

ITEM	13
MANAGER'S REPORT NO.	44
COUNCIL MEETING	1980 06 23

Re: STRIDE AVENUE DISPOSAL AREA
(Item 11, Manager's Report No. 11, 1980 February 11)

Following is a report from the Municipal Engineer regarding the above.

RECOMMENDATION:

1. THAT the recommendation of the Municipal Engineer be adopted.

* * *

TO: MUNICIPAL MANAGER

80 06 18

FROM: MUNICIPAL ENGINEER

SUBJECT: STRIDE AVENUE DISPOSAL AREA

RECOMMENDATION:

1. THAT the Corporation enter into an Engineering Agreement with E.H. Hanson & Associates Ltd. to conduct the further work required to satisfy the needs expressed in Section III of this report and as further detailed in the proposal received from the Company dated 80 04 28, at an estimated total cost of \$37,300.

REPORT

I BACKGROUND

At its meeting of 80 02 11, the Council approved of engaging the Consulting Engineering firm of Underwood McLellan Ltd. to carry out methane gas and leachate investigations in the Stride Avenue Disposal Area. The terms of reference called for a two-part program, the first being to determine the landfill characteristics and history and the second being a field program designed to identify the presence and character of landfill gas and leachate, as well as site-specific landfill gas and leachate migration patterns.

II CONSULTANT'S FINDINGS

The work called for in the assignment has been satisfactorily completed and the results are as follows:

"Conclusions

It is concluded that:

(cont'd)

- 1) The Stride Avenue Landfill covers approximately 14.5 ha with of the order of 500,000 tonnes of mixed refuse having been incorporated into it.
- 2) Data obtained from this study indicate that the Stride Avenue Landfill Site produces landfill gas. The landfill gas consists predominantly of methane (CH₄) and carbon dioxide (CO₂).
- 3) Methane, a constituent of landfill gas, when mixed with air in concentrations of 5-15%, is explosive when exposed to spark or flame.
- 4) Landfill gas migration through soils adjacent to the landfills is a function of soil type, moisture conditions within the soil and meteorologic conditions. Landfill gas migration through undisturbed sand and gravel that surrounds the landfill site has been documented. Gas concentrations in a probe 76 m from the landfill were found to be essentially the same as those found in the landfill itself.
- 5) On the basis of results to date from this study, and with comparisons from landfills in similar geologic conditions, off site gas migration of the order of 300 m would not be considered unusual. Natural venting may modify these limits.
- 6) Buildings constructed on refuse landfills and within the zone of concern of refuse landfills must be properly designed and constructed to address the landfill gas migration and unique foundational problems.
- 7) Buildings constructed outside of the zone of concern can utilize conventional construction techniques.
- 8) Some leachate is being produced by the landfill which may be contaminating the groundwater.
- 9) Some aspects of the future development plans of the Stride Avenue Landfill, as presently documented in the 1974 planning study are incompatible with the engineering and environmental concerns identified.

Recommendations

It is recommended that:

- 1) Additional probes be installed to document the zone over which significant gas concentrations occurs.
- 2) Until future data suggests revisions, a zone of concern of 300 m should be immediately established around the Stride Landfill.
- 3) All existing buildings within a 300 m wide radius of the Stride Landfill boundaries be monitored for methane gas. It may be necessary to increase the radius of building examination if high gas concentrations are detected.
- 4) Depending on the results of Items 1 and 3, alternative remedial concepts should be investigated.
- 5) Future buildings to be constructed within the zone of potential migration of gas from Stride Landfill must incorporate acceptable gas control features in their design.

- 6) The Stride Avenue Development Plan be re-evaluated in order to reflect the landfill and gas migration concerns.
- 7) Depending on usage of the groundwater "downstream" of the landfill, some further explorations to quantify the limits of a leachate plume may be warranted.
- 8) The Corporation investigate all current and closed landfills to determine whether methane gas and leachate generation and migration is compatible with the adjacent land use."

The covering letter accompanying the report advises:

"Our report identifies that methane gas and leachate is being produced within the landfill. Off site migration of the gas has been documented. Further studies are recommended to fully define the limits of gas migration and to define if nearby dwellings are affected. Off site migration of leachate is postulated to be occurring. Further studies to define the leachate plume may be warranted depending on the nearby usage of the groundwater. Alternative remedial actions can be defined on completion of these further studies.

