



IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 Issue: IV Month of publication: April 2025

DOI: https://doi.org/10.22214/ijraset.2025.68532

www.ijraset.com

Call: 🕥 08813907089 🔰 E-mail ID: ijraset@gmail.com



Sujan Sama¹, Pinak. S. Ramanuj², Mr. Vishva R. Patel³

¹PG Student, Dept. of Civil Engineering, [Shantilal shah Engineering college], [Bhavnagar, India] ²Assistance Professor, Dept. of Civil Engineering, [Shantilal Shah Engineering College], [Bhavnagar, India] ³Technical Assistant, [Bhavnagar Municipal Corporation], [Bhavnagar, India]

Abstract: This research focuses on the analysis and optimization of the water distribution network in Zone 5 of the Adhewada area, Bhavnagar, where water is supplied through a zone-wise and time-based system. The increasing population, rising water demand, and the need for structured infrastructure development have made it necessary to redesign the existing system. Current sources are inadequate to meet the minimum requirement of 140 liters per capita per day (lpcd), highlighting the need for a reliable and sustainable water supply solution. Real-time data was collected from the Bhavnagar Municipal Corporation (BMC) and used to simulate the network using WaterGEMS software. The study aims to assess the current distribution pattern, identify pressure-related issues, and propose improvements to enhance efficiency and equity in supply. By integrating actual field data with hydraulic modeling, the research provides practical recommendations for strengthening the reliability and performance of the water distribution system in the selected zone.

Keywords: Heads, Hydraulic Parameters, Junction, Node, Pressure, WaterGEMS, Elevation, velocity.

I. INTRODUCTION

The provision of a reliable and equitable water supply is a fundamental component of sustainable urban infrastructure. With rapid urbanization and population growth, many cities face increasing challenges in meeting the rising demand for potable water. Bhavnagar city, located in Gujarat, is no exception.

The Adhewada area in particular is witnessing significant development and population expansion, leading to elevated water demand. In this context, designing an efficient and optimized water distribution network is crucial to ensure consistent water availability while minimizing losses and improving pressure management.

Currently, water distribution in Bhavnagar is managed through a zone-wise, time-based supply system, where different zones receive water at different times of the day. Zone-based distribution can often result in pressure fluctuations, uneven supply, and potential losses due to outdated infrastructure or lack of hydraulic analysis. Zone 5 of Adhewada was selected as the focus area for this study due to its growing population and frequent complaints of low pressure and irregular supply.

This research aims to analyze and optimize the water distribution network in Zone 5 of Adhewada using WaterGEMS, a widely adopted hydraulic modeling software. The study incorporates real-time data collected from the Bhavnagar Municipal Corporation (BMC), including population statistics, pipe network layout, water demand, and supply schedule. Based on this data, a detailed hydraulic model was created to simulate the existing water distribution system.

The primary objectives of the research include evaluating the performance of the current distribution network, identifying areas with inadequate pressure or flow, and proposing design improvements for better efficiency and reliability. Furthermore, the study emphasizes the need for sustainable design strategies that can meet the minimum per capita water requirement of 140 liters per day. Given that existing sources are insufficient to meet future demands, the research also advocates for the inclusion of additional sustainable water sources and infrastructure upgrades.

By integrating real-world data with advanced hydraulic modeling tools, this research contributes practical solutions for urban water management in medium-sized cities like Bhavnagar. The outcomes of this study can be used as a reference by municipal authorities and planners to improve water service delivery, ensure equitable distribution, and support future infrastructure planning.



ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538 Volume 13 Issue IV Apr 2025- Available at www.ijraset.com

II. OBJECTIVES

- 1) To analyze the existing water distribution system in the Adhewada area and identify inefficiencies related to pressure, flow, and supply duration.
- 2) To collect pipe reports and junction reports of existing networks .
- *3)* To analyze the data by using WaterGEMS Software.
- 4) To contribute practical recommendations for future urban water supply planning and infrastructure development based on the outcomes of the simulation and analysis.
- 5) To identify critical issues such as low pressure zones, uneven distribution, and pipe losses that affect the overall service quality.

III. LITERATURE REVIEW

The design and planning of an effective water distribution network (WDN) is a core component of any urban infrastructure system. With the rising demand for uninterrupted water supply in growing cities, the focus has steadily shifted from traditional manual planning methods to advanced hydraulic modeling and simulation tools. One such tool, WaterGEMS, has become a widely used software in both academic research and real-world applications due to its powerful simulation, optimization, and analysis features.

A study by Patel and Mehta (2022) focused on designing a continuous water supply system for Surat city using WaterGEMS. Their work demonstrated how hydraulic modeling can help in understanding flow behavior and pressure distribution across large networks. Similarly, Mehta et al. (2022) analyzed and redesigned an existing 24/7 water supply system using WaterGEMS. Their study identified network inefficiencies and proposed solutions to improve the overall water delivery mechanism.

Another significant contribution was made by Dhumal et al. (2018), who emphasized the importance of switching from intermittent to continuous water supply systems. They used WaterGEMS to simulate improved system performance and reduce water losses. In a related approach, Netaji and Thorvelt (2020) compared existing intermittent supply systems with proposed continuous models, highlighting better service coverage and pressure management in the latter. Switnicka et al. (2017) explored optimization techniques within WaterGEMS to enhance network efficiency. They applied penalty-based optimization methods to balance cost and performance in network design. Gebremedhin and Tesseme (2020) conducted a case study in Wukro Town, Ethiopia, where they used WaterGEMS to redesign the town's network, focusing on capacity improvement and future scalability.

Several researchers have taken a broader perspective. Rai and Dohare (2019) reviewed how WaterGEMS can support hydraulic planning for large-scale events, like Simhastha Mela in Ujjain, where demand surges in short periods. In their critical review, Navin and Dohare (2022) compared WaterGEMS and EPANET, discussing their respective advantages in modeling complex systems. More recently, Trinh and Loan (2024) examined the potential of WaterGEMS in addressing water scarcity by enabling sustainable water distribution planning. Yennawar (2024) also supported this viewpoint, focusing on its role in designing smarter, more adaptable urban water networks.

Across all these studies, one common theme emerges: WaterGEMS enhances the ability to simulate real-world conditions, analyze pressure zones, optimize pipe sizing, and visualize system behavior. However, there are still areas for improvement. Most existing models rely on static data, lacking real-time demand patterns. There's also limited integration of smart technologies like IoT sensors or predictive analytics, which could further enhance the responsiveness and sustainability of such systems.

Recognizing these gaps, the present study focuses on designing a practical water distribution network for the Adhewada area in Bhavnagar, using real field data provided by the Bhavnagar Municipal Corporation. By using WaterGEMS, this research aims to address current limitations in zone-wise planning, pressure optimization, and equitable service delivery, while contributing practical insights for sustainable urban water management.

