International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

Analysis of the Application of Injection Well Technology in Reducing Puddle at RW 8 and 9 Blimbing Villages, Malang City, East Java

Runi Asmaranto[1], Mohammad Bisri[1], Prasetyo Rubiantoro[1], Annisa Zuyyinani'ma Syafira[2]
[1]Lecturer of Water Resources Engineering Department, Brawijaya University, Malang City, 65145, Indonesia
[2]Student of Water Resources Engineering Department, Brawijaya University, Malang City, 65145, Indonesia
Email address: [1]runiasmaranto71 @ gmail.com

***Abstract*— *An injection well is a well or hole at ground level that is used to hold rainwater in order to seep into the ground. There is a rainy season, Blimbing Village as a densely populated area of buildings and residents, becoming one of the puddle areas in Malang. This research aims to know the capacity of existing drainage channels, know the placement and dimensions of drainage channel structures in accordance with the conditions of RW. 8 and 9 Blimbing Villages and to know the percentage of rain runoff discharge reduction with the application of injection wells at the study site. To analyze it, 5-year rain runoff modeling was carried out using storm water management model (SWMM) instrument 5.1 by comparing drainage network conditions before and after injection well application. For the design rain simulation, rainfall data of the hours obtained from Blimbing rain gauge station for 10 years (2010 – 2019). The simulation results showed the capacity of existing drainage channels was unable to accommodate 5 yearly rain return period, resulting in puddles at 4 points location. Percentage reduction of land and channel runoff discharge with the application of injection wells ranges from 15%-68%.*

***Keywords*— *Drainage Channels; Injection Well; SWMM 5.1.*

I. PRELIMINARY

Blimbing Village, Blimbing Sub-District, Malang City experienced population growth and development that had an impact on changes in land use functions such as residential areas (Rike, 2016). This causes problems in the form of surface runoff that results in flooding during high rainfall (Rike, 2016).

The problem makes the function of drainage channel as a means for water to go to the river cannot be functioned to the maximum. Excess rainwater that cannot be accommodated drainage can cause flooding. One of the settlements that has a considerable runoff is in RW 8 and 9, Blimbing Village, Blimbing Sub-district, as a result of land cover changes. One of the efforts that can be made to solve the runoff problem is by the manufacture of suction wells (Desmawan, 2012).

The well is a means to hold rainwater and seep it into the ground (PU Department, 2012). Rainwater that falls on the roof of the house is not flowed into the gutter or yard of the house, but is flowed using pipes or waterways into the well so as to reduce the amount of run off that occurs (Mulyani, 2013).

The research studies to compare the injection well effects on their effectiveness in reducing surface runoff. Furthermore, compared to the percentage of use of wells to find out what percentage of wells can reduce surface runoff in RW. 8 and 9, Blimbing Village. It is expected that this research will be one of the guidelines in planning wells, especially in residential areas.

Based on the background of the problem the author proposes the following problem formula:

1. How puddles are happening in the RW. 8 and 9 Blimbing Village, Malang?;
2. How to apply injection well technology in RW.8 and 9 Blimbing Villages in Malang?
3. How to effectively apply injection well technology to reduce puddle in RW. 8 and 9 Blimbing Village Malang?

II. RESEARCH METHODOLOGY

A. Study Area Conditions

This study was conducted in the area of RW. 8 and 9 Blimbing Villages located in the district of Blimbing Malang. It has an area of 57,900 m^2 with land use for house building of (approximately 90%) and the rest is green open space and public facilities.

B. Data Used

1. Rainfall data for 10 years (2010-2019) from Blimbing rain gauge station, for planned rain calculations. Data provide by Dinas PU SDA East Java Province.
2. Topographic maps, existing drainage network maps, and land use maps. Data provide by Dinas PU, Malang City.
3. Data on the depth of the well (groundwater level), obtained from the results of the field review.