With respect to the implications of our studies to date on the property bounded by Stride, Mission and Fourteenth Avenues and the B.C. Hydro right-of-way, methane gas was monitored in significant quantities. Any structures to be constructed on this property would require gas control features be incorporated, either into the building itself, or at the landfill boundary. A separate report will specifically address the implications of a warehousing development on this property.

Our studies to date also show that the 1974 land use planning study, "Stride Avenue Development Plan", should be re-evaluated particularly in regards to single family residential dwellings on the landfill itself."

The full report is somewhat technical and is too bulky to distribute as a whole. However, if anyone is interested in perusing the full report or in borrowing a copy, some are available in the Engineering Department.

III FURTHER INVESTIGATIONS WARRANTED

The Underwood McLellan report concluded that "...off-site gas migration of the order of 300 m would not be considered unusual". Further, the report recommends that "...a zone of concern of 300 m should be immediately established around the Stride Landfill" and that "All existing buildings within a 300 m wide radius of the Stride Landfill boundaries be monitored for methane gas."

Your Municipal Engineer agrees with the recommendations in the report, particularly because of the serious potential nature of the methane gas migration problem. Having been apprised of the possible problems, the Corporation can ill-afford to not proceed to determine the nature and extent of those problems. To do so, the following needs are apparent.

- (1) Need for defining the true limits of the zone of concern.
- (2) Need for defining the nature and extent of "real" concerns.
- (3) Need for practicality, especially arising out of (2) above.

(cont'd)

- (4) Need for innovation, also arising out of (2) above.
- (5) Need for determining the quantitative aspects of gas migration. Very little work has been done on this need to date but is again particularly important in determining the extent of real concerns being warranted.

IV PROCEEDING WITH FURTHER INVESTIGATIONS

Your Municipal Engineer was quite concerned at the time of commencing the initial Stride Avenue gas and leachate investigations that there appeared to be only one firm really qualified to carry out the required work and this was Underwood McLellan Ltd. There appears now to be a second suitable firm available for this type of work in the form of E.H. Hanson & Associates Ltd. Mr. Hanson had worked for some time for Underwood McLellan Ltd., more recently as Area Manager of British Columbia for the firm. Of more pertinent interest to this report, Mr. Hanson was earlier in his career Director of the Environmental Services Division in the Winnipeg Offices of Underwood McLellan Ltd. at the very time that the City of Winnipeg caused Underwood McLellan Ltd. to conduct a major study and to determine solutions for its extensive leachate and gas migration problems. Reference was made to this work when the earlier report on Stride Avenue was presented to Council.

Proposals were invited from Underwood McLellan Ltd. and from E.H. Hanson & Associates Ltd. to carry out the required work to satisfy the needs expressed in Section III of this report. Copies of the two proposals are attached.

It is recommended that the Corporation retain the firm of E.H. Hanson & Associates Ltd. to conduct the further investigations into gas migration characteristics at the Stride Avenue Landfill at an estimated cost of \$37,300. The choice of proposal is based on the following major factors:

- (1) Lower overall estimated cost (\$37,300 compared to \$50,000 for Phase I of the Underwood McLellan Ltd. proposal).
- (2) An expression of practicality and innovation in the approach to the problem.
- (3) A dedication to determining a feasible method of volumetric measurement of the gas migration problem. This is considered to be a faster and less costly method of determining the true limits of the zone of concern, which is one of the major needs as expressed in this report.

The cost of the work would be charged to C.I.P. Code 70, Land Assembly and Development.


MUNICIPAL ENGINEER

EEO/ch
Att.
c.c. () Director of Planning

ITEM	13
MANAGER'S REPORT NO.	44
COUNCIL MEETING	1980 06 23

E. H. HANSON & ASSOCIATES LTD.

ENGINEERING SERVICES

#101 - 10449 - 137th Street
Surrey, B.C. V3T 5B1
PHONE (604) 584-1233

MUNICIPAL
LAND DEVELOPMENT
SOLID WASTE

April 28, 1980

The Corporation of the
District of Burnaby,
4949 Canada Way,
Burnaby, B. C.
V5G 1M2

ATTENTION: Mr. E. Olson, P. Eng., Municipal Engineer

Dear Sir:

RE: STRIDE AVENUE LANDFILL, BURNABY, B. C.

