S A W P A

SANTA ANA WATERSHED PROJECT AUTHORITY
11615 Sterling Avenue, Riverside, California 92503 • (951) 354-4220

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This meeting will be conducted in person at the address listed above. As a convenience to the public, members of the public may also participate virtually using one of the options set forth above. Any member of the public may listen to the meeting or make comments to the Committee using the call-in number or Zoom link above. However, in the event there is a disruption of service which prevents the Authority from broadcasting the meeting to members of the public, the meeting will not be postponed or rescheduled but will continue without remote participation. The remote participation option is provided as a convenience to the public and is not required. Members of the public are welcome to attend the meeting in-person.

REGULAR MEETING OF THE
PROJECT AGREEMENT 24 COMMITTEE
Inland Empire Brine Line

TUESDAY, SEPTEMBER 3, 2024 – 10:00 A.M.
(or immediately following the 9:30 a.m. SAWPA Commission meeting)

Committee Members

Eastern Municipal Water District	Inland Empire Utilities Agency
Joe Mouawad, General Manager	Director Jasmin A. Hall
Director David J. Slawson (Alt)	Shivaji Deshmukh, General Manager (Alt)
San Bernardino Valley Municipal Water District	**Western Municipal Water District**
Director T. Milford Harrison, Chair	Director Mike Gardner, Vice Chair
Director Gil Botello (Alt)	Craig Miller, General Manager (Alt)

AGENDA

1. CALL TO ORDER | PLEDGE OF ALLEGIANCE (T. Milford Harrison, Chair)

2. ROLL CALL

3. PUBLIC COMMENTS

Members of the public may address the Committee on items within the jurisdiction of the Committee; however, no action may be taken on an item not appearing on the agenda unless the action is otherwise authorized by Government Code §54954.2(b).

Members of the public may make comments in-person or electronically for the Committee's consideration by sending them to publiccomment@sawpa.gov with the subject line "Public Comment". Submit your electronic comments by 5:00 p.m. on Monday, September 2, 2024. All public comments will be provided to the Chair and may be read into the record or compiled as part of the record. Individuals have a limit of three (3) minutes to make comments and will have the opportunity when called upon by the Committee.

4. ITEMS TO BE ADDED OR DELETED

Pursuant to Government Code §54954.2(b), items may be added on which there is a need to take immediate action and the need for action came to the attention of the Santa Ana Watershed Project Authority subsequent to the posting of the agenda.

5. CONSENT CALENDAR

All matters listed on the Consent Calendar are considered routine and non-controversial and will be acted upon by the Committee by one motion as listed below.

A. APPROVAL OF MEETING MINUTES: AUGUST 6, 2024 5
Recommendation: Approve as posted.

6. COMMITTEE DISCUSSION/ACTION ITEMS

A. REACH IV-B CONDITION ASSESSMENT FINAL REPORT (PA24#2024.18).....13
Presenter: Daniel Vasquez
Recommendation: Receive and file.

B. INLAND EMPIRE BRINE LINE 10-YEAR CAPITAL IMPROVEMENT PLAN (PA24#2024.19) 60
Presenter: David Ruhl
Recommendation: Receive and file.

7. INFORMATIONAL REPORTS

Recommendation: Receive for information.

A. BRINE LINE FINANCIAL REPORT – JUNE 2024.....75
Presenter: Karen Williams

B. GENERAL MANAGER REPORT
Presenter: Jeff Mosher

C. COMMITTEE MEMBERS COMMENTS

D. CHAIR'S COMMENTS/REPORT

8. COMMITTEE MEMBER REQUESTS FOR FUTURE AGENDA ITEMS

9. CLOSED SESSION

There were no Closed Session items anticipated at the time of the posting of this agenda.

10. ADJOURNMENT

PLEASE NOTE:
In compliance with the Americans with Disabilities Act, if you need special assistance to participate in this meeting, please contact the Clerk of the Board at (951) 354-4220. Notification at least 48 hours prior to the meeting will enable staff to make reasonable arrangements to ensure accessibility to this meeting.

Materials related to an item on this agenda submitted to the Committee after distribution of the agenda packet are available for public inspection during normal business hours at the SAWPA office, 11615 Sterling Avenue, Riverside, and available at www.sawpa.org, subject to staff's ability to post documents prior to the meeting.

Declaration of Posting

I, Sara Villa, Clerk of the Board of the Santa Ana Watershed Project Authority declare that on August 29, 2024, a copy of this agenda has been uploaded to the SAWPA website at www.sawpa.gov and posted at SAWPA's office, 11615 Sterling Avenue, Riverside, California.

2024 Project Agreement 24 Committee Regular Meetings

Inland Empire Brine Line
First Tuesday of Every Month
(Note: All meetings begin at 10:00 a.m., or immediately following the 9:30 a.m. SAWPA Commission meeting, whichever is earlier, unless otherwise noticed, and are held at SAWPA.)

January		February	
1/2/24	~~Regular Committee Meeting~~ [cancelled]	2/6/24	Regular Committee Meeting
March		April	
3/5/24	Regular Committee Meeting	4/2/24	Regular Committee Meeting
May		June	
5/7/24	~~Regular Committee Meeting~~ [cancelled]	6/4/24	Regular Committee Meeting
5/14/24	Special Committee Meeting		
July		August	
7/2/24	Regular Committee Meeting	8/6/24	Regular Committee Meeting
September		October	
9/3/24	Regular Committee Meeting	10/1/24	Regular Committee Meeting
November		December	
11/5/24	Regular Committee Meeting	12/3/24	Regular Committee Meeting

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PROJECT AGREEMENT 24 COMMITTEE
Inland Empire Brine Line
REGULAR MEETING MINUTES
August 6, 2024

COMMITTEE MEMBERS PRESENT

T. Milford Harrison, Chair, San Bernardino Valley Municipal Water District Governing Board [via - zoom]
Mike Gardner, Vice Chair, Western Municipal Water District Governing Board
David Slawson, Alternate, Eastern Municipal Water District Governing Board
Jasmin A. Hall, Inland Empire Utilities Agency Governing Board

COMMITTEE MEMBERS ABSENT

None.

ALTERNATE COMMITTEE MEMBERS PRESENT [Non-Voting]

Gil Botello, San Bernardino Valley Municipal Water District Governing Board [via – zoom]
Joe Mouawad, Eastern Municipal Water District General Manager [via - zoom]

STAFF PRESENT

Jeff Mosher, Karen Williams, David Ruhl, Dean Unger, John Leete, Sara Villa, Shavonne Turner

OTHERS PRESENT

Andrew D. Turner, Lagerlof, LLP; Derek Kawaii, Western Municipal Water District; Bruce Whitaker, Orange County Water District; Tammie Myers, Monte Vista Water District

1. CALL TO ORDER | PLEDGE OF ALLEGIANCE

The Regular Meeting of the PA 24 Committee was called to order at 10:42 a.m. by Chair T. Milford Harrison's location, Hotel La Jolla, Curio Collection by Hilton, 7955 La Jolla Shores Drive, Room #308, La Jolla, CA 92037 on behalf of the Santa Ana Watershed Project Authority, 11615 Sterling Avenue, Riverside, CA 92503.

2. ROLL CALL

3. PUBLIC COMMENTS

There were no public comments; there were no public comments received via email.

4. ITEMS TO BE ADDED OR DELETED

There were no added or deleted items.

5. CONSENT CALENDAR

A. APPROVAL OF MEETING MINUTES: JULY 2, 2024

Recommendation: Approve as posted.

MOVED, to approve the Consent Calendar as posted.

Result:	**Adopted by Roll Call Vote**
Motion/Second:	Gardner/Hall
Ayes:	Gardner, Hall, Harrison, Slawson
Nays:	None
Abstentions:	None
Absent:	None

6. COMMITTEE DISCUSSION/ACTION ITEMS

A. INLAND EMPIRE BRINE LINE RESERVE FUNDS REVIEW (PA24#2024.16)

Karen Williams provided a presentation titled Inland Empire Brine Line Reserves Funds Review, contained in the agenda packet on pages 23-34. A brief overview of the Brine Line Reserve Policy (Policy) was provided. As per the approved Policy, funding above the target levels in the reserve funds will be discussed and approved by the PA 24 Committee and the Commission annually and during the biennial budget adoption process. Reserves under the target level, staff will involve member agencies in reviewing the timing for each reserve to achieve the target and will bring the evaluation of reserves above the targets to the PA 24 Committee and the Commission in August each year.

SAWPA currently maintains six (6) distinct reserve funds that pertain to the Brine Line. The six (6) reserve funds are as follows:

1. R-01 Brine Line Operating Reserve
2. R-02 Brine Line Debt Retirement Reserve
3. R-04 Pipeline Capacity Management Reserve
4. R-05 OC San Future Treatment & Disposal Capacity Reserve
5. R-06 OC San Pipeline Rehabilitation Reserve
6. R-07 Brine Line Replacement and Capital Investment Reserve

Ms. Williams provided a brief breakdown for each of the six (6) reserve funds. The R-01 Brine Line Operating Reserve, the target set for this reserve was $2,179,659 for FYE 2024. The target level set for this reserve is 25% of total operating expenses each year. Interest is earned each quarter and is based on the average monthly balance. It is recommended that the target level for this reserve be changed to $2,291,108 based on budgeted operating expenses of $9,164,430 for FYE 2025. The R-02 Debt Retirement, the target set for this reserve is $1,709,476. The target level set for this reserve is equivalent to the annual debt service payments and is required per the SRF Loan agreements. Interest is earned each quarter and is based on the average monthly balance. Currently, this reserve is over the target. The staff's recommendation is to allow R-02 to continue to earn interest and keep a balance over the target level.

The R-04 Pipeline Capacity Management, the target set for this reserve is $9,735,454. The target level set for this reserve is equal to 25% of the annual average CIP project costs associated with managing pipeline capacity. Interest is earned each quarter and is based on the average monthly balance. Currently, this reserve is over the target. The staff's recommendation is to allow R-04 to continue to earn interest and keep a balance over the target level. The R-05 OC San Future Treatment and Disposal Capacity, the target set for this reserve is $1,842,396. The target level set for this reserve was the June 30, 2022, reserve balance. Interest is earned each quarter and is based on the average monthly balance. Funds in this reserve are from treatment capacity purchases from San Bernardino Valley Municipal Water District. These funds will be used to purchase treatment & disposal capacity from OC Sanitation District. The current price to purchase

1 MGD of treatment & disposal capacity is $7.4 million. Currently, this reserve is over the target. The staff's recommendation is to allow R-05 to continue to earn interest and keep a balance over the target level.

The R-06 OC San Pipeline Rehabilitation, the target set for this reserve is $7,250,000. The target level set for this reserve is based on SAWPA's share of future OC San capital project costs. Currently this reserve is at $2,880,674, which is below the target level. During the FYE 2024 and 2025 budget process, contributions to this reserve were set at $325,309 and $155,786. Interest is earned each quarter and is based on the average monthly balance. This reserve and future contributions will be reviewed during the FYE 2026 and 2027 budget process. The R-07 Brine Line Replacement and Capital Investment, the target set for this reserve is $42,911,000. The target level set for this reserve is based on three components (Resiliency, CIP, and Renew and Replacement) and is reviewed each year. After the review by Engineering, the new maximum target needs to be set to $46,364,000 based on the current CIP. Currently this reserve is at $34,346,201, which is below the target level. During the FYE 2024 and 2025 budget process, contributions to this reserve were set at $1.9 million each year. Interest is earned each quarter and is based on the average monthly balance. This reserve and future contributions will be reviewed during the FYE 2026 and 2027 budget process.

Ms. Williams noted that with PA 24 Committee approval, this item will be brought forward for Commission approval at the next meeting.

MOVED, that the PA 24 Committee approve the following:

1. For R-01 Brine Line Operating Reserve set target to $2,291,108 based on 25% of total operating expenses of $9,164,430 for FYE 2025 (increase of $111,449) and continue to accrue interest, and
2. For R-07 Pipeline and Replacement and Capital Investment Reserve set the minimum and target limits to $18,884,000 and $46,364,000 based on the new CIP amount of $69 million, based on Engineering's review, and
3. Approve the funding levels (as of June 30, 2024) above the target levels and continue to accrue interest in FYE 2025 for the following reserve funds:
    a. R-02 Brine Line Debt Service Reserve
    b. R-04 Pipeline Capacity Management Reserve
    c. R-05 OC Future Treatment & Disposal Capacity Reserve

Result:	**Adopted by Roll Call Vote**
Motion/Second:	Slawson/Gardner
Ayes:	Gardner, Hall, Harrison, Slawson
Nays:	None
Abstentions:	None
Absent:	None

B. INLAND EMPIRE BRINE LINE MASTER PLAN UPDATE (PA24#2024.17)

David Ruhl provided a presentation titled Inland Empire Brine Line Master Plan (Master Plan) Update, contained in the agenda packet on pages 41-74. The Master Plan aims to guide the effective management and expansion of the Brine Line to best serve the Santa Ana River Watershed, Member Agencies, and Brine Line dischargers. It also seeks to address infrastructure needs for handling increasing salinity levels and evolving regulatory demands.

The Master Plan's objectives include identifying potential regional markets for future dischargers, assessing the Brine Line system's capacity under various flow conditions, and developing improvements to address any identified deficiencies. Additionally, it outlines potential capacity management strategies to optimize the regional use of the Brine Line.

Mr. Ruhl provided an overview of the Master Plan report organization and highlighted the summary of work and key findings for the following: 1) Market Assessment and Future Flow Projections, 2) Hydraulic Model Update and Calibration, 3) Brine Line System Capacity Analysis, 4) Capacity Management and Long-Term Planning Efforts, Brine Line Multi-Use Benefits, and 5) Future Facilities, Improvement, and Expansion.

Member Agency and stakeholder meetings were conducted over a one-year period from February 2023 through February 2024. Information was obtained on the brine management needs of each agency including groundwater desalination, wastewater desalination and industries that have a high salinity discharge. Information obtained from the stakeholder meetings was used to quantify the discharge projections over a defined period. Discharge projections were broken down into the Near – Term (1 – 10 years), Long – Term (11 – 35 years) and Build – Out (greater than 35 years).

Key findings with respect to the market assessment and future growth expectations include:

- Potable water production and RO concentrate from groundwater desalters and ion exchange desalters maintain the largest discharge to the Brine Line by volume for all planning periods.
- Wastewater desalination, which includes RO treatment of recycled water for discharge or indirect potable recharge increases by 500% over the planning period.
- Dry weather flow diversions that have a high salinity have a potential discharge to the Brine Line in the long term.
- Industrial discharges have a moderate increase while power generation and domestic flows remain about the same through the planning period.
- Additional treatment and disposal capacity will be required to accommodate future growth. It is projected that further capacity purchases will be needed in 2026, 2034, 2042, and 2051.
- Future growth in the two (2) Member Agency services areas is expected to exceed their current capacity in the Brine Line.

The existing and future Brine Line System Capacity Analysis conditions were modeled utilizing the calibrated hydraulic model, growth projections and planning periods previously defined. Key findings with respect to the Brine Line System Capacity Analysis include:

<u>Existing Discharge Capacity (June 2023)</u>

- All gravity flow pipelines maintained a d/D below 0.75
- Pressures and velocities remain within design limits

<u>Near-Term Discharge Capacity (2023-2033)</u>

- Same as existing discharge capacity.

<u>Long-Term Discharge Capacity (2034-2058)</u>

- Portions of Reaches IV-D, IV-A, and IV are projected to exceed d/D criteria.
- Maximum pressures and velocities remain within design limits, though closer to thresholds.

<u>Buildout Discharge Capacity (Beyond 2058)</u>

- Additional segments are expected to exceed d/D criteria, with increased risks of surcharging and overflows.
- Higher flows necessitate potential infrastructure improvements to prevent system deficiencies.

Ownership Discharge Capacity

- Similar to Long-Term and Buildout scenarios, specific segments are projected to exceed the d/D criterion, requiring monitoring and potential upgrades.
- Maximum pressures and velocities remain within acceptable ranges but approach critical limits.

