REGION 6
DALLAS, TX 75270

April 27, 2026

TRANSMITTED VIA EMAIL

The Honorable Ernest E. Vigil
Village of Chama
P.O. Box 784
Chama, NM 87520
ernestv@villageofchama.org

Re: Administrative Order; Docket Number: CWA-06-2026-1788
Village of Chama Wastewater Treatment Plant
NPDES Permit Number: NM0027731

Dear Mayor Vigil:

Enclosed is Administrative Order (AO), Docket Number CWA-06-2026-1788, issued to the Village of Chama Wastewater Treatment Plant WWTP for violations of the Clean Water Act (CWA), 33 U.S.C. § 1251 *et seq.* The violations are for failure to meet permit effluent limits.

The AO does not assess a monetary penalty; however, it does require compliance with applicable federal regulations. Please note that a response is due not later than June 15, 2026. The United States Environmental Protection Agency is committed to ensuring compliance with the requirements of the National Pollutant Discharge Elimination System (NPDES) program and my staff will assist you in any way possible. Please reference AO Docket Number CWA-06-2026-1788, and NPDES Permit Number NM0027731, on your response.

If you have any questions, please contact Ms. Rachel Matthews, of my staff, at (214) 665-8589 or at matthews.rachel@epa.gov.

Sincerely,

Digitally signed by MARGARET OSBOURNE
Date: 2026.04.27 14:22:33 -05'00'

Cheryl T. Seager, Director
Enforcement and
Compliance Assurance Division

Enclosure(s)

e.c. Ms. Shelly Lemon
NMED Water Bureau Chief
shelly.lemon@env.nm.gov

Ms. Susan LucasKamat
NMED Surface Water Quality Bureau
susan.lucaskamat@env.nm.gov

Naydeane Garcia
Clerk, Village of Chama
ngarcia@villageofchama.org

Teresa Steven
WWTP Operator
teresastevens@livingwaterstewardship.com

## STATUTORY AUTHORITY

The following findings are made, and Order issued, under the authority vested in the Administrator of the United States Environmental Protection Agency (EPA), by Section 309(a) of the Clean Water Act (the Act), 33 U.S.C. § 1319(a). The Administrator of EPA has delegated the authority to issue this Order to the Regional Administrator of EPA Region 6, who has further delegated this authority to the Director of the Enforcement and Compliance Assurance Division.

## FINDINGS

1. The Village of Chama (Respondent) is a municipality chartered under the laws of the State of New Mexico. As such, Respondent is a "person," as that term is defined at Section 502(5) of the Act, 33 U.S.C. § 1362(5), and 40 C.F.R. § 122.2.

2. At all times relevant to this Order, Respondent owned or operated a wastewater treatment plant (facility) located 0.5 miles west of the US 84/64 and NM 17 intersection in the Village of Chama, Rio Arriba County, New Mexico, and is therefore an "owner or operator" within the meaning of 40 C.F.R. § 122.2.

3. At all relevant times, the facility acted as a "point source" of a "discharge" of "pollutants" with its wastewater discharge To the receiving water named Rio Chamita, thence to Rio Chama, in Segment No. 20.6.4.119 20 of the Rio Grande Basin, which are "waters of the United States" within the meaning of Section 502 of the Act, 33 U.S.C. § 1362, and 40 C.F.R. § 122.2.

4. Because Respondent owned or operated a facility that acted as a point source of discharges of pollutants to waters of the United States, Respondent and the facility were subject to the Act and the National Pollutant Discharge Elimination System (NPDES) program.

5. Under Section 301 of the Act, 33 U.S.C. § 1311, it is unlawful for any person to discharge any pollutant from a point source to waters of the United States, except with the authorization of, and in compliance with, an NPDES permit issued pursuant to Section 402 of the Act, 33 U.S.C. § 1342.

6. Section 402(a) of the Act, 33 U.S.C. § 1342(a), provides that the Administrator of EPA may issue permits under the NPDES program for the discharge of pollutants from point sources to waters of the United States. Any such discharge is subject to the specific terms and conditions prescribed in the applicable permit.

7. Respondent applied for and was issued NPDES Permit No. NM0027731 (permit) under Section 402 of the Act, 33 U.S.C. § 1342, which became effective on March 1, 2023, with an expiration date of February 29, 2028. At all relevant times, Respondent was authorized to discharge pollutants from the facility to waters of the United States only in compliance with the specific terms and conditions of the permit.

8. Part I.A. of the permit places certain limitations on the quality and quantity of effluent discharged by Respondent established in the permit, as specified in Attachment A, which is incorporated herein by reference.

9. Pursuant to Part III.B. of the permit, Respondent is required to properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by Respondent as efficiently as possible and in a manner which will minimize upsets and discharges of excessive pollutants and will achieve compliance with the conditions of the permit.

10. Certified DMRs filed by Respondent with EPA show discharges of pollutants from the facility that exceed the permitted effluent limitations, as specified in Attachment B, which is incorporated herein by reference.

11. On March 16, 2022, EPA issued Administrative Order (AO) Docket Number CWA-06-2022-1763, which cited effluent violations. The AO required Respondent to eliminate effluent violations or submit a comprehensive plan of action to eliminate the violations.

12. In February 2023, Respondent submitted a comprehensive plan that included status of the facility, a compliance strategy, and a (dual route) pathway to compliance, as specified in Attachment C, which is incorporated herein by reference.

13. Each violation of the conditions of the permit described above is a violation of Section 301 of the Act, 33 U.S.C. § 1311.

## SECTION 309(a)(3) COMPLIANCE ORDER

14. Based on the foregoing Findings and pursuant to the authority of Section 309(a)(3) of the Act, 33 U.S.C. § 1319(a)(3), EPA hereby orders Respondent to take the following actions:

A. Immediately take all measures as necessary to comply with permit conditions and effluent limits.

B. Not later than June 15, 2026, submit a detailed response regarding all steps taken to meet the strategy and pathway to compliance detailed in the February 2023 comprehensive plan. If applicable, submit the following:

i. Copies of contractor agreements,
ii. Copies of design plans,
iii. Copies of follow-up reports, and
iv. Copies of any punch lists, if applicable

C. If Respondent would like to arrange a meeting with EPA to discuss the violations alleged in this Order, Respondent should contact EPA within thirty (30) days of the effective date of this Order. The meeting will be held at the Region 6 offices, 1201 Elm St., Dallas, Texas, or through a virtual platform, as appropriate, and Respondent can provide any information it believes is relevant to this Order. Respondent shall submit to EPA all information or materials it considers relevant to EPA at least ten (10) days prior to the meeting.

D. To arrange a meeting, or comment on this matter, please contact Rachel Matthews at (214) 665-8589.

E. All information, and/or correspondence, shall be electronically submitted to:

Ms. Rachel Matthews
matthews.rachel@epa.gov

GENERAL PROVISIONS

Respondent may seek federal judicial review of this Order pursuant to Chapter 7 of the Administrative Procedure Act, 5 U.S.C. §§ 701-706.

Issuance of this Section 309(a)(3) Compliance Order shall not be deemed an election by EPA to waive any administrative, judicial, civil, or criminal action to seek penalties, fines or other relief under the Act for the violations cited herein, or other violations that become known to EPA. EPA reserves the right to seek any remedy available under the law that it deems appropriate.

Failure to comply with this Section 309(a)(3) Compliance Order or the Act may result in further administrative action, or a civil judicial action initiated by the United States Department of Justice.

This Order does not constitute a waiver or modification of the terms or conditions of Respondent's NPDES permit, which remain in full force and effect. Compliance with the terms and conditions of this Order does not relieve Respondent of its obligation to comply with any applicable federal, state, or local law or regulation.

The effective date of this Order is the date it is received by Respondent.

Margaret Osbourne
Digitally signed by MARGARET OSBOURNE
Date: 2026.04.27 14:21:36 -05'00'

Cheryl T. Seager, Director
Enforcement and
Compliance Assurance Division

Attachment A

Administrative Order

Docket Number: CWA-06-2026-1788

PART I – REQUIREMENTS FOR NPDES PERMITS

SECTION A. LIMITATIONS AND MONITORING REQUIREMENTS

1. Effluent Limits – 0.324 MGD Design Flow

During the period beginning the effective date of the permit and lasting through the expiration date of the permit, the permittee is authorized to discharge treated municipal wastewater to Rio Chamita, thence to the Rio Chama in Water Quality Segment 20.6.4.119 NMAC from Outfall 001. Such discharges shall be limited and monitored by the permittee as specified below:

| **EFFLUENT CHARACTERISTICS** | **DISCHARGE LIMITATIONS** lbs/day, unless noted | | | **DISCHARGE LIMITATIONS** mg/l, unless noted (*1) | | | **MONITORING REQUIREMENTS** | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | 30-DAY AVG | DAILY MAX | 7-DAY AVG | 30-DAY AVG | DAILY MAX | 7-DAY AVG | MEASUREMENT FREQUENCY | SAMPLE TYPE |
| Flow | Report MGD | Report MGD | Report MGD | *** | *** | *** | Daily | Continuous |
| Biochemical Oxygen Demand, 5-day | 81 | N/A | 122 | 30 | N/A | 45 | Twice/Month | Grab |
| $BOD_5$ % removal (minimum) | ≥ 85 % | N/A | N/A | N/A | N/A | N/A | Twice/Month | Calculation (*5) |
| Total Suspended Solids | 81 | N/A | 122 | 30 | N/A | 45 | Twice/Month | Grab |
| TSS % removal (minimum) | ≥ 85 % | N/A | N/A | N/A | N/A | N/A | Twice/Month | Calculation (*5) |
| E. coli | N/A | 1.43 (*3) | N/A | 126 (*2) | 235 (*2) | N/A | Twice/Month | Grab |
| Ammonia (Mar. 1– June 30) | 27.0 | 40.5 | N/A | 10 | 15 | N/A | Twice/Month | Grab |
| Ammonia (July 1 – Feb. 28) | 12.7 | 19.1 | N/A | 4.7 | 7.1 | N/A | Twice/Month | Grab |
| Total Residual Chlorine (*6) | N/A | N/A | N/A | N/A | 11 ug/l | N/A | 5 days/Week | Instant. Grab (*4) |
| Phosphorus, Total Year round | Report | Report | N/A | Report | Report | N/A | Twice/Month | 3-Hr Composite |
| Phosphorus, Total (Oct. 1 – Apr. 30) | 2.5 | Report | N/A | 1.0 | 1.5 | N/A | Twice/Month | 3-Hr Composite |
| Phosphorus, Total | 1.0 | Report | N/A | 0.4 | 0.6 | N/A | Twice/Month | 3-Hr Composite |

| **EFFLUENT CHARACTERISTICS** | **DISCHARGE LIMITATIONS** lbs/day, unless noted | | | **DISCHARGE LIMITATIONS** mg/l, unless noted (*1) | | | **MONITORING REQUIREMENTS** | |
|---|---|---|---|---|---|---|---|---|
| POLLUTANT | 30-DAY AVG | DAILY MAX | 7-DAY AVG | 30-DAY AVG | DAILY MAX | 7-DAY AVG | MEASUREMENT FREQUENCY | SAMPLE TYPE |
| (May 1 – Sept. 30) | | | | | | | | |
| Nitrogen, Total (*8) year round | Report | Report | N/A | Report | Report | N/A | Twice/Month | 3-Hr. Composite |
| Nitrogen, Total (Oct.1 – Apr. 30) | 25.0 | Report | N/A | 10 | 15 | N/A | Twice/Month | 3-Hr. Composite |
| Nitrogen, Total (May 1 – Sept. 30) | 10 | Report | NA | 4.0 | 6.0 | N/A | Twice/Month | 3-Hr. Composite |

| EFFLUENT CHARACTERISTICS | | DISCHARGE LIMITATIONS Standard Units | | MONITORING REQUIREMENTS | |
|---|---|---|---|---|---|
| POLLUTANT | STORET CODE | MINIMUM | MAXIMUM | MEASUREMENT FREQUENCY | SAMPLE TYPE |
| pH | 00400 | 6.6 | 8.8 | 5 days/Week | Instant. Grab (*4) |

| EFFLUENT CHARACTERISTICS 7-Day Chronic Static Renewal (*7) /NOEC | Value | Frequency | Sample Type |
|---|---|---|---|
| Ceriodaphnia dubia | Report | Once/six months | 24-Hr Composite |
| Pimephales promelas | Report | Once/six months | 24-Hr Composite |

Footnotes:

*1 See **Appendix A of Part II** of the permit for minimum quantification limits.

*2 May be measured as colony forming units (cfu) per100ml or as Most Probable Number (MPN) per 100 ml depending on the EPA approved method being used for analysis. Geometric mean of E.coli shall be usd for reporting the 30-day average values.

*3 Billion ($1.0 \times 10^9$) cfu/day. Loading limit calculated as follows: {[Flow in MGD x cfu/100 ml effluent = $3.79 \times 10^7$] / $1.0 \times 10^9$}

*4 Regulations at 40 CFR Part 136 define “instantaneous grab” as analyzed within 15 minutes of collection.

*5 Percent removal is calculated using the following equation: [(average monthly influent concentration – average monthly effluent concentration) / average monthly influent concentration] * 100.
*6 When chlorine is used as either backup bacteria control or when disinfection of plant treatment equipment is required.
*7 Compliance with the Whole Effluent Toxicity limitations is required on Permit Effective Date. See PART II, Whole Effluent Toxicity Testing Requirements for additional WET monitoring and reporting conditions.
*8 Total Nitrogen is defined as the sum of total Kjedahl Nitrogen (as N) and Nitrate-Nitrite (as N).

