SPARWOOD AMBIENT AIR QUALITY COEFFICIENT OF HAZE STUDY

OCTOBER 1986

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INTRODUCTION

This report documents ambient air quality monitoring for soiling index in Sparwood and compares 1984-86 data to 1975-76 results published in the Kootenay Air and Water Quality Study Phase II[1].

Sparwood air quality is affected by a number of dust and smoke sources including local roads, residential wood stoves and Westar Mining Ltd. operations (see figure 1).

Westar Mining Ltd., formerly called Kaiser Resources Ltd., operates surface mines and the Elkview coal preparation plant approximately 3 km. northeast of Sparwood. The main point source of particulate matter is two stacks associated with the fluidized bed coal dryer. The permitted rate of discharge is 14115 m^3/min. Major improvements to this discharge are planned in 1986. Other point sources of particulate matter at the plant are relatively minor and include discharges from the breaker station, the raw coal conveyor, coal silos and boilers. The total volume discharged during the 1975-76 period was approximately 58000 m^3/min. These emissions are authorized by Waste Management Permit PA-1807, issued on July 23, 1975. This permit has been amended since 1975 to include emissions from coal silos that has increased the total volume discharged to approximately 64500 m^3/min. Westar Mining Ltd. previously operated a coke plant at Michel approximately 5 km. southeast of Sparwood. This plant operated during the 1975-76 sampling period but has now been shut down and was not operating during the 1984-86 sampling period. The discharges from the Michel coke plant were never under a Waste Management Permit.

There are numerous fugitive dust sources associated with the Westar operations including roads, tailings ponds, open coal storage, coarse refuse piles and overburden dumps.

A tape sampler was installed on the roof of the Sparwood Civic Building (Site 0250017) in July 1984 to determine if a correlation

exists between air emissions, wind speed and direction and particulate air quality at the Sparwood site. A comparison of current air quality to that monitored in 1975-76 at the Sparwood site was an additional reason for the monitoring program.

METHODS

Kootenay Regional Operations of the Waste Management Program uses a American Iron and Steel Institute type tape sampler to measure soiling index. The soiling index is an empirical measure of suspended particulate matter. The main advantage of the tape sampler for monitoring suspended particulate matter is that it provides hourly readings thereby providing data on changes in air quality that occur throughout the day. This instrument draws air at a known flow rate through a filter tape for two hours. After the sample is taken the tape automatically advances a few centimetres and the next sample is taken. The tape is analyzed by measuring the light transmittance through the spots formed on the tape by suspended particulate matter in the air. The readings are expressed as coefficient of haze units (C.O.H. units) per 1000 lineal feet of air sampled.[3] One C.O.H. unit is defined as that quantity of particulate matter which produces an optical density of 0.01 on filter paper. A lineal foot is calculated by multiplying the pumping rate, in cubic feet per minute, of the sampling pump, times the sampling period, in minutes, divided by the area, in square feet, of the sampling nozzle.

Wind speed and direction data for 1984-85 was obtained from an Environment Canada climate station[2] (Site 1157630) located approximately 2 km. north of Sparwood.

In this report the seasons are defined as follows:

Spring	March 22 - June 20
Summer	June 21 - September 22
Autumn	September 23 - December 21
Winter	December 22 - March 21

Average hourly results for the various seasons were derived by calculating the average C.O.H. result for each hour over the entire season.

The average monthly results in table 1 were derived by averaging the daily average C.O.H. results for each wind direction. The daily wind direction was arbitrarily determined to be the prevailing wind.

DISCUSSION

The average hourly soiling index values for each season are plotted as a function of the time of day in figures 2, 3, 4, 5 and 6. These graphs are compared to those obtained in the 1975-76 study.

Coefficient of haze values are assessed empirically as follows:

	COH/1000 lineal ft. of air
Light haze	0-1
Moderate haze	1-2
Heavy haze	2-3
Very heavy haze	3-4

Over the sampling period, July 1984 to February 1986 inclusive, 99.9% of the readings were classified as light haze compared with 99.7 during the 1975-76 study period. There were no readings classified as heavy haze during either study period.