Previous reports have indentified the limits of landfill and ascertained that methane was being produced in fairly high concentrations over the landfill and immediately adjacent to it at certain locations.

Further studies are now required to determine:

- 1) The area affected by off-site migration.
- 2) The concentrations and rate of migration or generation to determine whether or not the methane constitutes a hazard or potential hazard.
- 3) Should the results from steps 1 and 2 indicate cause for concern, to ascertain what appropriate measures may be taken to prevent migration. Preventative measures to be considered may include impervious barriers or numerous types of pervious venting arrangements to safely intercept the migrating gas.

We recommend that a study be undertaken addressing itself to points 1 and 2. The results of this study will determine the need for further work and if remedial actions are required, as described in item 3, those appropriate actions would be the subject of a separate study.

...../2

ITEM	13
MANAGER'S REPORT NO.	44
COUNCIL MEETING	1980 06 23

E. H. Hanson & Associates would be pleased to undertake the necessary studies. On steps one and two we would like to make the following observations:

Any test holes placed in or near methane generating substances are likely to eventually accumulate methane. Even though the migration rate or rate of generation may be very minimal, eventually the concentrations could become quite high. Thus it is possible that undue concern may be created.

A better measure of the potential hazard would be to determine not only the concentration of methane produced but the volume produced over a certain time frame. If the rate of production or migration can be determined even in an imperical manner, the testing results will be much more meaningful.

They could also be used as a very preliminary measure of whether or not methane recovery within the landfill could be viable as a source of energy.

In the case of landfills, methane is produced at atmospheric pressure unless some physical barrier allows for pressure build up. This being the case, there is no pressure differential to allow the use of gas flow meters to directly measure the volume of gas produced during a given time.

Measurements could be taken by use of vacuum pumps and continuous recorders but such elaborate procedures are not warranted at the present time.

To obtain a measure of the rate of methane seepage, we propose to employ a method which will allow each of the bore holes to be completely vented and purged of methane after each test. We will then record the time required to generate an explosive mixture as well as time required to create various ratios of methane to gas mixtures, above the explosive limit. These tests will be taken in the zones of concern on the periphery as well as directly over the landfill to obtain comparative measurements.

Methane is considerably lighter than air and higher concentrations will be accumulated at the top of each test hole. We will also take readings at various depths in each hole to ascertain the time required to reach various concentrations through the entire depth of the test hole. By knowing the volume of the auger holes, some determination can be made of the rate of generation or migration of the methane gas.

An explanatory diagram of the methane test holes is included for your perusal.

In addition to the above, and to quickly determine possible areas of concern in a less sophisticated manner, we propose to use rod probes to cover larger areas of possible concern. These can be undertaken without drilling equipment and with no disturbance to the area. These probes will give a general indication as to whether or not methane is present in concentrations great enough to warrant further testing.

A diagram based on aerial photography of the area is included. We have shown thereon the proposed location of tests to be undertaken by drilled holes as well as the area to be covered by rod probes. These are preliminary only and as the study progresses, variations in locations may be found appropriate. These variations will be discussed with yourself and other appropriate officials from civic departments of Burnaby.

We propose to undertake the study on a time and expenses basis with time charged at payroll times 2.0. Expenses will be charged at cost.

Outside testing laboratories may be employed on certain occasions and these services if required will be charged at cost. All work will be undertaken by personnel located in the Greater Vancouver area.

E. H. Hanson, P. Eng., will participate directly in the study, and be responsible for bringing it to a successful conclusion. Technical Assistance will be provided by Mr. R. Max Le Sueur.

ESTIMATED COSTS

We suggest that the following budget be allowed to complete the study.

