Hydrology report on low flows of Katherine R. at Nixon Crossing.

3/2/63
1) Introduction of the problem:

The planning section has asked for the following information of the Katherine R at Nieuw Crossing:

a) Frequency & duration of minimum flows,

frequency of which flow will fall below requirement (1.35 m/s)

b) Storage; minimum flow; if this is below requirement then for what duration.

c) What is minimum gauge level required to maintain town water supply (0.43 m/s)

In the planning section the statements in a), b), & c) are inadequate, as they are not logical when word 'requirement' is used alone without any qualifying phrases. However, inserting the word 'minimum' before the statements become clear for understanding meeting. It is assumed that this is the purpose.

The following text attempts to furnish, as best answers to these few queries as possible. However, even at the outset, the author must stress the reader that these answers are based mainly on the intuition of the hydrographer for the available records are few & hence both difficult to analyse. Nevertheless, even within the right line, liberal, aspect of the said "intuition", the basic principles of hydrology were strictly adhered to.
2. Frequency & duration of seasonal minimum flows

There is no continuous record of discharges at this station and this is due to the fact that the control is a road crossing, which changes constantly. Thus, varying CTF level, which in turn prevents an installation of instrument to record reliably & truly the stage-discharge relationship of the stream at this locality.

For this reason, frequency & duration of low flows can be assessed from detailed stream flows at this locality. However, since information may still be obtained from using the flow records of 1968-69, the period when the stream flow was measured, this is a questionable system (activity) between these two localities and thus the discharges at Railway Bridge are only a fraction of those experienced at Railway Bridge.

An available record for Railway Bridge runs as follows (all values as mean daily flows in cusec):

<table>
<thead>
<tr>
<th>Month</th>
<th>June</th>
<th>July 2nd</th>
<th>July 15th</th>
<th>July 28th</th>
<th>Aug 9th</th>
<th>Aug 28th</th>
<th>Sept 10th</th>
<th>Oct 1st</th>
<th>Nov 16th</th>
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</thead>
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<td>No.</td>
<td>15.2</td>
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<td>22.5</td>
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<td>272</td>
<td>99 (rise)</td>
<td>70</td>
<td>40</td>
<td>38.5</td>
<td>37</td>
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<td>27.5</td>
<td>27.5</td>
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</tbody>
</table>

Notes:
1) Values marked thus (*) only estimated - recorded sheets for these months were not yet been received (24th week year 1968/69).
2) For the 11 (eleven) years of record there has always been a rise in Dec. every other month of the preceding month (Nov) & thus Dec had been omitted to conserve space.
From the inspection of the table on the previous page, it can be easily seen that the water years 1951/2 and 1952/3 were the least and so far as the "dry season" flows in the Katherine R. at Katherine were concerned, were probably completion with rainfall one could get the stream of the frequency.

There is no question that annual rainfall is a parameter of the discharge of the river (i.e. the discharge is the function of rainfall), but it must be supplemented if we especially take into account the "dry season" flows (any average thing). The temporal distribution of the rainfall is far more important than its annual activity, of course, considering the matter from the point of the catchment area view.

Another point to be considered is the fact that the real "dry season" flows occur later in the year, say in Sept.

As an average, if the annual rainfalls are compared with the "dry season" flows in Sept., some particular years in the 11 (eleven) years of record (see the table below) is remarkable at present (which, in turn, partly reflects the reservoirs stored in the previous beneficial years, not injurious in its sense of meaning due to abundance in book and interpretation that the "water" not excess the lower distribution of rainfall. In this work, the wet season is read (high annual rainfall) it is distinctly that the rainfall would be limited to a month during July, with

