MONTEREY COUNTY WATER RESOURCES AGENCY
BOARD OF DIRECTORS
RESERVOIR OPERATIONS COMMITTEE

COMMITTEE MEMBERS

David Hart, Chair
Ken Ekelund
Richard Ortiz
Mark Nielsen
David Pozzi
Mark Gonzalez

John Baillie
Benny Jefferson
Dean Benedix
Michael Tozzi (Parks)
Mark Sandoval (CalParks)

TIME: 1:30 p.m.
DATE: Thursday, September 29, 2016
PLACE: Monterey County Water Resources Agency
Board Room
893 Blanco Circle
Salinas, CA 93901

AGENDA

1. **Call to Order**

2. **Public Comment**
(Limited to three (3) minutes per speaker on matters within the jurisdiction of the Agency not listed on this agenda. The public will have the opportunity to ask questions and make statements on agenda items as the Committee considers them.)

3. **Approve the Minutes of the Reservoir Operations Committee Meeting held on August 25, 2016**
The Committee will consider approval of the minutes of the above-mentioned meeting (Attachment 1).

3. **Receive report on the Chimney Fire**
Staff will present a verbal report on the aftermath of the Chimney Fire that took place around Nacimiento Reservoir.

4. **Review the status of both reservoirs; review releases and release schedule**
Staff will present a summary of current conditions at both reservoirs, as well as provide a synopsis of release changes that have occurred since the last meeting (Attachments 2, 2a, 3, 3a, 4).

5. **Receive report on the status of the Operations Policy Manual for San Antonio and Nacimiento Reservoirs**
Staff will report on the work being done to update the San Antonio and Nacimiento Reservoirs Operations Policy manual.

6. **Receive report regarding Operations and Maintenance activities at the Reservoirs**
Staff will present a verbal report discussing the Operations and Maintenance activities at both reservoirs over the last month and the maintenance activities planned for completion during this Fiscal Year. As part of this item, the Committee will consider the following:
   A. Are there conditions that maximum velocity through the Nacimiento low-level outlet conduit should be 20 feet per second (±300 cfs) based on the recommendation from the Hollenbeck Consulting Memorandum, Subject: Nacimiento Low Level Outlet Maximum Velocity Evaluation, dated September 14, 2016 (Attachment 5).
   B. Number of Nacimiento low level valves to be replaced and maintained.

7. **Receive report regarding operation of the Hydroelectric Plant using the high-head runner**
Staff will present a verbal report regarding maximum hydroelectric power generation potential using the Hydroelectric Plant high-head runner.

8. **Receive report regarding Interlake Tunnel Project**
Staff will report on current activities regarding the Interlake Tunnel Project.

9. **Receive status reports on:**
   A. Lake recreation by Concessionaire and Parks Department
   B. Easements and Agency Leases
   C. Quagga / Zebra Mussel Plan
   D. San Luis Obispo County Activities
   E. National Marine Fisheries Service
   F. Cloud Seeding

10. **Set next meeting date and discuss future Agenda items**
The Committee will discuss and determine details for its next meeting.

11. **Adjournment**

MONTEREY COUNTY WATER RESOURCES AGENCY
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RESERVOIR OPERATIONS COMMITTEE

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Mark Sandoval (CalParks)

TIME: **1:30 PM**
DATE: **Thursday, August 25, 2016**
PLACE: **Monterey County Water Resources Agency**
Board Room
890 Blanco Circle
Salinas, CA 93901
(831) 755-4860

MINUTES

1. **Call to Order at 1:32 P.M. by Chair David Hart and a quorum was established.**
   Members present: **David Hart, Ken Ekelund, Richard Ortiz, David Pozzi, Mark Gonzalez, John Baillie, Benny Jefferson, Mark Sandoval**
   Members absent: **Mark Nielsen, Dean Benedix, Michael Tozzi**

2. **Public Comment: None**

3. **Approve the Minutes of the Reservoir Operations Committee Meeting held on July 28, 2016**

   ACTION: **On motion and second of Committee members Baillie and Pozzi, the Committee approved the minutes.**

   YES: **Hart, Ekelund, Ortiz, Pozzi, Gonzalez, Baillie, Jefferson.**
   NO:
   ABSTAIN: **Sandoval**
   ABSENT: **Nielsen, Benedix, Tozzi.**

4. **Receive report on the Chimney Fire**
   Brent Buche, Deputy General Manager, reported on this item and showed a video.

