AN APPRAISAL OF THE NATURE OF FINE SETTLEABLE MATERIAL FROM ALICE SPRINGS WATER BORES.
By arrangement with Mr. Tad Soroczyński of Planning Branch Darwin, Mr. John Verhooven of Water Division Alice Springs was requested by telex on 11/2/82 to send to East Point Laboratory, 10 litre water samples from each operational water supply bore at Alice Springs.

13 samples were received for determination of suspended solids. A microscopic examination was made of the material left on the filter, after filtration of about 10 litres of water through a Sartorius 47 mm diameter membrane filter (filter type SM1406), with a 0.47 micron pore size.

All samples have the same R.S.P. and job number and were sampled at the bore by K. Steers of Alice Springs. The bores are listed below together with the suspended solids results.

R.S.P. No. 157
Job No. WSA 127-3460
Sampler K. Steers.

<table>
<thead>
<tr>
<th>R.N.</th>
<th>Bore</th>
<th>L.P.S.</th>
<th>Sampled</th>
<th>Susp. Solids</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6985</td>
<td>1A</td>
<td>14</td>
<td>16/2/82</td>
<td>0.10 mg/L</td>
<td></td>
</tr>
<tr>
<td>3738</td>
<td>1</td>
<td>10</td>
<td>17/2/82</td>
<td>0.23</td>
<td></td>
</tr>
<tr>
<td>5728</td>
<td>3</td>
<td>9</td>
<td>16/2/82</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>4437</td>
<td>4</td>
<td>13</td>
<td>16/2/82</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>4969</td>
<td>5</td>
<td>15</td>
<td>17/2/82</td>
<td>0.87</td>
<td></td>
</tr>
<tr>
<td>9003</td>
<td>6</td>
<td>7</td>
<td>18/2/82</td>
<td>5.30</td>
<td></td>
</tr>
<tr>
<td>6519</td>
<td>7</td>
<td>30</td>
<td>18/2/82</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>6986</td>
<td>10</td>
<td>10</td>
<td>17/2/82</td>
<td>0.64</td>
<td></td>
</tr>
<tr>
<td>10500</td>
<td>12</td>
<td>47</td>
<td>17/2/82</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>10501</td>
<td>13</td>
<td>32</td>
<td>18/2/82</td>
<td>0.11</td>
<td></td>
</tr>
<tr>
<td>11161</td>
<td>14</td>
<td>35</td>
<td>18/2/82</td>
<td>0.18</td>
<td></td>
</tr>
<tr>
<td>11334</td>
<td>15</td>
<td>85</td>
<td>18/2/82</td>
<td>0.46</td>
<td></td>
</tr>
<tr>
<td>11168</td>
<td>16</td>
<td>85</td>
<td>18/2/82</td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td>11182</td>
<td>17</td>
<td>85</td>
<td>18/2/82</td>
<td>0.27</td>
<td></td>
</tr>
</tbody>
</table>

Below are descriptions of the materials left on the filters after passing approximately 10 litres through the filters. The examinations were made microscopically using a Zeiss DVM Sterioscroscope, at magnifications varying from 10 to 80 times.
The description of the field of view seen in the microscope at a magnification of 25 is that of a scattering of light brown particles, specks of black material, larger pieces of brown material, a scattering of clear and black fibres.

(1) A number of very small grains of clear crystalline quartz material - roughly spherical in shape. Size generally much less than 0.1 mm diameter.

(2) Few very small grains of irregularly shaped brown material possibly iron, some roughly spherical in shape. Size generally about 0.3 mm diameter, down.

(3) Several very small grains of green coloured material - probably iron carbonate - size less than 0.1 mm length.

(4) Few very irregularly shaped black mineral particles, unidentified, size roughly 1 mm and less.

(5) Numerous minute light brown crystalline particles - could be quartz, stained with iron.

(6) A number of clear fibres, and black fibres - organic, several cm in length, much less than 0.1 mm dia - cannot identify, but might be contamination from the atmosphere, or during sampling.

(7) Few pieces of dark brown fiberous material, several fibres lying together to make the piece 1 mm long.

RN 3738 - Production Bore 1 - Suspended Solids 0.23 mg/L.

The description of the field seen in the microscope at a magnitude of 25, is that of numerous brown, irregularly shaped particles with a scattering of light green irregularly shaped pieces and a sprinkling of rounded glassy, clear particles. A small sprinkling of irregularly shaped green particles are noted, together with a number of clear to white, and black fibres.