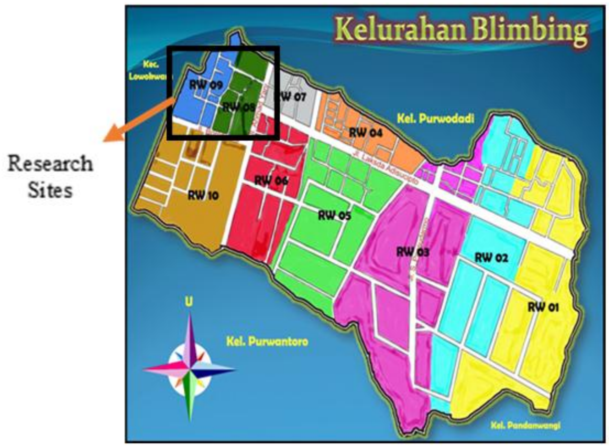

Fig. 1. Blimbing Village Administration Map

Runi Asmaranto, Mohammad Bisri, Prasetyo Rubiantoro, and Annisa Zuyyinani'ma Syafira, "Analysis of the Application of Injection Well Technology in Reducing Puddle at RW 8 and 9 Blimbing Villages, Malang City, East Java," *International Research Journal of Advanced Engineering and Science*, Volume 5, Issue 4, pp. 71-77, 2020.

International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

C. Rain Frequency Analysis Plan

1. Smirnov-Kolmogorov Test

To corroborate the estimated distribution selection taken, distribution testing was carried out using the Smirnov-Kolmogorov method of each distribution. This method is known as non-parametric match testing because the test does not use certain disribution functions.

The formula used in the Smirnov Kolmogorof Test method is as follows:

$$\mathbf{P} = \frac{\mathbf{m}}{\mathbf{n+1}} \mathbf{x\ 100\%}$$

With :
P = probability (%)
m = data sequence number
n = amount of data

$$\Delta \mathbf{maks} = \{\mathbf{Pe} - \mathbf{Pt}\}$$

With :
$\Delta maks$ = the maximum difference between empirical and theoretical odds
Pe = empirical opportunity
Pt = theoretical opportunity
Δcr = critical deviation (from table)

2. Chi-Square Test

The Chi Square test was conducted to test the suitability of the distribution of observational data to theoretical data in a vertical direction. Chi Square formula (X^2) as follows:

$$\mathbf{X^2\ count} = \sum_{i=1}^{k} \frac{(\mathbf{Fe} - \mathbf{Ft})^2}{\mathbf{Ft}}$$

With :
$X^2\ count$ = Chi Square price count
Fe = frequency of observation class j
Ft = theoretical frequency class j
k = number of classes

Degrees free d^k formulated as follows:

a. d^k = k-1 if the frequency is calculated without estimating the parameters of the sample.
b. d^k = k-1-m if frequency is calculated by estimating m parameters of the sample.

D. Rainfall Analysis by Mononobe Method

To calculate rain plan with mononobe formula should be available daily rain data. Common forms of mononobe formulas are:

$$\mathbf{I} = \frac{\mathbf{R24}}{\mathbf{24}} \left(\frac{\mathbf{24}}{\mathbf{t}}\right)^{2/3}$$

With :
I = rainfall intensity (mm/h)
R24 = daily maximum rainfall for 24 hours (mm)
t = duration / duration (hours)

E. Injection Wells

Injection wells are one of the many ways or techniques of *artificial recharge*, by injecting water into the aquifer below. Injection well techniques require a pressurized pumping installation used to force water to enter the aquifer layer. Injection wells serve to artificially inject water by injecting water into the aquifer layer. The target location is water eduction areas in cultivation areas, settlements, offices, shops, industries, facilities and infrastructure as well as other public facilities.

The purpose of the use of injection well technology is:
1. Preservation of groundwater resources, improvement of environmental quality and culture of environmental awareness.
2. Help to overcome the lack of clean water.
3. Maintain water equilibrium in the soil in the coastal aquifer system.
4. Reduce runoff and soil erosion.

The benefits of injection wells are:
1. Reduce surface flow so as to prevent / reduce flooding and puddles.
2. Maintain and increase groundwater level height.
3. Reduce erosion and sedimentation.
4. Reduce / withstand seawater intrusion for areas adjacent to coastal areas.
5. Prevent soil subsidance.
6. Reduce the concentration of groundwater pollution.

Fig. 2. Design of injection well

In addition to the well suction that is widely applied is injection wells. Theoretically the wells and injection wells are the same. The difference between the two wells include:

a. Injection wells have a minimum well depth of > 1 meter to hundreds of meters, so the water capacity is much greater than that of a suction well.
b. During the rainy season injection wells are able to hold water in order to reduce puddle, and in the dry season become a place of water savings.

Construction of injection wells that have been patented from HAKI with no patent IDP000040509 as follows:

a. The inner diameter of the well is 1 m and the depth of the well is 5 - 200 meters.
b. At the base of the well is equipped with filtration media consisting of the bottom of mango rocks as thick as 0.5 – 0.8 m from the base and pebbles as thick as 0.2 – 0.5 m from mango stone.
c. The body of the well at the lower end is arranged above the filtration media extending upwards to the digging hole.
d. The well cover is equipped with at least 1 (one) water input hole (inlet) placed on the outside of the quarry and connected through a pipe.