The seasonal variation of soiling index during the 1984-86 study period indicates that the lowest readings were in the spring and the highest in the autumn and winter. The 1975-76 study showed the lowest readings to be in the winter and the highest in the autumn and spring.

On a daily basis, the 1975-76 study showed that the maximum soiling index occurred between 10 p.m. and 10 a.m. the following day while the minimum occurred between 2 p.m. and 6 p.m. Plots of 1984-86 data showed the same general pattern.

The plots of the seasonal soiling index values in the 1984-86 study were generally slightly higher than those in the 1975-76 study.

Plant shutdowns and wind speed and direction data were used to assess potential effect of Westar Balmer operations on ambient air quality in Sparwood (figure 7). The 1975-76 Kootenay Air and Water Quality study Phase II[1] showed a decrease in the average hourly soiling index during June 1976 when Westar Mining Ltd. was shutdown due to a strike as compared to June 1975 when the plant was operating. Westar Mining Ltd. was shutdown from July 28, 1984 to August 26, 1984, but was operating during the same period in 1985. Average hourly plots for these two periods indicate that overall C.O.H. was higher during the shutdown period than when the plant was operating. However, during the period July 28, 1985 to August 26, 1985 when the plant was operating, average C.O.H. values were only obtained for 19 out of 30 days compared with 26 out of 30 days during the shutdown in 1984. This lack of data during the summer of 1985 may have caused a downward bias in soiling index during that period. An analysis of wind speed and direction data for these periods could provide additional information on the interpretation of the above results, however, the unavailability of wind data for August 1985 precluded this analysis.

To investigate how ambient air quality is affected by emissions, daily prevailing wind directions were compared to daily average soiling index levels (table 1). The comparison was for the period August 1984 to July 1985 because this was the only period studied where there was both wind and soiling index data. The data indicates that winds from the north direction (N, NE, NNE) result in higher soiling index values in the Sparwood area than winds from the south direction (S, SE, SSE, SW and SSW).

This data supports the conclusion of the 1975-76 study that N, NNE and NE winds transport suspended particulate matter from the Westar Mining plant to the Sparwood area and that the higher soiling index values are probably due to the emissions and fugitive dust from the Westar Mining operation.

CONCLUSIONS

1. Average hourly C.O.H. values during 1984-86 are slightly higher than in 1975-76.
2. During the period July 1984 to February 1986 99.9% of all C.O.H. measurements were classed as light haze. There are no existing criteria for C.O.H. in British Columbia. These results cannot be correlated with other parameters such as total suspended particulate and dustfall for which criteria or objectives are available. Further analysis of data will be required to determine if objectives are being met for these parameters.
3. During the 1984-86 study period maximum C.O.H. values were in the autumn and winter with minimum values in the spring.
4. Maximum C.O.H. values occur between 10 p.m. and 10 a.m. the followng day.. Minimum C.O.H. values occurred between 2 p.m. and 6 p.m.
5. During the 1984-86 study maximum C.O.H. values occurred at the Sparwood Civic Building site when winds were predominately from the North, Northeast and North-northeast. Values were lowest when winds were from the South, Southeast, South-southeast, Southwest or South-southwest.

RECOMMENDATIONS

1. It is recommended that the measurement of soiling index at the Sparwood Civic Building be discontinued because most readings continue to fall into the light haze category. It is further recommended that measurement of soiling index recommence for a 2-year duration after the new Westar Elkview dryer scrubbing system is installed and operational.

2. It is recommended that a complete analysis of other available ambient air data from Sparwood be made to determine if Provincial criteria and objectives are being met.