Attachment B

Administrative Order

Docket Number: CWA-06-2026-1788

| Attachment B - AO Docket # CWA-06-2026-1788 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Village of Chama** | | | | | | | |
| **NPDES Permit # NM0027731** | | | | | | | |
| Monitoring Period End Date | Parameter | DMR Value | Sample Type | Limit Value | Desciption | Limit Unit | Percent Exceedance |
| 2/28/2026 | Nitrogen, total [as N] | 16.1 | 3 Hour Composite | 10 | 30DA AVG | Milligrams per Liter | 61 |
| 2/28/2026 | Nitrogen, ammonia total [as N] | 8.6 | Grab | 4.7 | 30DA AVG | Milligrams per Liter | 83 |
| 2/28/2026 | Nitrogen, ammonia total [as N] | 17 | Grab | 7.1 | DAILY MX | Milligrams per Liter | 139 |
| 2/28/2026 | Nitrogen, total [as N] | 19 | 3 Hour Composite | 15 | DAILY MX | Milligrams per Liter | 27 |
| 1/31/2026 | Nitrogen, total [as N] | 15.2 | 3 Hour Composite | 10 | 30DA AVG | Milligrams per Liter | 52 |
| 1/31/2026 | Nitrogen, total [as N] | 15.8 | 3 Hour Composite | 15 | DAILY MX | Milligrams per Liter | 5 |
| 12/31/2025 | Nitrogen, total [as N] | 12.7 | 3 Hour Composite | 10 | 30DA AVG | Milligrams per Liter | 27 |
| 12/31/2025 | E. coli | 325.5 | Grab | 235 | DAILY MX | Colony Forming Units per 100ml | 39 |
| 11/30/2025 | pH | 6 | Grab | 6.6 | MINIMUM | Standard Units | |
| 10/31/2025 | Nitrogen, total [as N] | 16.2 | 3 Hour Composite | 15 | DAILY MX | Milligrams per Liter | 8 |
| 10/31/2025 | Phosphorus, total [as P] | 4.1 | 3 Hour Composite | 1 | 30DA AVG | Milligrams per Liter | 310 |
| 10/31/2025 | Nitrogen, total [as N] | 15.7 | 3 Hour Composite | 10 | 30DA AVG | Milligrams per Liter | 57 |
| 10/31/2025 | Phosphorus, total [as P] | 4.3 | 3 Hour Composite | 1.5 | DAILY MX | Milligrams per Liter | 187 |
| 9/30/2025 | Nitrogen, total [as N] | 24 | 3 Hour Composite | 6 | DAILY MX | Milligrams per Liter | 300 |
| 9/30/2025 | Phosphorus, total [as P] | 4.8 | 3 Hour Composite | 0.4 | 30DA AVG | Milligrams per Liter | 1100 |
| 9/30/2025 | Phosphorus, total [as P] | 4.9 | 3 Hour Composite | 0.6 | DAILY MX | Milligrams per Liter | 717 |
| 9/30/2025 | Nitrogen, total [as N] | 23.8 | 3 Hour Composite | 4 | 30DA AVG | Milligrams per Liter | 495 |
| 9/30/2025 | Phosphorus, total [as P] | 1.3 | 3 Hour Composite | 1 | 30DA AVG | Pounds per Day | 30 |
| 8/31/2025 | Phosphorus, total [as P] | 2.2 | 3 Hour Composite | 0.6 | DAILY MX | Milligrams per Liter | 267 |
| 8/31/2025 | Phosphorus, total [as P] | 1.6 | 3 Hour Composite | 0.4 | 30DA AVG | Milligrams per Liter | 300 |
| 7/31/2025 | Nitrogen, total [as N] | 6 | 3 Hour Composite | 4 | 30DA AVG | Milligrams per Liter | 50 |
| 7/31/2025 | Nitrogen, total [as N] | 7 | 3 Hour Composite | 6 | DAILY MX | Milligrams per Liter | 17 |
| 6/30/2025 | Nitrogen, total [as N] | 6 | 3 Hour Composite | 4 | 30DA AVG | Milligrams per Liter | 50 |
| 6/30/2025 | Nitrogen, total [as N] | 6.7 | 3 Hour Composite | 6 | DAILY MX | Milligrams per Liter | 12 |
| 5/31/2025 | Nitrogen, total [as N] | 10.5 | 3 Hour Composite | 6 | DAILY MX | Milligrams per Liter | 75 |
| 5/31/2025 | Nitrogen, total [as N] | 8.8 | 3 Hour Composite | 4 | 30DA AVG | Milligrams per Liter | 120 |
| 4/30/2025 | BOD, 5-day, 20 deg. C | 135 | Grab | 45 | 7 DA AVG | Milligrams per Liter | 200 |
| 4/30/2025 | Nitrogen, total [as N] | 29.7 | 3 Hour Composite | 10 | 30DA AVG | Milligrams per Liter | 197 |