<table>
<thead>
<tr>
<th>Year</th>
<th>1952</th>
<th>1953</th>
<th>1954</th>
<th>1955</th>
<th>1956</th>
<th>1957</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept.</td>
<td>27</td>
<td>33</td>
<td>32.5</td>
<td>30.5</td>
<td>40.5</td>
<td>67</td>
</tr>
<tr>
<td>Annual</td>
<td>1431</td>
<td>32.4</td>
<td>13.5</td>
<td>34.2</td>
<td>32.4</td>
<td>55.3</td>
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<tr>
<td>Sept.</td>
<td>1583</td>
<td>1566</td>
<td>1961</td>
<td>1962</td>
<td></td>
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<tr>
<td>Annual</td>
<td>37.0</td>
<td>3301</td>
<td>3726</td>
<td>31.5</td>
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<tr>
<td></td>
<td>23.4</td>
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</table>

The only expected figures in the case for Sept. 1952 as 32.4" which adds up too high, not so much with respect to the corresponding rainfall but mainly not it is, what one can expect.

The discharge values for the dry season 1950 will be re-checked by Hydrology office.
Thus, in spite of all the reservations expressed on this matter, it appears that an attempt may be made to investigate the possible relationship between the annual rainfall and the dry season flow of Katherine River at Katherine.

A table of statistical analysis of annual rainfall at Katherine is attached as sheet W.E.5.

The results of this analysis can be summarized as follows:

a) The period of eleven (11) years for which the stream discharge record is available is not of sufficient length to show the dispersion of annual rainfall during this period was in unrecorded section with the longer period of 29 years of rainfall record available for Katherine.

b) From the point of view, the eleven (11) years thus used probably represented worse conditions to dry season than those based on the amount of actual rainfall only (however, to be noted that there is not the productivity available at present anyway), hence long term rainfall considered.

c) Taking 1947-48 cases in Sept. at Railway Bridge as critical and comparing with the table in the previous page, it can be said that the upper quartile of annual rainfall is of the order of about 200 inches. This in turn suggests the selection of frequency of rainfall floods only and about 15 times its 100 years rainfall should be of that magnitude.

It can be thus said that the dry season flow conditions of the years 1957/58 and 1961/62 should appear 10 times in the railway (surprisingly, in the railway, they are even speeded 7 or 10 times, but, of course, this is more coincidental as any student of statistical mathematics knows).
<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>X</th>
<th>log X</th>
<th>Y</th>
<th>log Y</th>
<th>(log Y)²</th>
<th>(log Y)² - X²</th>
<th>log X - log Y</th>
<th>(log Y)² - X²</th>
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<th>(log Y)² - X²</th>
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<td>40.05</td>
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<td>8.650</td>
<td>2.950</td>
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**Notes:**
1. Number of items = N = 18
2. Sum of X's = ∑X = 721.8
3. Mean = X̄ = 40.105
4. Sum of squares = ∑X² = 2852.9
5. Squared sum = ∑X²/18 = 158.494
6. Correction for sum of squares = ∑X²/18 - (X̄)² = 158.494 - (40.105)² = 158.494 - 160.812 = -2.318
7. Sum of squared deviations = ∑(X²/18) minus ∑X²/18 - (X̄)² = -2.318
8. Variance = s² = 0.023
9. Standard deviation = s = 0.15
10. Mean plus (a) = 40.255
11. Mean minus (a) = 39.955
12. Antilog mean = antilog (-2.318) = 25.9° to be plotted on the 50% chance line (a)
13. Antilog mean plus (a) = antilog (-2.318 + 1.5) = 51.7° to be plotted on the 85% chance line (+)
14. Antilog mean minus (a) = antilog (-2.318 - 1.5) = 14.9° to be plotted on the 15% chance line (-)
15. To draw a straight line through the plotted points (a), (+), (-)
16. To test for the length of record: Use the table below on the assumption; Be 50% confident of the 10-year event then using the computed X read off Y as the minimum acceptable years of record (isotope linear when necessary).
17. Notes.
3) Frequency at which flow will fall below requirement.

This enquiry is really an extension of the line of reasoning
enquired for the previous chapter and is put under separate
heading because the previous section had done so in the review

During the year of 1962 seven (7) gaugings were taken
to various times and various discharges arrived at. These
gaugings are numbered from 12 to 19 and are plotted...

