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EXECUTIVE SUMMARY

A visit to collect water, steam condensate and gas samples has been made to the northern Rift Valley in connection with the United Kingdom-Government of Kenya Geothermal Project. The three-week visit was sufficient to accomplish all the sampling necessary to complete the geochemical investigations for Phase 3 of the Project. The samples collected will be analysed in the UK and the results will appear in a research report at a later date.
1. INTRODUCTION AND PURPOSE OF VISIT

This report describes a visit undertaken by W G Darling in connection with the third phase of the UK-GOK Rift Valley Geothermal Project. The main objective of the visit was to carry out the geochemical sampling necessary to complete the Phase 3 investigations.

2. ITINERARY

1 June    Travel to Nairobi
2-3 June  Discussions with Drs Dunkley and Smith (resident team), equipment organisation and preparation.
4 June    Travel to Baringo
5 June    Set up field laboratory. Sampling boiling springs near Namurunu.
6 June    Sampling fumaroles on the Barrier. Resampling of Lorusio hot spring.
7 June    Sampling hot springs, N.E. Suguta Valley.
8 June    Sampling boiling springs, S.E. Bogoria.
9 June    Sampling fumaroles on the Barrier, wells at Parakati and Tum.
10 June   Resampling at Napeiton and Kampi Ya Samaki wells.
11 June   Sample organisation and treatment. Resampling fumarole at Loruk to demonstrate techniques to ODA visitors (A Wood, R Cadwallader).
12 June   Resampling Nginyang Polytechnic well.
13 June   Travel to Ferguson's Gulf, Lake Turkana, sampling Loyangalani warm spring en route. Sampling warm springs at Eliye in pm.
14 June   Sampling fumaroles and spring on North Island (am) and Central Island (pm). Lakewater sampled at each site.
15 June   Travel to Baringo, sampling River Kerio en route.
16 June   Sampling of Arus fumaroles and 'frying pan' springs.
17 June   Sampling Lake Baringo. Travel to Nairobi.
18 June   Sample organisation and treatment.
19 June   Travel to Olkaria, sampling in N.E. Wellfield, search for possible sinter deposits in Olkaria area. Sample Lake Naivasha.
20 June   Sampling fumarole on Suswa ring graben. Return to Nairobi.
21 June   Final discussions with resident team and packing of samples.
22 June   Return to UK.
3. PROGRESS

The resident team of Drs Dunkley and Smith had previously identified sites of geothermal interest as far north as Loyangalani on Lake Turkana, and these were duly sampled. Also for the sake of regional completeness the volcanic centres of North and Central Islands were briefly visited. South Island was overflown but appeared to have no fumarolic activity worth sampling. This visit was therefore sufficient to carry out all the geochemical sampling necessary for the Phase 3 project area. In addition a few sites elsewhere were sampled or resampled in an attempt to answer questions which had arisen during previous work on Phases 1 and 2.

Details of all sample types collected are given in Table 1, while Figure 1 and the Appendix provide locations and other information about samples collected within the Phase 3 area.

4. PRESENT STATUS AND FUTURE WORK

Geochemical sampling for the Phase 3 area has been completed. The samples collected will be airfreighted to the UK where they will be analysed at BGS Wallingford. The results will be reported at a later date.
Figure 1. Map of Sampling Localities
<table>
<thead>
<tr>
<th>Locality</th>
<th>Site No.</th>
<th>Date</th>
<th>Sample Type</th>
<th>Grid Ref</th>
<th>Temp °C</th>
<th>pH</th>
<th>Chem</th>
<th>$\delta^{13}$C</th>
<th>Gases</th>
<th>NaOH</th>
<th>$^3$He/$^4$He</th>
<th>Other</th>
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<td>Lorusio</td>
<td>45</td>
<td>6.6.91</td>
<td>H</td>
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</table>

- H - spring, >50°C; C - borehole or well <50°C; S - surface water; F - fumarole; G - geothermal well
- All grid references to UTM except * which denotes EA grid

**TABLE 1: Geochemical field sampling data**
APPENDIX: Geochemical Sampling Site Details
KENYA RIFT VALLEY GEOTHERMAL PROJECT

HGS/GUK, MEDD DATASHEET FOR WATER SAMPLES

1. Sampled by: W.G.D  
   Sample No: 236  
   Date: 5.6.91  
   Sample type: SPRING  
   Temperature: 95°C

2. Place name: ELBOITONG S.  
   Grid Ref.: BN 2243 2180  
   Altitude (m):  
   Access notes: HELICOPTER

3. Description of springs
   Area of discharge: S. END OF SEVERAL KM OF DISCHARGE AT FOOT OF E. RIFT WALL  
   Number of springs:  
   Flow rates (liters/second):  
   Temperature (Max): 100°C (SLIGHT SUPERHEATING)  
   Temperature (Range): 85 - 100°C  
   Conductivity (µmhos): 7.10  
   pH:  
   Gas (amount and constancy): LARGE AMOUNT CO2  
   Smell:  
   Type of encrustation/alteration: CARBONATE DEPOSITS  
   Photograph: ✓  
   Notes: 

