Environment Canada | Environnement Canada

Memorandum - Note de service

TO/A Philippe Lavallee
INAC, Nunavut District
P.O. Box 2200
Iqaluit, NU X0A 0H0

PREPARED BY/ PRÉPARÉ PAR:

SECURITY/ SÉCURITÉ: UNCLASSIFIED

FROM/ DE Anne Wilson

FILE/ DOSSIER:

DATE: 2001-10-26

Subject/ Objet: **MICROTOX RESULTS**

Hi Philippe,

Enclosed are the Microtox results for the following samples:
Iqaluit lagoon discharge
Upper Base, Lower Pond
Upper Base, Inner Pond
Lower Base Runoff Path
Iqaluit Dump Leachate

This should be the last batch (I think). If you have any questions, please don't hesitate to call me at 867-669-4735 or Wade Romanko at 867-669-4736.

Thanks,

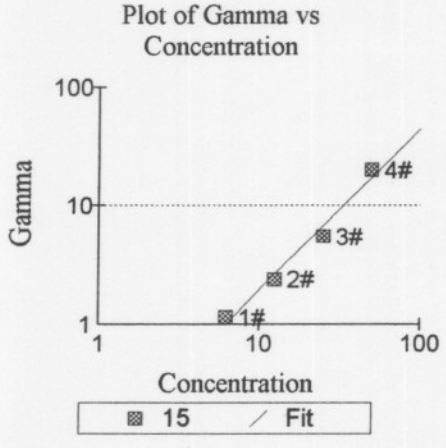
Anne

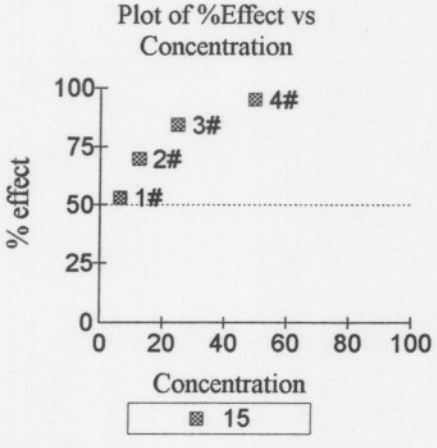
cc: Wade Romanko

MicrotoxOmni Test Report

Date: 2001-Sep-19 09:12 AM

Test Protocol: Zinc sulfate Standard
Sample: Sample 1
Toxicant: -
Reagent Lot no.: ACV026-6
Test description: Zinc Sulphate Standard
Test name: Zinc Sulfate Standard 1st
Database file: C:\Program Files\MicrotoxOmni\2001.mdb





15 Mins Data:

Sample	Conc	Io	It	Gamma	% effect
Control	0.000	94.69	70.06	0.7399 #	
1	6.188	96.13	33.20	1.142 #	53.32%
2	12.38	95.08	21.01	2.348 #	70.13%
3	24.75	92.19	10.49	5.502 #	84.62%
4	49.50	92.49	3.21	20.32 #	95.31%

- used in calculation; * - invalid data; D - deleted from calcs.

Calculations on 15 Mins data:
IC50 Concentration:6.303mg/L (95% confidence range: 3.627 to 10.95)
95% Confidence Factor: 1.738
Estimating Equation:LOG C =0.7162 x LOG G +0.7996
Coeff. of Determination (R^2):0.9802
Slope: 1.369
Correction Factor: 0.7399

Signature: _____

Printed: 2001-Oct-26 12:47 PM

REPORT OF TOXICITY USING MICROTOX

COMP. //LOCATION: **Iqaluit, Dump Leachate**
Sample Collected By: Phillippe Lavallee

Date/Time Sampled: September 17, 2001

Date/Time Received: September 18, 2001

Date/Time Test Start: September 19, 2001 / 10:06

Sample Type: Elutriate
Sampling Method: Grab

Method: ***Environment Canada Laboratories SOP#830.0 Revision 1, for Microtox Testing in Compliance with November 1992: Biological Test Method: Toxicity Test Using Luminescent Bacteria Photobacterium phosphoreum), November 1992, EPS 1/RM/24.***

Environment Canada has conducted testing on the material sampled according to its own Microtox standards and procedures. The data proceeding from that testing is intended as a preliminary screening tool only, and cannot be used for any other purpose. This data is provided on the condition that it not be used in any report that is intended for public or official use.

