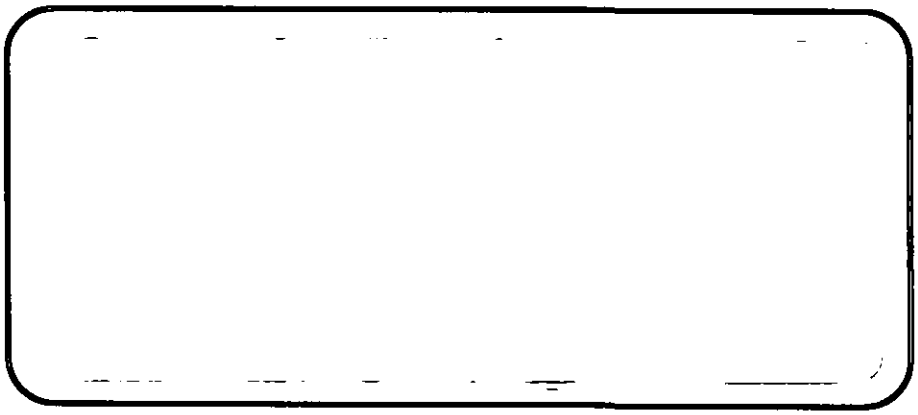
1985

CP Rail System



Environmental & Regulatory Affairs

Engineering Services

CP RAIL

PHASE I - SITE ASSESSMENT
WESTON YARD
WINNIPEG, MANITOBA

DECEMBER 1991

EXECUTIVE SUMMARY

The CP Rail Weston Yard, including the Weston Shops, the Winnipeg Diesel Shop and an Intermodal facility is located within the city of Winnipeg, 3.5 km northwest of the city centre.

The Weston Shops were constructed between 1905 and 1911 and have been expanded and modified since. The main activities of the shops have included servicing and repairing of locomotives and freight cars. The primary activities of the Winnipeg Diesel Shop are the servicing and fuelling of locomotives. Major fuelling facilities were added to the Weston Yard in the mid 1960s. The first stages of the Intermodal facility were constructed in the early 1960s.

During the course of this Phase I Site Assessment, information was collected regarding historic and current site activities, soil and groundwater conditions, adjacent land use and off-site and on-site buried utilities. Additional information was obtained from site walkthroughs and interviews with both current and former employees.

The Phase I Site Assessment has identified several areas of concern which may require further investigation. These areas include:

1. the former fuelling station, active from the mid 1960s through 1984,
2. the current fuelling station, in operation since 1984,
3. the truck transfer point at the current diesel fuel storage tanks,
4. load test and locomotive waiting areas adjacent to the Component Shop, Winnipeg Diesel Shop and Diesel Heavy Repair Shop,
5. hydrocarbon contaminated soil found in two bore holes within the Component Shop,
6. a small spill on the test track adjacent to the Materials Department,
7. a stockpile of potentially hydrocarbon contaminated fills on the northwest quadrant of the yard, excavated for construction of the Winnipeg Diesel Shop, and
8. locations of current and former oil tanks, paint shops and sand blasting areas.

The site is bordered by residential, commercial and industrial properties. The City of Winnipeg's McPhillips Water Reservoir is within 250 metres of the current and former fuelling facilities. With the exception of surficial fills, the site soils are generally silts and clays of very low permeability. There has been no evidence for off-site migration of contaminants and the probability of such would appear to be low.

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1.0 INTRODUCTION

The Weston yard is located within the city of Winnipeg, approximately 3.5 km northwest of the city centre, as shown on Drawing No. CG139.2-1. The major components of this yard are the Weston Shops operated by Mechanical System, the Winnipeg Diesel Shop operated by the Winnipeg Division of Heavy Haul System, and the Intermodal facility.

The Weston shops were constructed for the most part between 1905 and 1930; however, the addition or removal of structures, and a change in function of existing structures has occurred throughout the operational history. The major activities of the shops have been the servicing and repair of locomotives and freight cars. Fuelling of locomotives, previously carried out at the classification yard east of McPhillips Street, was moved to the Weston yard in the mid 1960s and continues to this day. Fuelling is associated with the Winnipeg Diesel Shop, which currently dispenses approximately 9.0 million litres of diesel fuel per month.

1.1 Objective

The objective of this Phase I Environmental Site Assessment study was to assess the potential for soil and groundwater environmental contamination of CP Rail Weston Yard due to past practices and activities in the yard. Sites of potential contamination were identified by collecting and analyzing historic information; no field or lab testing was carried out.

12 Scope of Study

This study was limited to areas of potential and known contamination on lands currently owned and used by CP Rail. Lands leased to other tenants or owned by other CP Limited companies were not considered. Compliance of present-day yard operations with current environmental regulations was not examined.

13 Sources of Information

In order to establish site history information from several different sources was evaluated. An environmental questionnaires circulated from the Office of the

Chief Engineer and completed by three sources, those being Weston Shops, Winnipeg Diesel Shop and the Winnipeg Division, provided site background information. CP Rail drawings and files from Weston Shops and the Office of the Chief Engineer, CP Rail Archives and the Government of Manitoba Archives were the main source of historical information. Geotechnical and groundwater information was gathered from published geological reports, the Manitoba Department of Natural Resources and CP Rail reports. Land use and buried utilities information was obtained from the City of Winnipeg.

Site spill history and background information was also gathered from interviews with long-serving CP Rail employees and retirees. Those interviewed formally or by telephone were:

Mr. Bill Welligan, retired General Locomotive Foreman,
Mr. Russell McCreedy, retired Shop Engineer,
Mr. Dave Schab, Area Supervisor B&B/Energy, Weston Shops,
Mr. Ray Kowal, Documentation Technician, Weston Shops,
Mr. Joe Nardone, Shop Industrial Engineer, Winnipeg Diesel Shop,
Mr. Norm Robertson, Assistant Manager, Intermodal,
Mr. Curtis Lawson, Office Manager, Winnipeg Division,
Mr. Mike Eggleston, Division Engineer, Lakehead Division (previously with Winnipeg Division)

2.0 SITE HISTORY

21 On Site Activities

2.1.1 Sources of Information

The historical development of buildings and facilities within the Weston Yard provides a good appreciation of activities which could have resulted in soil and groundwater contamination. The information contained in this section is based primarily on the following sources.

1. A CP Rail Archives listing providing dates of construction for many of the buildings.

2. A 1917 Fire Insurance Map.

3. CP Rail site plans and drawings for the years 1925, 1926, 1927, 1944, 1952, 1963, 1969, 1974, 1981, 1984 and 1991.

4. Air photographs for the years 1946, 1948, 1949, 1950, 1959, 1967, 1972, 1976, 1980, 1984, 1986, 1988 and 1991.

5. Discussions and interviews with current and former CP Rail employees.

2.1.2 Sequence of Site Development

The Canadian Pacific Railway reached Winnipeg from the east in 1881 and was completed to the west coast in 1885. The majority of the Weston Shop was built between 1905 and 1911 during a period of rapid growth and immigration into western Canada. Table 2.1 presents a list of the majority of the Weston Shop buildings with their original names, current names, and dates of construction. The numbers in the left column of this table are shown in square brackets, [ ], within the text of this report section for reference to Table 2.1. Drawing No. CG139.2-2 provides a site plan showing the locations of many current and historic buildings and facilities. The facilities constructed in this period included the Freight Car Shop [2], Boiler Shop [6], Power House [5], Tender/Wheel/Steam Shovel Shop [20], East and West Passenger Car Shops [11, 12], Frog and Switch Shop [13], Blacksmith Shop [15], Foundry [17], Locomotive Shop [10], Stores and Offices [19], Clock House/Library/Kitchen [H9], Repair Sheds [H1], a Paint and Oil Shop [H3], and other ancillary facilities.

The commentary accompanying the 1917 Fire Insurance Map demonstrates the extent of activities at this major facility. Activities included the building and repairing of wooden freight cars, and the repairing of locomotives and wooden passenger coaches including upholstering and painting. The plant ran day and night, and employed 2500 people. Electricity was obtained from the City at 2300 volts and transformed to 600 volts using oil transformers. Some of the power was transformed further to 110 volts for building lighting. Weston also generated some of its own power on site, primarily during the winter. Fuel for boilers was soft slack coal and shavings. Fuel oil furnaces and coke were used for "melting and other purposes" , soft coal for open hearths, and acetylene and electricity for cutting and welding.

The next significant development phase occurred primarily during the 1925 through 1930 period. This included expansion of the Freight Car Shop [2] and Blacksmith Shop [15], and construction of the Pattern Shop [16], Oil House [18], Gasoline House [H5], Firehall, Scale, Greenhouse, Sand and Coke Shed, and two Sand Blast facilities [H4, H6].

The next development of significance to this study was the 1940 construction of an Oil Separator Tank [3] near the northeast corner of the Freight Car Shop [2].

The progression of site activities during the 1950's is reflected in the change of building names (and functions) rather than the construction of additional buildings. A change in function may pre-date the building name change by a period of time, yet to be determined. The Wheel/Tender/Steam Shovel Shops became the Diesel Shop [20] as steam powered locomotives were replaced by diesel electric units. The East and West Passenger Car Shops [11, 12] were converted to Maintenance of Way Shops.

Diesel fuelling facilities [H10] with above ground tanks were constructed at Weston in the mid 1960's, 300m east of the Diesel Shop (currently Diesel Heavy Repair Shop [20]). The only building of any significance constructed in this period was the One Spot Repair Shop [1], located near the northwest corner of the Freight Car Shop [2]. During the 1960's and early 1970's, old steam locomotives were cut up and scrapped in the area west of the Blacksmith [15] and Frog Shops [13]. The Intermodal [25] and freight trucking facilities [26] along the west and north perimeters of the yard were started and expanded in these decades.

The Flood Retention Pond [22] and an associated Oil-Water Separator [23] were constructed at the southeast corner of Weston Yard in 1971. Prior to that date oily wash water and diesel fuel captured in drip trays were directed to the yard's combined sewer, and subsequently into the City sewer system without treatment. The other new structures built during this decade were the current Paint Shop [4], and an additional large fuel tank with an earth berm adjacent to the fuelling facility [H10].

The most significant developments during the 1980's were the construction of the new Winnipeg Diesel Shop [21], the relocation of the fuelling platforms to

TABLE 2.1 FACILITY NAMES AND CONSTRUCTION DATES

Number	Original Facility Name	Date Constructed	Current Name
1	One Spot Repair Shop	mid 1960's	same
2	Freight Car Shop	1910	same; extensions 1927, 1928
3	Oil Separator Tank	1940	Tank Car Cleaning Sump House
4	Paint Shop	1971	same
5	Power House	1905	same
6	Boiler Shop	1911	Wheel Shop (has been Paint Shop)
7	Tube Shop/Plate Rack	1911	Wheel Reclaim Shop
8	Air Brake Shop	1905-1910	Garage & Upholstery Shop
9	Planning Mill	1905-1910	Millwright & Electrical Shop
10	Locomotive Shop	1905-1910	System Component Shop
11	East Passenger Car Shop	1905	East Maintenance of Way Shop
12	West Passenger Car Shop	1907-1911	West Maintenance of Way Shop & Hopper Car Shop
13	Frog & Switch Shop	1905	Frog Shop
14	Garage	1905-1910	Signal Stores
15	Blacksmith Shop	1905	same; extension 1927
16	Pattern Shop	1929	Administration Building
17	Foundry	1905-1907	Steel Shop

TABLE 2.1 (continued) FACILITY NAMES AND CONSTRUCTION DATES

Number	Original Facility Name	Date Constructed	Current Name
18	Oil House	1924	Scrap Dock Reclaim Dept.
19	Stores, Offices, Platforms Timber Shelter	1905-1917	Materials Dept., Platform, Shelters
20	Wheel, Tender & Steam Shovel Shop	1907-1911	Diesel Heavy Repair Shop
21	Winnipeg Diesel Shop	1984	same
22/23	Retention Pond & Oil Water Separator	1971	same; Separator moved 1980's
24	Diesel Tanks	1984	same
25	Piggy Back Services	1967	Intermodal
26	Merchandise Services	1963	CP Express and Transport Ltd.
H1	Repair Sheds	pre 1917	Removed by 1944
H2	Oil and Coal House	pre 1917	Removed by 1944
H3	Oil and Paint Shop	pre 1917	Removed 1952-1963
H4	Oil House, then Sand Blast Facility	pre 1917	Changed 1929; removed 1952-1963
H5	Oil Tank & Oil Car House near Frog Shop	1911-1918	Removed 1959-1974
H6	Sand Blast House	1930	Removed 1952-1963
H7	Gasoline House	1931	Not named after 1944; removed 1952-1963
H8	Lime Shed	1914	Removed 1963-1969
H9	Clock House, Library, Lunch Room, Kitchen	1906	Removed 1952-1963
H10	Former Locomotive Fueling Facility	1967	Removed 1984; function moved to #24

Note: "H" indicates an historical facility that has been removed

the south side of this new shop, and the relocation of the diesel fuel storage tank farm [24]. Three large 886,500 litre tanks were erected at the present location. This facility includes a protective concrete berm, a pumphouse, and a pipeline to the locomotive fuelling platform.

During the construction of the new Winnipeg Diesel Shop [21], approximately 13,800 cubic metres of fill and natural soil were excavated, and placed in an area within the northwest quadrant of the yard. It is believed that foundation soils and sections of concrete floor slab originating from upgrading modifications to the Diesel Heavy Repair Shop [20] were also placed in that area.

The last development activity at the Weston shop of significance to this study was the relocation of the Oil Water Separator [23] during the mid 1980's from the bottom of the Flood Retention Pond [22] to its current location adjacent to the pond.

It should be noted that functions of many of the buildings, or portions thereof, have changed several times during the last four decades. These changes are considered too frequent and of insufficient relevance to document in this report; however, specific activities and functions of relevance are considered in additional detail in the subsections which follow. It should also be noted that several buildings, including the Maintenance of Way Shops [11, 12], are scheduled for demolition during 1992.

2.1.3 Oil, Gasoline and Liquid Chemical Storage Tanks

Four oil storage locations are shown on the 1917 Fire Insurance Map. These include: a small Coal and Oil House [H2] south of the main line and 120m west of McPhillips Street (removed by 1944); an Oil and Paint Shop [H3] (removed between 1952 and 1963) 230m due east of the current Diesel Heavy Repair Shop [20]; a large Oil House [H4] (changed to a Sand Blast Shop in 1929) located 76m to 105m west of the current Diesel Heavy Repair Shop [20]; and, above ground Oil Tanks [H5] (removed between 1969 and 1974) located 15m southwest of the southwest corner of the Frog Shop [13]. Fuel oil lines from these tanks supplied fuel to most of the major buildings. The fuel lines were located within the extensive network of underground concrete utilidors.

In 1924 an Oil House [18] was constructed south of the Blacksmith Shop [15]. It became the current Scrap Dock and Reclaim Department between 1969 and 1974. A small Gasoline House [H7] is shown 50m west of this Oil House [18] on the 1944 drawing, but had been removed prior to 1952.

An Oil Separator Tank [3] was constructed near the northeast corner of the Freight Car Shop [2] in 1940. It was called the Oil Sump on the 1969 drawing and the Tank Car Cleaning Sump House on the 1974 drawing. These name changes may reflect an upgrading of the unit or merely a change in function.

An above ground Lye cleaning tank was located in the current Systems Component Shop [10] (then Locomotive Shop) in this era; however, evidence of its date of construction, date of removal and operational history have not been determined.

The 1963 drawing shows an Oil Reclaiming Shop at the current (1991) Garage and Upholstery Shop [8]; however, this was removed prior to 1969.

A fuelling facility [H10] was constructed 300m east of the current Diesel Heavy Repair Shop [20] between 1963 and 1967. This facility included two above ground tanks protected by an earth containment berm. A third, larger tank was added between 1972 and 1976, with a separate earth containment berm.

The present fuel storage facility [24], consisting of three 886,500 litre above ground steel tanks protected by a concrete containment dyke, was constructed in 1984. It replaced the former fuelling facility [H10].

The following are additional storage tanks located at the Winnipeg Diesel Shop [21, includes 20] and well documented on the Environmental Screening Questionnaire. These tanks are less than eight years in age.

- a 6,800 litre underground concrete tank for skimmer effluent (mainly diesel fuel) associated with the drip tray collection system at the current fuelling station.

- a 4,600 litre underground steel tank for oily/watery sludge separator effluent collecting all drains from the Diesel Shop.

- a 13,600 litre underground concrete chemical toilet effluent tank.
- a 91,000 litre above ground steel used oil storage tank in the basement of the Diesel Shop.
- two 91,000 litre above ground steel new lube oil tanks, located as above.
- a 20,500 litre above ground steel new journal oil tank, located as above.
- a 18,000 litre above ground steel borate nitrate cooling solution tank, located as above.
- a 2,300 litre above ground steel new journal oil tank in the Diesel Heavy Repair Shop.
- a 2,300 litre above ground steel used oil tank in the Diesel Heavy Repair Shop.
- two 2,300 litre above ground steel oil skimmer effluent tanks associated with the wash track in the Diesel Heavy Repair Shop.
- a 16,000 litre below grade, concrete, locomotive wash water and sludge effluent recycling pit beneath the Diesel Heavy Repair Shop wash track.
- several above ground, self contained tanks associated with equipment Proceco washing units.

Waste oils from the above listed tanks are pumped out and taken for recycling, burning at the Power Plant [5], or disposal by a third party. All of the tanks associated with the Winnipeg Diesel Shop [21, includes 20] appear well built. There is no visual evidence of leakage from above ground tanks, and no reason to suspect any significant leakage from underground tanks.

The following are additional liquid storage tanks located at Weston Shops and not associated with the Winnipeg Diesel Shop or the trucking facilities along the north and west perimeters of the yard.

- a 900 litre above ground steel heating oil storage tank at the West Yard office, with ground surface staining indicating minor spillage.

- a 3,600 litre above ground, overhead, steel diesel fuel tank in the West Yard area, with ground surface staining indicating minor spillage.

- a 3,600 litre above ground, overhead, diesel fuel tank near the Power House [5].

- a 4,500 litre underground, fiberglass gasoline storage tank north of the Blacksmith Shop [15]; an old leaking underground steel tank had recently been removed, and any contaminated soil excavated prior to placement of this new tank.

- a 25,900 litre underground, concrete tank car residue storage tank at the Tank Car Cleaning [3] area near the northeast corner of the Freight Car Shop [2].

- several above ground, self contained tanks, associated with Proceco equipment wash units are located in the Wheel Shop [6] and Systems Component Shop [10].

- a large, partially underground, elongated, rectangular box concrete tank associated with the Oil Water Separator [23] for the Weston sewer system.

2.1.4 Fuelling Facilities

Coal

Coal was stockpiled along Keewatin Street until the early 1950's. Test hole logs for freight trucking facilities in this area encountered a thin remnant layer of coal just below ground surface.

Diesel Fuel

The locations and construction dates for the two diesel locomotive fuelling facilities [H10, 24] have been provided in the previous section and will not be repeated. The first fuelling facility [H10] was in operation between 1967 and

1984. The facility incorporated drip trays to collect diesel fuel spillage; however, the collection system was connected directly to the Weston sewer system and flowed directly into the City sewer system. The Oil Water Separator [23], built with the Storm Retention Pond [22] in 1971, functioned to remove much of the diesel fuel before the Weston sewer effluent left the yard.

The retired employees interviewed reveal that in the late 1960's and 1970's, the Buckeye adapters in locomotive fuel tanks occasionally malfunctioned. Consequently fuel pumping would not shut off when the tanks were filled. A portion of this excess would be directed by the drip tray collection system into the sewers. Some fuel may also have infiltrated into the ground. According to Mr. Mike Eggleston, corrosion of buried PVC telephone line conduits in this vicinity and hydocarbon odours during 1984 construction excavations provide evidence of contaminated soil.

Traction sand may have been contaminated by fuel spillage. This sand was reported to have been spread as fill for low spots in the Weston yard or hauled off site.

The current fuelling facility [24], in operation since 1984, has a more extensive network of drip trays to capture spilled diesel fuel. The drip trays beneath the fuelling station track feed into an oil water separator for recovery of the diesel fuel. Approximately 11,400 to 13,600 litres per month is recovered with this oil water separator. This represents 0.1% to 0.15% of the diesel fuel supply. The new drip tray catchment system incorporates concrete aprons and steam lines to prevent winter freezing of trapped water. Consequently, this is much more effective in preventing fuel spillage onto the adjacent ground surface than the catchment system used at the former fuelling facility [H10].

Locomotives waiting in line to be fueled drip small amounts of fuel, lubricating oil, and oil associated with air box drainage. Consequently the track ballast in these areas has become oil stained.

2.1.5 Sand Blasting Facilities

Sand blasting facilities pose a potential concern because of the lead previously used in paint. Sand blasting activities have been carried out in at least three

locations. In 1929 the Oil House [H4] located 76m west of the current Diesel Heavy Repair Shop [20] was either converted to or replaced by a Sand Blast building. Another building called the Sand Blasting House or the Car Sand Blasting Shop [H6] was constructed 25m north of the current East Maintenance of Way Shop [11] in 1930. Both structures were removed between 1959 and 1963.

Sand blasting is currently conducted on outside tracks, approximately 60m west of the West Maintenance of Way Shop [12].

The used sand would historically have been used to fill low lying areas within the Weston Yard or for development of on site roads. For some period within the last 2 decades, waste sand was moved off site and used for sand traps on a CP Rail employee's golf course. Currently, used sand is moved off site to a landfill by a third party.

2.1.6 Painting Facilities

Painting facilities pose a potential concern because of the use of oil based products and solvents. A small Oil and Paint Shop [H3] 230m east of the current Diesel Heavy Repair Shop [20], its construction pre-dating the 1917 Fire Insurance Map, was removed between 1952 and 1959. It is understood that much of the painting was done outside, adjacent to the shop. A portion of the current Wheel Shop [6] served as the Paint Shop until 1971 when it was replaced by the current (new structure) Paint Shop [4].

2.1.7 Car Burning and Dismantling of Steam Locomotives

Burning of wooden cars occurred in areas called the Farm (1926 drawing) 150m east of the Freight Car Shop [2] and the Old Farm (1926 drawing) 150-200m west of the Frog Shop [13] until the 1960's. Metal scrap was reclaimed after car burning. Old steam locomotives were cut up for scrap in the area west of the Frog Shop [13] and the Scrap Dock [18] from the late 1950's through the early 1970's.

2.1.8 Intermodal and Freight Trucking Facilities

The Intermodal facility [25] was developed along the north boundary, within the western half of the yard, in phases between 1967 and 1984. It includes an

office with weigh scales, a large yard, and a training facility. Fuelling does not occur on this site. Sewer and water lines are independent from the Weston Shop and are tied into the City system along Selkirk Avenue. Lignal sulphate is used rather than oil to keep down dust due to the close proximity of City sewers. If dangerous commodities are found to be leaking, they are to be placed on plastic sheeting at the southwest corner of the site. With the exception of 100 kegs of overproof rum, no leaks in excess of 20 litres have been reported.

The CP Express and Transport [26] facility at the northwest corner of Weston Yard was constructed between 1963 and 1967. The facility has several large, long warehouses for receiving freight from rail cars and transferring it to trucks. An on site fuelling system includes underground storage tanks.

Two additional trucking freight terminals were constructed along Keewatin Street in 1969 and between 1976 and 1980. These are presently operated by Consolidated Fast Freight. Fuelling operations do not occur on these properties.

22 Previous Waste Disposal Practices

Liquid Waste Disposal

There is no record of disposal of liquid wastes on the Weston Yard, and no recollection from the retired employees who were interviewed. A portion of waste oil was, however, used in the summer months to reduce dust from the site roads, and sprayed on weeds to reduce their growth. Based on available records these activities cannot be correlated with specific site areas.

Two small sumps, which may have contained oily waste, are indicated on the old drawings. The first is a 2m by 3m sump located 150m east of the southeast corner of the current Diesel Heavy Repair Shop [20]. The second sump was adjacent to the northeast corner of the Freight Car Shop [2], and was sometimes referred to as the Oil Separator [3].

The natural foundation soils at Weston are quite impermeable. It would have been impractical to dispose of oil or oily liquid wastes within sumps or lagoons on site. It is likely that any sumps were temporary storage points prior to off site disposal, or transportation of the oil to the Power Plant [5] for incineration.

Historically, oil wastes and solvents from normal cleaning operations within the shop buildings were probably washed into the Weston sewer system and consequently into the City sewers.

An Oil Water Separator [23] and Flood Retention Pond [22] were constructed in 1971, and effectively remove oil from the Weston combined sewer system before it empties into the City sewer at McPhillips Street. If the retention pond were filled to capacity during a severe rain storm, the effluent would by-pass rather than over flow the retention pond.

Currently, liquid oily wastes are either removed by a third party for disposal, collected and transported to the Power Plant [5] for incineration, or collected in tanker cars to be shipped to a recycler.

Solid Waste Disposal

There are no records of solid waste disposal within the yard, with the exception of ashes from the Power Plant [5], sand from historical sand blasting operations [H4, H6], and soil and concrete rubble from construction excavations for new or renovated facilities at the yard. Approximately 13,800 cubic metres of soil (fill, ballast, native soils) was excavated for the Winnipeg Diesel Shop [21] and placed in the northwest quadrant of the yard. That soil may have had hydrocarbon contamination. According to the Environmental Screening Questionnaire completed by Weston Shops, approximately 21,400 cubic metres of concrete rubble are contained in a one acre area located west of the B & B storage compound. When sufficient quantity accumulates, it is the stated intention to haul the rubble to a City of Winnipeg landfill site.

All other solid wastes were historically and are currently removed from the yard for disposal or recycling.

23 Adjacent Land Use and Activities

The majority of adjacent land is and has been used for residential and light industrial purposes. This section considers adjacent activities which could potentially have caused significant soil or groundwater contamination. The reader is referred to section 3.4 for a broader review of adjacent land use.

Industrial land use exists along the western (Keewatin Street) and the majority of the eastern (the exception being the Continental Motor Hotel) boundaries of the yard. A 150m wide strip of land adjacent to the east central quarter of the southern yard boundary, between Bury Street and the CP Rail La Riviere Subdivision track, is used for industrial purposes, and separates the Weston Yard from residential property. The activities include Canadian Bronze, Carter Day, Wellpan Recycling, Champion Road Machinery and the Manitoba Government Services Work Shops.

Three adjacent properties are considered potential sources of contamination. Canadian Bronze has been active for many decades and uses liquid chemicals in its plating operation. The CP Express facility and the Manitoba Government Work Shops include on-site fuelling facilities.

24 Spill and Remediation History

According to the Environmental Screening Questionnaire completed by Weston Shops, the most significant known spill within the shops property was a leak in an underground gasoline storage tank north of the Blacksmith Shop [15]. This was remediated to the satisfaction of the Manitoba Workplace Safety and Health Department and a new fiberglass storage tank installed in May, 1990.

A separate Environmental Screening Questionnaire was completed by the Winnipeg Diesel Shop [included 20,21,24]. According to that questionnaire, they were not aware of any spills of significant quantities of products which CP Rail uses or dangerous commodities which CP Rail transports.

Two small spills were recalled during the interviews with retired employees; however, the details and dates of the incidents are unclear. A spill of between 400 and 1000 litres of diesel fuel occurred during the 1970's near the current Systems Component Shop [10] when a locomotive left the test track, turned on its side, and had a fuel tank punctured. This spill occurred in the winter when the ground was frozen, and remediation was limited to a cleanup of the fuel on the ground surface.

The second incident noted by retired employees and partially recalled by some current employees was spillage within the concrete containment barrier around the current 3 large fuel storage tanks. This was said to be cleaned up without escape of hydrocarbons into the soil or groundwater.

3.0 PHYSICAL SETTING

3.1 Geography

The CP Rail Weston Shops are located within the Winnipeg city limits, 3.5 km northwest of the city center (considered the intersection of Main Street and Portage Avenue). The city center is located at geographic coordinates 633,700m E and 5,528,450 m N, and has a mean elevation of 232 m MSL.

The terrain is a flat lying glacial lake basin, with generally less than 10m relief over the entire city, dipping gently towards the Red and Assiniboine Rivers. The Weston Shops are in excess of 3.5km from these major drainage courses.

3.2 Climate

The climate of the Winnipeg area is characterized by very warm summers and very cold winters. Precipitation averages about 525 mm, of which 115 mm falls as snow. The majority of the rainfall occurs between 01 May and 01 October, with the months of June, July and August each having rainfalls between 75 mm and 80 mm.

Winnipeg has a mean annual temperature of 2.2°C, with January being the coldest month (mean of minus 19.3°C) and July the warmest (mean 19.6°C). The minimum temperature dips below 0°C for 195 days of the year. The prevailing wind direction is S and the average wind speed is 18.6 km/hr (ranges from 16.0 km/hr in July to 20.9 km/hr in April). Winnipeg has 2,321 hours of bright sunshine, which represents 51% of the possible hours.