The anticipated improvements to address findings for the Brine Line Capacity Analysis are the following:

- Critical infrastructure was identified on Reach IV, Reach IV-A lower and Reach IV-D.
- Implement smart manhole covers for real-time monitoring of critical segments to proactively manage and mitigate potential overflows and system failures.
- Continue to evaluate and monitor segments that flow 75% to 100% full.

Mr. Ruhl noted that key findings and recommendations with respect to the capacity management and long-term planning efforts include:

- Brine minimization is necessary by 2065.
- In-line centralized brine concentration approach was not considered to be feasible. However, advancements in treatment technologies and treatment requirements for emerging constituents of concern could change this finding.
- It may be more economical to remove PFAS from a few select dischargers rather than treating the Brine Flow at a centralized treatment facility.
- Evaluate the viability of point source PFAS treatment using a smaller scalable system, after performing PFAS sampling from individual dischargers.
- Conduct future study to more thoroughly assess the feasibility of Brine Line storage reservoirs.
- Conduct future studies and pilot projects to evaluate brine management technologies.
- Conduct a pilot study to better understand and manage PFAS concentrations in the Brine Line.

Mr. Ruhl noted that the future facilities, improvements, and expansions are the following:

- Pipeline Capacity Improvement Projects
- Operation and Maintenance Projects
- System Monitoring Projects
- Expansion Areas
    - EMWD / WMWD Service Area: Southern Riverside County Regional Brine Line
    - IEUA Service Area: Intertie with North System and Chino Basin Program
    - SBVMWD Service Area: Regional Recycled Water Facilities Project
    - WMWD Service Area: City of Riverside Recycled Water Desalination Plant

- On-going or Future Project Evaluations
    - Brine Minimization
    - PFAS Management
    - Green Hydrogen

Mr. Ruhl indicated that as brine discharges increase, SAWPA faces the challenge of maintaining and/or expanding the Brine Line system. To address this a variety of policy measures may be necessary to improve brine management and efficiency. These policies would address environmental, economic, and regulatory considerations to ensure sustainable and equitable brine management. Key policy areas for consideration include:

- Environmental Policies. Enhancing monitoring and reporting capabilities for continuous monitoring of brine discharges. Limits on brine discharge concentrations and constituents may be needed, particularly with emerging concerns (i.e., PFAS). Policies are intended to promote projects that restore and protect natural habitats, mandate advanced brine treatment technologies, and support stricter permitting processes for industries discharging brine.
- Economic Policies. Current practices require dischargers to bear the cost of facilities necessary for brine disposal, which can be cost-prohibitive. SAWPA may consider cost-sharing mechanisms, financial assistance programs, and infrastructure investments to upgrade brine treatment facilities. Incentives for sustainable brine management practices and revised fee structures to encourage reduction in brine discharge volumes may also be explored.
- Regulatory Policies. Updating permitting processes to include more requirements for brine management can help control Brine Line flows. Enhancing interagency collaboration and establishing a regional task force to coordinate efforts and share best practices can improve compliance and enforcement. Policies are intended to support innovative salinity control measures and advanced desalination or demineralization technologies.

The next steps and schedule for completion of the Master Plan is as follows:

Complete Draft Master Plan o Develop list of improvement projects and costs o Develop CIP	August 2024
Member Agency and Stakeholder Review Period	August – September 2024
Member Agency Stakeholder Workshop	September 2024
Incorporate comments / Final Draft	October 2024
Final Report to PA 24 Committee	November 2024

This item is to receive and file; no action was taken on agenda item no. 6.B.

7. INFORMATIONAL REPORTS

Recommendation: Receive and file the following oral/written reports/updates.

A. BRINE LINE FINANCIAL REPORT – MAY 2024

B. GENERAL MANAGER REPORT

There were no General Manager comments.

C. COMMITTEE MEMBERS COMMENTS

There were no Committee Member comments.

D. CHAIR'S COMMENTS/REPORT

There were no comments/reports from the Chair.

8. COMMITTEE MEMBER REQUESTS FOR FUTURE AGENDA ITEMS

There were no requests for future Agenda items.

9. CLOSED SESSION

There was no Closed Session.

10. ADJOURNMENT

There being no further business for review, Committee Chair T. Milford Harrison adjourned the Regular meeting at 11:36 a.m.

Approved at a Regular Meeting of the Project Agreement 24 Committee on September 3, 2024.

_____
T. Milford Harrison, Chair

Attest:

_____
Sara Villa, Clerk of the Board

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PA 24 COMMITTEE MEMORANDUM NO. 2024.18

DATE: September 3, 2024

TO: PA 24 Committee

SUBJECT: Reach IV-B Condition Assessment Final Report

PREPARED BY: Daniel Vasquez, Manager of Operations

RECOMMENDATION
Receive and file.

BACKGROUND
On February 6, 2024, SAWPA staff presented the Condition Assessment Draft Report to the PA 24 Committee for Reach IV-B. This section of Reach IV-B was previously assessed during an overnight shutdown during which manned-entry inspections occurred at three (3) maintenance access structures. This was coupled with CCTV of approximately 3,379 feet of pipe. During the February PA 24 Committee Meeting, SAWPA staff communicated that the draft report will be provided to Member Agency staff for review and the Final Report will be presented at a future meeting. A summary of the findings are as follows:

Condition Assessment Findings:

- Minor to moderate corrosion in pipe throughout inspected areas.
- Minor corrosion at most joints inspected.
- Moderate failure of coated lining in pipe throughout a majority of inspected pipeline.
- Minor loss of coated lining at manned-entry inspection locations.
- The consultant utilizes a condition rating index to provide consistent reporting of corrosion damage. The condition rating index is on a scale of 1–5, with a Level 1 rating indicating little or no damage and Level 5 rating indicating severe damage with imminent failure. Overall, the consultant rated the pipe at condition Levels 2 (minor) and 3 (moderate) throughout the pipe and at the manned-entry locations.

DISCUSSION
The findings conclude that all three manned-entry locations to be in fair condition with minor variability in observable corrosion. The overall pipe condition was found to be consistent with the manned-entry locations with an estimated remaining useful life of 10 to 20 years with the following recommendations:

Period	Summary of Recommendations	Cost
Near-Term (3-5 Years)	1. Bypass as necessary to complete the work. 2. Perform joint repairs at MAS 4B-0480. 3. Perform man-entry visual inspections and physical testing at MAS 4B-0320. 4. Install two new MAS.	$1,750,000
Mid-Term (7-10 Years)	1. Bypass as necessary to complete the work. 2. Heavy cleaning of the entire Reach IV-B. 3. CCTV and sonar inspection of the entire Reach IV-B. 4. Repeat man-entry visual inspections and physical testing at four locations. 5. Evaluate spot repairs versus long-term lining alternatives.	$3,200,000

	6. If spot repairs are selected as the preferred direction, complete joint repairs and lining spot repairs.	
Long-Term (10+ Years)	1. Rehabilitate the entire Reach IV-B pipeline (estimate assumes CIPP).	$8,790,000

No comments from member agency staff were received concerning the Draft Report. The Brine Line CIP will be updated with the near, mid, and long-term recommendations.

RESOURCE IMPACTS
Funds to cover Condition Assessment recommendations are anticipated to be included in future Budget Fund No. 320-03 (Pipeline Replacement and Capital Investment Reserve) and Fund 240 (Brine Line Enterprise).

Attachments:
1. PowerPoint Presentation
2. FIP Findings and Rehabilitation Recommendations Report – Reach IV-B

SANTA ANA WATERSHED PROJECT AUTHORITY

Reach IV-B Condition Assessment Status Update

PA 24 Committee
Agenda Item No. 6.A
Daniel Vasquez
Manager of Operations
September 3, 2024

Recommendation

- Receive and file.

Background

- In February of 2024, SAWPA Staff presented the Condition Assessment Draft Report to the PA 24 Committee for Reach IV-B.
- Draft report was provided to Member Agency staff for review
- The Near, Mid, and Long Term Recommendations have been refined.

Reach IV-B Pipeline and Man-Entry Inspection Locations

Condition Rating	Description	Representative Photograph
Level 1	Little or no corrosion • Wall thickness loss, general .....none • Wall thickness loss, pitting.....none to minimal • Extent (area) of corrosion.....may be widespread but superficial	
Level 2	Minor corrosion • Wall thickness loss, general .....up to 20% • Wall thickness loss, pitting.....up to 20% • Extent (area) of corrosion.....localized	
Level 3	Moderate corrosion • Wall thickness loss, general .....20% to 40% • Wall thickness loss, pitting.....20% to 60% • Extent (area) of corrosion.....up to half of surface	
Level 4	Severe corrosion • Wall thickness loss, general .....40% to 60% • Wall thickness loss, pitting.....60% to 100% (pinholes) • Extent (area) of corrosion.....most of surface	
Level 5	Failure or imminent failure • Wall thickness loss, general .....greater than 60% • Wall thickness loss, pitting.....100% (holes) • Extent (area) of corrosion.....most or all of surface	

Metal Condition Index Rating System

Testing Methods Used

- Visual Assessments
- Ultrasonic Thickness Testing
- Dry Film Thickness Testing
- Broadband Electromagnetic Testing
- CCTV Inspections

Missing Lining

Corrosion Discoloration at Crown and Joint

Deposits

Deposits and Missing Liner

Missing Liner and Damaged Metallic Pipe Wall

Coating Failure at Joint

Example Corrosion and Joint Lining Failures Found

Condition Assessment Conclusions

- Overall condition levels at level 2 and 3 throughout the piping and at the manned-entry locations with some isolated areas of moderate degradation.
- Minor to moderate corrosion in pipe throughout inspected areas.
- Minor corrosion at most joints inspected.
- Moderate failure of coated lining in pipe throughout a majority of inspected pipeline.
- Minor loss of coated lining at manned-entry inspection locations.

Summary of Recommendations

Period	Summary of Recommendations	Cost
Near-Term (3-5 Years)	1. Bypass as necessary to complete the work. 2. Perform joint repairs at MAS 4B-0480. 3. Perform man-entry visual inspections and physical testing at MAS 4B-0320. 4. Install two new MAS.	**$1,750,000**
Mid-Term (7-10 Years)	1. Bypass as necessary to complete the work. 2. Heavy cleaning of the entire Reach IV-B. 3. CCTV and sonar inspection of the entire Reach IV-B. 4. Repeat man-entry visual inspections and physical testing at four locations. 5. Evaluate spot repairs versus long-term lining alternatives. 6. If spot repairs are selected as the preferred direction, complete joint repairs and lining spot repairs.	**$3,200,000**
Long-Term (10+ Years)	1. Rehabilitate the entire Reach IV-B pipeline (estimate assumes CIPP).	**$8,790,000**

Next Steps

- Update the Brine Line CIP with the near, mid, and long term recommendations.

Questions?

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Woodard & Curran

FIP FINDINGS AND REHABILITATION RECOMMENDATIONS REPORT - REACH IV-B

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woodardcurran.com

0012408.00

Santa Ana Watershed Project Authority

Revised Final

June 24, 2024

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TABLES

FIGURES

APPENDICES

STANDARDS

AWWA C151 – Ductile-Iron Pipe, Centrifugally Cast
AWWA C210 – Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings

ABBREVIATIONS

BEM – Broadband Electromagnetic
Brine Line – Inland Empire Brine Line
CCTV – Closed Circuit Television
DIP – Ductile Iron Pipe
DFT – Dry Film Thickness
d/s – downstream
EMWD – Eastern Municipal Water District
FIP – Field Investigation Plan
ft – feet
IEUA – Inland Empire Utilities Agency
in – inches
lf – linear feet
MAS – Maintenance Access Structure
MGD – million gallons per day
NASSCO – National Association of Sewer Service Companies
OCSD – Orange County Sanitation District
OCWD – Orange County Water District
PACP – Pipeline Assessment Certification Program
CAL/OSHA – California Occupational Safety and Health Act
SAWPA – Santa Ana Watershed Project Authority
SBVMWD – San Bernardino Valley Municipal Water District
SRPS – South Regional Pump Station
SSPC – Society of Protective Coatings (formerly Steel Structures Painting Council)
STA – Station
u/s – upstream
UT – Ultrasonic Thickness
V&A – V&A Consulting Engineers, Inc.
VANDA® – V&A Condition Index
W&C – Woodard & Curran
WMWD – Western Municipal Water District

EXECUTIVE SUMMARY

The Inland Empire Brine Line (Brine Line) is approximately 73 miles of pipeline constructed to provide for the safe discharge of highly saline wastewater to protect the water quality of the Santa Ana River Watershed. During a 2021 Criticality Assessment completed by the Santa Ana Watershed Project Authority (SAWPA), the ductile iron pipe (DIP) section of Reach IV-B of the Brine Line was identified as being a highly critical segment requiring inspection and condition assessment.

Reach IV-B field inspections, including CCTV inspections and man-entry visual assessments and physical testing, were conducted in May 2023. The section of Reach IV-B that was assessed is approximately 1.6 miles of 36-inch DIP which runs along the Riverside County Flood Control District's Temescal Creek Channel access road. This section of the brine line conveys the high salinity brine water primarily from five desalters and several industrial dischargers via gravity to downstream reaches. The daily flow is approximately 5 to 7 million gallons per day (MGD). This report discusses the results of the inspections and provides a condition assessment of the DIP portion of the Reach IV-B Brine Line as described above.

Data from CCTV and three man-entry inspections of Reach IV-B indicate that the 36-inch DIP is in fair condition. Data from physical testing of the coal tar lining and the pipe at three locations revealed some variability in the condition of the pipe with VANDA ratings ranging from 1 to 3. However, despite some minor variability, all three locations appeared to be in fair condition. Assessment of CCTV data resulted in concurrence with the man-entry inspection findings. Based on visual assessments and physical testing results from the 2023 field inspections, the 36-inch pipe has an estimated remaining useful life of 10 to 20 years.

Siphons were not included in the scope due to issues with safe access to the pipeline, pipe geometry, and water level. As such, inspections were not performed on the eight siphons within Reach IV-B as part of this project. However, CCTV video of the upstream leg of the siphon located between 4B-0450 and 4B-0440 was captured. It was in similar condition to the rest of the pipeline inspected. As such, it is assumed that the siphons are in fair condition. Since siphon condition assessments were not completed, estimated remaining useful life is not provided for the siphons herein.

Near-Term recommendations resulting from the assessment include completion of the following within three to five years:

1. Bypass flows as necessary to complete the Near-Term recommended work. Perform joint repairs at MAS 4B-0480. By completing joint repairs at a single MAS location, SAWPA will gather valuable information regarding the duration and cost for joint repairs and be able to use that data to assess the overall benefit of future individual joint repairs versus CIPP lining of the entire pipeline.

2. Perform physical testing as MAS 4B-0320 in order to fill in the gap on missing physical testing data on the downstream end of the alignment.

3. Consider the addition of two new MASs for access improvements while the pipeline flows are bypassed.

The following work is also recommended in the Mid-Term:

1. Bypass flows to complete the Near-Term recommended work.

2. Perform heavy cleaning of the entire Reach IV-B pipeline.

3. Reinspect the entirety of Reach IV-B using CCTV and sonar, as appropriate.

   If, because of budgetary or logistical reasons, SAWPA does not wish to CCTV the entire alignment at the time that the point repairs are completed, it is suggested that, at a minimum, the segment of pipe between 4B-0450 and 4B-0490 be heavy cleaned and inspected. This segment is approximately 2,990 feet long and demonstrated evidence of corrosion in the form of possible tuberculation, loss of coal tar lining, and discoloration during the May 2023 CCTV inspections. However, CCTV video clarity prevented a thorough visual inspection of that reach of pipe.

4. Repeat man-entry visual assessments and physical testing at the same three locations as completed in 2023 plus MAS 4B-0320, and with the same tests conducted in 2023 in order to directly compare the same physical measurements completed as part of this project.

5. Evaluate the removal of corrosion and recoating of the upstream and downstream pipe joints with epoxy versus long-term CIPP pipe lining based on data collected in the Near-Term project. Identify further steps based on condition and fiscal impacts.