IV. STUDY AREA

Bhavnagar is a coastal city on the eastern coast of Saurashtra, also known as Kathiawar, located at 21.77°N 72.15°E.It has an average elevation of 24 metres (78 ft.). The total area of the town is 10,034 sq. Kms. Bhavnagar city is considered the economic, industrial and educational hub of the region. Adhewada village is located in Bhavnagar Tehsil of Bhavnagar district in Gujarat, India. It is situated 2km away from Bhavnagar, which is both district & sub-district headquarter of Adhewada village. As per the census record 2001 total area of Adhewada village is 994.49 HA. Bhavnagar is a coastal city on the eastern coast of Saurashtra, also known as Kathiawar, located at 21.77°N 72.15°E. It has an average elevation of 24 metres (78 ft.). It occupies an area of 53.3 km2 (20.6 sq. mi). The general slope dips towards the northeast at the apex of Gulf of Khambhat. A small non-perennial river named Kansara Nala passes through the outer area of the city. The adhewada area distribution system distributed in zone wise. Whole adhewada distributed in 5 zone like ; zone 1, zone 2,...zone 5.In this study the analysis of Zone-5 is performed using hydraulic simulation software waterGEMS.



International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538 Volume 13 Issue IV Apr 2025- Available at www.ijraset.com





LOCATION MAP

AREA MAP (ZONE WISE)

V. DATA COLLECTION

The map and detailed information of the existing Water Distribution System for the Adhewada area were collected from the Hydraulic Department of the Bhavnagar Municipal Corporation (BMC). For hydraulic modeling and simulation in WaterGEMS software, several key input parameters were required. These included the length and diameter of pipes, the elevation of each junction, water demand at individual nodes and junctions, pump specifications, and the location and capacity of reservoirs. All the necessary data was gathered from BMC's engineering division to ensure accurate modeling of the existing network conditions. This comprehensive dataset formed the foundation for evaluating the performance of the current system and designing an optimized water distribution network for the selected zone.

VI. METHODOLOGY

As mentioned earlier, the required data for simulation in WaterGEMS software was collected from the Hydraulic Department of the Bhavnagar Municipal Corporation (BMC) and field surveys. WaterGEMS serves as a powerful and user-friendly decision support tool for modeling, analyzing, and optimizing water distribution systems. It allows engineers to visualize, simulate, and evaluate the hydraulic behavior of water supply networks under varying demand and pressure conditions. The following steps were carried out using WaterGEMS software:

A. Drawing The Layout

The first step is to create a new hydraulic model. As per the existing network drawing first, draw the drawing in waterGEMS software.





International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538 Volume 13 Issue IV Apr 2025- Available at www.ijraset.com

VII. DATA ENTRY

With the help of collected data, the following data were entered into the software; Length of pipes, Diameter, Demand, Elevation, Material, etc. From property editor imports data for Reservoir, Junction, Pipes.

