

MAGNETOMETER SURVEY

HARTLEY & HARTLEY LANDFILL
NW¼ of NE¼ SECTION 25
15N R4E, Bay County

by

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Barrel Amount Estimations

Two methods were employed to estimate the number of barrels disposed at the site. One method was to divide the total volume of the high anomaly areas by a factor of 12.65 cubic feet, which is the average volume of randomly disposed barrels, co-disposed in flattened, semi-flattened and whole round states, as determined by actual excavation at the Berlin and Farro project. The area and volume of the high anomaly areas were determined for both the four and six foot depth estimations.

The second method utilized was based on the anomaly intensity, signature, and area of influence. The area of influence beneath a single sounding point was determined using the formula for the volume of a spherical segment at one base (Figure 5). In this manner the total measured volume was calculated. The unmeasured volume was calculated by taking the area outside the area of influence and rotating it about a single point, midway of the circle. An average amount of barrels per sounding point was determined using the formula $M=Tr^3$ where T is the magnetic intensity, r equals the staff height of the magnetometer plus the depth to the anomaly, and M is the magnetic moment for the intensity. The calculated magnetic moment is then divided by the magnetic moment for one barrel - 2.9161×10^4 which is the magnetic moment for one barrel as calculated from actual data obtained during the Berlin and Farro Landfill excavation - and a number of measured barrels is determined. This method was calculated for both a four and six foot depth. It was assumed that the average barrel concentrations in the measured and unmeasured areas between sounding points were equal; therefore, a percentage factor of unmeasured to measured area was used to determine the number of barrels contained between sounding points.

Results of the Magnetometer Survey

The volumetric method provided an estimated number of barrels for a four foot depth of approximately 11,500 barrels and a six foot depth of approximately 17,500 barrels.

The second method employed, which determined the unmeasured volume between soundings, indicated a number of barrels of approximately 17,500 for the four foot depth calculations and approximately 16,000 barrels for a six foot depth.

The data indicates that the number of barrels in the second method for the four foot depth exceeds the amount possible volumetrically of 11,500. The intensity of the anomaly indicates, therefore, a greater depth of metal. The six foot depth calculations correlates well between both methods giving a range of 16,000 to 17,500 barrels.

The magnetometer data indicates, therefore, a six foot depth and an approximate number of 17,000 barrels.

HARTLEY & HARTLEY LANDFILL

MAGNETOMETER SURVEY

The Hartley & Hartley site operated as a licensed dump since the early 1960's to 1978 when it closed. Barrels of industrial waste were accepted for incineration on-site; however, as illustrated in the 1978 aerial photograph, many were disposed on the surface and subsequently buried (Figure 1).

At the request of Gary Gettle, Environmental Enforcement Division, on June 21, 1983, a magnetometer survey was conducted to confirm the presence of drums, to map the locations of anomalies, and estimate the amount of barrels on-site. A model G-816/826 portable proton magnetometer was used.

Magnetometer Survey

After an initial site visit on May 3, 1983, we requested to Mr. Gettle that the Engineering Division survey a grid over the subject area. On May 18, 1983, a grid was established on twenty foot centers utilizing a previously surveyed north-south baseline. Due to conditions around the landfill, some of the traverses were adjusted (i.e., shortened or lengthened - Figure 2). Traverses were made in east-west directions with readings taken every twenty feet. A base station was established south of the site along the roadway in a relatively magnetically clean area (Figure 2). Base station readings were taken after every fourth traverse. Five readings were taken and averaged establishing a time-line background magnetic value.

Data Reduction

A magnetic residual was obtained for each survey point by removing the background value from the survey point magnetic value. A residual anomaly contour map was then constructed from this data (Figure 3).

Residual profiles were constructed over some of the anomalous areas. Depth approximations were made based on the anomaly signatures using the slope method calculation (Figure 4).

Data from this site indicated a depth for the anomaly centers lying between two to six feet. Visual observations, supported by datum supplied by the survey crew, show a surface elevation change on the average of four feet from the water surface in the surrounding swamp.

Metal Detector

On July 7, 1983, a Fisher model TW-5 metal detector was utilized to check its response to the anomalies indicated by the magnetometer and to define their boundaries. The established survey lines were traversed in the same manner as in the magnetometer survey. The magnetometer anomaly con our map was checked against the metal detector response. Excellent correlation was found between the reduced magnetometer field data and the detectors field response. A few small areas masked to the magnetometer because of their small size and the large intensities surrounding them were discovered by the metal detector (Figure 6). Boundaries of the magnetic anomalies to the west and north were defined. Large negative anomalies were indicated to have metal. The cause for this is anticipated to be due to the minimal distance between the magnetic bodies, therefore, causing them to act as one magnet instead of separate magnets.