4. Description of streams
   Approx. flow rate (liter/second):  
   Conductivity (µmhos):  
   pH:  
   Photograph:  
   Notes: 

5. Description of borehole sample
   Sample depth:  
   Discharge rate:  
   pH:  
   Conductivity (µmhos):  
   Stratigraphy/Lithology:  
   Notes:  

6. Descriptive notes of other samples (rainwater, lakewater)

7. Description of geological setting
   Faulting (field evidence, photo interpretation):  
   HOT FLUIDS PROBABLY UPEWELLING ALONG FAULT LINE  
   Volcanism (age and type of associated activity):  
   OPPOSITE NAMAKUNU - SEVERAL KM FROM LATE QUATERNARY BASALTS  
   Hydrothermal alteration (general description, sample):  
   Other notes: SAMPLED CHEMISTRY, STABLE ISOTOPES: 513C, GASES, HELIUM ISOTOPES
KENYA RIFT VALLEY GEOTHERMAL PROJECT

IGS/GOK, MERN  DATA SHEET FOR WATER SAMPLES

<table>
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<tr>
<th>Sampled by</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
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<tr>
<td>Sample type</td>
<td>HOT SPRING</td>
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<tr>
<td>Temperature</td>
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</table>

1. **Place name:** ELBOITONG N.
   **Grid Ref.:** BN22522204
   **Altitude (m):** 150.000
   **Access notes:** HELICOPTER

2. **Description of springs**
   **Area of discharge:** SEE DESCRIPTION FOR 236
   **Number of springs:**
   **Flow rates (liters/second):**
   **Temperature (Max):** 9.00
   **Temperature (Range):** LESS OUT THAN 236
   **Conductivity (μmhos):**
   **pH:**
   **Gas (amount and constancy):** LESS OUT THAN 236
   **Smell:**
   **Type of encrustation/alteration:**
   **Photograph:**
   **Notes:**

3. **Description of streams**
   **Approx. flow rate (liter/second):**
   **Conductivity (μmhos):**
   **pH:**
   **Photograph:**
   **Notes:**

4. **Description of borehole sample**
   **Sample depth:**
   **Discharge rate:**
   **pH:**
   **Conductivity (μmhos):**
   **Stratigraphy/lithology:**
   **Notes:**

5. **Description of geological setting**
   **Faulting (field evidence, photo interpretation):**
   **Volcanism (age and type of associated activity):**
   **Hydrothermal alteration (general description, ?sample):**

6. **Descriptive notes of other samples (rainwater, lakewater):**

7. **Other notes:** SAMPLED CHEMISTRY, STABLE ISOTOPES, δ13C, GASES, HELIUM ISOTOPES AND δ18O, 304
KENYA RIFT VALLEY GEOThERMAL PROJECT

RGS/COK, MEND DATA SHEET FOR WATER SAMPLES

1. Sampled by: WHO
   Date: 7.6.91
   Sample type: HOT SPRING
   Temperature: 69.8°C

2. Place name: LOGIPA N.E.
   Grid Ref.: 8N 2314 2490
   Altitude (m):
   Access notes: HELICOPTER

3. Description of springs

   Area of discharge SPRING AT N.E. CORNER OF L. LOGIPA
   Number of springs: 1
   Flow rates (liters/second): 1
   Temperature (Max): 69.8°C
   Temperature (Range):
   Conductivity (µhos):
   pH: 8.85
   Gas (amount and constancy): NONE
   Smell:
   Type of encrustation/alteration
   Photograph
   Notes

4. Description of streams

   Approx. flow rate (liter/second)
   Conductivity (µhos)
   pH
   Photograph
   Notes

5. Description of borehole sample

   Sample depth
   Discharge rate
   pH
   Conductivity (µhos)
   Stratigraphy/lithology
   Notes

6. Descriptive notes of other samples (rainwater, lakewater)

7. Description of geological setting

   Faulting (field evidence, photo interpretation)

   Volcanism (age and type of associated activity)
   S.E. FLANK OF BARRIER

   Hydrothermal alteration (general description, sample)

   Other notes SAMPLED CHEMISTRY, STABLE ISOTOPES, 8°3C, GASES, HELIUM ISOTOPES AND 8°18O - 504
### Kenyan Rift Valley Geothermal Project

**IGS/GUK, MEMD Datasheet for Water Samples**

1. **Sampled by**: [Name withheld]
   **Date**: 14-4-91
   **Sample Type**: HOT SPRING
   **Temperature**: 70.5°C