5. **Review the status of both Reservoirs; review releases and Release Schedule**
   Jason Demers, Hydrologist, reported on this item. There is a flow of 65 cfs in the Salinas River at the USGS Bradley gage. End of flow in the Salinas River is at river mile 85.5, approximately 5.5 river miles upstream of the Highway 101 Salinas River crossing in San

Lucas. San Luis Obispo County reported Nacimiento Water Project withdrawals of 742 acre-feet of water for the month of July 2016.

Nacimiento Reservoir elevation is 734.95 feet and 105,115 acre-feet of storage, 28% of capacity, and current release is 60 cfs.

San Antonio Reservoir elevation is 665.30 feet and 22,590 acre-feet of storage, 7% of capacity, and current release is 3 cfs.

Public Comment: Nancy Isakson, Salinas Valley Water Coalition

6. **Receive report on the status of the Operations Policy Manual for San Antonio and Nacimiento Reservoirs**
Jason Demers, Hydrologist reported on this item. The next Operations Policy Subcommittee meeting is scheduled for August 29, 2016 at the Agency.

7. **Receive report regarding Operations and Maintenance activities at the Reservoirs**
Chris Moss, Senior Water Resources Engineer, reported on this item with a slide presentation.

Public Comment: Lawrence Hinkle, Mission Ranches; Nancy Isakson, SVWC; William Light, Rava Ranches.

8. **Receive report regarding Interlake Tunnel Project**
David Chardavoyne, General Manager, reported on this item.

Public Comment: William Light, Nancy Isakson.

9. **Receive status reports on:**
   A. **Lake Recreation by Concessionaire and Parks Department**
   Mark Sandoval reported on this item.

   B. **Easement and Agency Leases**
   Brent Buche reported on this item.

   C. **Quagga / Zebra Mussel Plan**
   Mark Sandoval reported on this item.

   D. **San Luis Obispo County Activities**
   No report on this item.

   E. **National Marine Fisheries Service**
   No report on this item.

   F. **Cloud Seeding**
   No report on this item. The Committee discussed this item.

10. **Set next meeting date and discuss future Agenda items**

The same topics will be on the next Agenda. The next meeting is scheduled for Thursday September 29, 2016.

11. Adjournment by Chair David Hart at 2:58 P.M.

SUBMITTED BY: TERESA CAMPA

MONTEREY COUNTY WATER RESOURCES AGENCY
BOARD OF DIRECTORS - RESERVOIR OPERATIONS COMMITTEE

MEETING DATE:	September 29, 2016		**AGENDA ITEM:**
AGENDA TITLE:	Reservoir Release Update		
Consent ( )	**Action ( )**	**Information (X)**	
SUBMITTED BY: **PHONE:**	Germán Criollo (831) 755-4860	**PREPARED BY:** **PHONE:**	Jason Demers (831) 755-4860
DEADLINE FOR BOARD ACTION:		September 29, 2016	

RECOMMENDED BOARD ACTION:

None – item presented for informational purposes.

SUMMARY:

The Board of Directors receives monthly updates on the status of Agency reservoirs.

DISCUSSION/ANALYSIS:

RESERVOIR ELEVATION / STORAGE: As of September 22, 2016, San Antonio Reservoir is at an elevation of approximately 664.6 feet mean sea level (msl), 22,050 acre-feet of storage. Nacimiento Reservoir is at elevation 732.8 feet msl, 99,370 acre-feet of storage. San Antonio Reservoir is currently at 7% of storage capacity and Nacimiento Reservoir is at 26% of capacity.

