

Workshop F: CIRIA C553 Case Study

Learning Objectives

This workshop allows you to consider the issues of contaminated land risk assessment which might arise at a real site, and to apply the principles that have been explained throughout the entire course.

Case Study

A large land holding company, XXX Investments Ltd, intends to purchase a parcel of land occupied by an out of town store.

However the company is unsure of its liabilities with respect to contaminated land.

The site is located within an area on the edge of Oldtown with a long history of industrial usage.

The site consists of a retail store; fuel filling station and car parking area, divided by a public highway serving industrial premises in the vicinity (see Figure 1).

XXX Investments requires your help to advise on the contaminated land risks that may be associated with the site so that XXX can evaluate whether they wish to proceed with the purchase.

Firstly, remind yourself of the four stages of risk assessment.

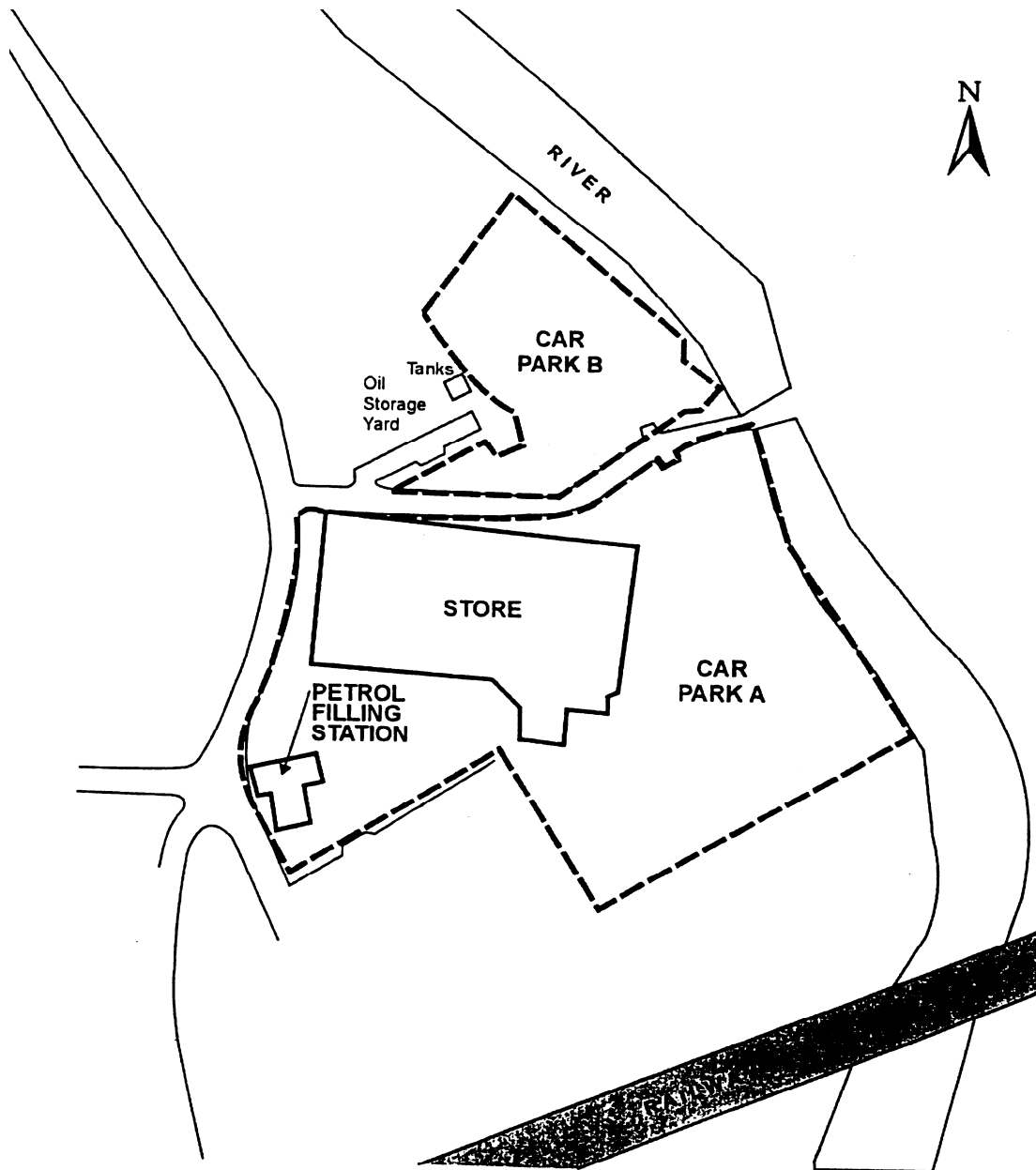
Hazard identification: what are the possible problems?