The additional areas which showed a metallic response to the metal detector and not the magnetometer will be included in the final estimate for total barrels on site (Figure 6).

Conclusions

The final combined results of the horizontal limits determined from the magnetometer and metal detector are illustrated in Figure 6. The magnetometer survey determined a vertical depth of six feet for the anomalies. The additional anomalies discovered by the metal detector were added to the magnetometer data and a final approximation of 18,500 barrels was determined. This barrel approximation is based on the assumption that the buried objects have 50 pounds of iron per barrel. The barrel amount may vary due to different size barrels and/or barrel condition (i.e., partially disintegrated).

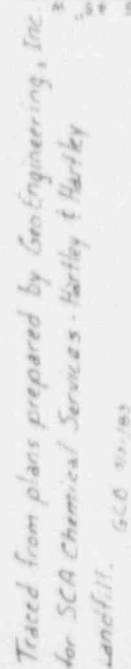


AERIAL PHOTOGRAPH - HARTLEY AND HARTLEY LANDFILL

FIGURE 1

Taken 7-1-69

44 0° 46' 04" E



Swimming and slides by MDNR Engineering Division 5/18/23.

Revised by B. MURSCH

O GRID STATION

FIGURE 2

RESIDUAL CONTOUR MAP



MAGNETOMETER INTERPRETATION

SLOPE TECHNIQUE

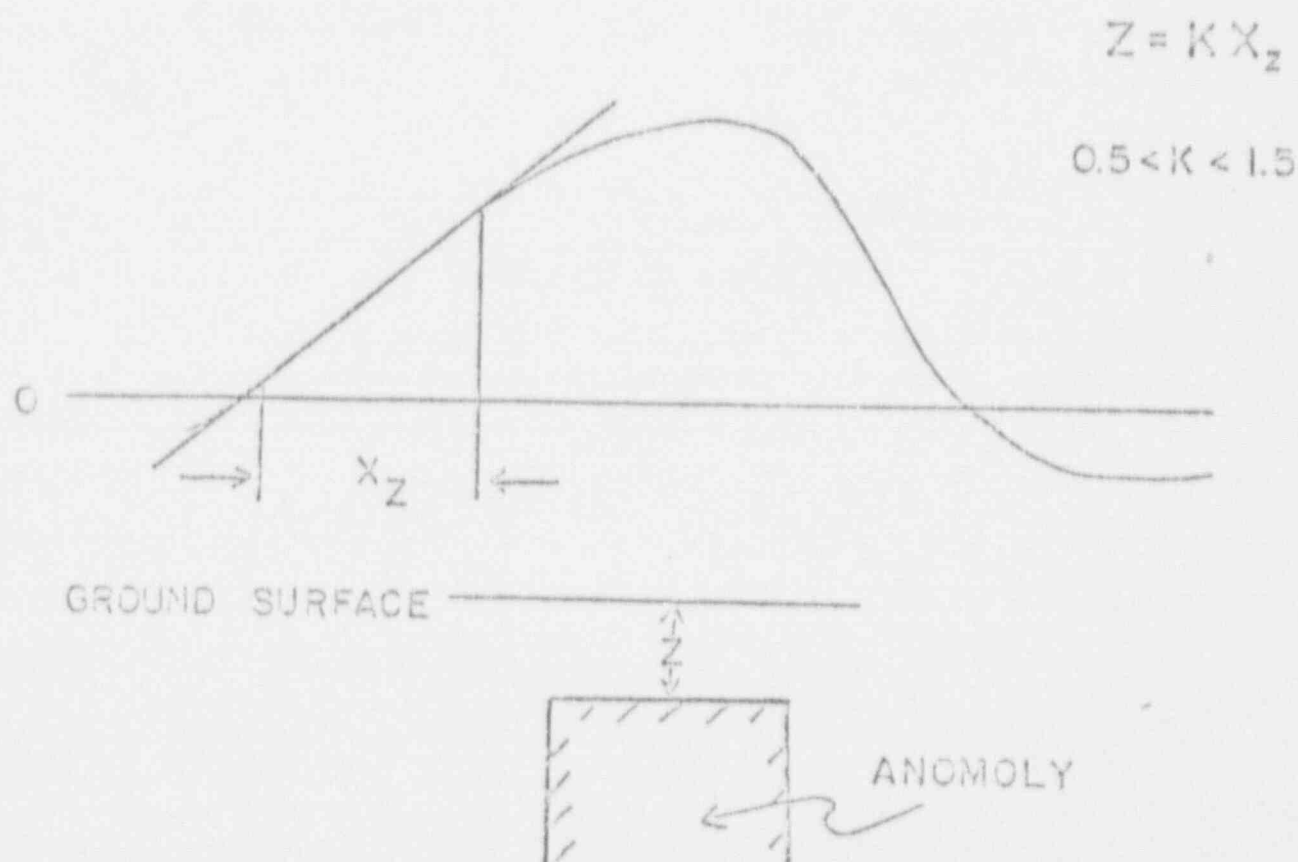


FIGURE 4

Drawn by B. Mursch

MAGNETOMETER INTERPRETATION

MEASURED AND UNMEASURED AREAS

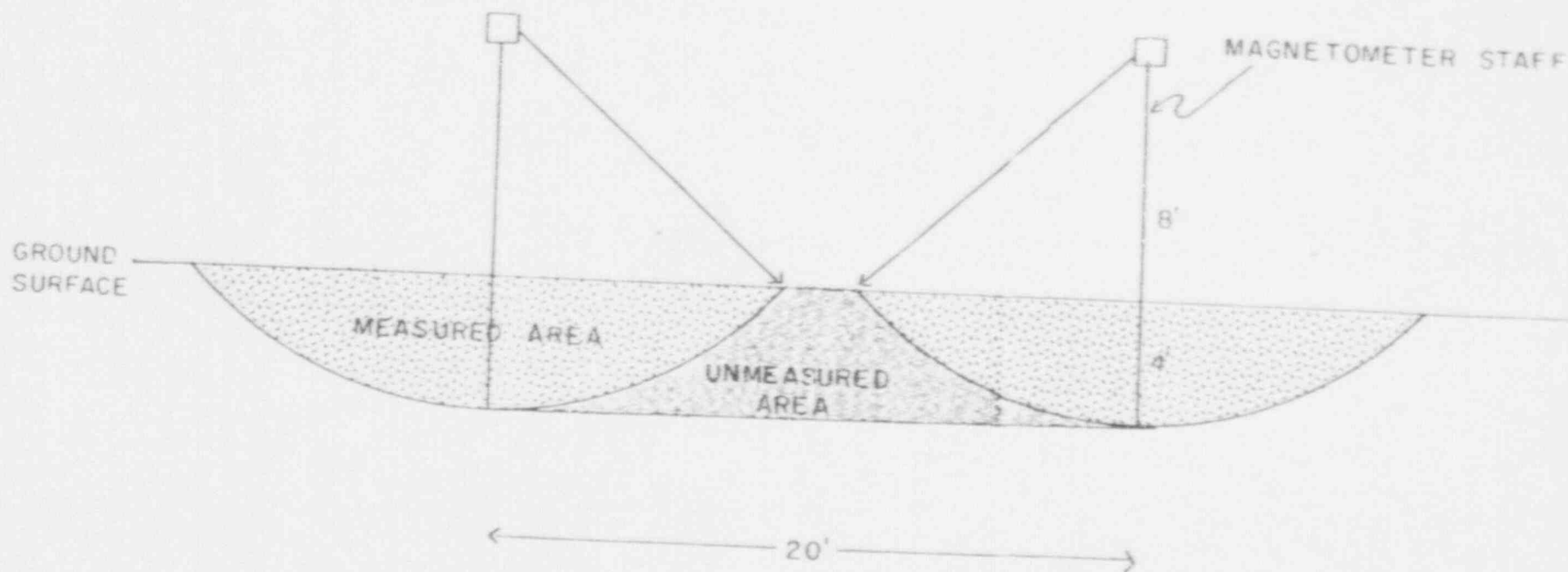


FIGURE 5

SCALE 1" = 4'

Drawn by B. Mursch



ANOMOLY MAP



FIGURE 6

RHSD Chronology
on
SCA (DNR) Landfill

- 4-14-83 Phone Tedeschi (EPA) to Bruchmann (RHSD) - Radiation indication found at landfill near Bay City. EPA needs assistance. Phone Shauver (DNR) to Bruchmann - Radiation readings found on DNR property adjacent to SCA Services landfill (formerly Hartley & Hartley) near Kawkawlin and Bay City.