RESULTS: NON TOXIC at 45% concentration

TEST ORGANISMS:
Species: Vibrio fisheri (Photobacterium phosphoreum)
Test Apparatus: Model 500 Analyzer

TEST SUBSTANCE/CONDITIONS

pH of Sample: 8.0 (No pH adjustment)

Sample Appearance: Greyish, no colour adjustment

Lot # of Osmotic Adjusting Solution: OAS007

Lot # of Reconstitution Solution: RSN099Y

Lot # of Diluent: DIL034L

TEST METHODS AND CONDITIONS

Test Start Date/Time: September 13, 2001 / 11:40 AM

Test Method: Basic 45% Test, 15 minute incubation.

QUALITY CONTROL

Reference Toxicant: Zinc Sulfate Standard

Reagent Lot #: ACV026-6

IC_{50} - 15 minutes mg/L: 6.3 mg/L

IC_{50} Confidence Range: 3.6 to 11.0 mg/L

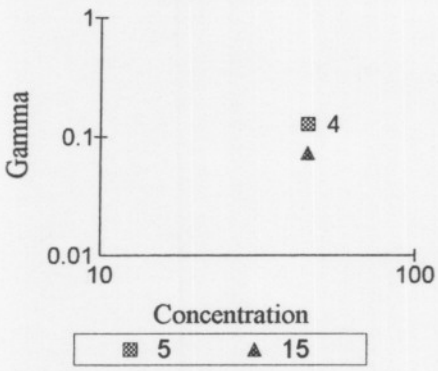
TEST ANALYST: Ron Bujold **INITIAL:** RB

MicrotoxOmni Test Report

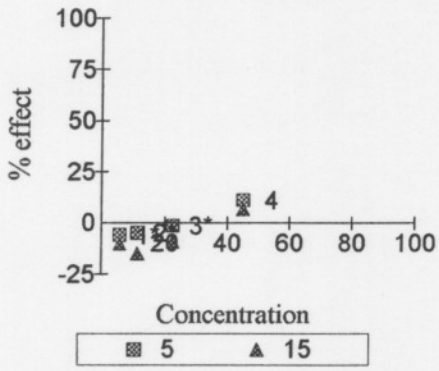
Date: 2001-Sep-19 10:06 AM

Test Protocol: Basic Test
Sample: Sample 3
Toxicant: -
Reagent Lot no.: ACV026-6
Test description: Iqaluit, 2001/09/17
Test name: Dump Leachate
Database file: C:\Program Files\MicrotoxOmni\2001.mdb

Plot of Gamma vs Concentration



Plot of %Effect vs Concentration



			5 Mins Data:			15 Mins Data:		
Sample	Conc	Io	It	Gamma	% effect	It	Gamma	% effect
Control	0.000	93.90	82.61	0.8798 #		77.52	0.8256 #	
1	5.625	89.23	82.94	-0.0535 *	-5.654%	81.04	-0.0910 *	-10.01%
2	11.25	87.84	80.84	-0.0440 *	-4.608%	83.22	-0.1286 *	-14.76%
3	22.50	91.61	81.59	-0.0121 *	-1.234%	82.37	-0.0818 *	-8.913%
4	45.00	97.19	75.78	0.1283	11.37%	74.74	0.0735	6.850%

- used in calculation; * - invalid data; D - deleted from calcs.

Satistical calculations could not be performed on the 5 Mins data.
Recommend re-testing sample at a higher initial concentration.
Highest % effect: 11.37%

Satistical calculations could not be performed on the 15 Mins data.
Recommend re-testing sample at a higher initial concentration.
Highest % effect: 6.850%

Signature: _____

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REPORT OF TOXICITY USING MICROTOX

COMP. //LOCATION: **Iqaluit, Lagoon Discharge**

Sample Collected By: Philippe Lavallee

Date/Time Sampled: September 17, 2001

Date/Time Received: September 18, 2001

Date/Time Test Start: September 19, 2001 / 09:43

Sample Type: Elutriate
Sampling Method: Grab

Method: ***Environment Canada Laboratories SOP#830.0 Revision 1, for Microtox Testing in Compliance with November 1992: Biological Test Method: Toxicity Test Using Luminescent Bacteria Photobacterium phosphoreum), November 1992, EPS 1/RM/24.***

Environment Canada has conducted testing on the material sampled according to its own Microtox standards and procedures. The data proceeding from that testing is intended as a preliminary screening tool only, and cannot be used for any other purpose. This data is provided on the condition that it not be used in any report that is intended for public or official use.