Hazard assessment: how big might these problems be?

Risk estimation: what will be their effects?

Risk evaluation: do they matter?

In this workshop, we will work sequentially through each of these four stages.



KEY



-  Location of Present Building
-  Boundary of Study Site

Figure 1. Location of current development (Scale 1:1250 approx).

b) Complete Table 2: Hazard Identification

Study Figure 2, a plan of the site which summarises the results of the historical study.

All former uses date from the late 19th century and ceased in the 1970s, when the site was redeveloped to create the present store complex.

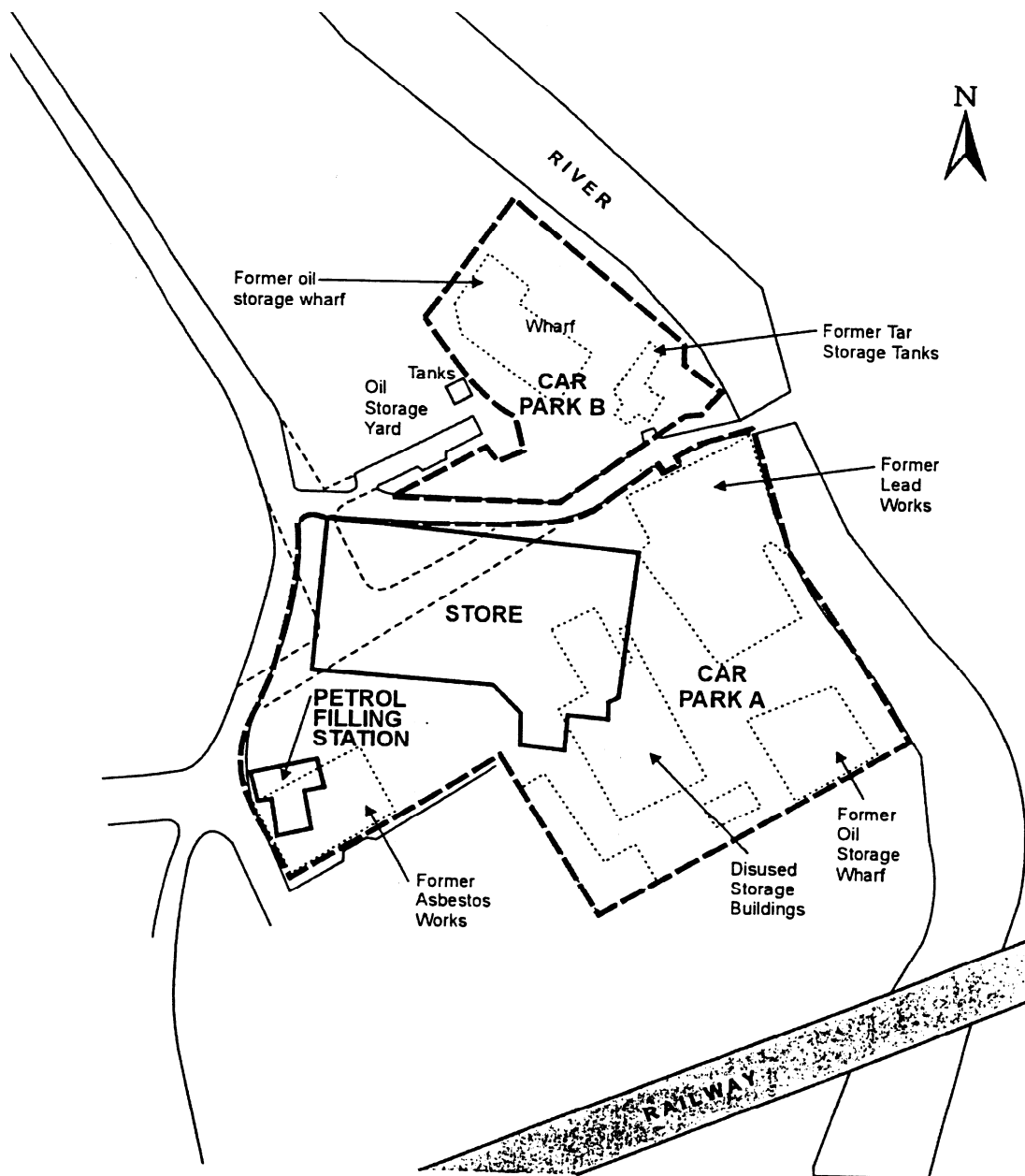
In Table 2, identify and list the key contaminants that might be associated with this site.