2. **Place Name**: CENTRAL ISLAND GREEN LAKE
   **Grid Ref.**: 8°27'N 37°4'E
   **Altitude (m)**: [Value withheld]
   **Access Notes**: HELICOPTER (OR BOAT)

3. **Description of Springs**
   - **Area of Discharge**: SEEPAGES ROUND E. SIDE OF CRATER LAKE
   - **Number of Springs**: NUMEROUS BUT V. SMALL (SOME UNDER WATER)
   - **See Sketch Map for 254.7**

4. **Description of Stream**
   - **Approx. Flow Rate (liters/second)**
   - **Conductivity (µmhos)**
   - **pH**
   - **Photograph**
   - **Notes**

5. **Description of Borehole Sample**
   - **Sample Depth**
   - **Discharge Rate**
   - **pH**
   - **Conductivity (µmhos)**
   - **Stratigraphy/Lithology**
   - **Notes**

6. **Descriptive Notes of Other Samples (Rainwater, Lake Water)**

7. **Description of Geological Setting**
   - **Faulting (Field Evidence, Photo Interpretation)**
   - **Springs Feeding Alkaline Crater Lake, on Same Side as Fumarolic Activity**
   - **Volcanism (Age and Type of Associated Activity)**
   - **Late Quaternary (Very Recent)**
   - **Hydrothermal Alteration (General Description, ?Sample)**

8. **Other Notes**: SAMPLED CHEMISTRY AND STABLE ISOTOPES + 818O - SO4
KENYA RIFT VALLEY GEOTHERMAL PROJECT

BGS/CUK, MERD Datasheet for water samples

1. Sampled by: UGO  Sample No: 240
    Date: 13.6.91
    Sample type: SPRING
    Temperature: 35.4°C

2. Place name: ELIYE SPRINGS
    Grid Ref.: 3°15'N 36°2'E 1:50,000 No:
    Altitude (m): Access notes: POSSIBLE BY ROAD

3. Description of springs

   Area of discharge: SPRINGS DISCHARGING IN AND AROUND SMALL LAKE IMPROUNDED BY DAM
   Number of springs: 20 (TOTAL)
   Flow rates (liters/second) 9.00
   Temperature (Max) 9.00
   Temperature (Range) 9.00
   Conductivity (µmhos) 9.00
   pH 9.00
   Gas (amount and constancy) SOME GAS BUBBLES
   Smell
   Type of encrustation/alteration
   Photograph
   Notes

4. Description of streams

   Approx. flow rate (liter/second)
   Conductivity (µmhos)
   pH
   Photograph
   Notes

5. Description of borehole sample

   Sample depth
   Discharge rate
   pH
   Conductivity (µmhos)
   Stratigraphy/lithology
   Notes

6. Descriptive notes of other samples (rainwater, lakewater)

7. Description of geological setting

   Faulting (field evidence, photo interpretation)

   Volcanism (age and type of associated activity)

   Hydrothermal alteration (general description, ?sample)

   Other notes: ON W. EDGE OF L. TORKANA
                 BELT OF SMALL DISCHARGES AND
                 SEEPAGES STRETCHING N. FOR SEVERAL KM
                 SAMPLED CHEMISTRY, STABLE ISOTOPES, δ 18O,
                 GASES, HELIUM ISOTOPES
KENYA RIFT VALLEY GEOTHERMAL PROJECT

BGS/GUK, MEND DATASHEET FOR WATER SAMPLES

1. Sampled by: JREFD
   Date: 13-6-91
   Sample type: SPR
   Temperature: 37.3°C

2. Place name: ELIYE NORTH
   Grid Ref.: 88 L276 8684
   Altitude (m): 1500,000
   EA Grid
   Access notes: POSSIBLE BY VEHICLE

3. Description of springs
   Area of discharge
   Number of springs: 10
   Flow rates (liters/second)
   Temperature (Max)
   Temperature (Range)
   Conductivity (µmhos)
   pH
   Gas (amount and constancy)
   Smell
   Type of encrustation/alteration
   Photograph
   Notes

4. Description of streams
   Approx. flow rate (liter/second)
   Conductivity (µmhos)
   pH
   Photograph
   Notes

5. Description of borehole sample
   Sample depth
   Discharge rate
   pH
   Conductivity (µmhos)
   Stratigraphy/lithology
   Notes

6. Descriptive notes of other samples (rainwater, lakewater)

7. Description of geological setting
   Faulting (field evidence, photo interpretation)
   Volcanism (age and type of associated activity)
   Hydrothermal alteration (general description, ?sample)
   Other notes: SEE REMARKS FOR SITE 140

