbert

ATKINS

- Atkins, UK
- Chief Geotechnical Engineer

HIGHWAYS AGENCY

zetica

- peter.gilbert@atkinsglobal.com

Research Project Objectives

1. Develop a method for providing geotechnical interpretation of pavement performance data

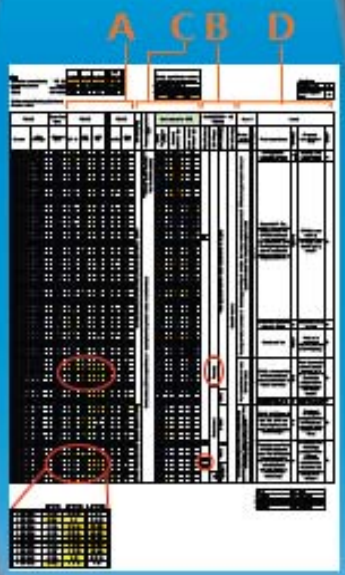
2. Develop Ground Penetrating Radar (GPR) technique to record foundation layers

3. Promote the technique among both pavement and geotechnical engineers

Geotechnical Asset Management of Pavement Foundations
Gestion géotechnique des infrastructures - supports de chaussées

= OUTPUT

(D) Identifying Poor Performance
Identification des mauvaises performances



Research Project Objectives
Objectifs du programme de recherche

Develop a methodology for providing geotechnical interpretation of pavement performance data (input to residual life assessments)

Enable remedial action design to consider foundation / subgrade issues

Develop Ground Penetrating Radar (GPR) technique to provide reasonably accurate profiles of foundation layers with minimal intrusive GI

Promote the technique developed within the pavement and geotechnical engineering communities

CONCEPT

(A) Ride Quality Data
Données de qualité de roulement

(B) Geotechnical Asset Data
Données géotechniques des infrastructures

(C) Pavement Foundation Construction Details
Détails de construction du support de chaussée