You may wish to speculate on the identities of the contaminants present at the site.

Otherwise you may assume that each of the identified hazards A, B and C will be associated with contaminants CA, CB, CC etc.

Table 2 Contamination that might be associated with the site.

Hazard	Description of hazard
A	eg Asbestos works
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
L	
M	



- KEY**
- Footprint of Previous Buildings
 - Location of Present Building
 - Boundary of Study Site
 - Previous Road

Figure 2. Location of current development in relation to former industries at the site (Scale 1:1250 approx).

Receptor	Pathway	Substances													
		CA	CB	CC	CD	CE	CF	CG	CH	CI	CJ	CK	CL	CM	
	eg. Ingestion of contaminated soil & dust														
Human Health															
Water Environment															
Flora & Fauna															
Building Materials															

Table W1 Preliminary conceptual model of pollutant linkages.

f) Risk Estimation

You have now identified areas of the site where contamination is potentially present.

However, the actual presence of contamination can only be confirmed by site investigations.

Think about where you might carry out site investigations.

Place rings on Figure 2 around the areas on or off the site where you might require more data.

Figure 3 shows location of site investigations that have been carried out to locate contamination.

How does this compare with your identified needs?

The investigation findings confirm the results of the geological map study.

Samples of soil and water were taken and tested.

The results of soil and water contamination testing are shown in Tables W2 and W3.

How might the significance of the contamination data be ascertained?

g) Modification of the Conceptual Model

The significance of the results is determined in this instance by comparison with generic assessment criteria.

The results exceeding the criteria are shown in bold on the tables.

Do the findings of the investigation cause any modification to your conceptual model?

What about the hydrocarbons found close to the boundary in Car Park B?

Why should these be elevated here?

What could the source(s) be?

