Lampiran 1. Diagram alir penelitian

mulai

Menghitung efisiensi

Debit pangkal

Trapezoidal

luas penampang

d(h₀/2+Sh₁+hn/2)

- d
- ho
- Shi
- hn

Q = V . A

Kecepatan (v)

Debit ujung

Trapezoidal

luas penampang

d(h₀/2+Sh₁+hn/2)

- d
- ho
- Shi
- hn

Q = V . A

Kecepatan (v)

Efisiensi = \( Q_ujung \times 100 \)

\( Q_pangkal \)

Saluran sekunder

S1

S2

\( S1 = \frac{P1 + P2 + P3}{3} \)

\( S2 = \frac{P1 + P2 + P3}{3} \)

\( E_s = \frac{S1 + S2}{2} \)

Efisiensi = \( Q_ujung \times 100 \)

\( Q_pangkal \)

Saluran primer

Saluran tersier

\( E_t = E_{t1} + E_{t2} + \ldots + E_{tn} \)

\( E_{ts} = E_{ts1} + E_{ts2} + \ldots + E_{tsn} \)

Efisiensi penyaluran = \( E_p \times E_s \times E_t \)

selesai
<table>
<thead>
<tr>
<th>$0^\circ C$</th>
<th>$p \text{ (mmHg)}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-60</td>
<td>0,0008</td>
</tr>
<tr>
<td>-40</td>
<td>0,096</td>
</tr>
<tr>
<td>-20</td>
<td>0,783</td>
</tr>
<tr>
<td>-10</td>
<td>1,964</td>
</tr>
<tr>
<td>-1</td>
<td>4,22</td>
</tr>
<tr>
<td>0(air+es+uap)</td>
<td>4,58</td>
</tr>
<tr>
<td>10</td>
<td>9,21</td>
</tr>
<tr>
<td>20</td>
<td>17,55</td>
</tr>
<tr>
<td>30</td>
<td>31,86</td>
</tr>
<tr>
<td>40</td>
<td>55,4</td>
</tr>
<tr>
<td>50</td>
<td>92,6</td>
</tr>
<tr>
<td>60</td>
<td>149,6</td>
</tr>
<tr>
<td>80</td>
<td>355,4</td>
</tr>
<tr>
<td>100</td>
<td>760,0 (1 atm)</td>
</tr>
<tr>
<td>110</td>
<td>1.074</td>
</tr>
<tr>
<td>125</td>
<td>1.740</td>
</tr>
<tr>
<td>200</td>
<td>11.650</td>
</tr>
<tr>
<td>250</td>
<td>29.770</td>
</tr>
<tr>
<td>300</td>
<td>64.300</td>
</tr>
<tr>
<td>350</td>
<td>123.710</td>
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</table>
Lampiran 3. Tabel kelembaban