Drilling, supervision and logging of test holes.	7,000.00
Gas collection assemblies, casings and monitoring equipment.	4,500.00
Monitoring, sampling and recording results in drilled test holes including liason with Burnaby staff.	14,800.00
Location surveys and tie-ins.	2,000.00
Rod test probes and recording thereof.	2,500.00
Analysis of test results and preparation of a comprehensive report including further liason with Burnaby staff. Diagrams and visual material included.	6,000.00

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ITEM	13
MANAGER'S REPORT NO.	44
COUNCIL MEETING	1980 06 23

147

- 4 -

Clerical, typing, printing
& binding. 500.00

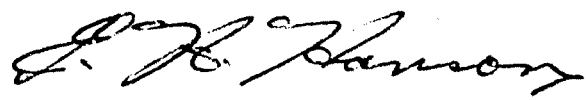
TOTAL..... \$37,300.00

We are willing to commence work immediately upon your authorization and estimate that the project will be completed within a 2 month period. Interim verbal or written reports will be provided as the work is carried out to keep you and your staff informed as to our findings and progress.

We look forward to working on this interesting and important project. If there are any questions or clarifications required, please contact the writer.

Yours truly,

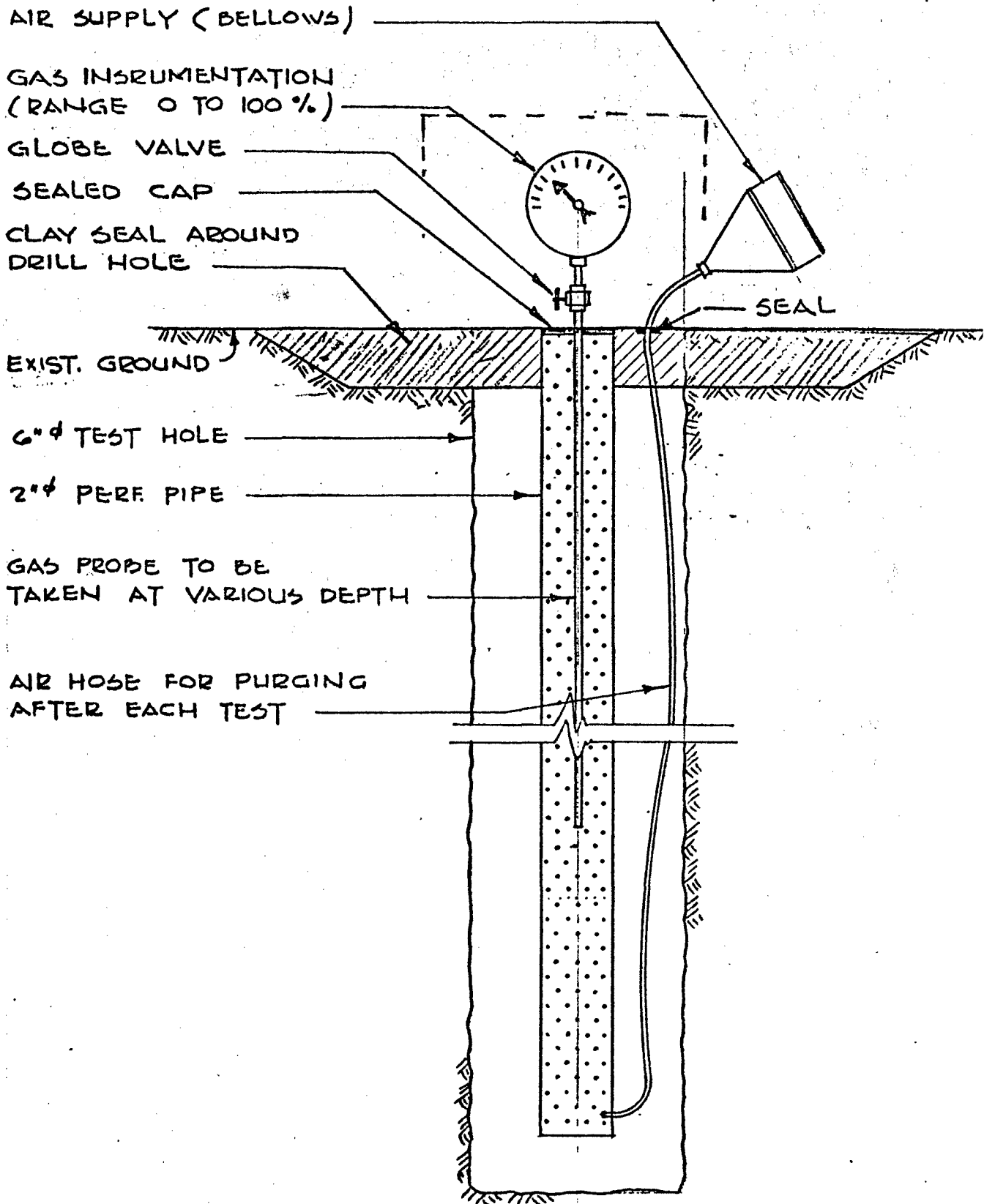
E. H. HANSON & ASSOCIATES LTD.