INPUT

INTERPRETATION

Input data

A. Ride Quality Data (LPV)

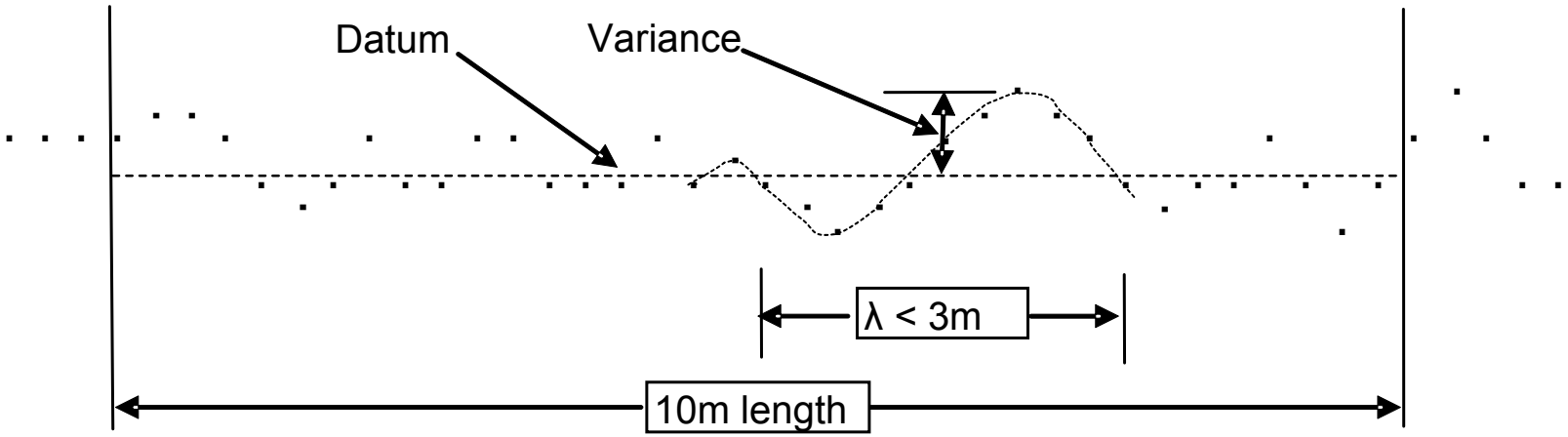
B. Geotechnical Asset Data

C. Pavement Foundation Construction Details

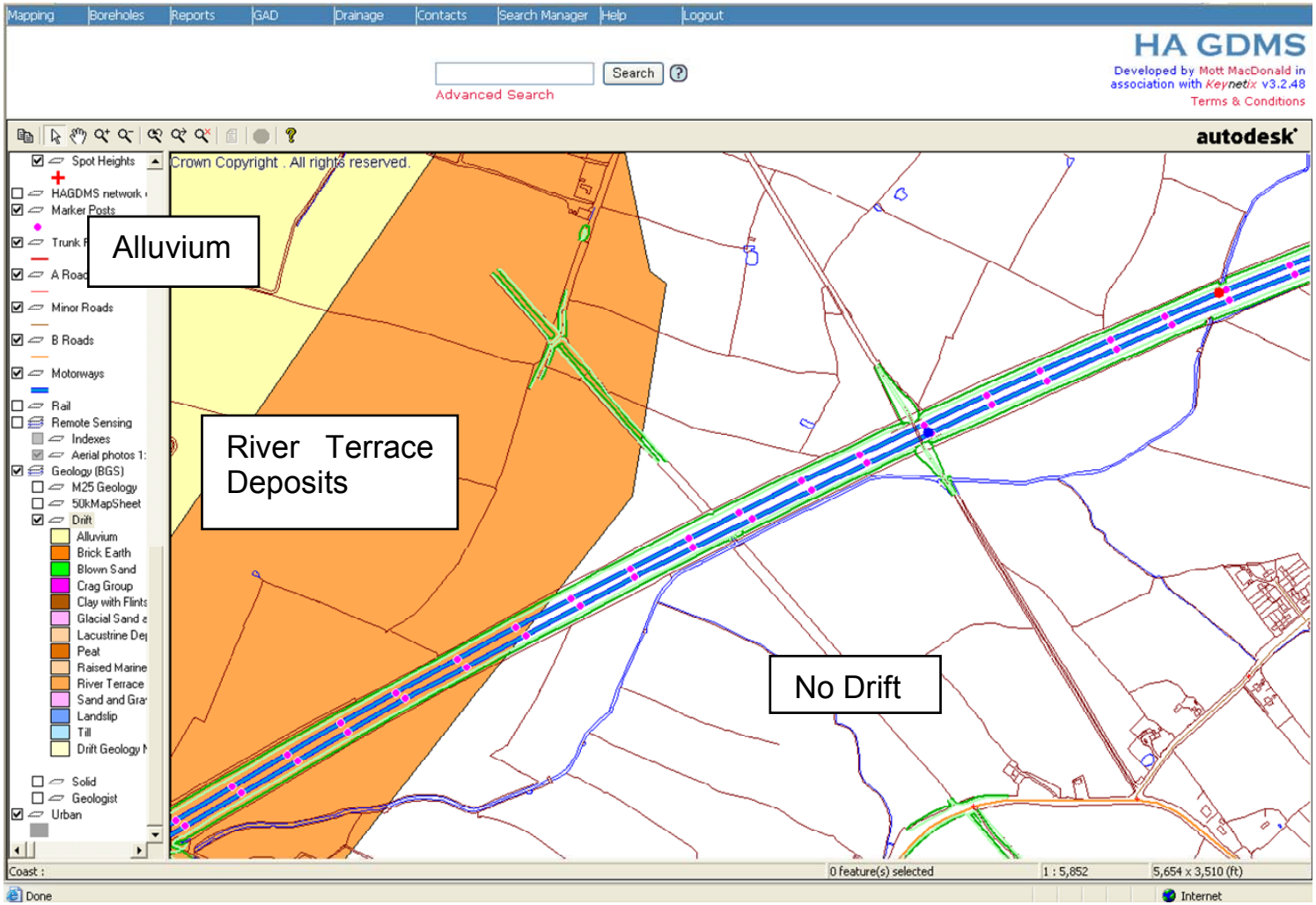
Longitudinal Profile Variance (LPV)