A line of best fit through these points is plotted on
semi-log paper, should closely resemble the trend seen
of the stream at this station. A logarithmic equation of the type
\[ Q = Q_0 e^{-cd} \]

In the present case, \( Q = 7000 \, \text{cusecs} \) at \( d = 0 \) and \( d \) being in
years added, using \( Q = 175 \, \text{cusecs} \) at \( d = 100 \), the value of \( c \)
is found as being \( -0.155 \) then the base flow recession curve at Nicuin crossing appears to follow the equation:

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is found as being \( -0.155 \) then the base flow recession curve at Nicuin crossing appears to follow the equation:
July, other low flows of the order of 20-55 cusecs happened in Oct of 1954 & 55 respectively. From last year (1961-62) average received out at Nivorn Crossing is has been Estimated that in July (the discharge of 57 cusecs at Stirling Bridge), the flow regime was of some 40 cusecs (on sheet 25) a flow significant. The true average flow of 25 cusecs, thus it could be assumed that rainfall in Oct, 54 was 50. 

The flow at Nivorn Crossing was below the required minimum.

A quite precisely this conception is not fully respecting and should need checking, which I may still try to find out. The other trend we can surely analyse, what else we can do with our year of record? — Strictly speaking: warning! Thus, all told, it is better to neglect the worst of remaining as worst feared, when we can have catch. Everything not as easily to the relative theory of the prosecution, but rather to its practical side; we left it again in undetermined and finally theoretical approach were better in surface regulations in the Nature of these words. For example: the main story is very ambiguous's work in the conception it will likely able to understand. This conception is theoretically not sound. To say, instead of set it aside away in practical observations, time to time again.

Thus, in a conclusion of this lengthy, it can be assumed; until further survey by practical measurements on river, the river's reality that only about 10 years to 100 years, the flow at Nivorn Crossing will be below the required min. of 55 cusecs.
Weekly consumption at Katherine as supplied by CDW there:

Week: 3.9.62-10.9.62
Consumer in gls: 1,101,800
23.7.62-30.7.62
25.6.62-2.7.62
18.6.62-25.6.62
5.6.62-11.6.62

Max. hourly capacity of the pumping installation: 9,000 gls.
At max. hourly capacity, the daily capacity is, say, 215,000 gls.
and weekly capacity, say, 1,500,000 gls. respectively.
Thus the figures of the measured consumption during the periods
as shown would have been achieved by continuous operation of
the pumping plant, say, for 74%, 63%, 54%, 48%, and 52% respectively.
In the introduction, it is already pointed out that the 'average annual flow is actually far above the minimum requirement suggesting that there will never be any restriction necessary to impose on water conservation at Katherine. Thus the conception of the average annual minimum flow is erroneous for the problem under consideration and indeed it will be disregarded.

Inspecting the base recession curve on sheet 19E8, it can be seen that the minimum requirement of 185 cu.mes is attained approx. 115-120 days after the stream was discharged. This occurs on or about Sep 1st at Katherine. Further, from the record, it is evident that in this (eleven) year the river was always rising in Dec. Thus the critical period appears to be at the middle of some two months, say, 50-70 days when the water had to be retained. And again, it has been already found that rains are in July. If the theory holds fast, it is expected, on average, 5 out of 10 year occasions of 100 years.

Thus it can be summarized as follows: it is likely that the water will have to be retained for two months once in ten years (again, it must be thinned — not unnecessarily evenly spread).

Of course, locating in one's mind, the relationships of discharge at Railway Bridge, to those at Katherine, necessitating elaborated on the sheet 19E7.
5) What is the min gauge height to maintain 0.43 cu sec

In the response mentioned on page 2 of the first paragraph, this question is unanswered for this time being. However, a suggestion has been already put forward to consider building of a rectangular weir at Niew Crossing & to provide it with a back gauge so that any instantaneous discharge below 7 cu/sec may be read just by reading the stir back gauge & referring this value to the rating table for the season. This rating could be done theoretically & only checked by a few gaugings. Also, provided that there would be no leak or seepage either on the weir or under the structure, the steady-discharge relationship would remain stable for considerable time & would need no more attention.