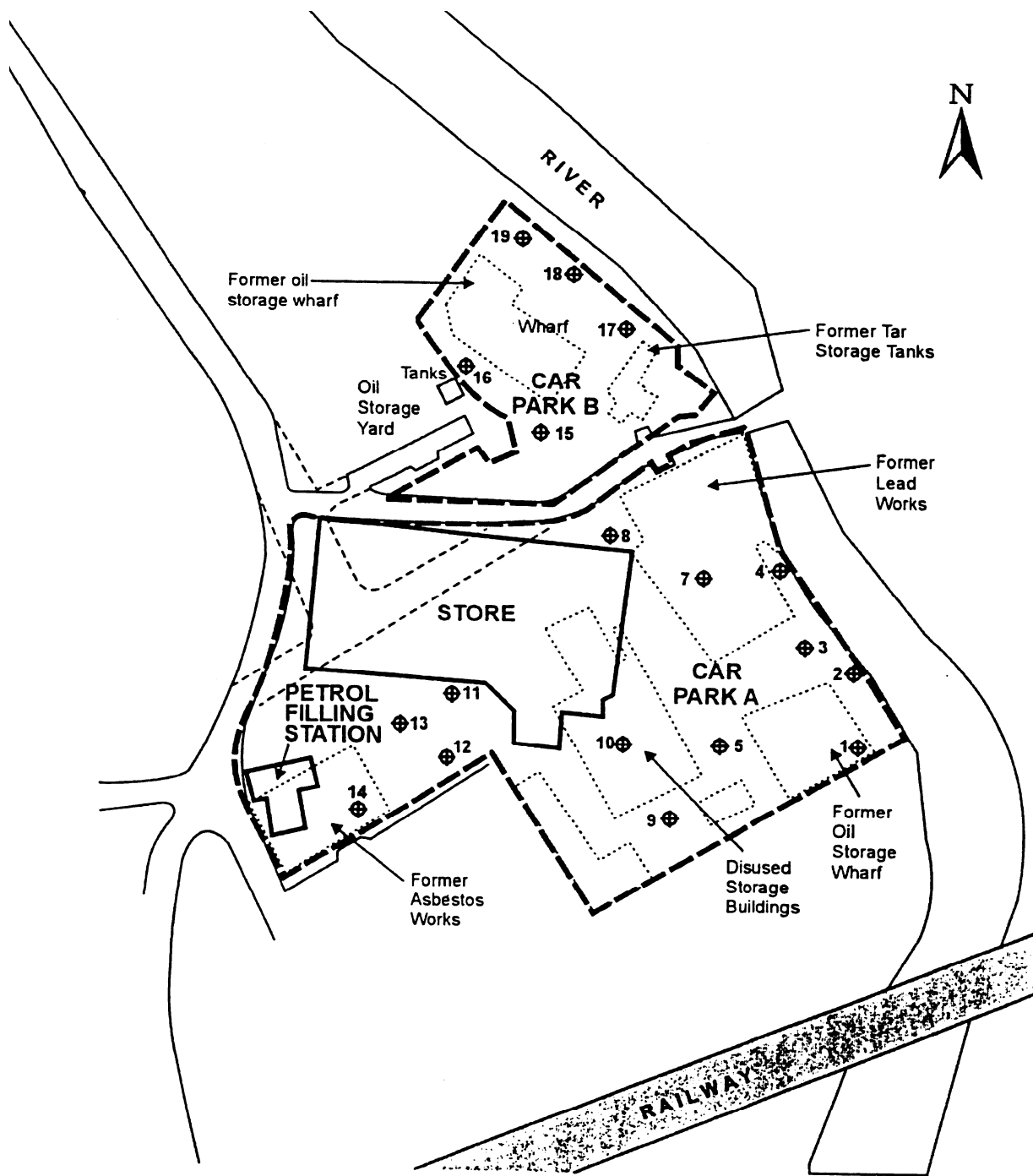


Figure 3. Probe hole locations at the site (Scale 1:1250 approx)