Sample chemistry: stable isotopes and $\delta^{13}C$.
## KENYA RIFT VALLEY GEOTHERMAL PROJECT

**HGS/GOK, MURD DATASHEET FOR WATER SAMPLES**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>1.</strong> Sampled by</td>
<td>W.S. O.</td>
</tr>
<tr>
<td><strong>Date</strong></td>
<td>18-6-91</td>
</tr>
<tr>
<td><strong>Sample type</strong></td>
<td>SPRING</td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td>89.2°C</td>
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<tr>
<td><strong>2.</strong> Place name</td>
<td>LOYANGALANI</td>
</tr>
<tr>
<td><strong>Grid Ref.</strong></td>
<td>BP 2473 3055</td>
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<td><strong>Altitude (m)</strong></td>
<td>1:50,000 No.:</td>
</tr>
<tr>
<td><strong>Access notes</strong></td>
<td>POSSIBLE BY ROAD</td>
</tr>
</tbody>
</table>

### 1. **Description of springs**

- **Area of discharge:** A FEW SQ METRES
- **Number of springs:** SEVERAL
- **Flow rates (liter/second):** TOTAL 2.0
- **Temperature (Max):**
- **Temperature (Range):**
- **Conductivity (μmhos):**
- **pH:**
- **Gas (amount and constancy):**
- **Smell:**
- **Type of encrustation/alteration:**
- **Photograph:**
- **Notes:**

### 2. **Description of borehole sample**

- **Sample depth**
- **Discharge rate**
- **pH**
- **Conductivity (μmhos):**
- **Stratigraphy/lithology**
- **Notes**

### 3. **Descriptive notes of other samples (rainwater, lakewater)**

### 4. **Description of geological setting**

- **Faulting (field evidence, photo interpretation):**
- **Volcanism (age and type of associated activity):**
- **Hydrothermal alteration (general description, ?sample):**

### 5. **Other notes**

- **Spring in centre of LOYANGALANI near police post. Water appears to be typical rift-wall type (non-volcanic). Sampled for chemistry, stable isotopes, gases, 813C and helium isotopes**
KENYA RIFT VALLEY GEOTHERMAL PROJECT

BGS/GNK, NERD Datasheet for Water Samples

1. Sampled by: WGD Sample No: 243
   Date: 9.6.91
   Sample type: WELL
   Temperature: AMBIENT

2. Place name: PALAKATI MISSION SCHOOL
   Grid Ref: BN 2427 2490 1:50,000 No:
   Altitude (m): POSSIBLE BY VEHICLE
   Access notes: POSSIBLE BY VEHICLE

3. Description of springs
   Area of discharge
   Number of springs
   Flow rates (liters/second)
   Temperature (Max)
   Temperature (Range)
   Conductivity (µhos/)
   pH
   Gas (amount and constancy)
   Smell
   Type of encrustation/alteration
   Photograph
   Notes

4. Description of streams
   Approx. flow rate (liter/second)
   Conductivity (µhos)
   pH
   Photograph
   Notes

5. Description of borehole sample
   Sample depth SURFACE
   Discharge rate UNKNOWN
   pH
   Conductivity (µhos)
   Stratigraphy/lithology
   Notes WELL NEAR SPRING (OUTPUT < 1 L/s)

6. Descriptive notes of other samples (rainwater, lakewater)

7. Description of geological setting
   Faulting (field evidence, photo interpretation)

   Volcanism (age and type of associated activity)

   Hydrothermal alteration (general description, ?sample)

   Other notes WELL SITUATED ON VOLCANIC
   PRE-RIFT BASEMENT ON RIFT SIDE E
   OF LAKE LOGIPI, SAMPLED FOR
   CHEMISTRY, STABLE ISOTOPES AND δ¹³C
KENYA RIFT VALLEY GEOTHERMAL PROJECT

IGCS/GUK, MERED DATA SHEET FOR WATER SAMPLES

1. Sampled by: WGD  Sample No: 244
   Date: 4.6.91
   Sample type: STREAM
   Temperature: ambient

2. Place name: TUM
   Grid Ref.: BN 2544 2383
   Altitude (m): 150,000 No.
   Access notes: POSSIBLE BY VEHICLE

3. Description of springs
   Area of discharge
   Number of springs
   Flow rates (liters/second)
   Temperature (Max)
   Temperature (Range)
   Conductivity (μmhos)
   pH
   Gas (amount and constancy)
   Smell
   Type of encrustation/alteration
   Photograph
   Notes

4. Description of streams
   Approx. flow rate (liter/second)
   Conductivity (μmhos)
   pH: 7.55
   Photograph
   Notes: SAMPLE COLLECTED FROM PIPE FEEDING RESERVOIR Intake several hundred metres higher on E. rift wall.