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|---|---|---|---|---|---|---|---|
| 4/30/2025 | Solids, total suspended | 168 | Grab | 45 | 7 DA AVG | Milligrams per Liter | 273 |
| 4/30/2025 | Phosphorus, total [as P] | 6.7 | 3 Hour Composite | 1.5 | DAILY MX | Milligrams per Liter | 347 |
| 4/30/2025 | Phosphorus, total [as P] | 3.8 | 3 Hour Composite | 1 | 30DA AVG | Milligrams per Liter | 280 |
| 4/30/2025 | E. coli | 1826.8 | Grab | 126 | 30DAVGEO | Colony Forming Units per 100ml | 1350 |
| 4/30/2025 | BOD, 5-day, 20 deg. C | 77 | Grab | 30 | 30DA AVG | Milligrams per Liter | 157 |
| 4/30/2025 | Nitrogen, ammonia total [as N] | 23.5 | Grab | 10 | 30DA AVG | Milligrams per Liter | 135 |
| 4/30/2025 | Solids, total suspended | 92 | Grab | 30 | 30DA AVG | Milligrams per Liter | 207 |
| 4/30/2025 | Nitrogen, total [as N] | 36.4 | 3 Hour Composite | 15 | DAILY MX | Milligrams per Liter | 143 |
| 4/30/2025 | E. coli | 17.3 | Grab | 1.43 | DAILY MX | Billion Colony Forming Units per Day | 1110 |
| 4/30/2025 | Nitrogen, ammonia total [as N] | 25.8 | Grab | 15 | DAILY MX | Milligrams per Liter | 72 |
| 4/30/2025 | E. coli | 9678.4 | Grab | 235 | DAILY MX | Colony Forming Units per 100ml | 4018 |
| 4/30/2025 | Solids, total suspended | 128.9 | Grab | 122 | 7 DA AVG | Pounds per Day | 6 |
| 3/31/2025 | E. coli | 2.17 | Grab | 1.43 | DAILY MX | Billion Colony Forming Units per Day | 52 |
| 3/31/2025 | Nitrogen, ammonia total [as N] | 17.2 | Grab | 10 | 30DA AVG | Milligrams per Liter | 72 |
| 3/31/2025 | Nitrogen, ammonia total [as N] | 19.4 | Grab | 15 | DAILY MX | Milligrams per Liter | 29 |
| 3/31/2025 | Solids, suspended percent removal | 67 | Calculated | 85 | MO AV MN | Percent | 120 |
| 3/31/2025 | E. coli | 911.9 | Grab | 126 | 30DAVGEO | Colony Forming Units per 100ml | 624 |
| 3/31/2025 | Nitrogen, total [as N] | 18.9 | 3 Hour Composite | 10 | 30DA AVG | Milligrams per Liter | 89 |
| 3/31/2025 | E. coli | 1203.3 | Grab | 235 | DAILY MX | Colony Forming Units per 100ml | 412 |
| 3/31/2025 | Nitrogen, total [as N] | 23.6 | 3 Hour Composite | 15 | DAILY MX | Milligrams per Liter | 57 |
| 2/28/2025 | Nitrogen, ammonia total [as N] | 12.9 | Grab | 4.7 | 30DA AVG | Milligrams per Liter | 174 |
| 2/28/2025 | Nitrogen, total [as N] | 15.9 | 3 Hour Composite | 10 | 30DA AVG | Milligrams per Liter | 59 |
| 2/28/2025 | Nitrogen, total [as N] | 18 | 3 Hour Composite | 15 | DAILY MX | Milligrams per Liter | 20 |
| 2/28/2025 | E. coli | 325.5 | Grab | 235 | DAILY MX | Colony Forming Units per 100ml | 39 |
| 2/28/2025 | Nitrogen, ammonia total [as N] | 13.7 | Grab | 7.1 | DAILY MX | Milligrams per Liter | 93 |
| 1/31/2025 | Nitrogen, total [as N] | 21.2 | 3 Hour Composite | 15 | DAILY MX | Milligrams per Liter | 41 |
| 1/31/2025 | Nitrogen, ammonia total [as N] | 22.2 | Grab | 7.1 | DAILY MX | Milligrams per Liter | 213 |
| 1/31/2025 | Nitrogen, ammonia total [as N] | 19.6 | Grab | 4.7 | 30DA AVG | Milligrams per Liter | 317 |
| 1/31/2025 | Nitrogen, total [as N] | 18.9 | 3 Hour Composite | 10 | 30DA AVG | Milligrams per Liter | 89 |
| 12/31/2024 | Nitrogen, ammonia total [as N] | 21.3 | Grab | 4.7 | 30DA AVG | Milligrams per Liter | 353 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12/31/2024 | Solids, suspended percent removal | 68 | Calculated | 85 | MO AV MN | Percent | 113 |
| 12/31/2024 | E. coli | 513.6 | Grab | 235 | DAILY MX | Colony Forming Units per 100ml | 119 |
| 12/31/2024 | Nitrogen, total [as N] | 24.1 | 3 Hour Composite | 10 | 30DA AVG | Milligrams per Liter | 141 |
| 12/31/2024 | Nitrogen, ammonia total [as N] | 22 | Grab | 7.1 | DAILY MX | Milligrams per Liter | 210 |
| 12/31/2024 | Nitrogen, total [as N] | 24.6 | 3 Hour Composite | 15 | DAILY MX | Milligrams per Liter | 64 |
| 11/30/2024 | Phosphorus, total [as P] | 1.8 | 3 Hour Composite | 1.5 | DAILY MX | Milligrams per Liter | 20 |
| 10/31/2024 | Nitrogen, total [as N] | 12.1 | 3 Hour Composite | 10 | 30DA AVG | Milligrams per Liter | 21 |
| 9/30/2024 | Nitrogen, total [as N] | 8.5 | 3 Hour Composite | 4 | 30DA AVG | Milligrams per Liter | 113 |
| 9/30/2024 | Nitrogen, total [as N] | 8.5 | 3 Hour Composite | 6 | DAILY MX | Milligrams per Liter | 42 |
| 9/30/2024 | Phosphorus, total [as P] | 1 | 3 Hour Composite | 0.4 | 30DA AVG | Milligrams per Liter | 150 |
| 9/30/2024 | pH | 6.1 | Grab | 6.6 | MINIMUM | Standard Units | |
| 9/30/2024 | Phosphorus, total [as P] | 1.1 | 3 Hour Composite | 0.6 | DAILY MX | Milligrams per Liter | 83 |
| 8/31/2024 | Nitrogen, total [as N] | 4.3 | 3 Hour Composite | 4 | 30DA AVG | Milligrams per Liter | 8 |
| 8/31/2024 | Nitrogen, total [as N] | 6.5 | 3 Hour Composite | 6 | DAILY MX | Milligrams per Liter | 8 |
| 8/31/2024 | pH | 6.5 | Grab | 6.6 | MINIMUM | Standard Units | |
| 7/31/2024 | Phosphorus, total [as P] | 1.3 | 3 Hour Composite | 0.6 | DAILY MX | Milligrams per Liter | 117 |
| 7/31/2024 | pH | 6 | Grab | 6.6 | MINIMUM | Standard Units | |
| 7/31/2024 | Nitrogen, total [as N] | 11.6 | 3 Hour Composite | 4 | 30DA AVG | Milligrams per Liter | 190 |
| 7/31/2024 | Phosphorus, total [as P] | 0.7 | 3 Hour Composite | 0.4 | 30DA AVG | Milligrams per Liter | 75 |
| 7/31/2024 | Nitrogen, total [as N] | 12.7 | 3 Hour Composite | 6 | DAILY MX | Milligrams per Liter | 112 |
| 6/30/2024 | pH | 6 | Grab | 6.6 | MINIMUM | Standard Units | |
| 6/30/2024 | Nitrogen, total [as N] | 9.4 | 3 Hour Composite | 6 | DAILY MX | Milligrams per Liter | 57 |
| 6/30/2024 | Phosphorus, total [as P] | 1.25 | 3 Hour Composite | 0.6 | DAILY MX | Milligrams per Liter | 108 |
| 6/30/2024 | E. coli | 5.5 | Grab | 1.43 | DAILY MX | Billion Colony Forming Units per Day | 285 |
| 6/30/2024 | E. coli | 421.7 | Grab | 126 | 30DAVGEO | Colony Forming Units per 100ml | 235 |
| 6/30/2024 | E. coli | 1553.1 | Grab | 235 | DAILY MX | Colony Forming Units per 100ml | 561 |
| 6/30/2024 | Phosphorus, total [as P] | 1.2 | 3 Hour Composite | 0.4 | 30DA AVG | Milligrams per Liter | 200 |
| 6/30/2024 | Solids, total suspended | 48 | Grab | 45 | 7 DA AVG | Milligrams per Liter | 7 |
| 6/30/2024 | Nitrogen, total [as N] | 9.3 | 3 Hour Composite | 4 | 30DA AVG | Milligrams per Liter | 133 |
| 6/30/2024 | Solids, total suspended | 32 | Grab | 30 | 30DA AVG | Milligrams per Liter | 7 |
| 5/31/2024 | pH | 6.1 | Grab | 6.6 | MINIMUM | Standard Units | |
| 5/31/2024 | Nitrogen, total [as N] | 16.4 | 3 Hour Composite | 6 | DAILY MX | Milligrams per Liter | 173 |
| 5/31/2024 | Phosphorus, total [as P] | 0.8 | 3 Hour Composite | 0.6 | DAILY MX | Milligrams per Liter | 33 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5/31/2024 | Phosphorus, total [as P] | 0.6 | 3 Hour Composite | 0.4 | 30DA AVG | Milligrams per Liter | 50 |
| 5/31/2024 | Nitrogen, total [as N] | 12.7 | 3 Hour Composite | 4 | 30DA AVG | Milligrams per Liter | 218 |
| 4/30/2024 | Nitrogen, total [as N] | 14.7 | 3 Hour Composite | 10 | 30DA AVG | Milligrams per Liter | 47 |
| 3/31/2024 | Phosphorus, total [as P] | 1.4 | 3 Hour Composite | 1 | 30DA AVG | Milligrams per Liter | 40 |
| 3/31/2024 | Nitrogen, total [as N] | 18.5 | 3 Hour Composite | 15 | DAILY MX | Milligrams per Liter | 23 |
| 3/31/2024 | Nitrogen, total [as N] | 18.5 | 3 Hour Composite | 10 | 30DA AVG | Milligrams per Liter | 85 |
| 3/31/2024 | pH | 5.8 | Grab | 6.6 | MINIMUM | Standard Units | |
| 2/29/2024 | Phosphorus, total [as P] | 1.9 | 3 Hour Composite | 1 | 30DA AVG | Milligrams per Liter | 90 |
| 2/29/2024 | Phosphorus, total [as P] | 2.7 | 3 Hour Composite | 1.5 | DAILY MX | Milligrams per Liter | 80 |
| 2/29/2024 | Nitrogen, total [as N] | 19.5 | 3 Hour Composite | 15 | DAILY MX | Milligrams per Liter | 30 |
| 2/29/2024 | pH | 6 | Grab | 6.6 | MINIMUM | Standard Units | |
| 2/29/2024 | Nitrogen, total [as N] | 18.9 | 3 Hour Composite | 10 | 30DA AVG | Milligrams per Liter | 89 |
| 1/31/2024 | Phosphorus, total [as P] | 2.3 | 3 Hour Composite | 1.5 | DAILY MX | Milligrams per Liter | 53 |
| 1/31/2024 | Nitrogen, total [as N] | 19.3 | 3 Hour Composite | 10 | 30DA AVG | Milligrams per Liter | 93 |
| 1/31/2024 | Nitrogen, total [as N] | 21.4 | 3 Hour Composite | 15 | DAILY MX | Milligrams per Liter | 43 |
| 1/31/2024 | Phosphorus, total [as P] | 2 | 3 Hour Composite | 1 | 30DA AVG | Milligrams per Liter | 100 |
| 12/31/2023 | Nitrogen, total [as N] | 24.9 | 3 Hour Composite | 15 | DAILY MX | Milligrams per Liter | 66 |
| 12/31/2023 | Phosphorus, total [as P] | 2.1 | 3 Hour Composite | 1 | 30DA AVG | Milligrams per Liter | 110 |
| 12/31/2023 | Phosphorus, total [as P] | 3.3 | 3 Hour Composite | 1.5 | DAILY MX | Milligrams per Liter | 120 |
| 12/31/2023 | Nitrogen, total [as N] | 22.4 | 3 Hour Composite | 10 | 30DA AVG | Milligrams per Liter | 124 |
| 11/30/2023 | Nitrogen, total [as N] | 16.4 | 3 Hour Composite | 10 | 30DA AVG | Milligrams per Liter | 64 |
| 11/30/2023 | Nitrogen, total [as N] | 17.2 | 3 Hour Composite | 15 | DAILY MX | Milligrams per Liter | 15 |
| 10/31/2023 | Nitrogen, total [as N] | 12.8 | 3 Hour Composite | 10 | 30DA AVG | Milligrams per Liter | 28 |
| 10/31/2023 | Nitrogen, total [as N] | 15.9 | 3 Hour Composite | 15 | DAILY MX | Milligrams per Liter | 6 |
| 9/30/2023 | Nitrogen, total [as N] | 8.4 | 3 Hour Composite | 4 | 30DA AVG | Milligrams per Liter | 110 |
| 9/30/2023 | Phosphorus, total [as P] | 2.3 | 3 Hour Composite | 0.6 | DAILY MX | Milligrams per Liter | 283 |
| 9/30/2023 | Phosphorus, total [as P] | 2.3 | 3 Hour Composite | 0.4 | 30DA AVG | Milligrams per Liter | 475 |
| 9/30/2023 | Nitrogen, total [as N] | 8.4 | 3 Hour Composite | 6 | DAILY MX | Milligrams per Liter | 40 |
| 8/31/2023 | Phosphorus, total [as P] | 2.8 | 3 Hour Composite | 0.6 | DAILY MX | Milligrams per Liter | 367 |
| 8/31/2023 | Phosphorus, total [as P] | 2 | 3 Hour Composite | 0.4 | 30DA AVG | Milligrams per Liter | 400 |
| 8/31/2023 | Nitrogen, total [as N] | 17.7 | 3 Hour Composite | 4 | 30DA AVG | Milligrams per Liter | 343 |
| 8/31/2023 | Nitrogen, ammonia total [as N] | 17.7 | Grab | 4.7 | 30DA AVG | Milligrams per Liter | 277 |
| 8/31/2023 | Nitrogen, ammonia total [as N] | 27.5 | Grab | 7.1 | DAILY MX | Milligrams per Liter | 287 |
| 8/31/2023 | Nitrogen, total [as N] | 27.5 | 3 Hour Composite | 6 | DAILY MX | Milligrams per Liter | 358 |
| 7/31/2023 | Nitrogen, total [as N] | 16.7 | 3 Hour Composite | 4 | 30DA AVG | Milligrams per Liter | 318 |
| 7/31/2023 | Nitrogen, ammonia total [as N] | 11.2 | Grab | 4.7 | 30DA AVG | Milligrams per Liter | 138 |
| 7/31/2023 | Phosphorus, total [as P] | 1.8 | 3 Hour Composite | 0.4 | 30DA AVG | Milligrams per Liter | 350 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7/31/2023 | Phosphorus, total [as P] | 2.7 | 3 Hour Composite | 0.6 | DAILY MX | Milligrams per Liter | 350 |
| 7/31/2023 | Solids, total suspended | 58 | Grab | 45 | 7 DA AVG | Milligrams per Liter | 29 |
| 7/31/2023 | Nitrogen, total [as N] | 19.5 | 3 Hour Composite | 6 | DAILY MX | Milligrams per Liter | 225 |
| 7/31/2023 | Solids, total suspended | 31.5 | Grab | 30 | 30DA AVG | Milligrams per Liter | 5 |
| 7/31/2023 | Nitrogen, ammonia total [as N] | 13.9 | Grab | 7.1 | DAILY MX | Milligrams per Liter | 96 |
| 6/30/2023 | BOD, 5-day, percent removal | 84 | Calculated | 85 | MO AV MN | Percent | 7 |
| 6/30/2023 | Nitrogen, total [as N] | 13.9 | 3 Hour Composite | 4 | 30DA AVG | Milligrams per Liter | 248 |
| 6/30/2023 | Nitrogen, total [as N] | 14 | 3 Hour Composite | 6 | DAILY MX | Milligrams per Liter | 133 |
| 6/30/2023 | Phosphorus, total [as P] | 1.2 | 3 Hour Composite | 1 | 30DA AVG | Pounds per Day | 20 |
| 6/30/2023 | Phosphorus, total [as P] | 1.9 | 3 Hour Composite | 0.4 | 30DA AVG | Milligrams per Liter | 375 |
| 6/30/2023 | pH | 9.6 | Grab | 8.8 | MAXIMUM | Standard Units | |
| 6/30/2023 | Phosphorus, total [as P] | 1.9 | 3 Hour Composite | 0.6 | DAILY MX | Milligrams per Liter | 217 |
| 5/31/2023 | E. coli | 1203 | Grab | 235 | DAILY MX | Colony Forming Units per 100ml | 412 |
| 5/31/2023 | Nitrogen, total [as N] | 9.4 | 3 Hour Composite | 6 | DAILY MX | Milligrams per Liter | 57 |
| 5/31/2023 | Phosphorus, total [as P] | 1.1 | 3 Hour Composite | 0.4 | 30DA AVG | Milligrams per Liter | 175 |
| 5/31/2023 | Nitrogen, total [as N] | 9.2 | 3 Hour Composite | 4 | 30DA AVG | Milligrams per Liter | 130 |
| 5/31/2023 | E. coli | 155.6 | Grab | 126 | 30DAVGEO | Colony Forming Units per 100ml | 23 |
| 5/31/2023 | Phosphorus, total [as P] | 1.2 | 3 Hour Composite | 0.6 | DAILY MX | Milligrams per Liter | 100 |

Attachment C

Administrative Order

Docket Number: CWA-06-2026-1788

Village of Chama Wastewater Treatment Plant
COMPLIANCE PLAN

In Response to Administrative Order on Consent
AO Docket Number CWA062022-1763, Permit No. NM0027731

February 2023

## Prepared for:

Village of Chama Wastewater Treatment Plant
107 Cottonwood Road, Chama, NM 87520

## Prepared by:

WSP USA Environment & Infrastructure Inc.
4221 Balloon Park Rd NE,
Albuquerque, NM, 87109

The technical material and data contained in this document were prepared under the supervision and direction of the undersigned, whose seal as a Professional Engineer, licensed to practice in the State of New Mexico, is affixed below.

W. DANIEL BOIVIN
NEW MEXICO
12933
PROFESSIONAL ENGINEER

27-Feb-2022

Engineer of Record: W. Daniel Boivin, PE (NM 12933)
Principal Author: Lin Yang, PE (TX 105219), WWTP Class III Operator NM 20019

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# 1 COMPLIANCE HISTORY

Chama Wastewater treatment Plant (WWTP) was first issued the National Pollution Discharge Elimination System (NPDES) permit in February 1975. The receiving water of WWTP's effluent is Rio Chamita and eventually to Rio Grande. The original WWTP was an aerated lagoon system. The lagoon system regularly violated the permitted discharge limits, which resulted in several Administrative Orders on Consent (AO) from EPA Region 6. The 2004 AO resulted in the upgrade of the WWTP to a mechanical system.

In June 2005, the Village selected Molzen Corben to prepare a preliminary study to select an appropriate technology for the upgrade. But the PER was suspended because serious inflow and infiltration (I&I) problems were detected. In the following years, focus was given to addressing the I&I issues. The draft of the PER was finally completed in February 2011. Soon thereafter, the New Mexico Environment Department (NMED) published the draft Total Maximum Daily Loads (TMDLs) for the Rio Chamita and sought public comments. The draft Rio Chamita TMDLs included seasonal loadings for nutrients, with stringent limitations for summer. In August 2011, the Rio Chamita's final TMDLs which included warm season and cold season nutrient loads, were approved. The TMDLs influenced the Village's WWTP National Pollution Elimination System (NPDES) Permit. A new Permit was issued in November 2011 and has nutrient limits as follows.

- 'Warm Season (May 1 to September 30) 4.0 mg/L TN and 0.4 mg/L TP, and
- Cold Season (October 1 to April 30) 10.0 mg/L TN and 1.0 mg/L TP.

The final PER was approved by NMED in April 2014 after several rounds of reviews, discussions, and amendments. The PER listed a membrane bioreactor (MBR) system as an option, but the old lagoon treatment plant was replaced by an oxidation ditch system in 2017.

In November 2017, the new oxidation ditch system, which incorporated a biological nutrient removal (BNR) process, came into service. The oxidation ditch is a three-stage pre-engineered treatment system provided by Westech and designed to produce effluent with a quality that will meet the cold season nutrient limits. The facility is in operation 24 hours each day and seven days per week with operators on site from 8:00a.m. to 5:00p.m., Monday through Friday. Operators are on call for evenings and weekends. A Supervisory Control and Data Acquisition (SCADA) system was included in this upgrade to provide 24/7 monitoring of plant operations.

The new WWTP produces improved effluent, consistently meeting permitted biological oxygen demand ($BOD_5$), total suspended solids (TSS), E. coli, and ammonia nitrogen discharge limits. However, the new facility has not been able to consistently comply with the nutrient limits set forth in the permit which became effective in October 2017. In March 2022, Region 6 issued an AO to the Village for its failure to meet the permitted effluent limits. The AO cites frequent violations of nutrient limits. $BOD_5$ violation was cited once. Limits for TSS concentration, E. coli daily quantity, and effluent pH were exceeded on multiple occasions. WET violation was cited twice.

The permit under which violations of effluent limitations were cited in the 2022 AOC became effective on October 1, 2017, and expired on September 30, 2022. The application for the permit renewal was submitted in August 2022. On January 24, 2023, the permit was reissued. The new permit will become effective on March 1, 2023. Key events since the operation of the new treatment facility are listed below.