Runi Asmaranto, Mohammad Bisri, Prasetyo Rubiantoro, and Annisa Zuyyinani'ma Syafira, "Analysis of the Application of Injection Well Technology in Reducing Puddle at RW 8 and 9 Blimbing Villages, Malang City, East Java," *International Research Journal of Advanced Engineering and Science*, Volume 5, Issue 4, pp. 71-77, 2020.

International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

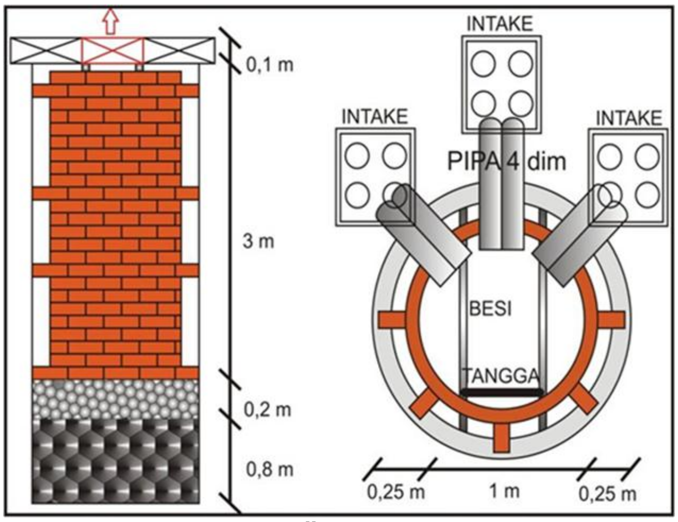

Fig. 3. Patent injection well construction No IDP000040509

F. Flood Modeling using SWMM 5.1. Application

According to Rosmann (2015), *SWMM is* a mathematical modeling used to simulate the quantity and runoff quality of an area due to rainwater or a combination with a wastewater system. *SWMM 5.1* combines dynamic rainfall-runoff calculations for a single ongoing event or simulation *(*Huber and Dickinson, 1998 in Ningsih, 2013*).*

Rain data is required to see the response *to* the subcatchment. Infiltration using *Horton's, Green and Ampt's or Curve Number* models, concentration times calculated based on *Kinematic Wave theory, and runoffs* passed on using *non linear algorithmic principles.* While surface flow is calculated taking into account land use type, topography, soil moisture, loss of infiltration in previous areas, and restraints on the surface.

The instrument used for the completion of this study is SWMM software, a model of rainfall simulation - dynamic runoff, used for single or long-term (continuous) rain events, both aspects of quantity and quality of runoff especially in urban areas.

The modeling scenarios used to answer the above problem formulations are:

1. Condition of existing drainage system with rain at 5-year period.
2. Application of injection wells with 5 yearly rain return period. It is then simulated to find out the decrease in runoff discharge.

III. RESULT AND DISCUSSIONS

A. Rain Analysis Plan

1. Smirnov-Kolmogorov Test

To corroborate the estimated distribution selection taken, distribution testing was carried out using the Smirnov-Kolmogorov method of each distribution. This method is known as non-parametric match testing because the test does not use certain distribution functions. For the calculation results of Smirnov-Kolmogorov Test can be seen in TABLE I.

TABLE I. Smirnov-Kolmogorov Test Recapitulation (Gumbel and Log Pearson III)

No	D_{critis}	D_{maks}	Description	
1,	0,409	0,109	D maks < D cr'	Gumbel Hypothesis Accepted
2,	0,486	0,109	D maks < D cr'	Gumbel Hypothesis Accepted

No	D_{critis}	D_{maks}	Description	
1,	0,4090	0,1339	D maks < D cr'	Log Pearson III Accepted
2,	0,4860	0,1339	D maks < D cr'	Log Pearson III Accepted

2. Chi-Square Test

The Chi Square test was conducted to test the suitability of the distribution of observational data to theoretical data in a vertical direction. For the calculation results of Chi-Square Test can be seen in TABLE II.

TABLE II. Chi-Square Test Recapitulation

	Gumbel		Log Pearson III	
Significant (%)	5%	1%	5%	1%
R_{cr}	7,81	11,35	7,81	11,35
R^2 count	2	2	2	2
Conclusion	Accepted	Accepted	Accepted	Accepted

B. Rainfall Analysis Plan with Mononobe Method

The rain event used is 5 hours, it is based on the maximum rain event specified from the modified formula Mononobe in Hadithusanto (2011). The rain event that occurred in the field is assumed to cause flooding for 5 hours. For the calculation results of Mononobe Method can be seen in TABLE III.