(1) Many pieces of irregularly shaped dark brown to light brown material - iron oxide or rust, size 1 mm in length down to fractions of a mm. Some large pieces include specks of light green material, possibly iron carbonate. Brown material confirmed as iron.

(2) Few rounded particles, very light brown/clear - probably quartz stained with iron, size 0.1 mm dia, down.

(3) Few irregular shaped pieces of pale green/brown material, probably iron carbonate. About 1 mm in length and 0.5 mm in width.
(4) Few irregular shaped pale green pieces of inorganic material, varying from roughly 0.75 mm in length, down. Confirmed by test as iron carbonate.

(5) Sample contains white, clear and black fibres about 1 to several mm in length, less than 0.1 mm diameter. Could be adventitious material, and contamination from the atmosphere or during sampling.

FN 5728 - Production Bore 3 - Suspended Solids 0.1 mg/L

The description of the field of view seen in the microscope at a magnification of 25 is that of a scattering of clear, brown and black particles, interspaced with a few clear and black fibres.

(1) A few very small grains of clear crystalline material about 0.1 mm dia and less.

(2) Very small grains of brown crystalline material - probably quartz stained with iron about 0.1 mm dia, and less.

(3) One piece of light grey/brown crystalline material, size about 1 mm square, composed of many smaller crystalline particles brown and black in colour, also clear particles. Gives the impression of numerous individual particles stuck together.

(4) Few particles of organic material unidentified, but could be small part of an insect or small organism.

(5) Few clear, glassy rounded crystalline particles, roughly less than 0.1 mm dia - probably quartz.

(6) One or two grains of clear/brown crystalline material about 0.3 mm dia, roughly rounded.

(7) Few very irregular shaped black minerals.

(8) Few black and clear unidentified fibres through the field of view, some fibres twined together, length several mm, and less than 0.1 mm dia.

FN 4437 - Production Bore 4 - Suspended Solids 0.10 mg/L

The description of the field of view seen in the microscope at a magnification of 25, is that of a scattering of a number of brown irregularly shaped particles (some tending to be spherical and giving the impression of being growth of iron material), interspaced with clear and black fibres, and small, colourless crystalline fragments.
(1) A number of brown, mud-like particles present as well as discrete, irregularly shaped brown particles of iron material, of various sizes of 0.5 mm dia down.

(2) Compared with the brown iron type particles, there was present in the field of view a scattering of clear, crystalline irregular shaped, fragment like particles, probably quartz.

(3) A few clear, brown and black fibres present unidentified, 1 to several mm in length, 0.1mm dia. May be adventitious material from the atmosphere or contamination during day sampling.

RN 4969 - Production Bore 5 - Suspended Solids 0.87 mg/L

The description of the field of view seen in the microscope at a magnification of 25, is that of very numerous, brown particles of greatly varying shapes and sizes. The impression is that the brown material is an iron incrustation which has flaked off a smooth surface, a few fibres can be seen interspaced between the brown particles, together with a few pieces of light green iron carbonate, and particles of quartz and mica-like material.

(1) Very numerous dark brown irregularly shaped pieces of iron material from about 1 mm in dia, or length, down to very small fractions of a mm diameter.

(2) Few pieces of green material - iron carbonate, irregular shapes - size 0.1 mm length or dia down.

(3) A few pieces of flattened brown iron material giving the impression that pieces have flaked off a flat surface.

(4) NOTE:- There is an absence of the large numbers of various coloured fibres seen in other samples. A few fibres were seen.

(5) A few small pieces of quartz and mica-like material seen - less than 0.1 mm dia or length.

RN 5003 - Production Bore 6 - Suspended Solids 5.30 mg/L

The description of the field of view seen in the microscope at a magnification of 25, is that of a large number of irregularly shaped particles of dark brown "chunky" iron material, of various sizes, interspaced with a few pieces of green iron carbonate material, a few fibres, and specks of irregularly shaped glassy quartz material and flat mica-like material.

(1) Numerous large brown to dark brown, irregularly shaped chunks of iron material - varying in size from 1 mm diameter or length down to very small size - looks like rust material, and tests prove it to be essentially iron.
(2) At least 6 larger chunks of brown iron material - irregularly shaped 3 mm in length.

(3) Some iron material (pieces) appear to be broken from a continuous layer or incrustation.

(4) Very few green coloured iron carbonate particles of irregular shape present, less than 0.1 mm diameter or length.

(5) A number of small particles of quartz material present, together with small, flat, mica-like matter.

(6) One piece of rod-like, clear crystalline glassy material present - distinct sides, perhaps 6-8 sides - about 0.8 mm long, about 0.2 mm wide.