- EPA Region 6 - Issued an AO on March 16, 2022, to address violations of the operating NPDES Permit No. NM27731. The AO requires the Village of Chama take following actions:
  - Take such measures as are necessary to comply with all permit conditions.
  - Within thirty (30) days of the effective date of this Order, the Village shall submit a written report detailing the specific actions taken to correct the cited violations and an explanation as to why such actions are anticipated to be enough to prevent recurrence of these or similar violations.
  - Within thirty (30) days of the effective date of this Order, the village shall provide written certification to EPA Region 6 signed by an authorized official [as defined in 40 C.F.R. § 122.22(a)(3)] that the cited violations have been corrected and the facility is in compliance with the requirements of the permit.
  - In the event the Village believes complete correction of the violations cited herein is not possible within thirty (30) days of the effective date of this Order, the Village shall, within thirty (30) days of the effective date of this Order, submit a comprehensive written plan for the elimination of the cited violations within the shortest possible time. Such plan shall describe in detail the specific corrective actions to be taken and why such actions are sufficient to correct the violations. The plan shall include a detailed schedule for the elimination of the violations within the shortest possible time, as well as measures to prevent these or similar violations from recurring.

- EPA Region 6 - Issued an AO on September 30, 2020 for a) failure to provide Whole Effluent Toxicity (WET) limit results in the correct form of "No Observed Effect Concentration for test species Ceriodaphnia dubia and Pimephales promelas" in the DMRs for the reporting periods of June 2018 and December 2018; b) Discharge violations regarding the WET limits for test species Ceriodaphnia dubia and Pimephales promelas in December 2017 and December 2019; and c) Failure to conduct monthly monitoring of WET limits for test species Ceriodaphnia dubia and Pimephales promelas after violating WET limits in December 2017 and December2019. The data was then entered on October 7, 2020, to comply with the requirements. The case was closed on October 25, 2020. The outcome of this AO was "Final Order No Penalty".

- EPA Region 6 – Issued an AO on March 13, 2018, in response to violations of, Biochemical Oxygen Demand, Total suspended solids, Ammonia, Total Aluminum. The compliance outcome was a unilateral administrative order without adjudication.

# 2 CURRENT NPDES PERMIT

The current permit was issued when Chama was transitioning from an old, aerated lagoon system to the new activated sludge (oxidation ditch) system in October 2017. Compliance with the new permit was scheduled in phases to allow Chama a transition period during which the Village could work towards compliance.

- Compliance schedule in Part I, Section E - Pollution Prevention Requirements, was changed from 12 months to 18 months from the permit effective date (October 1, 2017).
- Compliance Schedule for Total nitrogen (TN) and Total Phosphorus (TP) for the summer seasons and interim year-round limits was extended from 18 months to three years from the effective date of the permit. The limits are:

  Interim year-round limits from the effective date of the permit:
  
  TP<= 1 mg/L and TN<=10 mg/L
  
  Seasonal limits after three years
  
  TP<=1.0 mg/L (Oct - Apr) and TP<=0.4 mg/L (May - Sep)
  
  TN<=10 mg/L (Oct - Apr) and TN<=4.0 mg/L (Oct – Apr)

- Comment 5 on the permit stated that the new wastewater treatment system was designed to meet TN limit of 10 mg/L. Tertiary treatment and alkalinity supplementation which were proposed originally for meeting the discharge limits for all seasons were not constructed due to budget restraint. `
- Stated in Comment 7 of this permit, the EPA, and New Mexico Environment Department (NMED) were in the process exploring technology-based limits for nutrients based on wastewater treatment plant performance across New Mexico early in 2017. This project was intended to establish milestones for small communities like Chama to improve the performance over an extended time in a more feasible and reasonable time frame. The temporary standards project is open and NPDES permittees can submit an enrollment application. The application has to be approved by New Mexico Water Quality Control Commission (WQCC) and the EPA. Until the application of temporary standards is approved, the requirements outlined in the current permit must be observed. The compliance schedule remains three years from the effective date of the permit.

# 3 COMPLIANCE STATUS

The oxidation ditch technology used at Chama, is commonly applied to small to medium sized municipalities. The Chama WWTP is a three-stage Biological Nutrient Removal (BNR) system provided by Westech. The oxidation ditch BNR technology is proven to be a successful way for communities to meet permit limits at WWTPs across the country. Westech service warrantee guarantees the oxidation ditch system at Chama to meet the cold season permitted nutrient levels. Theoretically, the system should be able to comply with Chama's NPDES permit between October 1 and April 30.

The 2022 Administrative Order on Consent (AOC) requires Chama submit a written report detailing the measures and actions to be taken to correct the cited violation within 30 days of the order's effective date. The Village reached out to WSP USA Environment & Infrastructure Inc. (WSP)[1] for help in preparing such a report. Upon receiving the service contract, WSP visited the WWTP, and reviewed plant design documents

[1] Formerly Wood Environment & Infrastructure Solutions, Inc.

and operating data. Based on the findings, WSP prepared this compliance plan to address the requirements set forth in the AOC.

## 3.1 Discharge Limit Violations

The permit requires grab samples for $BOD_5$, TSS, pathogens (E. coli) , and ammonia nitrogen be taken twice per month. 3-hr composite samples twice per month are required for total nitrogen and total phosphorus. A grab sample for total recoverable aluminum is required once a year. Total chlorine residual and pH are required to be measured 5 days per week with a grab sample. And semi-annual 24-hour composite samples are required for Whole Effluent Toxicity (WET) testing.

A summary of the Chama WWTP's permit violations  is presented in Table 3-1 below:

Table 3-1 Summary of Chama WWTP Violations of the Permitted Discharge Limits

| Parameter Description | Dtatistical_base_desc | No. of Exceedances | Days with Exceedances | Contains Potential Outliers? |
|---|---|---|---|---|
| pH | MAXIMUM | 1 | 1 | |
| pH | MINIMUM | 8 | 7 | |
| Solids, total suspended | 30DA AVG | 4 | 89 | Y |
| Solids, total suspended | 7 DA AVG | 2 | 14 | |
| Nitrogen, total (as N) | 30DA AVG | 20 | 427 | |
| Nitrogen, total (as N) | DAILY MX | 10 | 10 | |
| Nitrogen, ammonia total (as N) | DAILY MX | 2 | 2 | |
| Phosphorus, total (as P) | 30DA AVG | 29 | 607 | |
| Phosphorus, total (as P) | DAILY MX | 16 | 16 | |
| Aluminum, total recoverable | DAILY MX | 1 | 1 | |
| Chlorine, total residual | INST MAX | 1 | 1 | |
| E. coli | DAILY MX | 8 | 8 | |
| Whole Effluent Toxicity [WET] - Ceriodaphnia dubia | MN VALUE | 2 | 2 | |
| Whole Effluent Toxicity [WET] - Pimephales promelas | MN VALUE | 3 | 3 | |
| BOD, 5-day, percent removal | MO AV MN | 1 | 30 | |
| Solids, suspended percent removal | MO AV MN | 1 | 30 | |

As can be seen from Table 3-1, Total Nitrogen (TN) and Total Phosphorus (TP) have highest number of violations. E. Coli and pH violated the limits on multiple occasions. TSS failed to meet the discharge limits 4 times. Whole Effluent Toxicity was found exceeding the limits for both testing species in December 2019. $BOD_5$ and ammonia-N limits exceeded the limits once in this permit cycle.

### 3.1.1 Nutrients - TN and TP

#### *3.1.1.1 Total Nitrogen*

The 2017 Permit gives the Village time to bring the WWTP into compliance with the Permit. Interim nutrient limits were applied to the WWTP for three years from the effective date of the Permit (Oct. 1, 2017). The seasonal nutrient limits became effective in October 2020.

Figure 3-1 shows TN compliance over the course of the 2017 Permit cycle (Oct 1, 2017, to Sep 30, 2022). Excluding the first 18 months (between Oct 2017 and Mar 2019), the TN daily maximum limit of 15 mg/L for winter months between October and April was mostly met; but the WWTP has not been able to comply with the daily maximum limit for the summer months between May and September (6 mg/L).  And the 30D average limit of 10 mg-TN/L was met only occasionally.  Although a few very low TN episodes have occurred; consistent performance has not been established.


Figure 3-1 Chama Effluent TN vs. Discharge Limits

### *3.1.1.2 Total Phosphorus*

Total Phosphorus also has seasonal limits. As shown in Figure 3-2, excluding the first 18 months of operation of the new WWTP, TP concentrations in the effluent have not been able to meet either the interim limit or 30D average and daily maximum limits. As with TN, TP discharge quantity limit for summer were also violated regularly. A ferric chloride system was installed when the oxidation ditch plant was built to remove excess TP that escaped the biological system. However, the ferric feed system has not been used since the first winter due to freezing of the injection piping.

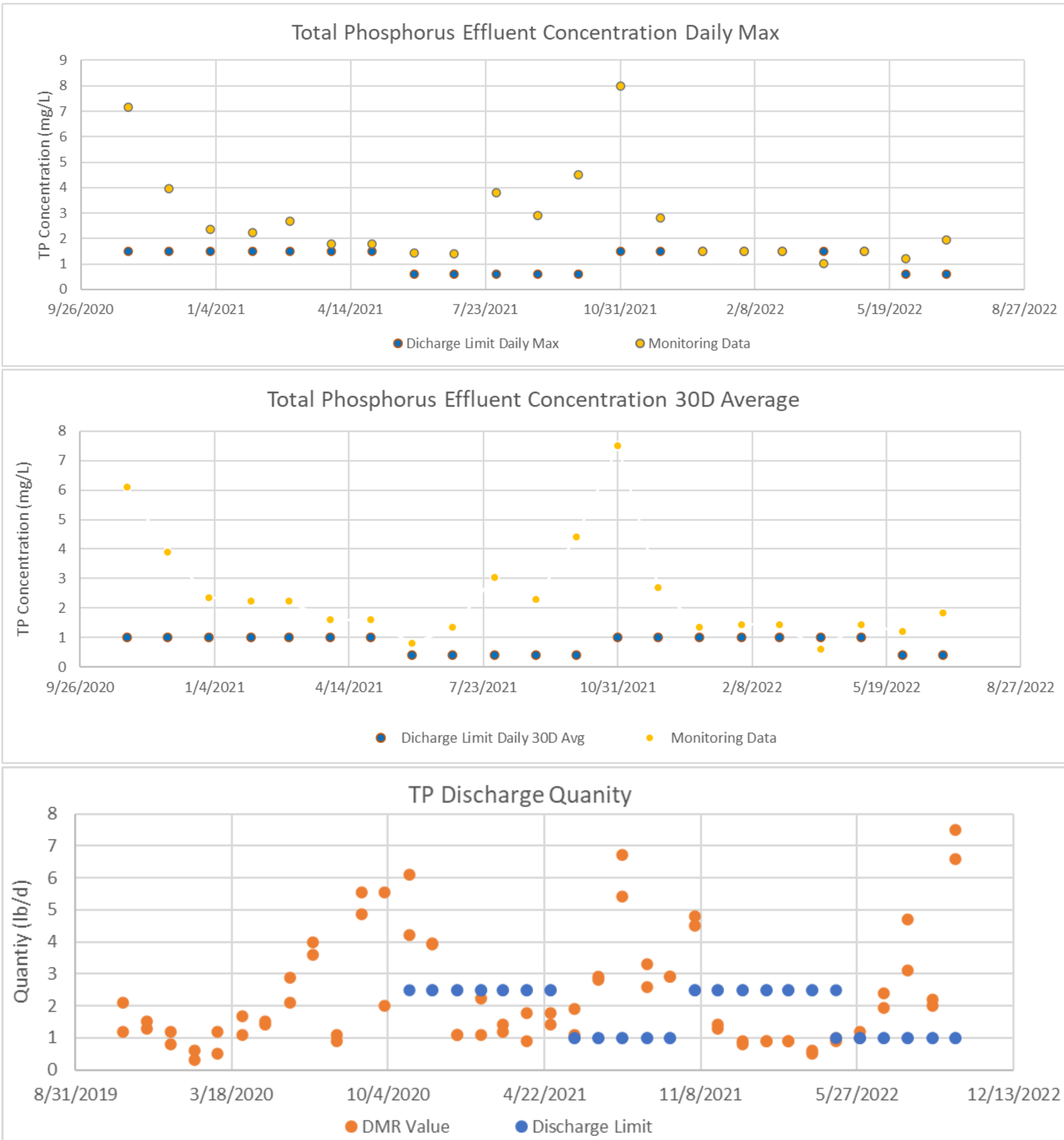



Figure 3-2 Chama Effluent TP vs. Discharge Limits

### 3.1.2 pH

Figure 3-3 provides an overview of pH compliance. Low pH violations have occurred several times. A high pH exceedance occurred only once.