5. Description of borehole sample
   Sample depth
   Discharge rate
   pH
   Conductivity (μmhos)
   Stratigraphy/lithology
   Notes

6. Descriptive notes of other samples (rainwater, lakewater)

7. Description of geological setting
   Faulting (field evidence, photo interpretation)
   Volcanism (age and type of associated activity)
   Hydrothermal alteration (general description, sample)
   Notes
   Other notes: TYPICAL RIFT WALL WATER Sampled for chemistry and stable isotopes.
KENYA RIFT VALLEY GEOTHERMAL PROJECT

NCG/CUK, NEKED DATASHEET FOR WATER SAMPLES

1. Sampled by: WJD
Date: 15.6.91
Sample Type: RIVER
Temperature: AMBIENT

2. Place name: R. KERID AT LOKORI
Grid Ref.: 3N 2122 1667
Altitude (m):
Access notes: ROAD BRIDGE

3. Description of springs

Area of discharge:
Number of springs
Flow rates (liters/second)
Temperature (Max)
Temperature (Range)
Conductivity (µhos)
pH
Gas (amount and constancy)
Smell
Type of encrustation/alteration
Photograph
Notes

4. Description of site

Approx. flow rate (liter/second): LARGE RIVER (AMOUNT UNCERTAIN)
Conductivity (µhos)
pH
Photograph
Notes: COPIOUS AMOUNTS OF SEDIMENT IN SUSPENSION

5. Description of borehole sample

Sample depth
Discharge rate
pH
Conductivity (µhos)
Stratigraphy/lithology
Notes

6. Descriptive notes of other samples (rainwater, lakewater)

7. Description of geological setting

Faulting (field evidence, photo interpretation)
Volcanism (age and type of associated activity)
Hydrothermal alteration (general description, ?sample)

Other notes: SAMPLED FOR CHEMISTRY AND STABLE ISOTOPES
KENYA RIFT VALLEY GEOTHERMAL PROJECT

1. Sampled by : W&D
   Date : 14.6.91
   Sample type: LAKESWATER
   Temperature: AMBIENT

2. Place name : NORTH ISLAND
   Grid Ref. : BH 2384 9500
   Altitude (m): 1:50,000 No.: EA GRID
   Access notes: HELICOPTER OR BOAT

3. Description of springs
   Area of discharge
   Number of springs
   Flow rates (liters/second)
   Temperature (°C)
   Temperature (Range)
   Conductivity (µmhos)
   pH
   Gas (amount and constancy)
   Smell
   Type of encrustation/alteration
   Photograph
   Notes

4. Description of streams
   Approx. flow rate (liter/second)
   Conductivity (µmhos)
   pH
   Photograph
   Notes

5. Description of borehole sample
   Sample depth
   Discharge rate
   pH
   Conductivity (µmhos)
   Stratigraphy/lithology
   Notes

6. Descriptive notes of other samples (rainwater, lakewater)
   SAMPLE OF L. TURKANA COLLECTED ON THE WESTERN SIDE OF NORTH ISLAND
   PH 9.45. SEE SKETCH MAP FOR SITE 252.

7. Description of geological setting
   Faulting (field evidence, photo interpretation)

   Volcanism (age and type of associated activity)

   Hydrothermal alteration (general description, sample)

   Other notes: SAMPLED FOR CHEMISTRY AND STABLE ISOTOPES
KENYA RIFT VALLEY GEOTHERMAL PROJECT

RGS/GUR, MERD DATA SHEET FOR WATER SAMPLES

1. Sampled by: WGD  
Sample No: 247
Date: 14.6.91  
Sample type: LAKEWATER  
Temperature: AMBIENT

2. Place name: CENTRAL ISLAND  
Grid Ref.: 3°28'N 37°3'E 1:50,000 No.:  1
Altitude (m):  
Access notes: HELICOPTER OR BOAT. SEE SKETCH MAP FOR SITE 254

3. Description of springs

<table>
<thead>
<tr>
<th>Area of discharge</th>
<th>Number of springs</th>
<th>Flow rates (liters/second)</th>
<th>Temperature (Max)</th>
<th>Temperature (Range)</th>
<th>Conductivity (μmhos)</th>
<th>pH</th>
<th>Gas (amount and constancy)</th>
<th>Smell</th>
<th>Type of encrustation/alteration</th>
<th>Photograph</th>
<th>Notes</th>
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4. Description of streams

<table>
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<tr>
<th>Approx. flow rate (liters/second)</th>
<th>Conductivity (μmhos)</th>
<th>pH</th>
<th>Photograph</th>
<th>Notes</th>
</tr>
</thead>
</table>

5. Description of borehole sample

Sample depth  
Discharge rate  
pH  
Conductivity (μmhos)  
Stratigraphy/lithology  
Notes