(7) A number of clear and black unidentified organic fibres present varying in size - from several mm in length down.

(8) Few dark brown pieces fibrous material - a number of fibres lying together to make up the piece. Looks like it could be part of a root.

NW 6519 - Production Bore 7 - Suspended solids 0.25 mg/L

The description of the field seen in the microscope at a magnification of 25 is that of a scattering of irregular shaped brown, black and green particles, interspaced with a few quartz particles and fibres.

(1) Few brown pieces of material, irregularly shaped - iron containing material - size 0.2 mm dia, down.

(2) Few clear, glassy particles, roughly spherical in shape. 0.5mm dia, down.

(3) Few pieces green, irregularly shaped material - probably iron carbonate.

(4) Few pieces irregularly shaped black material, - inorganic.

(5) Few pieces of what looks like dried organic material, very irregular shaped - unidentified - size roughly 2mm dia, down.

(6) Few clear and black, pink, unidentified organic fibres present.

(7) A large piece of light brown fibrous material, unidentified organic material, several mm in length, 1-1.5 mm width.

(8) Suggest that (6) and (7) may be adventitious material, contamination from the sample bottle, the sampling process or from the atmosphere.
RN 6986 Production Bore 10 - Suspended Solids 0.64 mg/L

The description of the field seen in the microscope at a magnification of 25, is that of a few, light brown irregular shaped particles being made up of numerous smaller particles, interspaced with a few clear fibres, and individual particles of glassy quartz material and some flat mica-like particles.

(1) Few light brown irregular shaped crystalline, glassy pieces of material say 1-7 mm dia, roughly, and made up of a large number of individual crystalline particles. When a larger piece is brought into contact with concentrated hydrochloric acid, then it immediately decays into many irregular shaped, small glassy acid insoluble particles.

(2) Few clear, pink and blue individual fibres present - probably organic - size several mm in length, down, less than 0.1 mm dia.

(3) Few larger pieces of sticky, irregularly shaped, clear to brown coloured amorphous organic material present.

(4) Few individual particles of quartz like material present - roughly 0.1 mm dia, and less.

RN 10500 - Production Bore 12 - Suspended Solids 0.32 mg/L

The description of the field seen in the microscope at a magnification of 25, was that of one or two large pieces of crystalline, inorganic material of irregular shape, composed of many smaller particles of light and dark brown crystalline irregularly shaped particles cemented together, surrounded by very numerous very small dark brown, light brown and colourless particles, some fibres, and larger glassy crystalline quartz particles.

(1) Numerous small grains of inorganic material, some brown in colour, some colourless, size generally about 0.01 mm or less.

(2) A piece of inorganic crystalline, irregularly shaped, size roughly 1.5 mm dia, brown in colour consisting of numerous smaller particles of generally crystalline material cemented together.

(3) Few grains of colourless irregularly shaped, crystalline quartz - size 0.5 mm dia and less, some light brown and clear.

(4) Few pieces of green coloured irregular shaped crystalline material, probably iron carbonate, size 0.1 mm in length or dia.

(5) Scattering of pink, clear and black fibres present, varying in size from several mm in length and much less than 0.1 mm in dia - probably organic in nature.

(6) Several pieces of irregularly shaped, dark brown material consisting of fibres lying parallel - could be part of a root.
RN 10501 - Production Bore 13 - Suspended Solids 0.11 mg/L

The description of the field seen in the microscope at a magnification of 25, was that of a scattering of brown and dark brown irregular shaped particles of various sizes interspaced with fibre, some colourless crystalline particles.

(1) Few larger particles, dark grey, dark brown in colour, iron containing irregular shaped - size order of 1 mm length or diameter, down.

(2) Numerous small inorganic particles, clear, brown and black in colour, usually much less than 0.1 mm in dia.

(3) Couple of flat brown, dark grey inorganic pieces of material which look like they might have flaked off something - probably composed of iron.

(4) Some colourless, dark blue, light brown, black fibres present, perhaps from mm in length, much less than 0.1 mm in width.

(5) One or two dark brown organic fibrous pieces of material present.

(6) One or two pieces of light green, irregularly shaped material present, probably iron carbonate.

RN 11361 - Production Bore 14 - Suspended Solids 0.18 mg/L

The description of the field seen in the microscope at a magnification of 25 was that of scattering of dark brown, light brown iron containing particles varying in size from 1mm dia.down, interspaced with small colourless crystalline particles, brown particles of various shapes and sizes, and a few fibres.

(1) A number of pieces of brown iron bearing materials, generally 0.5 mm or less, in length or diameter, of irregular shape.