<table>
<thead>
<tr>
<th>Pembacaan thermometer bola basah</th>
<th>Selisih antara thermometer bola kering dan bola basah</th>
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<tbody>
<tr>
<td>Derajat centrigrade (°C)</td>
<td>Persentasi (%)</td>
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<tr>
<td>0</td>
<td>100 90 80 71 63 56 49 43 37 32 28 23 20 16 13</td>
</tr>
<tr>
<td>1</td>
<td>100 90 81 72 65 58 51 45 40 35 30 26 22 19 16</td>
</tr>
<tr>
<td>2</td>
<td>100 90 82 74 66 59 53 47 42 37 33 29 25 22 19</td>
</tr>
<tr>
<td>3</td>
<td>100 91 82 75 67 61 55 49 44 39 35 31 27 24 21</td>
</tr>
<tr>
<td>4</td>
<td>100 91 83 75 69 62 56 51 46 41 37 33 30 26 24</td>
</tr>
<tr>
<td>5</td>
<td>100 91 84 76 70 64 58 53 48 43 39 35 32 29 26</td>
</tr>
<tr>
<td>6</td>
<td>100 92 84 77 71 65 59 54 49 45 41 37 34 31 28</td>
</tr>
<tr>
<td>7</td>
<td>100 92 85 78 72 66 61 56 51 47 43 39 36 33 30</td>
</tr>
<tr>
<td>8</td>
<td>100 92 85 79 73 67 62 57 52 48 44 41 37 34 32</td>
</tr>
<tr>
<td>9</td>
<td>100 93 86 79 74 68 63 58 54 50 46 42 39 36 33</td>
</tr>
<tr>
<td>10</td>
<td>100 93 86 80 75 69 64 59 55 51 47 44 41 38 35</td>
</tr>
<tr>
<td>11</td>
<td>100 93 87 81 75 70 65 60 56 52 49 45 42 39 36</td>
</tr>
<tr>
<td>12</td>
<td>100 93 87 81 76 71 66 61 57 54 50 47 43 41 38</td>
</tr>
<tr>
<td>13</td>
<td>100 94 88 82 76 71 67 63 58 55 51 48 45 42 39</td>
</tr>
<tr>
<td>14</td>
<td>100 94 88 82 77 72 68 63 59 56 52 49 46 43 40</td>
</tr>
<tr>
<td>15</td>
<td>100 94 88 83 78 73 68 64 60 57 53 50 47 44 42</td>
</tr>
<tr>
<td>16</td>
<td>100 94 88 83 78 74 69 65 61 58 54 51 48 45 43</td>
</tr>
<tr>
<td>17</td>
<td>100 94 89 83 79 74 70 66 62 59 55 52 49 46 44</td>
</tr>
<tr>
<td>18</td>
<td>100 94 89 84 79 75 70 67 63 59 55 53 50 47 45</td>
</tr>
<tr>
<td>19</td>
<td>100 94 89 84 80 75 71 67 63 60 56 54 51 48 46</td>
</tr>
<tr>
<td>20</td>
<td>100 95 89 85 80 76 72 68 64 61 57 55 52 49 47</td>
</tr>
<tr>
<td>21</td>
<td>100 95 90 85 80 76 73 68 65 62 58 55 53 50 47</td>
</tr>
<tr>
<td>22</td>
<td>100 95 90 85 81 77 73 69 66 62 58 56 53 51 48</td>
</tr>
<tr>
<td>23</td>
<td>100 95 90 86 81 77 73 70 66 63 59 57 54 51 49</td>
</tr>
<tr>
<td>24</td>
<td>100 95 90 86 82 78 74 70 67 63 60 58 55 52 50</td>
</tr>
<tr>
<td>25</td>
<td>100 95 90 86 82 78 74 71 67 64 61 58 56 53 50</td>
</tr>
<tr>
<td>26</td>
<td>100 95 91 86 82 78 75 71 68 65 62 59 56 54 51</td>
</tr>
<tr>
<td>27</td>
<td>100 95 91 87 83 79 75 72 68 65 62 59 57 54 52</td>
</tr>
<tr>
<td>28</td>
<td>100 95 91 87 83 79 75 72 69 66 63 60 57 55 52</td>
</tr>
<tr>
<td>29</td>
<td>100 95 91 87 83 79 76 72 69 66 63 60 58 55 53</td>
</tr>
<tr>
<td>30</td>
<td>100 96 91 87 83 80 76 73 70 67 64 61 58 56 53</td>
</tr>
<tr>
<td>31</td>
<td>100 96 91 87 83 80 76 73 70 67 64 61 59 56 54</td>
</tr>
<tr>
<td>32</td>
<td>100 96 91 88 84 80 77 73 70 67 65 62 59 57 54</td>
</tr>
<tr>
<td>33</td>
<td>100 96 92 88 84 80 77 74 71 68 65 63 60 58 55</td>
</tr>
<tr>
<td>34</td>
<td>100 96 92 88 84 81 77 74 71 68 65 63 60 58 55</td>
</tr>
<tr>
<td>35</td>
<td>100 96 92 88 84 81 78 74 71 68 66 63 61 58 56</td>
</tr>
</tbody>
</table>
Lampiran 4. Gambar penampang saluran

Saluran Primer

B = 6 m

d = 1 m

h = 0,94 m

B = 4,7 m

d = 0,79 m

h = 0,71 m

Keterangan :

B = Lebar air dalam saluran

d = Jarak interval

h = Tinggi air.