6. Based on results of the evaluation completed above, determine the necessity to perform joint repairs and lining spot repairs.

The Long-Term recommendation resulting from the assessment and a rehabilitation alternatives analysis conducted as part of this project is to rehabilitate the entire 8,567 feet of the DIP portion of Reach IV-B using cured-in-place pipe lining. This will likely need to occur within the next 10-20 years. This recommendation should be further refined after the Mid-Term inspection results have been evaluated and remaining useful life has been updated.

1. BACKGROUND

The Santa Ana Watershed Authority Project (SAWPA) was formed in 1972 as a Joint Powers Authority comprised of five member agencies: Eastern Municipal Water District (EMWD), Inland Empire Utilities Agency (IEUA), Orange County Water District (OCWD), San Bernardino Valley Municipal Water District (SBVMWD), and Western Municipal Water District (WMWD).

The Inland Empire Brine Line (Brine Line) is approximately 73 miles of pipeline constructed to provide for the safe discharge of highly saline wastewater to protect the water quality of the Santa Ana River Watershed. The Brine Line carries this highly saline wastewater to a wastewater treatment plant in Huntington Beach that is operated by Orange County Sanitation District (OSCD). In 2021, a Criticality Assessment completed by SAWPA identified Reach IV and the ductile iron pipe (DIP) section of Reach IV-B as critical segments of the Brine Line requiring inspection and condition assessment.

The section of Reach IV-B that was identified as critical in the 2021 Criticality Assessment is approximately 1.6 miles of 36-inch DIP which crosses several roads in the City of Corona and runs along the Riverside County Flood Control District's Temescal Creek Channel access road. This section of the Brine Line conveys high salinity brine water primarily from five desalters and several industrial dischargers via gravity to Reach IV downstream. The Corona Temescal Desalter discharges into this section as well as the South Regional Pump Station (SRPS) emergency connection. The Reach IV-B daily flow is approximately 5 to 7 million gallons per day (MGD).

In April 2023, Woodard & Curran (W&C) prepared a Field Investigation Plan (FIP) for Reach IV-B (**Appendix A**). Field investigations, including manned-entry visual assessments and physical testing, on Reach IV-B were completed by W&C's subconsultant, V&A Consulting Engineers, Inc. (V&A), on May 2nd and May 3rd, 2023. Man-entry inspections were completed at maintenance access structures (MAS) 4B-0340, 4B-0450, and 4B-0480. See **Figure 1**. Pipe cleaning and CCTV inspections were completed by SAWPA's consultant, Innerline.

This FIP Findings and Rehabilitation Recommendations Report summarizes the FIP work and inspection findings for Reach IV-B and provides recommendations for pipe renewal based on those findings.

Figure 1: Reach IV-B Pipeline and Man-Entry Inspection Locations

2. FIELD INVESTIGATION SUMMARY

In April 2023, W&C prepared a Field Investigation Plan (FIP) to present the most appropriate inspection methods necessary in order to identify conditions of the Reach IV-B pipeline and identify the appropriate level of data to complete this goal. The FIP also discussed inspection schedule and inspection team coordination in the field. The complete FIP is provided in **Appendix A**.

Field inspection work was executed over a single 24-hour shutdown period beginning on May 2, 2023, and ending on May 3, 2023. The shutdown was coordinated by SAWPA and performed by SAWPA and its member agencies. V&A's man-entry inspection portion of the field work was performed at night. Prior to all field inspection work, a health and safety program was established.

The field inspection work included the following:

a. Pipe cleaning (Innerline Engineering)

b. CCTV inspection (Innerline Engineering)

c. Man-entry physical inspections at maintenance access structures (MAS) 4B-0480, 4B-0450, and 4B-0340 (V&A Consulting Engineers, Inc.)

2.1 CCTV Inspections

Closed-circuit television (CCTV) inspections were used to document and assess the internal condition of pipes. The CCTV inspections on Reach IV-B were completed by SAWPA's contractor, Innerline Engineering, and followed the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) coding system. Locations of the CCTV work were selected by Innerline Engineering. Videos and PACP reports were provided to SAWPA which W&C used to help assess the internal condition of the Brine Line. See **Section 3.1.1**.

Prior to CCTV inspections, Innerline Engineering performed light cleaning of the pipeline segment being inspected. Due to time constraints associated with the planned shut-down of the pipeline, additional time could not be spent on heavy cleaning or debris removal and the inspected pipe contained scaling and tuberculation that presented difficulties in visually assessing the pipeline in those locations.

No CCTV was completed through the eight siphons along the Reach IV-B alignment.

2.2 Man-Entry Inspections

W&C retained the services of V&A to perform man-entry condition assessment including visual assessment and physical testing of the Brine Line. V&A performed condition assessments at MAS 4B-0480, 4B-0450, and 4B-0340. During confined space entry of the three MASs, V&A completed the following assessments:

a. Visual Assessment: Visual observations of the metallic surfaces (where visible), linings, and coatings. V&A documented their observations with digital photographs and field notes and summarized the notable defects in a report (**Appendix B**). The condition of the structures was rated using the VANDA Metal Condition Index (**Figure 2**).

The VANDA Metal Condition Index was created by V&A to provide consistent reporting of corrosion damage based on qualitative, objective criteria. Condition of corrosion can vary from Level 1 to Level 5 based upon visual observations and field measurements, with Level 1 indicating the best-case scenario (little to no damage) and Level 5 indicating the worst-case scenario (severe damage). VANDA ratings were applied to evaluated metallic surfaces based on final collected data.

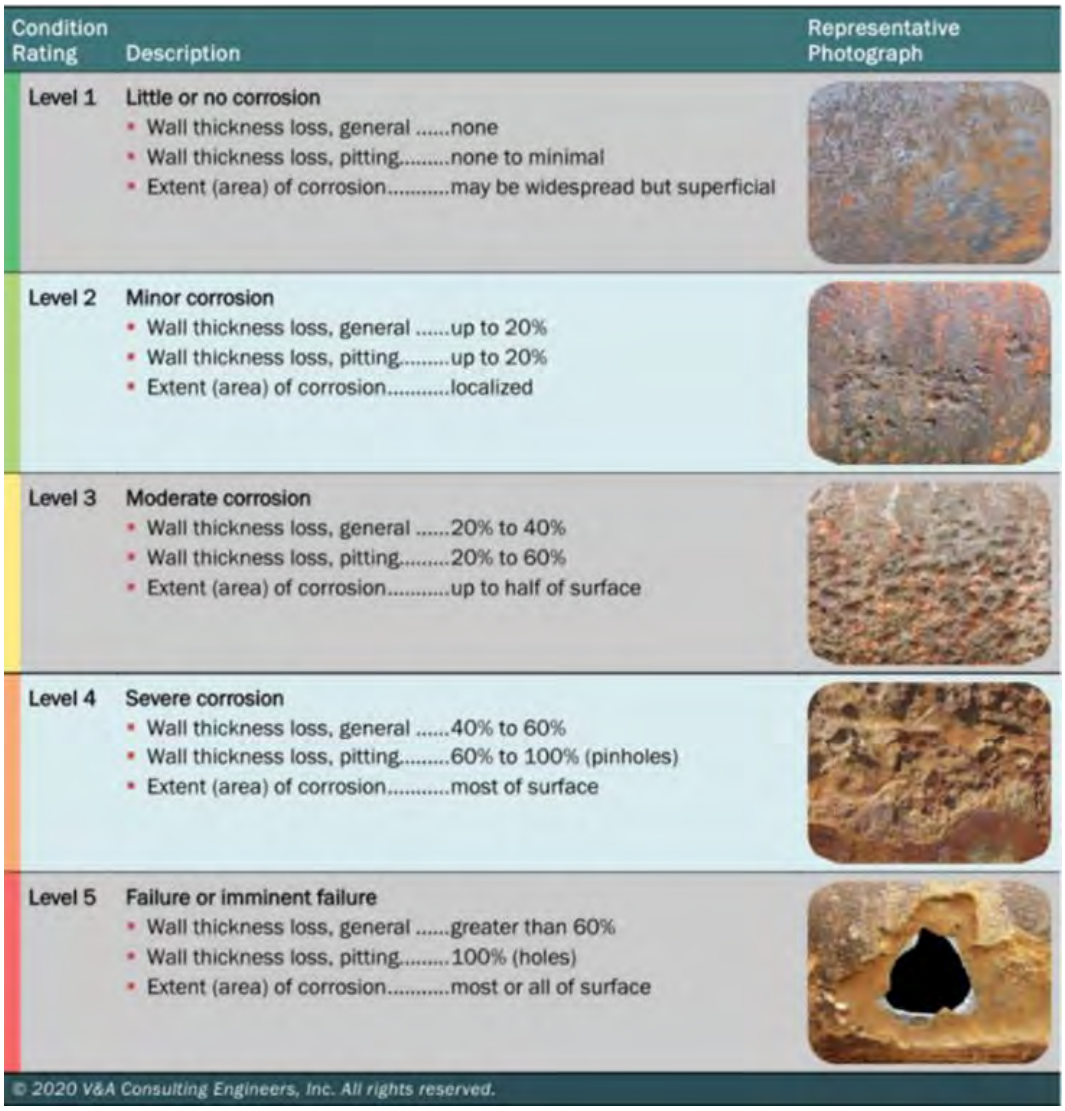

Figure 2: Summary of VANDA Metal Condition Index Rating System

b. Ultrasonic Thickness (UT) Testing: V&A performed UT testing, a non-destructive evaluation technique, at the accessible metallic surfaces. UT testing allows for point measurements of metallic surfaces to determine the existing thickness of those metallic components. High-frequency sound waves are transmitted through one side of a metal wall from a transducer. When the sound waves reach the other side of the metal wall, a fraction of the waves echo back to the transducer. The metal thickness is determined by recording the time it takes for the sound wave to travel through

the metal pipe wall and return. For each measurement location, UT testing measurements were completed around the pipe circumference in eight clock locations.

c. Dry Film Thickness (DFT) Testing: For coated metallic surfaces, V&A performed DFT measurements to determine the remaining thickness of the coating protecting the metallic components. A DFT gauge uses electromagnetic induction or eddy current technology to measure the thickness of a variety of coatings on metal surfaces. For the Reach IV-B assessments, V&A used a gauge that can measure coatings up to 0.2-inches (200 mils) in thickness.

d. Broadband Electromagnetic (BEM) Testing: V&A performed BEM testing to determine thickness of metallic surfaces without removing any of the remaining pipe coating. A BEM scan is a frequency-independent application of electromagnetic or eddy current systems with the capture process adjusted for the specific pipe material and site condition. The technology allows for the assessment of metal thickness loss and for the evaluation of metallurgical changes in the pipe composition as formed by corrosion processes such as graphitization. Graphitization is described in detail in Section 1. The electromagnetic signal response from the pipe is altered by changes in electromagnetic permeability. The change in signal is used to locate areas of wall thinning.

   The BEM scan is performed by capturing readings as an antenna is positioned along a rectangular grid over the pipe surface. The test grid typically covers a 3-foot section of the pipe. The field measurements were taken by V&A and the collected data was processed by Rock Solid Group to provide a contour map of the apparent structural wall thickness around the circumference of the pipe.

3. CONDITION ASSESSMENT FINDINGS

Ductile iron pipe (DIP) degradation can be caused by the generation of H_2S and subsequent biogenic corrosion which ultimately wears away the pipe material internally. This process is called graphitization. Graphitization is a degradation process in which the metal in the pipe goes into solution leaving behind a corrosion product that consists of a mass of residual graphite interspersed with iron oxide. During the chemical reaction, the iron oxide replaces the graphite in the pipe wall. The byproduct of graphitization in DIP presents itself as a series of round nodules that are not interconnected and are easily removed from the wall face. Graphitized iron pipes respond with a dull sound when struck with a metal object, are soft like pencil lead, and can be gouged or dug into with a knife or other tool. The graphitization nodules as described above increase in size and thickness as corrosion progresses. Therefore, the size and profile of the nodules can be indicative of the severity of the graphitization corrosion to which the pipe has been subjected.

When considering H_2S attack and its resulting graphitic corrosion, it should be noted that H_2S attack will dissolve pipe wall material but leave the graphitic corrosion in place. As such, the inspections were conducted to accurately assess the thickness of the healthy pipe wall material remaining. These inspections, both visual inspections and physical testing, were used in combination to determine the condition of the existing pipe. No external pipe wall condition assessments were conducted nor are external pipe wall condition assessments recommended at this time.

3.1 Visual Assessments

3.1.1 CCTV

Visual assessment of the internal pipe wall condition is primarily based on the CCTV footage, supplemented by the visual observations of the internal pipe wall at the MASs during the man-entry physical inspections. As such, quality of the CCTV video footage impacts the quality of the visual assessments. For some of the Reach IV-B pipeline inspected with CCTV, pipe wall condition either could not be assessed or visual assessment was impeded by reduced visibility. Some of the reasons for this reduced visibility include poor lighting, excessive water vapor in the pipe causing reflection of light and fogging of the field of view, and operator speed. Good-practice for CCTV equipment and operation includes a 360-degree radial view color camera with an articulating head and minimum capability of 350 lines of resolution. Travel speed should be a uniform rate and no more than 30-feet per minute. In addition, for a lined DIP pipe, the operator should be instructed to stop, pan, and zoom at joints at regular intervals to obtain detailed observations of any corrosion occurring at the pipe joints.

In general, the pipe that was visible was observed to be in fair condition. The pipe appears to be in the initial stages of corrosive degradation, with the majority of the pipe exhibiting discoloration (i.e., orange tinting) and observations of the pipe wall's protective coal tar lining sloughing off and missing in some locations. The majority of the joints seem to have evidence of infiltration staining and initial stages of coal tar lining failure observed as discolorations at and around the joints. The upstream end of the pipe has more significantly advanced corrosion evidence at the pipe joints than the downstream end. Throughout the pipe, there were deposits or sediment below the springline, even after the pipe had been cleaned by Innerline. It is possible that these deposits are graphitization nodules that are covered in sediment or failing coal tar lining material. Without adequate heavy-cleaning, it is difficult to say definitively the condition of

the bottom half of the majority of the Reach IV-B pipeline. Lastly, there were some obstructions in the pipe invert that were not able to be removed during cleaning (e.g., bricks).

In general, because of issues with access, geometry, and water level, inspections were not performed on the eight siphons within Reach IV-B as part of this project. However, our team did capture CCTV video of the upstream leg of the siphon located between 4B-0450 and 4B-0440. It was in similar or better condition than the rest of the pipe inspected. Assuming that conditions are consistent across the entire alignment, then we can assume that the up and down legs of the remaining seven siphons are in fair condition. In addition, generally the bottom leg or "belly" portion of a siphon is submerged through the entirety of its lifetime. Since no air is typically present in the belly of the siphon, then there is no catalyst for microbial degradation. Therefore, it is unlikely that there is excessive degradation of the bottom leg of the eight existing siphons in the system. However, microbial degradation is not the only failure mode that can be seen in siphons. Other concerns include joint leaks, joint separations, and cracked or fractured pipe caused by soil movement. Since condition assessments were not completed on the siphon segments, no estimated remaining useful life is provided herein for those sections of the pipeline.

Locations of the CCTV work were selected by Innerline Engineering in order to inspect as much of the pipeline as possible during the shut-down period. Priority was given to the upstream and downstream pipelines associated with the MASs identified for man-entry visual inspections and physical testing. Approximately 3,379 feet of pipe was inspected via CCTV out of a total length of approximately 8,837 feet (38%). The remainder of the pipe was unable to be inspected with CCTV due to the following:

- Pipe geometry and standing water depth (i.e., steep slopes) amounting to 2,568-ft (29% of total pipeline length),
- The presence of eight siphons along individual pipe segments amounting to 2,161-ft (24% of total pipeline length), and
- Abandoned surveys (i.e., unable to travel further lengths primarily due to heavy debris) amounting to 737-ft (8% of total pipeline length).