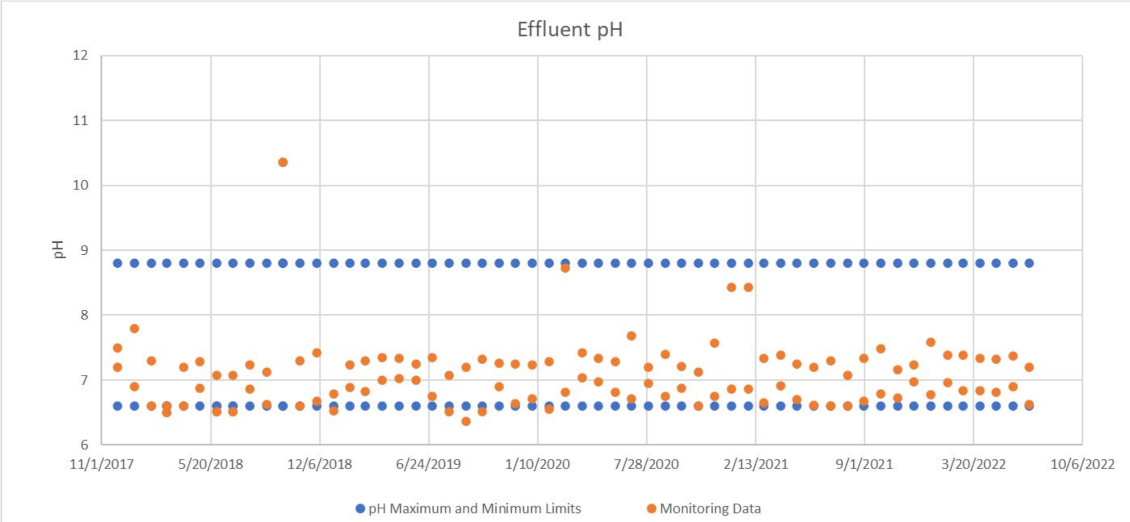
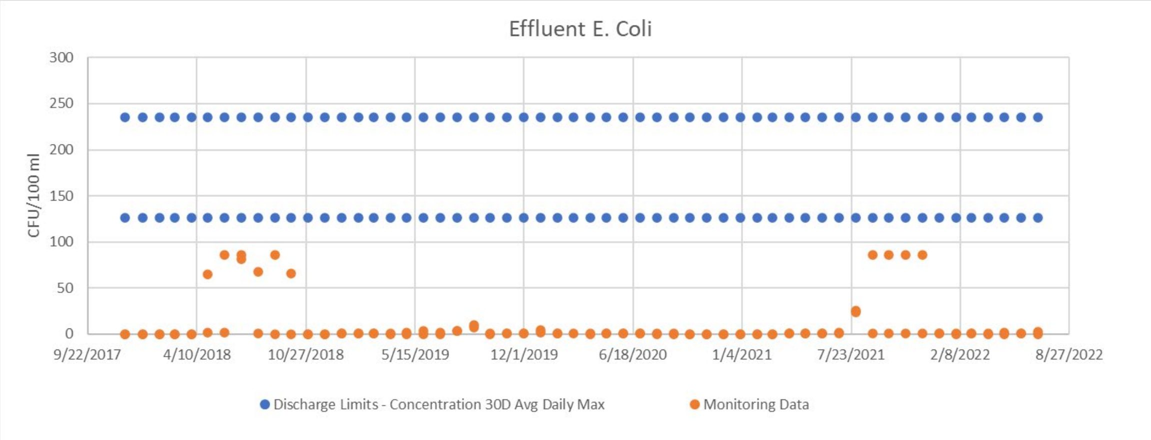



Figure 3-3 Effluent pH Vs. Discharge Limits

Low alkalinity in the outflow from secondary treatment gives little buffer to maintain a stable pH. The oxidation ditch system is highly effective at removing ammonia. Average effluent alkalinity obtained from the Whole Effluent Toxicity (WET) test reports was found to be 94. When sewage coming into the plant contains high TKN, the resulting biological nitrification can cause the pH to drop below the bottom limit.

### 3.1.3 E. coli

Although daily maximum and 30D average concentration limits have not been exceeded, E. coli discharge quantity exceeded the daily maximum limit of 1.43 BCFU/d on multiple occasions.



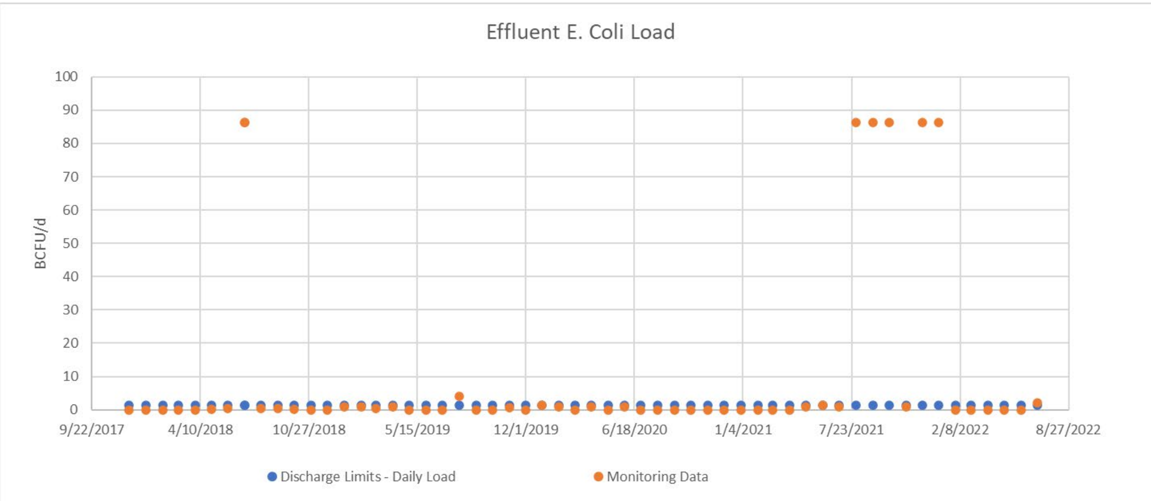
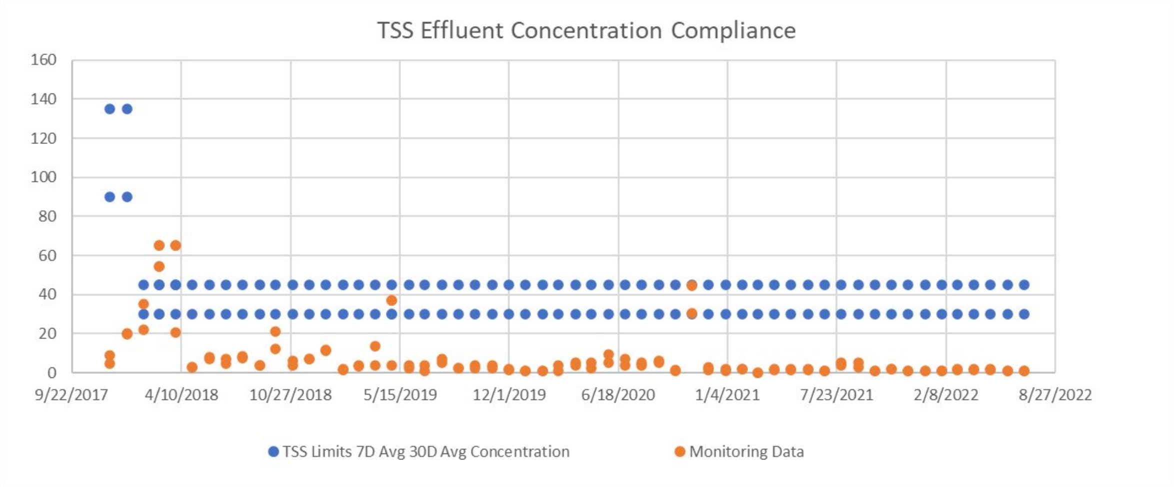




Figure 3-4 Effluent E. Coli Vs. Discharge Limits

### 3.1.4 Total Suspended Solids (TSS)

TSS violations can be found in Figure 3-5. Both concentration limits and quantity limits were exceeded a few times in early 2018 when the activated sludge system had been in service for only a few months. Overall, the WWTP can consistently meet the TSS discharge limits.



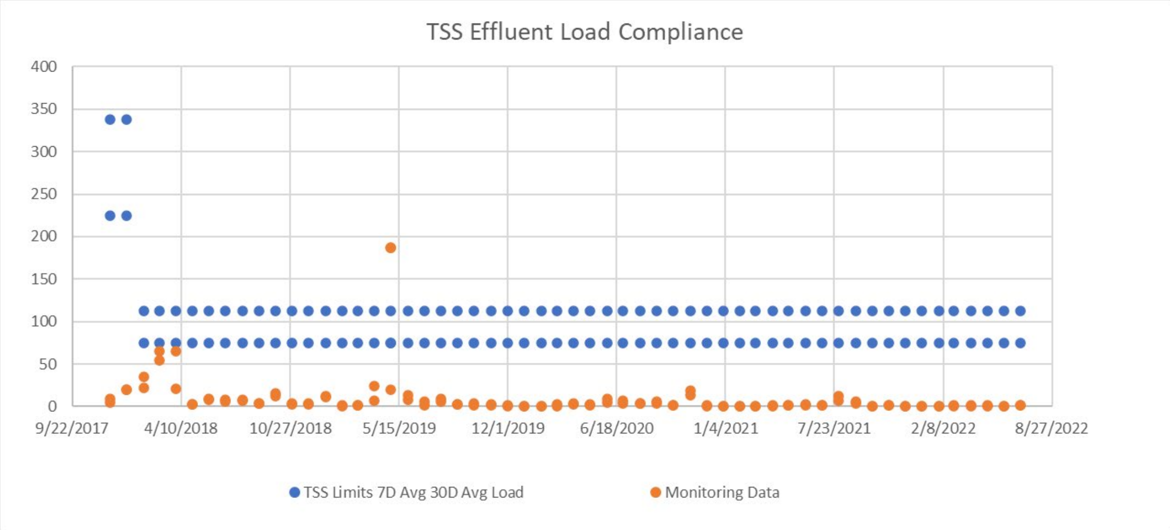




Figure 3-5 Effluent TSS vs. Discharge Limits

## 3.2 Operational Deficiencies Record

One operational deficiency was listed in the 2020 AOC. The Village was cited for “using incorrect form to report WET” on the DMR for December 2018 and June 2020 , and for failure to conduct monthly monitoring of WET limits for test species Ceriodaphnia dubia and Pimephales promelas after violating WET limits in December 2017 and December 2019.

The limit violations listed in the 2022 AO indicate some operational practices can be improved. Occasional low pH occurrences suggest a way for operators to control pH would be beneficial. Occasional E coli. violations indicate UV disinfection was compromised due to the reduced transmittance of the UV lamps, suggesting more frequent lamp cleaning may be needed.

The Village only samples the influent and effluent twice a month for DMR purposes, and the tests were conducted by an external lab. Most of the time the WWTP is operated without knowing what contaminant loads are coming in and going out to the river. Regular monitoring of both influent an effluent strength is an essential part of managing the WWTP's treatment.

The Village lacks capacity to measure critical parameters for daily process monitoring. Although the lab at the WWTP is equipped for monitoring most of the process parameters, the operators do not measure the parameters due to insufficient of funding to purchase reagents. WSP suggested the operators measure MLSS on a daily basis to find the current operating SRT and to re-establish a new sludge wasting schedule. The operators have started MLSS measurements. The new MLSS data and current sludge wasting schedule suggests daily sludge wasting rate be increased. Current wasting rate results in a long SRT in the system. A mixed liquor sample from the RAS stream was sent to the contracted lab to measure MLSS and MLVSS. MLSS was found to be 5270 mg/L and the MLVSS was 4065 mg/L. The MLVSS to MLSS ratio in that sample was 77%, which is within the typical range (between 70 and 80%) for WWTPS that are not equipped with primary clarifiers. The operators are currently in the process to gradually increase sludge wasting rate until desired SRT is established. This is to establish a more active and healthier microbial environment in the oxidation ditch to enhance the growth of nitrogen and phosphorus removal bacteria.

The Village has a chemical phosphorus removal process (that uses ferric salt) at the WWTP, but the unit has not been in operation. This chemical process was installed to attain low phosphorus concentrations in the plant's effluent. However, the effluent's alkalinity is often low (under 100 mg/L as $CaCO_3$). As a result, the acidity of ferric chloride could jeopardize the plant's effluent pH and cause violation of the low pH limit. To use ferric chloride for phosphorus removal would likely also require alkalinity supplementation.

Lack of spare parts for critical equipment also contributes to the operational problems. In late September and early October 2022, the belt filter press went down due to failure of a part, and a replacement part was not readily available. In the meantime, the sludge digester was nearly full and had little capacity for sludge wasting. A waste truck was called, and the digester was emptied. The part was ordered but did not arrive until three weeks later.

Equipment maintenance and repair is often delayed.  The Village outsources mechanical equipment preventative maintenance and repair. In August two submersible mixers in the anaerobic zone went down and the repair did not happen for over 20 days.

The dissolved oxygen (DO) concentration in the oxidation ditch is perhaps the most important parameter that affects the plant's performance.  The aerators were not operated at an appropriate speed. After consulting with Westech, the oxidation ditch provider, the operation of the aerators was changed to running one at a time, with 70% to 75% of full speed. The aerator opposite to the entrance of the oxidation ditch was put in service first and the one near the entrance was standing by. The change produced satisfactory DO levels in the first channel and also maintained solids suspended. However, the DMR results for this month showed increased TN and TP concentrations (both samples were taken after the change) in the effluent. During the subsequent visit in October, it was found that the gate for internal mixed liquor recycle was not open. The gate was then fully opened, and the working aerator was switched as well. This change effectively reduced total nitrogen discharge. The October DMR showed compliance of total nitrogen. The November DMR report showed further improved of effluent quality. Total nitrogen was further reduced, and total phosphorus concentration dropped to below the 30D average and daily maximum limits in November.