LPV is a measure of road profile unevenness used to assess **ride quality** (International Roughness Index)

- Profile recorded by **laser sensors** at 0.1m centres
- Moving average datum points for **3m, 10m & 30m wavelengths**
- **Variance** from the datum averaged over 10m length = LPV
- 10m LPV is best indicator of foundation performance
- High 30m LPV can indicate subsidence



Geotechnical Asset Data – web based GIS



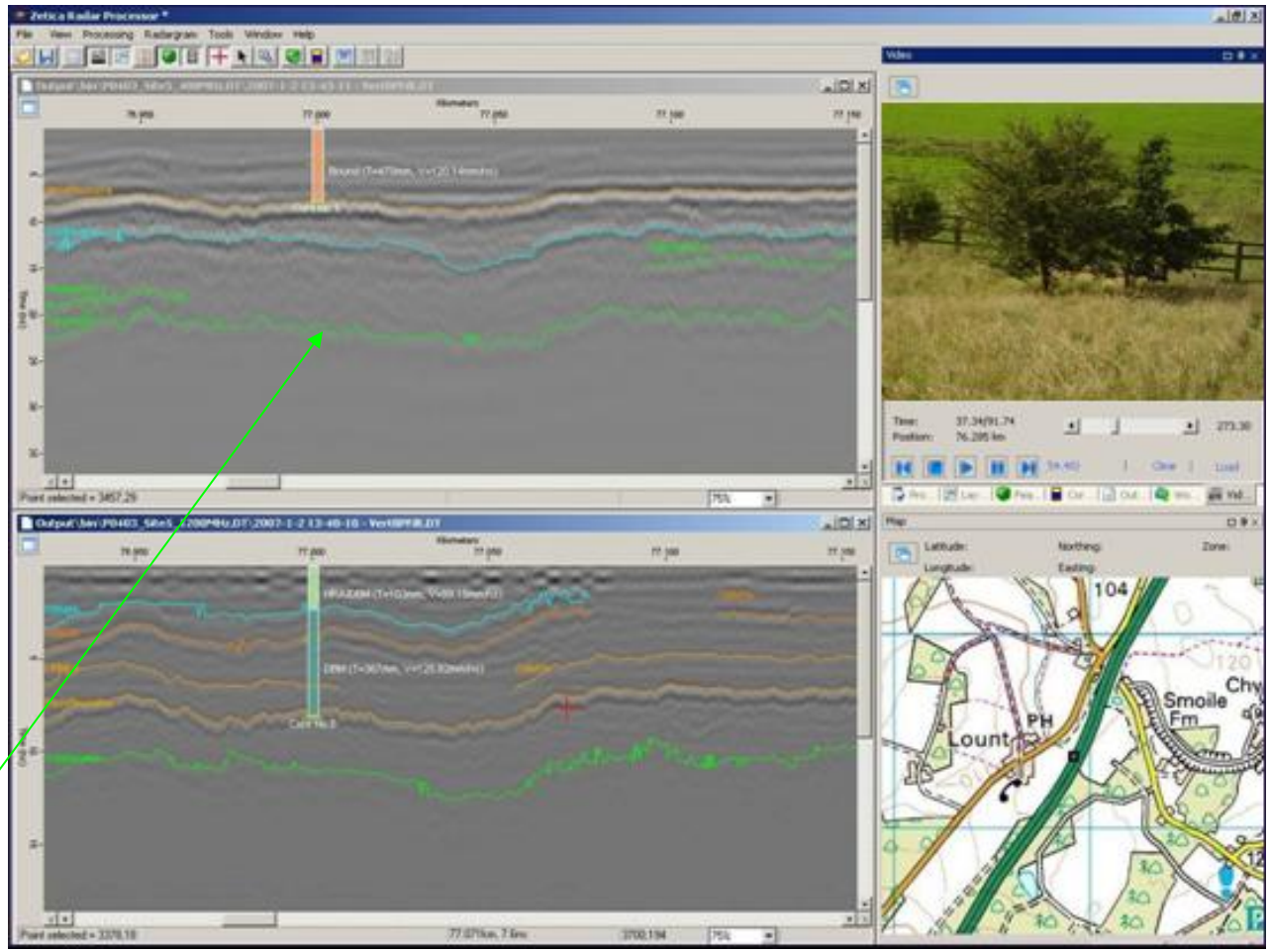
Ground Penetrating Radar for pavement foundations