Period - P										
1										
iow All>										
nerty Search	1									
<genera< td=""><td>Þ</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></genera<>	Þ									
ID								255		
Label Notes								R-1		
GIS-IDs								<cole< td=""><td>ection: 0 items></td><td></td></cole<>	ection: 0 items>	
Hyperlinks	iv>							<cole< td=""><td>ection: 0 items></td><td></td></cole<>	ection: 0 items>	
X (m)								3,988	8.22	
Y (m) Active T	vology							1,707	7.95	
Is Active?	4-1-12]							True		
Operatio	nal							Cole	ections	
Physical										
Elevation Zone	m)							51.35 (Non	5	
Hydraulic	Grade Pattern							Fixed	1	
Elevation	Inlet/Outlet Invert) (m)							0.00		
Water Q	ality							0.50		
Age (Initia Concentra) (hours) tion (Initial) (ma/L)							0.000	U	
Is Constitu	ent Source?							False	9	
Trace (Init Results	ial) (%)							0.0		
Hydraulic	Grade (m)							51.35	5	
Flow (Out Flow (In n	nct) (L/s) et) (L/s)							110		
Alert Leve	(Ever)							None	2	
Alert Leve Has Calcu	(Now) lation Messanes Now?							None		
Calculatio	n Messages							<cole< td=""><td>ection: 0 items></td><td></td></cole<>	ection: 0 items>	
Results (timum, Transient) (m)							(N/A)	3	
Head (Min	imum, Transient) (m)							(N/A))	
Pressure (Maximum, Transient) (k Minimum, Transient) (kl	kPa) (Pa)						(N/A) (N/A)		
Air Volum	(Maximum, Transient) (Ki	(Fa)) (L)						(N/A)	0	
Vapor Volu	me (Maximum, Transie	ent) (L)						(N/A))	
exTable: J	el for this element.	t Time: 0.000 hours	(ZONE	5.wtg)						
exTable: J	unction Table (Current	t Time: 0.000 hours • 🙀 • 🗓 •	(ZONE	5.wtg)	Demod	Damand	Hydraulic	Dress ==		
iptive la xTable: J	unction Table (Current	t Time: 0.000 hours → I Egg → I IID → Label (n	(ZONE	5.wtg) Zone	Demand Collection	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)		
exTable: J	unction Table (Current	t Time: 0.000 hours • Egg • IEo • Label (n	(ZONE	5.wtg) Zone	Demand Collection	Demand (L/s)	Hydraulic Grade (m) 51.35	Pressure (kPa) 235 231		
exTable: J	bel for this element. unction Table (Current ID 10 10 10 10 10 10 10 10 10 10	t Time: 0.000 hours • Egg • Hib • Label Elevi (n	(ZONE 27.35 27.40 27.45	5.wtg) Zone <none> <none></none></none>	Demand Collection <collection: <collection:< td=""><td>Demand (L/s) 0 0</td><td>Hydraulic Grade (m) 51.35 51.03 49.64</td><td>Pressure (kPa) 235 231 217</td><td></td><td></td></collection:<></collection: 	Demand (L/s) 0 0	Hydraulic Grade (m) 51.35 51.03 49.64	Pressure (kPa) 235 231 217		
exTable: J exTable: J 1 2 3 4	el for this element.	t Time: 0.000 hours • Ege Hito • Label (n	(ZONE 27.35 27.40 27.45 27.50	5.wtg) Zone <none> <none> <none> <none></none></none></none></none>	Demand Collection <collection: <collection: <collection:< td=""><td>Demand (L/s) 1 0 0 0</td><td>Hydraulic Grade (m) 51.35 51.03 49.64 48.86</td><td>Pressure (kPa) 235 231 217 209</td><td></td><td></td></collection:<></collection: </collection: 	Demand (L/s) 1 0 0 0	Hydraulic Grade (m) 51.35 51.03 49.64 48.86	Pressure (kPa) 235 231 217 209		
exTable: J exTable: J 1 2 3 4 5 6	D D 1D 1 32 3-1 34 3-2 36 3-3 38 3-4 40 3-5 42 3-5	t Time: 0.000 hours • [20]• Hto • Label (n	(ZONE 27.35 27.40 27.45 27.50 27.56 27.57	5.wtg) Zone <none> <non< td=""><td>Demand Collection: <collection: <collection: <collection: <collection:< td=""><td>Demand (L/s) 1 0 0 0 1</td><td>Hydraulic Grade (m) 51.35 51.03 49.64 48.86 47.81 47.47</td><td>Pressure (kPa) 235 231 217 209 198 195</td><td></td><td></td></collection:<></collection: </collection: </collection: </td></non<></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none>	Demand Collection: <collection: <collection: <collection: <collection:< td=""><td>Demand (L/s) 1 0 0 0 1</td><td>Hydraulic Grade (m) 51.35 51.03 49.64 48.86 47.81 47.47</td><td>Pressure (kPa) 235 231 217 209 198 195</td><td></td><td></td></collection:<></collection: </collection: </collection: 	Demand (L/s) 1 0 0 0 1	Hydraulic Grade (m) 51.35 51.03 49.64 48.86 47.81 47.47	Pressure (kPa) 235 231 217 209 198 195		
exTable: , -1 -2 -3 -4 -5 -6 -7	Del Gene Attention Table (Current ID ID ID ID ID 32 3-1 ID	t Time: 0.000 hours • [5] • [1] • Label Eleven	(ZONE ion 27.35 27.40 27.45 27.50 27.56 27.57 27.58	5.wtg) Zone	Demand Collection <collection: <collection: <collection: <collection: <collection: <collection:< td=""><td>Demand (L/s) 1 0 0 0 1 1 1 1</td><td>Hydraulic Grade (m) 51.35 51.03 49.64 48.86 47.81 47.47 47.47</td><td>Pressure (kPa) 235 231 217 209 198 195 191</td><td></td><td></td></collection:<></collection: </collection: </collection: </collection: </collection: 	Demand (L/s) 1 0 0 0 1 1 1 1	Hydraulic Grade (m) 51.35 51.03 49.64 48.86 47.81 47.47 47.47	Pressure (kPa) 235 231 217 209 198 195 191		
exTable: . 1 2 3 4 5 5 6 7 8 8	Del for this element. ID ID <td>t Time: 0.000 hours • [5] • H · • Label Eleven</td> <td>(ZONE ion 27.35 27.40 27.45 27.50 27.56 27.57 27.58 27.59</td> <td>5.wtg) Zone (None> (None> (None> (None> (None> (None> (None> (None> (None>) (None> (None>) (None> (None>) (None>) (None> (None>) (None</td> <td>Demand Collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection:< td=""><td>Demand (L/s) 1 0 0 0 0 1 1 1 1 1</td><td>Hydraulic Grade (m) 51.35 51.03 49.64 48.86 47.81 47.81 47.47 47.12 46.93</td><td>Pressure (kPa) 235 231 217 209 198 195 191 191 191</td><td></td><td></td></collection:<></collection: </collection: </collection: </collection: </collection: </collection: </td>	t Time: 0.000 hours • [5] • H · • Label Eleven	(ZONE ion 27.35 27.40 27.45 27.50 27.56 27.57 27.58 27.59	5.wtg) Zone (None> (None> (None> (None> (None> (None> (None> (None> (None>) (None> (None>) (None> (None>) (None>) (None> (None>) (None	Demand Collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection:< td=""><td>Demand (L/s) 1 0 0 0 0 1 1 1 1 1</td><td>Hydraulic Grade (m) 51.35 51.03 49.64 48.86 47.81 47.81 47.47 47.12 46.93</td><td>Pressure (kPa) 235 231 217 209 198 195 191 191 191</td><td></td><td></td></collection:<></collection: </collection: </collection: </collection: </collection: </collection: 	Demand (L/s) 1 0 0 0 0 1 1 1 1 1	Hydraulic Grade (m) 51.35 51.03 49.64 48.86 47.81 47.81 47.47 47.12 46.93	Pressure (kPa) 235 231 217 209 198 195 191 191 191		