It should be noted that CCTV lengths as recorded by the CCTV contractor within an individual segment of pipe (i.e., from MAS to MAS) are inconsistent with the record drawings due to the presence of siphons. For example, the CCTV for MAS 4B-0450 to MAS 4B-0440 captured 652-ft of inspection data, but the record drawings indicate this segment of pipe is 351.2-ft based on stationing which does not account for the full lengths of downward and upward legs of a siphon.

Innerline Engineering's CCTV reports are provided in **Appendix C** along with W&C's detailed summary of observations. Example screen grabs of the pipe condition throughout Reach IV-B are provided below. It should be noted that the pipe segment between MAS 4B-0480 and 4B-0490 exhibited liner failure in the upstream-most 42-feet of pipeline. This is the only pipe segment that was inspected with CCTV that exhibited this level of corrosive degradation. An example is shown in **Figure 8**.

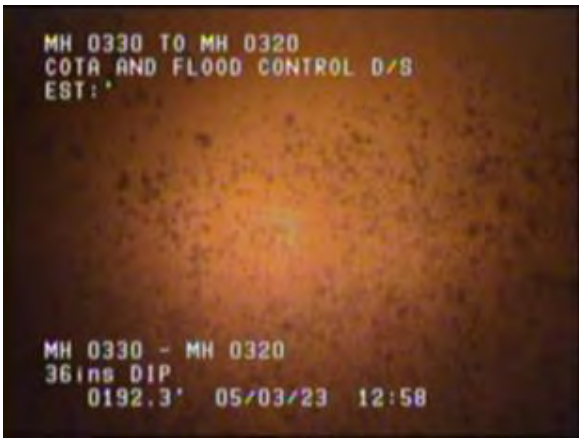

Figure 3: Early Corrosion Evidence at Pipe Crown

Figure 4: Missing Lining Material at 8 o'clock

Figure 5: Corrosion Discoloration at Crown and Joint

Figure 6: Deposits

Figure 7: Deposits and Missing Liner

Figure 8: Missing Liner, Damaged Metallic Pipe Wall

3.1.2 Man-Entry Visual Assessment

Observations made by V&A during the man-entry condition assessment from three MAS locations were documented with photographs. The visual assessment completed as part of the man-entry work focused on the condition of the metallic surfaces and coating system. **Table 1** summarizes the visual assessments conducted at each manhole including pipe barrel conditions, lining conditions, conditions at the upstream (u/s) and downstream (d/s) pipe joints, and sediment and/or debris observations. There was no evidence of infiltration observed at any of the man-entry inspection locations. See **Section 2.2** for additional discussion on the VANDA Metal Condition Index.

Table 1: Summary of Man-Entry Visual Assessments

MAS	VANDA Level	Barrel Conditions	Joint Conditions	Sediment / Debris Observations
4B-0340	2	Minor corrosion at crown. Coal tar lining intact.	Small coating failures and minor corrosion at u/s and d/s joints.(1) D/s joint offset approximately 3/8- to ½-inch at the crown.	In the invert up to flowline.
4B-0450	2	Coal tar lining intact.	Areas of coal tar lining failures and minor corrosion at u/s and d/s joints. (1)	In the invert of the u/s pipe and debris in the invert of the d/s pipe.
4B-0480	3	Coal tar lining deteriorated above the waterline and moderate corrosion present.	Coal tar lining failures and moderate corrosion at u/s and d/s joints. (1)	None noted in the pipe inverts.

Notes:
(1)Coating failures and minor corrosion at joints is typically observed in aging DIP pipes due to the field application of the lining at the joints as compared to the shop-applied lining in the barrel sections of the pipe.

The following photos were provided by V&A as a representation of their visual assessments.

MAS 4B-0340

Figure 9: Looking Upstream

Figure 10: Corrosion at Crown

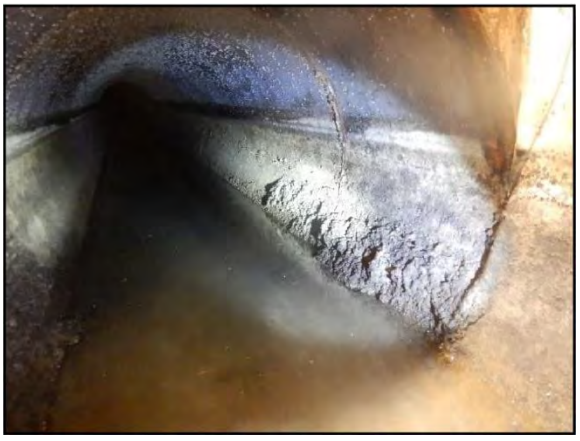

Figure 11: Sediment/Deposits

Figure 12: Coating Failure at Joint

MAS 4B-0450

Figure 13: Looking Downstream

Figure 14: Looking Upstream

Figure 15: Lining Failure at U/S Joint

Figure 16: Sediment in Invert

MAS 4B-0480

Figure 17: Looking Downstream

Figure 18: Moderate Corrosion (Looking Upstream)

Figure 19: Moderate Corrosion at Crown

Figure 20: Coating Failure at Joint

3.2 Physical Testing

3.2.1 Ultrasonic Thickness Testing

UT measurements were performed on the upstream and downstream pipes at each MAS that was entered by V&A. Because the pressure or thickness class for the pipes at each location was not available from SAWPA record information, the nominal thickness was estimated based on the measurements. Nominal wall thicknesses used to calculate wall loss were assumed per AWWA C151, considering conservative values based on the range of measurements. The wall loss analysis does not account for differences in nominal thicknesses due to manufacturing tolerances or from one site to the next. The nominal thickness for all sites was assumed to be 0.480-inches, which corresponds to Special Thickness Class 51 and is slightly thicker than Pressure Class 250 (0.47-inches). It should be noted that for a gravity line such as this, external loading

would control the design. It is unknown what pipe class would have been specified for an individual burial depth or soil conditions.

UT measurements are summarized in **Table 2**. The testing was completed in the first full pipe segment outside each MAS, and the locations are referenced from the first pipe joint outside each MAS. The short pipe segments passing through the MAS were not tested.

Table 2: Summary of UT Data

MAS	Location Description	Minimum Thickness (in.)	Average Thickness (in.)	Maximum Thickness (in.)	Maximum Thickness Loss (%)
4B-0340	Immediately downstream	0.396	0.414	0.438	18%
4B-0340	9-inches upstream	0.424	0.430	0.442	12%
4B-0340	2-ft 9-in upstream	0.354	0.381	0.398	26%
4B-0450	9-in downstream	0.427	0.449	0.474	11%
4B-0450	2-ft 9-in downstream	0.400	0.421	0.441	17%
4B-0480	2-ft 6-in upstream	0.440	0.524	0.615	8%
4B-0480	1-ft upstream	0.506	0.565	0.611	0%
4B-0480	1-ft downstream	0.446	0.467	0.502	7%

The calculated metal loss on the piping ranged from 0% to 26%, which is considered minimal (VANDA Level 1) to moderate (VANDA Level 3). It should be noted that the thickness was relatively consistent within each set of readings, so perhaps different classes of pipe (with different nominal thicknesses than assumed) were installed at different locations (perhaps due to varying depths of cover).

3.2.2 Dry Film Thickness Testing

A digital thickness gauge was used to measure the thickness of the coal tar epoxy lining inside the DIP. Measurements were taken on the DIP at locations where the lining was intact. The average DFT measurements ranged from 44 mils to 51 mils. The results exceeded the 16 mil minimum of AWWA C210. The results of the DFT Testing are provided in **Table 3**.

Table 3: Summary of DFT Data

Location	# of Measurements	Minimum (mils)	Maximum (mils)	Average (mils)	Standard Deviation (mils)
4B-0340	6	39	48	44	3
4B-0450	5	38	49	45	4
u/s of 4B-0480	16	40	64	51	8
d/s of 4B-0480	6	43	48	46	2

3.2.3 Broadband Electromagnetic Testing

BEM scanning was conducted inside the pipe at each of the three MAS entered by V&A. The BEM scan area was 3-ft long (along the pipe axis) and covered the full pipe inner circumference, except where the scan grid was interrupted by liquid or sediment at the pipe invert.

The BEM scan contour plots show that the greatest discernable loss was approximately 13% on the contour plot for MAS 4B-0340. This corresponds to approximately 39 inches from the u/s joint and around the entire scannable circumference. Clear variations in the BEM contour plots were compared to photos, videos, and notes taken during the assessment. At MAS 4B-0340, the downstream end of the scan (nearest the MAS) appears significantly thicker. This may be from extra metal at the joint (i.e., bell of the adjoining pipe segment). At 4B-0450, the u/s end of the scan (nearest the MAS) exhibits the same pattern. The lining in these scanned locations appears to be mostly intact, so the variations may be due to external corrosion. Overall, the BEM scanning appears to indicate minimal to moderate corrosion. As such, the pipes were determined by V&A to be VANDA 2 to VANDA 3 condition with respect to metal loss.

If a pipe's invert has insufficient coal tar epoxy lining with exposed areas of DIP, it may lead to corrosion in the submerged portion(s) of the pipeline. In such cases, corrosion can occur in submerged areas due to pitting corrosion where anodic and cathodic points form between exposed or partially exposed metal and nonexposed metal. In addition, erosion corrosion can exacerbate the pitting corrosion process where flowing sediment and debris erodes the coating and corroded surface. However, the BEM findings for MAS 4B-0450, which included the pipe invert and is shown in Figure 22, indicated a consistent pipe wall thickness.

BEM results are shown in **Table 4** followed by graphic representations of the BEM results provided by the Rock Solid Group. The nominal thickness assumed for these calculations is the same as the nominal thickness assumed for other portions of this analysis, 0.480-inches.

Table 4: Summary of BEM Data

MAS	Minimum Thickness (in.)	Average Thickness (in.)	Maximum Thickness (in.)	Maximum Thickness Loss (%)
4B-0340	0.419	0.466	0.584	13%
4B-0450	0.456	0.492	0.545	5%
4B-0480	0.471	0.558	0.617	2%