RESERVOIR RELEASES: Minimum fisheries releases are currently being made from both reservoirs. Minor fluctuations in release rates are not presented in this report but are documented in the Salinas Valley Water Project Annual Flow Reports.

Releases as of September 22, 2016:

- San Antonio Reservoir: 3 cfs
- Nacimiento Reservoir: 60 cfs

Total releases from both reservoirs to the Salinas River are approximately 63 cfs. The following "provisional" flows have been recorded by the USGS:

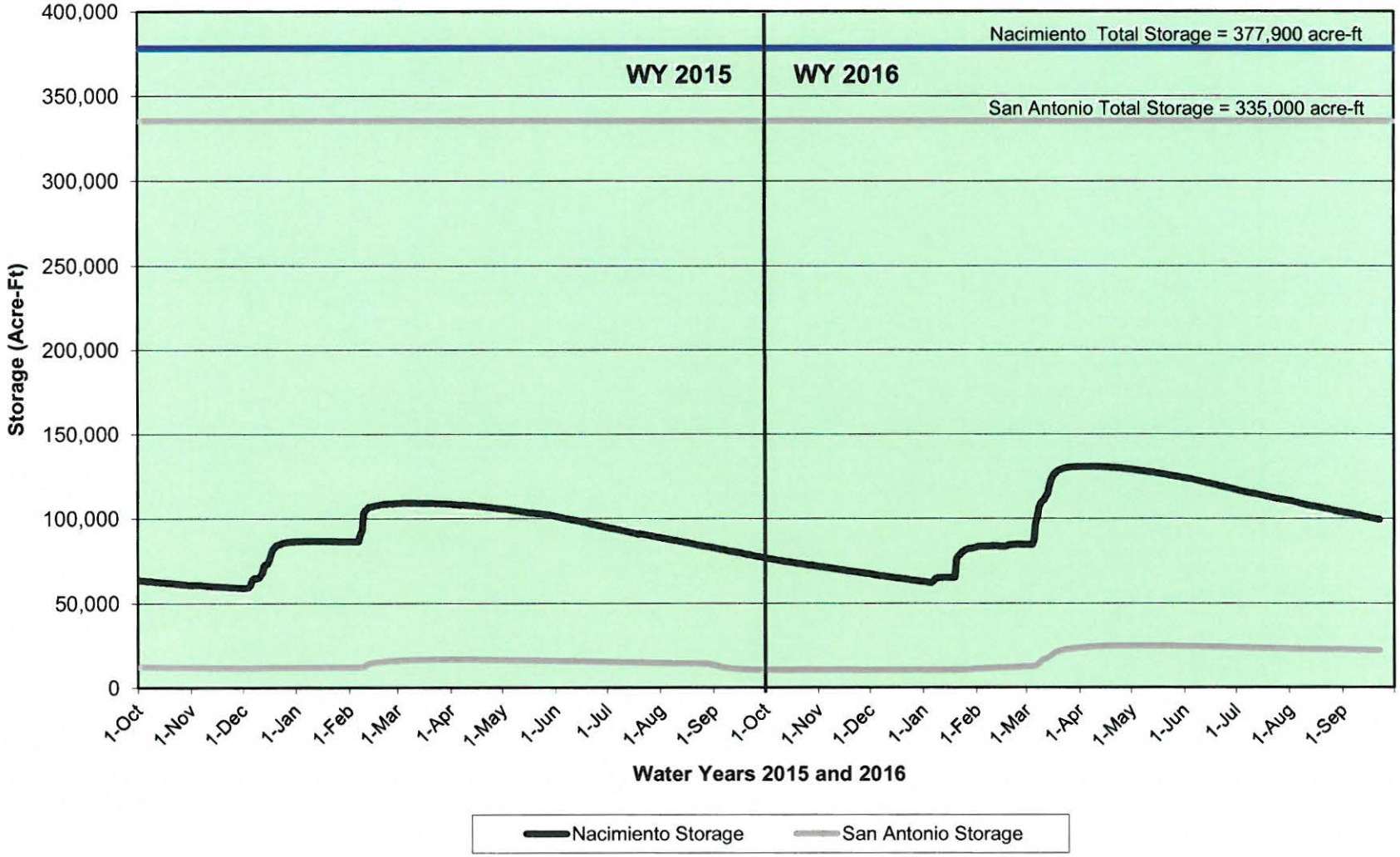
- Salinas River near Spreckels: 0 cfs
- Salinas River near Chualar: 0 cfs
- Salinas River near Soledad: 0 cfs
- Salinas River near Bradley: 68 cfs (steady)