(2) A few grains of glassy, spherical shaped colourless to light brown crystalline quartz like material, approx 0.2 mm dia.

(3) One piece of brown material, 1.5 mm in length, 1 mm width, probably containing iron, irregular shaped.

(4) A piece of dark brown mica like material.

(5) Few pieces of dark brown/black fibrous material, composed of several fibres lying together - about 1 mm in length. Other unidentified fibres, organic material found.

(6) Few clear fibres - several mm in length, much less than 0.1 mm dia.

RN 11334 - Production Bore 15 - Suspended Solids 0.46 mg/L

The description of the field seen in the microscope at a magnification of 25, was that of numerous light brown crystalline quartz grains of various sizes interspaced with a few black coloured, inorganic mineral particles and a few fibres.
(1) Numerous light brown essentially individual glassy clear grains of quartz material probably stained with iron, size generally 1 mm dia down, generally irregular in shape but tending to be spherical.

(2) Few clear, glassy, grains of quartz present, size 0.5 mm dia down.

(3) Clear and black fibres present - several mm in length, much less than 0.1 mm dia.

(4) Several pieces of dark brown fibrous material present. Appears as a number of similar fibres lying parallel, stuck together.

(5) Several pieces of mica-like material present.

(6) Several pieces, dark brown crystalline material, 0.75 mm dia, composed of many smaller crystalline brown coloured quartz particles cemented together.

(7) A few colourless and black fibres present - varying from several mm in length, and much less than 0.1 mm dia.

FN 11188 - Production Bore 16 - Suspended Solids 0.21 mg/L

The description of the field of view seen in the microscope at a magnification of 25, was that of a few large chunks of brown/dark greyish coloured material, surrounded by many smaller pieces of similar coloured material, plus individual clear quartz grains and a few fibres.

(1) Numerous pieces of brown, various sized, irregularly shaped, material. Tests proved this to be Calcium Carbonate, coated with a surfacing of iron. Largest particle about 1 mm dia, and sizes reducing to small fractions of mm.

(2) Few pieces of crystalline quartz material present, clear but coated with iron material. A few pieces of clear, uncoloured quartz present. Sizes vary from say 1 mm dia, through to fractions of a mm.

(3) Few pieces of mica-like material present, size 0.75 mm down.

(4) Few coloured and brown/grey fibres present.

FN 11182 - Production Bore 17 - Suspended Solids 0.27 mg/L

The description of the field of view seen in the microscope at a magnification of 25, was that of irregularly shaped brown iron containing particles of various shapes and sizes, interspaced with several types of fibres, some coloured quartz material of various sizes but generally brownish in colour, together with mica-like material and unidentified organic particles. A few particles of crystalline material appear to be composed of a number of smaller crystalline particles cemented together.
(1) Many dark brown, iron containing pieces of material present, irregularly shaped, some flattish in nature, size varying from about 1 mm in length, down. Numerous brown particles present, of very small size, probably tiny fractions of a mm in dia.

(2) Numerous brown coloured, clear quartz particles present, many tending to be spherical in shape, size generally 0.1 mm dia, few larger. One or two about 1 mm in dia, many particles have dia much less than 1 mm.

(3) Few pieces flat, greyish coloured mica-like material present - size 0.5 mm, roughly square.

(4) Few pieces of light green, crystalline material present, probably iron carbonate - size 1 mm down, irregular shape.

(5) A number of clear and dark-grey coloured fibres present, varying from several mm in length, and much less than 0.1 mm in dia. Other coloured fibres present - eg, blue and pink coloured.

(6) Evidence of some crystalline particles being composed of many smaller coloured, crystalline quartz particles.

(7) Pieces of dark brown fibrous material present - may be parts of roots etc.

(8) One or two pieces of material present, probably of some small insect or organism.

SUMMARY

A perusal of the results contained in the previous pages shows that each sample submitted to the laboratory contained measurable, small concentrations of suspended solids. The values detected were very much less than any value which would give concern for a deterioration of the Drinking Water Quality. However, mineral particles, quartz grains, iron particles and very small pieces of organic material found during the microscopic examinations of the suspended solids filtered from each sample, does show that small portions of sandstone and corrosion products are being removed from the aquifer and associated pipework and fitting, during pumping.

It is understood that material of this kind might be the cause of damage to watermeters and the erosion of water fittings. It is suggested that similar samples should be examined when new bores for water supply are equipped and put into use.

(Signed)

HUGH O. WILSON
Senior Chemist
East Point Laboratory
1/4/82