70km/hr surveying

1200MHz antenna

400MHz antenna

Ground Penetrating Radar for pavement foundations



Base of foundation (1m penetration)

Interpretation

Overlay of data sets:-

Pavement performance data - LPV

+

Geotechnical Asset Data – geology, earthworks, structures, drainage

+

Pavement foundation construction - GPR

Interpretation

Overlay of data sets:-

Pavement performance data - LPV

+

Geotechnical Asset Data – geology, earthworks, structures, drainage

+

Pavement foundation construction - GPR

} Identify data trends / variations

Interpretation

Overlay of data sets:-

Pavement performance data - LPV

+

Geotechnical Asset Data – geology, earthworks, structures, drainage

+

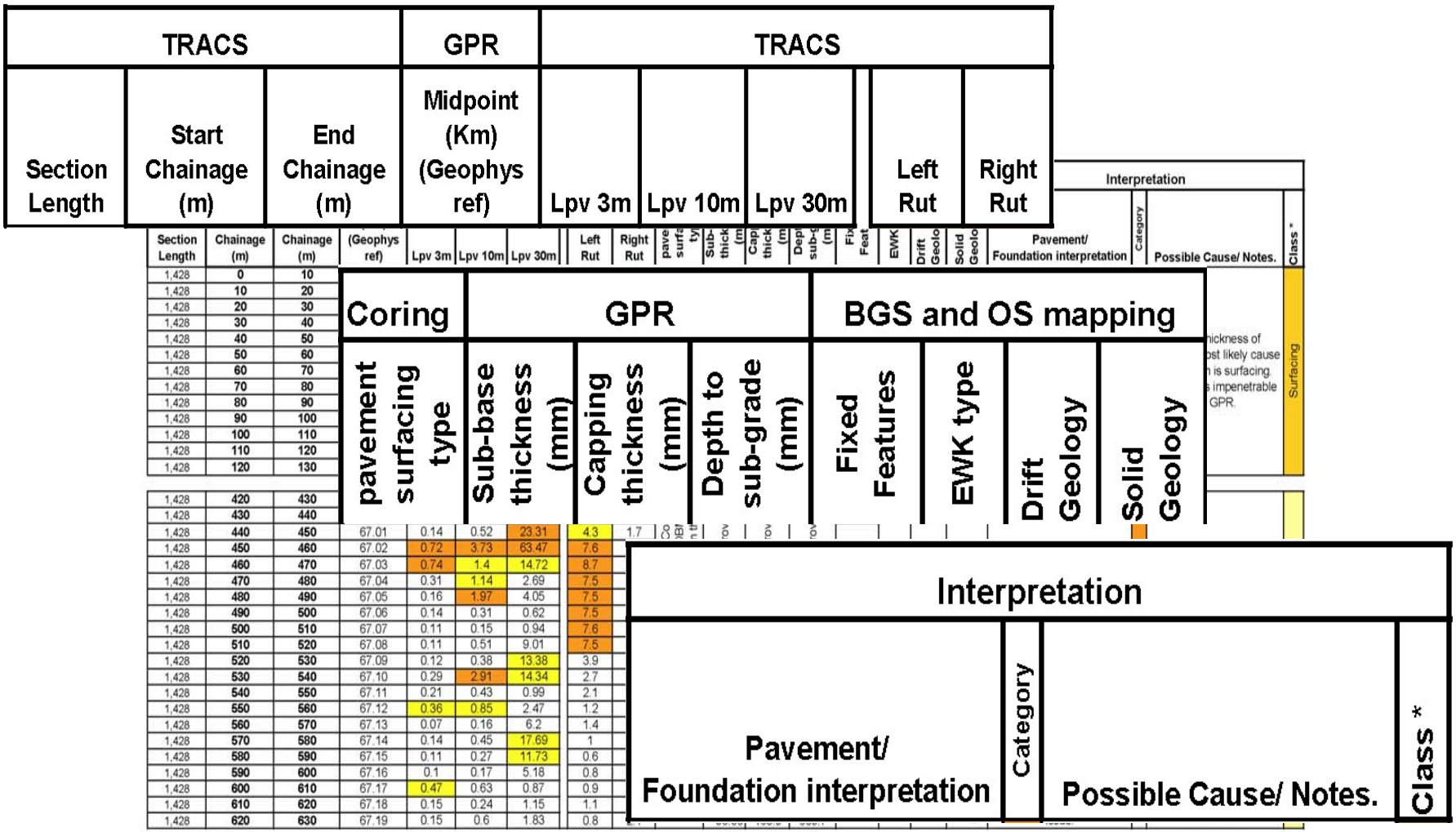
Pavement foundation construction – GPR

Identify data trends / variations

=

Identify potential explanations for poor performance

Output



Section Length	Chainage (m)	Chainage (m)	(Geophys ref)	Lpv 3m	Lpv 10m	Lpv 30m	Left Rut	Right Rut
1,428	0	10						
1,428	10	20						
1,428	20	30						
1,428	30	40						
1,428	40	50						
1,428	50	60						
1,428	60	70						
1,428	70	80						
1,428	80	90						
1,428	90	100						
1,428	100	110						
1,428	110	120						
1,428	120	130						
1,428	420	430						
1,428	430	440						
1,428	440	450	67.01	0.14	0.52	23.31	4.3	1.7
1,428	450	460	67.02	0.72	3.73	63.47	7.6	
1,428	460	470	67.03	0.74	1.4	14.72	8.7	
1,428	470	480	67.04	0.31	1.14	2.69	7.5	