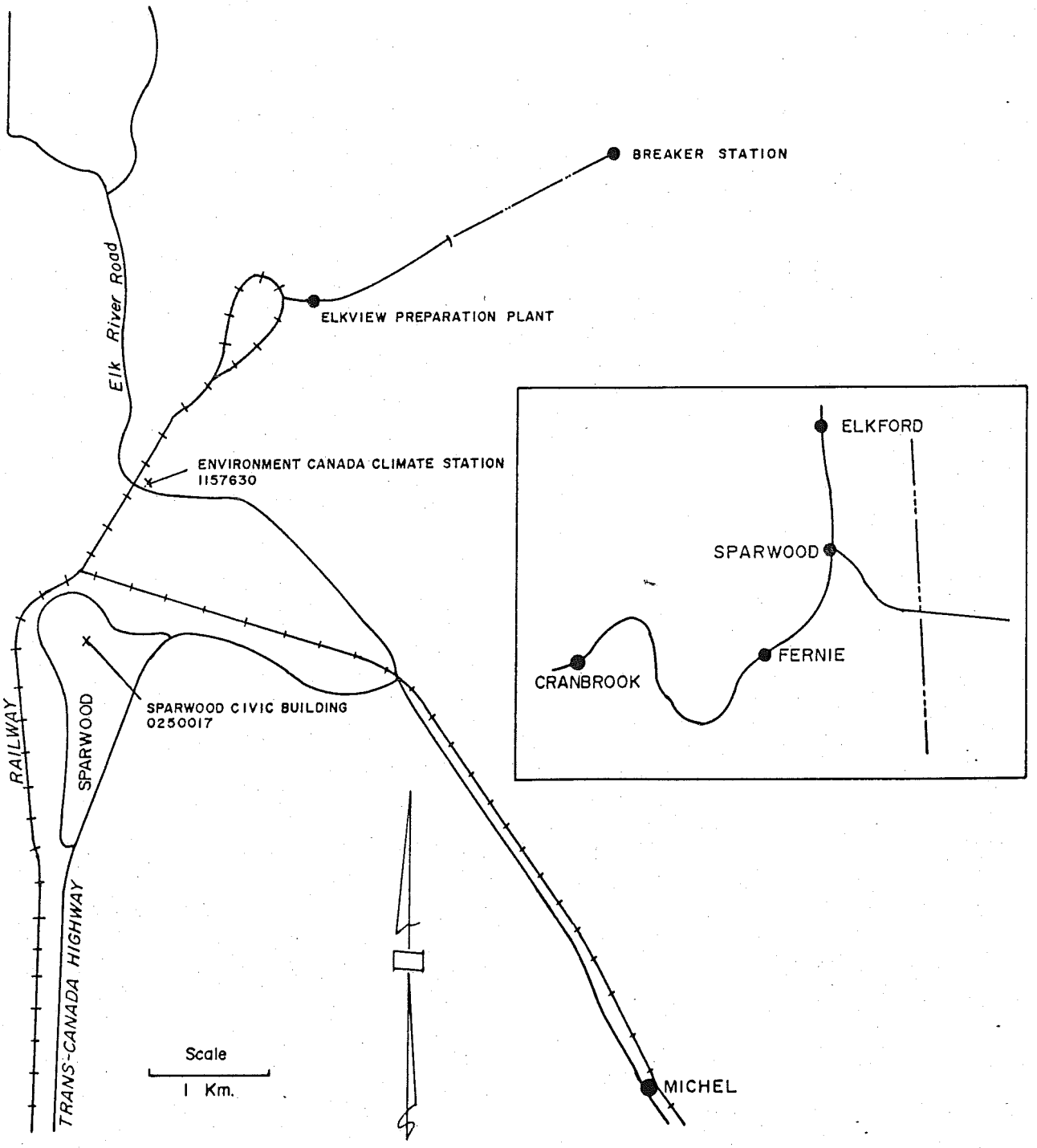
REFERENCES

1. Kootenay Air and Water Quality Study Phase II, Air Quality in the Elkford-Sparwood-Fernie Region, Ministry of the Environment, Water Investigations Branch, April 1978.