RESULTS: TOXIC - IC_{50} Concentration: 1.1% (Toxic 0 to 50%)

TEST ORGANISMS:
Species: Vibrio fisheri (Photobacterium phosphoreum)
Test Apparatus: Model 500 Analyzer

TEST SUBSTANCE/CONDITIONS

pH of Sample: 7.8 (No pH adjustment)

Sample Appearance: Greyish, no colour adjustment

Lot # of Osmotic Adjusting Solution: OAS007

Lot # of Reconstitution Solution: RSN099Y

Lot # of Diluent: DIL034L

TEST METHODS AND CONDITIONS

Test Start Date/Time: September 19, 2001 / 09:43

Test Method: Basic 45% Test, 15 minute incubation.

QUALITY CONTROL

Reference Toxicant: Zinc Sulfate Standard

Reagent Lot #: ACV026-6

IC_{50} - 15 minutes mg/L: 6.3 mg/L

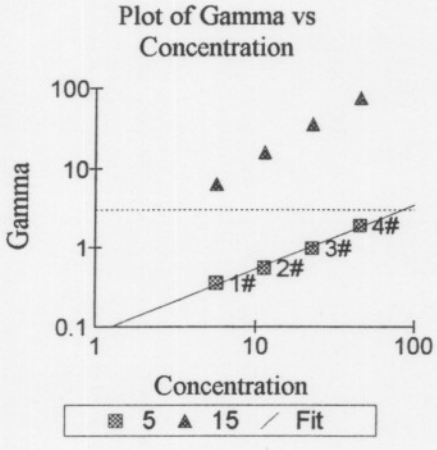
IC_{50} Confidence Range: 3.6 to 11.0 mg/L

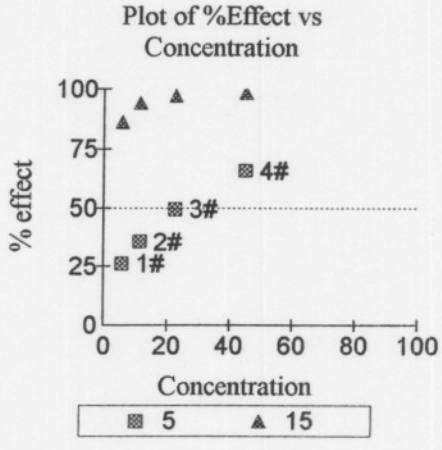
TEST ANALYST: Ron Bujold **INITIAL:** RB

MicrotoxOmni Test Report

Date: 2001-Sep-19 09:43 AM

Test Protocol: Basic Test
Sample: Sample 2
Toxicant: -
Reagent Lot no.: ACV026-6
Test description: Iqaluit, 2001/09/17
Test name: Lagoon Discharge
Database file: C:\Program Files\MicrotoxOmni\2001.mdb





		5 Mins Data:				15 Mins Data:		
Sample	Conc	Io	It	Gamma	% effect	It	Gamma	% effect
Control	0.000	94.93	89.96	0.9476 #		78.42	0.8261 #	
1	5.625	98.65	68.79	0.3590 #	26.42%	10.95	6.442 #	86.56%
2	11.25	93.63	56.94	0.5583 #	35.83%	4.49	16.23 #	94.19%
3	22.50	94.18	44.76	0.9940 #	49.85%	2.10	36.05 #	97.30%
4	45.00	94.73	30.50	1.943 #	66.02%	1.01	76.48 #	98.71%

- used in calculation; * - invalid data; D - deleted from calcs.