# 4 PRESENT FACILITY

The sewage comes into the plant through the old manual bar screen structure and then is pumped to the oxidation ditch. A mechanical drum screen was constructed when the WWTP was upgraded in 2017. However, the mechanical screen froze in winter, so it is being bypassed and not used.  The oxidation ditch is a three-stage biological nutrient removal system, which is comprised of an anerobic selector, an anoxic zone, and an aerobic zone. A diagram of the three-stage system is presented in Figure 4-1. The screened raw sewage first enters the anaerobic selector where it combines with returned activated sludge (RAS). Phosphorus accumulating organisms (PAOs) presented in the RAS are the responsible microorganisms for biological phosphorus removal. The PAOs in the RAS take up easily biodegradable organic carbon in the raw sewage and in the meantime release the accumulated phosphorus in the anaerobic zone. This prepares the PAOs to take up excess phosphorus when they are exposed to an oxidative condition. The mixture then enters the anoxic zone where it encounters the nitrate rich stream circulated from the end of the oxidation ditch. With abundant food source, the denitrifying micro-organisms convert nitrate and nitrite to nitrogen gas. The denitrified stream then enters the aerated section of the oxidation ditch. In this section ammonia is nitrified, and phosphorus is absorbed by the PAOs. At the end of the racetrack, a large stream of nitrified mixture is directed to the anoxic zone through the internal recycle gate. The rest mixed liquor exits the oxidation ditch and enters the clarifiers for solids and liquid separation. The clear supernatant then enters the UV chamber for disinfection. A small portion of the disinfected water is stored in a plant water storage tank and majority of the treated effluent flows to the effluent works where it is released to the river. A site layout of the oxidation ditch treatment system can be found in the Attachment.

Three-stage Oxidation Ditch at Chama WWTP

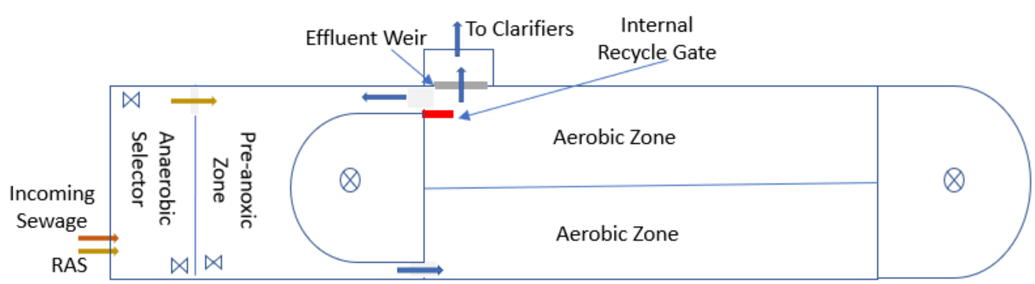



Figure 4-1 Three-Stage Oxidation Ditch

## 4.1 Performance

The oxidation ditch system at Chama WWTP has been in service for five years. The WWTP started monitoring total nitrogen and total phosphorus from beginning of 2018. The effluent quality from the new WWTP has improved significantly over the effluent produced by the old pond-based plant. Despite its superior performance in removing BOD, TSS, E. coli and ammonia, the system struggles to meet the nutrient (nitrogen and phosphorus) discharge requirements. Refer to Table 4-1 for the statistics of the effluent quality.

Table 4-1 Oxidation Ditch Plant Effluent Quality

| | **BOD5** | **% rem** | **TSS** | **% rem** | **Ammonia** | **% rem** | **TP** | **% rem** | **TN** | **% rem** |
|---|---|---|---|---|---|---|---|---|---|---|
| Max(mg/L) | 29.0 | | 170 | | 2.1 | | 7.2 | | 43.0 | |
| Avg(mg/L) | 4.34 | 97% | 9.09 | 94% | 0.39 | 98% | 2.06 | 61% | 12.69 | 66% |
| Std. Dev | 4.19 | 0.062 | 23.03 | 0.13 | 0.45 | 0.051 | 1.36 | 22% | 6.10 | 17% |
| 30D Avg Limit (mg/L) | 30 | 85% | 30 | 85% | 5.1 | | 1 (Oct-Apr)<br>0.4 (Apr-ep) | | 10 (Oct-Apr)<br>4 (Apr-Sep) | |

## 4.2 Operation and Maintenance

The WWTP was operated by an experienced Village staff operator who holds a New Mexico Class IV Wastewater Treatment certification. The operator worked eight hours per day five days a week. The operator overlooked every aspect of the operation and perform tasks, including:

- Checking DO in the basin daily and pH in effluent
- Checking equipment operation daily
- Observing the plant and reviewing available data to evaluate treatment and to make operational adjustments.
- Performing basic maintenance
- Collecting influent and effluent samples twice a month for DMR reporting
- Preparing the monthly DMR
- Collecting effluent samples daily for chlorine residual analysis
- Collecting mixed liquor samples for MLSS and sludge volume index measurements
- Check gauge readings.

However, the operator retired in mid-September 2022 and the position was filled early February. The WWTP was temporarily run by a contracted water and wastewater operating company during the transition period. The contracted firm provides one Level IV operator and a few others with Level III certifications.

The Village contracts major maintenance/repair and process monitoring/control work to outside companies.

# 5 COMPLIANCE OPTIONS

## 5.1 Improve Operation

Proper process control is critical for a treatment system to perform as it is designed. The most important control parameters for nutrient removal in oxidation ditch systems are: DO distribution, sludge retention time, flow velocity in the channel, and the rate of internal recycle etc.

Research on performance of oxidation ditch system suggests that with proper DO profile and flow velocity in the channel total nitrogen can be reduced to below the permitted level. Some case studies have achieved very low TN (<3 mg/L) without polishing step by maintaining proper DO profile that promotes simultaneous nitrification and denitrification (SND). DO in the aerobic section of the oxidation ditch should be maintained between 1.5 and 2.0 mg/L for ammonia conversion, whereas maintaining a low DO zone (between 0.1 and 0.5 mg/L) in the ditch can remove total nitrogen by promoting SND. Literature suggests MLSS concentration in an oxidation ditch system be in the range of 1,500 to 5000 mg/L; but 2,000 to 3,500 mg/L MLSS or maintaining SRT between 20 to 25 days is most common in practice.

Currently the oxidation ditch at Chama WWTP maintains MLSS at between 4000 and 5000 mg/L by wasting sludge at 100 ~ 130 gpm for 15 minutes a day. MLSS in the wasted sludge was found to be around 5000 mg/L. This operating condition results in an SRT over 100 days. Due to a long SRT and old bacteria, the MLSS settles very slow, leading to a high sludge blanket in the clarifiers. And the denitrification bacteria in the activated sludge may have been in an endogenous respiration state with low activity. Research suggests high degree nutrient removal occurs at SRTs under 30 days. To improve treatment, sludge wasting rate needs to be increased in order to create favorable conditions for biological nutrient removal.

After operation has been corrected and the WWTP is capable of achieving its design targets, the WWTP can use automation to assist in controlling the operation. Using online analyzers and controllers, the control system will automatically adjust operating parameters. Automatic control is particularly helpful because the operator only works daytime, five days a week. Automation can maintain the proper operating range 24/7.

## 5.2 Adding Higher Level Treatment

Although with optimal operation it is possible for Chama to meet more stringent nutrient limits with the three-stage oxidation ditch, it is necessary to add additional polishing treatment to assure the WWTP effluent consistently meet nutrient limits all year-round. Therefore, installing a polishing process onto the existing treatment system will be the best-fit solution to bring the Village to compliance.

High level treatment options include:

- Option 1: Add Treatment Stages - Expand the existing three-stage system to five-stage. A five-stage BNR oxidation ditch will add a post denitrification tank following the existing basin with external organic carbon addition. A polishing step will follow the post denitrification tank to breakdown the remaining organic carbon from the post denitrification step. Filtration needs to follow the secondary effluent to remove particulate phosphorus, or the secondary effluent may fail TP limit. Five-stage oxidation ditch systems have demonstrated to be capable of producing an effluent with TN below 3 mg/L, and with chemical addition TP can be lowered to below 0.4 mg/L.

- Option 2: Conventional Denitrification Filter - The denitrification filter can effectively remove nitrate/nitrite as well as particulate phosphorus. Although the TN limit can be met by a tertiary denitrification filter, phosphorus removal cannot be guaranteed as the filter does not remove soluble phosphorus. If the oxidation ditch failed to remove soluble phosphorus the finally effluent could violate TP limit. The WWTP has not been able to biologically remove phosphorus efficiently. It would rely on injecting chemical to reduce soluble phosphorus. Higher chemical dose more sludge is produced. Given the fact that alkalinity in the secondary effluent from Chama WWTP is low, chemical addition may depress effluent pH, especially in the warm months when the TP limit is low. The lower the limit, the higher the ferric dose is required. This in turn may require an alkalinity supplementation. However, if the existing three-stage system can perform as it should, half of the alkalinity consumed can be recovered. With less TP and TN to the clarifiers (under 1 mg/L and 10 mg/L respectively), less chemicals usage can be expected, and alkalinity supplementation may not be needed. A denitrification filter system can well serve a well performed biological nutrient removal system. A downside of a denitrification filter is that a large amount of treated water is required for backwash. This will cause a hydraulic surge on the system. The WWTP has experienced high incoming flows (reaching the design capacity of the WWTP) in the summer. A hydraulic surge will reduce the detention time in the secondary system and can potentially result in reduced treatment efficiency.

- Option 3: Simultaneous Phosphorus removal and Denitrification - "Blue Pro/Blue Nite" Filtration system manufactured by Nexom removes phosphorus and nitrate/nitrite in the same unit. Denitrification can restore some alkalinity. Nexom claims Blue Pro will use 30% less ferric than conventional chemical precipitation. The combined effects may exempt the WWTP from requiring alkalinity supplementation. With less chemical use than the conventional precipitation method, TP in the treated water can reach below 0.1 mg/L. Another advantage of the Nexom system is that the system runs a continuous backwash at less than 15 gpm. This continuous backwash flow will be recycled back to the clarifiers, and it will account for less than 10% of the design flow. This recycle stream is less likely to create hydraulic stress on the secondary treatment system.

## 5.3 Summary

Beside nutrient violations, Chama WWTP has occasionally violated other parameters. But those other violations have been addressed through improved operation and maintenance. . Complying with the nutrient limits is challenging for the existing plant. By design, the existing three-stage oxidation ditch system is able to comply with the nutrient limits most of the year (between October 1 and April 30).

However, in the long run the WWTP will need to add a polishing treatment process in order to reliably meet the more stringent TN and TP limits between May 1 and September 30. The corrective actions that can be taken for the short term is to reintroduce the ferric feed system and to create a condition in the oxidation ditch that promotes SND during summer. Research has demonstrated that SND can maximize total nitrogen removal without external carbon source.

# 6 Compliance Strategy

Evidence has shown a well operated 3-stage system can meet the cooler season nutrient limits. Adding higher level treatment will guarantee the WWTP to be compliant all year round. Actions to achieve compliance are divided into five phases:

- Phase I: Process Adjustment - Establish an optimal operating condition that will produce effluent that will meet permitted nutrient limits for the months between October and April. This stage focuses on adjusting operation without capital investment. Operational improvements can be made while other strategies that involve capital investment are being evaluated, designed, and constructed. This phase will require more frequent sampling to examine the effects of every change made to the operation.

- Phase II: Reactivate Ferric Feed - Bring ferric chloride feed system back online for phosphorus polishing during summer. The outdoor injecting piping will be electrical heat taped to ensure the dosing system function in the freezing months. Capital investment will be required.

- Phase III: Automatic Controls - Install analyzers and controllers to enable an automated process control. Due to lack of operational staff, automated process control alleviates the stress on the operator and will help the operation to run in the desired range.

- Phase IV: Initiate preliminary engineering work to identify the most flexible and cost-effective solution for effluent polishing. The preliminary engineering work will help Village apply for fundings for the upgrade.

- Phase V: Detailed engineering design and construction.

## 6.1 Phase I – Process Adjustment

### 6.1.1 SRT Adjustment

Solids Retention Time (SRT) is a critical parameter used in designing and operating an activated sludge system. The traditional method for controlling SRT is to manually adjust the sludge wasting rate based on the food-to-microorganism (F/M) ratio or mixed liquor suspended solids (MLSS) concentration. Oxidation ditch systems are usually operated with an SRT between 15 days and 30 days. SRT longer than 40 days can inhibit denitrification bacteria activity due to high endogenous decay of bacteria cells. The oxidation ditch system at Chama has been running with a high SRT, which could contribute to inefficient nutrient removal. The plant will gradually increase sludge wasting until the SRT reaches 30 days.

MLSS is the most convenient parameter for monitoring without the need to know the daily incoming organic food of the bacteria. Therefore, monitoring MLSS daily will be adopted. This requires the operator take MLSS samples from basin and from the return sludge. WSP can support the operator with a simple tool to calculate the SRT and the required sludge wasting. In the meantime, the operator also will need to measure effluent nitrate, nitrite, and soluble phosphorus daily. Mixed liquor volatile suspended solids (MLVSS) concentration is the actual indicator for SRT; however, the WWTP is not equipped to measure MLVSS. The operator will start sending mixed liquor samples to the outside lab for a period of time to measure MLSS and MLVSS in order to establish relationship between MLVSS and MLSS so MLSS can be used in the future for estimating SRT.

High SRT benefits nitrification but has adverse impact on phosphorus removal. SRT between 15 and 25 days would be explored to identify optimal SRT for the WWTP for nitrogen and phosphorus removal. Chama is in cold climate. SRT needs to be adjusted for season changes. To find the optimal SRT for warmer and cooler seasons, timeline for this study can be expected to run from this winter through the summer season of 2023.