-1 -1 -2 -3 -4 -5 -6 -7 -8 -9 -10	el for this element. unction Table (Current TD TD TD TD TD TD TD TD TD TD	t Time: 0.000 hours Fight = Hib, = Label field f	(ZONE 27.35 27.40 27.45 27.50 27.56 27.57 27.58 27.59 27.60 27.61	5.wtg) Zone (None> (Non	Demand Collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection:< td=""><td>Demand (L/s) 0 0 1 1 1 1 1 1 1</td><td>Hydraulic Grade (m) 51.35 51.03 49.64 47.81 47.74 47.72 46.53 46.53</td><td>Pressure (kPa) 235 231 217 209 198 195 191 199 198 199 188 187</td><td></td><td></td></collection:<></collection: </collection: </collection: </collection: </collection: </collection: </collection: 	Demand (L/s) 0 0 1 1 1 1 1 1 1	Hydraulic Grade (m) 51.35 51.03 49.64 47.81 47.74 47.72 46.53 46.53	Pressure (kPa) 235 231 217 209 198 195 191 199 198 199 188 187		
-1 -1 -2 -3 -4 -5 -6 -7 -8 -9 -10 -11	Line for this element.	t Time: 0.000 hours I Go + Ho, + Label (r	(ZONE ion 27.35 27.40 27.50 27.50 27.57 27.59 27.60 27.61 27.61	5.wtg) Zone Cone> Cone>	Demand Collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection:< td=""><td>Demand (L/s) 1 0 0 0 0 1 1 1 1 1 1 1 1 1 1</td><td>Hydraulic Grede (m) 51.135 51.03 49.64 48.86 47.67 47.12 46.93 46.53 46.53</td><td>Pressure (kPa) 235 231 227 209 198 195 191 199 188 187 187 187 187 187</td><td></td><td></td></collection:<></collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: 	Demand (L/s) 1 0 0 0 0 1 1 1 1 1 1 1 1 1 1	Hydraulic Grede (m) 51.135 51.03 49.64 48.86 47.67 47.12 46.93 46.53 46.53	Pressure (kPa) 235 231 227 209 198 195 191 199 188 187 187 187 187 187		
IlexTable: . IlexTable: . Il	el for this element. unction Table (Current D D 32 34 34 32 36 33 34 42 36 33 34 4 40 35 42 36 42 36 43 37 44 37 44 37 44 37 44 37 44 37 44 37 44 37 44 37 44 37 44 37 44 37 44 37 44 37 44 37 44 37 44 37 44 37 45 38 39 50 3-10 52 3-11 54 3-12 56 5 5 5 5 5 5 5 5 5 5 5 5	t Time: 0.000 hours t Time: 0.000 hours Label Bever (e	(ZONE ion 27.35 27.40 27.45 27.50 27.56 27.57 27.58 27.59 27.60 27.61 27.62 27.63 27.64	5.wtg) Zone Cone> Cone> 	Demand Collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection:< td=""><td>Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1</td><td>Hydraulic Grade (m) 51.35 51.33 49.64 49.86 49.86 47.712 46.83 46.73 46.64 46.55 46.64</td><td>Pressure (kPa) 235 231 227 209 199 199 199 199 188 187 188 187 186 185 1914</td><td></td><td></td></collection:<></collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: 	Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulic Grade (m) 51.35 51.33 49.64 49.86 49.86 47.712 46.83 46.73 46.64 46.55 46.64	Pressure (kPa) 235 231 227 209 199 199 199 199 188 187 188 187 186 185 1914		
-1 -1 -2 -3 -4 -4 -5 -6 -7 -7 -8 -8 -9 -10 -11 -11 -12 -13 -14	el for this element. unction Table (Current	t Time: 0.000 hours v [2] v 15 v Label Beneficial (n	(ZONE ion 27.35 27.40 27.45 27.50 27.56 27.57 27.58 27.59 27.60 27.61 27.62 27.63 27.64 27.65	Swrtg) Zone <none> <none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none>	Demand Collections (Collections) (Collections) (Collections) (Collections) (Collections) (Collections) (Collections) (Collections) (Collections) (Collections) (Collections)	Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulic Grade (n) 51.153 49.646 47.81 47.77 47.712 46.633 46.633 46.675 46.644 46.555 46.645	Pressure (\$Pa) 235 231 217 209 198 195 191 199 198 195 191 188 187 186 185 184 184		
LexTable: LexTab	el for this element.	t Time: 0.000 hours • (5) • (5) • tabel Berrie (e	(ZONE ion 27.35 27.40 27.45 27.50 27.56 27.57 27.58 27.60 27.61 27.62 27.63 27.64 27.65 27.65	Swrtg) Zone <none> <none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none></none>	Demand Collections Collections Collections Collections Collections Collections Collections Collections Collections Collections Collections Collections Collections Collections	Demand (L/s) 1 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulc Grade (n) 51.155 51.03 49.64 47.81 47.81 47.87 47.71 47.71 47.72 46.63 46.655 46.64 46.55 46.645	Pressure (\$Pa) 235 231 217 209 198 195 191 199 198 199 198 199 198 199 198 197 196 6 197 196 197 197 196 197 197 197 197 197 197 197 197 197 197		
	el for this element. ID ID ID ID ID ID II II II I	t Time: 0.000 hours I (50 + 15) + Label Berri 6 - - - - - - - - - - - - -	(ZONE 27.35 27.40 27.45 27.56 27.57 27.58 27.59 27.60 27.61 27.62 27.63 27.64 27.65 27.65 27.65 27.65 27.65 27.65	5.wtg) Zone dione> di	Demand Collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection:< td=""><td>Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</td><td>Hydraulic Grede (m) 51.35 51.03 49.64 47.81 47.74 47.72 47.72 46.53 46.55 46.64 46.55 46.45 46.55 46.45 46.53 46.53</td><td>Pressure (\$Pa) 235 231 217 209 198 195 191 198 195 191 188 187 186 185 184 183 184 183 183 183</td><td></td><td></td></collection:<></collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: 	Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulic Grede (m) 51.35 51.03 49.64 47.81 47.74 47.72 47.72 46.53 46.55 46.64 46.55 46.45 46.55 46.45 46.53 46.53	Pressure (\$Pa) 235 231 217 209 198 195 191 198 195 191 188 187 186 185 184 183 184 183 183 183		