A summary of the climatic data for Winnipeg, as tabulated from Environment Canada records, is presented at Table 3.1. Drawings No. CG139.2-3 and CG139.2-4 graphically present the precipitation, the mean temperature, the

TABLE 3.1 WINNIPEG METEOROLOGICAL DATA

STATION	WINNIPEG	LATITUDE	49° 54' N
PERIOD	1951-1980	LONGITUDE	97° 14' W
		ELEVATION	239 m

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	ANNUAL
MEAN DAILY MAXIMUM TEMPERATURE	-14.3	-10.1	-2.8	8.9	18.0	23.1	25.9	24.7	18.4	11.5	-0.3	-9.4	7.8
MEAN DAILY MINIMUM TEMPERATURE	-24.2	-21.0	-13.5	-2.2	4.5	10.5	13.3	11.8	6.3	0.7	-8.8	-18.6	-3.4
MEAN DAILY TEMPERATURE	-19.3	-15.6	-8.2	3.4	11.3	16.8	19.6	18.3	12.4	6.1	-4.5	-14.0	2.2
STANDARD DEVIATION, DAILY TEMP.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EXTREME MAXIMUM TEMPERATURE	7.8	11.7	23.3	34.3	37.0	36.7	37.8	40.6	36.2	29.4	23.9	11.7	40.6
EXTREME MINIMUM TEMPERATURE	-42.2	-45.0	-37.8	-26.3	-11.1	-3.3	1.1	0.6	-7.2	-17.2	-32.2	-37.8	-45.0
MEAN RAINFALL	0.2	0.7	3.3	27.1	63.2	80.1	75.9	75.2	53.0	25.9	5.5	0.9	411.0
MEAN SNOWFALL	21.1	16.8	19.4	11.4	2.5	0.0	0.0	0.0	0.3	5.0	19.7	18.3	114.5
MEAN TOTAL PRECIPITATION	21.3	17.5	22.7	38.5	65.7	80.1	75.9	75.2	53.3	30.9	25.2	19.2	525.5
STANDARD DEVIATION, TOTAL PRECIPITATION													
MEAN WIND SPEED	18.6	18.1	19.3	20.9	20.2	18.1	16.0	16.4	18.5	19.6	19.4	18.6	18.6
PREVAILING DIRECTION	S	S	S	S	S	S	S	S	S	S	S	S	S
MEDIAN DEPTH OF SNOW COVER in	0	0	0	0	0	0	0	0	0	0	0	0	0

mean wind speed and the computed monthly evapotranspiration for each month of the year.

3.3 Hydrology

3.3.1 Regional Hydrology

The Winnipeg area is generally flat lying and has a poorly developed surface drainage system. As the result of poor surface and subsurface (infiltration) drainage, low lying or depressional areas were swampy or boggy before development enhanced the drainage. The major drainage courses through Winnipeg are the Red and Assiniboine rivers. The upland area northwest of the city and the Weston Shops is drained by Omand's Creek, which empties south and west into the Assiniboine River. Much of this creek channel has been deepened and straightened to traverse the residential area of Winnipeg. The newer residential subdivisions northwest of Weston Shops have been developed with stormwater retention ponds to alleviate overtaxing of the combined (stormwater/sanitary) sewer system.

The area around Weston had very poor drainage until development introduced a network of roads and ditches, and subsequently a series of sewers. The city sewers in the vicinity of Weston drain eastward to the major trunkline beneath McPhillips Street, then northward and eastward to the North End Water Treatment Plant.

3.3.2 Site Drainage and Sewers

The developed portion of the yard, primarily areas around buildings, is drained by an extensive network of sewers, manholes and catch basins. This is a combined sewer system (exterior rainwater/meltwater, sanitary wastes, and all liquid wastes which enter the sewer system in each shop building). The Weston sewer flows to the oil-water separator near the southeast corner of the yard before emptying into the city sewer system along McPhillips Street. The Weston Yard and the adjacent city of Winnipeg sewer lines and water lines are shown on Drawing Nos. CG139.2-5 and CG139.2-6 respectively.

Catch basins east of the Winnipeg Diesel Shop, and a series of drip trays beneath a section of waiting tracks east of the current fuelling station, are also connected to the Weston sewer system. Drip trays and catchment pits directly beneath the fuelling station are connected to an independent oil-water separator which removed the diesel fuel. The water from this separator is subsequently directed into the Weston sewer system.

The Weston sewers are apparently overtaxed by a one in ten year storm event. The retention pond has been full twice since its construction in 1971. During prolonged rainfall another consequence is that storm water begins to back up into the concrete utilidor system connecting the shops.

The north and west portions of the yard are not connected to the Weston sewers. Ditches around the CP Express and Transport site and the Intermodal facility have been constructed to facilitate drainage from these areas and to reduce the groundwater level within the granular pad fills. These ditches are believed to be connected to the sewer system along Selkirk Avenue and Keewatin Street.

The west central portion of the yard is drained by a ditch trending towards the southeast corner of the CP Express and Transport site, and connecting to the ditch running along the south side of the Intermodal property.

In summary, the majority of the east portion of the yard, including the fuelling area, is drained through the Weston combined sewer system to the oil-water separator near the southeast corner of the yard, and subsequently into the city sewer system. The west portion of the yard is drained by a limited number of ditches, which empty into the city sewer system along Keewatin Street and Selkirk Avenue.

3.4 Adjacent Land Use and Potential Receptors

3.4.1 Residential Land Use

Drawing No. CG139.2-7 presents City of Winnipeg land use zoning in the vicinity of Weston Yard. Selkirk Avenue runs along the northern boundary of the yard. With the exception of a small piece of commercial property at Sheppard Street, all of the land use along Selkirk Avenue is single family

residential units. Residential property is either adjacent to or within 250m of the southern boundary for the most westerly 75 percent of the site. This includes both single and multi-family dwellings. There is no residential land use along the western (Keewatin Street) or eastern (McPhillips Street) boundaries.

3.4.2 Commercial Land Use

Commercial land use adjacent to the Weston Yard is limited to the Continental Motor Hotel to the east, along McPhillips Street, and a small store to the north at Selkirk Avenue and Sheppard Street. Commercial activity along Logan Avenue to the south is greater than 200m from the yard property line.

3.4.3 Industrial Land Use

Industrial land use exists along the western (Keewatin Street) and the majority of the eastern (the exception being the Continental Motor Hotel) boundaries of the yard.

A 150m wide strip of land adjacent to the east central quarter of the southern yard boundary, between Bury Street and the CP Rail La Riviere Subdivision track, is used for industrial purposes, and separates the Weston Yard from residential property. The occupants include Canadian Bronze, Carter Day, Wellpan Recycling, Champion Road Machinery and the Manitoba Government Services Work Shops.

3.4.4 Institutional Land Use

Four schools are located within 500m of the boundaries of the yard. Those are Florence Nightengale School (200m north), Shaughnessy Park School (300m north), Sisler High School (500m north) and Weston School (320m south). Four churches are located within 500m, but no closer than 250m, of the yard boundaries. There are no known hospitals or medical clinics in close proximity to the Weston Yard.

3.4.5 Recreational and Public Land Use

Several community centers and small parks are located within 500m. Those are Weston Community Club (adjacent to the south yard boundary near the west end of the yard), Northwood Community Center (400m north), Shaughnessy Park Recreational Center (300m north of the northwest corner of the yard), and the Old Exhibition Grounds (250m east, across McPhillips Street). Several other small recreational park land areas do not have significant permanent structures, the most noteworthy being the elevated football fields on the covered McPhillips Reservoir, adjacent to the south boundary along the eastern quarter of the yard.

3.4.6 McPhillips Reservoir

Located south of the Winnipeg Diesel Shop, this is a major water storage and pumping station for the City of Winnipeg. It has a storage capacity of 227 million litres, and a daily pumping capacity of 364 million litres. The floor elevation of the reservoir is 228.6m, which is 4.5m below the ground surface elevation at the Winnipeg Diesel Shop. The suction line between the reservoir and the pumping station is an additional 2.5m below the reservoir floor. There has, however, never been any indication of hydrocarbons at the reservoir, or in a 45m deep groundwater monitoring well installed near the reservoir in 1968.

3.4.7 Water Wells

Drawing No. CG139.2-8 presents a map showing locations of commercial water wells within several kilometers of the Weston Yard. There were no available records of residential water wells, however it is believed that such wells are rare. A record of historical commercial, agricultural or residential wells that have been abandoned was also not available.

4.0 GEOLOGY

4.1 Geomorphology

Winnipeg is situated at the confluence of the meandering Red and Assiniboine Rivers, in the broad plain of the Red River Valley. The majority of Winnipeg,

including the Weston site in northwest Winnipeg, is a flat lying glacial lake basin. The main geomorphologic features around the site are as follows:

1. The flat glacial lake basin has a general slope dipping 0.06% to the southwest. The Weston site has historically been referred to as boggy and poorly drained. The slope changes to 0.2 to 0.3 percent approximately 1.0 km west of the Weston Yard.

2. The Red River is located 3 km to the east.

3. The Assiniboine River is located 4 km to the south.

4. Woodman Creek is located 2 km to the west.

4.2 Regional Geology

4.2.1 General

The Winnipeg area is located stratigraphically on the north-east fringe of a sequence of gently dipping sedimentary rock units which overlie Precambrian basement rocks. Extensive periods of erosion prior to glaciation have removed many overlying younger formations in the Winnipeg area, with the result that each formation remaining terminates in an erosional wedge, thinning to the east as shown in Drawing No. CG139.2-9.

Due to the preglacial periods of erosion, with subsequent deposition, the Paleozoic carbonate bedrock surface exhibits remains of infilled caverns, sinkholes and crevasses. The infillings range from kaolinitic clays or silica sands, thought to be Cretaceous in age, to complex mixtures of silt, sand and gravel till materials.

The bulldozing action of advancing glaciers during the last Ice Age has torn loose and broken up blocks of the weathered carbonate bedrock. In addition, dense basal till units and glaciofluvial sands and gravels were deposited in direct contact with the ice on the disturbed bedrock surface. Local infilling of previously void crevasses and caverns occurred as well.

When the glaciers retreated northward for the last time about 13,500 years ago, they created a lake basin between the ice front, the Manitoba escarpment, and the heights of land to the east in north-western Ontario and to the south in Minnesota. Thus the pro-glacial Lake Agassiz was formed. In a complex series of advances and retreats of the ice margin, near the Winnipeg area much of the time, water-laid tills were deposited directly on the bedrock surface or over dense basal tills. This was followed by glaciolacustrine silty clays and silts, containing frequent ice rafted materials in the lower sections. Extensive glaciofluvial deposits, such as the Birds Hill complex, were also laid down during this time.

With time, Lake Agassiz level gradually dropped and the land began to emerge. Successive stages of lake drainage are marked by beach ridges to the north of Winnipeg. Silts and fine sands were deposited over the earlier lake deposits.

The average thickness of the surficial deposits in the Winnipeg area is from 15 to 21m. In recent times, changes have involved natural river erosion and the formation of alluvial deposits, as well as the formation of swamp lands in lower lying or depressional areas, due mainly to the poor drainage characteristics of the lake bottom sediments.

An extensive confined aquifer occurs in the fractured and jointed upper 15m of the bedrock underlying the Winnipeg area. The recharge areas are located in the uplands along the borders of the Red River Basin.

A typical undisturbed soil profile in the Winnipeg area, given the geological history described, consists of glacial Lake Agassiz deposits of silts and clays overlying silty till and Paleozoic carbonate bedrock. Variations in the stratigraphy and the distribution of the soil units are discussed below.

4.2.2 The Complex Zone

The upper most unit, designated as the Complex Zone, is generally about 3m thick. The Complex Zone consists mainly of stratified silty clay and silt, with varying amounts of organic soils, alluvial silts and sands and man-made fill.

This unit ranges from 0.6m to as much as 4.5m in thickness. The bottom of the silt usually defines the base of the Complex Zone.

In undisturbed areas, the stratified clay and silt unit of the Complex Zone contains tan silt interlayers and lenses which are generally encountered within the top 2m of the profile. These interlayers and lenses typically range from 0.05m to about 1.0m in thickness with a maximum of about 3m. The silt layers can vary greatly in thickness and continuity over relatively short distance.

The silt layers and lenses are often finely laminated with silty clay interlayers. The geotechnical properties of the silt units are predominantly governed by the frequency of these silty clay interlayers and the presence of absence of perched groundwater. The silt units have low plasticity or are non-plastic. They are usually loose or soft. Their moisture contents range from about 20 to 35 percent. Natural unit weights usually are within the range of 18.8 to 20.4 kN/m^3. The silts are sensitive to disturbance when saturated and are highly frost susceptible.

The laminated silty clay, often being the predominant material in the upper 3m zone, is medium to highly plastic. The silty clay liquid limits range from about 40 to 85, and plasticity indexes range from approximately 20 to 60. Moisture contents range from about 20 to 40 percent, and the liquidity index (corresponding to the stiff consistency) is usually only slightly greater than zero. A wide scatter is observed in unconfined compression test results. This is attributed to the heavily fissured, nuggety structure, which is a result of the intense physical weathering in this zone.

4.2.3 The Glaciolacustrine Clay

Glaciolacustrine silty clay generally underlies the Upper Complex Zone. Its thickness is generally between 9 and 12m, although it varies from 0 to 21m within Winnipeg. The upper 1.5 to 4.5m is weathered to a brown or mottled gray-brown color, while the clay below is gray (or blue, as termed by some). The brown clay typically is highly plastic, has a laminate structure and stiff consistency. The gray clay becomes soft with depth as the till is approached. The upper brown clay is usually highly fissured with the fissure frequency decreasing with depth into the gray clay and to the underlying till. Numerous

silt clasts and pockets occur in both clays. Rock fragments ranging from gravel to boulder sizes are found in the lower portion of the gray clay. They are seldom encountered in the brown clay. White gypsum pockets and veins occur randomly throughout the upper portion of the brown clay, often as filling in fissures.

Both clays are inorganic and have moisture contents varying from about 40 to 60 percent. In areas where the depth to till is less than 6m moisture contents are usually less than 40 to 45 percent, and the entire clay stratum is weathered to a brown to brownish-gray color.

On average, however, the brown clay is typically more plastic than the underlying gray clay. For the brown clay the liquid limit ranges from 80 to 110, and the plastic index from 60 to 70. For the gray clay the liquid limit ranges from 65 to 90, and the plastic index from 40 to 65. The liquidity index is usually less than 0.5 in the brown clay. In the gray clays at greater depths, the liquidity index approaches or slightly exceeds 0.5. Liquidity indexes near 1.0 have been observed in the soft zone near the clay/till contact.

The clay size fraction (material finer than 0.002 mm) is usually slightly higher for the brown than the gray clay. It varies from about 70 to 85 percent, with trace amounts of sand sizes. The clay mineralogy of the brown and gray clays is similar, being predominantly illite and smectite.

The range of undrained shear strengths, S_u, including results from unconfined compression, and laboratory and field vane tests, is 35 kPa to 85 kPa. The clays may be considered slightly to moderately sensitive, with the ratio of intact to remoulded shear strength varying from about 2 to 4.

These clays are subject to considerable volume change (1 to 3%) with changes in moisture content. Swelling pressures are generally less than 70 kPa. If the clay desiccates and is subsequently rewetted, very large volumetric increases or substantial swelling pressures develop. Excessive shrinkage and cracking will occur on drying.

4.2.4 The Tills

Silty tills underlie the clay deposits. The contact between the clay and the till may occasionally involve a transition zone of till lenses in clay, and then clay inclusions in the till. The till thickness ranges from 0 to greater than 9m, but is typically 3 to 6m thick. The upper part of the till is frequently loose and soft, and water bearing. The lower till section is usually dense to very dense. The tills are highly variable in terms of thickness, density index or consistency, boulder content, and permeability.

The tills are heterogenous mixtures of clay to boulder sizes and are typically well graded. The matrix material between the larger fragments usually contains from 40 to 60 percent silt and clay sizes. The silt sizes are predominant. The matrix is slightly plastic, with liquid limits ranging from about 15 to 20 and plasticity indexes from 2 to 7. The upper soft zone in the till contains more clay and therefore is slightly more plastic than the lower tills. Moist unit weights range from 21.2 to 24.3 kN/m^3. Hairline fractures have been observed in the dense or hard tills. These fractures, and sand and gravel seams, probably account for most of the permeability of the till.

4.2.5 The Carbonate Rock

The till is generally underlain by Paleozoic carbonate bedrock. The bedrock surface is quite irregular, having been extensively weathered in preglacial times and then having been modified by glaciation. The upper 0.3 to 0.9m of the bedrock are usually highly fractured and disturbed, and often intermixed with sand and gravel, which may be preglacial. It appears that the bulldozing action of the advancing glaciers had dislodged blocks of the carbonate bedrock along jointing and bedding planes. At some places this has resulted in a mixture of rock fragments and till material. Deep irregular fissures and depressions containing shattered rock, sand, silt, gravel and clay have been encountered.

Openings along the bedding planes, observed both in outcrops and excavations, usually do not exceed 25 mm in height. Major joint operations strike both north-west and north-east, and vary in size from hairline fractures to openings over 0.3m wide. The joint blocks are 0.3 to 3m wide. Rock socketed caisson

excavations have frequently exposed joints and bedding planes infilled with clay or silt. These seams are usually less than about 50 mm thick.

The upper bedrock in the Winnipeg area basically consists of Paleozoic sedimentary rocks. The Selkirk and Fort Garry members of the Red River formation form the near surface bedrock in the central and eastern portion of the City of Winnipeg. The Selkirk member is primarily a mottled, tan colored dolomitic limestone with occasional layers high in calcium near the top . Typically this member is 40m thick. The Fort Garry member consists of buff dolomite with thin limestone layers in the upper part and a marker bed or red argillaceous breccia at the top of the lower part. The limestone bed at the top of this member is of high calcium, but is at most 2m thick. The Fort Garry member has an average thickness of 33m. The Stonewall formation, which is dolomite, is encountered 1.0 km beyond the west end of the Weston Yard, and will not be described further in this report.

4.3 Site Geology

The entire Weston yard is built on the flat, poorly drained, glacial lake basin terrain typical of much of Winnipeg. This has been verified by a limited number of bore holes and construction excavations. The bore holes were located at the McPhillips Reservoir adjacent to the SE corner of the yard, within the south central portion of the Freight Car Shop, within the Systems Component Shop and at the trucking facility along Keewatin Street. The construction excavations were for the Intermodal Facility and for the new Winnipeg Diesel Shop. The retired employees also noted excavations for machine foundations or pits within the Frog Shop and the Diesel Heavy Repair Shop. The bore holes logs are presented within Appendix D.

The following description is somewhat general, and should be verified by site specific subsurface investigations at any areas of contaminant concern.

The uppermost Complex Zone was generally 2.2 to 3.0m in thickness, with occasional localized areas exceeding 4.0m. It consisted of various amounts/types of fill, over clay, over a 0.5 to 2.0m thick layer of wet, loose/soft tan coloured silt. The fill may consist of granular material (building foundations, track ballast, road surfaces), ashes (from Power Plant, burning of

wood cars, etc.), or a mixture of clays, silts, granular material, etc. resulting from construction excavations in the yard (13,800 cubic metres excavated for construction of the new Winnipeg Diesel Shop was placed in an area east of the CP Express facility).

The weathered brown glaciolacustrine silty clay extends from the base of the uppermost Complex Zone to a depth of approximately 5.5m (4.5 to 7.5 mm in bore holes). Although not logged as such, it is likely to be fissured and have a higher permeability than the underlying gray clay.

The gray glaciolacustrine clay was encountered from the base of the overlying brown clay to a depth of 11.5m (10.5 to 12.5m in bore holes). The underlying silt glacial till extended to a depth of approximately 15m and overlies the carbonate limestone bedrock. With the exception of the 43m hole at the McPhillips reservoir, all bore holes experienced auger refusal at approximately 14.5m, within the base of the silt till.

5.0 HYDROGEOLOGY

5.1 Regional Hydrogeology

5.1.1 General

A hydrogeological cross section through Winnipeg is presented as Drawing No. CG139.2-10. The major aquifer underlying the Winnipeg area, called the Upper Carbonate aquifer, occurs in the top 15 to 30 mm of the Paleozoic limestone's and dolomites. The aquifer is partially confined above by the glacial drift and below by the slightly pervious underlying carbonate rock. In western Winnipeg major water flow zones occur in the central segments of the carbonate rock. These aquifer zones have generally been included with the upper carbonate aquifer but could properly be named the Middle Carbonate aquifer. A relatively minor, aquifer, called the Lower Carbonate aquifer, occurs in the bottom 7.5 to 15 mm of the Red River formation, along the contact with the upper shale unit of the Winnipeg formation.

The Winnipeg formation contains an Upper Sandstone aquifer, 6 to 12m thick and a Lower Sandstone aquifer 3m thick. Both of the sandstone aquifers contain

saline water. Recharge occurs through the glacial till and glaciofluvial deposits located in the uplands along the border of the Red River Basin and in the Birds Hill. The Sandstone aquifer is in excess of 170m below the Weston Yard, and will not be considered further in this report.

5.1.2 Groundwater Development

During the early development of Winnipeg, the Upper Carbonate aquifer was an important source of municipal and industrial water. From 1900 to 1919 pumpage from the aquifer fulfilled the water requirements of the first city owned water system. Groundwater usage declined dramatically following the opening of the Lake of the Woods aqueduct in 1919. Subsequently the pumpage has risen steadily because of private well development. The 1980 estimated annual pumpage of 11.8 billion litres/year is approximately fifteen percent of the total annual water consumption for the metropolitan Winnipeg area. Because of its constant low temperature, groundwater is mainly used for commercial and industrial cooling. A number of the cooling systems recharge the spent water to the aquifer by means of a return well. There are 90 commercial wells operating in the City. Groundwater is also used for market garden irrigation and in suburban fringe areas for domestic water supplies. In 1983, the groundwater usage in Winnipeg varies from approximately 23×10^6 litres/day in the winter to 91×10^6 litres/day during the summer when the air conditioning demand is at a maximum.

5.1.3 Carbonate Aquifers

The Upper Carbonate aquifer is characterized by a network of fractures, joints, and bedding planes which provide aquifer hydraulic conductivity. Geochemical solution processes acting for at least the past several thousand years have enlarged the pore spaces and modified the network. Fracture openings generally have maximum widths at the bedrock surface and decrease in size with depth. The upper 7.5m of the carbonate rock is the major zone of permeability in the aquifer, and is thus the section of most active flow.

Large solution cavities in the bedrock, typical of karst topography have been encountered. Interception of these solution cavities by wells results in high capacity, whereas, wells that do not intercept these features may have a low

specific capacity. As the hydraulic conductivity is generally highest in the upper part of the bedrock, the slope of the bedrock surface has a controlling influence on the local and regional directions of groundwater movement in the aquifer. Openings along the bedding planes, observed both in outcrops and in excavations, usually do not exceed 25 mm in height. Major joint openings strike both north-west and north-east, and may vary in size from hairline fractures to openings over 0.3m wide. The joint blocks are 0.3 to 3m wide.

The transmissivity of the Upper Carbonate aquifer ranges from under 25 to over 2500 m^2/day. The storage coefficient varies from 1×10^{-6} to 1×10^{-3}. The working value used is 1×10^{-5}.

In western Winnipeg the productivity in the Upper Carbonate is sometimes low. However, major water flows have been encountered 60m below the bedrock surface, some 90m below ground level. This zone, referred to as the Middle Carbonate aquifer, appears to have its hydraulic conductivity related to openings along bedding planes. Pumping tests carried out in these zones indicate transmissivities between 250 and 1250 m^2/day. The storage coefficient ranges between 1×10^{-5} and 1×10^{-4}.

Data from bore hole water pressure tests and pumping tests indicate that the permeability of the Lower Carbonate aquifer is much less than that of the Upper Carbonate aquifer. The interception of fractures is less frequent and the groundwater flows are usually small, indicating narrow openings. The maximum transmissivity of this aquifer is probably less than 62 m^2/day.

5.1.4 Hydraulic Characteristics of Surficial Deposits

Under Winnipeg the Agassiz sediments have a maximum thickness of 24 m and an average thickness of 12m. The Lake Agassiz deposits in general consist of two distinct geohydrologic units. The upper more permeable unit consists of 1.5 to 4.5m of silt and very fine sand interbedded with thin beds of clay (Complex zone described in subsection 4.2). Hvorslev tests in piezometers installed in this zone in the area east of Winnipeg indicate the hydraulic conductivity ranges from 5.1×10^{-10} to 3.2×10^{-9} m/s. The average value is 2.06×10^{-9} m/s. Laboratory tests on samples from the glaciolacustrine clay unit indicate a hydraulic conductivity in the order of 10^{-11} to 10^{-13} m/s.

Hairline fractures were observed in the clay units during the Red River floodway excavation. Similar occurrences have been recorded at several other deep excavations. These fractures appear to form a secondary permeability system. The most important hydrogeologic aspect of the lower Agassiz unit is its restriction of recharge to the Upper Carbonate aquifer, and the consequent deterrence of pollution from sources and land fills. This aspect of the clay is further enhanced by its ability to retard the movement of chemicals by the process of chemical diffusion into the clay blocks.

5.1.5 Groundwater Movement in the Upper Carbonate Aquifer

In the Red River Basin the Upper Carbonate aquifer is the most important part of the extensive zone of groundwater movement that occurs within the upper portion of the bedrock. The groundwater regime in this zone can be divided into three segments of predominantly lateral movement: from the east, from the northwest, and from the southwest. Recharge for the northwestern region occurs in the areas of thin glacial till northwest of Winnipeg, and is responsible for flow underlying the Weston site.

In 1894 before extensive groundwater pumping occurred, the potentiometric surface in the Upper Carbonate aquifer was 0.3 to 1m above ground level in northwestern Winnipeg. Adjacent to the Red River in north central Winnipeg the potentiometric surface was 3 to 6m below ground level. Currently in the central part of the city, pumping has extensively depressed the potentiometric surface. In the central part of the draw down cone the depths to water range from 21 to 24m. The draw down cone varies considerably in form between winter and summer. Also there is considerable variation depending on geographic location.

On a regional basis the aquifer has been considered to be isotropic and the groundwater flow directions are interpreted as occurring in the direction of the hydraulic gradient, that being in the south east direction beneath the Weston site. It is recognized, however, that irregular groundwater flow channels in the joints, fractures and bedding planes probably result in areas of local anisotropy.

5.1.6 Vertical Groundwater Movement Through Surficial Soils

In addition to the regional lateral flow systems there are local vertical flow regimes within the overburden that move water stored in the Upper Agassiz unit down to the Upper Carbonate aquifer. The water table in the Upper Complex zone is usually between 1.5 and 3m below ground level. The potentiometric surface of the Upper Carbonate aquifer varies from 6 to 24m below ground level. Therefore under most of the Winnipeg area there are strong vertical gradients in the clay.

While the low hydraulic conductivity of the clay units severely restricts vertical groundwater movement, there is still some water moving down through the clay and till in to the Upper Carbonate aquifer. Utilizing one tenth the average insitu (horizontal) hydraulic conductivity for the clay (one tenth of 2.06×10^{-9} m/s) and an average vertical gradient of 0.5, the vertical flow through the clay and till would be about 3.25 l/m^2, or 3.25 mm of surface water per year.

5.1.7 Groundwater Chemistry of Upper Carbonate Aquifer

The groundwater flow in the northwestern flow system, pertinent to the Weston site, which cross carbonate rock is fresh in the recharge and slightly brackish and very hard in discharge areas. In northwest Winnipeg the total dissolved solids range from 1000 to 1500 mg/l, the chloride ion concentration ranges from 200 to 500 mg/l, and the sulphate ion ranges from 200 to 400 mg/l.

5.2 Site Hydrogeology

The site geology (Section 4.3) is very typical of the general Winnipeg geological stratigraphy, consequently the site hydrogeology is dominated by the regional hydrogeological characteristics described in the previous section. For the purposes of this study, the dominant characteristics are as follows:

- The major carbonate aquifer underlies the site at a depth of approximately 15m.
- The thick sequence of very low permeability glaciolacustrine clays significantly restrict seepage from the ground surface down to the

carbonate aquifer, and cause a perched water table in the overlying Complex zone silts and fills.

- The thick, loose, wet silt layer comprising the lower portion of the Upper Complex Zone, appears to have a year round perched water table which would restrict the downward migration of free phase hydrocarbon contaminants. Although encountered in all bore holes, this silt layer may be discontinuous over the site.