Universitas Sumatera Utara
Lampiran 4. (sambungan)

Saluran Sekunder

Pengukuran I

Pangkal

\[ B = 3,3 \text{ m} \]
\[ d = 0,416 \text{ m} \]
\[ h = 0,626 \text{ m} \]

Ujung

\[ B = 2,5 \text{ m} \]
\[ d = 0,416 \text{ m} \]
\[ h = 0,67 \text{ m} \]

Pengukuran II

Pangkal

\[ B = 2,51 \text{ m} \]
\[ d = 0,418 \text{ m} \]
\[ h = 0,61 \text{ m} \]

Ujung

\[ B = 2,48 \text{ m} \]
\[ d = 0,413 \text{ m} \]
\[ h = 0,556 \text{ m} \]

Pengukuran III

Pangkal

\[ B = 2,40 \text{ m} \]
\[ d = 0,4 \text{ m} \]
\[ h = 0,554 \text{ m} \]

Ujung

\[ B = 2,38 \text{ m} \]
\[ d = 0,369 \text{ m} \]
\[ h = 0,448 \text{ m} \]
Pengukuran IV

Pangkal

B = 2,34 m

d = 0,39

h = 0,458 m

Ujung

B = 2,18 m

d = 0,363 m

h = 0,4 m

Keterangan :

B = Lebar air dalam saluran

d = Jarak interval

h = Tinggi air.
Lampiran 4. (sambungan)

Saluran Tersier

Tersier I (MC1Ka)

Pengukuran I

Pangkal          Ujung

\[
\begin{align*}
P &= 0.8 \text{ m} \\
h &= 0.34 \text{ m}
\end{align*}
\]

Pengukuran II

Pangkal          Ujung

\[
\begin{align*}
a &= 0.23 \text{ m} \\
h &= 0.23 \text{ m} \\
P &= 0.67 \text{ m}
\end{align*}
\]

Keterangan:

\[
\begin{align*}
a &= \text{Alas} \\
P &= \text{Panjang} \\
H &= \text{Tinggi}
\end{align*}
\]
Tersier II (MC1Ki)

Pengukuran I

Pangkal

\[ a = 0,47 \text{ m} \]
\[ h = 0,32 \text{ m} \]
\[ P = 1,15 \text{ m} \]

Ujung

\[ a = 0,44 \text{ m} \]
\[ h = 0,26 \text{ m} \]
\[ P = 0,73 \text{ m} \]

Pengukuran II

Pangkal

\[ a = 0,36 \text{ m} \]
\[ h = 0,26 \text{ m} \]
\[ P = 0,77 \text{ m} \]

Ujung

\[ a = 0,33 \text{ m} \]
\[ h = 0,28 \text{ m} \]
\[ P = 0,84 \text{ m} \]

Keterangan :

\[ a \quad = \text{Alas} \]
\[ P \quad = \text{Panjang} \]
\[ H \quad = \text{Tinggi} \]
Tersier V (MC4Ka)

Pengukuran I

Pangkal

\[ a = 0,24 \text{ m} \]
\[ h = 0,24 \text{ m} \]
\[ P = 0,61 \text{ m} \]

Ujung

\[ a = 0,28 \text{ m} \]
\[ h = 0,18 \text{ m} \]
\[ P = 0,73 \text{ m} \]

Pengukuran II

Pangkal

\[ a = 0,27 \text{ m} \]
\[ h = 0,28 \text{ m} \]
\[ P = 0,76 \text{ m} \]

Ujung

\[ a = 0,26 \text{ m} \]
\[ h = 0,22 \text{ m} \]
\[ P = 0,68 \text{ m} \]