6. Descriptive notes of other samples (rainwater, lakewater)

SAMPLE OF LAKE TURKANA COLLECTED ON THE NORTH SIDE OF CENTRAL ISLAND. LESS SUSPENDED MATTER THAN FOR N. ISLAND. pH 9.45

7. Description of geological setting

Faulting (field evidence, photo interpretation)

Volcanism (age and type of associated activity)

Hydrothermal alteration (general description, ?sample)

Other notes SAMPLED FOR CHEMISTRY AND STABLE ISOTOPES
### KENYA RIFT VALLEY GEOTHERMAL PROJECT

**NGS/GOK, MERD DATASHEET FOR WATER SAMPLES**

| 1. Sampled by: | W.G.D. | Sample No: 249 |
| Date: | 6-6-81 |
| Sample type: | FUMAROLE |
| Temperature: | 92.8°C |

| 2. Place name: | KAKORININGA RINGE |
| Grid Ref.: | NN 2106 2562 |
| Altitude (m): | |
| Access notes: | HELICOPTER |

| 3. Description of springs |
| Area of discharge |
| Number of springs |
| Flow rates (liters/second) |
| Temperature (Max) |
| Temperature (Range) |
| Conductivity (µmhos) |
| pH |
| Gas (amount and constancy) |
| Smell |
| Type of encrustation/alteration |
| Photograph |
| Notes |

| 4. Description of streams |
| Approx. flow rate (liter/second) |
| Conductivity (µmhos) |
| pH |
| Photograph |
| Notes |

| 5. Description of borehole sample |
| Sample depth |
| Discharge rate |
| pH |
| Conductivity (µmhos) |
| Stratigraphy/lithology |
| Notes |

| 6. Descriptive notes of other samples (rainwater, lakewater) |
| WEAK FUMAROLE. pH 7.5. LOW GAS. |

| 7. Description of geological setting |
| Faulting (field evidence, photo interpretation) |

Volcanism (age and type of associated activity): KAKORININGA IS THE MAIN RECENT BARRIER VOLCANO (TELEK AND ANDREWS TO THE N. AND S. RESPECTIVELY.)

Hydrothermal alteration (general description, sample)

Other notes:

*SAMPLED FOR CHEMISTRY & STABLE ISOTOPES*
KENYA RIFT VALLEY GEOTHERMAL PROJECT

BGS/GUR, NERC DATA SHEET FOR WATER SAMPLES

1. Sampled by: WD Sample No: 249
   Date: 6.6.91
   Sample type: FUMAROLE
   Temperature: 94.0°C

2. Place name: KAKORINYA WEST WALL
   Grid Ref.: BN 230B 2562
   Altitude (m): 150,000 No.
   Access notes: HELICOPTER

3. Description of springs
   Area of discharge
   Number of springs
   Flow rates (liters/second)
   Temperature (Max)
   Temperature (Range)
   Conductivity (μmhos)
   pH
   Gas (amount and constancy)
   Smell
   Type of encrustation/alteration
   Photograph
   Notes

4. Description of streams
   Approx. flow rate (liter/second)
   Conductivity (μmhos)
   pH
   Photograph
   Notes

5. Description of borehole sample
   Sample depth
   Discharge rate
   pH
   Conductivity (μmhos)
   Stratigraphy/lithology
   Notes

6. Descriptive notes of other samples (rainwater, lakewater)
   MEDIUM TO WEAK FUMAROLE, SOME CO2 DETECTABLE, pH 5.40

7. Description of geological setting
   Faulting (field evidence, photo interpretation)

   Volcanism (age and type of associated activity)
   SEE 248

   Hydrothermal alteration (general description, sample)

   Other notes
   SAMPLED FOR CHEMISTRY, ISOTOPES,
   GASES, HELIUM ISOTOPES
KENYA RIFT VALLEY GEOTHERMAL PROJECT

HCS/GOK, NERD DATASHEET FOR WATER SAMPLES

1. Sampled by: LFOE Sample No: 250
   Date: 9.6.91
   Sample type: FUMAROLE
   Temperature: 94.4°C

2. Place name: KAKORINYA S.S.E.
   Grid Ref.: BN 2310 2555 1:50,000 No.: A
   Altitude (m): Access notes: HELICOPTER

3. Description of springs
   Area of discharge
   Number of springs
   Flow rates (liters/second)
   Temperature (Max)
   Temperature (Range)
   Conductivity (µmhos)
   pH
   Gas (amount and constancy)
   Smell
   Type of encrustation/alteration
   Photograph
   Notes

4. Description of streams
   Approx. flow rate (liter/second)
   Conductivity (µmhos)
   pH
   Photograph
   Notes

5. Description of borehole sample
   Sample depth
   Discharge rate
   pH
   Conductivity (µmhos)
   Stratigraphy/lithology
   Notes