C. Results from Modeling using SWMM 5.1. Application

For data results from subcatchment using the *SWMM 5.1* application and channel geometry data can be seen in TABLE IV and TABLE V, and for runoff results on the channel can be viewed in TABLE VI.

D. Simulation Results using SWMM 5.1. Application

Before running the simulation to analyze the performance of this drainage system, it must be done the simulation settings by pressing *the Options >> General button.* In this study, modeling included rain/runoff, flow routing with *'Dynamic Wave'*, as well as infiltration modeling with *Horton Methods.* For analysis date input, use the same date as the input in the Rain Time Series Editor data *fill.* Furthermore, the simulation can be run at the press of a *button or Project >>* Run *Simulation*.

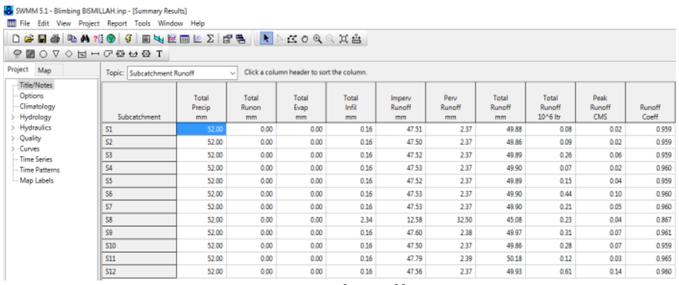
Fig. 4. Amount of runoff overtime

Runi Asmaranto, Mohammad Bisri, Prasetyo Rubiantoro, and Annisa Zuyyinani'ma Syafira, "Analysis of the Application of Injection Well Technology in Reducing Puddle at RW 8 and 9 Blimbing Villages, Malang City, East Java," *International Research Journal of Advanced Engineering and Science*, Volume 5, Issue 4, pp. 71-77, 2020.

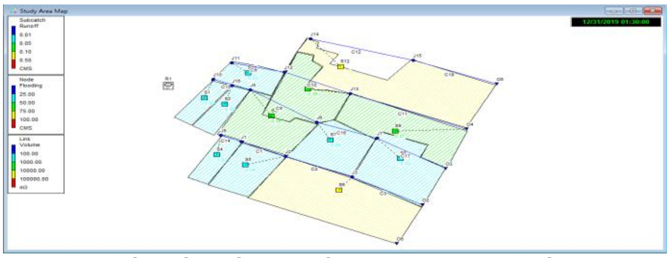

Fig. 5. Channel simulation results using SWMM 5.1 Application

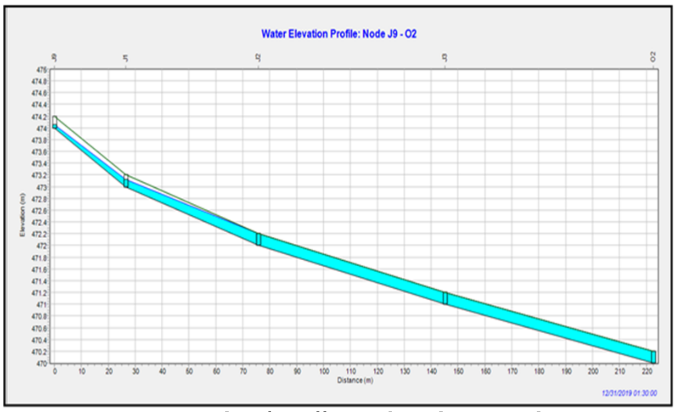

Fig. 6. Examples of insufficient channels in C2 and C3

It can be seen that the maximum flow height where in some channels the overflow can be seen in the flow profile shown in Fig. 6. From the results obtained, at Fig. 6. can be seen at 01.30 *time of day* for flow from *nodes* J9 to O2 in the presence of overflows on channels C2 and C3.