1,428	480	490	67.05	0.16	1.97	4.05	7.5	
1,428	490	500	67.06	0.14	0.31	0.62	7.5	
1,428	500	510	67.07	0.11	0.15	0.94	7.6	
1,428	510	520	67.08	0.11	0.51	9.01	7.5	
1,428	520	530	67.09	0.12	0.38	13.38	3.9	
1,428	530	540	67.10	0.29	2.91	14.34	2.7	
1,428	540	550	67.11	0.21	0.43	0.99	2.1	
1,428	550	560	67.12	0.36	0.85	2.47	1.2	
1,428	560	570	67.13	0.07	0.16	6.2	1.4	
1,428	570	580	67.14	0.14	0.45	17.69	1	
1,428	580	590	67.15	0.11	0.27	11.73	0.6	
1,428	590	600	67.16	0.1	0.17	5.18	0.8	
1,428	600	610	67.17	0.47	0.63	0.87	0.9	
1,428	610	620	67.18	0.15	0.24	1.15	1.1	
1,428	620	630	67.19	0.15	0.6	1.83	0.8	

Methodology – seeking data trends

Variations in the data reflect changes in stiffness, e.g.

- ✓ Earthworks transition zones
- ✓ Soft ground / subsidence
- ✓ Culverts / underbridges
- ✓ Changes in pavement construction

Conclude on likely cause of poor performance

- ➢ Surfacing problems
- ➢ Geotechnical problems
- ➢ Undefined

Plan detailed Ground Investigation (if appropriate)

Conclusions

1. Research objectives satisfied

2. Geotechnical input to residual life assessments
3. Identifies geotechnical factors affecting performance
4. Cost effective
5. Improved design of maintenance works
6. Performance Specification

7. Method is ready for use by others

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Poster session Thursday afternoon

= OUTPUT

INPUT

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Paris 2007