- Although more permeable than the underlying glaciolacustrine clays, this Complex Zone silt would have a relatively low vertical and horizontal permeability.

- Clays and silty clays of the Complex Zone, generally above the water table, are likely to have a low to moderate permeability resulting from their shrinkage/swelling characteristics and the normal freeze/thaw and wet/dry cycles associated with the Winnipeg climate.

- Fill materials such as ballast, sand blasting sand, and ashes will have a moderate to high permeability. These materials would permit moderate to high surface water infiltration during periods of rain, and a temporary storage zone for that infiltration water.

- The network of sewers, manholes and catch basins may accept some seepage from the fill and to a lesser extent the silt of the Complex zone, and consequently perform as a partial subsurface drainage system.

The piezometric level in the carbonate limestone aquifer is affected by recharge, and very significantly by pumping within the city. Potentiometric contour lines interpolated from observation wells, plotted by Kjartanson et al (1983) indicate that the depth below ground surface to the piezometric level was 13m and 15m at the NW corner of the yard, and 20m and 33m at the SE corner of the yard in 1974 and 1980 respectively. Using this information, the potentiometric gradient would have been 0.5% and 0.7%, dipping to the south east, for 1974 and 1980 respectively. Kjartanson et al (1983) also state that in 1894, before significant pumping started, the potentiometric surface in the Carbonate aquifer was 0.3 to 1.0m above ground level in the Weston region.

Under developed portions of the yard, generally within the northern and western portions of the yard have been described by retired employees as boggy and poorly drained, and often having standing water. This is not evident from the air photographs (post 1946); however, it is apparent that the Weston yard has poor natural surface and subsurface drainage.

6.0 KNOWN CONTAMINANTS

61 Known versus Suspected

This section addresses areas known to be contaminated, as confirmed by previous site specific excavations or drilling. Areas that are suspected to be contaminated or potentially contaminated as indicated by historic activities and/or surface staining, but have not been verified as "known" by excavation or drilling, are considered in section 7.0 of this report.

62 Previous Fuelling Facility (mid 1960's to 1974)

This fuelling facility was constructed 300m east of the current Diesel Heavy Repair Shop between 1963 and 1967, and was removed in 1984 when the current facility was constructed. The facility consisted of three above ground storage tanks with earth containment berms, fuelling stations with associated drip trays, and brake sand equipment and stockpiles. Conventional fuelling practices resulted in frequent fuel spillages, occasionally overflowing the drip trays (considered in section 2.1.4 of this report). Soil contamination has been confirmed orally by Mr. Mike Eggleston (currently Division Engineer in Thunder Bay), who supervised construction of the new Winnipeg Diesel Shop and ancillary facilities. Diesel contaminated soil was encountered in the vicinity of the previous fuelling facility during trenching for removal and relocation of buried telephone wires within PVC conduits. The presence of diesel fuel was confirmed by both smell, and corrosion of the buried PVC conduit. Written records of this contamination have not been located in the course of the present study. The extent (vertical/lateral) of contamination has not been investigated.

6.3 Underground Gasoline Storage Tank

A leaking underground, steel gasoline storage tank was removed and replaced by a fiberglass tank in 1990. Contamination was limited to the granular bedding around the tank, and had not penetrated the native clay soils. The site was remediated to the satisfaction of the Manitoba Workplace Safety and Health Department, and is consequently not an area of concern.

6.4 Punctured Fuel Tank Leak near Systems Component Shop

This relatively small fuel spill has been described in section 2.4. Two of eight holes drilled by UMA Engineering Ltd. for the purposes of a foundation investigation in 1987 within this shop building encountered hydrocarbon contamination. It was limited to the shallow silt layer (>2.3m depth), and described as dark stains, a petroleum smell, and an oily substance. This contamination may not be associated with the known fuel spill, and may in fact result from other activities within the shop building.

7.0 POTENTIAL AREAS OF CONCERN

7.1 Criteria for Selection of the Areas of Concern

The following section summarize the potential areas of concern for soil and groundwater contamination within the Weston Yard. The potential concerns have been based on one or more of the following criteria:

- known contaminated areas which have not been delineated or remediated.
- locations where surface staining could indicate either minor surficial or subsurface contamination.
- locations where known activities or practices may have resulted in soil and groundwater contamination.
- the locations of historic facilities as indicated by old drawings where normal practices for that era or spills/accidents could have resulted in soil and groundwater contamination.

An index map showing the approximate locations of the identified areas is shown on Drawing No. CG139.2-11. The letters presented within angular brackets, < >, in the following subsections refer to the letters in the legend of that drawing.

72 Major Fuelling Facilities

The current and former fuelling facilities within the southeast portion of the Weston Yard are major potential sources of soil and groundwater contamination. Potential contamination is associated with : (1) fuelling spills and accidents which were not captured by the drip trays; (2) normal dripping of lubricating oil, air box oil and fuel by locomotives on the waiting tracks; and, (3) the possible release of chromate cooling water in the waiting track areas. The potential areas of concern are as follows:

a. The former fuelling facility is a known area of concern <A>, and described in section 6.2.

b. There are no known fuel spills at the current fuelling facility. The concrete catchment/collection system incorporates wide concrete aprons, and may be capable of capturing spills and any significant accidental spills. This fuelling facility has been designated a potential area of concern <B> only because of the nature of activities at the location.

c. The tanker truck fuel transfer location adjacent to the current fuel tanks pumphouse is a potential area of concern <E>. Spills may have occurred and run off the concrete apron into the surrounding soil. No such spills have, however, been documented.

73 Current Above Ground Storage Tanks

There are many above ground storage tanks within the Weston Yards, associated with Weston Shops and the Winnipeg Diesel Shop. These have been documented in Section 2.1.3 of this report The existing tanks have been inspected during the site walkthrough, and appear to be in good condition. Ground surface staining at several fuel oil tanks is likely associated with minor accidents during transfer of fuel to or from the tanks. The extent of subsurface

contamination at such locations should be investigated with test pits to confirm that no significant unreported fuel spills have occurred. The tanks locations which present a potential concern are as follows:

a. a 900 litre heating oil tank at the West Yard office <D>.

b. a 3,600 litre overhead, steel diesel fuel tank in the West Yard <C>.

c. a 3,600 litre overhead, steel, diesel fuel tank at the Power House <F>.

All other known above ground tanks are surrounded by concrete containment barriers which show no signs of spills, and could be cleaned up without soil and groundwater contamination in the event of a spill. Consequently those tanks have not been designated herein as potential areas of concern.

7.4 Historical Above Ground Tanks

All historical oil storage locations identified from old drawings have been designated as potential areas of concern. These have been considered within subsection 2.1.3 and are listed as follows:

a. Coal and Oil House located 120m west of McPhillips <I>.

b. Oil and Paint Shop located 230m east of current Diesel Heavy Repair Shop <G>.

c. Oil House located 76m to 105m west of the current Diesel Heavy Repair Shop <H>.

d. Oil tanks located 15m southwest of Frog Shop <J>.

e. Oil House located south of the Blacksmith Shop <K>.

f. Gasoline House located 50m west of the above noted Oil House <L>.

g. Lye cleaning tank within the current Systems Component Shop [10].

75 Underground Storage Tanks and Sumps

All underground storage tanks have been considered within section 2.1.3 of this report. The integrity of underground tanks could not be evaluated during the site walkthrough. Many of these tanks are less than 10 years old, and have not been tested for leaks. All underground tanks should be tested on a periodic basis. It may be difficult to test the open tanks (ie, wash track sump, fuel spill collection system at fuelling facility). Short sampled bore holes adjacent to these tanks to check for evidence of leaked product may be more appropriate.

Due to the age and apparent integrity of these tanks, they have not been categorized as areas of concern for soil and groundwater contamination at this site; however, all underground tanks should be tested and monitored.

The one area of potential concern identified in this section is the Tank Car Cleaning Sump House <M> adjacent to the Freight Car Shop. It was constructed before 1940, and has gone through several name changes which may reflect changes in its function.

76 Solid Waste Disposal Landfills

There is no record of solid waste landfills on this site.

77 Waste Water Lagoons

There have been no waste water lagoons identified for the Weston Yard. Several minor sumps have been identified in section 2.2 of this report. The most significant fluid storage pond is the floodwater retention pond associated with the Weston sewer system. This pond is filled only during rain storms when the effluent flow rate exceeds the capacity of the oil water separator. Due to the nature of the sewer effluent, the side slopes of the pond are oil stained. The pond was built with native clay materials, and is unlikely to experience significant leakage.

Consequently no area of potential concern have been identified under this heading.

7.8 Locomotive Test Load Areas

When repair of a locomotive is completed, the locomotive is moved outdoors to be test run for as much as several hours. Designated test load areas were not identified on drawings. Load testing may have occurred adjacent to the facility in which the locomotive was repaired. In addition to normal dripping, lubricating and fuel oil leaks may have occurred during testing. It is probable that chromate treated cooling water was historically drained from locomotives onto the ground surface in these locations. Chromate based corrosion inhibitors in cooling water were replaced by borate nitrate compounds effective August of 1988. The identified areas of potential concern are as follows:

a. east of the Systems Component Shop <N>.

b. east and west of the Diesel Heavy Repair Shop <O, P>.

c. east of the Winnipeg Diesel Shop <Q>.

7.9 Locomotive Wash Areas

The current wash area is inside the Diesel Heavy Repair Shop, and includes a large underground sump and an oil-water separator. Historic wash areas were not located during this study.

No areas of potential concern have been identified under this heading .

7.10 Car Cleaning Facilities/Locations

Tank car cleaning is currently conducted on a designated track northeast of the Freight Car Shop. The oily, dirty water is collected within a catchment system and directed to the Tank Car Cleaning Sump House. The Sump House has been identified as an area of potential concern <M> within section 7.5.

7.11 Sand Blasting Facilities

Locations of several sand blasting facilities have been provided in section 2.1.5. Potential soil and groundwater concerns are associated with lead in paints; consequently, disposal of the sand is a related concern. Sand blasting is presently conducted outdoors, approximately 60m to 100m west of the West

Maintenance of Way Shop. The two historic facilities <H, R> and the current sand blasting location <S> have been identified as potential areas of concern.

7.12 Paint Shop Facilities

Two historic paint shops, in addition to the current facility, were located on old drawings, as indicated in section 2.1.6. The oldest facility, which predates the 1917 map, is located 230m east of the Diesel Heavy Repair Shop. It is designated as a potential area of concern <G>. Whereas any paint or solvent spills associated with the later facilities would have been flushed into the sewer system, the handling, storage, spillage, cleanup and disposal of such materials at the original paint shop site is unknown.

7.13 Transfer Facilities

Transfer of bulk freight commodities does not take place at the Weston Yard. Containers and packaged freight are transferred at the trucking facilities.

No areas of potential concern have been identified under this heading.

7.14 Oil-Water Separators

Four oil-water separators have been identified within the Weston property, those being : (1) the combined sewer system; (2)the spilled fuel separation at the current fuelling facility; (3) at the wash track in the Diesel Heavy Repair Shop; and (4) at the Tank Car Cleaning Sump House adjacent to the Freight Car Shop. Only the last of these facilities has been identified as an area of potential concern (see section 7.5, Underground Storage Tanks and Sumps).

7.15 Temporary Drum Storage

Drums of new chemicals were generally found at the Stores Department or within shop buildings, and were stored safely. Drums of waste oil and solvents are collected and stored near the Freight Car Shop, and taken off site by a third party. A fenced in area east of the Tank Car Cleaning Sump House is designated for storage of hazardous materials.

No areas of potential concern have been identified under this heading.

7.16 Storage of Transformers and Batteries

Old batteries were found both inside the south end of the West Maintenance of Way Building, and outdoors adjacent to that building. Batteries are disposed of by a third party off site. Transformers with PCB fluids are currently stored at a CP Rail facility in Transcona. During the 1980's CP Rail developed and instituted rigorous procedures for handling transformers and capacitors containing PCB material. In 1989 CP Rail had six soil samples collected at three different CPR Weston shops from 0.3 to 0.6m depths tested; no PCB's were detected.

No areas of potential concern have been identified under this heading.

7.17 Known Spills

Known spills or leaks which could potentially cause soil and groundwater contamination have been considered within section 6.0, or previously within section 7.0.

The leaking gasoline tank identified in section 6.3 has been remediated, and is no longer a concern.

The locomotive derailment and fuel spill adjacent to the Systems Component Shop remains an area of concern <T>.

7.18 Leaking Tank Car Area

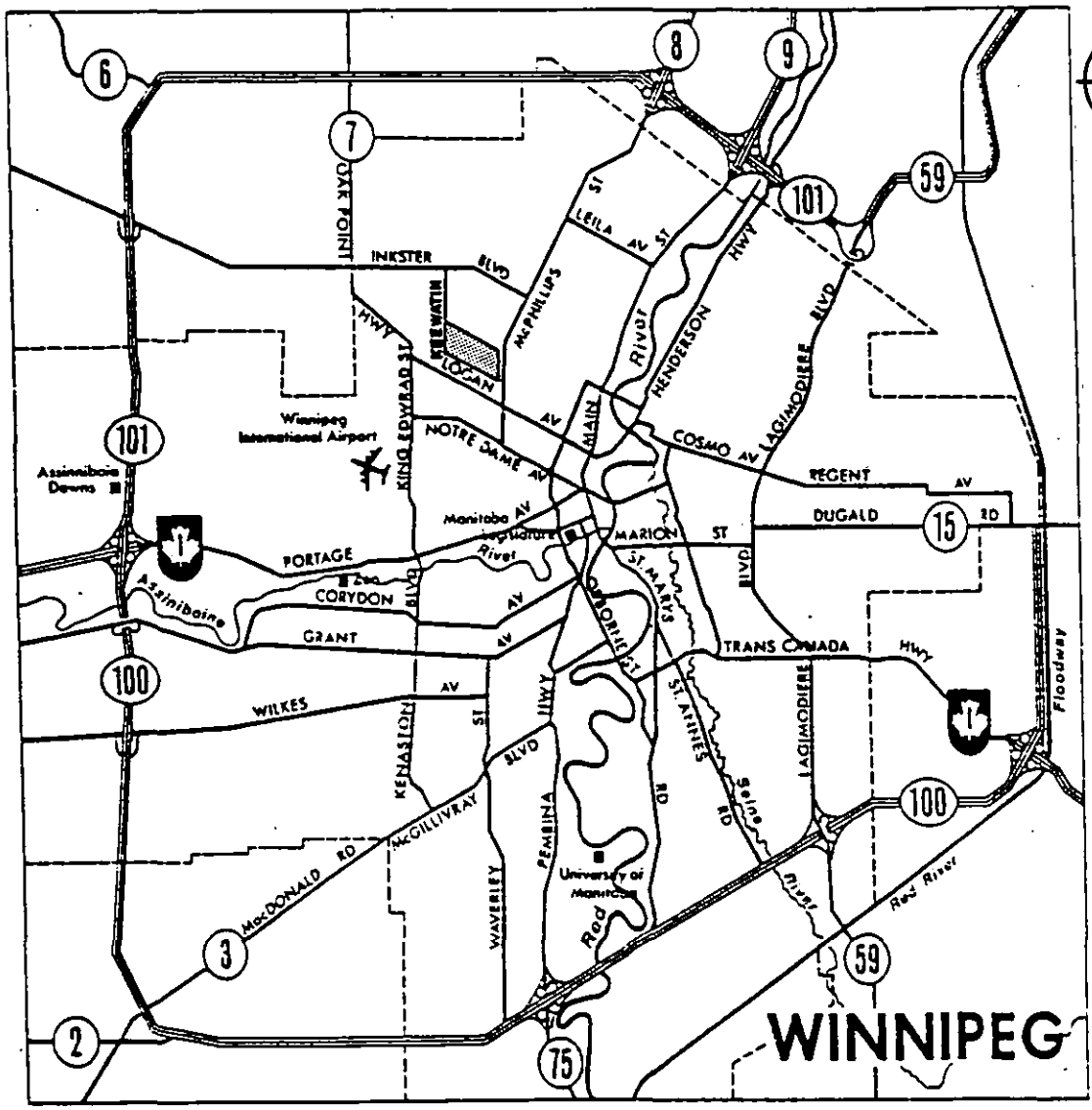
Leaking tank cars must be emptied prior to repair. Any leaking loads are first moved to a designated track northwest of the One Spot Car Repair Shop, until they can be pumped out. This leaking loads area is underlain by a concrete apron, however, it does not have drip trays to capture the fluids. Consequently toxic liquid may have infiltrated through joints and cracks in the concrete and contaminated the soils. This location has been designated an area of potential concern <U>.

7.19 Potentially Contaminated Fill

Large volumes of soil excavated during construction of the Diesel Shop and renovation of the Diesel Heavy Repair Shop have been stockpiled east of the CP Express facility. The materials are suspected of contamination because of the operations that would have occurred in their areas of origin. This has been designated an area of concern <V>, as the hydrocarbon content of this material should be evaluated.

8.0 CLOSING REMARKS

This report presents a Phase I Environmental Site Assessment based solely on existing information on the Weston Yard and surrounding area. Materials reviewed in the preparation of this report are summarized in Appendix A. Observations made during the site walkthrough are documented in Appendix B. Information obtained in the interviews with long term employee are recorded in Appendix C. Areas identified as contaminated or potentially contaminated will require further investigation to verify the degree and extent of the contamination.



LEGEND:

WESTON YARD LOCATION

0 2.5 5 10 km

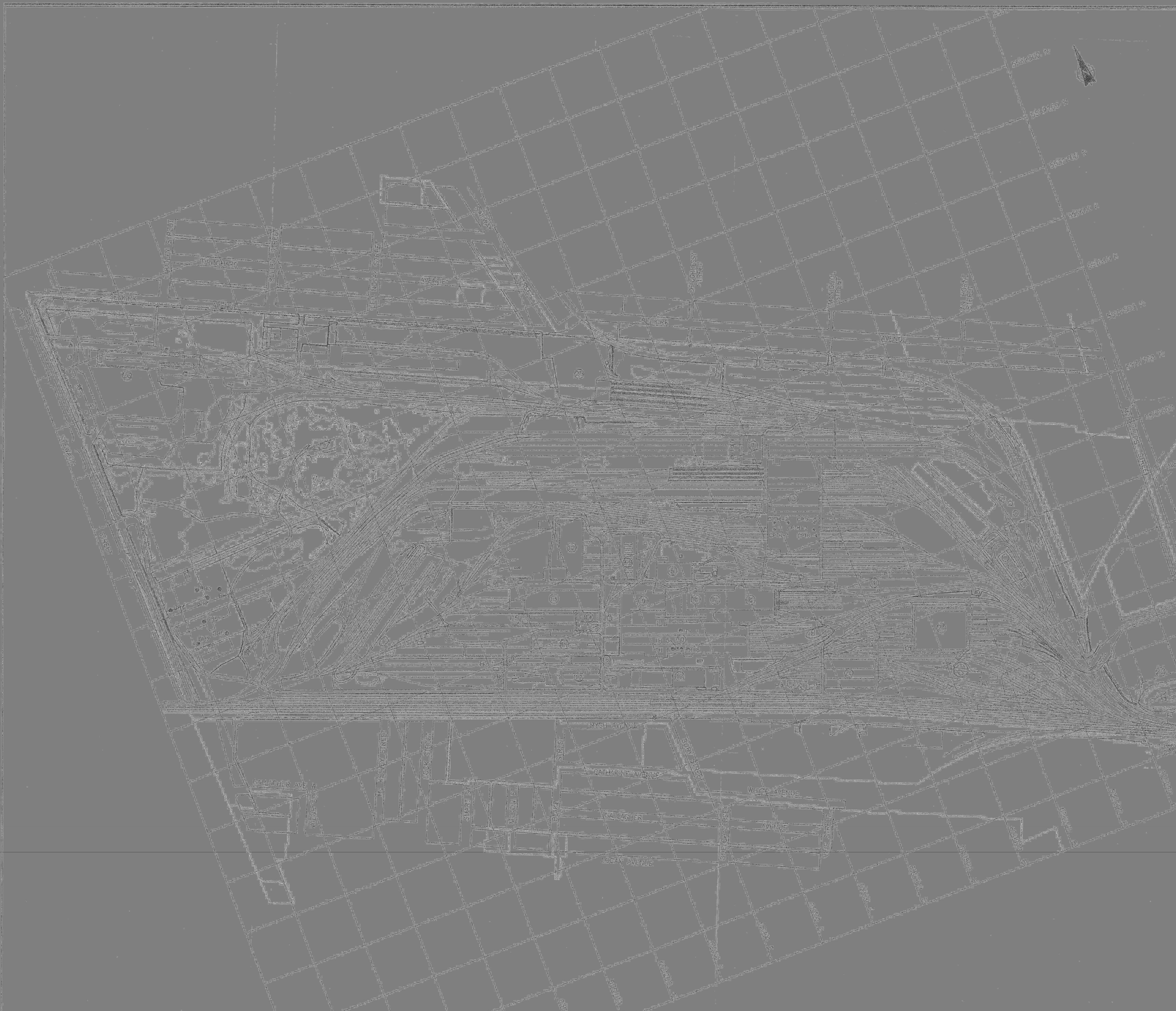
DATE	DRAWN BY	APPROVED BY	SCALE	PLAN NO
92/02/17	JMB		1:200,000	CG139.2 - 1

CP Rail

PHASE 1 ENVIRONMENTAL IMPACT ASSESSMENT

WESTON YARD

SITE LOCATION MAP



(1) ONE SPOT REPAIR SHOP
(2) FREIGHT CAR SHOP
(3) TANK CAR CLEANING SUMP HOUSE
(4) PAINT SHOP
(5) POWER HOUSE
(6) WHEEL SHOP
(7) WHEEL RECLAIM SHOP
(8) GARAGE & UPHOLSTERY SHOP
(9) MILLWRIGHT & ELECTRICAL SHOP
(10) SYSTEM COMPONENT SHOP
(11) EAST MAINTENANCE OF WAY SHOP
(12) WEST MAINTENANCE OF WAY & HOPPER CAR SHOP
(13) FROG SHOP
(14) SIGNAL STORES
(15) BLACKSMITH SHOP
(16) ADMINISTRATION BUILDING
(17) STEEL SHOP
(18) SCRAP DOCK RECLAIM DEPARTMENT
(19) MATERIALS DEPARTMENT, PLATFORM, SHELTERS
(20) DIESEL HEAVY REPAIR SHOP
(21) WINNIPEG DIESEL SHOP
(22) RETENTION POND
(23) OIL WATER SEPARATOR
(24) DIESEL TANKS
(25) INTERMODAL FACILITY
(26) CP EXPRESS

H1 REPAIR SHEDS
H2 OIL AND COAL HOUSE
H3 OIL AND PAINT SHOP
H4 OIL HOUSE, THEN SAND BLAST FACILITY
H5 OIL TANK & OIL CAR HOUSE NEAR FROG SHOP
H6 SAND BLAST HOUSE
H7 GASOLINE HOUSE
H8 LIME SHED
H9 CLOCK HOUSE, LIBRARY, LUNCH ROOM, KITCHEN
H10 FORMER LOCOMOTIVE FUELING FACILITY

NOTE:
"H" INDICATES A HISTORICAL FACILITY THAT HAS BEEN REMOVED

LEGEND:
BORE HOLE LOCATIONS:
- IN FREIGHT CAR SHOP PROJECT No 0375-145-01-02 (AFTER UMA ENGINEERING LTD, 1991)
- IN SYSTEM COMPONENT SHOP PROJECT No 0375-104-01-01 (AFTER UMA ENGINEERING LTD, 1978)
- AT FREIGHT TRUCKING FACILITY (AFTER INDEPENDANT TEST LABS LTD, 1968)
- FOR MANITOBA GROUNDWATER OBSERVATION STATION MO-14 NORTH OF McPHILLIPS RESERVOIR, 1968)

NOTE:
CONTOUR INTERVAL = 0.5 m

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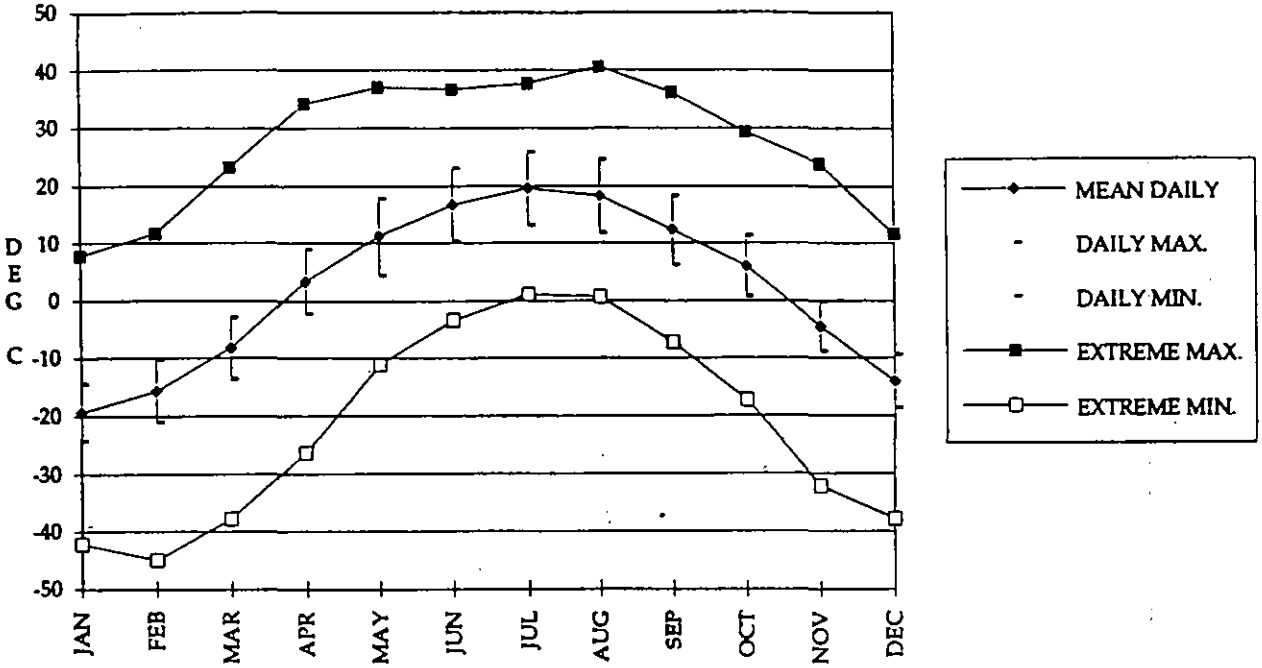
WINDSOR STATION – MONTREAL, QUEBEC

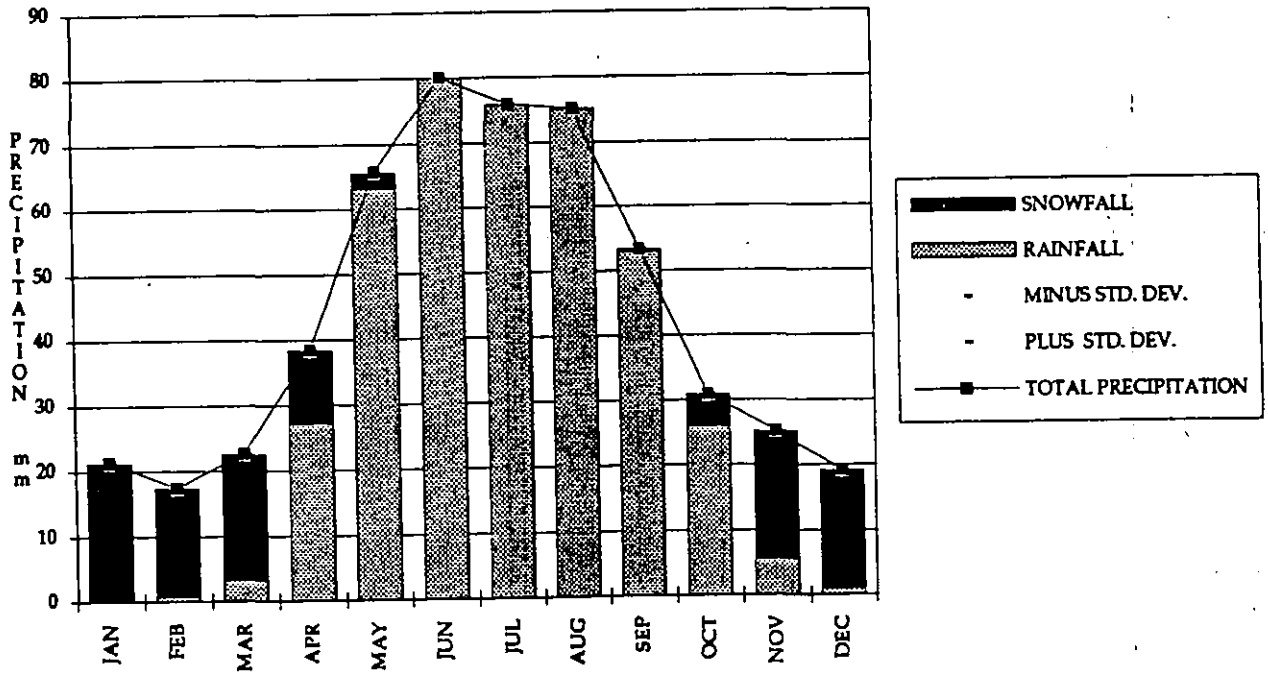
PHASE I ENVIRONMENTAL SITE ASSESSMENT
WESTON YARD
SITE PLAN & TOPOGRAPHY WITH CURRENT AND HISTORIC FACILITIES