Sample	Depth	Arsenic (Total)	Copper (Total)	Lead (Total)	pH	Total Cyanide	Total Sulphate	TPH	Asbestos
Generic Threshold		55	190	530	<5	50	2000	5000	0.01
Units	m	mg/kg	mg/kg	mg/kg		mg/kg	mg/kg	mg/kg	%
1	0.80	<1	<1	<1	7.2	<1	<1	6000	<0.001
	1.20	<1	<1	<1	7.3	<1	<1	6500	<0.001
2	0.60	<1	<1	400	7.4	<1	<1	4000	<0.001
	1.60	<1	<1	500	7.4	<1	<1	6000	<0.001
3	0.50	20	100	600	7.2	<1	<1	<1	<0.001
	2.50	2	100	350	7.2	<1	<1	<1	<0.001
4	0.50	40	180	900	7.5	20	<1	<1	<0.001
	1.20	35	190	1200	7.6	10	<1	<1	<0.001
5	1.00	<1	<1	<1	7.2	<1	<1	500	<0.001
	3.50	<1	<1	<1	7.3	<1	<1	200	<0.001
6	0.50	<1	<1	400	7.3	<1	<1	<1	<0.001
	2.90	<1	<1	350	7.3	<1	<1	<1	<0.001
7	0.60	<1	<1	200	7.3	<1	<1	<1	<0.001
	3.00	<1	<1	215	7.4	<1	<1	<1	<0.001
8	1.00	<1	<1	100	7.2	<1	<1	<1	<0.001
	3.00	<1	<1	70	7.2	<1	<1	<1	<0.001
9	0.25	<1	<1	<1	7.5	<1	<1	<1	<0.001
	2.30	<1	<1	<1	7.4	<1	<1	<1	<0.001
10	1.10	<1	<1	<1	7.3	<1	<1	<1	<0.001
	2.50	<1	<1	<1	7.3	<1	<1	<1	<0.001
11	0.45	<1	<1	<1	7.1	<1	<1	2000	<0.001
	1.60	<1	<1	<1	7.2	<1	<1	2300	<0.001
12	0.50	<1	<1	<1	7.0	<1	<1	5400	<0.001
	2.30	<1	<1	<1	7.0	<1	<1	5000	<0.001
13	0.40	<1	<1	<1	7.1	<1	<1	3000	<0.001
	3.50	<1	<1	<1	7.1	<1	<1	3200	<0.001
14	0.85	<1	<1	<1	7.2	<1	<1	6000	0.31
	1.60	<1	<1	<1	7.2	<1	<1	6200	0.28
15	0.25	<1	<1	<1	7.0	<1	<1	8500	<0.001
	2.50	<1	<1	<1	7.1	<1	<1	9800	<0.001
16	1.10	<1	<1	<1	7.2	<1	<1	7000	<0.001
	1.90	<1	<1	<1	7.2	<1	<1	7500	<0.001
17	1.20	<1	<1	<1	6.9	<1	<1	3200	<0.001
	1.90	<1	<1	<1	6.8	<1	<1	3000	<0.001
18	0.50	<1	<1	<1	7.0	<1	<1	2000	<0.001
	2.70	<1	<1	<1	6.9	<1	<1	2200	<0.001
19	1.00	<1	<1	<1	7.0	<1	<1	1500	<0.001
	3.50	<1	<1	<1	7.0	<1	<1	1000	<0.001

Table W2 results of soil contamination testing at each sample location on site.

Sample	Arsenic (Total)	Copper (Total)	Lead (Total)	pH	Total Cyanide	TPH	N	P	Anth	R	B(a)A	Chy	B(a)P	Bper	B(k)F	IP
Generic Threshold	ug/l	ug/l	ug/l		ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Value	60	75	75		1500	600	70	5	5	1	0.5	0.05	0.05	0.05	0.05	0.05
4	32	52	71	7.5	<1	30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01
10	<1	<1	<1	6.9	<1	5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01
14	<1	<1	<1	6.8	<1	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01
16	7	5	5	6.5	275	3500	280	75	60	35	7	5	6	5	4	3
17	5	4	5	6.9	200	1200	110	39	15	6	5	3	3	2	1	1

Table W3. Results of groundwater contamination testing at sample locations on site.

Polycyclic Aromatic Hydrocarbons (PAH)

TPH = Total Petroleum Hydrocarbons

N = Napthalene

P = Phenanthrene

Anth = Anthracene

Fl = Fluoranthene

B(a)A = Benzo(a)anthracene

Chy = Chrysene

B(a)P = Benzo(a)pyrene

Bper = Benzo(ghi)perylene

B(k)F = Benzo(k)fluoranthene

IP = Indeno(1,2,3-cd)pyrene

h) Risk Evaluation

Evaluate the risks identified. Write down the identified Pollutant Linkages:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

What Pollutant Linkages might be considered unacceptable?

Why?

Is there a need for any immediate action?