6. Descriptive notes of other samples (rainwater, lakewater)
   FUMAROLES ON ROCKY MOUND. LOW CO₂.
   pH 6.10

7. Description of geological setting
   Faulting (field evidence, photo interpretation)

   Volcanism (age and type of associated activity)
   SEE 248

   Hydrothermal alteration (general description, ?sample)

   Other notes
   SAMPLED FOR CHEMISTRY, STABLE ISOTOPES,
   GASES AND HELIUM ISOTOPES
KENYA RIFT VALLEY GEOTHERMAL PROJECT

1. Sampled by: *Lito*
   Sample No: 231
   Date: 9.6.91
   Sample type: Fumarole
   Temperature: 92.9°C

2. Place name: *Kakorinya S.W.*
   Grid Ref.: BN 2295 2557
   Altitude (m): HELICOPTER
   Access notes: HELICOPTER

3. Description of Springs
   Area of discharge
   Number of springs
   Flow rates (liters/second)
   Temperature (Max)
   Temperature (Range)
   Conductivity (µmhos)
   pH
   Gas (amount and constancy)
   Smell
   Type of encrustation/alteration
   Photograph
   Notes

4. Description of Streams
   Approx. flow rate (liter/second)
   Conductivity (µmhos)
   pH
   Photograph
   Notes

5. Description of borehole sample
   Sample depth
   Discharge rate
   pH
   Conductivity (µmhos)
   Stratigraphy/lithology
   Notes

6. Descriptive notes of other samples (rainwater, lakewater)
   Fair amount of steam but very little gas.
   pH 6.55

7. Description of geological setting
   Faulting (field evidence, photo interpretation)
   Volcanism (age and type of associated activity)
   See 248
   Hydrothermal alteration (general description, sample)
   Other notes
   Sampled for chemistry and stable isotopes
KENYA RIFT VALLEY GEOTHERMAL PROJECT

BG/UK, MEDD DATASHEET FOR WATER SAMPLES

1. Sampled by: WARD
   Date: 14/6/91
   Sample type: FUMAROLE
   Temperature: 95.5°C

2. Place name: NORTH ISLAND - SLOPE
   Grid Ref.: 88 2392 9484
   Altitude (m):
   Access notes: HELICOPTER OR BOAT

3. Description of springs

   Area of discharge
   Number of springs
   Flow rates (liters/second)
   Temperature (Max)
   Temperature (Range)
   Conductivity (µhos)
   pH
   Gas (amount and constancy)
   Smell
   Type of encrustation/alteration
   Photograph
   Notes

4. Description of streams

   Approx. flow rate (liter/second)
   Conductivity (µhos)
   pH
   Photograph
   Notes

5. Description of borehole sample

   Sample depth
   Discharge rate
   pH
   Conductivity (µhos)
   Stratigraphy/lithology
   Notes

6. Descriptive notes of other samples (rainwater, dewwater)

   FAIRLY VIGOROUS, GALLY FUMAROLE
   DEPOSITING NATIVE SULPHUR
   pH = 4.55 - SULPHURIOUS SMELL

7. Description of geological setting

   Faulting (field evidence, photo interpretation)

   Volcanism (age and type of associated activity)

   Hydrothermal alteration (general description, ?sample)

   Other notes

   SAMPLED FOR CHEMISTRY, STABLE ISOTOPES, GASES, HELIUM ISOTOPES
   AND SULPHUR
KENYA RIFT VALLEY GEOTHERMAL PROJECT

BGS/GUK, Herd DATA SHEET FOR WATER SAMPLES

1. Sampled by: WGD
   Date: 14.6.91
   Sample type: Fumarole
   Temperature: 95.9°C

2. Place name: CENTRAL ISLAND - SUMMIT
   Grid Ref.: BH 2391 9482
   Altitude (m): 1:50,000 No.
   Access notes: HELICOPTER OR BOAT

3. Description of springs
   Area of discharge
   Number of springs
   Flow rates (liter/second)
   Temperature (Max)
   Temperature (Range)
   Conductivity (µmhos)
   pH
   Gas (amount and constancy)
   Smell
   Type of encrustation/alteration
   Photograph
   Notes

4. Description of streams
   Approx. flow rate (liter/second)
   Conductivity (µmhos)
   pH
   Photograph
   Notes

5. Description of borehole sample
   Sample depth
   Discharge rate
   pH
   Conductivity (µmhos)
   Stratigraphy/lithology
   Notes

6. Descriptive notes of other samples (rainwater, lakewater)
   FAIRLY VIGOROUS, GASY FUMAROLE,
   SULPHUROUS SMELL. pH = 5.80
   HIGHER WATER/GAS RATIO THAN 752