CHIEF ENGINEER
ENGINEER OF TRACK
APPROVED BY
CHK. BY
SCALE 1:2500
DR. BY JMB
DATE 92/02/12
OFFICE FILE No.
PLAN No. CG139.2-2

TEMPERATURE



PRECIPITATION



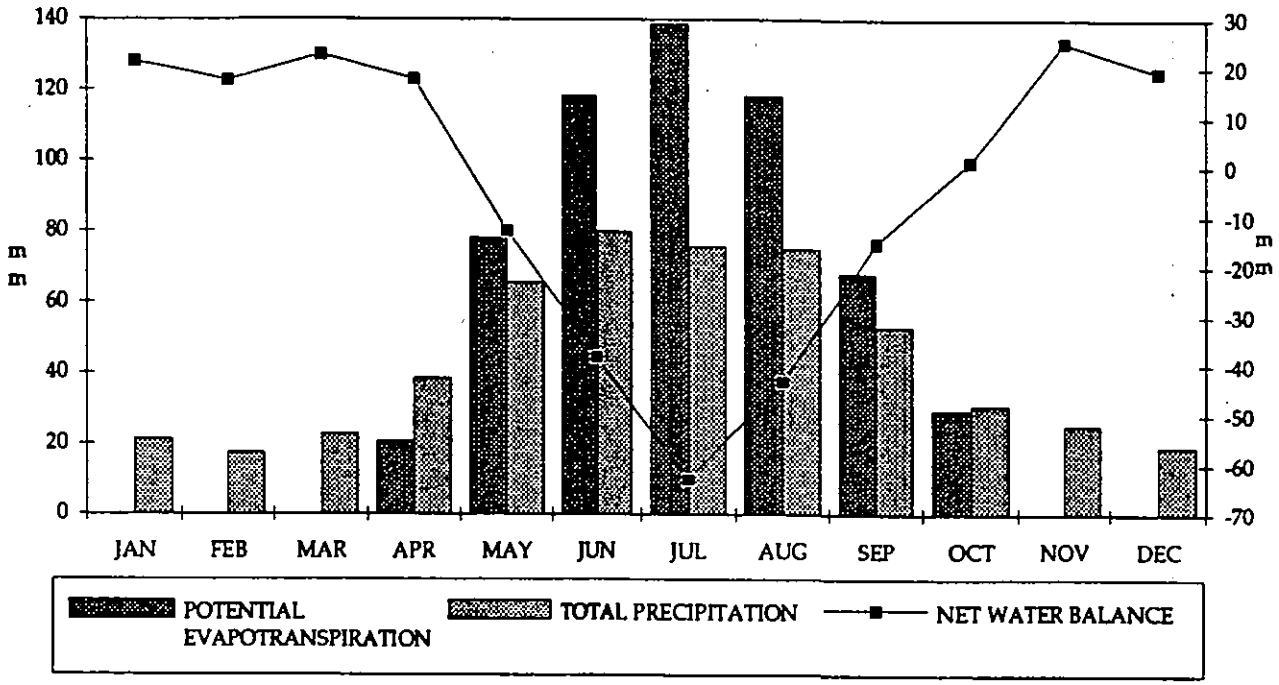
DATE	DRAWN BY	APPROVED BY	SCALE	PLAN NO
92/02/13	L. L.		N/A	CG139.2 - 3

CP Rail

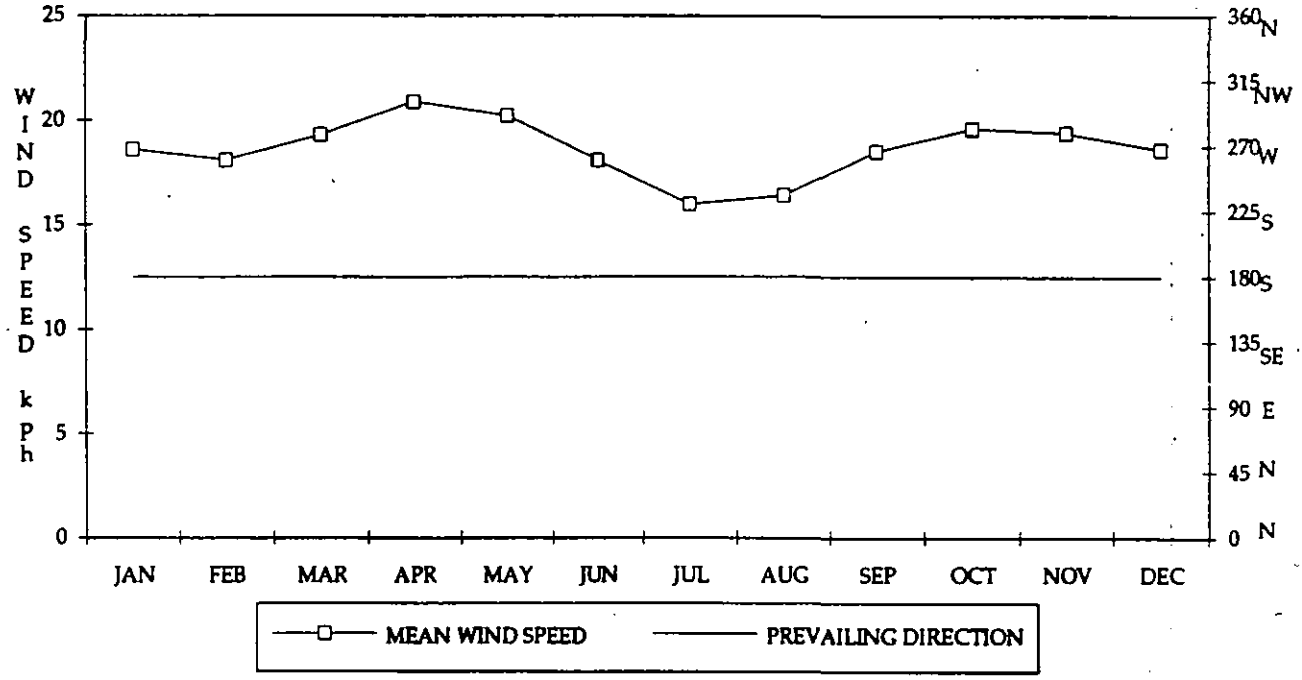
PHASE I ENVIRONMENTAL SITE ASSESSMENT
WESTON YARD

ANNUAL TEMPERATURE AND PRECIPITATION
WINNIPEG

POTENTIAL EVAPOTRANSPIRATION



MEAN WIND SPEED AND PREVAILING DIRECTION

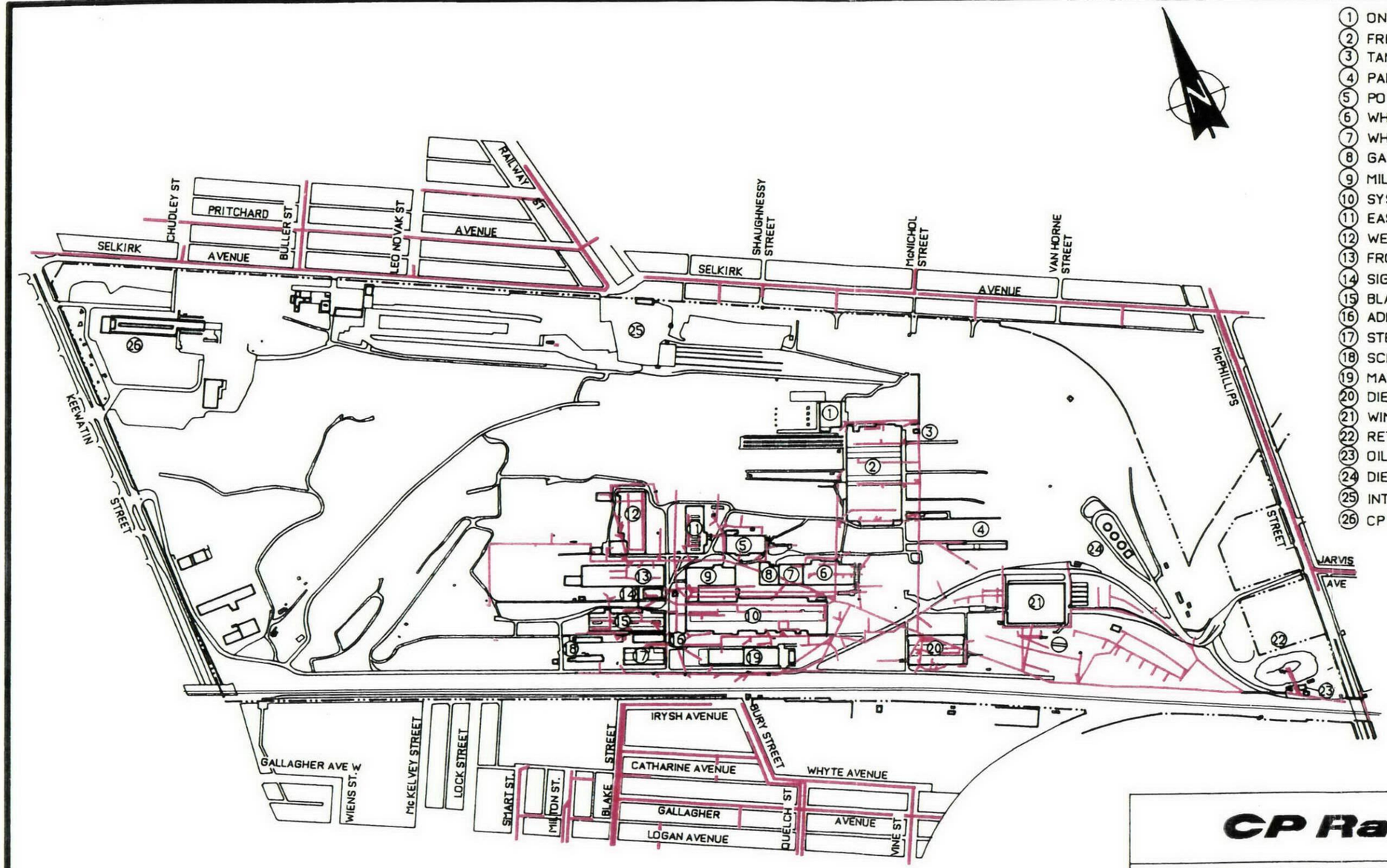


DATE	DRAWN BY	APPROVED BY	SCALE	PLAN NO
92/02/13	L. L.		N/A	CG139.2 - 4

CP Rail

PHASE I ENVIRONMENTAL SITE ASSESSMENT
WESTON YARD

ANNUAL POTENTIAL EVAPOTRANSPIRATION AND ANNUAL MEAN WIND SPEED AND PREVAILING DIRECTION - WINNIPEG



1. ONE SPOT REPAIR SHOP
2. FREIGHT CAR REPAIR SHOP
3. TANK CAR CLEANING SUMP HOUSE
4. PAINT SHOP
5. POWER HOUSE
6. WHEEL SHOP
7. WHEEL RECLAIM SHOP
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12. WEST MAINTENANCE OF WAY & HOPPER CAR SHOP
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14. SIGNAL STORES
15. BLACKSMITH SHOP
16. ADMINISTRATION BUILDING
17. STEEL SHOP
18. SCRAP DOCK RECLAIM DEPARTMENT
19. MATERIALS DEPARTMENT, PLATFORM, SHELTERS
20. DIESEL HEAVY REPAIR SHOP
21. WINNIPEG DIESEL SHOP
22. RETENTION POND
23. OIL WATER SEPARATOR
24. DIESEL TANKS
25. INTERMODAL FACILITY
26. CP EXPRESS

0 50 100 200 400 m

LEGEND:

SEWER LINE LOCATIONS

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PHASE I ENVIRONMENTAL SITE ASSESSMENT

WESTON YARD

WESTON YARD AND ADJACENT
CITY OF WINNIPEG SEWER LINES

CHIEF ENGINEER

ENGINEER OF TRACK

APPROVED BY

CHK. BY

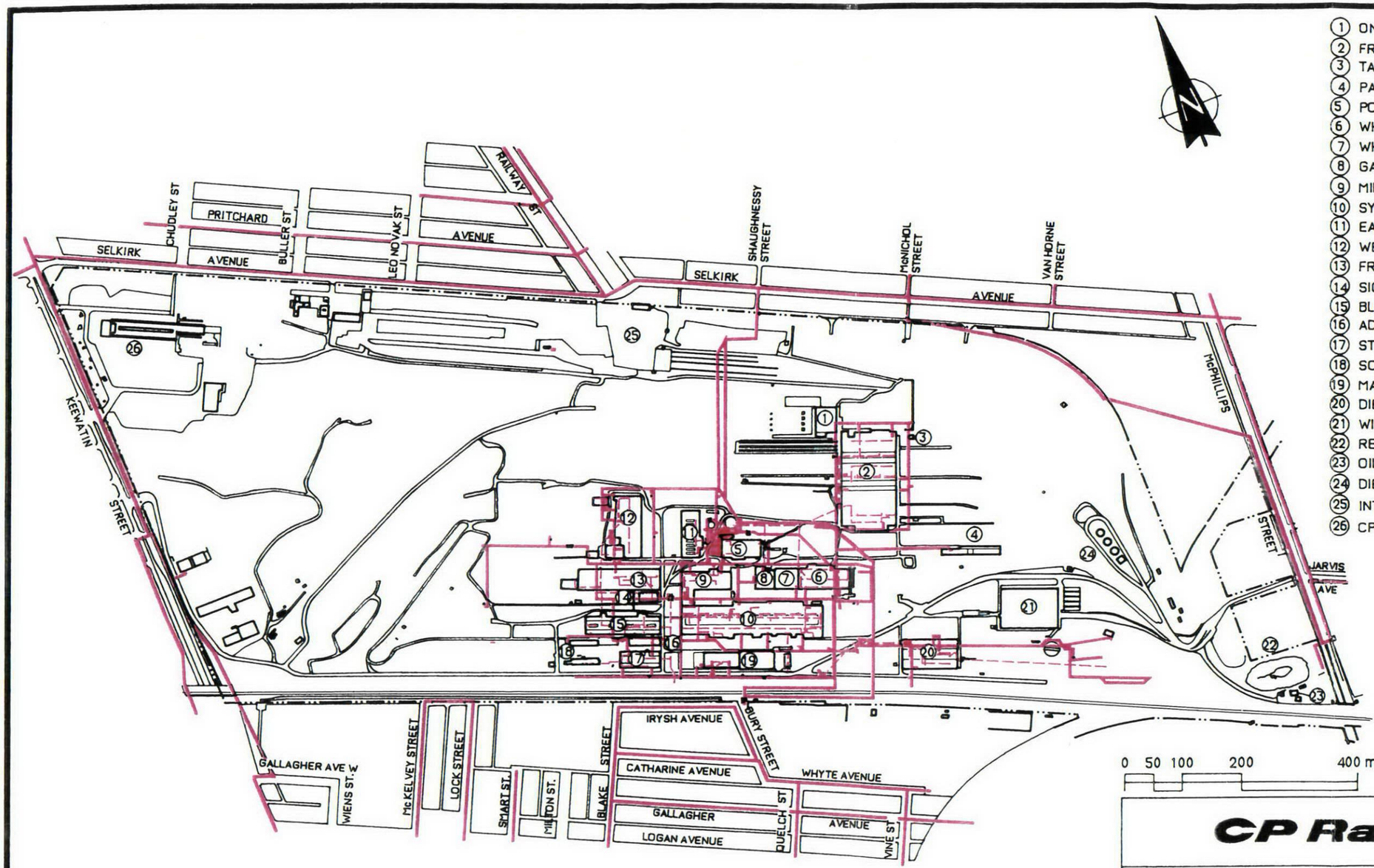
SCALE 1:7500

DR. BY JMB

DATE 92/02/15

OFFICE FILE No.

PLAN No. CG139.2 -5



1. ONE SPOT REPAIR SHOP
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22. RETENTION POND
23. OIL WATER SEPARATOR
24. DIESEL TANKS
25. INTERMODAL FACILITY
26. CP EXPRESS

LEGEND:

WATER MAIN LOCATIONS

WESTON DRINKING & SERVICE WATER LOCATIONS

CP Rail

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WINDSOR STATION - MONTREAL, QUEBEC

PHASE I ENVIRONMENTAL SITE ASSESSMENT

WESTON YARD

WESTON YARD AND ADJACENT CITY OF WINNIPEG WATER LINES

CHIEF ENGINEER

ENGINEER OF TRACK

APPROVED BY

CHK. BY

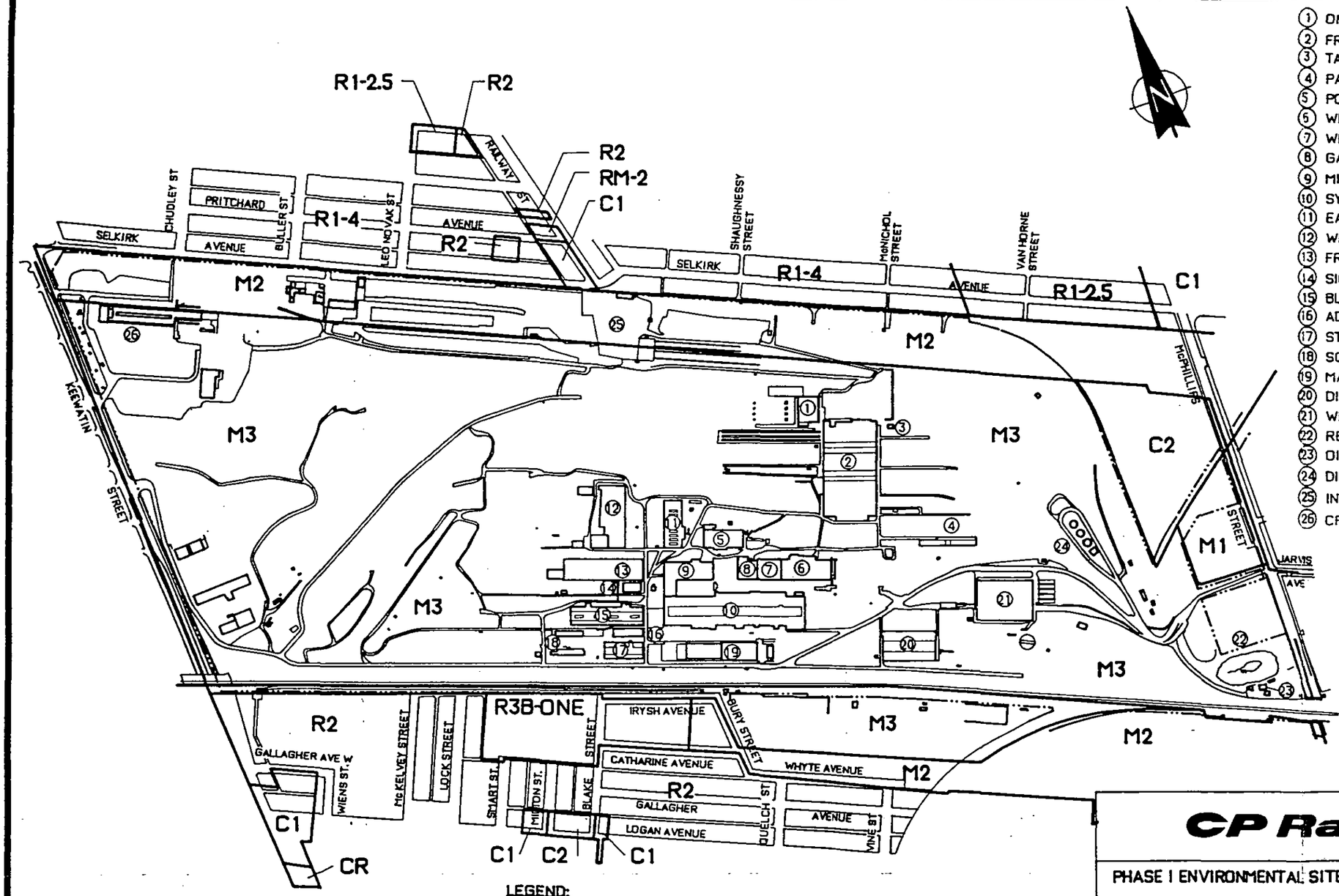
SCALE 1:7500

DR. BY JMB

DATE 92/02/15

OFFICE FILE No.

PLAN No. CG139.2 - 6



LEGEND:

R1	SINGLE FAMILY RESIDENTIAL	C1	LOCAL COMMERCIAL
R2	SINGLE & DUPLEX FAMILY RESIDENTIAL	C2	GENERAL COMMERCIAL
RM, R3B, R4	MULTI UNIT RESIDENTIAL	M1	LIGHT INDUSTRIAL
		M2	MODERATE INDUSTRIAL
		M3	HEAVY INDUSTRIAL

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WINDSOR STATION – MONTREAL, QUEBEC

PHASE I ENVIRONMENTAL SITE ASSESSMENT

WESTON YARD

ADJACENT LAND USE ZONING

CHIEF ENGINEER

ENGINEER OF TRACK

APPROVED BY

CHK. BY

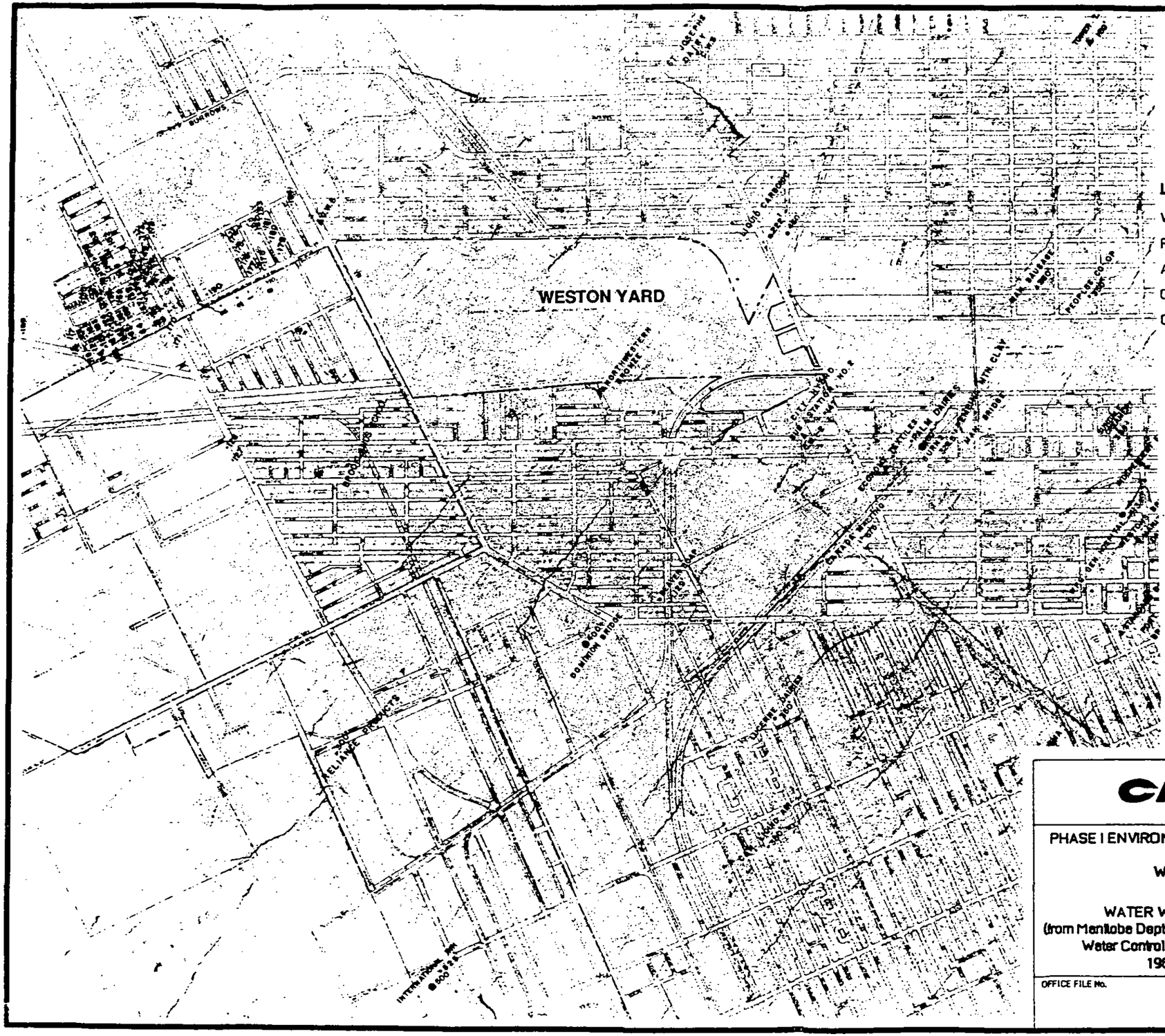
SCALE 1:7500

DR. BY JMB

DATE 92/02/15

OFFICE FILE No.

PLAN No. CG139.2 - 7



LEGEND:

- WELL SITE & DEPTH WITH NAME OR NUMBER
- RECHARGE WELL & DEPTH WITH NAME OR NUMBER
- ABANDONED WELL & DEPTH WITH NAME OR NUMBER
- OBSERVATION WELL & DEPTH WITH NAME OR NUMBER
- C. W. 6 FORMER CITY WATER SUPPLY WELL ▲C.W.6

0 125 250 500m

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WINDSOR STATION – MONTREAL, QUEBEC

PHASE I ENVIRONMENTAL SITE ASSESSMENT

WESTON YARD

WATER WELL LOCATION PLAN
(from Manitobe Dept of Agricultura and Conservation
Water Control and Conservation Branch,
1964 Well Inventory)

CHIEF ENGINEER

ENGINEER OF TRACK

APPROVED BY

CHK. BY

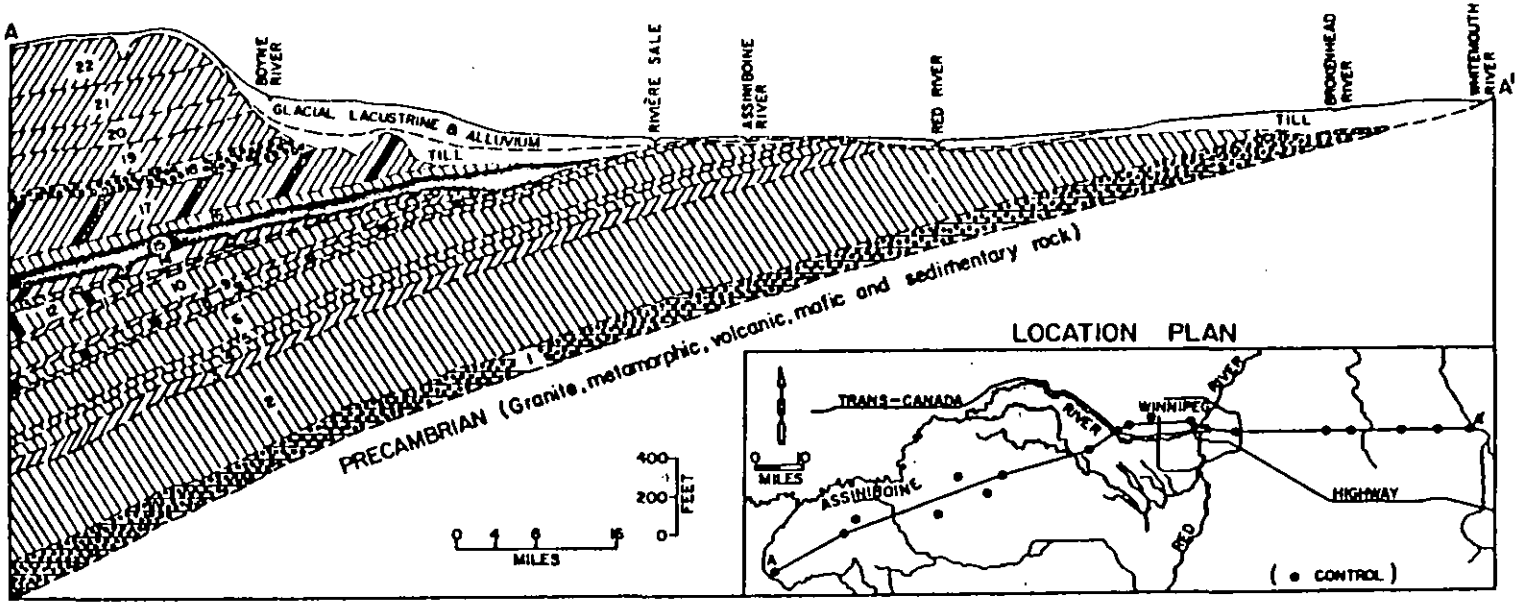
SCALE

DR. BY CMC

DATE 92/02/13

OFFICE FILE No.