Synopsis of Reservoir Release Changes from
December 1, 2015 to September 22, 2016

	San Antonio Reservoir		Nacimiento Reservoir		
Date	**Starting Flow**	**Ending Flow**	**Starting Flow**	**Ending Flow**	**Total Releases**
December 8, 2015	3	2	60	60	62
December 18, 2015	2	3	60	60	63

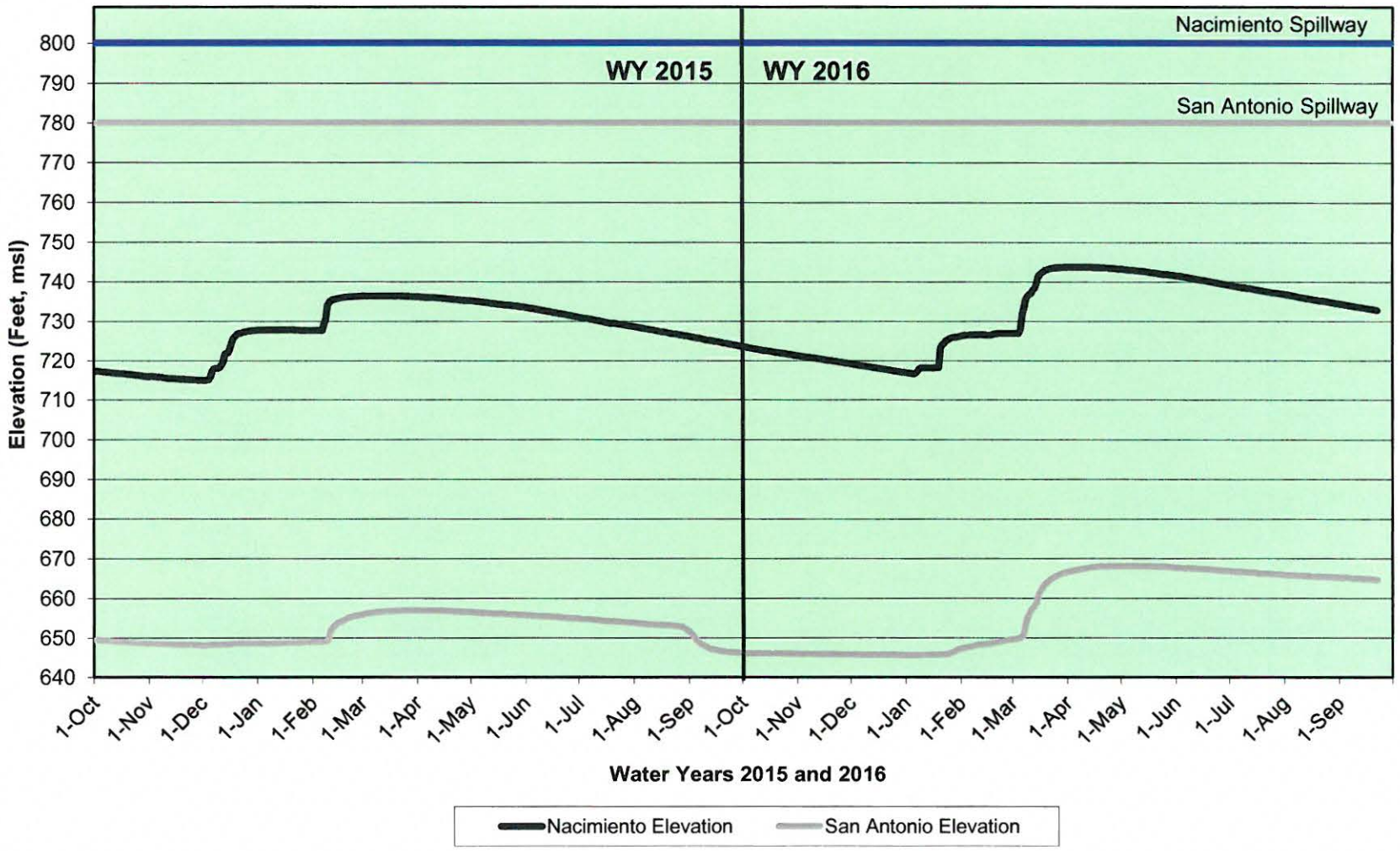
ATTACHMENT 2a

Reservoir Storage



ATTACHMENT 3

Reservoir Elevation



ATTACHMENT 3a

MONTEREY COUNTY WATER RESOURCES AGENCY

PRELIMINARY - Estimated Elevation/Storage/NWP Diversions; after September 1st

9/22/2016

RESERVOIR RELEASE SCHEDULE FOR 2016

	NACIMIENTO									SAN ANTONIO				
	Combined Releases (cfs)*	Combined Releases (ac-ft)	Evap. Losses (ac-ft)**	Reservoir Releases (cfs)*	Reservoir Releases (ac-ft)	NWP Orders (ac-ft)	NWP Diversions (ac-ft)	**Storage** (ac-ft)	**Elev.** (ft)	Evap. Losses (ac-ft)**	Reservoir Releases (cfs)*	Reservoir Releases (ac-ft)	**Storage** (ac-ft)	**Elev.** (ft)
1/1/2016								**62,755**	**717.0**				**10,254**	**645.5**
	63	3,874	208	60	3,689	576	247			67	3	184		
2/1/2016								**83,120**	**726.3**				**11,065**	**647.1**