Now if it is not possible to assess the corresponding 0.4 to the Katherine town water supply of 0.43 cu sec, let us spend some time considering the possibility of occurrence of such a flow at all. However would this be a very little attention?

Unfortunately, there are no records available, but there is no gauging carried out on 23rd May 1967, which gave the instantaneous discharge of 0.43 cu/sec. In all practical purposes the critical value, concerning the sheet 56 & setting the gauging station (423) without its correction for pumping during several hours, is hard to determine. Stiller a value of such a value if this correction were not introduced. Thus it can be assumed with a fair degree of confidence that the true discharge of the rainfall at the locality at the time mentioned was of the order of some 0.9 cu/sec and the measured value of 0.43 cu/sec was arrived at only because the gauge cross-section is downstream of the pumping site & of course the pumps were running at the time of gauging.

P.S. The author tried to establish the fact whether the

bricks were set by writing to Cow at K.N. but they do not keep much a detailed log of the brick & of course, the pumps were running at the time of gauging.
However, how all the evidence, it appears almost impossible that the presence would not have been noticed and the true discharge at the time would have been only 0 or 0.

Also another approach was tried, whether the stream is intermittent or perennial in this locality. Subsequently, there is no conclusive evidence either for the presence or for the latter. However, from all recent facts, it seems that the stream must be perennial.

In the storage capacity of water at Katherine is not great and thus, even several days of dry stream would have surely brought this fact to the notice of the authorities in the past, for there would have been a great water shortage.

Further proof of this assumption can be possibly found in the theory of intermittent streams, which depend on substantial ground flow and, even they are known to require a lot of initial rainfall to keep up the field moisture deficiency to such a significant level that surface runoff and thus precipitation of flow in the stream is possible. This is definitely not the case of Katherine R. at Ntirim Crossing.

Established the fact that the stream is in this locality perennial, it can be from the previous work in this theater, deduced, when the stream would reach such a low discharge, which is shown to occur that this would happen, after 200 days after the stream had the intermittent discharge of Trustees. Surely, with all things considered, it appears extremely unlikely that such an occurrence would happen, even if it is not impossible from purely theoretical point of view, and perhaps the frequency (possibility) of once in 100 years or even once in 500 years would best illustrate this recurrence.
Hydrology report on low flows of Katherine R. at Nixon Crossing.

[Signature]

9/2/63
Introduction of the problem:

The planning section was asked for the following information of the Katherine R at Fliet Crossing:

a) Frequency & duration of minimum flow
b) Depth at which flow will fall below requirement (1.35 m)
c) Storage minimum flow - if this is below requirement then for what duration,
d) What is minimum gauge level required to maintain town water supply (24.3 m)

Before proceeding, the statements in a) & c) are worthwhile, as they are not logical, while word "minimum" is used alone without any qualifying provision. However, inserting the word "annual" before both statements becomes clear and regular in practice. It is assumed that this is the problem the planning section is seeking the answer.

The following text attempts to furnish, as best answers to these four queries as possible. However, even at the outset, the author must assure the reader that they (answers) are based mostly on the initiative of the author, for the available records are few, hence being both insufficient & unreliable. Nevertheless, even with this, the reliable liberal dose of the said situation, the basic principles of Hydrology were strictly adhered to.
Frequency and duration of annual minimum flows

There is no continuous record of discharges at this station and this is due to the fact that the control is a head crossing, which alters constantly.

Thus, despite making careful and frequent measurements at Weir Crossing, it is impossible to record reliably and truly the stage-discharge relationship of the stream at this locality.