2. Environment Canada, Canadian Climate Centre, Wind Summary of Station 1157630, January 1984 - July 1985.

3. AISI Samplers, Health Branch, Department of Health Services and Hospital Insurance, Province of British Columbia, 1970.

FIGURE 1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ELKVIEW PREPARATION PLANT
Elk River Road
ENVIRONMENT CANADA CLIMATE STATION
1157630
SPARWOOD CIVIC BUILDING
0250017
SPARWOOD
RAILWAY
TRANS-CANADA HIGHWAY
Scale
1 Km.
MICHEL
ELKFORD
SPARWOOD
FERNIE
CRANBROOK

FIGURE 2

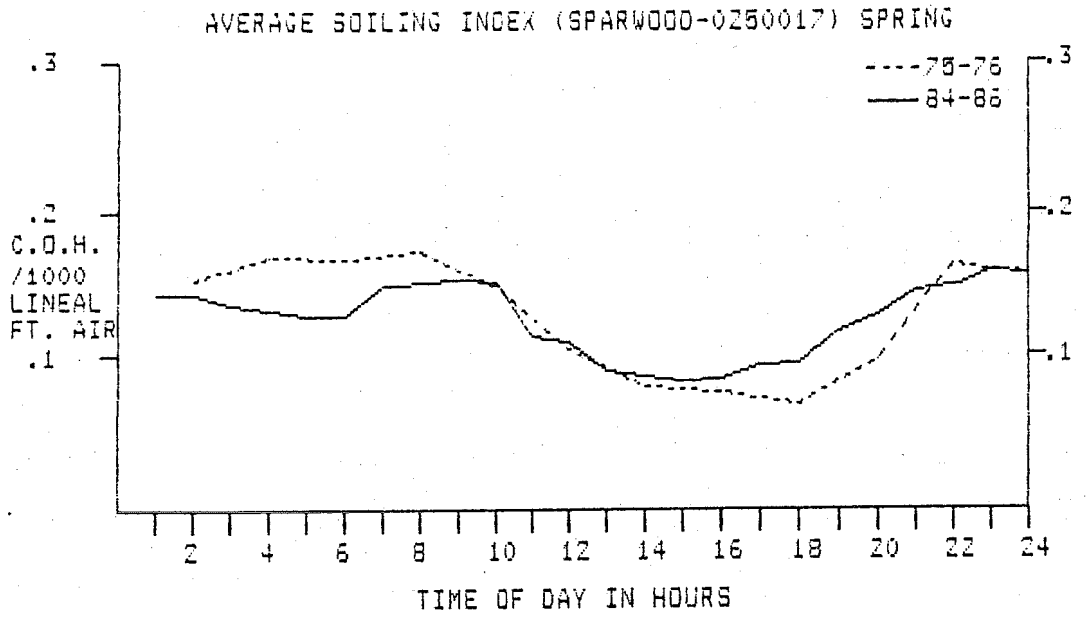
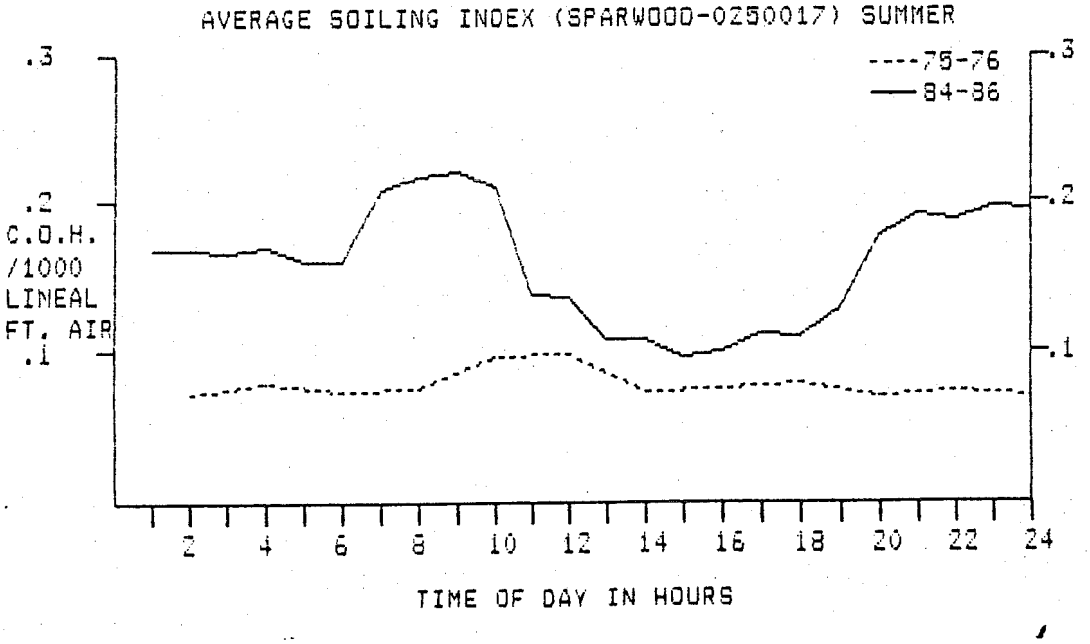