	el for this element.	t Time: 0.000 hours I (Eg) + IE) + Label Bever (e - - - - - - - - - - - - -	(ZONE ion 27.35 27.40 27.57 27.56 27.57 27.58 27.59 27.60 27.61 27.62 27.63 27.64 27.65 27.65 27.65 27.65 27.65 27.60 27.55	5.wtg) Zone dlone> dl	Demand Collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection:< td=""><td>Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</td><td>Hydraulic Grade (m) 51.35 51.03 49,64 47,81 47,87 47,72 47,72 46,53 46,55 46,64 46,55 46,64 46,55 46,64 46,55 46,64 46,55 46,64 46,55 46,51 46,55 46,51 46,55 46,51 46,55 46,51 46,55 46,51 46,5</td><td>Pressure (\$Pa) 235 231 227 209 198 195 199 198 197 199 198 197 198 197 198 197 198 197 198 197 198 197 198 198 197 198 198 197 198 198 197 198 199 199 199 199 199 199 199 199 199</td><td></td><td></td></collection:<></collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: 	Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulic Grade (m) 51.35 51.03 49,64 47,81 47,87 47,72 47,72 46,53 46,55 46,64 46,55 46,64 46,55 46,64 46,55 46,64 46,55 46,64 46,55 46,51 46,55 46,51 46,55 46,51 46,55 46,51 46,55 46,51 46,5	Pressure (\$Pa) 235 231 227 209 198 195 199 198 197 199 198 197 198 197 198 197 198 197 198 197 198 197 198 198 197 198 198 197 198 198 197 198 199 199 199 199 199 199 199 199 199		
	el for this element.	t Time: 0.000 hours I (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	(ZONE ion 27.35 27.40 27.45 27.50 27.50 27.50 27.60 27.61 27.62 27.63 27.64 27.65 27.64 27.65 27.65 27.60 27.55 27.37	5.wtg) Zone dione> di	Demand Collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection:< td=""><td>Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</td><td>Hydraulic Grade (m) 51.35 51.03 49.64 48.86 47.81 47.47 47.72 46.53 46.633 46.635 46.64 46.55 46.64 46.55 46.64 46.57 46.51 46.51</td><td>Pressure (\$Pa) 235 231 217 209 198 195 199 188 197 186 187 186 187 184 183 183 183 183 183 183 183 183 183 183</td><td></td><td></td></collection:<></collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: 	Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulic Grade (m) 51.35 51.03 49.64 48.86 47.81 47.47 47.72 46.53 46.633 46.635 46.64 46.55 46.64 46.55 46.64 46.57 46.51 46.51	Pressure (\$Pa) 235 231 217 209 198 195 199 188 197 186 187 186 187 184 183 183 183 183 183 183 183 183 183 183		
exTable:	el for this element.	t Time: 0.000 hours • [5] • [5] • [5] • Label [6] 	(ZONE 27.35 27.40 27.55 27.50 27.56 27.57 27.58 27.61 27.65 27.65 27.65 27.65 27.65 27.65 27.65 27.37 27.36	5.wtg) Zone d/one> d/o	Demand Colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections< td=""><td>Demand (L/s) 1 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1</td><td>Hydraulic Grade (n) 51.15 51.03 49.64 48.86 47.81 47.81 47.77 47.72 46.83 46.83 46.83 46.85 546.64 46.55 46.64 46.55 46.64 46.53 46.64 46.23 46.23 46.17 46.</td><td>Pressure (\$Pa) 2255 2217 2217 209 1955 1951 1951 1951 1951 1951 1951 19</td><td></td><td></td></colections<></colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections 	Demand (L/s) 1 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulic Grade (n) 51.15 51.03 49.64 48.86 47.81 47.81 47.77 47.72 46.83 46.83 46.83 46.85 546.64 46.55 46.64 46.55 46.64 46.53 46.64 46.23 46.23 46.17 46.	Pressure (\$Pa) 2255 2217 2217 209 1955 1951 1951 1951 1951 1951 1951 19		
extable: -1 -2 -3 -4 -5 -6 -7 -8 -9 -10 -11 -12 -13 -14 -15 -16 -6 -6 -7 -7 -8 -9 -10 -11 -11 -12 -3 -3 -4 -4 -5 -5 -6 -6 -7 -7 -7 -8 -9 -10 -11 -12 -3 -3 -4 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5	el for this element.	t Time: 0.000 hours • G ₀ • H ₀ • Label Bever (e) • • • • • • • • • • • • •	(ZONE 27.35 27.40 27.50 27.50 27.50 27.57 27.58 27.59 27.61 27.61 27.65 27.64 27.65 27.65 27.65 27.65 27.65 27.60 27.55 27.36 27.36	5.wtg) Zone dione> di	Demand Collections	Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulic Gred (m) 51.35 51.03 49.64 49.86 47.81 47.47 47.12 46.93 46.53 46.53 46.55 46.54 46.53 46.53 46.53 46.53 46.53 46.53 46.53 46.54 46.53 46.54 46.53 46.54 46.53 46.54 46.53 46.54 46.55 46.54 46.55 46.54 46.55 46.54 46.55	Pressure (kPa) 235 231 217 209 198 199 198 197 199 198 197 199 198 197 199 198 197 199 198 197 194 194 193 193 193 193 193 193 193 193 193 193		
	el for this element.	t Time: 0.000 hours I I I I I I I I I I I I I I I I I I I	(ZONE 27.35 27.40 27.45 27.50 27.50 27.50 27.52 27.50 27.61 27.62 27.65 27.65 27.65 27.65 27.65 27.65 27.65 27.37 27.36 27.36 27.36 27.36	5.wtg) Zane dione> di	Demand Colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection:< td=""><td>Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</td><td>Hydraulc Grede (m) 51.35 51.03 49.64 47.81 47.74 47.72 47.72 46.53 46.55 46.64 46.55 46.64 46.55 46.64 46.55 46.64 46.53 46.71 46.11 46.21 46.21 46.55</td><td>Pressure (kPa) 235 231 227 209 198 195 195 195 195 195 195 195 195 195 195</td><td></td><td></td></colection:<></colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: 	Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulc Grede (m) 51.35 51.03 49.64 47.81 47.74 47.72 47.72 46.53 46.55 46.64 46.55 46.64 46.55 46.64 46.55 46.64 46.53 46.71 46.11 46.21 46.21 46.55	Pressure (kPa) 235 231 227 209 198 195 195 195 195 195 195 195 195 195 195		
exTable:	ee for this element. ID ID ID ID ID I 34 32 34 34 32 36 33 34 34 40 35 42 36 43 37 42 36 43 37 42 36 43 39 44 40 35 42 36 44 39 50 340 45 38 344 40 50 340 52 341 54 342 56 343 54 34 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	t Time: 0.000 hours I (5) - 15) - Label Bever 6 - - - - - - - - - - - - -	(ZONE 27.35 27.40 27.45 27.50 27.50 27.52 27.50 27.61 27.62 27.65 27.65 27.65 27.65 27.65 27.65 27.65 27.65 27.65 27.65 27.37 27.36 27.37 27.36 27.35 27.35	5.wtg) Zone dione> dione+ dione> dione> dione> dione> dione> dione> dione> dione> dione> di	Demand Collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection:< td=""><td>Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</td><td>Hydraulic Grade (m) 51.35 51.03 49,64 47,81 47,87 47,72 47,72 47,72 47,72 47,72 46,53 46,555 46,5555 46,5555 46,5555 46,5555 46,55555 46,5555555555</td><td>Pressure (\$Pa) 235 231 227 209 198 195 199 198 197 199 198 197 199 198 197 198 197 198 197 198 197 198 198 197 198 198 197 198 198 198 197 198 198 197 198 199 198 199 198 199 199 199 199 199</td><td></td><td></td></collection:<></collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: 	Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulic Grade (m) 51.35 51.03 49,64 47,81 47,87 47,72 47,72 47,72 47,72 47,72 46,53 46,555 46,5555 46,5555 46,5555 46,5555 46,55555 46,5555555555	Pressure (\$Pa) 235 231 227 209 198 195 199 198 197 199 198 197 199 198 197 198 197 198 197 198 197 198 198 197 198 198 197 198 198 198 197 198 198 197 198 199 198 199 198 199 199 199 199 199		