For this reason the frequency and duration of low flows can be assessed from detailed observed flows, at this locality. However, since no continuous record has been obtained from using the flow records of the same stream near Railway Bridge, this locality can be treated with caution. This is supported by ground observations, which are considerably higher than the records at Weir Crossing and only a fraction of those measured at Railway Bridge.

The available record for Railway Bridge was as follows: all values are measured daily except on flood day and in winter.

<table>
<thead>
<tr>
<th>Date</th>
<th>Discharge (litre/sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 14</td>
<td>10,500</td>
</tr>
<tr>
<td>July 1</td>
<td>12,000</td>
</tr>
<tr>
<td>Aug 18</td>
<td>16,500</td>
</tr>
<tr>
<td>Nov 14</td>
<td>20,000</td>
</tr>
</tbody>
</table>

Note: Values marked with an * represent estimated measurements due to floods or other events that have not been recorded.

b) The 1975 hydrograph period is similar to that of 1974 with a rise in early February. The rise in mid October is not as high as in 1974.
<table>
<thead>
<tr>
<th>Week of</th>
<th>Rainfall (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1937</td>
<td>2.7</td>
</tr>
<tr>
<td>1938</td>
<td>3.3</td>
</tr>
<tr>
<td>1939</td>
<td>2.5</td>
</tr>
<tr>
<td>1940</td>
<td>3.0</td>
</tr>
<tr>
<td>1941</td>
<td>4.5</td>
</tr>
</tbody>
</table>

The table above shows the weekly rainfall (in inches) from 1937 to 1941. The rainfall data is crucial for understanding the water supply and planning for future needs.
The results of this analysis can be summarized as follows:

a) The period of November means for which the estimate
   discharge required is available, is not sufficient
   to deduce the discharge of annual rainfall during
   this period was the rainfall equivalent with
   the longer period of 23 years of rainfall record with
   100% confidence.

b) From the record of every ten years, the mean
   rainfall represented, water conditions for dry season
   drought, based on the amount of annual rainfall
   during rainy season, was pointed out in table 1. Here is the
   conduct of rainfall (run-off capacity), the trend long
   term trend is considered.

c) Table 24-25 relates the length of dry season bridge as
   criteria and compared with the table for the normal
   period of every 10 years, it was noted that the upper
   equivalent of
   rainfall rainfall is of the order of some
   0.8. There
   in terms of rainfall the rainfall of dry season
   compared with the amount 10 years. Better because the rainfall
   accounted for that we intend.

However, this also showed that the dry season when conditions
of the years 1972-82 a period 10 years.

Based upon the table in the previous paragraph, in the actual test, they are corrected
up to 10 years, but T-k factor, this is more convincing
as any standard of statistical one.
Frequency of which flow will fall below requirement

This survey is really just an extension of the line of recession
published in the previous chapter and is just another way of
showing how the recession portion has done in the recession.

During the year of 1962 seven (7) gaugings were taken
at various times and various elevations in this reach. These
gaugings are numbered from 12 to 19 and are plotted.

A line of best fit through these points as plotted on
a semilog paper should clearly reveal the time recession
curve outside of the stream of this station. Such a best fit
gauging-recurrence curve is represented by the exponential
equation of the type: \( Q = Q_e^{-b \cdot t} \) or in logarithmic
form: \( \log Q = \log Q_e - b \cdot \log t \) (which represents a
straight line relation in this).

For the present case, \( Q = 70 \text{ cusecs} \), \( Q_e = 0 \) and \( d = \text{day} = 1 \),\( \cdot \)

\( \log Q = \log 70 = 1.846 \).

\( \log Q_e = \log 0 = -9.900 \).

\( b = \frac{1.846 - (-9.900)}{1} = 11.746 \).

\( c = \frac{1.846 - (-9.900)}{1} = 11.746 \).

\( d = \text{day} = 1 \).

\( \log Q_e = \log 0 = -9.900 \).

New equation: \( Q = 70 \cdot e^{-11.746 \cdot t} \).