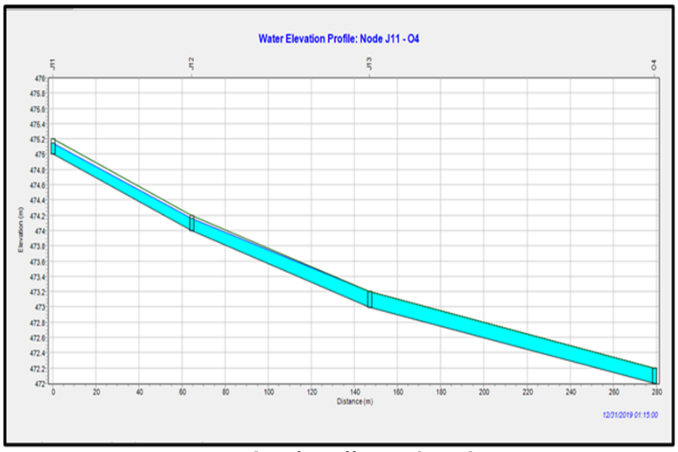

Fig. 7. Examples of insufficient channels in C11

It can be seen that the maximum flow height where in some channels the overflow can be seen in the flow profile shown in Fig. 7. From the results obtained, at Fig. 7. can be seen at 01. 15 *time of day* for flow from *nodes* J11 to O4 in the presence of overflows on channels C11.

E. Infiltration Well Application Simulation

After planning the infiltration well unit, a simulation of the application of the ecodrain can be carried out with a 5 year return period of rain. Summary of simulation results of sub-catchment surface runoff and channel runoff discharge for injection well application. Steps for adding injection wells:

1. First, on the SWMM 5.1 menu, click the hydrology icon >> add lid control.

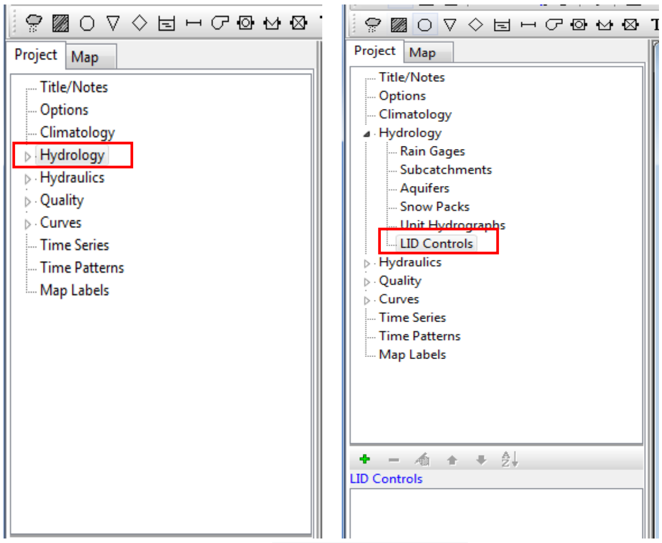

Fig. 8. Lid control application

2. After adding the lid control, then enter the injection well data that was previously recorded.

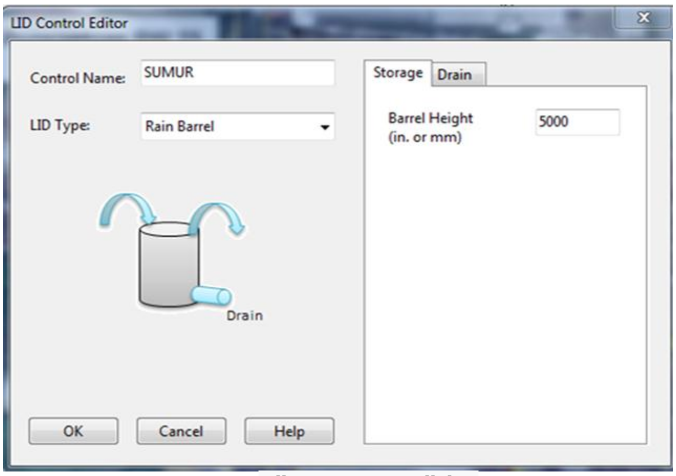

Fig. 9. Filling injection well data

3. Next, fill in the properties when the injection well will be applied to a subtcament where puddle occurs. Select subcatchment >> right click properties >> lid control >> fill in the appropriate data.