	el for this element.	t Time: 0.000 hours v [Gg v] Ho v Label Ben for tabel Ben for for for for for for for for	(ZONE 27.35 27.40 27.52 27.52 27.52 27.52 27.52 27.52 27.52 27.52 27.62 27.62 27.62 27.62 27.65 27.55 27.65 27.65 27.55 27	5.wtg) Zone dione> di	Demand Collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection: <collection:< td=""><td>Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</td><td>Hydraulic Grade (m) 51.35 51.03 49.64 49.86 47.71 47.72 47.72 47.72 46.53 46.63 46.63 46.63 46.65 46.64 46.63 46.63 46.63 46.63 46.63 46.63 46.55 46.64 14 46.53 46.55 46.55 46.55 46.55 46.55 46.55 46.57 4</td><td>Pressure (\$Pa) 235 231 217 209 198 195 199 188 187 186 187 186 187 186 187 188 183 183 183 183 183 183 183 183 183</td><td></td><td></td></collection:<></collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: </collection: 	Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulic Grade (m) 51.35 51.03 49.64 49.86 47.71 47.72 47.72 47.72 46.53 46.63 46.63 46.63 46.65 46.64 46.63 46.63 46.63 46.63 46.63 46.63 46.55 46.64 14 46.53 46.55 46.55 46.55 46.55 46.55 46.55 46.57 4	Pressure (\$Pa) 235 231 217 209 198 195 199 188 187 186 187 186 187 186 187 188 183 183 183 183 183 183 183 183 183		
LexTable: lexTable: -1 -1 -2 -3 -4 -5 -5 -6 -7 -8 -9 -10 -11 -12 -13 -14 -15 -16 -7 -7 -8 -9 -9 -10 -11 -12 -2 -3 -4 -5 -5 -5 -5 -5 -5 -5 -5 -5 -5	el for this element.	t Time: 0.000 hours • [5] • 15 • Label from (n 	(ZONE 27.35 27.40 27.57 27.50 27.58 27.59 27.60 27.61 27.62 27.63 27.62 27.63 27.65 27.56 27.55 27	5.wtg) Zone d/lone> d	Demand Colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections <colections< td=""><td>Demand (L/s) 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</td><td>Hydraulic Grade (n) 51.35 51.03 49.64 48.86 47.81 47.77 47.72 46.53 46.63 46.55 46.64 46.55 46.64 46.55 46.64 46.57 46.57 46.57 46.53 46.17 46.17 46.17 46.17 46.17 46.17 46.53 46.57 46.53 46.57 46.53 46.57 46.53</td><td>Pressure (\$Pa) 235 231 217 217 209 198 195 199 198 199 198 199 198 187 186 187 184 183 183 183 183 182 182 182 182 182 182 182 183 183 183 183 183 183 183 183 183 183</td><td></td><td></td></colections<></colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections </colections 	Demand (L/s) 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulic Grade (n) 51.35 51.03 49.64 48.86 47.81 47.77 47.72 46.53 46.63 46.55 46.64 46.55 46.64 46.55 46.64 46.57 46.57 46.57 46.53 46.17 46.17 46.17 46.17 46.17 46.17 46.53 46.57 46.53 46.57 46.53 46.57 46.53	Pressure (\$Pa) 235 231 217 217 209 198 195 199 198 199 198 199 198 187 186 187 184 183 183 183 183 182 182 182 182 182 182 182 183 183 183 183 183 183 183 183 183 183		
LexTable: LexTable: -1 -1 -2 -3 -4 -5 -5 -6 -7 -8 -9 -10 -11 -12 -2 -3 -4 -4 -5 -5 -6 -6 -7 -1 -1 -1 -1 -2 -2 -3 -4 -1 -1 -2 -2 -3 -4 -1 -1 -2 -2 -3 -4 -1 -1 -1 -2 -2 -3 -4 -1 -1 -1 -1 -1 -1 -2 -2 -3 -4 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1	el for this element. IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	t Time: 0.000 hours • G ₀ • H ₀ • Label Bev (e 	(ZONE 27.35 27.40 27.45 27.50 27.56 27.57 27.58 27.60 27.61 27.61 27.63 27.64 27.65 27.65 27.65 27.67 27.65 27.67 27.36 27.35 27.40 27.35 27.40 27.56 27.57 27.56 27.55 27.57 27.56 27.55 27.56 27.55 27.57 27.56 27.55 27.55 27.56 27.55 27.56 27.55 27.56 27.55 27.56 27.55 27.56 27.55 27.56 27.55 27.56 27.55 27.56 27.55 27.56 27.55 27.55 27.56 27.55	5.wtg) Zone d/one> d/o	Demand Colection: <colection:< td=""> <colection:< td=""></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<>	Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulic (m) 51.35 51.30 49.64 48.86 47.81 47.47 47.12 46.93 46.53 46.53 46.53 46.53 46.53 46.53 46.55 46.55 46.55 46.55 45.55 45.55 45.57 45.57	Pressure (kPa) 235 231 217 209 198 199 198 197 199 198 197 199 198 197 199 198 197 193 193 193 193 193 193 193 193 193 193		
lexTable lexTab	el for this element.	t Time: 0.000 hours I III IIII IIIII IIIIIIIIIIIIIIIIIIII	(ZONE 27.35 27.40 27.45 27.56 27.57 27.58 27.60 27.61 27.62 27.63 27.64 27.65 27.65 27.65 27.65 27.65 27.65 27.35 27.36 27.35 27.36 27.35 27.36 27.35 27.36 27.35 27	5.wtg) Zane dione> dio	Demand Colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection: <colection:< td=""><td>Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</td><td>Hydraulc Grede (m) 51.35 51.03 49.64 49.86 49.781 47.74 47.72 46.53 46.55 46.64 46.55 46.64 46.55 46.64 46.55 46.64 46.53 46.53 46.53 46.53 46.53 46.53 45.55 45.87 45.58</td><td>Pressure (kPa) 235 231 227 209 198 195 195 195 195 195 194 185 185 185 185 185 185 185 185 185 185</td><td></td><td></td></colection:<></colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: </colection: 	Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulc Grede (m) 51.35 51.03 49.64 49.86 49.781 47.74 47.72 46.53 46.55 46.64 46.55 46.64 46.55 46.64 46.55 46.64 46.53 46.53 46.53 46.53 46.53 46.53 45.55 45.87 45.58	Pressure (kPa) 235 231 227 209 198 195 195 195 195 195 194 185 185 185 185 185 185 185 185 185 185		