Keterangan:

\[ a \quad = \quad \text{Alas} \]
\[ P \quad = \quad \text{Panjang} \]
\[ H \quad = \quad \text{Tinggi} \]
Tersier VII (MC6Ka)

Pengukuran I

Pangkal

\[ P = 0.5 \text{ m} \]
\[ h = 0.24 \text{ m} \]

Ujung

\[ P = 0.5 \text{ m} \]
\[ h = 0.21 \text{ m} \]

Pengukuran II

Pangkal

\[ P = 0.5 \text{ m} \]
\[ h = 0.21 \text{ m} \]

Ujung

\[ P = 0.5 \text{ m} \]
\[ h = 0.20 \text{ m} \]

Keterangan:

\[ P = \text{Panjang} \]
\[ H = \text{Tinggi} \]
Tersier VIII (SC1K1)

Pengukuran I

Pangkal

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>0,43 m</td>
</tr>
<tr>
<td>h</td>
<td>0,26 m</td>
</tr>
<tr>
<td>P</td>
<td>1,18 m</td>
</tr>
</tbody>
</table>

Ujung

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>0,43 m</td>
</tr>
<tr>
<td>h</td>
<td>0,20 m</td>
</tr>
<tr>
<td>P</td>
<td>1,05 m</td>
</tr>
</tbody>
</table>

Pengukuran II

Pangkal

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>0,47 m</td>
</tr>
<tr>
<td>h</td>
<td>0,22 m</td>
</tr>
<tr>
<td>P</td>
<td>1,28 m</td>
</tr>
</tbody>
</table>

Ujung

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>0,45 m</td>
</tr>
<tr>
<td>h</td>
<td>0,23 m</td>
</tr>
<tr>
<td>P</td>
<td>1,19 m</td>
</tr>
</tbody>
</table>

Keterangan :

a  = Alas
P  = Panjang
H  = Tinggi
Tersier IX (SC2Ki)

Pengukuran I

Pangkal

Ujung

P = 0,4 m  
h = 0,23 m

P = 0,4 m  
h = 0,19 m

Pengukuran II

Pangkal

Ujung

P = 0,4 m  
h = 0,26 m

P = 0,4 m  
h = 0,23 m

Keterangan:

P = Panjang
H = Tinggi
Tersier X (SC2Ka)

Pengukuran I

Pangkal

\[ a = 0,23 \text{ m} \]
\[ h = 0,29 \text{ m} \]
\[ P = 0,66 \text{ m} \]

Ujung

\[ a = 0,25 \text{ m} \]
\[ h = 0,25 \text{ m} \]
\[ P = 0,61 \text{ m} \]

Pengukuran II

Pangkal

\[ a = 0,25 \text{ m} \]
\[ h = 0,28 \text{ m} \]
\[ P = 0,84 \text{ m} \]

Ujung

\[ a = 0,27 \text{ m} \]
\[ h = 0,26 \text{ m} \]
\[ P = 0,78 \text{ m} \]

Keterangan :

\[ a \quad = \text{Alas} \]
\[ P \quad = \text{Panjang} \]
\[ H \quad = \text{Tinggi} \]
Lampiran 5. Data efisiensi saluran irigasi