\( \log Q = \log 70 = 1.846 \).

\( \log Q_e = \log 0 = -9.900 \).

\( b = \frac{1.846 - (-9.900)}{1} = 11.746 \).

\( c = \frac{1.846 - (-9.900)}{1} = 11.746 \).

Now, returning back to the previous chapter we must correlate
the discharge at Reachers Bridge with this gauge at Naim Crossing.

The inspection of Table 1, Sheet 1, shows that the

Only other low flows of the order of 20-50 were happened.
In Oct. of 1934 & 55 respectively. From last year (1961/62)

Drought reduced our at Viceroy crossing. It was now evident
flooded 1st in July. (The discharge of 2750 cu. m at Darwin)

Prong) the lowest flow was of some 50 cu. m (1 sheet 125)
3 times it still well above the time required. Flow of 125 cu.
was just assumed that needed in Old 54 [per Cu.]
55. The flow at Viceroy crossing was below the required
minimum.

Quite frankly this conception is not fully satisfying need
be used thinking which only time can give. On the
other hand we must not ourselves - what we can do
with one year of record? - Strictly speaking, wrong!

This all told, it is better to accept other line of reasoning
as but forward, even if we have certain uncertainties
not in keeping with the natural theory of the phenomenon and refer
to its practical side, for the establishment it applied in hydrology
that mainly practical approach may be identified in nature

An example is given in the section of need of
the problem. This conception is theoretically discussed to say
the least, it needs good for practical observations
the time time again.

There is a realisation of this aspect it can be assumed,
with improved theoretical and practical observations on this
aspect of the given reality that only about 10-15
100 using the steps of Viceroy crossing will be needed to
investigate until 125 cu. m.
Weekly consumption at Katherine as supplied by CDW there:-

<table>
<thead>
<tr>
<th>Week</th>
<th>Consumption in gls</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.9.62-10.9.62</td>
<td>1,101,800</td>
</tr>
<tr>
<td>23.7.62-30.7.62</td>
<td>949,500</td>
</tr>
<tr>
<td>25.6.62-2.7.62</td>
<td>813,300</td>
</tr>
<tr>
<td>18.6.62-25.6.62</td>
<td>776,600</td>
</tr>
<tr>
<td>5.6.62-11.6.62</td>
<td>780,300</td>
</tr>
</tbody>
</table>

Max. hourly capacity of the pumping installation: 9,000 gla.

At max. hourly capacity, the daily capacity is, say, 215,000 gls. and weekly capacity, say, 1,500,000 gls. respectively.

Thus the figures of the measured consumption during the periods as shown would have been achieved by continuous operation of the pumping plant, say, for 74%, 63%, 54%, 48%, and 52% respectively.

---

LEGEND: • MEASURED DISCHARGE
          • ASSUMED DISCHARGE

<p>|</p>
<table>
<thead>
<tr>
<th>June 9th</th>
<th>June 14th</th>
<th>July 27th</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 21st</td>
<td></td>
<td></td>
</tr>
<tr>
<td>June 28th</td>
<td></td>
<td></td>
</tr>
<tr>
<td>July 5th</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct 23rd</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1962

<table>
<thead>
<tr>
<th>JUNE</th>
<th>JULY</th>
<th>AUG</th>
<th>SEPT</th>
<th>OCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
</tbody>
</table>

1963

<table>
<thead>
<tr>
<th>NOV</th>
<th>DEC</th>
<th>JAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925</td>
<td>150</td>
<td>250</td>
</tr>
</tbody>
</table>

250 DAYS
"Average annual minimum flow - if this is below requirement, then for what duration?"

As already pointed out in the introduction, this study is somewhat vague and even after inserting the word 'annual', although it may complete 100% and still not give the right picture, if based only on the data available and, so far, treated in this text.

From the table on the sheet No. 2, it can be readily seen that the 'annual minimum flow' is actually far above the minimum requirement suggesting that there will never be any restrictions necessary to impose on water conservation at Katherine. Thus, the conception of the average annual minimum flow is erroneous for the problem under consideration and, hence, it will be disregarded.