PLAN No. CG139.2 - 8



MESOZOIC

CRETACEOUS

22 RIDING MOUNTAIN FORMATION (Siliceous shale, minor bentonite)
21 VERMILION RIVER FORMATION (Carbonaceous, calcareous, non-calcareous shale, minor bentonite)
20 FAVEL FORMATION (Calcareous shale, minor limestone and bentonite)
19 ASHVILLE FORMATION (Shale, minor sand, silt and bentonite)
18 SWAN RIVER FORMATION (Sandstone and shale)

JURASSIC

17 MELITA FORMATION (Shale, with minor sandstone, limestone and anhydrite)
16 RESTON FORMATION (Interbedded argillaceous limestone and shale)
15 UPPER AMARANTH FORMATION (Anhydrite)
14 LOWER AMARANTH FORMATION (Red dolomitic shale with minor anhydrite)

PALAEOZOIC

DEVONIAN

13 DUPEROW FORMATION (Limestone and dolomite)
12 SOURIS RIVER FORMATION (Dolomite, limestone, shale and minor anhydrite)
11 FIRST RED SHALE (Shale)
10 DAWSON BAY FORMATION (Argillaceous and fossiliferous limestone)
9 SECOND RED SHALE (Shale)
8 WINNIPEGOSIS FORMATION (Fossiliferous, dolomite and minor anhydrite)
7 ASHERN FORMATION (Argillaceous dolomite and dolomitic shale)

SILURIAN

6 INTERLAKE GROUP (Dolomite, minor sandy argillaceous beds)

ORDOVICIAN

5 STONEWALL FORMATION (Dolomite, dolomitic limestone, minor sandy beds)
STONY MOUNTAIN FORMATION
4 GUNTON MEMBER (Dolomite)
3 SHALE MEMBER (Shale and argillaceous limestone)
2 RED RIVER FORMATION (Dolomitic limestone and dolomite)
1 WINNIPEG FORMATION (Shale and sandstone)

CARBONATE ROCK
SHALE
MAINLY ANHYDRITE
SANDSTONE
SHALE – SANDSTONE
CARBONATE ROCK – SHALE WITH MINOR ANHYDRITE

CP Rail

PHASE I ENVIRONMENTAL SITE ASSESSMENT

WESTON YARD

GEOLOGICAL CROSS SECTION THROUGH WINNIPEG (after Render, 1970)

DATE	DRAWN BY	APPROVED BY	SCALE	PLAN NO
92/02/11	CMC		AS NOTED	CG139.2 - 9

CP Rail

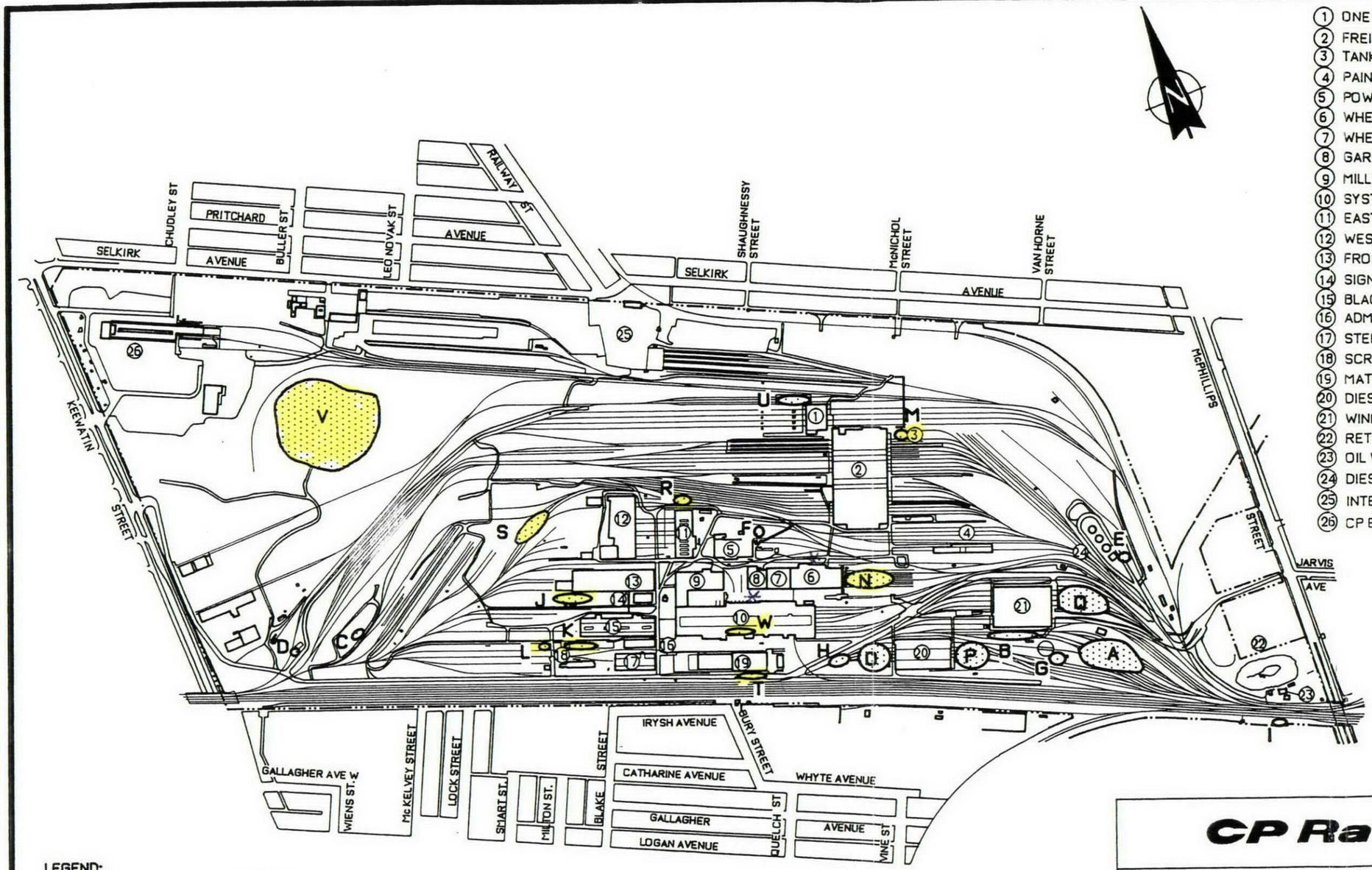
PHASE I ENVIRONMENTAL SITE ASSESSMENT

WESTON YARD

HYDROGEOLOGICAL CROSS SECTION

THROUGH WINNIPEG (after Render, 1970)

DATE	DRAWN BY	APPROVED BY	SCALE	PLAN NO
92/02/11	CMC		AS NOTED	CG139.2 - 10



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17. STEEL SHOP
18. SCRAP DOCK RECLAIM DEPARTMENT
19. MATERIALS DEPARTMENT, PLATFORM, SHELTERS
20. DIESEL HEAVY REPAIR SHOP
21. WINNIPEG DIESEL SHOP
22. RETENTION POND
23. OIL WATER SEPARATOR
24. DIESEL TANKS
25. INTERMODAL FACILITY
26. CP EXPRESS

0 50 100 200 400 m

LEGEND:

AREA OF CONCERN 1

- A FORMER FUELING FACILITY (1967-84)
- B FUELING FACILITY
- C 360010 OVERHEAD DIESEL FUEL TANK, WEST YARD
- D 900 I WEST YARD OFFICE HEATING OIL TANK
- E TRUCK TRANSFER LOCATION, MAJOR FUEL STORAGE TANKS
- F 360010 OVERHEAD DIESEL FUEL TANK, POWER HOUSE
- G FORMER OIL & PAINT SHOP IN AREA 1
- H FORMER OIL HOUSE , FORMER SAND BALLST FACILITY
- I FORMER COAL & OIL HOUSE (PRE 1944)
- J FORMER OIL TANKS SW OF FROG SHOP
- K FORMER OIL HOUSE S OF BLACKSMITH SHOP
- L FORMER GASOLINE HOUSE
- M TANK CAR CLEANING SUMP HOUSE (SEVERAL HISTORIC USES)
- N LOCOMOTIVE LOAD TEST/RUNNING AREA E OF COMPONENT SHOP
- O LOCOMOTIVE LOAD TEST/RUNNING AREA W OF DIESEL HEAVY REPAIR SHOP
- P LOCOMOTIVE LOAD TEST/RUNNING AREA E OF DIESEL HEAVY REPAIR SHOP
- Q LOCOMOTIVE LOAD TEST/RUNNING AREA E OF WINNIPEG DIESEL SHOP
- R FORMER SAND BLASTING FACILITY N OF E MAINTENANCE OF WAY SHOP
- S CURRENT OUTDOOR SAND BLASTING AREA
- T LOCOMOTIVE SPILL ADJACENT TO MATERIALS DEPT
- U LEAKING TANK CAR AREA
- V POTENTIALLY CONTAMINATED FILL DUMP/STORAGE SITE
- W CONTAMINATED SOIL IN BORE HOLES IN COMPONENT SHOP

CP Rail

OFFICE OF THE CHIEF ENGINEER
WINDSOR STATION - MONTREAL, QUEBEC

PHASE I ENVIRONMENTAL SITE ASSESSMENT

WESTON YARD

POTENTIAL AREAS OF CONCERN

CHIEF ENGINEER

ENGINEER OF TRACK

APPROVED BY

CHK. BY

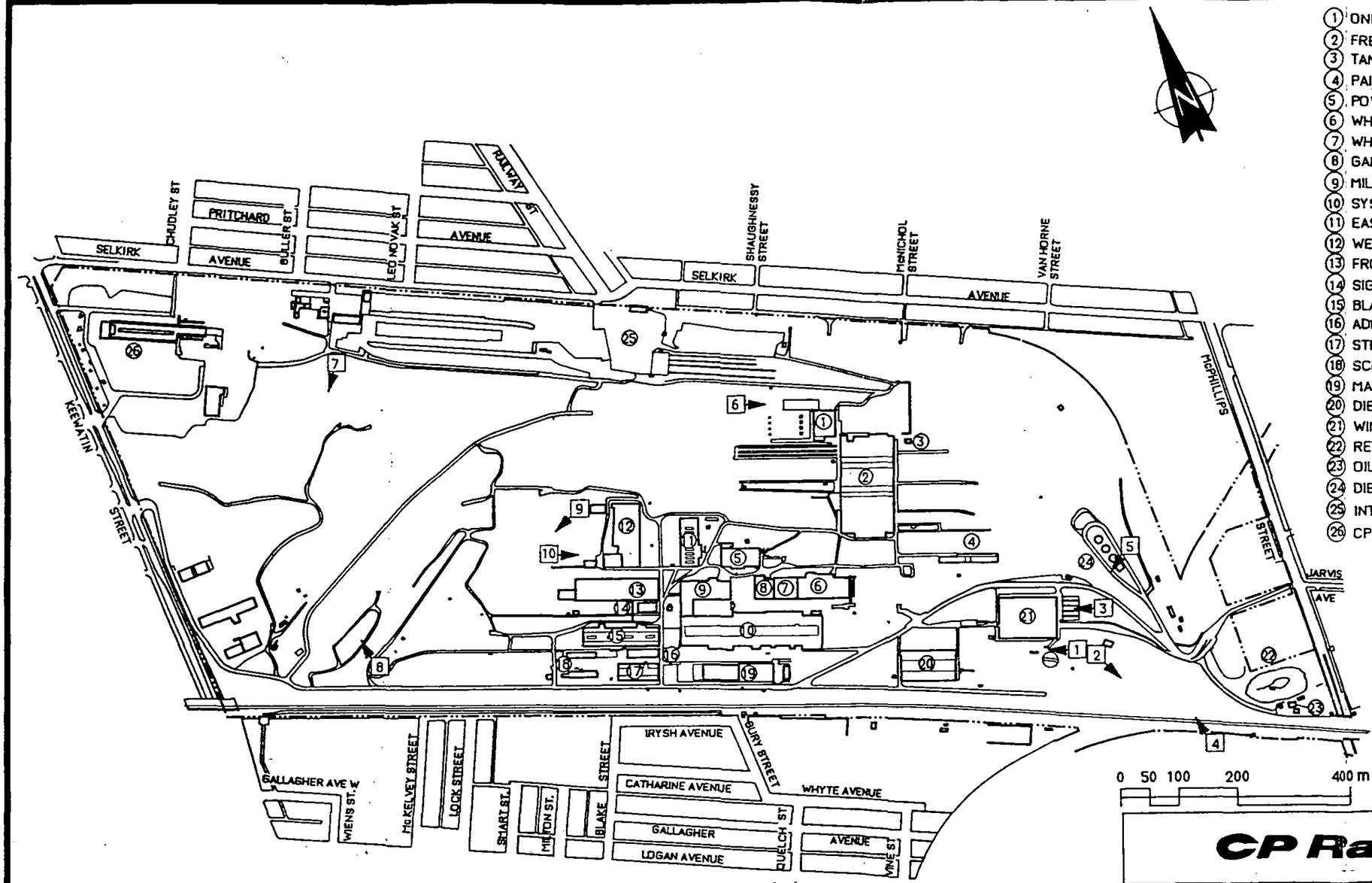
SCALE 1:7500

DR. BY JMB

DATE 92/02/15

OFFICE FILE No.

PLAN No. CG139.2 - 11



1. ONE SPOT REPAIR SHOP
2. FREIGHT CAR REPAIR SHOP
3. TANK CAR CLEANING SUMP HOUSE
4. PAINT SHOP
5. POWER HOUSE
6. WHEEL SHOP
7. WHEEL RECLAIM SHOP
8. GARAGE & UPHOLSTERY SHOP
9. MILLWRIGHT & ELECTRICAL SHOP
10. SYSTEM COMPONENT SHOP
11. EAST MAINTENANCE OF WAY SHOP
12. WEST MAINTENANCE OF WAY & HOPPER CAR SHOP
13. FROG SHOP
14. SIGNAL STORES
15. BLACKSMITH SHOP
16. ADMINISTRATION BUILDING
17. STEEL SHOP
18. SCRAP DOCK RECLAIM DEPARTMENT
19. MATERIALS DEPARTMENT, PLATFORM, SHELTERS
20. DIESEL HEAVY REPAIR SHOP
21. WINNIPEG DIESEL SHOP
22. RETENTION POND
23. OIL WATER SEPARATOR
24. DIESEL TANKS
25. INTERMODAL FACILITY
26. CP EXPRESS

LEGEND:

STANDING POSITION WHEN PHOTOGRAPH TAKEN [1]

SIGHT DIRECTION OF PHOTOGRAPH ◄

CP Rail

OFFICE OF THE CHIEF ENGINEER
WINDSOR STATION – MONTREAL, QUEBEC

PHASE I ENVIRONMENTAL SITE ASSESSMENT

WESTON YARD

PHOTOGRAPH INDEX PLAN

CHIEF ENGINEER

ENGINEER OF TRACK

APPROVED BY

CHK. BY

SCALE 1:7500

DR. BY JMB

DATE 92/02/15

OFFICE FILE No.

PLAN No. CG139.2 - 12

Photo 1 Winnipeg Diesel Shop Fuelling Station

Photo 2 Vicinity of Former Fuelling Facility (mid 1960s to 1984)

Photo 3 Trackage Directly East of Winnipeg Diesel Shop Showing Stained Ground

Photo 4 Slope of Covered McPhillips Reservoir, Adjacent to Weston Yard

Photo 5 Truck Transfer Point at Current Fuel Storage Facility

Photo 6 Leaking Tank Car Storage Area Northwest of One Spot Car Repair Shop

Photo 7 Earth Fill with Concrete Rubble in Northwest Quadrant of Weston Yard

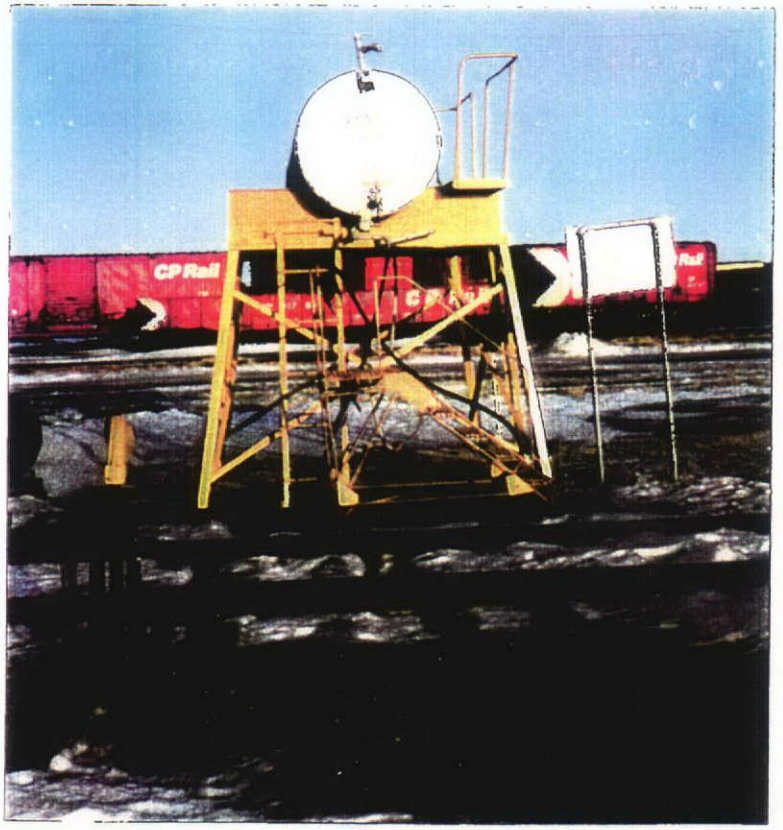


Photo 8 3600 Litre Overhead Diesel Fuel Tank in West Yard

Photo 9 Activity in Current Outdoor Sand Blasting Area

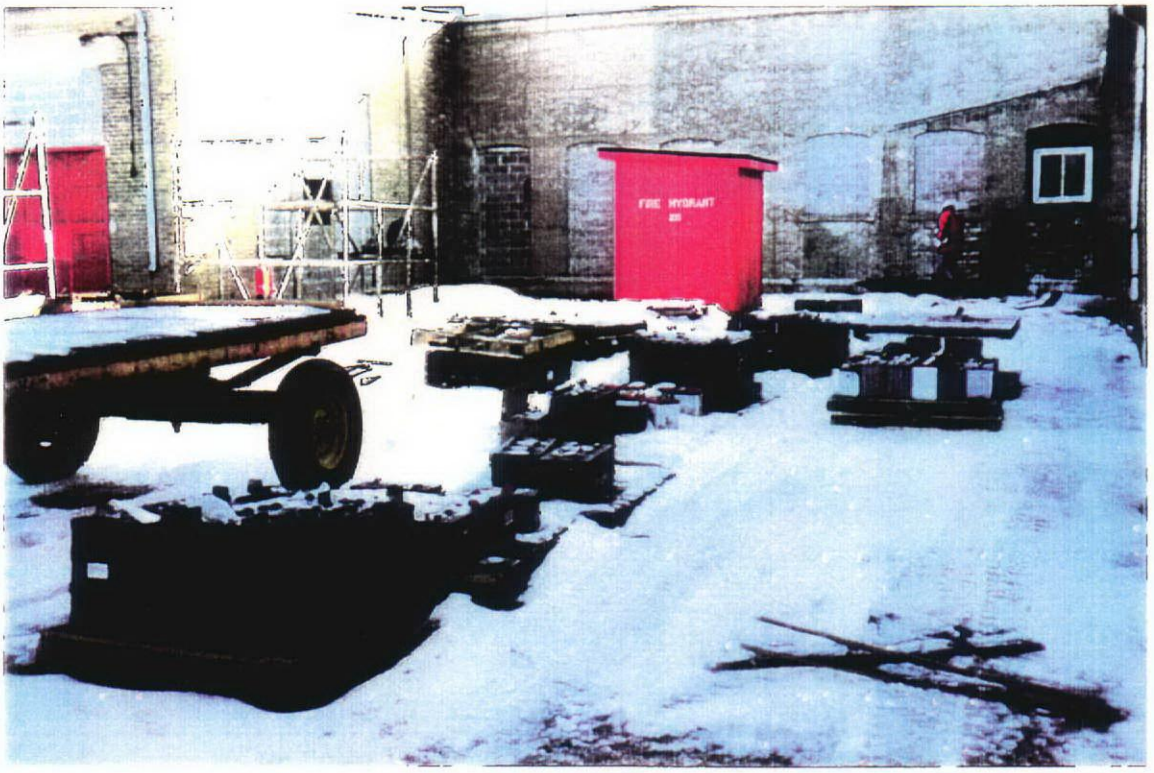


Photo 10 Battery Storage Area at Southwest Corner of West Maintenance of Way Shop

APPENDIX A

A.1 Books Reviewed

- Berton, P., (1970), "The National Dream", Published by McClelland and Stewart Ltd., Toronto.
- Berton, P., (1971), "The Last Spike", Published by McClelland and Stewart Ltd., Toronto.
- The Canadian Encyclopedia, Second Edition, (1988), Hurtig Publishers Ltd., Edmonton.
- Wells, E., (1982), "Winnipeg, Where the West Begins, An Illustrated History", Published by Windsor Publications Ltd., Burlington, Ontario.

A.2 Research Reports Reviewed

- Charron, J.E., (1965), "Groundwater Resources of Winnipeg Area, Manitoba", Published by the Geological Survey of Canada, Department of Mines and Technical Surveys, Ottawa.
- Kjartanson, B., (1983), "Geological Engineering Report for Urban Development of Winnipeg", Published by the Department of Geological Engineering, University of Manitoba, Winnipeg.

A.3 Consultants Reports Reviewed

- Independent Test Lab Ltd., 04 July 1968, "Canadian Pacific Railway Company, Weston Freight Terminal - Winnipeg, Manitoba, Subsurface Investigation"
- UMA Engineering Ltd., (1987), "Canadian Pacific Railway, Weston Shops, Geotechnical Investigation", UMA Job Number 41 06 0375 104 01 01.
- UMA Engineering Ltd., (1991), "CP Rail, Geotechnical Investigation, Sandblasting Facility, Weston Shops", UMA Job Number 41 06 0375 145 01 02.

A.4 Maps and Plans Reviewed

- City of Winnipeg, (197?), Zoning Maps for the Weston Yard and Surrounding Area.
- City of Winnipeg, Water and Waste Division, (197?), Municipal Water Main Plans for the Weston Yard and Surrounding Area.
- City of Winnipeg, Water and Waste Division, (19??), Municipal Sewer Line Plans for the Weston Yard and Surrounding Area.
- The Metropolitan Corporation of Greater Winnipeg, Waterworks and Waste Disposal Division, (1966, revisions to 1969 as constructed), "McPhillips Street Pumping Station, Yard Piping - Plans", File 651-D-5990, Page 1 of 6.

- The Metropolitan Corporation of Greater Winnipeg, Waterworks and Waste Disposal Division, (1966, revisions to 1969 as constructed), "McPhillips Street Pumping Station, Yard Piping - Profiles", File 651-D-5990, Page 2 of 6.
- Fire Insurance Map of the Weston Yard, Winnipeg, (1917), Volume 7, Sheets 705, 729 and 734
- National Topographic Map Series, (1987), Map Winnipeg 62 H/14.
- Province of Manitoba, Department of Agriculture and Conversation, Water Control and Conservation Branch, (1965), "Map Showing 1964 Well Inventory, North Sheet", File Number 10-1-7-1045.
- Sherlock's City Map, Winnipeg.

A5 CP Rail Drawings Reviewed

- 1925 through 1927, Several Untitled and Undated Drawings from this Period (based on buildings shown with known construction dates)
- 28 October 1928, Layout of Shops, Drawing 12H-LW-1431
- 05 February 1944, Layout of Oil Pipes, Drawing 12-H-LW-1439
- 07 February 1944, Layout of Pipe Ducts, Drawing 12-H-LW-1442
- 1944, Layout of Weston Shops, (an untitled plan showing dates of existing buildings with some of the construction and expansion dates).
- 24 September 1952, Layout of Weston Shops, Drawing F-12H-LW-1464
- November 1963, Layout of Weston, Drawing F-12-H-LW-1464
- 07 May 1969, Layout of Weston, S-12-H-LW-1464-A
- November 1971, Oil Separator Pond Site Plan and Sections, Reid Crowther & Partners Ltd. Drawing 3265-100
- November 1974 (revisions to 1984), Canadian Pacific Railway, Prairie Region, Winnipeg Terminal, Sheets 3 and 4.
- 27 December 1974, (Revision N, 11 July 1977), General Plan of Weston Shops, Drawing E-12-H-LW-2364-N
- 02 January 1975, Weston Sewer System
- 08 January 1975, Weston Drinking and Service Water Lines
- 08 January 1975, Weston Water Mains

- 08 January 1975, Gas Lines, Weston Shops
- 11 July 1977, General Plan of Weston Shops, Drawing E-12-H-LW-2364-N
- January 1981 (last revision), Layout of Weston on a 2 Foot Contour Interval Base Plan, Base Plan prepared for Reid Crowther & Partners Ltd. on behalf of CP Rail by Spartan Air Services Ltd.
- 28 June 1983, New Diesel Shop Fueling Facilities, Weston Shops, Office File 700-75-94, Plan 29120-B1
- 26 July 1984, Winnipeg Diesel Shop Surface Drainage and Track Collector Pans, Drawing D5 39
- 20 August 1984, Layout of Weston, Drawing S-12-H-LW-1464-F
- 30 October 1989, Layout of Weston, Drawing S-12-H-LW-1464-I
- October 1991, Weston Shop - Track Layout, CP Rail Mechanical Department Drawing SKM-0320.

A.6 Other Materials Reviewed

- CP Rail, (1991), "CP Rail Environmental Screening Questionnaires - Weston Shops", Completed by A. Tennier, R. Ramchandani and C. Lowry.
- CP Rail, (1991), "CP Rail Environmental Screening Questionnaires - Winnipeg Diesel Shop", Completed by H. R. Hill.
- CP Rail, (1991), "CP Rail Environmental Screening Questionnaires - Winnipeg Division", Completed by C. C. Lawson.
- CP Rail Archives, Weston Shops, Winnipeg Terminal Division, Listing of Building Names/ Types/Dates of Construction for Insurance Purposes, Pages 66-71.
- CP Rail Archives, Winnipeg-Local Yard, Winnipeg Terminal Division, Listing of Building Names/Types/Dates of Construction for Insurance Purposes, Pages 56-64.
- Environment Canada, (1983), "Principal Station Data, Winnipeg International Airport", a Publication of the Canadian Climate Program, File No. PSD/DSP-11.
- Environment Canada, Environmental Protection Branch, (11 August 1989), "Analysis Result for PCB in Soil".

APPENDIX B

B Site Walkthrough

This appendix documents the site walkthrough of the Weston Yard. The walkthrough was conducted in three separate visits. The first, second and third visits were for walkthroughs of the Weston Shops, the Winnipeg Diesel Shop and the Intermodal Facility respectively. All the buildings and facilities in the shops were visited. During the walkthrough, notes were made and photographs were taken. A wealth of historical drawings were pulled and reviewed at the Weston shops with the invaluable assistance of Mr. Ray Kowal, Documentation Technician.

B.1 Walkthrough of the Weston Shops

The walkthrough of the Weston Shops was conducted on 13 November 1991. The walkthrough team consisted of Mr. Chris Graham and Mr. Kevin Clifton on behalf of the Office of the Chief Engineer, and Mr. Dave Schab (Area Supervisor B&B/Energy) and Mr. Ray Kowal (Documentation Technician) of the Weston Shops. Following the actual physical walkthrough, numerous historical drawings were pulled from the files and reviewed in significant detail.

The table at the end of this appendix is a compilation of the comments from the review of CP Rail Drawing E-12-H-LW-2364-N. The following are some of the observations and comments pertinent to the potential for soil or groundwater contamination:

- Old sandblasting facilities were located west of the Diesel Heavy Repair Shop and then north of the East Maintenance of Way Shop. The activity is now conducted outside, west of the West Maintenance of Way Shop. This activity was observed during the walkthrough.