E. H. Hanson, P. Eng.
President

EHH/rt

Enclosures.



NOT TO SCALE

E. H. HANSON & ASSOC. LTD
ENGINEERING SERVICES
SURREY, B.C. APRIL '80

DISTRICT OF BURNABY
STRIDE AVE LANDFILL STUDY
TYPICAL TESTHOLE

ITEM	13
MANAGER'S REPORT NO.	44
COUNCIL MEETING	1980 06 23

149

E. H. HANSON & ASSOCIATES LTD.

ENGINEERING SERVICES

#101 - 10449 - 137th Street
Surrey, B.C. V3T 5B1
PHONE (604) 584-1233

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MUNICIPAL
LAND DEVELOPMENT
SOLID WASTE

MAY 13 1980

May 13, 1980

REFERENCE	NO.	DATE
EEO		

The Corporation of the
District of Burnaby,
4949 Canada Way,
Burnaby, B. C.
V5G 1M2

ATTENTION: Mr. E. E. Olson, P. Eng., Municipal Engineer

Dear Sir:

RE: STRIDE AVENUE LANDFILL, BURNABY, B. C.

Pursuant to our proposal of April 28th, E. H. Hanson & Associates Ltd., have now formed a working arrangement with Heath Survey Consultants of Canada Ltd. Heath's head office is in London, Ontario and they have one representative in Vancouver.

They are a company formed under Federal charter in 1956 and also have registration in British Columbia.

They manufacture and distribute monitoring equipment for gas detection and also take consulting assignments for design of methane control facilities for buildings.

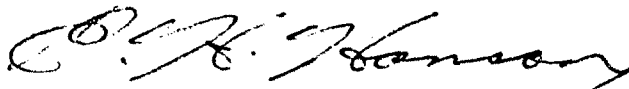
They are considered one of the foremost equipment suppliers and consultants in their field.

Their back-up expertise may prove valuable in our final analysis of the the scope of problem. They would provide valuable input in designing a practical methane control system should this phase be found necessary.

Yours truly,

E. H. HANSON & ASSOCIATES LTD.

Per:



Elson H. Hanson, P. Eng.,
President

EHH/rt

ITEM	13
MANAGER'S REPORT NO.	44
COUNCIL MEETING	1980 06 23

Underwood McLellan Ltd.

200-6545 Bonsor Avenue
 Burnaby, B.C. V5H 1H3
 Telephone (604) 438-5311

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14 1980

FILE NO.

OUR FILE NO. 1094 009 00 02

April 1, 1980

The Corporation of the District
 of Burnaby
 4949 Canada Way
 Burnaby, B.C.
 V5G 1M2

Attention: Mr. E. E. Olson, P. Eng.

Dear Sir:

RE: Stride Avenue Landfill

Our report on "Preliminary Investigations at the Stride Avenue Landfill" dated March 24, 1980 delineated the limits of the landfill, identified that methane gas was being generated and was migrating offsite, and suggested that offsite migration could approach 300 m (1000 ft.).

We recommend a two phase program of detailed investigation be implemented at the Stride Landfill. Phase I will better define the limits of off-site migration of methane gas and identify if any of the nearby existing residential and industrial development is susceptible to methane gas in concentrations that may be hazardous. In addition, Phase I will also address possible remedial measures, including gas barriers and methane recovery as may be applicable to the safe development of the adjacent land.

Phase II, as presently conceived, will focus on actual test well installations within the landfill to recover methane gas and thereby demonstrate the effectiveness of this concept for control of methane migration off-site. This test well program will also enable us to evaluate the potential economic return available from use of the gas recovered either as a source of energy (heat) or for the generation of electricity.