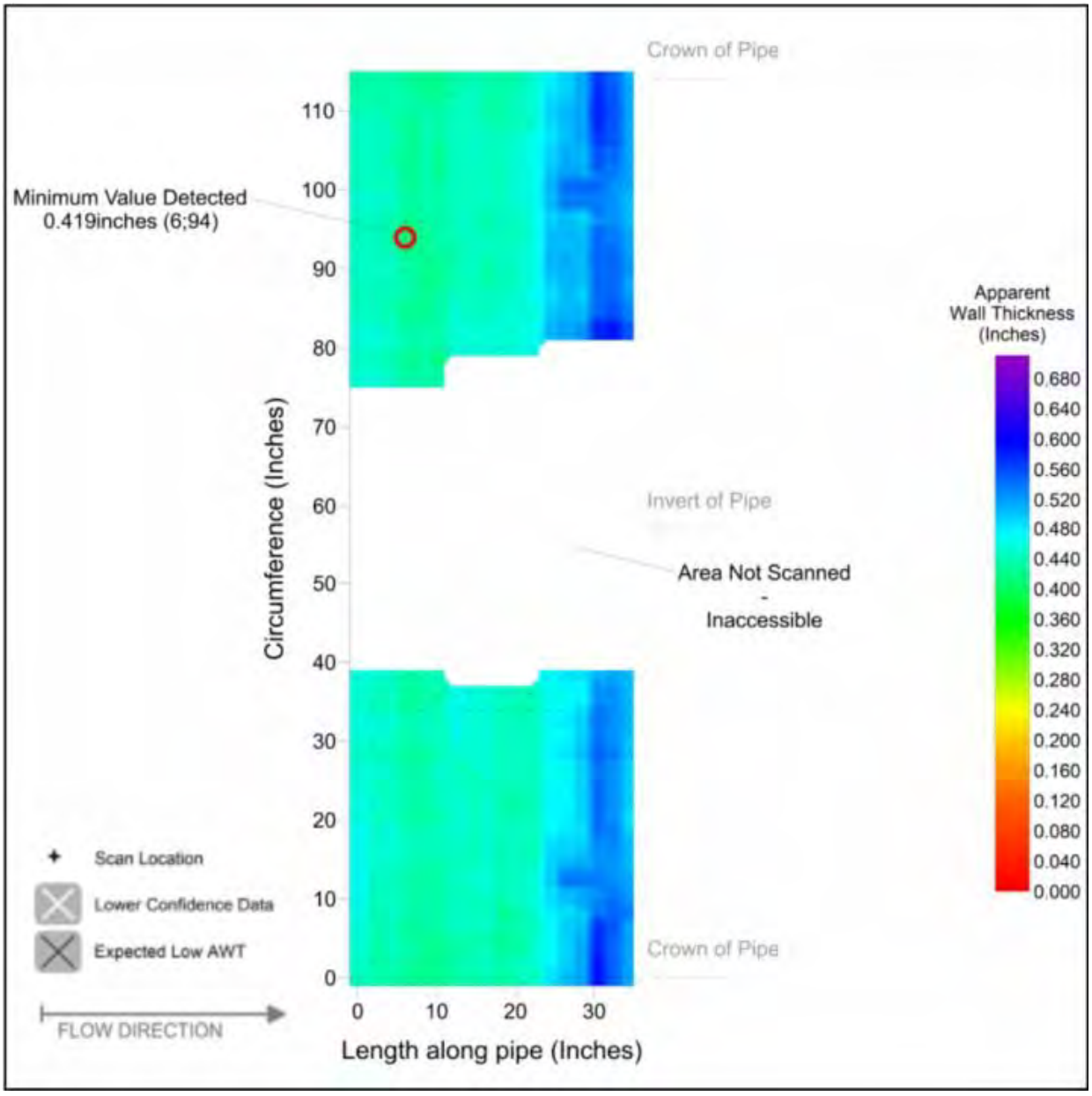

Figure 21: MAS 4B-0340 BEM Scan Results

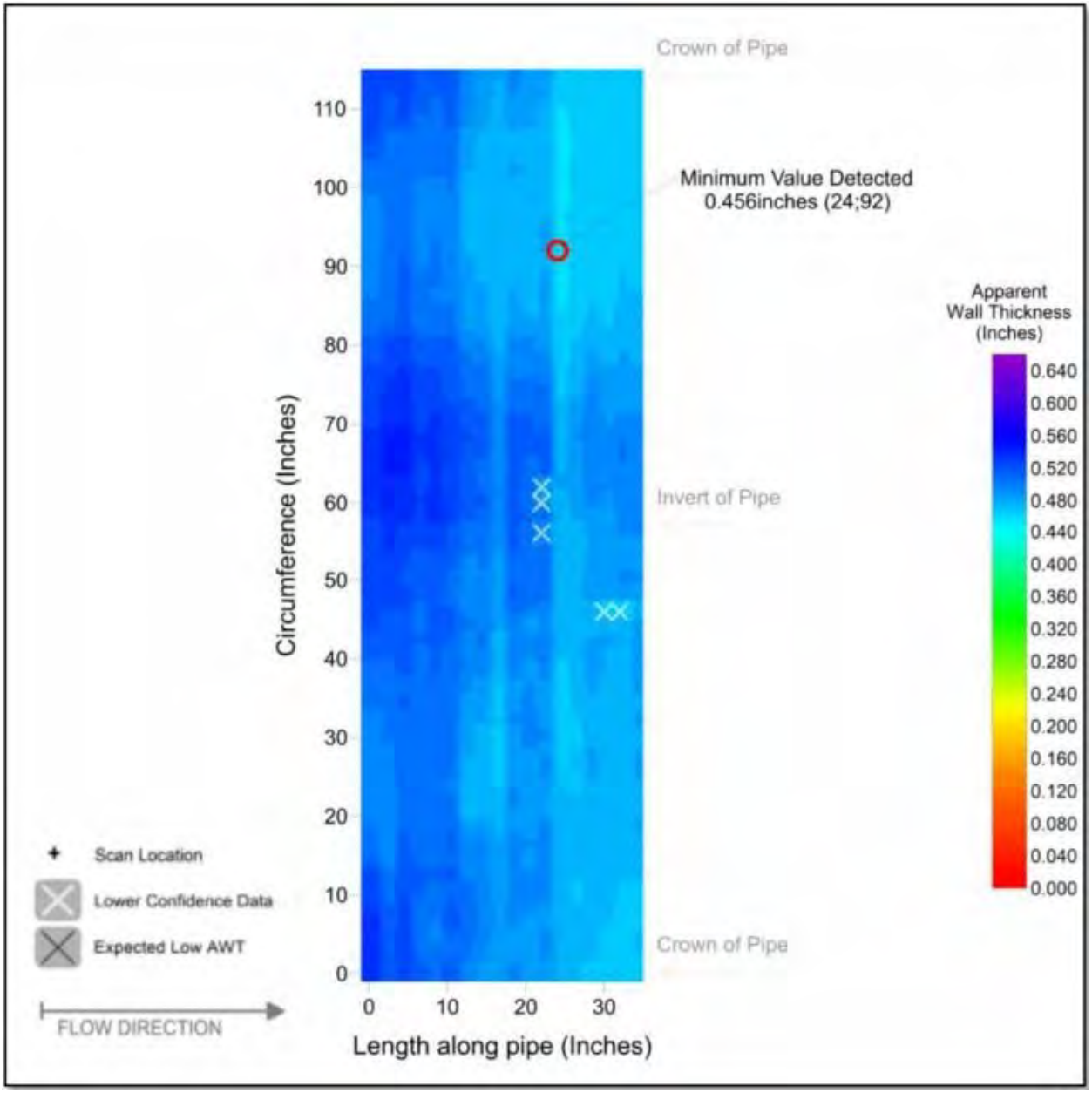

Figure 22: MAS 4B-0450 BEM Scan Results

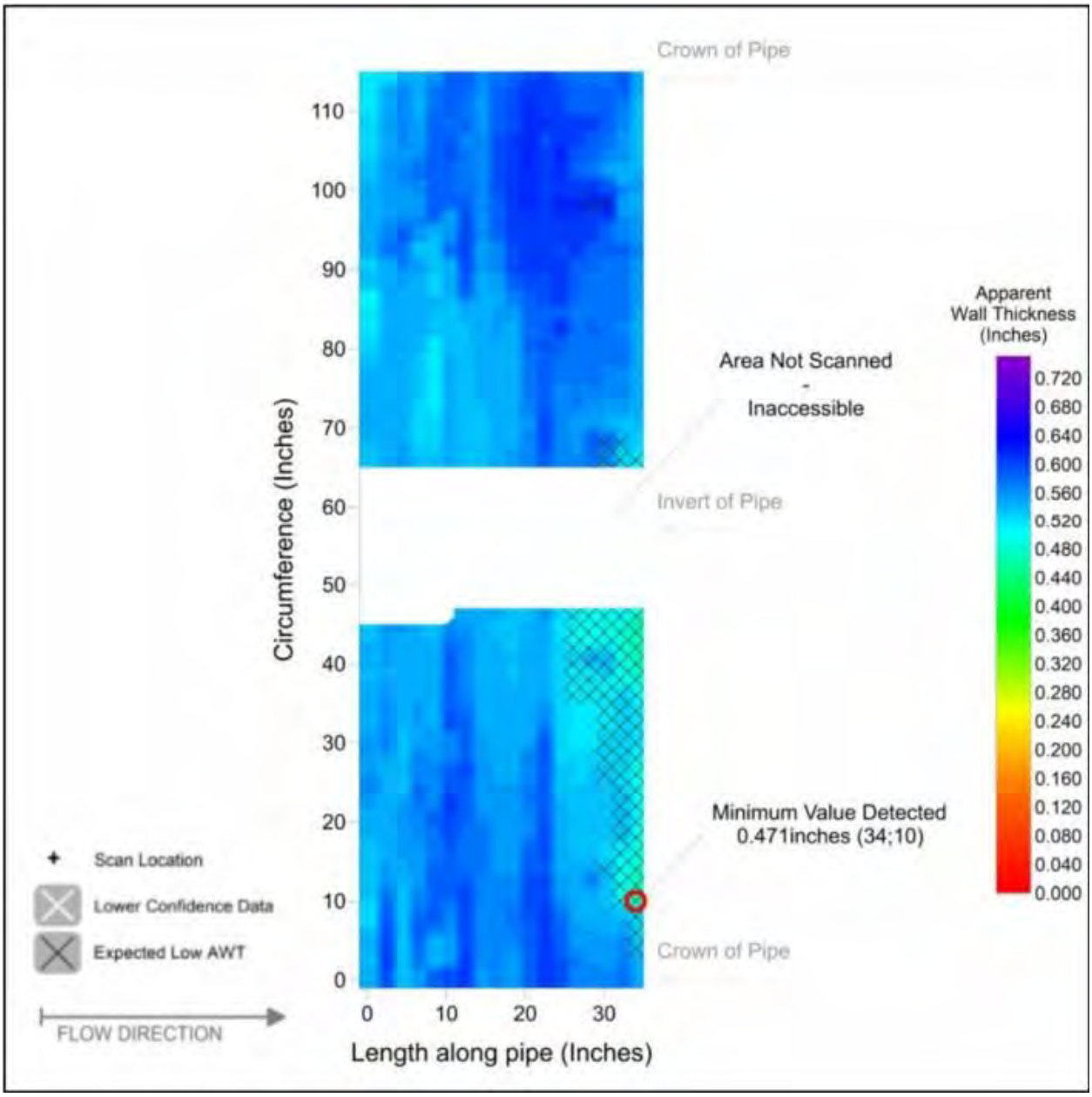

Figure 23: MAS 4B-0480 BEM Scan Results

3.3 Condition Assessment Conclusions

Based on the CCTV visual assessments and the man-entry visual assessment and physical testing of the pipeline from three discrete locations of the Reach IV-B pipeline, the overall condition of the 36-in DIP pipe appears to be fair. With overall VANDA condition levels 2 and 3 at the man-entry locations and PACP Pipe Structural codes no greater than 2, the pipe shows signs of minor degradation with some isolated locations of moderate degradation. The following summarizes the overall pipe defects as of the date of collection of the CCTV and man-entry data:

- Minor corrosion at the pipe crown throughout a majority of the pipeline inspected as evidenced by small tubercles and discoloration,
- Minor to moderate corrosion in the pipe barrel throughout a majority of the pipeline inspected as evidenced by observed discoloration. The pipe barrel is defined as the interior wall of the pipeline between MASs. This data was augmented by thickness measurements ranging from 8% to 26% wall loss at the three man-entry inspection locations,
- Minor to moderate corrosion at most joints inspected as evidenced by infiltration staining and discoloration and moderate corrosion at the upstream-most joints as evidenced by discoloration and lining degradation,
- Moderate failure of coal tar lining in the pipe barrel throughout a majority of the pipeline inspected as evidenced by the inconsistent appearance of the pipe wall, and
- Minor loss of coal tar lining at the man-entry inspection locations. DFT measurements meet the requirements of AWWA C210. So, the liner has not failed in those locations.

4. REPAIR AND REHABILITATION RECOMMENDATIONS

4.1 Near-Term

4.1.1 Cleaning and Repairs

The following is recommended within the next three to five years:

1. Bypass flows as necessary to complete the following recommendations.
2. Perform joint repairs at MAS 4B-0480. Completing joint repairs at a single MAS location in the Near-Term will provide valuable information regarding the amount of time required to complete each joint repair such that a more accurate estimate can be made regarding the amount of time required to complete all necessary joint repairs and the associated shut-down duration. Data from the joint repair at a single location will further aide SAWPA in characterizing the cost and complexity of the joint repairs including an assessment of the overall benefit of individual joint repairs versus MAS to MAS CIPP lining.
3. Perform physical testing at MAS 4B-0320 in order to fill in the gap on missing physical testing data on the downstream end of the alignment. Visual assessment and physical testing at this man-entry location at the downstream end of the alignment would be useful to assess the condition of the structure and the pipe as there is potential for corrosion at this location due to both the horizontal and vertical geometry of the alignment. Physical tests performed at this location should be the same as those performed in May 2023.
4. Consider the addition of new MASs. Addition of these structures could be accomplished during the system bypass required for the rest of the above recommendations. See **Section 4.4** for additional discussion.

4.1.2 Additional Considerations

Although sonar is the most appropriate inspection method for understanding the condition within the pipe below the waterline or characterizing the amount of sediment or debris present at the invert of the pipe, sonar does have some limitations. There are minimum clearance requirements (i.e., a minimum of 5 inches between the bottom of the sonar equipment and the pipe invert or top of existing debris within the pipe) that must be met in order for the sonar equipment to be able to capture adequate imagery. In addition, sonar inspection technology takes a profile scan once per second which is then translated into an image of the pipe below the water line every 2 to 3 feet. So, the data collected is a snapshot of the condition of the pipe or the volume of debris present which is then extrapolated to the rest of the submerged portion of the pipe.

An estimated cost for implementation of Near-Term recommendations is provided in **Section 4.6.** It should be noted that the addition of two new MASs is included in the Near-Term cost estimate.

4.2 Mid-Term

The following is recommended within the next seven to ten years:

1. Bypass flows to complete the following recommendations.

2. Perform heavy cleaning of the entire pipe.

3. Reinspect the entirety of Reach IV-B using CCTV and sonar, as appropriate.

4. Repeat man-entry visual assessments and physical testing at the same three locations completed in 2023 plus MAS 4B-0320, and with the same tests conducted in 2023 in order to directly compare the same physical measurements completed as part of this project. This would provide SAWPA with two data points at each location to better characterize the rate of pipe deterioration and determine the projected remaining useful life of the pipeline.

5. Evaluate the removal of corrosion and recoating of the upstream and downstream pipe joints at each MAS with epoxy versus Long-Term CIPP full-length MAS to MAS lining based on data collected in the Near-Term project. Identify further steps based on observed condition and fiscal impacts.

6. Based on results of the evaluation completed in number 5 above, determine the necessity to perform joint repairs and lining spot repairs at areas of coating failure and corrosion near MAS 4B-0480 and any other locations identified during the re-inspection.

   Weld repair plates may be required where excessive pitting has occurred. If the evaluation completed in number 5 above indicates lining spot repairs, the following steps should be implemented for lining spot repairs and maintenance coating:

   a. Prepare the local surface area for coating per SSPC SP11 Power Tool Cleaning to Bare Metal.

   b. Apply a primer coat of a surface tolerant epoxy at 2 to 3 mils DFT and two coats of an epoxy at 4 to 6 mils. The repair coating should match the same product as the existing coating system, if possible. Other recommended products include Carboline Carboguard 891, Sherwin Williams Macropoxy 646PW, or PPG Amerlock 2.

   c. For sections of pipe where the entire liner has failed, abrasive blast per SSPC SP10 and coat these sections with a 100% solids epoxy such as Carboline Plasite 4500, Sauereisen Sewerguard 210 XB, or Warren Environmental 301-14 at 40 to 50 mils.

   In addition, since approximately 42 feet of liner failure was observed in the CCTV footage in the pipe between MAS 4B-0480 and 4B-0490, an additional 395 square feet of lining spot repair (as defined above) has been added to the assumed square footage of liner repair in **Table 6** and Near-Term cost estimate. The total square footage of assumed repairs is presented in **Table 5** and **Table 6** below.

Table 5: Assumed Square Footage of Joint Repairs(1)

# of MAS(2)	# of Joint Repairs	Joint Repair Surface Area (sq.ft.)	Total Joint Repair Surface Area (sq.ft.)
17	2 per MAS: 1 u/s and 1 d/s	1ft width over the pipe circumference = 9.4 sq.ft.	17 MAS x 2 joints x 9.4 sq.ft. = **320 sq.ft.**

(1) All quantities are assumed. The only joints to have been verified to be in need of Near-Term repairs are those inspected by V&A as described in Section 3.1.2.

(2) Although there are 18 MASs on the alignment, MAS 4B-0480 will have received joint repair treatment as part of the Near-Term project and is not included in the calculation for square footage of joint repairs for the Mid-Term project.

Table 6: Assumed Square Footage of Liner Repairs(1)

# of MAS	Assumed Length of Liner Repair	Assumed Liner Repair Area per MAS	Total Assumed Liner Repair Surface Area	Additional Liner Repair Surface Area	Total Liner Repair Surface Area
6	10 ft	10 ft x 9.4 ft = 94.2 sq.ft.	6 MAS x 94 sq.ft. = 565 sq.ft.	42 ft between 4B-0480 and 4B-0490 = 395 sq.ft.	**960 sq.ft.**

(1) All quantities are assumed. The only liner repair to have been verified to be in need of Near-Term repairs is the liner inspected by V&A near MAS 4B-0480 as described in Section 3.1.2.

As noted above, the Mid-Term recommendations are based on observations in the three MAS structures that V&A entered in May 2023. For a conservative Mid-Term project description and cost estimate, we have assumed that V&A's observations within these three MAS structures are representative of each of the MAS structures along the alignment. Therefore, the Mid-Term joint and liner repair square footage in **Tables 5 and 6** and the cost estimate provided in **Section 4.6** includes repair of one upstream and one downstream pipe joint at each MAS and lining spot repairs at one out of every three MAS structures. It is important to note that the lining spot repairs were assumed to be 10-foot lengths each, but the actual length of lining spot repairs required is unknown due to the lack of quality CCTV footage.

Re-inspection of the pipeline in seven to ten years is recommended for the following reasons:

- Only 38% of the brine line was inspected via CCTV in May 2023 due to time constraints and the high percentage of siphons along this segment. As such, a more extensive CCTV inspection program is suggested while the flows will be bypassed.

  It is suggested that, at a minimum, the segment of pipe between 4B-0450 and 4B-0490 is heavy cleaned and inspected during the system shut down. This segment is approximately 2,990 feet long and demonstrated evidence of corrosion in the form of possible tuberculation, loss of coal tar lining, and discoloration during the May 2023 CCTV inspections. CCTV inspection of this section of pipe should be able to be completed within 24 hours of flow control implementation.

  A clear visual of existing conditions (with near complete removal of sediment and debris) was not captured as part of the CCTV inspection completed in May 2023. As such, inspecting the siphons using CCTV and sonar in any sections that cannot be fully dewatered will provide a more complete representation of the pipe condition.

- While the current estimated remaining useful life is 10 to 20 years, the rate of deterioration is unknown. Available data is from one point in time. It will be useful to compare existing data with data from a future inspection to characterize rate of deterioration and further refine remaining useful life at the seven to ten-year mark.

- CCTV inspection of the 7,944-feet of (non-siphon) pipe is recommended to help characterize rate of deterioration as well as assess areas of potential concern that cannot be inspected via man-entry

due to time and safety constraints. It will also be useful to inspect those portions of the pipeline that were obscured with sediment or debris during the initial inspection of the pipeline in order to gain a better understanding of the degree of graphitization corrosion within the DIP pipeline. Heavy cleaning is recommended prior to the next CCTV inspection.

An estimated cost for implementation of Mid-Term recommendations is provided in **Section 4.6.** It should be noted that the Mid-Term cost estimate assumes that joint repairs and lining spot repairs were included as part of the cost estimate.