Image: control of the second	el for this element.	t Time: 0.000 hours I I I I I I I I I I I I I I I I I I I	(ZONE 27.35 27.40 27.45 27.50 27.57 27.58 27.60 27.61 27.62 27.62 27.63 27.65 27.65 27.65 27.65 27.65 27.65 27.65 27.55 27.55 27.37 27.36 27.35	5.wtg) Zone dione> dione+ dione> dione+ dione> dione+ dione+ dione+ dione+ dione+ dione+ di	Demand Collection: <collection:< td=""> <co< td=""><td>Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</td><td>Hydraulic Grade (m) 51.35 51.03 49,64 47,81 47,87 47,72 47,72 47,72 47,72 47,72 47,72 47,72 47,73 46,53 46,55 46,64 46,55 46,55 46,55 46,55 46,57 46,57 45,58 45,58 45,58</td><td>Pressure (\$Pa) 235 231 227 209 198 195 191 199 198 197 198 197 198 197 198 197 198 197 198 197 198 197 198 198 197 198 193 193 193 193 199 199 199 199 199 199</td><td></td><td></td></co<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<></collection:<>	Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulic Grade (m) 51.35 51.03 49,64 47,81 47,87 47,72 47,72 47,72 47,72 47,72 47,72 47,72 47,73 46,53 46,55 46,64 46,55 46,55 46,55 46,55 46,57 46,57 45,58 45,58 45,58	Pressure (\$Pa) 235 231 227 209 198 195 191 199 198 197 198 197 198 197 198 197 198 197 198 197 198 197 198 198 197 198 193 193 193 193 199 199 199 199 199 199		
Image: control of the second	el for this element.	t Time: 0.000 hours	(ZONE 27.35 27.40 27.45 27.57 27.58 27.59 27.60 27.61 27.62 27.63 27.62 27.63 27.65 27.65 27.65 27.65 27.65 27.65 27.55 27.35 26.01 25.55 27.35 26.01 25.55 27.35 25.55 27.35 25.55 27.35 25.55 25.55 25.55 25.55 25.55	5.wtg) Zone d/one> d/o	Demand Colection Colection:	Demand (L/s) 1 1 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulic Grade (m) 51.35 51.03 49.64 49.86 47.71 47.72 46.53 46.63 46.55 46.64 46.55 46.64 46.55 46.64 46.55 46.55 46.55 46.55 46.55 46.55 46.57 46.51 46.57 46.51 46.57 46.51 46.57 46.51 46.57 46.51 46.57 46.51 46.55 45.55 45.5	Presure (\$Pa) 235 231 217 209 198 195 199 198 199 198 188 187 186 187 186 187 188 187 188 183 183 183 183 183 183 183 183 183		
Image: constraint of the second sec	el for this element.	t Time: 0.000 hours • 20 +	(ZONE 27.35 27.40 27.50 27.50 27.57 27.50 27.57 27.52 27.61 27.62 27.63 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.65 27.64 27.65 27.62 27.65 27.62 27.65 27.62 27.65 27.62 27.65 27.62 27.65 27.55 25.55 25.75 25	5.wtg) Zone d/kone> d	Demand Colection: Colection: C	Demand (i, /s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulic (n) 51.35 51.30 49.64 48.86 47.81 47.47 47.12 46.93 46.53 46.53 46.53 46.53 46.53 46.53 46.55 46.5	Pressure (kPa) 235 231 217 209 198 199 198 197 199 198 197 199 198 197 199 198 197 198 193 193 193 193 193 193 193 193 193 191 191		
Image: constraint of the second sec	Del for this element. ID ID 32 34 40 35 33 34 40 35 33 34 40 35 41 36 42 36 44 36 44 36 44 36 44 37 35 344 46 38 46 39 46 39 46 39 46 34 47 36 48 32 59 313 58 314 60 345 61 348 63 323 70 320 71 322 76 323 78 324 300 325 62 34 39 324 39 </td <td>t Time: 0.000 hours The light of the second of the second</td> <td>(ZONE 27.35 27.40 27.50 27.50 27.57 27.50 27.61 27.62 27.63 27.61 27.62 27.63 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.55 25.555 25.5555 25.5555 25.5555 25.55555 25.55555555</td> <td>5.wtg) Zone d/lone> d</td> <td>Demand Colections <colections< td=""> C</colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></td> <td>Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</td> <td>Hydrauk Grede (m) 51.35 51.03 49.64 49.86 47.781 47.47 47.47 47.47 47.52 46.53 46.53 46.55 46.64 46.55 46.64 46.55 46.51 46.53 46.55 45.55 45.55 45.55 45.55 45.55 45.54 45.55 45.54 45.55 45.54 45.55 45.54 45.55</td> <td>Pressure (kPa) 235 231 217 209 198 195 195 195 195 195 195 195 195 195 195</td> <td></td> <td></td>	t Time: 0.000 hours The light of the second	(ZONE 27.35 27.40 27.50 27.50 27.57 27.50 27.61 27.62 27.63 27.61 27.62 27.63 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.64 27.65 27.55 25.555 25.5555 25.5555 25.5555 25.55555 25.55555555	5.wtg) Zone d/lone> d	Demand Colections <colections< td=""> C</colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<></colections<>	Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydrauk Grede (m) 51.35 51.03 49.64 49.86 47.781 47.47 47.47 47.47 47.52 46.53 46.53 46.55 46.64 46.55 46.64 46.55 46.51 46.53 46.55 45.55 45.55 45.55 45.55 45.55 45.54 45.55 45.54 45.55 45.54 45.55 45.54 45.55	Pressure (kPa) 235 231 217 209 198 195 195 195 195 195 195 195 195 195 195		
Image: constraint of the second sec	Del for this element. ID ID 32 34 33 34 34 32 35 33 36 33 37 34 40 35 42 36 42 36 43 32 44 34 40 35 42 36 42 36 42 36 43 34 44 37 42 36 43 32 44 37 54 32 55 32 56 34 56 37 56 32 56 32 56 32 57 323 78 324 80 325 52 32 50 33 53	t Time: 0.000 hours I III III III III IIII IIII IIII IIII	(ZONE 27.35 27.40 27.52 27.52 27.52 27.52 27.52 27.52 27.61 27.62 27.63 27.65 27.65 27.65 27.65 27.65 27.65 27.65 27.65 27.55 27.37 27.35 25.50 25.55 25.55 25.56 25.55 25.56 25.55 25	S.wtg) Zane	Demand Colection: <colection:< td=""> C</colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<>	Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulc Grade (m) 51.35 51.03 49,64 48,85 47,81 47,87 47,87 47,87 46,53 46,55 46,45 46,55 46,45 46,55 46,45 46,55 46,45 46,55	Pressure (\$Pa) 235 231 227 209 198 195 199 188 187 186 185 184 183 182 183 182 183 183 182 183 183 182 184 183 183 183 182 185 184 183 183 182 196 193 195 195 195 195 195 195 195 195 195 195		
Implies a second seco	Del for this element. ID ID 32 3-1 34 3-2 36 3-3 36 3-3 40 3-5 42 3-6 44 3-7 40 3-5 42 3-6 44 3-7 45 3-8 46 3-8 46 3-8 46 3-7 56 3-13 58 3-14 46 3-8 46 3-9 50 3-10 52 3-11 58 3-14 56 3-13 58 3-24 76 3-24 77 3-21 76 3-23 77 3-24 80 3-29 81 3-27 78 3-24 90 3-24 90 3-24	t Time: 0.000 hours The light of the second	(ZONE 27.35 27.40 27.57 27.58 27.59 27.57 27.58 27.59 27.61 27.61 27.65 27.65 27.65 27.65 27.65 27.37 27.35 25.55 25.70 25.55 25	5.wtg) Zone	Demand Colection: <colection:< td=""> C</colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<></colection:<>	Demand (L/s) 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Hydraulc Grade (n) 51.35 51.03 49.64 49.86 47.81 47.87 46.83 46.73 46.83 46.73 46.83 46.73 46.83 46.73 46.83 46.74 46.73 46.74 46.73 46.74 46.75 46.74 46.77 46.73 46.74 46.73 46.74 46.77 46.73 46.74 46.75 46.77 46.77 45.85 45.58 45.59 45.59 45.43 45.44 45.40 45.41 45.42 45.43 45.43 45.44 45.45 45.45	Pressure (\$Pa) 235 231 217 209 195 195 195 198 188 188 188 188 188 188 188 188 188		



ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538 Volume 13 Issue IV Apr 2025- Available at www.ijraset.com

VIII. RUN THE MODEL

After all necessary data are imported, the model is Run. Then, Flow in the network will be shown in WaterGEMS, as shown in Fig



IX. CALCULATION SUMMARY

Once the model runs successfully, the next step is to review the results using the FlexTables. The Junction FlexTable displays details such as hydraulic grade line, pressure, and demand at each junction. The Pipe FlexTable includes parameters like flow, velocity, head loss, and pipe status. These reports help in assessing network performance and identifying elements that require design improvements.



ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538 Volume 13 Issue IV Apr 2025- Available at www.ijraset.com

X. RESULT AND DISCUSSION

The pipe report of the proposed network includes 115 pipes. The material used for all the pipes is ductile iron, with a Hazen-Williams roughness coefficient (C) value of 140. The observed velocity across the network ranges from 0.08 m/s to 1.45 m/s, which lies within acceptable hydraulic standards. The diameters of the pipes vary from 100 mm to 600 mm. The comparison between the existing network and the WaterGEMS simulation results shows a maximum error of 0.25 and a minimum error of -0.19.. Despite this, the network demonstrates adequate flow capacity to satisfy the projected water demand.

The junction report consists of 86 nodes analyzed using WaterGEMS software, with pressure head calculations based on the Hazen-Williams formula. As per the CPHEEO manual, a minimum pressure head of 7 meters is required to ensure reliable water supply across the network. The simulation revealed fluctuations in pressure head values at various junctions, with water demand ranging from 0.14 liters per second to 11.22 liters per second. These findings highlight critical areas in the system that may require hydraulic improvements to enhance distribution efficiency

XI. CONCLUSION

The present study successfully demonstrates the design and analysis of a water distribution network using WaterGEMS software for the Adhewada region of Bhavnagar. Through the integration of field data—such as pipe lengths, diameters, elevations, and nodal demands—the model provided a detailed understanding of the hydraulic behavior of the existing and proposed systems. The simulation results highlighted areas with insufficient pressure head and excessive head loss gradients, guiding necessary design adjustments to meet CPHEEO standards. The findings underscore the effectiveness of WaterGEMS as a decision-support tool in optimizing urban water infrastructure. This research contributes valuable insights for municipal planners and engineers aiming to improve water supply efficiency. Future research could incorporate real-time monitoring data, demand forecasting, and energy efficiency analysis to further enhance the reliability and sustainability of water distribution systems.

REFERENCES

- DHUMAL J.R., DANALE M.S., JADHAV G.H. (2018). Design of continuous water supply system by using WaterGEMS, International Journal of Advance Research in Science and Engineering, Vol. 7, Special Issue No 1, pp. 346-351.
- [2] DUMANE M.M., SALUNKE P.S., KAMBLE S.P., NALVADE O.S., PONDKULE S.P. (2018). Water distribution network by using WaterGEMS software, International Journal of Creative Research Thoughts, Vol. 6, Issue 2, pp. 1048–1053
- [3] KAWATHE L.N., THORVAT A.R. (2020). Analysis and Design of Continuous Water Distribution System against Existing Intermittent Distribution System for Selected Area in Pandharpur, M.S., India, Aquademia, Vol. 4, Issue 2, ep20028
- [4] BERHANE T., AREGAW T.T. (2020). Optimization of Water Distribution System Using WaterGEMS: The Case of Wukro Town, Ethiopia, Journal of Civil and Environmental Research, Vol. 12, Issue 6, pp. 1-14
- [5] N.P.Sonaje and M.G.Joshi, 2015, "A review of modeling and application of water distribution networks(WDN) softwares, International Journal of Technical Research & Applications"-Vol.6
- [6] ALIGHALEHBABAKHANI F., MCELMURRY S., MILLER C.J., ABKENAR S.M. S. (2013). A case study of energy cost optimization in Monroe water distribution system, In 2013 International Green Computing Conference Proceedings, IEEE, pp. 1-5.
- [7] BENTLEY WaterGEMS CONNECT Edition Update 2 User Manual, https://docs.bentley.com/LiveContent/web/Bentley%20WaterGEMS%20SS6 v1/en/GUID-7729EB68-D805-4E81-ADD1-6C66FF34C11E.html
- [8] YADAV V.G., MEHTA D., WAIKHOM S.I. (2015). To assess the prevailing water distribution network using EPANET, International Research Journal of Engineering and Technology, Vol. 2, Issue 8, pp. 777-781.
- [9] SOURABH N., BATLIWALA M., TIMBADIYA P.V. (2019). Design of Water Distribution Network for Educational Institute for Revised Demand, Conference: HYDRO-2018 INTERNATIONAL, Hydraulics, Water Resources and Coastal Engineering, NIT Patna, Patna, Bihar, India.
- [10] Adhav, N., Zerikunthe, V., Sasane, A., & Deshmukh, A. (2022). Analysis and Redesign of 24/7 Water Distribution Network using Watergem Software. International Journal for Research in Applied Science and Engineering Technology. <u>https://doi.org/10.22214/ijraset.2022.44100</u>.
- [11] Berhane, T. (2020). Optimization of Water Distribution System Using WaterGEMS: The Case of Wukro Town, Ethiopia. Civil and Environmental Research. <u>https://doi.org/10.7176/cer/12-6-01</u>
- [12] Navin, U., & Dohare, D. (2022). A Critical Review on Design And Analysis of Water Distribution Network Using Watergems And Epanet Softwares. SAMRIDDHI: A Journal of Physical Sciences, Engineering and Technology. <u>https://doi.org/10.18090/samriddhi.v14i03.21</u>.
- [13] Bhoyar, R. (2017). MODELLING AND OPTIMIZATION OF WATER DISTRIBUTION SYSTEM" SITE: NAGPUR. International Journal of Advance Research and Innovative Ideas in Education, 3, 1056-1068. <u>https://doi.org/10.21090/ijaerd.32252</u>.
- [14] Salunke, P., Dumane, M., Kamble, S., Nalvade, O., Pondkule, S., & Binayke, R. (2018). An Overview: Water Distribution Network By Using Water Gems Software. , 28-31. <u>https://doi.org/10.29070/15/56757</u>.
- [15] SHINDE P., PATIL P., HODAGE R. (2018). Design and Analysis of Water Distribution Network Using WaterGEMS, International Journal of Advance Reasearch in Science and Engineering, Vol. 7, Issue 3, pp. 13-18.
- [16] SAMINU A., ABUBAKAR N., SAGIR L. (2013). Design of NDA water distribution network using EPANET, International Journal of Emerging Science and Engineering, Vol. 1, Issue 9, pp. 5-9.



ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538

Volume 13 Issue IV Apr 2025- Available at www.ijraset.com

- [17] MEHTA D.J., PRAJAPATI K.J. (2018). Simulation of existing water distribution network at Punagam Area of Surat City using WaterGEMS software. In Urbanization challenges in emerging economies: Energy and water infrastructure; transportation infrastructure; and planning and financing, Reston, VA: American Society of Civil Engineers, pp. 312-321.
- [18] Nekrasov, A., Tsarev, N., Adamova, A., & Ivanova, O. (2019). Modeling and designing the combined drinking and fire protection water distribution system for an industrial park by using WaterGEMS. SECOND INTERNATIONAL CONFERENCE ON MATERIAL SCIENCE, SMART STRUCTURES AND APPLICATIONS: ICMSS-2019. <u>https://doi.org/10.1063/1.5140111</u>.
- [19] Dr. R.M. Damgir, Supriya Patil Maharashtra, India (June-2017)-" Hydraulic Modelling of Water Distribution System with Refrence to Technical Sustainability by using WaterGems" ISSN :2347-6710, vol.6 Issue 6, June-2017
- [20] Prashant Virjibhai Vaghela, Sejal S. Bhagat (2013). —"Analysis of existing water distribution network by using Water GEMS a case study of Rajkot city", International Journal of Advance Research in Engineering, Science Management.











45.98



IMPACT FACTOR: 7.129







INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 🕓 (24*7 Support on Whatsapp)