### DATA EFSIENSI PENYALURAN IRIGASI

<table>
<thead>
<tr>
<th></th>
<th>PRI</th>
<th>ME</th>
<th>R</th>
<th>SEKUNDER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pengu</td>
<td>Pengu</td>
<td>Pengu</td>
<td>Pengu</td>
</tr>
<tr>
<td></td>
<td>kuran</td>
<td>kuran</td>
<td>kuran</td>
<td>kuran</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>II</td>
<td>III</td>
<td>IV</td>
</tr>
<tr>
<td>Lebar (m)</td>
<td>6</td>
<td>0,7</td>
<td>1</td>
<td>0,7</td>
</tr>
<tr>
<td></td>
<td>0,7</td>
<td>1</td>
<td>0,7</td>
<td>1</td>
</tr>
<tr>
<td>h0 (m)</td>
<td>1</td>
<td>0,7</td>
<td>0,7</td>
<td>0,7</td>
</tr>
<tr>
<td></td>
<td>0,7</td>
<td>0,7</td>
<td>0,7</td>
<td>0,7</td>
</tr>
<tr>
<td>h1 (m)</td>
<td>0,94</td>
<td>0,7</td>
<td>0,7</td>
<td>0,7</td>
</tr>
<tr>
<td></td>
<td>0,7</td>
<td>0,7</td>
<td>0,7</td>
<td>0,7</td>
</tr>
<tr>
<td>h2 (m)</td>
<td>0,87</td>
<td>0,5</td>
<td>0,5</td>
<td>0,5</td>
</tr>
<tr>
<td></td>
<td>0,5</td>
<td>0,5</td>
<td>0,5</td>
<td>0,5</td>
</tr>
<tr>
<td>h3 (m)</td>
<td>0,81</td>
<td>2,7</td>
<td>1,3</td>
<td>0,8</td>
</tr>
<tr>
<td></td>
<td>2,7</td>
<td>1,3</td>
<td>0,8</td>
<td>0,7</td>
</tr>
<tr>
<td>Luas (A)</td>
<td>4,68</td>
<td>9</td>
<td>1,722</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>1,722</td>
<td>9</td>
<td>1,722</td>
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<td>0,8</td>
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<td>1,076</td>
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<td>0,858</td>
<td>0,7</td>
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<td></td>
<td>27</td>
<td>0,858</td>
<td>25</td>
<td>0,858</td>
</tr>
<tr>
<td>Panjang (m)</td>
<td>50</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>t1</td>
<td>31,4</td>
<td>24,</td>
<td>24,</td>
<td>24,</td>
</tr>
<tr>
<td></td>
<td>24,</td>
<td>24,</td>
<td>24,</td>
<td>24,</td>
</tr>
<tr>
<td>t2</td>
<td>35,1</td>
<td>22,</td>
<td>22,</td>
<td>22,</td>
</tr>
<tr>
<td></td>
<td>22,</td>
<td>22,</td>
<td>22,</td>
<td>22,</td>
</tr>
<tr>
<td>t3</td>
<td>34,6</td>
<td>23,</td>
<td>23,</td>
<td>23,</td>
</tr>
<tr>
<td></td>
<td>23,</td>
<td>23,</td>
<td>23,</td>
<td>23,</td>
</tr>
<tr>
<td>t Rata-</td>
<td>33,7</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Kecepatan (V) (m/s)</td>
<td>0,29</td>
<td>0,7</td>
<td>0,4</td>
<td>0,2</td>
</tr>
<tr>
<td></td>
<td>0,2</td>
<td>0,7</td>
<td>0,4</td>
<td>0,2</td>
</tr>
<tr>
<td>Debit (m³/s)</td>
<td>1,39</td>
<td>0,2</td>
<td>1,2</td>
<td>0,2</td>
</tr>
<tr>
<td></td>
<td>0,2</td>
<td>1,2</td>
<td>0,2</td>
<td>0,2</td>
</tr>
</tbody>
</table>

Universitas Sumatera Utara
Lampiran 5. (sambungan)