### 6.1.2 Surface Aerator Adjustment

This step is to establish desired DO distribution in the ditch that favors nitrogen removal by adjusting aeration. It has been demonstrated at various oxidation ditch facilities, that properly controlled aeration creates a low DO Zone (0.1 to 0.5 mg/L) where nitrification and denitrification occur simultaneously (SND). The effect of SND has been shown to achieve removal of greater than 90% of total nitrogen.

Aeration adjustment will involve following activities:

- Switch operating aerator & adjust speed: The two aerators are located opposite to each other. By design, the oxidation ditch only needs one aerator running a time. Per Westech, either aerator is able to produce an effluent that meets design targets. The goal is to find how switching aerators and changing speed affect the effluent quality. Operator will measure DO at four locations every day and change the aerator speed as needed to maintain the desired DO profile in the ditch.

- Sequence Aerators On/Off & Adjust Submergence: Sequencing the aerators on and off, as well as adjusting submergence, may be exercised if effluent is not improved by simply alternating the aerator and adjusting speed. It also can combine with aerator adjustment to further improve the treatment. The recommended maximum submergence of the impeller by Westech is where the tips of the blades are slightly below the water surface. The minimum submergence is at the impeller plate level where the tips of the blades are completely exposed. The deeper submergence the better aeration. Submergence is varied by raising or lowering the water surface level through the adjustable weir at the outlet of the oxidation ditch. Switching the aerator on/off has been found to be helpful in nitrogen removal at some oxidation ditch facilities.

### 6.1.3 Internal Recycle Adjustment

There is a by-pass gate to allow a portion of nitrified stream to circulate back to the anoxic zone for nitrogen removal. The amount of nitrogen that is removed from the anoxic zone is dependent on the amount of nitrate/nitrite as well as available substrate. Substrate from the raw sewage usually is abundant after the anaerobic reactor, which is easily biodegradable and is the favored food for denitrification bacteria. However, a large amount of recycle will introduce more oxygen to the anoxic zone, which can adversely impact denitrification process. Furthermore, a higher recycle rate will dilute the organic food concentration which in turn will reduce the denitrification rate. It also increases flow velocity in the system. The combined effect can cause nitrate/nitrite flow through the anoxic zone with fewer reduction, and the residual DO can be carried further than desired.

### 6.1.4 Monitor Impact of Return Flow from Solids Stream

The oxidation ditch system at Chama consists of an anaerobic selector up front, which enables the system biologically remove phosphorus. PAOs from the RAS first release phosphorus when is exposed to raw sewage in the un-aerated reactor, where volatile fatty acids (VFAs) are present in abundance. PAOs release the stored phosphorus and take up VFAs and convert them to energy to be used when food is scarce. When PAOs are exposed to an aerobic condition where organic food is scarce, the stored energy is utilized for cell maintenance and reproduction. Part of the metabolism of PAO cells is accumulating a higher amount of phosphorus than they have released in the anaerobic phase. Phosphorus is removed from the system by wasting excess sludge. The Chama WWTP uses aerobic digestion to stabilize the wasted sludge before dewatering. Dewatering typically occurs a few times a month. The microbial cells are broken down in the extended aerobic digestion and, as a result, phosphorus is released to the liquid phase. Due to the small volume of the digester, phosphorus concentrations in the liquid phase tend to be high. In the digester, aeration is intermittent. When aeration is off, solids settle and is thickened. The supernatant is removed by a decanter and is returned to the oxidation ditch. During belt press operation, the filtrate that contains high phosphorous concentration is returned to the oxidation ditch inlet as well. The additional phosphorus added back to the system may cause plant effluent phosphorus exceeding the discharge limit. Therefore, understanding the impact of the return flows can help devise a strategy to minimize the adverse effects. Samples of the supernatant and filtrate of the filter press will be analyzed for phosphorus and for impact evaluation.

### 6.1.5 Sampling During the Trials

The WWTP takes influent and effluent samples twice a month for DMR purposes. During the process adjustment phase, influent and effluent grab samples will be taken more frequently to analyze for the parameters below, preferably daily in the lab at the WWTP to eliminate the delay. The lab at the WWTP is equipped with a Hach spectrophotometer which is capable of testing a variety of parameters. The Village shall allocate part of Chama's sewage system improvement fund to purchase necessary reagents and accessories to run the tests.

1. COD
2. TSS
3. Ammonia Nitrogen
4. Total P and Soluble P (or ortho-P)

5. Nitrate and nitrite
6. MLSS in the basin and in the return sludge. Initially mixed liquor samples will be tested for MLSS and MLVSS at the contracted lab to develop MLVSS/MLSS correlation. This shall begin when the operating SRT is in the desired range. Five mixed liquor samples from different days will suffice for determining the ratio.
7. Sludge settling test for Sludge Volume Index (SVI)

With more intensive testing and process monitoring, the effects of the adjustments can then be evaluated. Optimal operating condition can be then identified. With fine-tuned operation, the oxidation ditch system at Chama can be expected to meet the nutrient limits for the months from October to April. For the warm weather limits, Phase II actions need to be taken, i.e., incorporating the daily phosphorus monitoring and chemical treatment.

## 6.2 Phase II – Implement Chemical Phosphorus Removal

Phase II is to bring ferric chloride dosing system back online. The WWTP has a ferric chloride dosing system in place, but the system has not been used since the first winter the WWTP came into service. As of January 2023, heat tracing on the outdoor injection piping has been installed and the chemical has been purchased.

Pilot testing to establish ferric chloride dosing rates must precede the system's full-scale operation. Only after the relationship between the incoming reactive phosphorus concentration and the ferric chloride dosing amount is established, will the operator be able to adjust the speed of the metering pump to respond to incoming phosphorus. As part of ferric dosing operation, phosphorus needs to be tested daily, first thing in the morning.

Due to low alkalinity in the treated effluent, the acidic nature of ferric salt can cause pH to drop to below the bottom permitted limit. To counteract the negative impact of ferric salt on water pH, alkalinity supplementation will be considered. Liquid lime probably suits Chama better due to its lower cost. The WWTP operator tried various sources to locate a liquid lime supplier but has not had success. Per the current operator, a caustic feed system has also been set up. This system will be used when effluent pH drops below the bottom limit.

Pilot testing is scheduled to start in March 2023. As soon as the correlation between pump speed and incoming phosphorus is found, the chemical feed system can be put in service as needed. The operator will initially measure phosphorus daily and use the dosing correlation to find the corresponding pump speed for the day. The operator must order the required reagents before the pilot testing begins. It is critical because overdosing could jeopardize effluent pH and under dosing can cause the effluent to exceed the phosphorus limit.

The Chemicals needs to be stored in a above freezing condition and the WWTP does not have temperature-controlled room for the storage. There are challenges for the WWTP to adopt chemical treatment systems for colder months. After the initial startup of ferric system, more engineering work will be needed to enable online monitoring of tank level as well as online phosphorus analyzer for automated dosing control, heat the chemical room etc. These will be addressed in the later phase.

The target of starting the full-scale chemical phosphorus removal is in May 2023 when more stringent phosphorus limit is applied.

## 6.3 Phase III - Control Upgrade

Today the wastewater treatment system lacks automatic control. There is only one DO probe installed for the entire system. Multi-point DO monitoring in the oxidation ditch makes DO profile visible to the operator. This can help the operator adjust aerator operation.

Further, the WWTP only samples the influent and the effluent twice a month and the samples are tested by an external lab. To inject correct amount of chemical needs daily input of incoming phosphorus. Either using online phosphorus and pH analyzers or performing tests on site every day will need to occur for successful chemical treatment.

Incorporating automatic process control has been proved to be successful at many wastewater treatment facilities. DO profile monitoring along the channel benefits nitrogen removal operation, and phosphorus online analyzer controls chemical dosing system for phosphorus removal. Continuous effluent pH monitoring can alarm the operator when the permit limit is violated. The controllers will automatically adjust aerator speed and chemical doses etc. therefore effluent quality can effectively be under control.

Although automated process controls can adjust processes to help the WWTP perform dependable, high-quality treatment, the plant still needs experienced operator(s). The operator(s) must have knowledge of automated systems and skills to operate SCADA. Understanding what a value on the screen means and what must be done if the value is out of desired range is essential. And proper and diligent maintenance on the analyzers has to occur, or the controls system will not work. The operator(s) can become adept at analyzer maintenance and monitoring the process through training and practice. To have qualified operator is a key factor for the success of an automated process plant. As requested by the WWTP operator, WSP will assist the Village contracted firm to develop the control scheme. Implementation of the automation is expected to start in the first half of 2023.

## 6.4 Phase IV - Engineering Study

Although with improved operation, the existing wastewater treatment plant should be able to produce a quality effluent, treatment beyond the three-stage system currently employed can enable the plant to comply with the permitted nutrient limits all year round. Either tertiary treatment or adding two more polishing stages at the end of the existing oxidation ditch will further reduce TN and TP. Two treatment options are considered, tertiary treatment filters and upgrading the three-stage system to a five stages system.

### 6.4.1 Tertiary Treatment

Among the tertiary treatment options, Blue Pro® Reactive Filtration and Blue Nite® Biological Denitrification tertiary treatment system by Nexom stands out and appears to be a best fit technology for the Chama WWTP. Blue PRO® is a continuous backwash up-flow sand filtration system for Total Phosphorus (TP) removal and Total Suspended Solids (TSS) polishing. Blue Nite® is continuous backwash up-flow sand filtration system with a carbon source dosing system for nitrate and nitrite removal and Total Suspended Solids (TSS) polishing.

The two processes can be integrated to accomplish phosphorus and nitrogen removal in one filtration system. Nexom proposed two duty filter modules with total capacity of 0.3 MGD. The modular configuration of the filters allows for easy future expansion. Blue PRO® installations are meeting phosphorus permit limits as low as 0.1 mg/L TP. Blue Nite is integrated with the Blue Pro to achieve simultaneous biological removal of nitrate and nitrite.  Plus, the system is simple to operate. The system can be integrated into the existing wastewater treatment systems seamlessly. The chemical dose used in BluePRO® is lower than the traditional chemical treatment that precipitates phosphorus in the secondary clarifier. With less chemical usage, the BluePRO® system should provide operational savings to pay for the upfront capital investment in less than three years. Figure 5-1 is the schematic of typical Blue Pro filter.

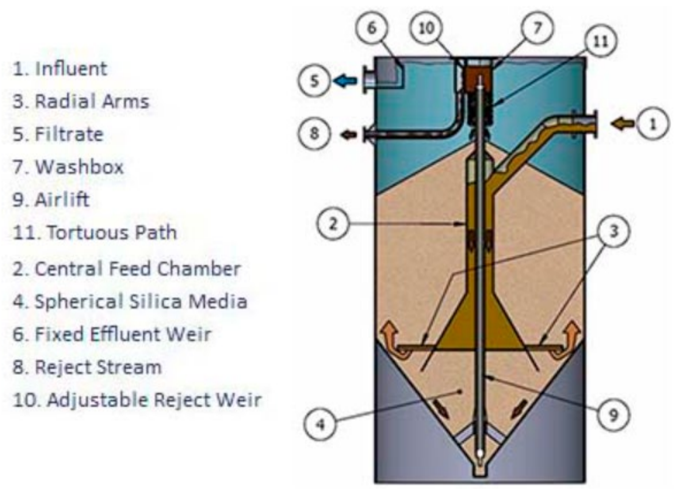



Figure 6-1 Blue Pro/Blue Nite Central Flow Filter

Water to be treated enters the bottom of the filter through a central assembly and is distributed to the media bed through radial arms. The water flows up through the media zone, with clean water existing the filter at the top over a fixed effluent weir. A small amount of filtrate is used to continuously clean the media in the wash box. Media in the vessel moves slowly down, counter to the upward flow. The cleanest media is at the top of the vessel while the dirtiest is at the level of the distribution arms. The vessel's cone bottom collects the spent media and directs the media to a center shaft. Air enters the shaft at the bottom and lifts the media up while providing a rigorous scrubbing action that dislodges the particulates and media coatings. The media is then discharged to a wash box at the top of the vessel where it receives a final, thorough washing. The controlled water velocity in the wash box enables the cleaned media to return to the filter bed, while particulates and spent media surface coatings are carried way from the reactor as a reject stream. The reject is then recycled to the clarifier for solids removal. One key feature of the BluePro® system is that the reactive media is regenerated in situ.

Part of the reason BluePro® is efficient is because the media is coated with a reactive chemical, i.e., a single ferric base chemical. The chemical is injected in front of the central flow filter to minimize floc formation and maximize coating on the media. This chemical coats the media throughout the active zone of the filter bed where the adsorption of phosphorus and filtration of solids occur. The backwash (reject stream) contains ferric coating that is reactive to combine with phosphorus. When is returned to the secondary clarifiers, it continues removing phosphorus from the clarifier influent.

The BlueNite® Biological Denitrification uses the same up flow filtration mechanism as BluePRO® but uses the media as an attached-growth platform for heterotrophic bacteria. Accompanied by an injected carbon source, the bacteria can thrive and denitrify incoming nitrate and nitrite and polish TSS and other trace contaminants at the same time. With an appropriate design and process controls BlueNite® can maintain target effluent NOx-N below 3 mg/L. Fixed-film heterotrophic bacteria convert nitrates ($NO3^-$ and $NO2^-$) to atmospheric nitrogen ($N_2$). The composition of the bacterial population depends largely on the specific type of carbon used. Bacteria and solids wasting occurs through continuous backwash. The integration of the two mechanisms, phosphorus removal and denitrification, enables effluent polishing in one step. Estimated O&M cost of running the Blue Pro/Blue Nite can be found it Table 6-1.