4.3 Long-Term

Because deterioration of the pipeline appears to be fairly uniform along its length with the most active deterioration occurring at the joints and because the condition of the eight siphons is unknown, it is conservative to assume that the entire 8,567-feet of the DIP portion of Reach IV-B will require structural rehabilitation within the next 10-20 years. This recommendation should be further refined after the mid-term inspection results have been evaluated and the remaining useful life of the pipeline has been updated. An estimated cost for implementation of long-term recommendations is provided in **Section 4.6.**

4.4 Other Considerations

As stated in Section 3.1.1, approximately 24% of the Reach IV-B pipeline was unable to be inspected due to the presence of siphons. The addition of more MASs would increase SAWPA's access and improve future attempts to inspect the pipeline. Specifically, additional access between MAS 4B-0320 and 4B-0330 would have the potential to inspect an additional 1,422-feet of pipeline. Similarly, the segment between MAS 4B-0450 and 4B-0470 is over 2,000-feet long and approximately half of this segment was able to be cleaned and inspected when Innerline attempted to access the pipeline from each terminal manhole. An additional access point at approximately the mid-point of this long run of pipe could provide better leverage for cleaning and inspection. A cost estimate for constructing two new MASs within the system has been provided in the Near-Term estimate in **Section 4.6.**

Similarly, inspecting the non-siphon portions of the pipeline between MAS 4B-0390 and 4B-0400, 4B-0400 and 4B-0410, 4B-0410 and 4B-0420, 4B-0420 and 4B-0430, and 4B-0430 and 4B-0440 would have increased the total amount of pipeline inspected by approximately 1,500-feet (with those siphons amounting to only approximately 500 horizontal feet of pipeline that could not be inspected). These segments do not necessarily need additional access provided, rather, additional planning for the cleaning and inspection to include these segments would provide additional CCTV data and information with which to assess the pipe's condition.

4.5 Pipe Rehabilitation Alternatives and Recommendation

The following pipe rehabilitation options have been evaluated following the condition assessment of Reach IV-B: segmental sliplining, continuous sliplining, spiral wound tight-fit lining, and cured-in-place pipe (CIPP) lining. See **Appendix F** for a detailed comparison of the different options considered. It should be noted that implementation of each of these options will require encroachment permits from the City of Corona and the Riverside County Flood Control District.

For the purposes of this evaluation, we have assumed that all 8,567-feet of Reach IV-B will require rehabilitation within 10 to 20 years and that SAWPA should budget accordingly. Based on our initial

rehabilitation alternatives analysis using assessment criteria that was originally weighted with input from SAWPA on the Reach IV-D project completed in 2018, CIPP lining of the existing pipeline is the recommended full system rehabilitation solution. See **Table 7**.

Table 7: Weighted Alternatives Assessment

Alternatives		Segmental Sliplining		Continuous Sliplining		Spiral Wound Tight-Fit Lining		Cured-in-Place Pipe Lining	
Criterion	Weight	Score[1]	Weighted Score	Score[1]	Weighted Score	Score[1]	Weighted Score	Score[1]	Weighted Score
Constructability/Work Area Requirements	1	1	1	1	1	4	4	4	4
Impacts to Hydraulic Capacity	2	1	2	1	2	3	6	4	8
Traffic/Public Disruption	1	1	1	1	1	1	1	1	1
Regulatory/Permitting	1	2	2	2	2	5	5	5	5
Relative Cost	1.5	3	4.5	3	4.5	4	6	4	6
Risk of SSO	1	2	2	2	2	3	3	4	4
Solution Longevity	1	5	5	5	5	5	5	5	5
TOTAL			**17.5**		**17.5**		**30**		**33**

Note:
[1] A higher weighted score indicates a higher ranked alternative.

CIPP lining is a long-term structural rehabilitation solution that has one of the smallest installation footprints (as compared to the other rehabilitation alternatives considered) and the least impacts to the hydraulic capacity of the existing pipeline. It is estimated that an approximately 0.656-inch-thick liner will be needed for structural rehabilitation of the 36-inch diameter brine line. That is a total capacity loss of approximately 1.31-inches or 4% loss in cross-sectional area with a total resultant inside diameter of 34.69-inches. It should be noted that the liner thickness design may vary due to depth of pipe cover depending on the location along the alignment. The thickness provided above is based on the average depth of the eight siphons. The planning-level construction cost estimate (in 2023 dollars) for rehabilitation of Reach IV-B using CIPP is approximately $9 million (2024 dollars, **Appendix E**). This does not include Engineering or Construction Management services.

Bypass pumping will be required during installation of the CIPP liner. In 10 to 20 years, it is projected that the peak dry weather flows in Reach IV-B will increase. However, the actual volume increase is unknown at this time. As such, the relative cost analysis completed for all four of the rehabilitation options considered and the planning level cost estimate for installation of the recommended CIPP rehabilitation solutions was based on bypass of the existing flowrate of 7 million gallons per day with shallow buried bypass piping across roadways.

Rehabilitation recommendations and costs provided in this report are based on current technologies readily available in the marketplace as of 2023. It should be noted that cost/complexity of project will generally increase as time goes on, primarily due to the potential for increased traffic control requirements and increased volume of bypass flows. However, the advent of new trenchless pipeline rehabilitation products

in the marketplace may decrease cost and increase ease of installation. We recommend that SAWPA re-evaluate rehabilitation alternatives and associated costs based on the most up-to-date technologies available in the marketplace in the future when the project moves into the design phase.

4.6 Cost Summary

The following is a summary of estimated costs for Near-, Mid-, and Long-Term recommendations.

Period	Summary of Recommendations	Cost [1]
Near-Term (3-5 Years)[2]	1. Bypass as necessary to complete the work. 2. Perform joint repairs at MAS 4B-0480. 3. Perform man-entry visual inspections and physical testing at MAS 4B-0320. 4. Install two new MASs.	$1,750,000
Mid-Term (7-10 Years)[3]	1. Bypass as necessary to complete the work. 2. Heavy cleaning of the entire Reach IV-B. 3. CCTV and sonar inspection of the entire Reach IV-B. 4. Repeat man-entry visual inspections and physical testing at four locations. 5. Evaluate spot repairs versus long-term lining alternatives. 6. If spot repairs are selected as the preferred direction, complete joint repairs and lining spot repairs.	$3,200,000
Long-Term (10+ Years)	1. Bypass the entire Reach IV-B, including shallow bury at street crossings. 2. Rehabilitate the entire Reach IV-B pipeline (estimate assumes CIPP).	$8,790,000

(1) Estimates provided in 2024 dollars and are rounded to the nearest ten thousand.

(2) Near-Term costs provided assume that the two new MASs will be constructed in the Near-Term work.

(3) Mid-Term costs provided assume that spot repairs would be implemented. If this is the case, the cost for Long-Term recommendations may not apply or could be significantly lower, depending on the Long-Term condition of the spot repairs.

4.6.1 Mid-Term Repairs Cost Estimating Details

The following information pertains to the cost estimates for Mid-Term Repairs for joint and liner spot repairs:

- $50/sq.ft.: Cost to repair pipe joints including equipment setup, abrasive blasting per SP10, 100% solids epoxy lining materials and application, confined space entry support, and ventilation. Approximately two joints can be abrasive blasted and coated in two days. The Near-Term cost estimate assumes this type of joint repair.

- $40/sq.ft.: Cost to repair pipe joints including equipment setup, high-pressure water-jetting surface preparation, 100% solids epoxy lining materials and application, confined space entry support, and ventilation. Approximately four joints can be water-jetted and coated in two days. Water-jetting surface preparation reduces the service life of the 100% solids epoxy coating as compared to abrasive blasting because it does not roughen the surface, rather it removes the old lining, rust, and

loose material. This is not recommended for this project since pipeline rehabilitation is not currently slated for the near-term or mid-term time frames.

- $40/sq.ft.: Cost to spot repair the coal tar lining with Carboline Carboguard 890 VOC, Sherwin Williams Macropoxy 646, or PPG Amerlock 2 including materials and labor.
- $50/sq.ft.: Cost to repair the coal tar lining in sections of the pipe with entire liner failures. Includes abrasive blasting per SP10 and coating with 100% solids epoxy coating such as Carboline Plasite 4500, Sauereisen Sewergard 210 XB, or Warren Environmental 301-14 at 40 to 50 mils. The Near-Term cost estimate assumes this type of liner spot repair.
- $4,500/MAS: worker confined space entry
- $2,400/day: field inspection oversight

5. APPENDICES

5.1 Appendix A: Final Field Inspection Plan for Reach IV-B

5.2 Appendix B: V&A Inland Empire Brine Line Reach IV-B Condition Assessment Report

5.3 Appendix C: Innerline Engineering CCTV Inspection Reports with W&C Detailed Summary

5.4 Appendix D: Reach IV-B Record Drawings

5.5 Appendix E: Planning Level Cost Estimates for Near-Term, Mid-Term, and Long-Term Recommendations

5.6 Appendix F: Rehabilitation Alternatives

Woodard & Curran

woodardcurran.com

PA 24 COMMITTEE MEMORANDUM NO. 2024.19

DATE: September 3, 2024

TO: Project Agreement 24 Committee
(Inland Empire Brine Line)

SUBJECT: Inland Empire Brine Line 10–Year Capital Improvement Plan

PREPARED BY: David Ruhl, Executive Manager of Engineering and Operations

RECOMMENDATION
Receive and file.

DISCUSSION
The Inland Empire Brine Line CIP is necessary to assure the long-term future viability and sustainability of the Brine Line. The 10-year Brine Line CIP is estimated at $78 Million through Fiscal Year 2035. The CIP addresses known operation and maintenance challenges, with on-going system investigations to monitor and plan system improvement needs in the future. CIP projects are defined based on on-going system inspections, followed by scheduled design and construction of needed repairs, rehabilitation, or replacement. System inspections, like the recent Reach IV-D Corrosion Inspection, Reach IV Condition Assessment and Reach IV-B Condition Assessment, may identify immediate repairs, rehabilitation, or replacement projects, or may necessitate on-going inspection to monitor system degradation, resulting in a near or long-term CIP Project. Similarly, as with Reach V, inspection access is not readily available, resulting in CIP projects to construct needed access.

As part of the Brine Line Master Plan, a prioritized list of recommended Brine Line improvement projects was developed and organized into a 40–year plan that corresponds with the projected growth and build-out of the Brine Line system through year 2065. Those projects that are recommended in the near term (1–10 years) were added to the 10–year CIP. The total estimated project costs associated with the build-out of the Brine Line system are $367 Million.

A Brine Line Criticality Assessment was completed in 2021. Based on the criticality results, the 10-year CIP projects are prioritized due to criticality. High criticality projects will be implemented in earlier years while medium to low criticality projects can be completed in later years. Additional projects, investigations and studies were included in the CIP for parts of the Brine Line identified as high and very high criticality. Investigations and studies are included where criticality (system age, vulnerabilities due to pipe materials and corrosive environments) necessitate the need. Additional investigations and studies may lead to immediate action to protect the integrity of the Brine Line or may allow for the reassessment of the criticality to medium or low. Upon completion of these investigations, the CIP will be reviewed and revised if necessary. In addition, the CIP will be periodically evaluated for required changes related to maintaining operational capability, serving new discharger needs, meeting future capacity requirements, and managing peak flows.

Attachment 1 lists the projects in the CIP along with a brief description and project justification. Attachment 2 is the 10–Year CIP adjusted for inflation, which lists the projects, and project costs

per fiscal year. The CIP includes estimated project costs through build out of the Brine Line system (years 11–40). The CIP includes projects planned for the next budget cycle and will be evaluated and refined as the Brine Line Budget for Fiscal Years 2026 and 2027 is developed.

The 10–year CIP and build-out projects are included in the draft Brine Line Master Plan. A workshop to review the CIP and Master Plan is schedule with Member Agency staff in September.

RESOURCE IMPACTS
The CIP is estimated at over $78 Million through 2035. Projects included in the CIP would be implemented based on need and included in a future approved budget. Funding future CIP projects is determined on the benefits of utilizing either cash financing (Reserves) or debt financing (SRF Loan) or a combination of both. Reserve targets and future contributions to Reserves will be reviewed during the Fiscal Years 2026 and 2027 budget process.

Attachments:
1. CIP Project Descriptions
2. 10–Year CIP
3. PowerPoint Presentation

Attachment 1: CIP Projects and Projects identified in the Master Plan for consideration

Project ID	Project Name and Description	Justification
1	**Reach IV-B DIP Section MAS Structures:** Construct additional MAS on Reach IV-B. Based on recommendations from the 2024 Condition Assessment.	Maintain a high level of system performance. Provide access for inspection and cleaning.
2	**Reach IV-E Siphon Mainline Valve:** Installation of a new MAS within the Brine Line downstream of existing MAS 4E-0040 to facilitate newly constructed Agua Mansa Lateral.	To be used as a low flow bypass, thereby allowing dewatering of the existing siphon section. Allow emergency by-pass on portion of Reach IV-E.
3	**Reach IV Condition Assessment/Rehabilitation:** A complete inspection and condition assessment of the Reach to identify existing structural or maintenance issues.	Reach IV is the oldest portion of the Brine Line. The goal is a rehabilitation program intended to improve and extend the remaining useful life of the existing Reach. Recommendations based on the 2024 Condition Assessment.
4	**Reach IV-B Ductile Iron Pipe (DIP) Rehabilitation Project:** Cleaning, CCTV and Sonar inspection of 8,600 LF of pipeline including siphons. Perform joint repairs and spot repairs. Lining of 8,600 feet of 36 pipeline.	A portion of Reach IV-B (8,600 LF) was constructed with 36" cement-mortar lined DIP in the late 1990s and is now over 20 years old. Corrosion (both internal and external) can significantly impact the structural integrity of DIP pipe. Recommendations based on the 2024 Condition Assessment.
5	**Reach IV-D Corrosion Rehabilitation:** Cleaning, CCTV and liner repairs in the near term. Reinspecting the entire 7 miles including siphons in the mid-term. Lining of 7 miles of 42-inch pipe in two phases.	Approximately 7 miles of Reach IV-D is unlined along the pipeline invert so that the existing material has been exposed to corrosion. Recommendations based on the 2018, 2019 and 2024 Condition Assessment.
6	**Reach V MAS Condition Assessment:** Perform condition assessment on Reach V to define and locate the adequate number of MAS and develop an order of magnitude project cost.	Approximately 15 miles of Reach V is currently not accessible due to the lack of an adequate number of MAS. Access to Reach V is critical for performing routine inspections, cleaning of the pipeline, and mitigating operational issues. Additional study is necessary to identify a suitable number and placement of MAS within Reach V.
7	**Reach IV-B Condition Assessment / Repairs:** Approximately 30,000 LF of Reach IV-B, constructed between 1981 and 1996, will be inspected and evaluated for rehabilitation.	Maintain high level of system reliability and performance.
8	**Reach IV-E Condition Assessment / Repairs:** Perform an investigation and assessment to understand the reliability and performance of Reach IVE and identify potential issues and actions needed to extend the remaining useful life of the system.	Reach IVE was constructed in 1995. A portion of the Reach IVE is in a long siphon and access is limited. This inspection and subsequent repairs will extend the remaining useful life of the system
9	**Reach V - Temescal Canyon Rd (El Cerrito Segment) Widening:** Relocate existing Air Release Valves and protect Brine Line during street widening project.	Riverside County Transportation Department plans to widen Temescal Canyon Road from El Cerrito to Tom Barnes Road.