F. Simulation Result After Repair

Data on the addition of injection wells is then inputted and simulated back to the SWMM 5.1 model. From the re-simulation results, it can be seen that the C2 and C3 channels have no overflowing channels. The channel conditions with the change in dimensions are shown in Fig. 11. as follows:

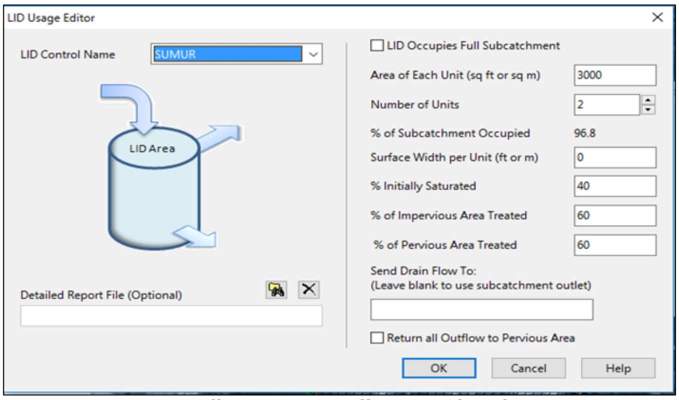

Fig. 10. Filling injection wells into a subcatchment

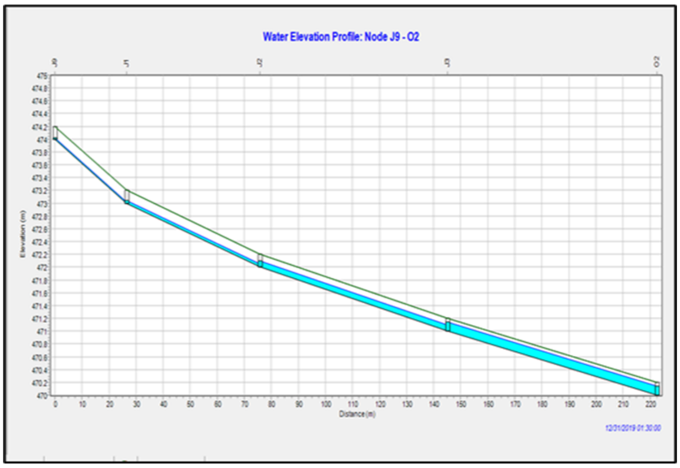

Fig. 11. Example of the simulation results of a channel C2 and C3 that has been installed with an injection well

It can be seen that the results of the maximum flow height where after being installed with two injection wells using the *SWMM 5.1* application are able to reduce the overflow that occurs can be seen in the flow profile shown in Fig. 11. From the results obtained, in Fig. 11 it can be seen at 01.30 the time of day for the flow from Nodes J9 to O2 in channels C2 and C3 did not overflow after two injection wells were installed with a resulting puddle reduction of 43 - 68%.

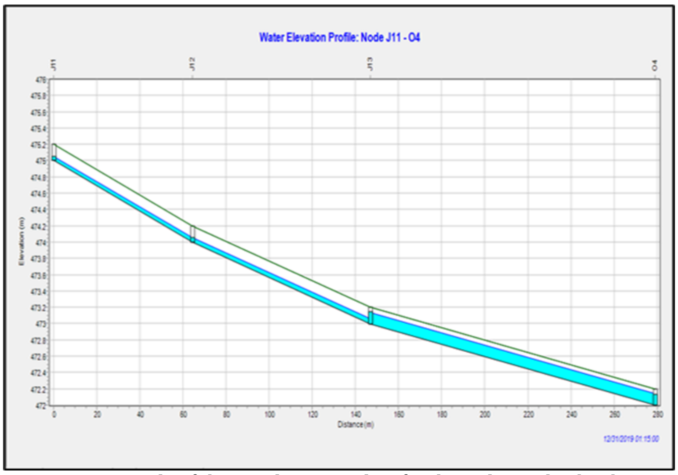

Fig. 12. Example of the simulation results of a channel C11 that has been installed with an injection well

It can be seen that the results of the maximum flow height where after being installed with two injection wells using the *SWMM 5.1* application are able to reduce the overflow that occurs can be seen in the flow profile shown in Fig. 12. From the results obtained, in Fig. 12. It can be seen at 01.15 the time of day for the flow from Nodes J11 to O4 on channel C11 did not overflow after two injection wells were installed with the resulting puddle reduction of 15%.

IV. CONCLUSION

Based on the results of the research, it can be concluded that :

1. Using the SWMM 5.1 application, it is obtained that there is a puddle occurring in the RW.8 and 9 regions precisely on channels C2, C3, and C11. In the drainage network system in the RW 8 and 9 area of Blimbing, channels C2, C3 and C11 are overloaded.
2. The application of injection well technology can be applied in the area of RW.8 and 9 through SWMM 5.1 application resulting in that by using injection wells as many as 4 injection wells, precisely 2 injection wells are placed between the C2 and C3 channels, and 2 injection wells placed on the C11 channel are obtained that in such conditions there is no puddle in the channel.
3. The effectiveness of the application of injection well technology using SWMM 5.1 applications obtained in C2, C3, and C11 channels results in a puddle effectiveness of 15-68%.