- The locations of historical oil tanks southwest of the Frog Shop, and Gasoline and Lime Sheds southwest of the Blacksmith Shop were mentioned, and have subsequently been found on historical drawings.

- Above ground oil tanks in the west yard were viewed. Staining on the is apparently due to small amounts of spillage during fuel transfers, and not due to a single significant spill.

- The soil and rubble fill in the northwest portion of the yard is from the excavation for the Winnipeg Diesel Shop in 1984. Some of the excavation was in the vicinity of an old fuelling facility, therefore the fill material will have some hydrocarbon contamination.

- The "leaking tank car area" northwest of the One Spot Car repair was noted as a location where leaking fuel or chemicals could have penetrated into the soil through joints in the concrete apron or washed off the edges of that apron.

- Locations of several small historical oil and used oil sheds and tanks were indicated.

- The hazardous compound storage area and the steam car/drum cleaning area east of the Freight Car Shop was viewed. There was no indication of any leaks or spillage at the fenced hazardous storage compound. The car/drum steam cleaning area has a good system of underdrains, directing liquids into an oil water separator. The oil water separator was the historical location of the "Oil Sump House".

- The location of a historical lime vat, a historical trichloroethylene degreaser and several current vapour degreasers were reviewed. There are no records of significant spills. Historically spills would have been washed into the drains and into the sewer system.

- The trackage east of the Component Shop is stained due to dripping from locomotives. It has been used as a load test area.

- The location of an underground gasoline tank north of the Blacksmith Shop was reviewed. A steel tank was recently replaced with a fibre glass tank. Clean up of locally contaminated soil was carried out to the satisfaction of government inspectors.

- A meat hook galvanizing facility was in operation for some time in the present location of the Scrap Dock and Reclaim Department. This has also been a historical location of fuel oil tanks.

- Drums (45 gallons) of chemicals were observed to be stored safely in several buildings, with no evidence of leaks or significant spills.

B2 Walkthrough of the Winnipeg Diesel Shop

The walkthrough of the Winnipeg Diesel Shop was conducted on 14 November 1991. The walkthrough team consisted of Mr. Chris Graham on behalf of the Office of the Chief Engineer and Mr. Joe Nardone, Shop Industrial Engineer of the Winnipeg Diesel Shop. The walkthrough included the Winnipeg Diesel Shop building and associated fuelling platform, the Diesel Heavy Repair Shop and the three large Diesel Fuel Storage Tanks. The following are pertinent observations and discussions from this visit:

- The location and function of each of the many underground and inside tanks were discussed. The details provided in the Environmental Questionnaire response are thorough and accurate. All visible tanks (primarily inside buildings) are in very good condition. The underground tanks are less than 8 years old and have not experienced known problems.

- Excellent drip trays in the fuelling area. They feed to an oil water separator. Skimmed oil sent to St. Luc. Water to Weston sewer and through another oil-water separator..

- Fuelling varies 250000-450000 L/day.

- They recover 2500-3000 gallons/ month or less than 1000 gal/week. Also indicated that some of the drip trays on the other lines are connected to the sewer system, so spills would go directly to the main oil/water separator.

- Very good handling of new and waste oils. All drains to a steel box separator with overflow into sewer.

- Borate recovered and reconditioned. Historically, chromate dumped.

- Car wash in old shop of interest. The skimmed oil is stored in 2 tanks and piped to the Power Plant (2 yr old pipeline). Sludge collected and cleaned out by a 3rd party.

- Oil stained ground observed at east and west ends of the two shop buildings is due primarily to dripping rather than spills.

- Mentioned excavation of soil east of new shop to re-level the tracks.

- No understanding of incident reporting, but would probably go to the National Transportation Association (NTA).

- Fuelling man remembers a unit going off track and leaking about 1200 litres on the test lead.

- Some memory of a fuelling overflow at the three large fuel oil storage tanks, but was easily kept within the containment barrier. There is some spillage at the fuel truck off-loading area for these fuel tanks.

B3 Walkthrough of the Intermodal Facility

The walkthrough/visit of the Intermodal facility took place December 3, 1991. Mr. Norm Robertson, Assistant Manager of the facility, provided information to Mr. Chris Graham. The following brief comments and observations were recorded:

- Facility supposedly started in 1957. Area to east has 4" minus limestone fill. The container pad area generally excavated to 8'-9', but as much as 15' and filled with good quality limestone and compacted gravel.
- Use lignal sulfate rather than oil to keep down dust, as near City sewers.
- If dangerous commodity were found to be leaking, they would be put on plastic on SW end of yard. Generally nothing more than 5 gallons (except for 100 kegs of overproof rum).
- Ties into City Sewer and Water system at Selkirk Ave.
- The upper portion of the excavation included fill containing ashes, sand, etc. When excavating through the fill, lots of water continuously ran out of the fill. Water appears to pond/perch in the fill in this historically low swampy area.

B4 Notes on Building Histories of Weston Shops

The following table is based on a detailed discussion with Mr. Ray Kowal, Documentation Technician, Weston Shops.

Notes on building histories at Weston Shops, Winnipeg. These notes are based on the CP Rail drawing #E-12-H-LW-2364-N, General Plan of Weston Shops.

Key #	Name	Description
1	Air Brake Shop	A small shop area inside the Component Shop. This shop has been moved from the ****** building to the ********* building.
2	Buildings & Bridges Shop	Shop area used by B & B to support their work.
3	Blacksmith Shop	Shop performs general welding, machining, cast, heat treatment, etc. of parts in support of Frog Shop, Freight Car Shop, etc.
4	Boiler Shop	Small shop area inside CS. Handles boiler repair and machining on boilers.
5	Diesel Shop	Area in CS, performs repairs and maintenance on third-party claimed (accident damaged) diesel units.
6	Car Dismantling Area	Also known as Scrap Farm, Reclamation Area, or Farm. Area for cutting and sorting of scrap metal cars, components, etc.
7	Chimney	Power plant chimney
8	CP Rail Intermodal Services	sorting and dropoff area for intermodal trailers.
9	CP Express Transport	Offices & warehouse (?) for CPET.
10	CP Express Transport	Garage for CPET. Repairs, maintenance, etc. for CPET fleet.
11	Diesel Fuel Storage Tanks	Old tanks to supply fuelling area. removed for construction of new Winnipeg Diesel Shops.
12	Old Winnipeg Diesel Shop	Renovated in 19?? along with construction of new Winnipeg Diesel Shops
13	Old Winnipeg Diesel Shop Service Building	Office for enginemen & firemen to book in and out of yard. Handled service orders for locomotives needed.
14	Garage	Formerly Dry Kiln (associated with Lumber Shed, #31), then renovated to Garage for vehicle maintenance, then demolished. Replaced by current Lumber/Storage Shed, used to store lumber & equipment used to handle lumber.
15	Transformer	Provides electricity to Weston Shops

16	Electrical Shop	Originally Planing Shop (wood planing?), then Airbrake Shop (servicing air brakes on cars), then Electrical Shop. Now Engineer of Tests, used for miscellaneous testing & Quality Control on Wheel Shop work.
17	Employee's East Parking Lot	Employee vehicle parking
18	Employee's North Parking Lot	Employee vehicle parking
19	Employee's West Parking Lot	Employee vehicle parking. Now demolished for ???? freight yard.
20	Enginemen's Bunk House	Bunkhouse used by enginemen, firemen awaiting outgoing trains.
21	Fire Hall	Formerly provided fire protection to Weston Shops. No longer used as such; now storage for fire extinguishers etc.
22	First Aid	First Aid station located in building with workers' lockers & lunchroom.
23	Flood Pond	Provides storm water storage before skimming and release to city sewer system.
24	Freight Car Shop	Also known as Car Shop. Overhaul facilities for freight cars from the axles up.
25	Freight Terminal Building	Handling facility for freight loading/unloading.
26	Frog Shop	Formerly Car Shop (overhaul of freight cars). Now used for manufacture of switches or "frogs" and associated hardware.
27	Garage & Vehicle Repair Shop	In process of moving to Foundry building. Building to be converted to B & B Shops.
28	Hopper Car Shop	originally West Coach Shop, used for repair and maintenance of passenger coaches. Then Hopper Car Shop, for cleaning & maintenance of hopper cars. Now West Maintenance Of Way shop, used by MOW crews. Scheduled for demolition in 1992.
29	Liquid Oxygen Tanks	Oxygen for oxy-acetylene welding.
30	Locomotive Transfer Table	Transfer locomotives between bays in Locomotive Shop.
31	Lumber Shed	Now demolished. See #14 above
32	Machine Shop	Area in Component Shop used for general machining & light fabricating.

33	East Maintenance of Way	originally East Coach Shop, used for repairs to passenger coaches, then hopper car maintenance. Currently used for vehicle maintenance by division MOW. Scheduled for demolition in 1992.
34	West Maintenance of Way	originally West Coach Shop, used for repairs to passenger coaches, then hopper car maintenance. Currently used for vehicle maintenance by division MOW. Scheduled for demolition in 1992.
35	Millwright Shop	Shop area used by Millwrights group. Now used for mechanical maintenance.
36	One-Spot Car Repair Shop	Built as one-spot repair. Performs minor repairs on loaded railcars to enable them to reach destination with load. Leaking cars are parked outside on concrete apron for repairs.
37	Rail Car Paint Shop	Built as paint shop. Paints railcars after repairs at Weston Shops.
39	Miscellaneous Paint Shop	Originally Acetylene Building, providing storage of welding supplies separate from the Locomotive Shop, to which it is now attached. Now used to paint miscellaneous components from Locomotive Shop.
40	Pedestrian Overpass	Provides pedestrian access to yard over tracks.
41	Pedestrian Subway	Provides pedestrian access to yard under tracks.
42	Police Office - Main Gate	Later moved to become main gate security office.
43	Power House	Provided power to Weston Shops, now used only to provide heating steam and compressed air. At one time contained Millwrights' Shop & Welding Shop.
44	Radio Repair Shop	Expanded to present-day Signals & Communications. Originally located in old Weston Diesel Shop.
45	Rail Saw Building	Housing for saw used to cut rails; rails stored in area.
46	Rugby Tower	Provides control of rail traffic entering & exiting Weston Shops yard.
47	Sand House Drier	Used to dry traction sand.
48	Sand Pile & Storage	Storage of traction sand. Also used as scalehouse to weigh cars.
49	Scale	Used for weighing cars.

50	Scrap Dock & Reclaim Department	Originally Oilhouse, then Scrap Dock, then Meat Hook Tinning (Galvanizing), then Scrap Dock, then Buildings & Bridges Office. Now houses Scrap Dock & Upholstery Shop.
51	Signal Shop	Originally window & sash storage, then Signal Storage, now general Storage.
52	Signal Stores	Formerly Garage. Now storage for Frog Shop.
53	Steel Shop	Originally Foundry, then Tinsmith Shop, now Garage.
54	Stores Shelter	originally built as a roof shelter, then Stores Shelter, then Timber Shelter. Now storage for miscellaneous components.
55	Stores & Offices	Formerly Works Manager's Office, then Shop Engineer's Office, now home to Accounting and Purchasing & Materials offices.
56	Tank Car Cleaning Sump House	Contains sump into which car washing residues are collected & settled. New building built recently over sump, along with hazardous materials storage area.
57	Test House	Former home to aircraft engine test facilities. Converted to electrical storage, then demolished.
58	Upholstery Shop	Originally handled repairs to seats and upholstery in passenger cars. Was recently working on similar items, such as welders' clothing and other protective clothing. Currently vacant, undergoing renovations for use as Buildings & Bridges Office.
59	Walkway	Asphalt sidewalk for employee use. Now demolished
60	Water Reservoir	Water supply to Power House. Now demolished.
61	Works Manager's Office	Now located in Administration Building.
62	Welding Shop	Shop area in Locomotive Shop used for welding & fabrication.
63	Wheel & Axle Shop - Railcars	Wheel & axle overhauls performed on rail car running gear.
64	Wheel & Axle Shop - Diesel	Wheel & axle overhauls performed on locomotive running gear.

APPENDIX C

C Interview With Long Term Employee

This appendix documents the 04 December 1991 interview with two CP Rail long term employee, Mr. Bill Welligan, a retired General Locomotive Foreman, and Mr. Russell McCreedy, a retired Shop Engineer. Mr. Dave Schab, Area Supervisor B&B/Energy was present for much of the joint interview, which was conducted in the conference room at the Administration Building, Weston Shops. The interview was centered around the review of historic drawings and air photos in order to assist the memory and validate the time frames.

Mr. Welligan worked with CP Rail at Weston Shops from 1949 through 1986. Mr. McReedy started at Weston Shops in 1938, and retired in the mid 1980s. The following are specific pieces of information from the interview:

- Journal oil would be saved to be reused. No indication of oil dumped on site with exception of a slight possibility NE of the Car Shop in 1940s; this was based on apparent ground surface colouring from an air photo rather than actual knowledge of any such practice or incident.
- Saturated ashes fill were encountered when excavating at Frog Shop, however, no indication of hydrocarbon or chemical contamination.
- Garbage said to be hauled away rather than dumped on site.
- Fill of wood and coal ashes were dumped anywhere on site in low areas. No extra fill was hauled in from off site.
- The areas not developed were low and swampy.
- In 1960s/70s, spray painted cars outside, in the area of the 1971/72 Paint Shop.
- Tender /Wheel Shop became Diesel Shop in 67, then fuelling activities began.
- Cutting up old Steam Engines in the car burning area occurred during the 1960s and early 1970s. Box cars also burned in 1970s.
- Regarding fuelling in the late 1960s and the 1970s, the Buckeye Adapter in the fuel tanks did not always work well, and the fuel flow would not always shut off when the locomotive tanks were full. They indicated that there were no drip trays, so that much fuel spilled onto the ground surface in this area. It was later stated that much of the spilled fuel may have gone

into the sewer system via drip trays, rather than penetrating the ground surface. The fuel storage tanks did have an earth retainment system.

- Regarding the apparently dark area NE of Steel Car Shop in 1946 air photo, it could have been black for several reasons, such as spraying oil on weeds, or car burning ashes.

- Anywhere diesel locomotives were parked or idled, there would have been dripping. This include fuel, air box drainage and lubricating oil.

- Sand from sand blasting was taken off site to a golf course and to a landfill. It was previously used for on-site roads.

- Coal was stored in large piles along Keewatin Street in the 1930s and 1940s. This is what appears in 1946 air photos.

- Chromate based locomotive cooling fluids would have been drained directly onto the ground surface in the vicinities of the Diesel Shop and Component Shop.

- Old fuel lines to shops were in the tunnels.

APPENDIX D

D: Bore Hole and Water Well Logs

This appendix presents the available bore hole and water well logs on/or adjacent to the Weston Yard. The location of these bore holes is indicated on Drawing CG139.2-2, within this document. The logs were copied from the following sources:

D.1 UMA Engineering Ltd., (1991), "CP Rail, Geotechnical Investigation, Sandblasting Facility, Weston Shops", UMA Job Number 41 06 0375 145 01 02.

CPTH-1 to CPTH-5 inclusive

D.2 UMA Engineering Ltd., (1987), "Canadian Pacific Railway, Weston Shops, Geotechnical Investigation", UMA Job Number 41 06 0375 104 01 01.

TH1, TH5, TH6 and TH8

(TH2, TH3, TH4 and TH7 did not penetrate more than 0.5 m)

D.3 Independent Test Lab Ltd. (1968), "Canadian Pacific Railway Company, Weston Freight Terminal - Winnipeg, Manitoba, Subsurface Investigation".

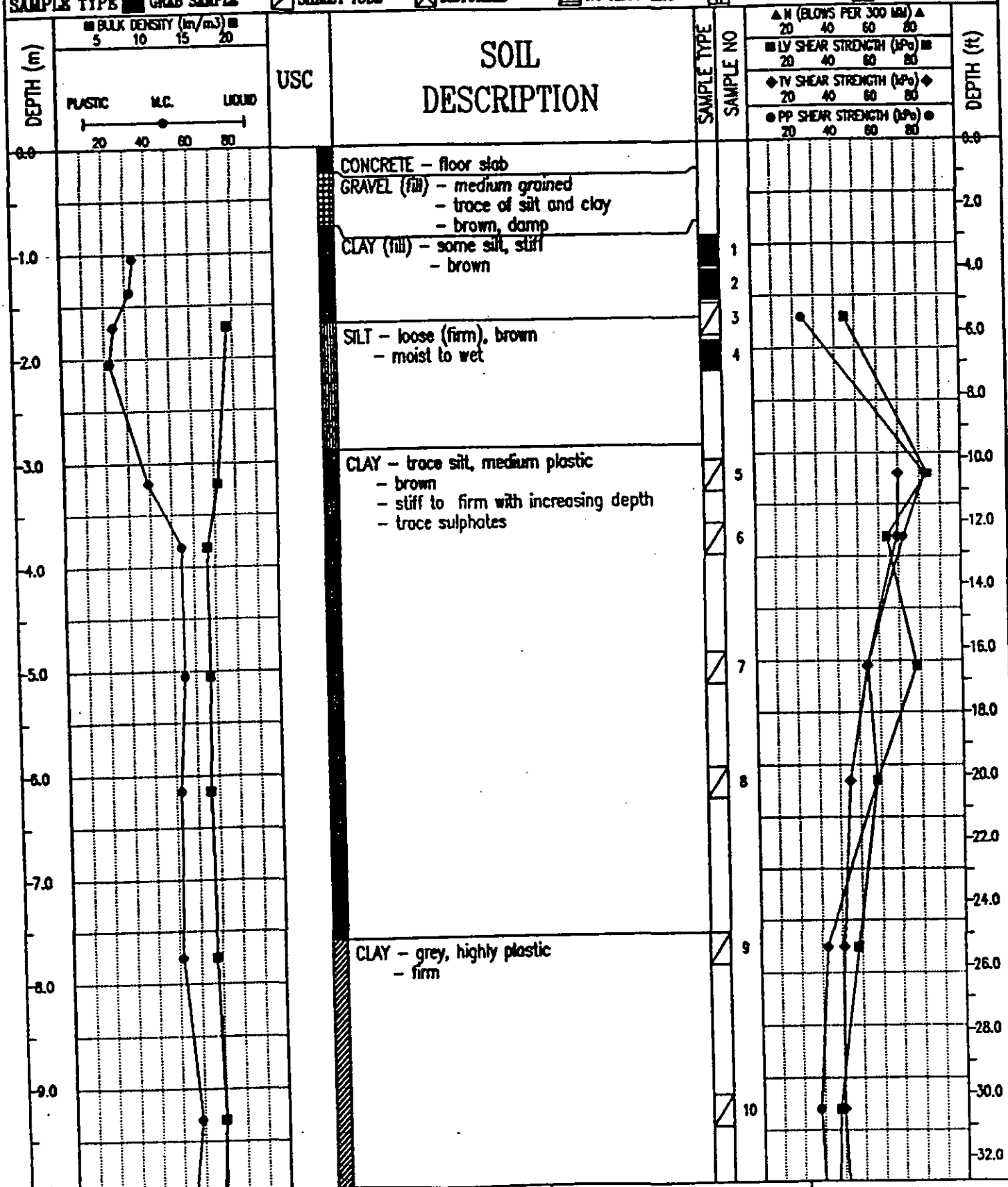
BH1 to BH7 inclusive

D.4 Province of Manitoba, Department of Natural Resources, Groundwater Division

Ground Water Observation Station Winnipeg MO-14

PROJECT: WESTON YARDS – CAR SHOP	DRILLED BY: PADDOCK DRILLING LTD.	BOREHOLE No. CPTH-1
CLIENT: CP RAIL	DRILL TYPE:100 MM DIA. SOLID STEM AUGER	Project No: 0375-145-01-02
PROJECT ENGINEER: KMS		ELEVATION 100.000 (m)

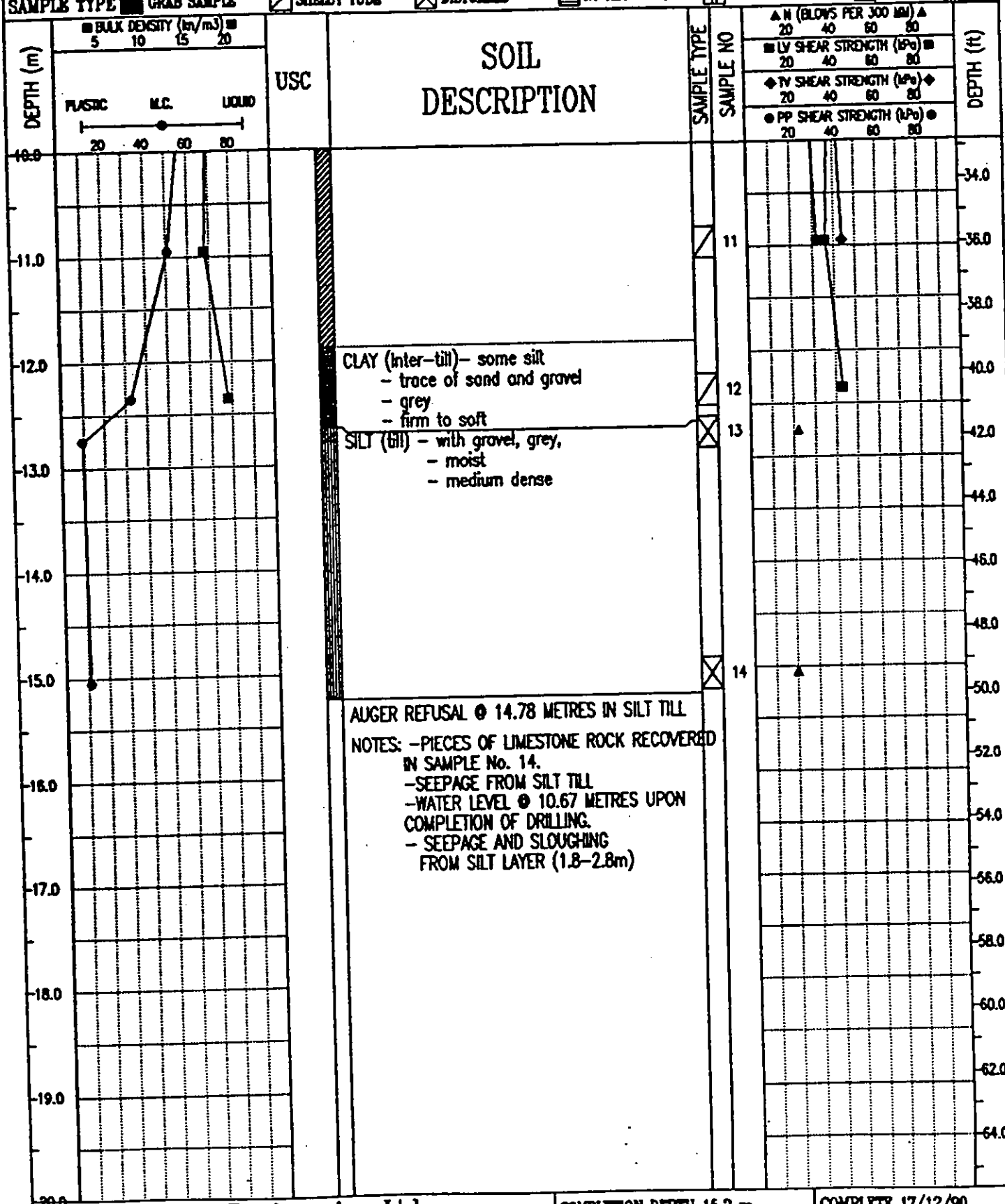
SAMPLE TYPE: GRAB SAMPLE | SHELBY TUBE | DISTURBED | NO RECOVERY | CORE BARREL | WIRELINE-TYPE



UMA Engineering Ltd. Winnipeg, Manitoba	COMPLETION DEPTH 16.2 m
	COMPLETE 17/12/90
LOGGED BY KK	DWG NO.
	Page 1 of 2

PROJECT: WESTON YARDS – CAR SHOP	DRILLED BY: PADDOCK DRILLING LTD.	BOREHOLE No. CPTH-1
CLIENT: CP RAIL	DRILL TYPE:100 MM DIA. SOLID STEM AUGER	Project No: 0375-145-01-02
PROJECT ENGINEER: KMS		ELEVATION 100.000 (m)

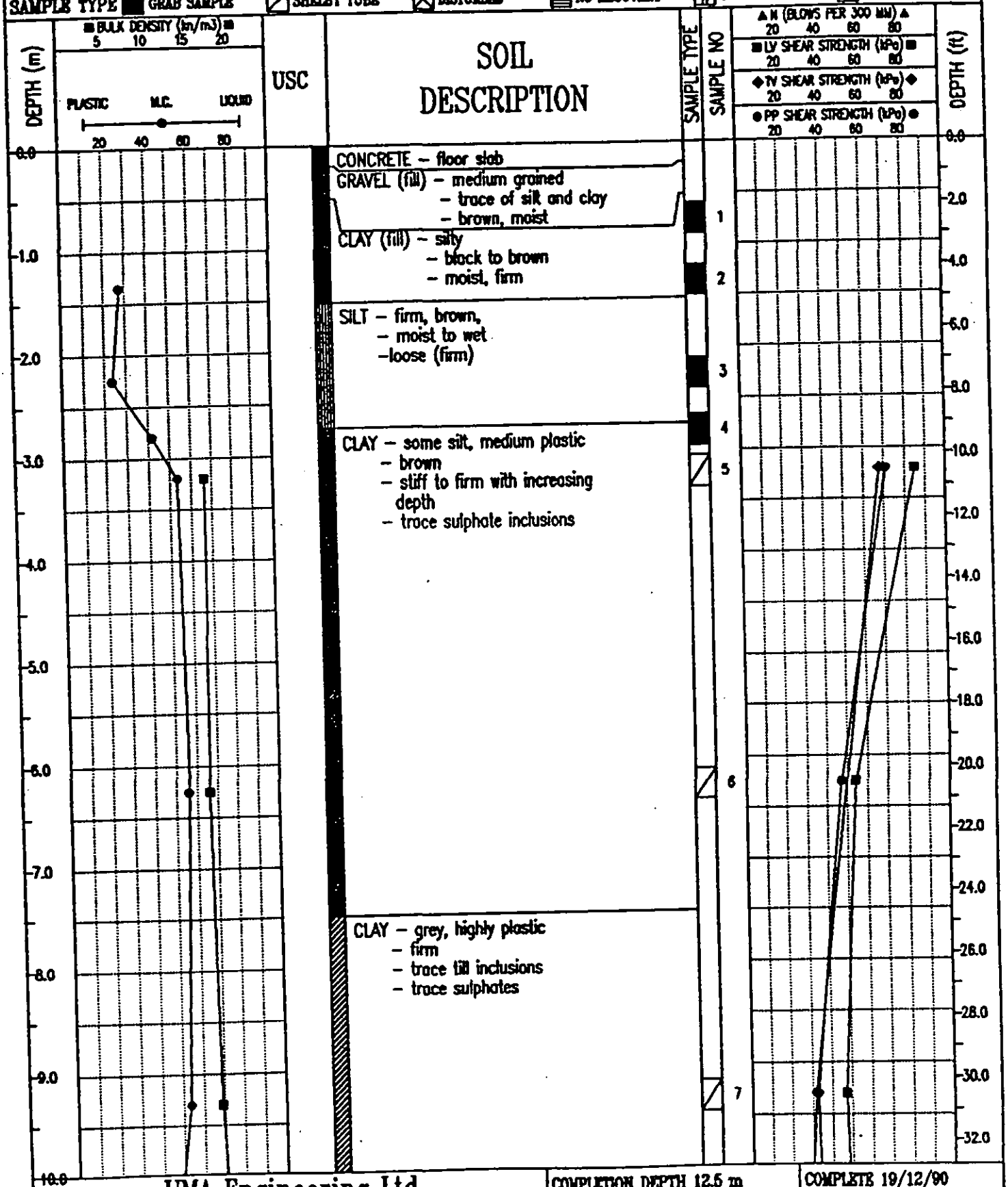
SAMPLE TYPE: GRAB SAMPLE | SHELBY TUBE | DISTURBED | NO RECOVERY | CORE BARREL | WIRELINE-TYPE



UMA Engineering Ltd. Winnipeg, Manitoba	COMPLETION DEPTH 16.2 m	COMPLETE 17/12/90
	LOGGED BY KK	DWG NO.
		Page 2 of 2

PROJECT: WESTON YARDS – CAR SHOP	DRILLED BY: PADDOCK DRILLING LTD.	BOREHOLE No. CPTH-2
CLIENT: CP RAIL	DRILL TYPE:100 MM DIA. SOLID STEM AUGER	Project No: 0375-145-01-02
PROJECT ENGINEER: KMS		ELEVATION 100.000 (m)

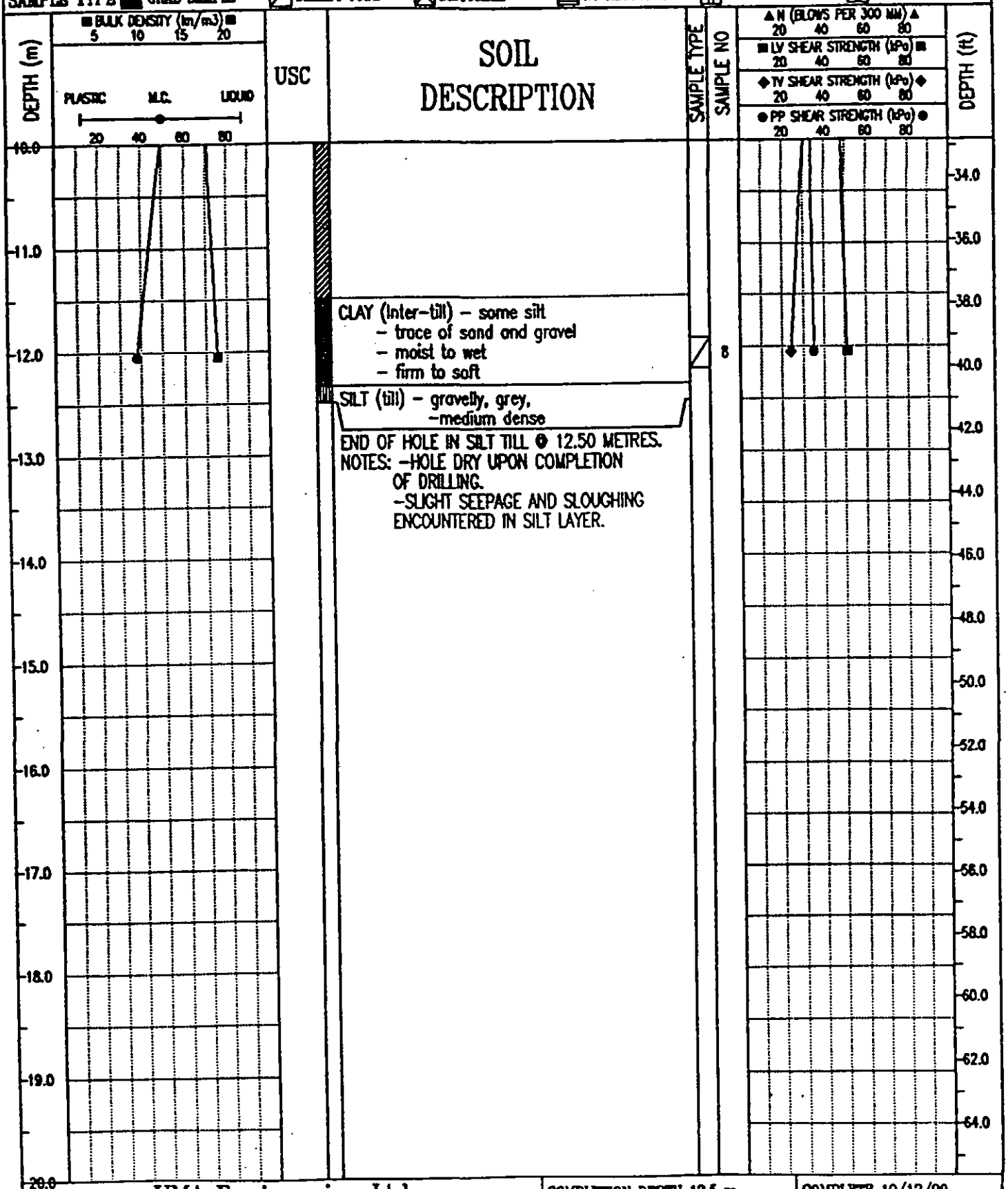
SAMPLE TYPE: GRAB SAMPLE | SHELBY TUBE | DISTURBED | NO RECOVERY | CORE BARREL | WIRELINE-TYPE



UMA Engineering Ltd. Winnipeg, Manitoba	COMPLETION DEPTH 12.5 m	COMPLETE 19/12/90
	LOGGED BY KK	DWG NO.