10	**Prado Access Road Improvements:** This project would improve about 3 - 6 miles of the Brine Line access road giving access to critical Brine Line facilities immediately once the reservoir has drained.	Provide access to the Brine Line. Protect the Brine Line from sedimentation within the Prado inundation area and scouring and erosion from the Santa Ana River.
11	**Alcoa Dike Protection:** Raise 2 MAS upon completion of project	A portion of IV-B was replaced in 2020 due to Alcoa Dike. Two new MAS were constructed and left below existing grade during construction of the Dike.
12	**Prado Reservoir (below 556') MAS Protection:** Modify 1 - 3 MAS below 556' elevation to be watertight.	As part of the Army Corps Mainstem project, all structures below 556 need to be watertight.
13	**Reach V Air Vac Modifications:** Relocations or modification to place the Air Vacuum Valves in vaults will protect them from damage and uncontrolled spills.	Modification to air vacuum valves on Reach V is necessary due to location in unsecure areas and at risk due to vandalism, traffic accidents or development.
14	**Reach IV-D Condition Assessment / Repairs:** Perform an assessment to identify potential issues and actions needed to extend the remaining useful life of the system. Project is in 3 phases and includes approximately 38,000 feet of pipe in each phase	Reach IV-D was constructed in the early to mid-1990s. An investigation and assessment is necessary to understand the reliability and performance of Reach IV-D.
15	**Reach V Indian Truck Trail Protection:** Protection of the Brine Line to prevent further erosion and impact to the Brine Line	A portion of the Reach V Brine Line on Indian Truck Trail in Temescal Valley is subject to erosion due to stormwater.
16	**Reach V Baker Street Protection:** Protect approximately 2 miles of Reach V on the unpaved portion of Baker Street from erosion and human activity.	Structural projection of the Brine Line.
17	**Reach IV-A Upper Pine Avenue Siphon:** Protection / Relocation of Brine Line that crosses Chino Creek.	Protection of the Brine Line due to realignment of Pine Avenue and new road crossing at Chino Creek.
18	**Capacity Management:** Project involves planning for future discharges and understanding and controlling peak flows. Capacity management projects could include flow stabilization and peak discharge elimination and concentration of brine flows.	Capacity management is critical to achieve the goal of salt balance in the upper watershed. Flow to OCSD is limited to 30 MGD and instantaneous peaks above 30 MGD are not allowed.
19	**Reach IV-D Mission Tunnel:** Correct an existing joint leak on Reach IV-D in the Mission Tunnel.	Maintain high level of system performance.
20	Hydraulic "Choke Points" Analysis: Further evaluation to determine hydraulic constraints in the Brine Line system.	Improve system capacity.
21	**OC San Future CIP:** Annual contribution of $400,000 for future OC San CIP.	SAWPA through the cost sharing agreement for the operation and maintenance of the SARI in Orange County, is obligated to pay a portion of the costs for this CIP.
22	**Smart MAS Cover Installation:** Install smart MAS covers at six (6) locations to monitor water levels during maximum flow conditions.	Monitor the "choke points," including six (6) sections with d/D values anticipated to be between 0.75 and 1.0 identified in the capacity analysis.

23	**Future Study on Green Hydrogen:** Evaluate the feasibility of using green hydrogen technology using Brine Line water.	The use of green hydrogen technology in the future could significantly reduce overall flows within the Brine Line system and reduce OC San treatment costs.
24	**Future Studies on Brine Minimization:** Evaluate various brine minimization strategies for the Brine Line system.	Minimize brine flows in order to increase the available capacity of the Brine Line.
25	**SCADA System:** Construct Master Station, operation workstation; initial set-up, integration of programming and automation. Install SCADA system at 36 existing discharger sites and 5 in line monitoring sites.	Collection of real-time flow and quality information increases SAWPA's ability to monitor, operate, and control the Brine Line system.
26	**Off-Line Storage System:** Install six (6) 2-MG and one (1) 0.5-MG off-line storage reservoirs (locations TBD); Project to be phased over 10 years.	To dewater the Brine Line system for necessary repairs/rehabilitation.
27	**IV-A Lower (Prado Inundations Area) Pipeline Replacement and Relocation:** Replace 18,000 LF of existing 36-inch pipe with 48-inch pipe in Reach IV-A Lower, west of Prado Dam.	Pipeline is under capacity and located adjacent to the Prado Dam.
28	**Reach IV-D Parallel Line from MAS 4D-150 to MAS 4D 0110:** Construct a parallel 36" line.	Relieve anticipated buildout capacity deficiencies in Reach 4D.
29	**Reach IV Parallel Line from MAS 4-0130 to MAS 4-0030:** Construct a parallel 30" line.	Relieve anticipated buildout capacity deficiencies in Reach 4.

Note: The shaded projects (22-29) are recommended improvement projects from the draft Master Plan Report.

Attachment 2: Inland Empire Brine Line 10 - Year Capital Improvement Plan (CIP)

	Year	1	2	3	4	5	6	7	8	9	10	11-40
ID#	Project	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	FY 2035 - 65
1	Reach IV - B DIP Section New MAS Structures	$334,750										
2	Reach IV-E Siphon Mainline Valve			$420,700	$433,321							
3	Reach IV Condition Assessment/Rehabilitation										$1,142,329	$8,250,000
4	Reach IV - B DIP Rehabilitation					$4,266,129						$8,790,000
5	Reach IV-D Corrosion Rehabilitation	$96,820								$1,172,991	$18,371,538	$27,807,650
6	Reach V MAS Condition Assessment						$686,580			$2,609,546	$2,687,833	$2,000,000
7	Reach IV-B Condition Assessment / Repairs		$450,883	$464,409					$1,076,755			$33,970,000
8	Reach IV - E Condition Assessment / Repairs			$491,727								$750,000
9	Reach V - Temescal Canyon Rd Widening	$103,000										
10	Prado Access Road Improvements.	$103,000	$106,090		$2,813,772							
11	Alcoa Dike Protection (Raise 2 MAS)	$77,250										
12	Prado (below 566' Elevation) MAS Protection	$206,000	$212,180									
13	Reach V Air Vac Modifications						$537,324					
14	Reach IV - D Condition Assessment / Repairs						$746,283		$791,731		$839,948	
15	Reach V Indian Truck Trail Protection								$728,393			
16	Reach V Baker St Protection										$53,757	$1,000,000
17	Reach IV-A Upper Pine Ave Siphon	$154,500										
18	Capacity Management						$388,067					$27,000,000
19	Reach IV-D Mission Tunnel		$185,658									
20	Hydraulic "Choke Points" Analysis						$119,405					$100,000
21	OC San Future CIP	$400,000	$400,000	$400,000	$400,000	$400,000	$400,000	$400,000	$400,000	$400,000	$400,000	$12,400,000
22	Smart MAS Cover Installation						$102,688	$105,769				
23	Future Study on Green Hydrogen		$210,058									
24	Future Studies on Brine Minimization						$104,679	$107,819	$111,054			
25	SCADA System	$585,349	$602,909	$44,583	$305,163	$314,317	$275,030	$283,281	$291,779	$300,532		
26	Off-line Storage System				$225,102			$13,415,218		$14,232,205		$87,262,400
27	IV-A Lower (Prado) Relocation											$55,114,000
28	Reach IV-D Parellel Line D1											$4,825,000
29	Reach IV-D Parellel Line D2											$19,520,000
	Fiscal Year Total	$2,060,669	$2,167,778	$1,821,419	$4,177,357	$4,980,446	$3,360,056	$14,312,087	$3,399,712	$18,715,275	$23,495,405	$288,789,050
	Cumulative Total	$2,060,669	$4,228,447	$6,049,866	$10,227,223	$15,207,669	$18,567,725	$32,879,812	$36,279,524	$54,994,798	$78,490,203	$367,279,253

Note: CIP projects adjusted for inflation at 3% per year.

The shaded projects are improvement projects identified in the Draft Master Plan for consideration

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Inland Empire Brine Line 10 – Year Capital Improvement Plan

David Ruhl, Executive Manager of Engineering and Operations

September 3, 2024

Agenda Item No. 6.B

Capital Improvement Plan

- Assure the long-term future viability and sustainability of the Brine Line
- $78 million over 10 years (year 2035)
- Includes recommended improvement projects from the draft Master Plan
- Organized into a 40 – year plan that corresponds to build-out of the Brine Line system (year 2065)
- Prioritized based on criticality and need

Reach IV-A and IV-B Rehabilitation Project

Capital Improvement Plan

CIP addresses

- Known system improvements
  - Reach V New MAS
  - Reach IV-B New MAS
  - Reach IV-E mainline valve
- Known O&M challenges
  - Reach V Relocation of Air – Vacs
  - Prado Access Road Improvements
  - Protection from stormwater/erosion
- On-going investigations to monitor system improvement and future needs
  - Reach IV-B DIP Corrosion
  - Reach IV-D Corrosion
  - Condition assessments (inspection , design, repair/rehabilitation)
- System improvements identified in the Master Plan
  - MAS smart cover installation
  - SCADA system
  - Investigate off-line storage system

Reach V – Relocation and Improvement

Inland Empire Brine Line 10 - Year Capital Improvement Plan (CIP)

	Year	1	2	3	4	5	6	7	8	9	10	11-40
ID#	Project	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	FY 2035 - 65
1	Reach IV - B DIP Section New MAS Structures	$334,750										
2	Reach IV-E Siphon Mainline Valve			$420,700	$433,321							
3	Reach IV Condition Assessment/Rehabilitation										$1,142,329	$8,250,000
4	Reach IV - B DIP Rehabilitation					$4,266,129						$8,790,000
5	Reach IV-D Corrosion Rehabilitation	$96,820								$1,172,991	$18,371,538	$27,807,650
6	Reach V MAS Condition Assessment						$686,580			$2,609,546	$2,687,833	$2,000,000
7	Reach IV-B Condition Assessment / Repairs		$450,883	$464,409					$1,076,755			$33,970,000
8	Reach IV - E Condition Assessment / Repairs			$491,727								$750,000
9	Reach V - Temescal Canyon Rd Widening	$103,000										
10	Prado Access Road Improvements.	$103,000	$106,090		$2,813,772							
11	Alcoa Dike Protection (Raise 2 MAS)	$77,250										
12	Prado (below 566' Elevation) MAS Protection	$206,000	$212,180									
13	Reach V Air Vac Modifications						$537,324					
14	Reach IV - D Condition Assessment / Repairs						$746,283		$791,731		$839,948	
15	Reach V Indian Truck Trail Protection								$728,393			
16	Reach V Baker St Protection										$53,757	$1,000,000
17	Reach IV-A Upper Pine Ave Siphon	$154,500										
18	Capacity Management						$388,067					$27,000,000
19	Reach IV-D Mission Tunnel		$185,658									
20	Hydraulic "Choke Points" Analysis						$119,405					$100,000
21	OC San Future CIP	$400,000	$400,000	$400,000	$400,000	$400,000	$400,000	$400,000	$400,000	$400,000	$400,000	$12,400,000
22	Smart MAS Cover Installation						$102,688	$105,769				
23	Future Study on Green Hydrogen		$210,058									
24	Future Studies on Brine Minimization						$104,679	$107,819	$111,054			
25	SCADA System	$585,349	$602,909	$44,583	$305,163	$314,317	$275,030	$283,281	$291,779	$300,532		
26	Off-line Storage System				$225,102			$13,415,218		$14,232,205		$87,262,400
27	IV-A Lower (Prado) Relocation											$55,114,000
28	Reach IV-D Parellel Line D1											$4,825,000
29	Reach IV-D Parellel Line D2											$19,520,000
	Fiscal Year Total	$2,060,669	$2,167,778	$1,821,419	$4,177,357	$4,980,446	$3,360,056	$14,312,087	$3,399,712	$18,715,275	$23,495,405	$288,789,050
	Cumulative Total	$2,060,669	$4,228,447	$6,049,866	$10,227,223	$15,207,669	$18,567,725	$32,879,812	$36,279,524	$54,994,798	$78,490,203	$367,279,253

Note: CIP projects adjusted for inflation at 3% per year.

The shaded projects are improvement projects identified in the Draft Master Plan for consideration

Next Steps

- Member Agency staff review (September workshop)
- Fiscal Year 2026 and 2027 budget process
  - Review Reserve contributions
  - Evaluate and refine projects planned for next budget cycle

Reach IV-A CCTV Inspection

Recommendation

- Receive and file

Questions?

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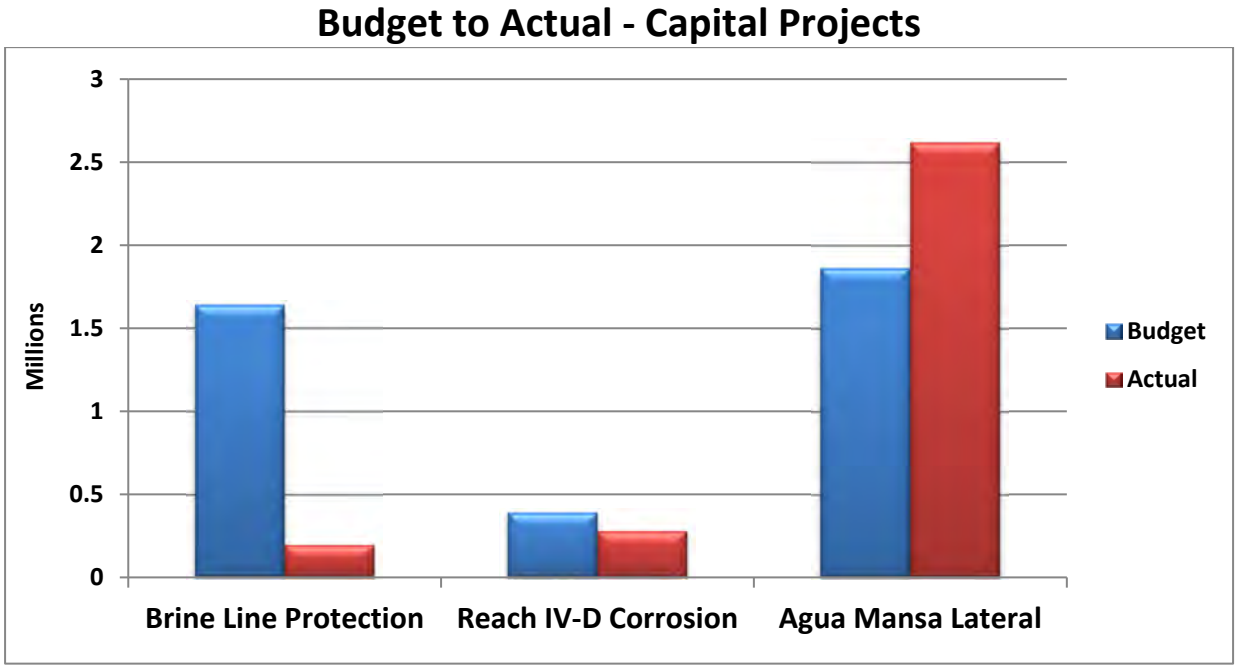
Santa Ana Watershed Project Authority
PA24 - Brine Line - Financial Report
June 2024

Staff comments provided on the last page are an integral part of this report.

Overview	This report highlights the Brine Line's key financial indicators for the Fiscal Year-to-Date (FYTD) through June 2024 unless otherwise noted.