FIGURE 3



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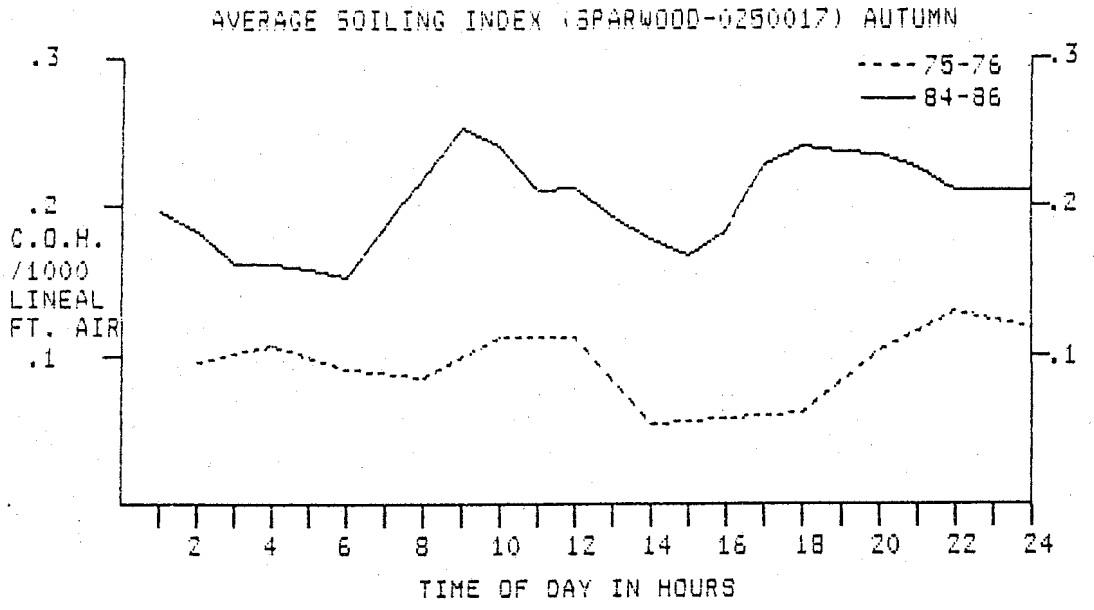