Calculations on 5 Mins data:
IC50 Concentration:21.24% (95% confidence range: 16.91 to 26.69)
95% Confidence Factor: 1.256
Estimating Equation:LOG C =1.218 x LOG G +1.327
Coeff. of Determination (R^2):0.9918
Slope: 0.8142
Correction Factor: 0.9476

Calculations on 15 Mins data:
IC50 Concentration:1.131% (95% confidence range: 0.7584 to 1.686)
95% Confidence Factor: 1.491
IC50 value was calculated from extrapolated data.
Estimating Equation:LOG C =0.8413 x LOG G +0.0534
Coeff. of Determination (R^2):0.9977
Slope: 1.186
Correction Factor: 0.8261

Signature: _____

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Taiga Environmental Laboratory
4601-52nd Ave., Box 1500, Yellowknife, NT. X1A 2R3
Tel: (867)-669-2788
Fax: (867)-669-2718

- CERTIFICATE OF ANALYSIS -

Prepared For: Nunavut District Office DIAND, Operations *Attn:* Philippe Lavalllee

Sample ID: sewage discharge **Taiga Sample ID:** 212613

Client Project: **Sample Type:** sewage **Received Date:** 18-Sep-01

Location: Iqaluit **Sampling Date:** 17-Sep-01

Report Status: **Final** ***Approved by:***

Test Parameter	Result	Units	Detection Limit	Analysis Date
Physicals				
Solids, Total Suspended	38	mg/L	3	28-Sep-01
Nutrients				
Ammonia as N	33.2	mg/L	0.005	21-Sep-01
Biological Oxygen Demand	109	mg/L	2	18-Sep-01
Nitrate+Nitrite as N	0.057	mg/L	0.008	10-Oct-01
Phosphorous, Total	4.39	mg/L	0.004	27-Sep-01
Microbiology				
Coliforms, Fecal	1060000	CFU/100mL	1	19-Sep-01
Subcontracted Organics				
Phenols	92.0	µg/L	0.5	05-Oct-01

Field Data (01/09/17) sewage
Temperature: 10.5 °C
Conductivity: 516 µS/cm
pH: 7.1

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4601-52nd Ave., Box 1500, Yellowknife, NT. X1A 2R3
Tel: (867)-669-2788
Fax: (867)-669-2718

- CERTIFICATE OF ANALYSIS -

Prepared For: Nunavut District Office DIAND, Operations *Attn:* Philippe Lavalllee

Sample ID: dump leachate **Taiga Sample ID:** 212614

Client Project: **Sample Type:** wastewater **Received Date:** 18-Sep-01

Location: Iqaluit **Sampling Date:** 17-Sep-01

Report Status: **Final** ***Approved by:***

Test Parameter	Result	Units	Detection Limit	Analysis Date
Physicals				
Solids, Total Suspended	65	mg/L	3	28-Sep-01
Nutrients				
Ammonia as N	24.4	mg/L	0.005	21-Sep-01
Nitrate+Nitrite as N	0.018	mg/L	0.008	10-Oct-01
Organic				
Oil and Grease	2.6	mg/L	0.2	10-Oct-01
Metals, Total				
Arsenic	<1.0	µg/L	1.0	05-Oct-01
Cadmium	0.7	µg/L	0.3	19-Sep-01
Chromium	3	µg/L	3	19-Sep-01
Cobalt	4	µg/L	1	19-Sep-01
Copper	10	µg/L	2	19-Sep-01
Iron	3770	µg/L	30	02-Oct-01
Lead	<1	µg/L	1	19-Sep-01
Manganese	9840	µg/L	1	19-Sep-01

Report Date: Wednesday, October 17, 2001

Indian and Northern Affairs Canada
Affaires indiennes et du Nord Canada

INAC, Nunavut District Office
P.O. Box 100
Iqaluit, NU
X0A 0H0

tel.: (867) 975-4275
fax.: (867) 979-6445

Your file Votre référence

Our file Notre référence
N5L3-0087 (expired)

November 6, 2001.

Rick Butler
Chief Executive Officer
City of Iqaluit
P.O. Box 460
Iqaluit, NU X0A 0H0

September 17, 2001 Municipal Water Use Inspection - Report

Firstly, I wish to thank André Savard for the much appreciated time and assistance provided during the tour of the City's water use and waste disposal facilities. Attached for your records is the Municipal Water Use Inspection Report pertaining to the September 17, 2001 inspection; few outstanding concerns were noted. Thus, the following considerations will need to be addressed:

- **Water supply:** No concerns were noted at the well-kept water treatment plant. In addition, a cursory examination of the available consumption logs revealed monthly water usages well within previously licenced thresholds. Further, the attached analytical results relating to a pre-treatment sample taken at the treatment plant indicate that the raw water meets the *Guidelines for Canadian Drinking Water Quality* for all tested parameters.