- 4-14-83 Recognizing that the area was near Bay City, a May 1980 aerial survey report was recovered from the Division's Velsicol Chemical Company, St. Louis file. In addition to the Velsicol survey in 1980, a mysterious aerial survey was also ordered by the Environmental Protection Agency (EPA) of an area near Bay City. The aerial survey was of the SCA landfill and indicated the presence of thorium on DNR land and also on a larger area of SCA property.
- 4-19-83 Memo Klaviter (CEHS) to Bruchmann - Confirmation of a trip scheduled for May 25, 1983 to visit the landfill. [Trip was rescheduled for 4-20-83].
- 4-20-83 Survey and sampling of SCA landfill by RHSD, DNR, and EPA. One soil sample collected. Sample visually appeared similar to Dow thorium slag.
S 670±40 pCi/g
- 4-22-83 Media Contact, Hearn (Bay City Times) to Hennigan (RHSD) - regarding SCA landfill and 4/20/83 site visit.
- 4-26-83 Memo Klaviter to Bruchmann confirming an organizational meeting scheduled for May 6 regarding SCA landfill.
- 4-29-83 Memo Bails (DNR) to DNR staff - Acknowledgement of chemical and radioactive material contamination at SCA property, advice for protective clothing, and assignment of high priority for investigation.
- 5-2-83 Memo DeHaan (RHSD) to Hennigan - regarding the radioactivity survey of DNR land near SCA landfill on 4-20-83 by RHSD, DNR, and EPA. Soil sample analysis revealed 670±40 pCi/gm. dry of thorium-232 with daughters. DNR planning radar study to determine the number of barrels buried on DNR property.
S
- 5-3-83 Memo Jacob (Toxic Substance Control Commission [TSCC]) to Hesse (CEHS) - concerning a telephone call from a private citizen saying that federal inspectors from EPA and DNR inspectors had been at the landfill and wanting to know the health consequences of their findings. Information given to Klaviter.