**TERSIER I DAN II**

<table>
<thead>
<tr>
<th>Pengukuran</th>
<th>Pangkal</th>
<th>Ujung</th>
<th>Pangkal</th>
<th>Ujung</th>
<th>Pangkal</th>
<th>Ujung</th>
<th>Pangkal</th>
<th>Ujung</th>
</tr>
</thead>
<tbody>
<tr>
<td>h1 (m)</td>
<td>0,34</td>
<td>0,3</td>
<td>0,21</td>
<td>0,17</td>
<td>0,28</td>
<td>0,21</td>
<td>0,24</td>
<td>0,27</td>
</tr>
<tr>
<td>h2 (m)</td>
<td>0,34</td>
<td>0,3</td>
<td>0,24</td>
<td>0,18</td>
<td>0,35</td>
<td>0,32</td>
<td>0,28</td>
<td>0,32</td>
</tr>
<tr>
<td>h3 (m)</td>
<td>0,34</td>
<td>0,3</td>
<td>0,24</td>
<td>0,2</td>
<td>0,33</td>
<td>0,25</td>
<td>0,25</td>
<td>0,24</td>
</tr>
<tr>
<td>h Rata-rata (m)</td>
<td>0,34</td>
<td>0,3</td>
<td>0,23</td>
<td>0,18</td>
<td>0,32</td>
<td>0,26</td>
<td>0,26</td>
<td>0,28</td>
</tr>
<tr>
<td>Alas</td>
<td>0</td>
<td>0</td>
<td>0,23</td>
<td>0,21</td>
<td>0,47</td>
<td>0,44</td>
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<tr>
<td>Kecepatan (V) m/s</td>
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<td><strong>0,189</strong></td>
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<td><strong>0,039</strong></td>
<td><strong>0,027</strong></td>
<td><strong>0,057</strong></td>
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**TERSIER V DAN VII**

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## TERSIER X

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Lampiran 6. Data untuk menghitung evaporasi
Daerah Deli Serdang dan Sekitarnya
Bulan Juni 2009

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Lampiran 7. Perhitungan evaporasi

1. Tekanan uap jenuh ($e_s$)

\[
\frac{30 - 28,1}{28,1 - 20} = \frac{31,86 - x}{x - 17,55}
\]

\[
1,9 \times -33,35 = 258,07 - 8,1 x
\]

\[
10 x = 291,42
\]

\[
x = 29,14 \text{ mmhg}
\]

2. Kelembaban relatif

\[
28,1 - 25,4 = 2,7
\]

\[\cdot \frac{3,0 - 2,7}{2,7 - 2,5} = \frac{74 - x}{x - 78}\]

\[
0,3 \times -23,4 = 14,8 - 0,2 x
\]

\[
0,5 x = 38,2
\]

\[
x = 76,4
\]

\[\cdot \frac{3,0 - 2,7}{2,7 - 2,5} = \frac{75 - x}{x - 78}\]

\[
0,3 \times -23,4 = 15 - 0,2 x
\]

\[
0,5 x = 38,4
\]

\[
x = 76,8
\]

\[
x = \frac{76,8 + 76,4}{2}
\]

\[= 76,6 \%
\]

3. Tekanan uap aktual ($e_d$)
76,6\% \times 29,14 = 22,32 \text{ mmHg}

4. Evaporasi

\[
E_o = 0,35 \left( e_s - e_d \right) \left( 0,5 + 0,54 u_2 \right)
\]

\[
E_o = 0,35 \left( 29,14 - 22,32 \right) \left( 0,5 + 0,54 \times 0,8 \right)
\]

\[
E_o = 0,35 \left( 6,82 \right) \left( 0,93 \right)
\]

\[
E_o = 2,22 \text{ mm/hari}
\]
Lampiran 8. Perhitungan rembesan

1. Saluran sekunder

\[ Q = k (B - 2d) \]

\[ k = 6,8 \times 10^{-7} \text{ cm/detik} \]

\[ Q = 6,8 \times 10^{-7} \ (253 - 2(57)) \]

\[ Q = 6,8 \times 10^{-7} \ (139) \]

\[ Q = 9,452 \times 10^{-4} \ \text{cm}^3/\text{detik} \]

3. Saluran tersier

\[ Q = k (B - 2d) \]

\[ Q = 6,8 \times 10^{-7} \ (73 - 2(25)) \]

\[ Q = 6,8 \times 10^{-7} \ (23) \]

\[ Q = 1,564 \times 10^{-4} \ \text{cm}^3/\text{detik} \]
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Lampiran 9. Tabel keterangan keadaan pintu pembagi air
Gambar 1. Irigasi Timbang Deli

Gambar intake irigasi Timbang Deli
Gambar saluran primer
Gambar saluran sekunder
Gambar saluran tersier