- **Sewage disposal:** Whereas work remains ongoing at the sewage treatment plant, the City exclusively relies upon the lagoon for its sewage disposal. Accordingly, a high rate of flow must be maintained at the decant station in order to ensure that the required freeboard is conserved along the retention berms of the sewage disposal facility (figure 1). However, this translates into the decrease of the retention and treatment time provided by the sewage disposal facility prior to effluent discharge. Indeed, the attached analytical results relating to a sample collected from the decant structure (figure 2) indicate that while the level of faecal coliform breaches the previously licenced standards (1 060 000 CFU/100ml vs 1 million CFU/100ml), concentrations of ammonia (33.2 mg/L vs 2.2 mg/L) and phenols (92 μg/L vs 4 μg/L) exceed the *Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life*. Moreover, the Microtox sample, which constitutes a reliable toxicity indicator (IC_{50}), shows that half of light-producing bacteria were inhibited by a sample concentration of only 1.1%, whereas 50% and over is considered non-toxic. Accordingly, the Inspector reiterates that substantial efforts ought to be devoted to the timely commission of an alternate means of sewage treatment and disposal.

- **Solid waste disposal:** Segregation of waste, aiming to guarantee that only combustible wastes reach the burnpile (figure 3), is undertaken at the solid waste disposal facility. In this regards, hazardous materials, tires, and bulky metal wastes (figure 4) are separately stockpiled. Regardless, outstanding concerns were noted in relation to leachate production and discharge. In fact, since the last inspection, no noticeable improvements appear to have been made to the discharge culvert which still lies in a state of disrepair (figure 5). As was previously outlined, the reestablishment of a suitable, gated decant structure would allow for the intended monitoring of the leachate prior to its discharge to receiving waters. As such, the attached analytical results relating to a leachate sample taken from the outflow of the discharge culvert (figure 6) reveal that levels of ammonia (24.4 mg/L), cadmium (0.7 µg/L vs 0.017 µg/L), copper (10 µg/L vs 4 µg/L), iron (3.77 mg/L vs 0.3 mg/L), and zinc (756 µg/L vs 30 µg/L) exceed the *Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life*. Nonetheless, the associated microtox sample did not attribute toxicity to the leachate.

- **Non-compliance of Act or Licence:** The City does not currently possess the Water licence it requires under both the *Northwest Territories Waters Act* and the *Nunavut Land Claims Agreement* for its municipal water uses and waste disposals. Nevertheless, the Inspector recognizes that the City has submitted a Water licence renewal application, and that it cannot consequently be held accountable for procedural complications which may have subsequently been encountered. This being said, the Inspector trusts that the City will, during the unlicenced interim period, diligently oversee its municipal water uses and waste disposals without the need for external prompting.

Please feel free to contact me at (867) 975-4298 or lavalleep@inac.gc.ca should any questions/comments arise.

Sincerely,

Philippe Lavallée
Water Resources Officer
INAC, Nunavut District

c.c. - Nunavut Water Board, Gjoa Haven
- CG&T, Iqaluit (Doug Sitland)
- Baffin Health & Social Services, Iqaluit (Shaun Mackie)
- EC Environmental Protection, Yellowknife (Anne Wilson)
- DFO Habitat Management, Iqaluit (Jordan DeGroot)

Indian and Northern Affairs Canada | Affaires Indiennes et du Nord Canada

MUNICIPAL WATER USE INSPECTION FORM

Date: 2001/09/17 **Licensee Rep.** (Name/Title): André Savard / Water Treatment Plant Operator

Licensee: **City of Iqaluit** Licence No.: **N5L3-0087** (expired)

WATER SUPPLY

Source(s): Lake Geraldine **Quantity used:** recorded @ water treatment plant

Owner:/Operator: City

Indicate: **A** - Acceptable **U** - Unacceptable **NA** - Not Applicable **NI** - Not Inspected

Intake Facilities: NI **Storage Structure:** A **Treatment Systems:** A **Chemical Storage:** A

Flow Meas. Device: A **Convey. Lines:** NI **Pumping Stations:** A

Comments: No concerns noted at the well-kept water treatment plant. A glimpse at the consumption logs indicated monthly water usage hovering around 45 000 m^3. Chlorination, filtration, and fluoridation in use.