ACKNOWLEDGEMENT

Thank you to all parties who have played a role in the research activities. especially in:

1. Brawijaya University
2. City public works office (PU) Malang
3. Citizens in RW. 8 dan 9 area of Blimbing

So that research activities can run smoothly with the participants.

REFERENCES

[1] Google earth. http://earth.google.com (accessed on date 14 Juli 2020)
[2] Fascal, Sumiadi, & Primantyo Andre. (2019). “Analysis of flood management of linei river at toboali city using swmm 5.1 (case study of the rawabangun region)”, *International Research Journal of Advanced Engineering and Science*, vol. 4, issue 3, pp. 54-60.
[3] Ardiyana, Mita, Mohammad Bisri, & Sumiadi. (2016). “Studi penerapan ecodrain pada sistem drainase perkotaan. jurnal teknik pengairan”, vol. 7, Nomor 2, Desember 2016, hlm. 295 – 309.
[4] Sebandar, Mauluddin, Mohammad Bisri, & Sumiadi. (2018). “Studi alternatif penaggulangan genangan berbasis konservasi di sistem drainase oesapa-lasiana kota kupang. jurnal teknik pengairan”, vol. 9 Nomor 2, November 2018, hlm 125 – 137.
[5] Desmawan, Muhammad. 2012. “Studi sumur resapan pada drainase jalan dalam upaya pelestarian kestabilan air tanah”, Lampung: Universitas Muhammadiyah Metro.
[6] Harto, Sri Br. 1993. *Analisis Hidrologi*. Gramedia Pustaka Utama. Jakarta.
[7] Mulyani, Rima. 2013. “Efektivitas pembangunan sumur resapan dalam pengendalian limpasan di das pesanggaran*”*. Bogor : Institut Pertanian Bogor.
[8] Huber and Dickinson (1988),”Storm water management model”, version 4 (User Manual), Department of Environmental Engineering Sciences, University of Florida, Gainesville,Florida

International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

[9] Kelurahan Blimbing. ‘’Profil Gambaran Umum Kelurahan Blimbing’’, [diakses 29 Agustus 2020]. Available from *https://kelblimbing.malangkota.go.id/gambaran-umum-kondisi-daerah/*
[10] Lily, Montarcih. 2018. *Rekayasa Hidrologi* Edisi Revisi. Yogyakarta : Penerbit ANDI.
[11] M Rizal Zarkani, Bambang Sujatmoko, dan Rinaldi. 2016. “Analisa drainase untuk penanggulangan banjir menggunakan epa swmm (studi kasus: perumahan mutiara witayu kecamatan rumbai pekanbaru)”. Jurnal. Pekanbaru: Fakultas Teknik Sipil Jurusan Teknik Sipil, Universitas Riau.
[12] Rossman, L.E. (2015). Storm Water Management Model User’s Manual Version 5.1.
[13] Soemarto, CD. 1987. *Hidrologi Teknik*. Surabaya : Usaha Nasional.
[14] Suhardjono, 1984. *Drainase*. Malang : Universitas Brawijaya Malang Fakultas Teknik.
[15] Suripin, 2004. *Sistem Drainase Perkotaan Yang Berkelanjutan.*Yogyakarta : Penerbit ANDI.

TABLE III. Rain Intensity Calculation Results with Mononobe Method

Duration (Hours)	**24-Hour Maximum Rainfall (R24)**				
	2 th	**5 th**	**10 th**	**20 th**	**25 th**
	4280,452	**5118,804**	**5654,617**	**6205,514**	**6374,901**
	Rain Intensity Plan with Mononobe (mm/h)				
0,08	18549,372	22182,376	24504,328	26891,642	27625,683
0,16	9274,686	11091,188	12252,164	13445,821	13812,841
0,25	5935,799	7098,360	7841,385	8605,326	8840,219
0,33	4496,818	5377,546	5940,443	6519,186	6697,135
0,5	2967,900	3549,180	3920,693	4302,663	4420,109
1	1483,950	1774,590	1960,346	2151,331	2210,055
2	741,975	887,295	980,173	1075,666	1105,027
3	494,650	591,530	653,449	717,110	736,685
4	370,987	443,648	490,087	537,833	552,514
5	296,790	354,918	392,069	430,266	442,011
6	247,325	295,765	326,724	358,555	368,342
12	123,662	147,883	163,362	179,278	184,171
24	61,831	73,941	81,681	89,639	92,086