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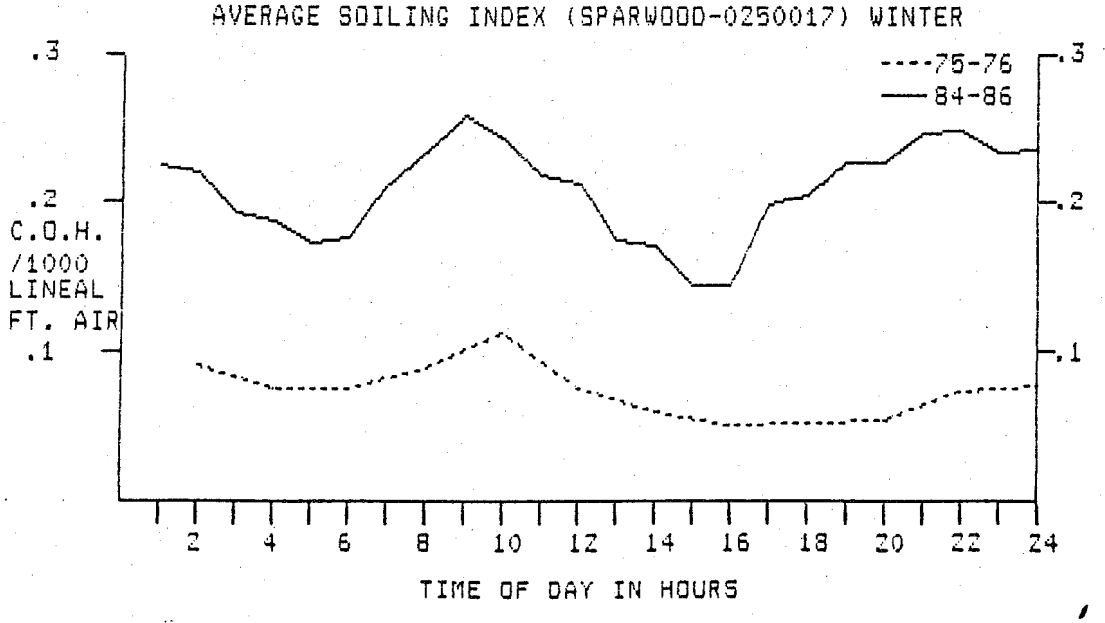