WASTE DISPOSAL

Sewage: **Sewage Treatment System** (Prim./Sec/Ter.): primary; discharge to ocean

Natural Water Body: **Continuous Discharge** (land or water): x

Seasonal Discharge: **Wetlands Treatment:** **Trench:**

Solid Waste: **Owner/Operator:** City

Landfill: **Burn & Landfill:** x **Other:**

Indicate: **A** - Acceptable **U** - Unacceptable **NA** - Not Applicable **NI** - Not Inspected

Discharge Quality: sampled **Decant Structure:** A **Erosion:** A

Discharge Meas. Device: none **Dyke Inspection:** none **Seepages:** A

Dams, Dykes: A **Freeboard:** A **Spills:** 01-199/200/219/231/289

Construction: NA **O&M Plan:** NA **A&R Plan:** NA

Periods of Discharge: A **Effluent Discharge Rate:** not measured

Comments: Level of the sewage lagoon relatively high, but adequate freeboard nonetheless provided; no signs of breaching at the spillway. Considerable volume of flow from the decant structure. Ongoing work at the sewage treatment plant, but facility not yet commissioned. Bulky metals, tires, and hazardous materials segregated from combustible wastes at the solid waste disposal facility. Batteries are neutralized prior to disposal. Waste oil disposal handled by a third party equipped with a furnace. Hazardous materials temporarily stockpiled without containment; larger burnpiles impede the use of the sealift container designated for that purpose. Pooled water noticeable along the toe of the bulky metal wastes disposal area. Discharge culvert still in a state of disrepair; leachate observed freely flowing through and around the structure. Sheen noted in waters immediately downstream of the discharge culvert. Several spills relating to the sewage conveyance lines occurred since spring.

FUEL STORAGE

Owner/Operator:

Indicate: **A** - Acceptable **U** - Unacceptable **NA** - Not Applicable **NI** - Not Inspected

Berms & Liners: **Water within Berms:** **Evidence of Leaks:**

Drainage Pipes: **Pump Station & Catchment Berm:**

Pipeline Condition: **Not Applicable:** x **Condition of Tanks:**

SURVEILLANCE NETWORK PROGRAM (SNP)

Samples Collected **Hamlet:** to be taken towards the end of September

INAC: raw water @ treatment plant, sewage discharge, dump leachate

Signs Posted **SNP:** yes **Warning:** yes

Records & Reporting: not applicable

Geotechnical Inspection: not applicable

Non-Compliance of Act or Licence: Community is currently unlicenced, however the City has submitted a Water Licence renewal application; procedural delays extend beyond its control.

Philippe Lavallée

Inspector's Name

Inspector's Signature

figure 1. Sewage disposal facility; 2001/09/17.

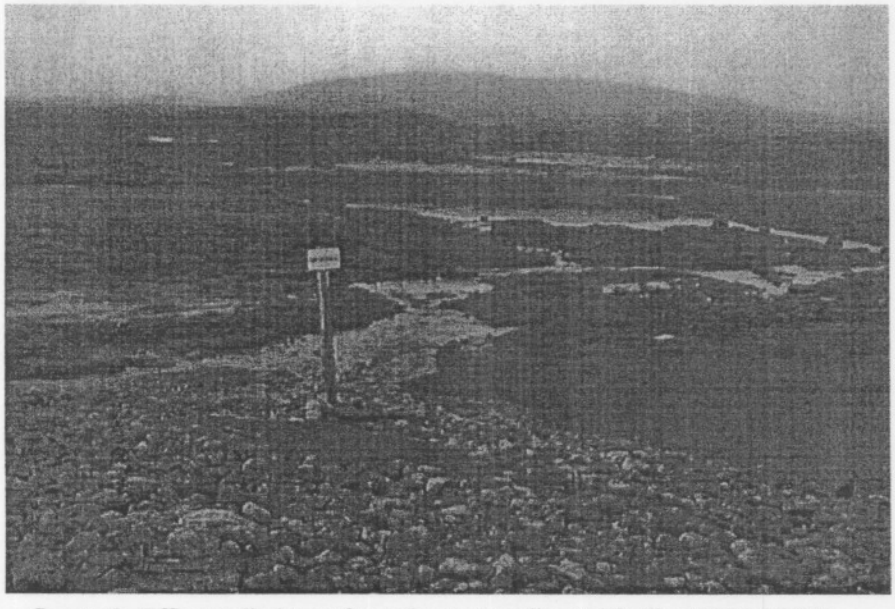

figure 2. Effluent discharge from the sewage disposal facility; 2001/09/17.

figure 3. Combustible wastes at the solid waste disposal facility; 2001/09/17.

figure 4. Bulky metal wastes at the solid waste disposal facility; 2001/09/17.