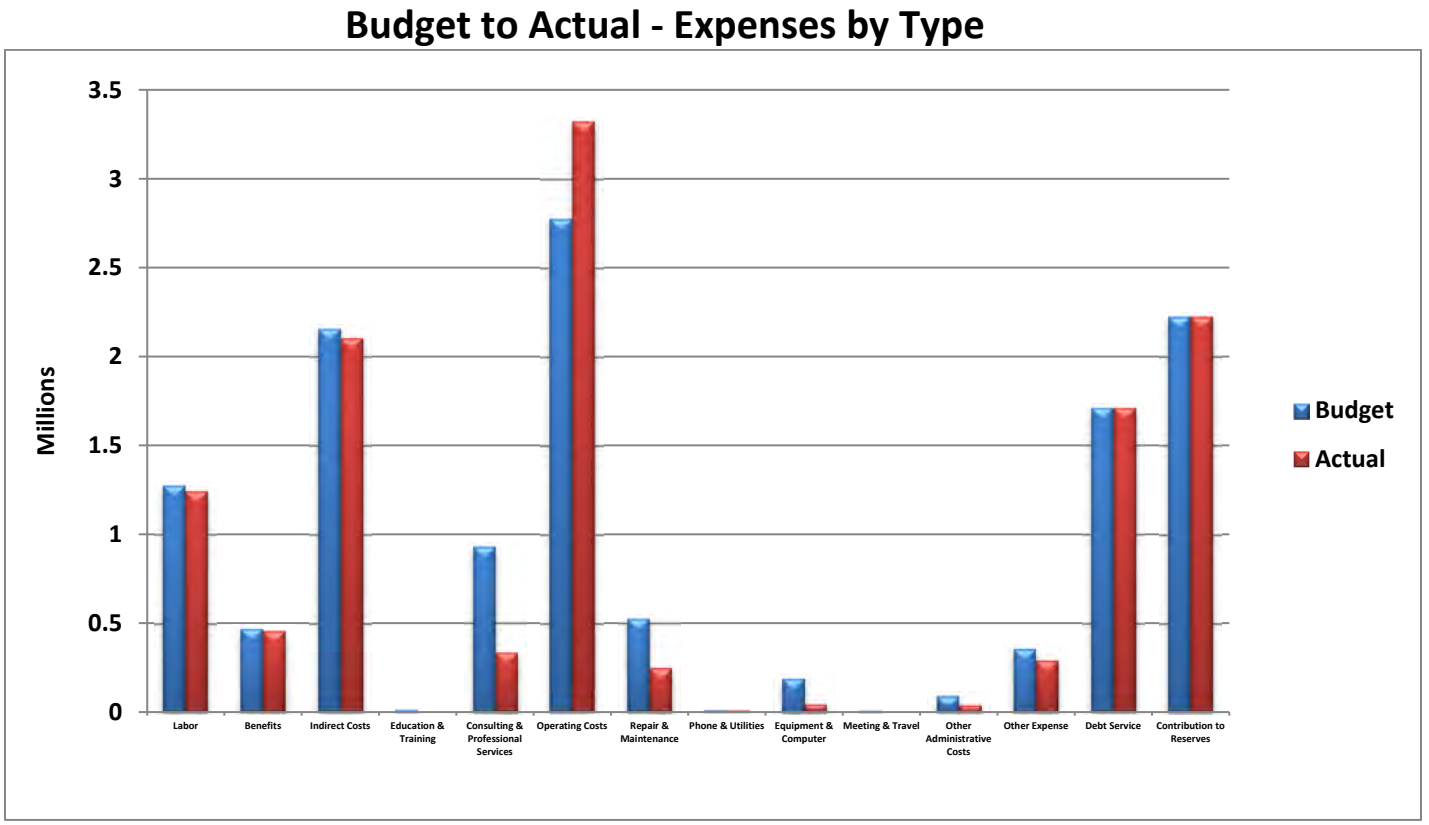
Brine Line - Capital Projects

Budget to Actual – Capital Projects				Concern
	Annual Budget	FYTD Budget	FYTD Actual	Favorable (Unfavorable) Variance
Brine Line Protection	$ 1,639,115	$ 1,639,115	$196,867	$1,442,248
Reach IV-D Corrosion	391,577	391,577	279,225	112,352
Agua Mansa Lateral	1,862,445	1,862,445	2,618,813	(756,368)
Total Capital Costs	**$3,893,137**	**$3,893,137**	**$3,094,905**	**$798,232**

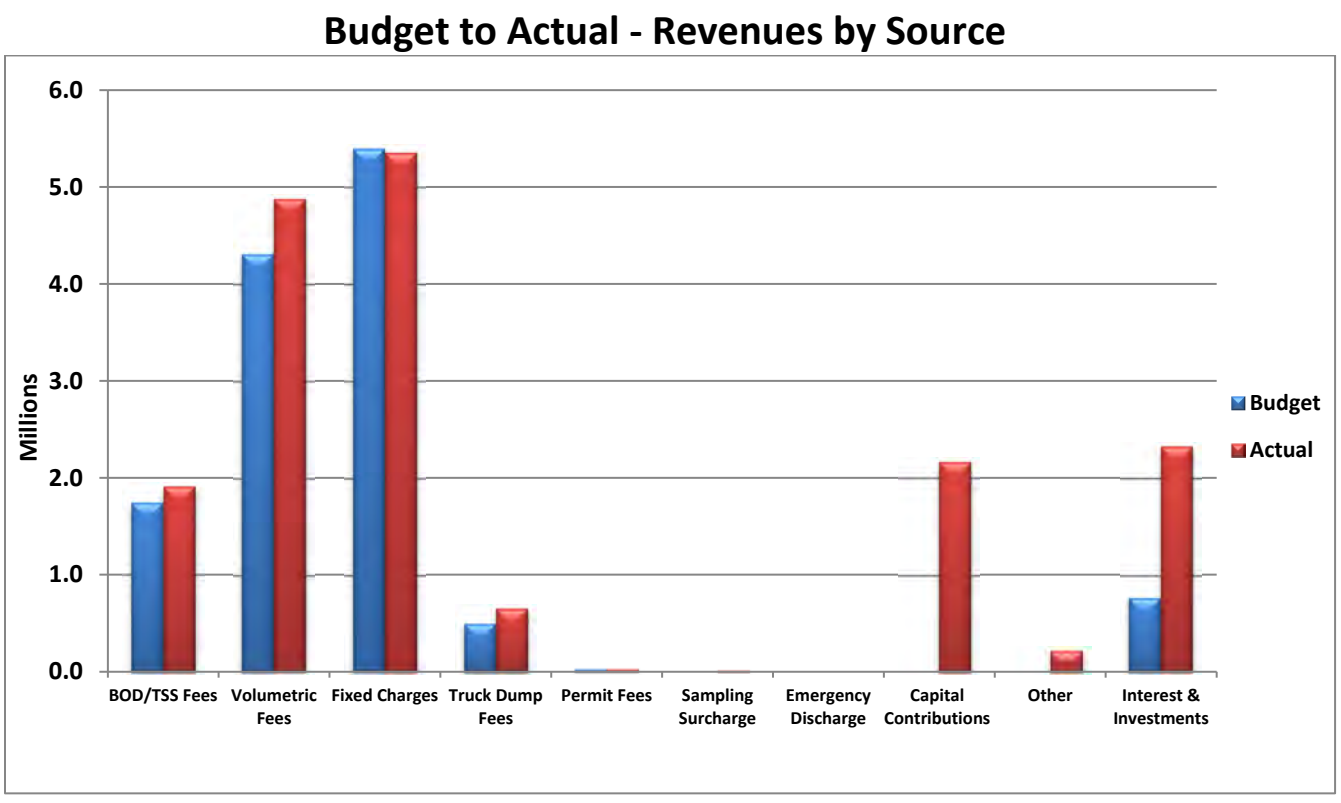


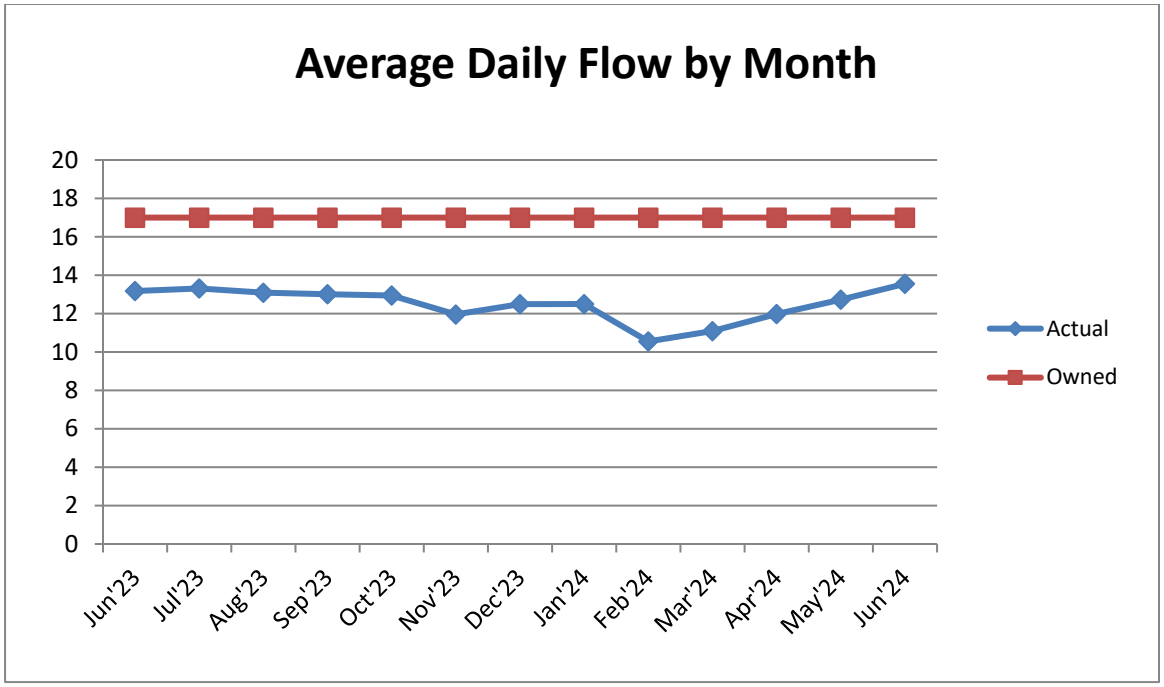
Brine Line – Operating

Budget to Actual - Expenses by Type				Favorable
	Annual Budget	FYTD Budget	FYTD Actual	Favorable (Unfavorable) Variance
Labor	$1,274,437	$1,274,437	$1,243,036	$31,401
Benefits	467,548	467,548	456,194	11,354
Indirect Costs	2,155,749	2,155,749	2,103,217	52,532
Education & Training	14,500	14,500	108	14,392
Consulting & Prof Svcs	930,000	930,000	340,138	589,862
Operating Costs	2,776,349	2,776,349	3,324,310	(547,961)
Repair & Maintenance	525,080	525,080	250,554	274,526
Phone & Utilities	12,000	12,000	9,042	2,958
Equip & Computers	188,706	188,706	48,133	140,573
Meeting & Travel	7,000	7,000	579	6,421
Other Admin Costs	89,915	89,915	40,379	49,536
Other Expense	355,551	355,551	293,382	62,169
Debt Service	1,709,476	1,709,476	1,709,476	-
Contribution to Reserves	2,225,309	2,225,309	2,225,309	-
Total	**$12,731,620**	**$12,731,620**	**$12,043,857**	**$687,763**



Budget to Actual - Revenues by Source				Favorable
	Annual Budget	FYTD Budget	FYTD Actual	Favorable (Unfavorable) Variance
BOD/TSS Fees	$1,738,500	$1,738,500	$1,905,187	$166,687
Volumetric Fees	4,308,095	4,308,095	4,879,411	571,316
Fixed Charges	5,396,025	5,396,025	5,355,510	(40,515)
Truck Dump Fees	492,400	492,400	647,714	155,314
Permit Fees	26,600	26,600	27,700	1,100
Sampling Surcharge	-	-	14,589	14,589
Emergency Discharge Fees	-	-	567	567
Capital Contributions	-	-	2,166,016	2,166,016
Other Revenue	-	-	217,073	217,073
Interest & Investments	770,000	770,000	2,327,818	1,557,818
Total	**$12,731,620**	**$12,731,620**	**$17,541,585**	**$4,809,965**



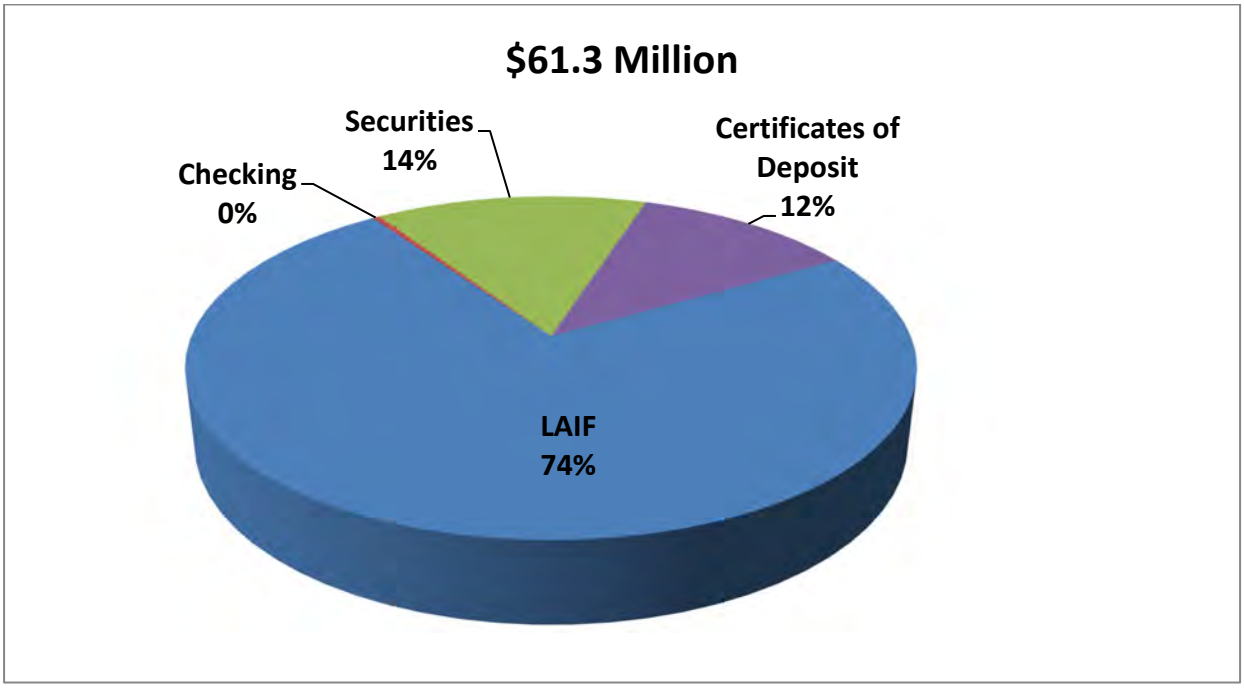


Total Discharge by Agency
(in million gallons)

Discharger	Jul'23	Aug'23	Sep'23	Oct'23	Nov'23	Dec'23	Total
Chino Desalter Authority	112.9255	98.9731	115.9900	100.2035	100.3549	122.5894	651.0364
Eastern Municipal Water District	118.6649	113.3889	120.1618	103.9813	94.6151	119.3859	670.1979
Inland Empire Utilities Agency	14.0668	13.8985	13.1309	13.2450	13.5089	13.9267	81.7768
San Bernardino Valley MWD	45.5391	45.0113	43.0704	44.7854	44.5283	45.3451	268.2796
Western Municipal Water District	129.1791	128.7686	119.3664	109.8389	105.7687	107.9789	700.9006
SAWPA Adjustment	2.0000	2.5000	1.5000	0.0000	0.0000	0.0000	6.0000
Truck Discharge	3.3964	3.0670	3.0422	3.3005	2.9823	3.1076	18.8960
Total	**425.7718**	**405.6074**	**416.2617**	**375.3546**	**361.7582**	**412.3336**	**2,397.0873**

Discharger	Jan'24	Feb'24	Mar'24	Apr'24	June'24	Jun'24	Total
Chino Desalter Authority	100.8655	85.3453	99.1696	100.8362	109.2480	117.6017	1,264.1027
Eastern Municipal Water District	88.6661	81.6807	99.2079	96.1957	101.7405	105.7744	1,243.4632
Inland Empire Utilities Agency	12.8018	12.8128	14.1122	13.3698	14.2028	15.4873	164.5635
San Bernardino Valley MWD	43.6713	37.5042	42.9846	38.3572	42.8450	43.4906	517.1325
Western Municipal Water District	113.9276	91.4526	98.6692	102.7898	116.3183	120.5613	1,344.6194
SAWPA Adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	6.0000
Truck Discharge	3.1975	2.9483	3.3836	3.3080	3.4763	3.7809	38.9906
Total	**363.1298**	**311.7439**	**357.5271**	**354.8567**	**387.8309**	**406.6962**	**4,578.8719**

Total Cash & Investments



Reserve Fund Balance

	Amount
Debt Retirement	$2,979,538
Pipeline Replacement & Capital Investment	34,149,034
OC San Pipeline Rehabilitation	2,849,924
Pipeline Capacity Management	12,671,389
OC San Future Treatment & Disposal Capacity	1,940,031
Brine Line Operating	2,240,462
Brine Line Operating Cash	4,429,327
Total Reserves	**$61,259,705**

Legend		
		Compared to Budget
	Ahead or Favorable	Above +5% Favorable Revenue or Expense Variance
	On Track	+5% to -2% Variance
	Behind	-3% to -5% Variance
	Concern	Below -5% Variance

Staff Comments

For this month's report, the item(s) explained below are either "behind", a "concern", or have changed significantly from the prior month.

Capital Projects are 20.5% below budget. Operating Expenses are 5.4% below budget and Revenues are 37.8% above budget.