PROJECT: WESTON YARDS – CAR SHOP	DRILLED BY: PADDOCK DRILLING LTD.	BOREHOLE No. CPTH-2
CLIENT: CP RAIL	DRILL TYPE:100 MM DIA. SOLID STEM AUGER	Project No: 0375-145-01-02
PROJECT ENGINEER: KMS		ELEVATION 100.000 (m)

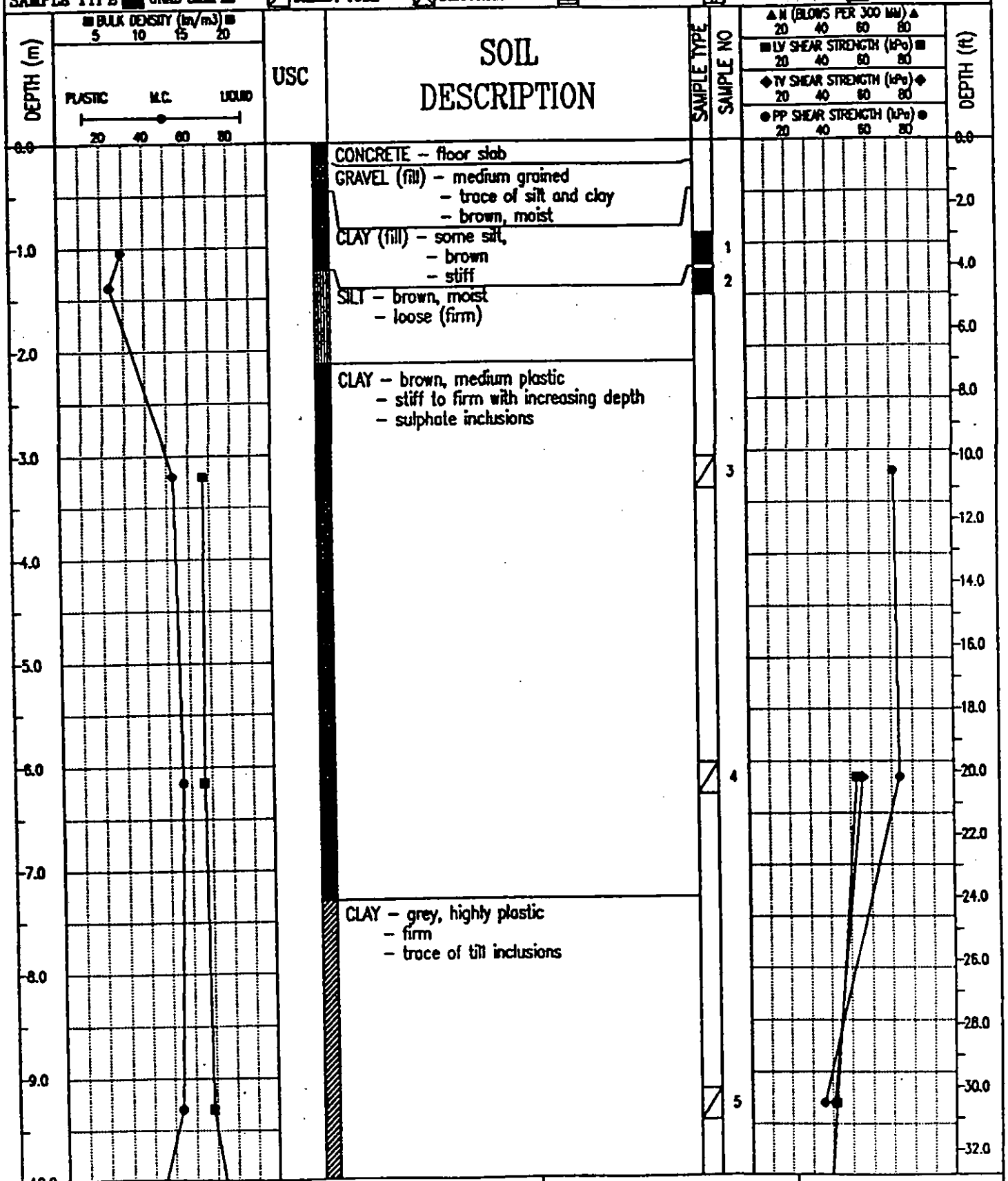
SAMPLE TYPE: GRAB SAMPLE | SHELBY TUBE | DISTURBED | NO RECOVERY | CORE BARREL | WIRELINE-TYPE



UMA Engineering Ltd. Winnipeg, Manitoba	COMPLETION DEPTH 12.5 m	COMPLETE 19/12/90
	LOGGED BY KK	DWG NO.

PROJECT: WESTON YARDS – CAR SHOP	DRILLED BY: PADDOCK DRILLING LTD.	BOREHOLE No. CPTH-3
CLIENT: CP RAIL	DRILL TYPE:100 MM DIA. SOLID STEM AUGER	Project No: 0375-145-01-02
PROJECT ENGINEER: KMS		ELEVATION 100.000 (m)

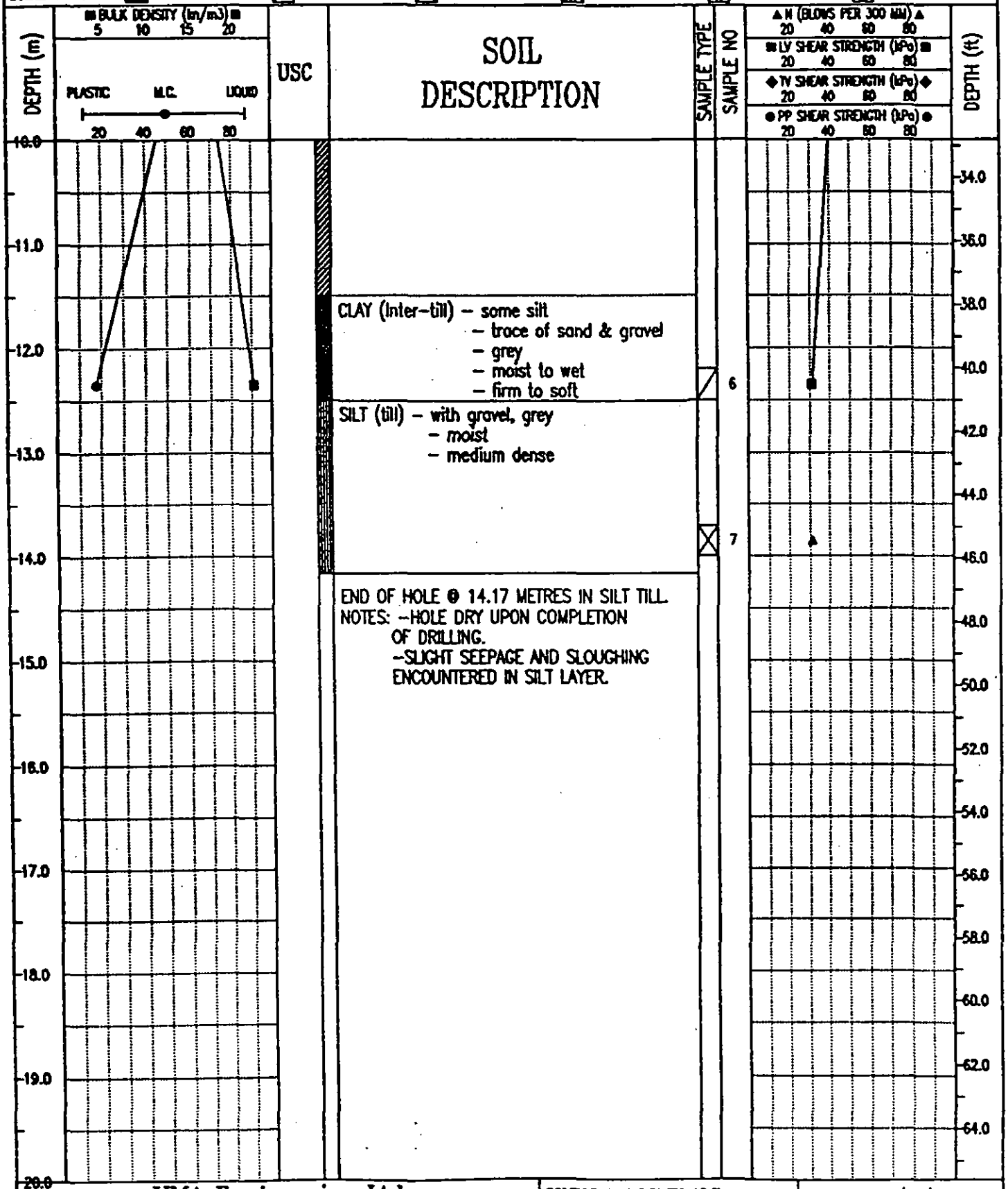
SAMPLE TYPE: GRAB SAMPLE | SHELBY TUBE | DISTURBED | NO RECOVERY | CORE BARREL | WIRELINE-TYPE



UMA Engineering Ltd. Winnipeg, Manitoba	COMPLETION DEPTH 13.7 m	COMPLETE 18/12/90
	LOGGED BY KK	DWG NO.

PROJECT: WESTON YARDS – CAR SHOP	DRILLED BY: PADDOCK DRILLING LTD.	BOREHOLE No. CPTH-3
CLIENT: CP RAIL	DRILL TYPE:100 MM DIA. SOLID STEM AUGER	Project No: 0375-145-01-02
PROJECT ENGINEER: KMS		ELEVATION 100.000 (m)

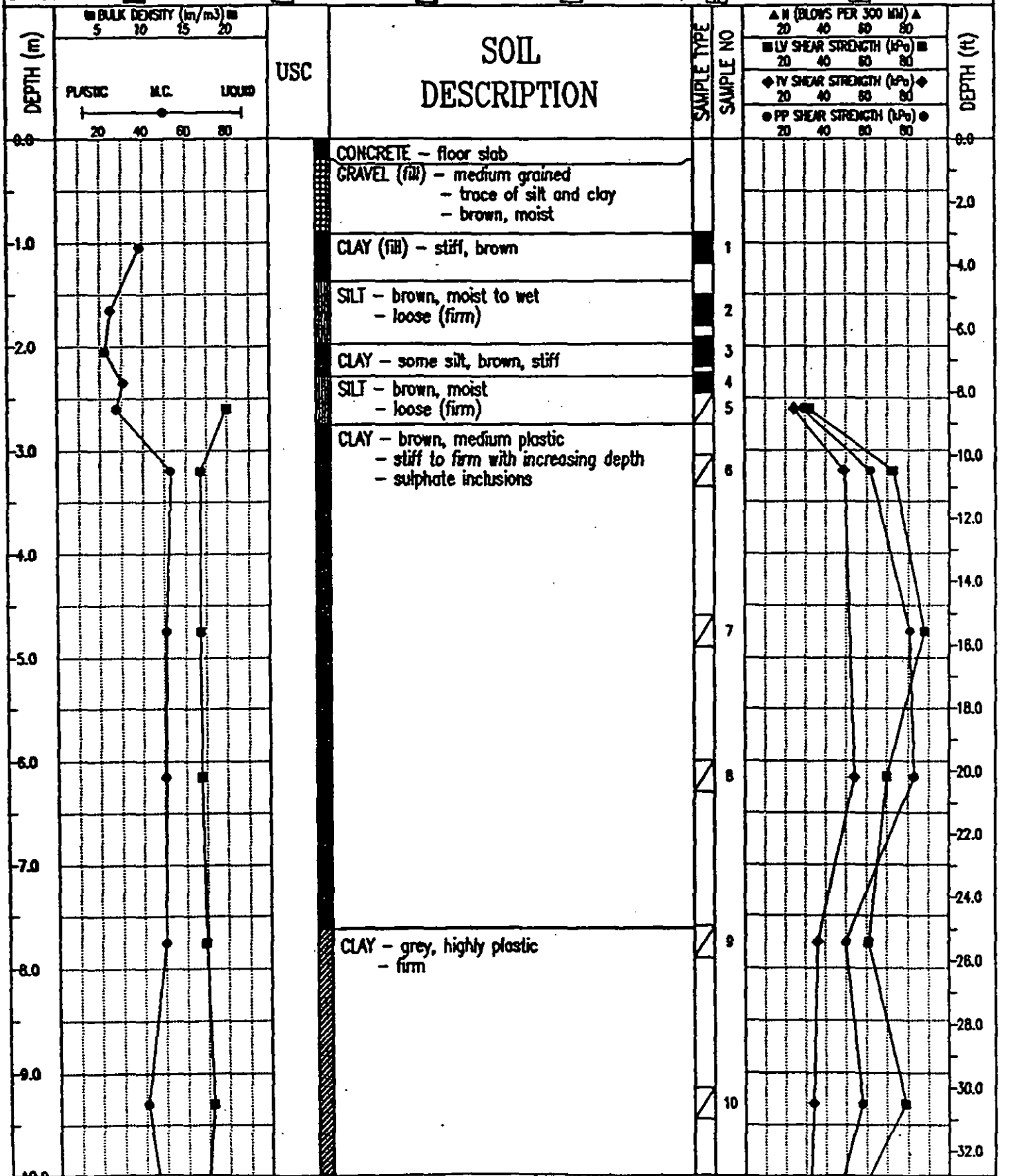
SAMPLE TYPE: GRAB SAMPLE | SHELBY TUBE | DISTURBED | NO RECOVERY | CORE BARREL | WIRELINE-TYPE



UMA Engineering Ltd. Winnipeg, Manitoba	COMPLETION DEPTH 13.7 m	COMPLETE 18/12/90
	LOGGED BY KK	DWG NO.

PROJECT: WESTON YARDS – CAR SHOP	DRILLED BY: PADDOCK DRILLING LTD.	BOREHOLE No. CPTH–4
CLIENT: CP RAIL	DRILL TYPE:100 MM DIA. SOLID STEM AUGER	Project No: 0375–145–01–02
PROJECT ENGINEER: KMS		ELEVATION 100.000 (m)

SAMPLE TYPE: GRAB SAMPLE | SHELBY TUBE | DISTURBED | NO RECOVERY | CORE BARREL | WIRELINE-TYPE



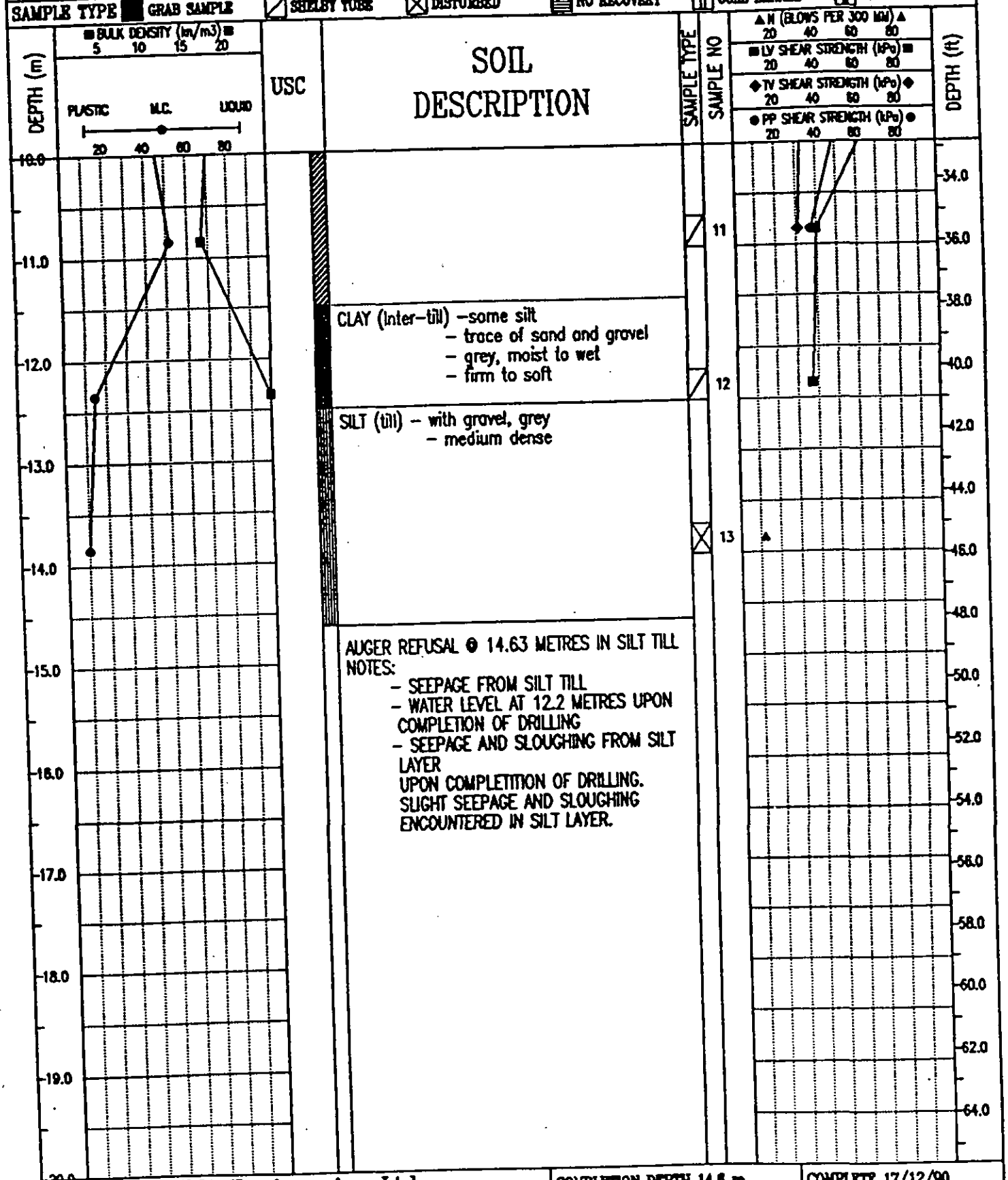
UMA Engineering Ltd. Winnipeg, Manitoba	COMPLETION DEPTH 14.8 m	COMPLETE 17/12/90
	LOGGED BY KK	DWG NO.

PROJECT: WESTON YARDS – CAR SHOP | DRILLED BY: PADDOCK DRILLING LTD. | BOREHOLE No. CPTH-4

CLIENT: CP RAIL | DRILL TYPE:100 MM DIA. SOLID STEM AUGER | Project No: 0375-145-01-02

PROJECT ENGINEER: KMS | ELEVATION 100.000 (m)

SAMPLE TYPE: GRAB SAMPLE | SHELBY TUBE | DISTURBED | NO RECOVERY | CORE BARREL | WIRELINE-TYPE



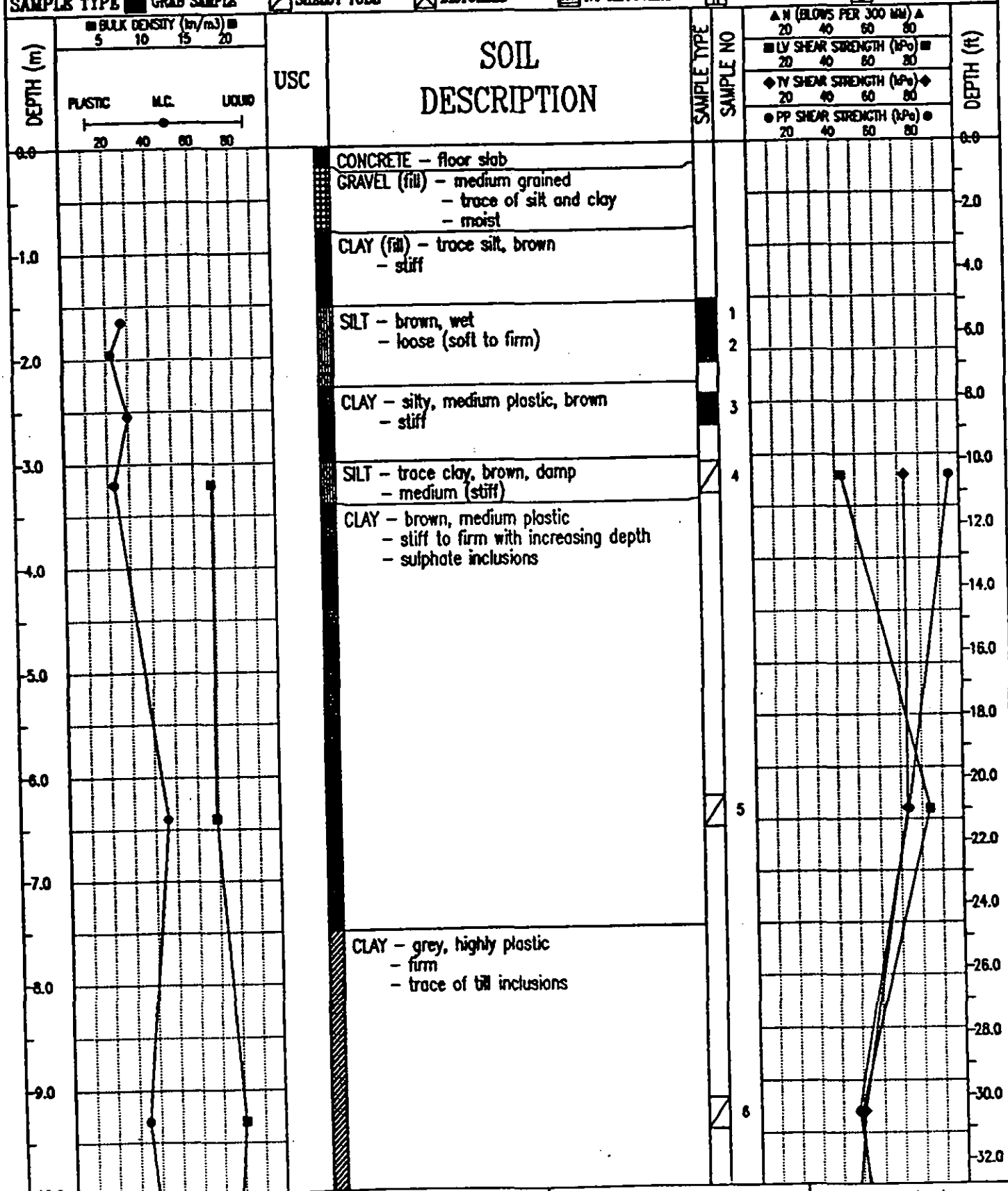
UMA Engineering Ltd.
Winnipeg, Manitoba

COMPLETION DEPTH 14.6 m | COMPLETE 17/12/90

LOGGED BY KK | DWG NO. | Page 2 of 2

PROJECT: WESTON YARDS – CAR SHOP	DRILLED BY: PADDOCK DRILLING LTD.	BOREHOLE No. CPTH-5
CLIENT: CP RAIL	DRILL TYPE:100 MM DIA. SOLID STEM AUGER	Project No: 0375-145-01-02
PROJECT ENGINEER: KMS		ELEVATION 100.000 (m)

SAMPLE TYPE: GRAB SAMPLE | SHELBY TUBE | DISTURBED | NO RECOVERY | CORE BARREL | WIRELINE-TYPE



CONCRETE – floor slab

GRAVEL (fill) – medium grained
– trace of silt and clay
– moist

CLAY (fill) – trace silt, brown
– stiff

SILT – brown, wet
– loose (soft to firm)

CLAY – silty, medium plastic, brown
– stiff

SILT – trace clay, brown, damp
– medium (stiff)

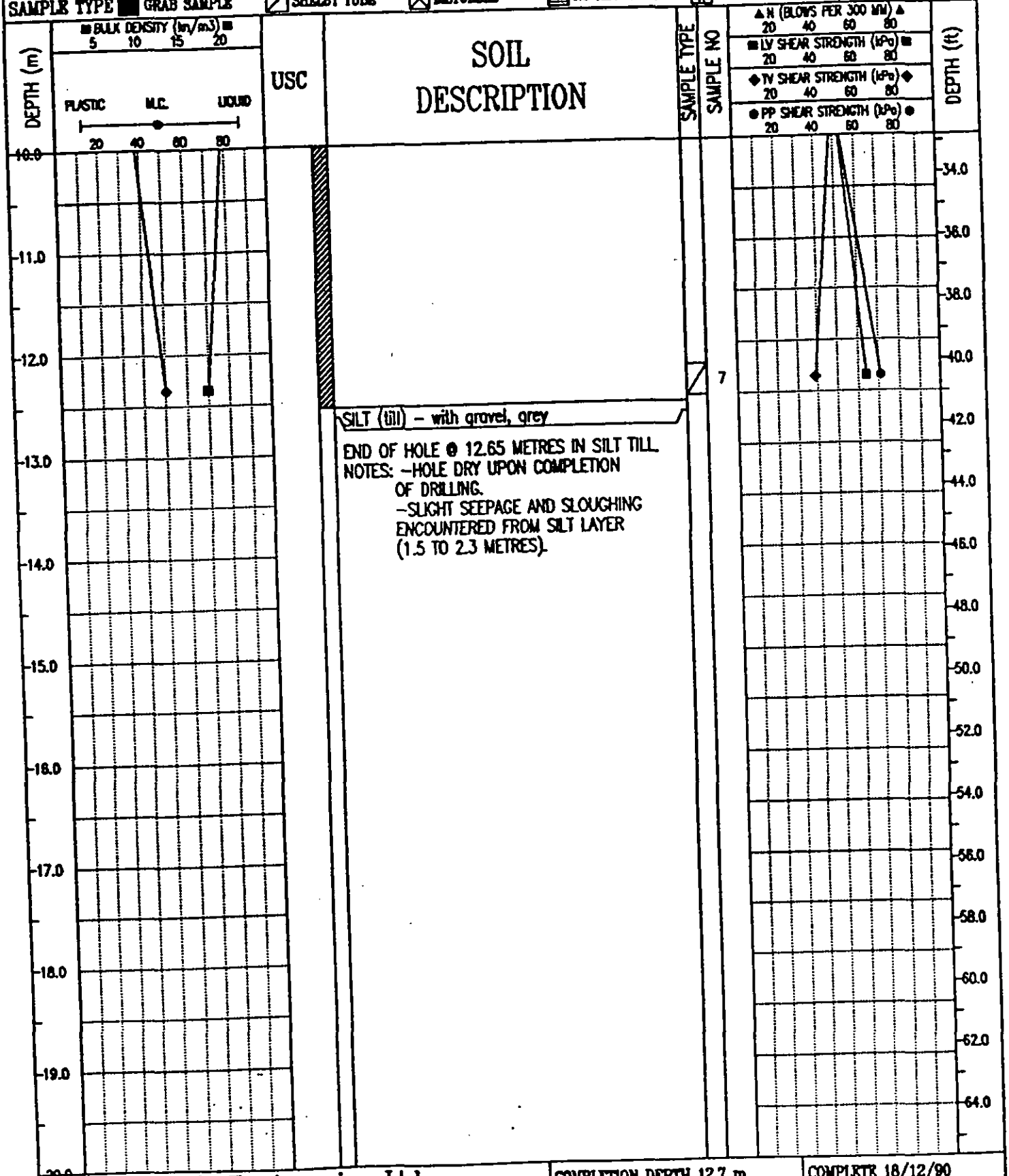
CLAY – brown, medium plastic
– stiff to firm with increasing depth
– sulphate inclusions

CLAY – grey, highly plastic
– firm
– trace of till inclusions

UMA Engineering Ltd. Winnipeg, Manitoba	COMPLETION DEPTH 12.7 m	COMPLETE 18/12/90
	LOGGED BY KK	DWG NO.