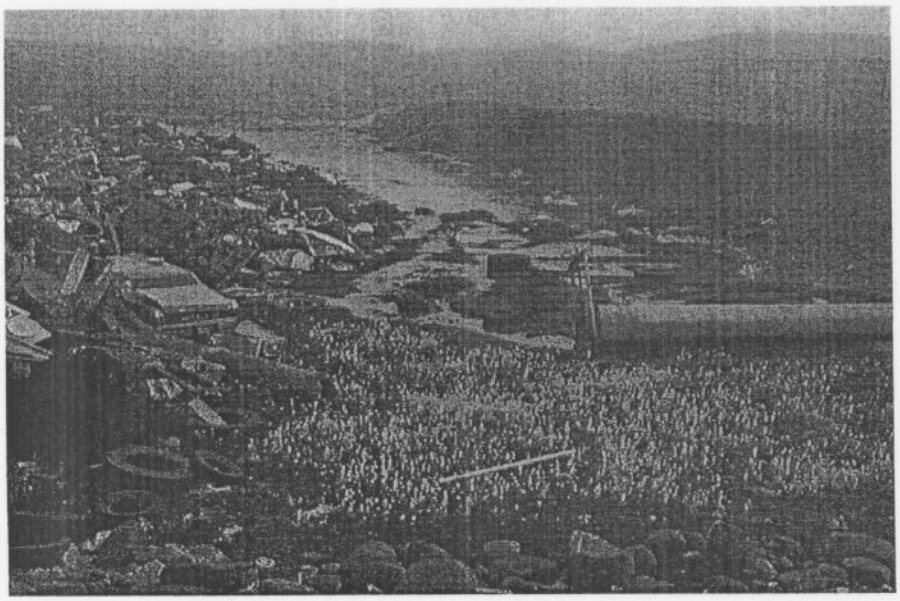

figure 5. Pooled water within the solid waste disposal facility; 2001/09/17.

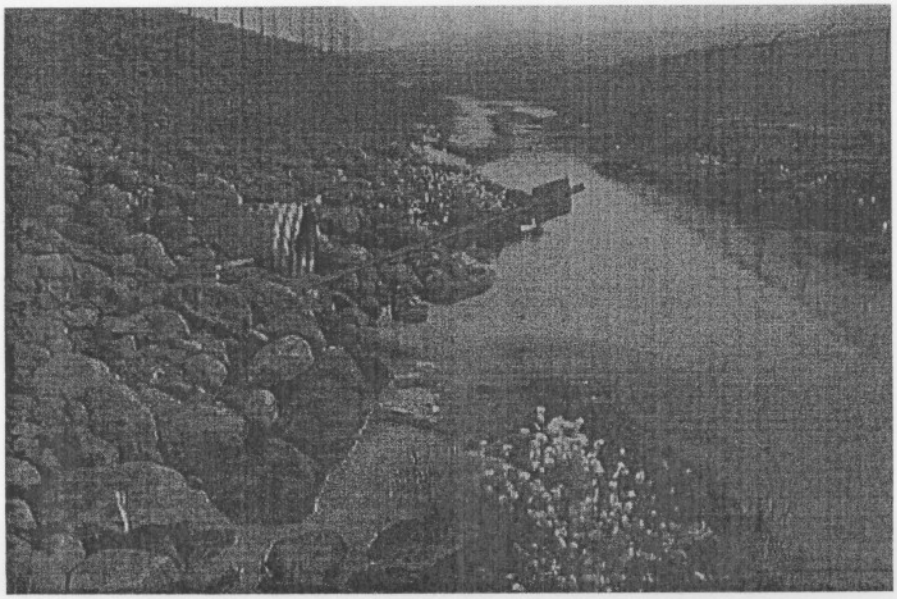

figure 6. Leachate discharge from the solid waste disposal facility; 2001/09/17.