TABLE IV. Data from Subcatchment (SWMM 5.1 Application)

No.	**Sub DTA**	**A (ha)**	**Width (m)**	**Slope (%)**	**n Soundproof**	**n Porus**	**h impermeable (mm)**	**h puddle porus (mm)**	**Imp. Puddle-free (%)**
1	S1	0,16	24,41	0,12	0,013	0,2	2,54	2,54	20
2	S2	0,18	26,06	0,12	0,013	0,2	2,54	2,54	20
3	S3	0,52	82,40	0,12	0,013	0,2	2,54	2,54	20
4	S4	0,15	24,21	0,12	0,013	0,2	2,54	2,54	20
5	S5	0,31	49,19	0,12	0,013	0,2	2,54	2,54	20
6	S6	0,89	144,89	0,12	0,013	0,2	2,54	2,54	20
7	S7	0,42	69,41	0,12	0,013	0,2	2,54	2,54	20
8	S8	0,5	77,33	0,12	0,013	0,2	2,54	2,54	20
9	S9	0,62	132,54	0,12	0,013	0,2	2,54	2,54	20
10	S10	0,57	82,59	0,12	0,013	0,2	2,54	2,54	20
11	S11	0,24	129,97	0,12	0,013	0,2	2,54	2,54	20
12	S12	1,23	224,93	0,12	0,013	0,2	2,54	2,54	20

TABLE V. Channel Geometry Data (SWMM Application 5.1)

No.	**Channel Name**	**Node Inlet-Outlet**	**Elv. Inlet-Outlet**	**Form**	**B (m)**	**h (m)**	**Slope**	**Material**	**n (*Manning)***
1	C1	J1	473	Parabolic	0,2	0,2	0,12	Concrete pairings	0,014
		J2	472						
2	C2	J2	472	Parabolic	0,2	0,2	0,12	Concrete pairings	0,014
		J3	471						
3	C3	J3	471	Parabolic	0,2	0,2	0,12	Concrete pairings	0,014
		O2	470						
4	C5	J5	474	Rectangular	0,3	0,6	0,12	Concrete pairings	0,014
		J6	473						
5	C9	J11	475	Rectangular	0,15	0,2	0,12	Concrete pairings	0,014
		J12	474						
6	C10	J12	474	Rectangular	0,15	0,2	0,12	Concrete pairings	0,014
		J13	473						
7	C11	J13	473	Rectangular	0,15	0,2	0,12	Concrete pairings	0,014
		O4	472						
8	C12	J14	474	Rectangular	0,15	0,2	0,12	Concrete pairings	0,014
		J15	473						
9	C14	J9	474	Parabolic	0,66	0,2	0,12	Concrete pairings	0,014
		J1	473						
10	C15	J10	475	Rectangular	0,3	0,6	0,12	Concrete pairings	0,014
		J5	474						
11	C16	J6	473	Rectangular	0,3	0,6	0,12	Concrete pairings	0,014

No.	Channel Name	Node Inlet-Outlet	Elv. Inlet-Outlet	Form	B (m)	h (m)	Slope	Material	n (*Manning)*
		J7	472						
12	C17	J7	472	Rectangular	0,3	0,6	0,12	Concrete pairings	0,014
		O3	471						
13	C18	J15	473	Rectangular	0,15	0,2	0,12	Concrete pairings	0,014
		O5	472						

TABLE VI. Runoff Discharge Simulation Results per Drainage Channel

No.	Channel Name	Channel Height (m)	Maximum Water Height in The Channel (m)	Maximum Speed (m/s)	Maximum discharge (m^3/s)	Description
1	C1	0,2	0,16	0,88	0,75	**Enough**
2	C2	0,2	0,20	1,28	1	**Overflow**
3	C3	0,2	0,20	1,21	1	**Overflow**
4	C5	0,6	0,21	1,24	0,35	**Enough**
5	C9	0,2	0,15	1,15	0,81	**Enough**
6	C10	0,2	0,19	1,01	0,93	**Enough**
7	C11	0,2	0,20	0,89	1	**Overflow**
8	C12	0,2	0,19	0,98	0,97	**Enough**
9	C14	0,2	0,09	0,64	0,31	**Enough**
10	C15	0,6	0,12	0,52	0,2	**Enough**
11	C16	0,6	0,28	1,58	0,47	**Enough**
12	C17	0,6	0,33	1,76	0,54	**Enough**
13	C18	0,2	0,19	1,01	0,94	**Enough**