A/12

- 5-4-83 Memo Bruchmann to Jager (EOHSA) - Cover for 5-2-83 Memo and meeting scheduled by DNR for May 6 to discuss investigation strategy.
- 5-6-83 Meeting between RHSD, WSD, EOHSA, CEHS, and DNR - DNR background information and maps, RHSD aerial survey. Site visit for a more extensive sampling and survey planned for 5-25-83.
- 5-9-83 Memo DeHaan to SCA file - summary of MDPH/DNR meeting of 5-6-83.
- 5-11-83 Media Contact Callander (Bay City Times) to Hennigan - inquiry about hazardous chemicals found on site. Referred to DNR.
- 5-11-83 Memo Bruchmann to Hesse - answers to 5-3-83 TSCC concerns.
- 5-16-83 Letter Bruchmann to Miller (Nuclear Regulatory Commission [NRC]) - information on SCA landfill and request for an NRC investigation if an NRC licensee seems to be involved.
- 5-25-83 Sample sheets with laboratory analytical data. SCA sample of 4-20-83 = 20% magnesium. Dow thorium slag sample = 14% magnesium.
- 5-27-83 Letter Tanner (DNR) to Adamkus (EPA) - request that Hartley & Hartley (SCA) site be added to their existing list of candidates for the CERCLA National Priority List.
- 6-1-83 Survey and sampling of SCA landfill area by RHSD, DNR, EPA, and Golson (Bay County Health Department) - Six (6) soil samples collected; 3 from contaminated DNR property, 2 "background" samples about 5-10 feet from contaminated areas, and one from contaminated SCA property. One groundwater (swampwater) sample collected from DNR property. Survey of the portion of SCA property indicated on 1980 aerial survey revealed radiation levels similar to those from the adjacent DNR property.
- 6-1-83 Media Contact Elliot (WJRT Channel 12) to Hennigan - interview at SCA Chemicals Services, Inc. landfill.
- 6-2-83 Media Contact, Hearn to Hennigan - regarding 6-1-83 visit to SCA landfill.
- 6-21-83 Memo Holcomb (TSCC) to Hesse - request for information on SCA landfill.
- 7-12-83 Sample sheets with laboratory analytical data from 6-1-83 field trip. 3 contaminated soil samples from DNR property = 39 ± 2 , 120 ± 4 , and $124 \pm$ pCi/gm thorium-232 and 16, 17, and 6.1% magnesium, respectively. 2 "background" samples from DNR property = 1.9 ± 0.3 and 1.4 ± 0.3 pCi/gm thorium-232 and 0.01 and 0.83% magnesium, respectively. SCA property contaminated soil

S 83-91 to 83-96
Hennigan

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sample = 78±1 pCi/gm thorium-232 and 13% magnesium. Surface water sample from DNR property had no significant gamma activity. Conclusion: DNR and SCA property is contaminated with magnesium/thorium material, probably from an NRC licensee.

7-12-83 Letter Bruchmann to Miller (NRC) describing SCA landfill area contamination, noting three NRC licensees who used thorium in significant amounts, and requesting an investigation by NRC.

7-12-83 Received Memo of 7-8-83, Golson to selected residents near SCA site - arrangements for collecting well water samples.
S 11/12 to 11/18

*Handwritten: 7-27-83
also 27 pCi/gm
th 232*
7-27-83 Letter Gettel (DNR) to Klaviter and Fredle (EPA) - results of magnetometer survey of DNR property. Estimate of barrels buried to a depth of six feet raised from 4,000 barrels to 18,500 barrels.

8-2-83 Phone Conference Call Menczer (NRC), Sremiawski (NRC), and Lasuk (NRC) to Bruchmann regarding planned trip to SCA landfill on 8/9-11/83. NRC referred to DNR for landfill users. We will accompany NRC with DNR.