This letter requests your approval of approximately \$50,000 for Phase I of the investigations, all as described in more detail below. On completion of Phase I, a detailed estimate of costs for Phase II will be prepared for your approval.

.../2

Consulting Engineers and Planners

ITEM	13
MANAGER'S REPORT NO.	44
COUNCIL MEETING	1980 06 23

Mr. E. E. Olson
April 1, 1980
Page 2

151

Drawing 1 attached shows the landfill, adjacent development as well as the location of borrow pits A and B. These borrow pits are currently being used to dispose of garden clippings, tree branches, etc. after partial on-site burning.

Drawing 1 also shows the tentative location of drill holes and gas probes recommended to define:

- the limit of refuse (as opposed to clean fill) along the southwest boundary of the Stride Landfill
- whether materials deposited in borrow pits A and B are producing methane gas
- off site migration patterns of methane gas.

Should gas probes adjacent to existing development identify methane gas in potentially hazardous concentrations, detailed discussions with you will precede any gas monitoring within the dwellings or structures themselves.

All drill holes will be accurately logged and tested for the presence of gas. Most holes will have a permanent gas probe installed for long term monitoring. All probes will be monitored regularly during the investigation program. We have also allowed for weekly readings to be taken for one month after completion of the investigation. Alternate arrangements for long term monitoring can be made at a later date.

To provide drill access, particularly between the Stride Landfill and Marine Drive, clearing and dozer work will be required. We have assumed that District staff and equipment will be made available to perform this work.

Our report will summarize all the results of the field program, including drill logs and gas measurements. Our conclusions and recommendations will address:

- methane gas migration patterns off site (zone of concern)
- recommended filling alternatives for borrow pits A and B
- alternative gas barrier concepts and costs as may be applicable along the southwest boundary of the Stride Landfill
- other alternative gas control concepts including methane recovery
- factors for consideration by the District in the reformulation of the Stride Avenue Development Plan.

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Mr. E. E. Olson
 April 1, 1980
 Page 3

Considering the potential impact our studies may have, we will keep you closely informed of our findings during the study. We will submit our report in draft form for your review and comments prior to its finalization. We recommend you consider establishing an ad-hoc committee to participate in the study and review of the conclusions. This committee could include representatives from the following civic departments:

- building inspection
- planning
- engineering
- legal,

all of whom will have valuable contributions to make.

We estimate our fees for this work will be of the order of \$50,000.00, as per the following breakdown:

Field investigations:

drilling	\$17,800
gas probes (materials)	5,600
supervision	6,200
survey	2,000
Gas monitoring (probes plus homes)	2,400
Analysis and report (including discussions with the District)	<u>15,500</u>
TOTAL	\$49,500

Actual invoices will be on a time and expenses basis with time for UMA personnel charged at the rate of payroll times 2.0, and expenses at cost without markup.

The study will be coordinated by Mr. S. Strilchuk and will involve the following technical staff who all have extensive experience in landfills and the evaluation and control of their environmental concerns:

- Mr. L. D. Keil, P. Eng.
- Mr. L. Baniyas, C.E.T.
- Mr. D. Olinyk, P. Eng.
- Mr. V. Lau
- Mr. R. Westlake

.../4

ITEM	13
MANAGER'S REPORT NO.	44
COUNCIL MEETING	1980 06 23

153

Mr. E. E. Olson
April 1, 1980
Page 4

In addition, we consider the advice and guidance of Mr. J. Pacey, President, Emcon Associates of San Jose, California would be invaluable to the study itself and the interpretation of the results. We have worked extensively with Mr. Pacey on a number of solid waste assignments and have made allowance in the above budget for his input.

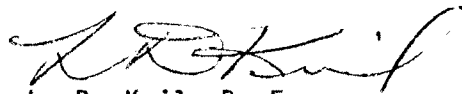
We look forward to this important assignment, and to assisting you in the formulation of a safe development plan for land on and adjacent to the Stride Avenue Landfill. Please contact either of the undersigned if you have any questions or comments.

Yours truly,

UNDERWOOD MCLELLAN LTD.



S. Strilchuk
Branch Manager



L. D. Keil, P. Eng.
Director
Earth Sciences Division

LDK/sp

Attach.