PROJECT: WESTON YARDS – CAR SHOP	DRILLED BY: PADDOCK DRILLING LTD.	BOREHOLE No. CPTH-5
CLIENT: CP RAIL	DRILL TYPE:100 MM DIA. SOLID STEM AUGER	Project No: 0375-145-01-02
PROJECT ENGINEER: KMS		ELEVATION 100.000 (m)

SAMPLE TYPE: GRAB SAMPLE | SHELBY TUBE | DISTURBED | NO RECOVERY | CORE BARREL | WIRELINE-TYPE



SILT (till) – with gravel, grey

END OF HOLE @ 12.65 METRES IN SILT TILL.
NOTES: –HOLE DRY UPON COMPLETION OF DRILLING.
–SLIGHT SEEPAGE AND SLOUGHING ENCOUNTERED FROM SILT LAYER (1.5 TO 2.3 METRES).

UMA Engineering Ltd. Winnipeg, Manitoba	COMPLETION DEPTH 12.7 m	COMPLETE 18/12/90
	LOGGED BY KK	DWG NO.
		Page 2 of 2

UMA Engineering Ltd.
Engineers & Planners
1479 Buffalo Place, Winnipeg, Manitoba, Canada R3T 1L7

PROJECT: [illegible]
CLIENT: C.P. RAIL
JOB NO.: 0375-104-01-01
DRILLING DATE: OCT. 1, 1987
DRILLED BY: MAPLE LEAF ENTERPRISES

TEST HOLE NO. 1

SURFACE ELEVATION: FLOOR
CO-ORDINATES:

MOISTURE CONTENT —○
LIQUID LIMIT ——□
PLASTIC LIMIT ——△
20 40 60 80%

DEPTH feet	DEPTH metres	SOIL PROFILE	SOIL DESCRIPTION	SAMPLE NO.	STANDARD PEN.(N)	COMP. STRENGTH □psf □kPa	MISC TESTS AND REMARKS
22							
23	7		**CLAY** - grey - occasional silt inclusions - plastic - moist - firm	B7			L_v= 33 kPa γ_w= 1.74 g/cc γ_d= 1.12 g/cc
24							
25							
26	8						
27							
28				G8			
29			- occasional pebble - siltier				
30	9						
31							
32							
33	10		**CLAY** - grey - plastic - moist - soft	B9			L_v= 11 kPa γ_w= 1.79 g/cc γ_d= 1.12 g/cc PI= 56.9
34							
35			**TILL** - grey - silty - wet - soft				
36	11						
37							
38				G10			
39	12						
40							
41							

UMA Engineering Ltd.
Engineers & Planners
1479 Buffalo Place, Winnipeg, Manitoba, Canada R3T 1L7

PROJECT: WESTON SHOPS
CLIENT: C.P. RAIL
JOB NO.: 0375-104-01-01
DRILLING DATE: OCT. 1, 1987
DRILLED BY: MAPLE LEAF ENTERPRISES

TEST HOLE NO. 1

SURFACE ELEVATION: FLOOR
CO-ORDINATES:

MOISTURE CONTENT — ○
LIQUID LIMIT ——— □
PLASTIC LIMIT ——— △
20 40 60 80%

feet	DEPTH metres	SOIL PROFILE	SOIL DESCRIPTION	SAMPLE NO.	STANDARD PEN.(N)	COMP. STRENGTH □psf □kPa	MISC TESTS AND REMARKS
43	13		- occasional cobbles				
44							
45							
46	14						
47							
48				G11			
49	15		Auger refusal @ 14.8 m.				
50							
51							
52	16						
53							
54							
55							
56	17						
57							
58							
59	18						
60							
61							
62	19						

NOTES:

- seepage from silt layer
- suspected water bearing layer in till

UMA Engineering Ltd.
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PROJECT: WESTON SHOPS
CLIENT: C.P. RAIL
JOB NO.: 0375-104-01-01
DRILLING DATE: OCT. 1, 1987
DRILLED BY: MAPLE LEAF ENTERPRISES

TEST HOLE NO. 5

SURFACE ELEVATION: FLOOR
CO-ORDINATES:

MOISTURE CONTENT —○
LIQUID LIMIT ——□
PLASTIC LIMIT ——△
20 40 60 80%

DEPTH feet	DEPTH metres	SOIL PROFILE	SOIL DESCRIPTION	SAMPLE NO.	STANDARD PEN.(N)	COMP. STRENGTH □psf □kPa	MISC TESTS AND REMARKS
0			CONCRETE				
1			GRAVEL - clean - damp				
2			SILTY CLAY - brown - stiff	G12			
3	1		SILT - trace of clay (increased % with depth) - light brown - occasional seam of very fine grey sand - occasional pebble - petroleum smell - wet - soft	G13			
4				G14			
5							
6							
7	2						
8			CLAY (CH) - brown - plastic - occasional silt inclusions - moist - stiff to firm	B15			89% clay 11% silt Activity =0.7 (very high) L_v=53 kPa γ_w=1.77 g/cc γ_d=1.22 g/cc PI=61.4
9							
10							
11							
12							
13	4			B16			L_v=40 kPa γ_w=1.66 g/cc γ_d=1.07 g/cc
14			CLAY - grey - plastic - trace of silt, occasional pebbles - moist - firm				
15							
16							
17	5						
18				G17			
19							
20	6						

UMA Engineering Ltd.
Engineers & Planners
1479 Buffalo Place, Winnipeg, Manitoba, Canada R3T 1L7

CLIENT: C.P. RAIL
JOB NO.: 0375-104-01-01
DRILLING DATE: OCT. 1, 1987
DRILLED BY: MAPLE LEAF ENTERPRISES

TEST HOLE NO. 5

SURFACE ELEVATION: FLOOR
CO-ORDINATES:

MOISTURE CONTENT —○
LIQUID LIMIT ——□
PLASTIC LIMIT ——△
20 40 60 80%

feet	DEPTH metres	SOIL PROFILE	SOIL DESCRIPTION	SAMPLE NO.	STANDARD PEN.(N)	COMP. STRENGTH □psf □kPa	MISC TESTS AND REMARKS
22							
23	7			B19			PI=48.6%
24							80% clay
25			CLAY (CH)				20% silt
26	8		- grey				Activity
27			- trace of silt				= 0.6
28			- occasional pebbles	G20			(very high)
29	9		- moist				
30			- firm to soft with depth				
31							
32							
33	10			G21			
34							
35							
36	11						
37							
38			TILL	G22			
39	12		- silty				
40			- some clay				
41			- brown				
			- soft and wet at clay interface				

UMA Engineering Ltd.
Engineers & Planners
1479 Buffalo Place, Winnipeg, Manitoba, Canada R3T 1L7

PROJECT: WESTON SHOPS
CLIENT: C.P. RAIL
JOB NO.: 0375-104-01-01
DRILLING DATE: OCT. 1, 1987
DRILLED BY: MAPLE LEAF ENTERPRISES

TEST HOLE NO. 5

SURFACE ELEVATION: FLOOR
CO-ORDINATES:

MOISTURE CONTENT —○ LIQUID LIMIT ——□ PLASTIC LIMIT ——△ 20 40 60 80%	feet DEPTH metres	SOIL PROFILE	SOIL DESCRIPTION	SAMPLE NO.	STANDARD PEN.(N)	COMP. STRENGTH □psf □kPa	MISC TESTS AND REMARKS
	43 13						
	44						
	45						
	46 14						
	47						
	48		- boulders at 14.5 m				
	49 15						
	50						
	51						
	52 16		NOTE: - seepage and sloughing from silt layer				
	53						
	54						
	55						
	56 17						
	57						
	58						
	59 18						
	60						
	61						
	62 19						

UMA Engineering Ltd.
Engineers & Planners
1479 Buffalo Place, Winnipeg, Manitoba, Canada R3T 1L7

PROJECT: WESTON SHOPS
CLIENT: C.P. RAIL
JOB NO.: 0375-104-01-01
DRILLING DATE: OCT. 1, 1987
DRILLED BY: MAPLE LEAF ENTERPRISES

TEST HOLE NO. 6

SURFACE ELEVATION: FLOOR
CO-ORDINATES:

MOISTURE CONTENT — O
LIQUID LIMIT ——— □
PLASTIC LIMIT ——— △
20 40 60 80%

feet	DEPTH metres	SOIL PROFILE	SOIL DESCRIPTION	SAMPLE NO.	STANDARD PEN.(N)	COMP. STRENGTH □psf □kPa	MISC TESTS AND REMARKS
0			CONCRETE				
1			GRAVEL - brown, clean - fill material				
2			CLAY				
3	1						
4			SILT				
5							
6	2						
7							
8							
9							
10	3						
11							
12							
13	4		CLAY - grey - moist - plastic - firm to stiff	B23			L_v=51 kPa γ_w=1.66 g/cc γ_d=1.05 g/cc
14							
15							
16	5						
17							
18				B24			Slough in tube
19							
20	6						

UMA Engineering Ltd.
Engineers & Planners
1479 Buffalo Place, Winnipeg, Manitoba, Canada R3T 1L7

PROJECT: WESTON SHOPS
CLIENT: C.P. RAIL
JOB NO.: 0375-104-01-01
DRILLING DATE: OCT. 1, 1987
DRILLED BY: K.M.S.

TEST HOLE NO. 8

SURFACE ELEVATION: FLOOR
CO-ORDINATES:

MOISTURE CONTENT —○
LIQUID LIMIT ——□
PLASTIC LIMIT ——△
20 40 60 80%

DEPTH feet	DEPTH metres	SOIL PROFILE	SOIL DESCRIPTION	SAMPLE NO.	STANDARD PEN.(N)	COMP. STRENGTH □psf □kPa	MISC TESTS AND REMARKS
			CONCRETE				
1			GRAVEL - brown - clean - fill material	G1			
2			SILTY CLAY	G2			
3	1		- dark grey, some silt - moist, stiff	G3			F_v=71kPa peak 25 kPa res.
4			SILT - light brown to 1.4m - grey with dark grey streaks 1.4-2.3m - light brown 2.3-2.4m - moist to wet below 1.5m	G4			F_v=79kPa peak 20 kPa res.
5				G5			
6				G6			F_v=71kPa peak 17 kPa res.
7	2			G7			
8			- oily substance in silt below 1.5m - petroleum smell below 1.5m - occasional pebble - soft to very soft with depth	G8			F_v=113kPa peak 28 kPa res.
9				G9			F_v=42kPa peak 0 kPa res.
10				G10			
11	3		CLAY - brown - silty - occasional pebbles - plastic - moist - stiff	G11			F_v=64kPa peak 32 kPa res.
12				G12			F_v=64kPa peak 26 kPa res.
13	4			G13			F_v=59kPa peak 17 kPa res.
14				G14			F_v=59kPa peak 17 kPa res.
15				G15			F_v=59kPa peak 17 kPa res.
16							
17	5		CLAY - grey - plastic - moist - stiff to firm	G16			
18			End of hole in clay at 5.4m.				
19							
20	6						

DEPTH ELEV. FT.	SOIL PROFILE	PENETRATION VALUE BLOWS / FT.	SOIL DESCRIPTION
			• DATE OF DRILLING - JUNE 11, 1968
0			
2.0			SILTY CLAY & VEGETATION
3.5			COAL FILL
			NON PLASTIC, TAN SANDY SILT - WATER SEEPAGE - STRATUM CAVING
11.0			
			MEDIUM STIFF, HIGHLY PLASTIC, GREY BROWN, SILTY CLAY
18.0			
			MEDIUM STIFF, HIGHLY PLASTIC GREY SILTY CLAY
			NOTE: 1. AT POINT OF AUGER REFUSAL WATER ENTERED BORING AND ROSE TO WITHIN 9' OF SURFACE IN 1 TO 2 MINUTES
			2. ☒ - DENOTES UNDISTURBED SAMPLE
45.0			
			SOFT, SLIGHTLY PLASTIC, TAN GLACIAL TILL - AUGER REFUSAL ON BOULDERS AND/OR BEDROCK AT 55'

DEPTH SCALE: 0, 10, 20, 30, 40, 50

UNCONFINED STRENGTH (Kg/cm²) — UNCONFINED TEST ○ NAT. ⊠ REM. TRIAXIAL TEST ◎

0 1 2

WATER CONTENT (%) — ● NATURAL ▲ L.L. ■ P.L.

0 20 40 60 80

BORING NO 1

PROJECT: WESTON FREIGHT TERMINAL - WINNIPEG, MAN.

LOCATION: SEE PLAN NO. 61-82Q

GROUND SURFACE ELEVATION UNKNOWN GROUND WATER ELEVATION SEE ABOVE

METHOD OF ADVANCING BORING 16" DIAM. POWER AUGER

CANADIAN PACIFIC RAILWAY COMPANY
WINNIPEG TERMINAL DIVISION
PRAIRIE REGION

independent test-lab limited

COMPILED BY:	DATE	LAB. NO
L.E.H.	JUNE 1968	64-82Q

DEPTH ELEV. FT.	SOIL PROFILE	PENETRATION VALUE BLOWS / FT.	SOIL DESCRIPTION
			DATE OF DRILLING - JUNE 12, 1968
0			
0.5 / 1.5			COAL FILL - SILTY CLAY & VEGETATION
			NON PLASTIC, TAN SANDY SILT - STRATUM CAVING
8.0			
			MEDIUM STIFF, HIGHLY PLASTIC, GREY SILTY CLAY
			NOTE: 1. AT POINT OF AUGER REFUSAL, WATER ENTERED BORING AND ROSE TO WITHIN 17' OF SURFACE IN 30 MINUTES
			2. ⊠ - DENOTES UNDISTURBED SAMPLE
43.0			
			SLIGHTLY PLASTIC, TAN GLACIAL TILL - STRATUM DENSE FROM 43' TO 50' - SOFT FROM 50'-55'. AUGER REFUSAL ON BOULDERS AND/OR BEDROCK AT 55'

DEPTH SCALE: 0, 10, 20, 30, 40, 50

UNCONFINED STRENGTH (TSF) ---- UNCONFINED TEST ○ NAT. ⊙ REM.
TRIAXIAL TEST ⊕

0 1 2

WATER CONTENT (%) ● NATURAL ▲ L.L. ■ P.L.

0 20 40 60 80

BORING NO. 2

PROJECT: WESTON FREIGHT TERMINAL - WINNIPEG, MAN.

LOCATION: SEE PLAN No. 61-829

GROUND SURFACE ELEVATION UNKNOWN GROUND WATER ELEVATION SEE ABOVE

METHOD OF ADVANCING BORING 16" DIAM. POWER AUGER

CANADIAN PACIFIC RAILWAY COMPANY
WINNIPEG TERMINAL DIVISION
PRAIRIE REGION

independent test-lab limited

COMPILED BY: L.E.H. DATE: JUNE 1968 LAB. NO. 65-829

DEPTH ELEV. FT.	SOIL PROFILE	PENETRATION VALUE BLOWS / FT.	SOIL DESCRIPTION
0			* DATE OF DRILLING - JUNE 12, 1966
1.5			SILTY CLAY & COAL FILL
			NON PLASTIC, TAN SANDY SILT
6.0			
			MEDIUM STIFF, HIGHLY PLASTIC, GREY BROWN, SILTY CLAY
18.0			BORING DISCONTINUED
			⊠ - DENOTES UNDISTURBED SAMPLE

DEPTH SCALE: 0, 10, 20

UNCONFINED TEST ○ NAT. ⊠ REM.
TRIAXIAL TEST ⊕

0 1 2

WATER CONTENT (%) ——— ● NATURAL ▲ L.L. ■ P.L.

0 20 40 60 80

BORING NO. 3

PROJECT: WESTON FREIGHT TERMINAL - WINNIPEG, MAN.

LOCATION: SEE PLAN NO. 61-82 Q

GROUND SURFACE ELEVATION UNKNOWN GROUND WATER ELEVATION BORING DRY

METHOD OF ADVANCING BORING 16" DIAM. POWER AUGER

CANADIAN PACIFIC RAILWAY COMPANY
WINNIPEG TERMINAL DIVISION
PRAIRIE REGION

independent test-lab limited

COMPILED BY: L. E. N. | DATE: JUNE 1966 | LAB NO. 66-82 Q

DEPTH ELEV. FT.	SOIL PROFILE	PENETRATION VALUE BLOWS / FT.	SOIL DESCRIPTION	DEPTH SCALE
0			DATE OF DRILLING - JUNE 12, 1968	0
1.0			SILTY CLAY & VEGETATION	
2.5			COAL FILL	
5.5			NON PLASTIC, TAN SANDY SILT	
12.0			MEDIUM STIFF, HIGHLY PLASTIC, GREY BROWN, SILTY CLAY	10
			MEDIUM STIFF, HIGHLY PLASTIC, GREY SILTY CLAY	20
			⊠ - DENOTES UNDISTURBED SAMPLE	30
35.0			SOFT, SLIGHTLY PLASTIC, LIGHT GREY, GLACIAL TILL	40
41.0			DENSE GLACIAL TILL	
46.0			SOFT GLACIAL TILL	
48.0			AUGER REFUSAL	50

UNCONFINED STRENGTH (psf) ---- UNCONFINED TEST ○ NAT. ⊠ REM. TRIAXIAL TEST ●

0 1 2

WATER CONTENT (%) —— ● NATURAL ▲ L.L. ■ P.L.

0 20 40 60 80

BORING NO. 4

PROJECT: WESTON FREIGHT TERMINAL - WINNIPEG, MAN.

LOCATION: SEE PLAN No. 61-82Q

GROUND SURFACE ELEVATION UNKNOWN GROUND WATER ELEVATION BORING DRY

METHOD OF ADVANCING BORING 16" DIAM. POWER AUGER

CANADIAN PACIFIC RAILWAY COMPANY
WINNIPEG TERMINAL DIVISION
PRAIRIE REGION

independent test-lab limited

COMPILED BY: L.E.H. DATE JUNE 1968 LAB. NO. 6T-82Q

DEPTH ELEV. FT.	SOIL PROFILE	PENETRATION VALUE BLOWS / FT.	SOIL DESCRIPTION	DEPTH SCALE
0			DATE OF DRILLING - JULY 10, 1968.	0
2.5			1' OF BROWN, SOFT, SILTY CLAY FILL, 6" OF COAL FILL AND 1' OF FONT, BROWN, SILTY CLAY WITH ASH. DRY TO WET, TAN, NON-PLASTIC, SANDY SILT - WATER SEEPAGE - STRATUM CAVING.	
6.5			BROWN, STIFF TO MEDIUM STIFF, HIGHLY PLASTIC, SILTY CLAY.	10
15.0			GREY, MEDIUM STIFF, HIGHLY PLASTIC, SILTY CLAY.	20
30.0			GREY, MEDIUM STIFF, HIGHLY PLASTIC, SILTY CLAY WITH TRACES OF SOFT GLACIAL TILL. NOTE: AT POINT OF AUGER REFUSAL WATER ENTERED BORING AND ROSE TO WITHIN 25 FEET SURFACE IN 45 MINUTES.	30
42.0			GREY, SLIGHTLY PLASTIC TO NON-PLASTIC, GLACIAL TILL (SOFT, WET FROM 42-46', 54-57'; AND HARD, DRY FROM 46-54') - AUGER REFUSAL ON BOULDERS AND/OR BEDROCK AT 57'.	40
				50

SHEAR STRENGTH (P.S.F.) ——— UNCONFINED TEST ○ NAT. ⊠ REM. TRIAXIAL TEST ⊕

WATER CONTENT (%) ——— ● NATURAL ▲ L.L. ■ P.L.

BORING NO. 5 PROJECT: WESTON FREIGHT TERMINAL - WINNIPEG, MAN.

LOCATION: SEE PLAN NO. 71-82Q

GROUND SURFACE ELEVATION UNKNOWN GROUND WATER ELEVATION AS NOTED ABOVE

METHOD OF ADVANCING BORING 16" & 24" DIAM. POWER AUGER.

CANADIAN PACIFIC RAILWAY COMPANY
WINNIPEG TERMINAL DIVISION
PRAIRIE REGION

independent test-lab limited

COMPILED BY: J.E.P. DATE JULY, 1968 LAB. NO. 72-82Q

DEPTH ELEV. FT.	SOIL PROFILE	PENETRATION VALUE BLOWS / FT.	SOIL DESCRIPTION	DEPTH SCALE
0			DATE OF DRILLING - JULY 10, 1968.	
1.0			LIGHT BROWN, SILTY CLAY FILL.	
2.5			GRAVEL AND CINDERS WITH CINDERS.	
3.0			BLACK, ORGANIC, SILTY CLAY.	
4.0			MOIST, BROWN SILTY CLAY WITH ROOTS.	
5.5			BROWN, MEDIUM STIFF, MEDIUM PLASTIC, SILTY CLAY	5
9.0			MOIST TO WET, TAN, NON PLASTIC, SANDY SILT - WATER SEEPAGE - STRATUM CAVING.	
13.0			BROWN, MEDIUM STIFF, HIGHLY PLASTIC, SILTY CLAY.	10
			BORING DISCONTINUED AT 13'. SLIGHT SEEPAGE FROM CINDERS & GRAVEL.	15

SHEAR STRENGTH (P.S.F.) ——— UNCONFINED TEST ○ NAT. ◎ REM. TRIAXIAL TEST ⊕

WATER CONTENT (%) ——— ● NATURAL ▲ L.L. ■ P.L.

BORING NO. 6 PROJECT: WESTON FREIGHT TERMINAL - WINNIPEG, MAN.

LOCATION: SEE PLAN NO. 71-82Q.

GROUND SURFACE ELEVATION UNKNOWN GROUND WATER ELEVATION AS NOTED ABOVE

METHOD OF ADVANCING BORING 16" DIAM. POWER AUGER

CANADIAN PACIFIC RAILWAY COMPANY
WINNIPEG TERMINAL DIVISION
PRAIRIE REGION

independent test·lab limited

COMPILED BY: J.C.P. DATE: JULY, 1968 LAB. NO. 71-82Q

DEPTH ELEV. FT.	SOIL PROFILE	PENETRATION VALUE BLOWS / FT.	SOIL DESCRIPTION
			DATE OF DRILLING - JULY 10, 1968.
0			
1.0 / 1.5			LIGHT BROWN SILTY CLAY FILL UNDER 3" ASPHALT ACCR.R. COAL FILL.
4.5			BROWN, STIFF, MEDIUM PLASTIC, SILTY CLAY.
6.5			MOIST, TAN, NON-PLASTIC, SANDY SILT.
10.0			BROWN, MEDIUM STIFF, HIGHLY PLASTIC, SILTY CLAY.
			BORING DISCONTINUED AT 10'. HOLE DRY ON COMPLETION.

DEPTH SCALE: 5, 10

SHEAR STRENGTH (P.S.F.) ——— UNCONFINED TEST ○ NAT. ◻ REM. TRIAXIAL TEST ⊕

WATER CONTENT (%) ——— ● NATURAL ▲ L.L. ■ P.L.

BORING NO. 7 PROJECT: WESTON FREIGHT TERMINAL - WINNIPEG, MAN.

LOCATION: SEE PLAN NO. 71-82Q.

GROUND SURFACE ELEVATION UNKNOWN GROUND WATER ELEVATION BORING DRY.

METHOD OF ADVANCING BORING 16" DIAM. POWER AUGER.

CANADIAN PACIFIC RAILWAY COMPANY
WINNIPEG TERMINAL DIVISION
PRAIRIE REGION

independent test-lab limited

COMPILED BY: J.E.P. DATE JULY, 1968 LAB. NO. 74-829

WR-gw-8

PROVINCE OF MANITOBA GROUND WATER OBSERVATION STATION

STATION DESCRIPTION

STATION NUMBER 5OT-9325 NAME WINNIPEG MO 14 CARD NO 1 OF 1

REMARKS

LOCATION

QUARTER SEC TWP RGE E/W OF PRINCIPAL MERIDIAN

LOT No 35 OR ST JAMES PARISH OR SETTLEMENT

LATITUDE NORTH LONGITUDE WEST

UTM GRID ZONE 14U 100,000 M. SQ. PU EASTING 313 NORTHING 5507

ESTABLISHED DAY 29 MONTH 2 YEAR 1968

ABANDONED DAY MONTH YEAR

MEASURING POINT

LOCATION TOP OF WELL CASING

ELEVATION 760.72 FT. (M.S.L.) HEIGHT ABOVE GROUND LEVEL 1.5 FT.

OTHER DATA (FILE, REPORT, ETC.)

WELL LOG

(DEPTH IN FEET BELOW GROUND LEVEL)

FROM	TO	DESCRIPTION
0	38	CLAY
38	42	CLAY & SOME SAND & PEBBLES
42	49	GLACIAL TILL
49	51	BROKEN LIMESTONE BEDROCK
51	141	SOLID LIMESTONE BEDROCK

WELL CONSTRUCTION

(DEPTH IN FEET BELOW GROUND LEVEL)

CASING

DIA. INCHES	FROM	TO
4	0	50.75

PERFORATIONS

DIA. INCHES	FROM	TO

TYPE

SLOT SIZE

MATERIAL

OPEN HOLE

DIA. INCHES	FROM	TO
4 1/2	50.75	141

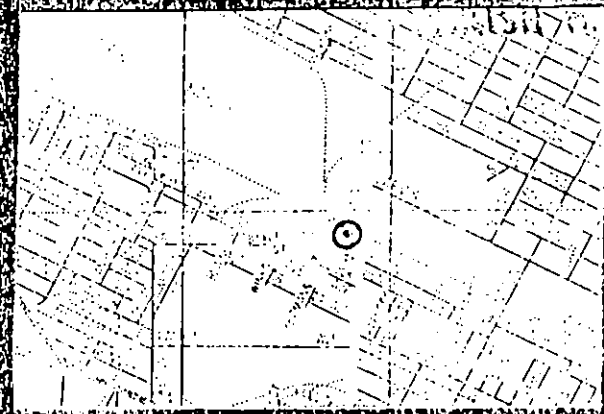
REMARKS

G.L. ELEV. = 233.07 M.

LOCATION SKETCHES

AREAL

SCALE



DETAILED

SCALE