7. Description of geological setting
   Faulting (field evidence, photo interpretation)

   Volcanism (age and type of associated activity)

   Hydrothermal alteration (general description, sample)

   Other notes
   SAMPLED FOR CHEMISTRY,
   STABLE ISOTOPES, GAS AND HELIUM
   ISOTOPE
### KENYA RIFT VALLEY GEOTHERMAL PROJECT

**Datasheet for water samples**

1. **Sampled by:** WGD  
   **Date:** 14.6.91  
   **Sample type:** Fumarole  
   **Temperature:** 97.5°C

2. **Place name:** CENTRAL ISLAND - LOWER  
   **Grid Ref.:** 8°27'N 33°4'E  
   **Altitude (m):**  
   **Access notes:** HELICOPTER OR BOAT

3. **Description of springs**
   - **Area of discharge**
   - **Number of springs**
   - **Flow rates (liters/second)**
   - **Temperature (Max)**
   - **Temperature (Range)**
   - **Conductivity (µmhos)**
   - **pH**
   - **Gas (amount and constancy)**
   - **Smell**
   - **Type of encrustation/alteration**
   - **Photograph**
   - **Notes**

4. **Description of streams**
   - **Approx. flow rate (liter/second)**
   - **Conductivity (µmhos)**
   - **pH**
   - **Photograph**
   - **Notes**

5. **Description of borehole sample**
   - **Sample depth**
   - **Discharge rate**
   - **pH**
   - **Conductivity (µmhos)**
   - **Stratigraphy/Lithology**
   - **Notes**

6. **Descriptive notes of other samples (rainwater, lakewater)**
   - **FAIRLY VIGOROUS, GASY FUMAROLE IN ZONE OF INTENSE ALTERATION. SULPHUROUS SMELL, NATIVE SULPHUR. pH = 5.85**

7. **Description of geological setting**
   - **Faulting (field evidence, photo interpretation)**
   - **Volcanism (age and type of associated activity)**
   - **Hydrothermal alteration (general description, sample)**

8. **Other notes**
   - **SAMPLED FOR CHEMISTRY, STABLE ISOTOPES, GASES, HELIUM ISOTOPES**
KENYA RIFT VALLEY GEOTHERMAL PROJECT

HGS/GOR, MUIR Datasheet for Water Samples

1. Sampled by: WGD
   Date: 14-6-91
   Sample type: Fumarole
   Temperature: 97.4°C

2. Place name: CENTRAL ISLAND - UPPER
   Grid Ref.: 207'N 37°E 1:50,000 No.:
   Altitude (m):
   Access notes: HELICOPTER OR BOAT

3. Description of springs
   Area of discharge
   Number of springs
   Flow rates (liters/second)
   Temperature (Max)
   Temperature (Range)
   Conductivity (µmhos)
   pH
   Gas (amount and constancy)
   Smell
   Type of encrustation/alteration
   Photograph
   Notes

4. Description of streams
   Approx. flow rate (liter/second)
   Conductivity (µmhos)
   pH
   Photograph
   Notes

5. Description of borehole sample
   Sample depth
   Discharge rate
   pH
   Conductivity (µmhos)
   Stratigraphy/lithology
   Notes

6. Description of other samples (rainwater, lakewater)
   EXTREMELY VIGOROUS FUMAROLE, ABLE TO LIFT SMALL PIECES OF CLAY OR ROCK.
   HIGH WATER/GAS RATIO. SULPHUROUS SMELL. pH = 5.70

7. Description of geological setting
   Faulting (field evidence, photo interpretation)
   Volcanism (age and type of associated activity)
   Hydrothermal alteration (general description, sample)
   Notes

Other notes
   SAMPLED FOR CHEMISTRY, ISOTOPES, GASES, HELIUM ISOTOPES.
MONITORING REPORT: ACTION SUMMARY SHEET

NB This sheet should be kept prominently on file until all recommended action taken or otherwise dealt with. Then to be filed with Monitoring Report as Key Document.

<table>
<thead>
<tr>
<th>Project/Programme</th>
<th>KENYA RIFT VALLEY GEOTHERMAL PROJECT PHASE 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name(s) of Monitor(s)</td>
<td>MR W G DARLING</td>
</tr>
<tr>
<td>Date of Monitoring Visit</td>
<td>1-22 JUNE 1991</td>
</tr>
</tbody>
</table>

**SUMMARY OF RECOMMENDED ACTION IN ORDER OF IMPORTANCE**

<table>
<thead>
<tr>
<th>Recommended Action</th>
<th>Recommended Timing</th>
<th>Action to be Initiated by</th>
<th>Recommendation considered: approved action (if any) taken (initials and date)</th>
<th>See Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO ACTION REQUIRED</td>
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