Table 6-1 Blue Pro/Blue Nite O&M Cost Estimate

| Annual average conditions | Quantity | Motor Power | | Duty kW | Monthly cost* | Annual cost* |
|---|---|---|---|---|---|---|
| | | bhp | kW | | | |
| Duty compressor motors | 1 | 10 | 7.5 | 5 | $360 | $4,320 |
| Booster Pumps | 2 | 1.5 | 1.12 | 2.24 | $161 | $1,935 |
| Filter airlifts | 2 | - | - | | - | $514 |
| Pneumatic maintenance | 1 | - | - | | - | $500 |
| 40% Ferric Chloride | | | | | $1,900 | $22,800 |
| MicroC | | | | | $5,000 | $60,000 |
| Total O&M | | | | | | $90,069 |

* Electricity cost is assumed to be $0.1
* Filter boost pumps is assumed to be needed.

To build a Blue Pro/Blue Nite system with two duty filters, the construction cost will be around one million dollars, which does not include online phosphorus and nitrate/nitrite analyzers nor the building to house the filters. However, if the existing oxidation ditch system can produce quality effluent that complies with the winter nutrient limits, the filters can be drained and put offline during cold months.

The tertiary treatment is sensitive and must be carefully operated. If the organic carbon is overdosed the effluent may suffer a BOD violation. Therefore, the performance of the tertiary system will be dependent on the diligence, knowledge, and experience of the operator(s). The tertiary treatment relies on chemicals to remove excess phosphorus and nitrate/nitrite, with the assistance of online analyzers and controllers.

Diligent inspection and cleaning the analyzers will be important for the instruments to produce accurate readings.

### 6.4.2 Five-Stage BNR Oxidation Ditch

Five stage oxidation ditch is a proven technology that can reduce total nitrogen to below 3 mg/L and TP to below 0.3 mg/L. Figure 6-1 is a diagram of the five-stage system that can be implemented at Chama. It will require additional treatment reactors to follow the existing three-stage oxidation ditch system. Operation of a five stage BNR oxidation ditch system will be similar to the operation of the existing three-stage system. Per Westech, additional volume for the post denitrification will be same as the pre-anoxic zone, which will provide two hours hydraulic residence time (HRT). The final polishing tank needs to provide 30 minutes HRT. Westech recommends a small blower and a diffused air grids for the polishing tank.

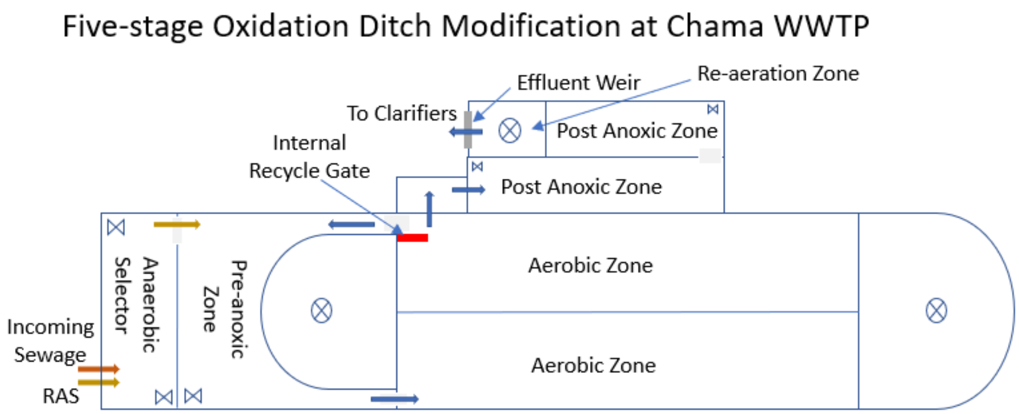



Figure 6-2 Five-Stage Oxidation Ditch

Given the fact the three-stage system has not been performing as it should, operation of the five-stage system can be more challenging to the operator(s). To guarantee TP to meet the more stringent limit during the warm season, a tertiary filtration system needs to follow the secondary treatment. Traditional filters need a large amount of effluent water to backwash the media. During the warm season when the plant influent reaches its design capacity, the periodic filter backwash flow would strain the treatment system and performance may decline. In addition, traditional filters require large footprints, which would not be available at the WWTP at Chama where two additional reactors would be needed for the five stage system.

Construction of the five-stage system would require a larger space for the additional reactors plus two conventional sand filters. Flow redirection will also be more complicated as the mixed liquor will exit the oxidation ditch at the end of the final polishing tank. Significant piping work and a higher construction cost will accompany this option. Cost for Constructing the polish stages and sand filters will be over two million dollars.

### 6.4.3 Summary

Nexom Blue Pro/Blue Nite filtration system seems more advantageous over the five-stage BNR system. The filtration system is operator friendly, robust in removing nutrients and can be relied on to produce quality effluent when the secondary nutrient removal fails. Cost for constructing two filter modules will only be half of cost to expand the existing system to five-stage and the two polishing sand filters. Therefore, the Blue Pro/Blue Nite system to upgrade the WWTP and to bring the WWTP to compliance is recommended.

## 6.5 Phase V - Detailed Design and Project Implementation

This Compliance Plan may provide to meet the engineering planning requirements of many public work funding agencies. The Village can begin applying for funding using this document as an attachment to funding applications. Detailed design of the polishing treatment and other necessary improvements of the existing WWTP might not begin until total project funding is secured. Given the time that will be required to obtain funding, it is likely the detailed design will not begin until 2024. Design-build mode can be explored with NMED in order to speed up the process.

# 7 PATHWAY TO COMPLIANCE

After reviewing the WWTP's history of violations, performing field visits, and observing the operation of the BNR oxidation ditch treatment system, a pathway for Chama to be compliant with the NPDES permit is identified. Two parallel routes will be taken. The two routes may interact but mostly they will run independently of each other. The pathway is shown in Figure 7-1.

## 7.1 Operation Route

Operation route is a series of actions aimed at improving operation step by step so the WWTP will perform to its designed ability. The actions are largely process adjustments. The adjustments are expected to improve the operation of the BNR oxidation ditch system so it will comply with nutrient limitations between October and April.

### 7.1.1 Operation Correction

The WWTP shall immediately start purchasing reagents and necessary accessories and training the operators to perform process monitoring tests. The village will need a full-time operator who can perform the daily laboratory work in addition to the regular operation and maintenance tasks required by the plant. The additional work includes multipoint DO checks, checking Oxidation and Reduction Potential (ORP) in anaerobic and anoxic reactors and pH in final effluent, MLSS analysis, soluble phosphorus, nitrate, and nitrite measurements.

Making operation changes is straightforward and cost effective to attain winter compliance. It will also be a good learning curve for the operators to understand BNR and help them react correctly to compromised performance. Based on the findings, the O&M and Standard Operation Procedures (SOPs) shall be updated to standardize the operation.

### 7.1.2 Bring Ferric Feed Back Online

Bring the ferric dosing system back online to enhance phosphorus removal when biological phosphorus removal fails to achieve desired reduction. The ferric feed system is especially important for warmer months when phosphorus limit is 40% of the limit for cold months. Alkalinity supplementation with lime or other alkaline chemicals will be considered if pH in the effluent drops as a result of ferric dosing.

### 7.1.3 Process Automation

Process automation upgrade can occur concurrently while the other corrective actions are underway. Process automation will install online analyzers and controller and upgrade the SCADA system to incorporate process automation. This will be designed and implemented by the Village's currently contracted firm. The analyzers that will help nutrient removal process include:

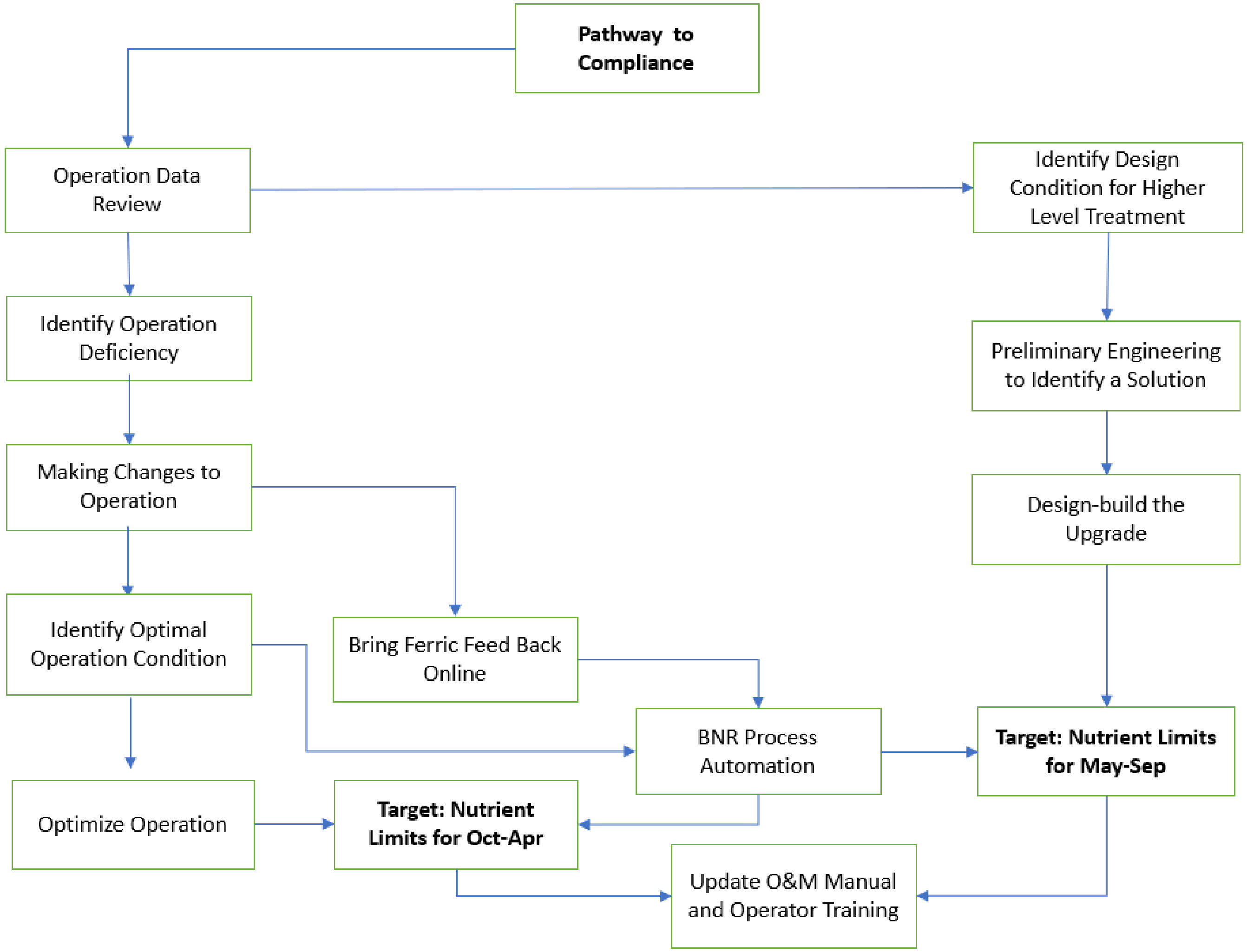
- ORP in the aerobic and anoxic zones
- Multiple DO monitoring points along the racetrack of the oxidation ditch
- Soluble phosphorus analyzer
- Nitrate/nitrite analyzer
- Effluent pH probe

Analyzer products needs to be evaluated for accuracy, consistency, and maintenance requirements.

## 7.2 Engineering Route

The village will proceed on the engineering route by contracting with an engineering consultant to prepare a Preliminary Engineering Report (PER). The PER will select a best-fit compliance option that will upgrade the plant for compliance and improve the WWTP overall operation.

Figure 7-1 Chama WWTP Pathway to Compliance



## 7.3 Operator Training

Operational adjustments used to improve the performance of the WWTP will be good tutorials for the operators to gain knowledge and experience about operating a BNR plant. With the lessons learned, operators should be able to operate the WWTP to its design ability and possibly beyond. Operator's knowledge and experience is critical to a successful WWTP. When the corrective measures are installed, the plant's O&M manual will be updated and Standard Operation Procedures (SOP) for operating the BNR oxidation ditch and the tertiary treatment systems shall be developed. The operator(s) will be trained for operating the polishing treatment facility, online analyzer maintenance and common trouble shooting practices, reactions to compromised performance, operation on the SCADA system etc.

# 8 CONCLUSIONS

The actions and strategies contained herein map out a pathway to compliance and have been communicated with the Village. The pathway is composed of two routes that will travel simultaneously and supplemented by operator training. One route is operational, and the other is engineering. The Village understands the importance of complying with their NPDES limits and the work that will be needed achieve the goal. Operational changes will be made to the current WWTP using an experimental approach and are intended to bring the plant's performance up to its original design ability. Engineering/capital improvements will be identified and characterized through a PER process that will aim at attaining superior performance needed to meet summer nutrient limits. Operational adjustments will start immediately. Following the submission of this compliance plan, a PER project will begin. A PER will help the village better define and cost the needed improvements and to apply for funding. The operational route will not require capital investment except for purchasing accessories for process monitoring. The engineering route will ultimately result in the selection of a capital improvement to the plant. Operator training must be scheduled into the WWTP's staffing plan. These phased actions will bring the WWTP at Village of Chama into compliance with its NPDES Permit.

# 9 COMPLIANCE SCHEDULE

The schedule can be found in Figure 9-1.

## Figure 9-1 Compliance Schedule