FIGURE 6

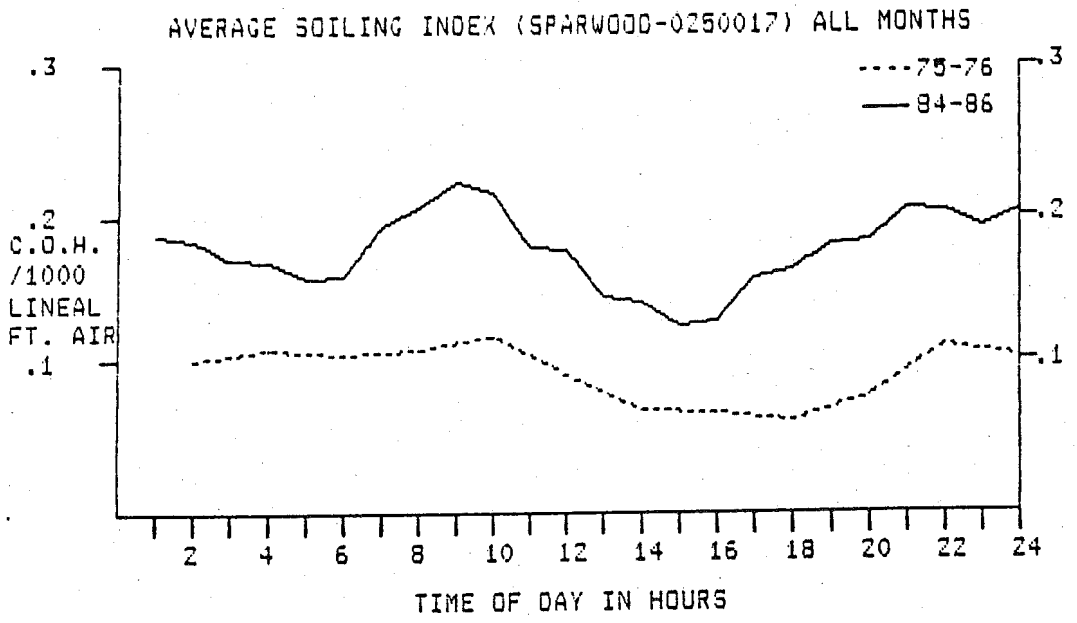

FIGURE 7

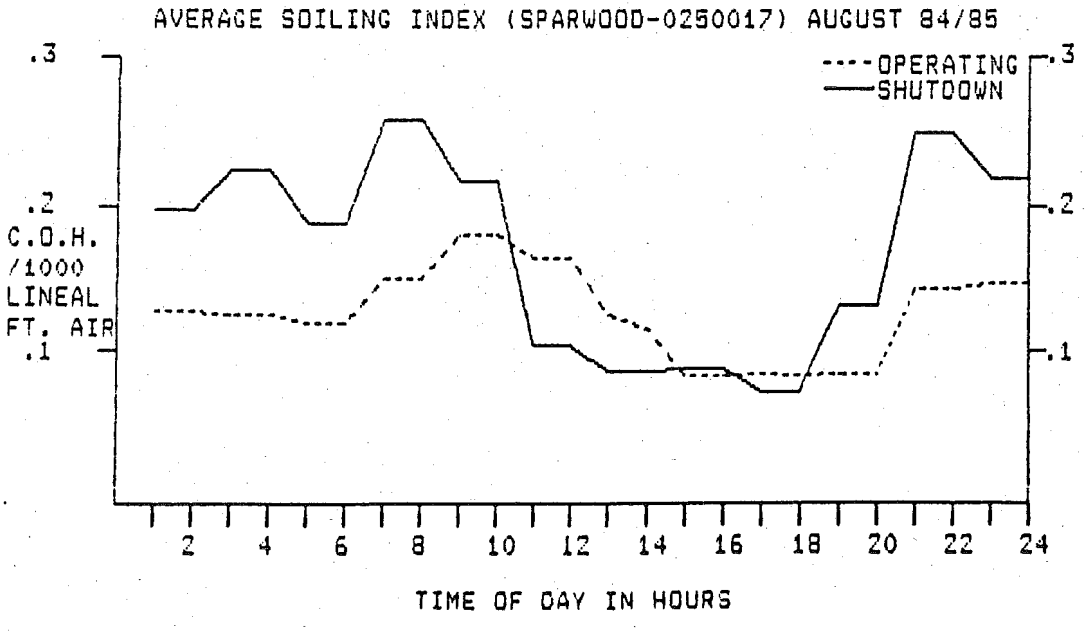

TABLE 1

COMPARISON OF WIND DIRECTION AND SOILING INDEX LEVEL

WIND DIRECTION*

DATE	N Average Soiling Index (C.O.H.)	S Average Soiling Index (C.O.H.)	E Average Soiling Index (C.O.H.)	W Average Soiling Index (C.O.H.)
Aug./84	.20 (10)	.16 (12)	-----	-----
Oct./84	-----	.16 (5)	-----	-----
Nov./84	.42 (5)	.20 (8)	-----	-----
Dec./84	.31 (4)	.10 (12)	.22 (4)	-----
Jan./85	.27 (10)	.16 (3)	.04 (2)	.27 (2)
Feb./85	.32 (2)	.16 (19)	-----	-----
Mar./85	.22 (4)	.15 (23)	-----	-----
Apr./85	-----	.10 (18)	-----	-----
May/85	.16 (4)	.13 (21)	-----	-----
June/85	.12 (3)	.11 (21)	-----	-----
July/85	.24 (3)	.13 (11)	-----	-----

( ) - Number of values

* - N Direction consists of winds from the N, NNE and NE.

- S Direction consists of winds from the S, SSE, SE, SSW and SW.

- E Direction consists of winds from the E, ESE and ENE.

- W Direction consists of winds from the W, WSW and WNW.