Inspecting the low recession curve on sheet No. 8, it can be seen that the minimum requirement of 1.5 cu.m/sec is attained approximately 115-120 days after the stream was discharging 7 cu.m/sec in May and Sept. 1971 at Katherine Crossing. However, it occurred in July. Further on, from the records, it is evident that in the month of June, the river was always rising in 1971. Thus, the critical period appears to be of the order of more than two months, i.e., 50-75 days, when the water level is retarding, e.g., it has been already found that 7 cu.m/sec in July of the lowest flood level is to be expected an average of about 10-day periods of 100 years.

This, it can be magnified as follows: - it is likely that the water will have to be rationed at Katherine for two weeks once in ten years (again, it must be drained - not necessarily evenly spaced!).

"Of course, leaving in our mind the relationships of discharges at Bethany Bridge to those at Niteros Crossing as elaborated on in sheet No. 7."

MTA - Water Resources Branch, Darwin NT
Hydrographic Section
HYDROLOGY OFFICE

Prepared by:

TRUSCOTT
5) What is the main gauge height to maintain 0.43 cusecs.

For the reason mentioned on page 2, on the first paragraph, this question is unworthy for the time being. Hence, no suggestion has been already put forward to consider building of a rectangular weir at Niron Crossing & to provide it with a back gauge, so that any future increase discharge below 7 cusecs can be anchored just but reading of 0.43 cusec & referring this value to the rating table for the weir. This acting could be done theoretically but only checked by few gaugings. It is provided, that these would be set in a reserve either around or under the structure, the stage-discharge relationship would remain stable for considerable time & would need no very little attention.

Even if it is not possible to assess the corresponding, it is the fact, the town water supply of 0.43 cusecs, let us spend some time considering the possibility of occurrence of such a flow at all, for same would clearly delay its importation.

Unfortunately, there are no records available, but there is one gauging carried out on Oct. 27th 1924, which gave the instantaneous discharge of 0.44 cusecs, i.e. for all practical purposes the critical value, considering the data MS laid out, the gauging table (p. 19) without its correction for pumping seriously misleads as it appears to be possible to have a value of 0.44 cusec without correction. Thus, it can be assumed with a fair degree of confidence that the true discharge at the level of the time mentioned, was of the order of more 0.4 cusecs and the measured value of 0.44 cusecs was arrived at only because the gauging occurred to demonstrate the pumping rate. Of course, the pumps were running at the time of gauging.

N.B. The author tried to establish the fact whether the pumps can or not, by writing to C.W. at K.N., but they did not keep me a detailed log of the pumps to be able to point out "yes" or "no" in this case, but the data was carried out.
However, from all the evidence, it appears almost im-
possible, that the rains would not have been suf-
ficient and the true discharge at the time would have been
only 0.10 cusecs.

Another approach was tried, whether the streams
in intermittent or perennial in this locality. Unfortun-
atecly, again, there is no conclusive evidence either for
the former or for the latter. However, from all the ex-
ternal it seems that the stream must be perennial.

Further proof of this assumption can be possibly found
in the theory of intermittent streams, which do not have
substantial ground flow and once they stop flowing
their catchments need a lot of initial rainfall to
raise up the field moisture storage to such a re-
tained level that excess runoff is thus re-starting
of flow in the streams is possible. This is definitely
true in the case of Katherine R. at Niron Crossing.

As established, the fact that the streams is in this loc-
ality perennial can be from the frequent work in this
bush, they declared, when the streams would receive
a low discharge. Thus, it can be shown that there
would happen approx. 200 days after, the stream had
the intermittent discharge of Terendie. Surely, with all
things considered it appears extremely unlikely that
such an occurrence would happen, even if it is not
impossible from purely theoretical point of view, and
perhaps a frequency occurring of once in 100 years or even
more, would be illustrated by this occurrence.