	63	3,624	225	60	3,451	716	309			67	3	173		
3/1/2016								**84,680**	**727.0**				**12,282**	**649.5**
	63	3,874	498	60	3,689	1,012	412			128	3	184		
4/1/2016								**130,685**	**743.7**				**23,630**	**666.6**
	63	3,749	845	60	3,570	1,101	439			222	3	179		
5/1/2016								**129,008**	**743.2**				**24,750**	**668.0**
	63	3,874	1,408	60	3,689	1,112	562			393	3	184		
6/1/2016								**123,975**	**741.5**				**24,430**	**667.6**
	63	3,749	1,902	60	3,570	2,106	680			535	3	179		
7/1/2016								**116,795**	**739.1**				**23,790**	**666.8**
	63	3,874	2,009	60	3,689	2,121	742			571	3	184		
8/1/2016								**110,475**	**736.9**				**22,950**	**665.8**
	63	3,874	1,846	60	3,689	2,121	923			520	3	184		
9/1/2016								**103,630**	**734.4**				**22,510**	**665.2**
	63	3,749	1,492	60	3,570	1,686	TBR			420	3	179		
10/1/2016								**96,882**	**731.9**				**21,911**	**664.4**
	63	3,874	1,049	60	3,689	1,189	TBR			300	3	184		
11/1/2016								**90,955**	**729.5**				**21,427**	**663.8**
	63	3,749	515	60	3,570	631	TBR			160	3	179		
12/1/2016								**86,239**	**727.6**				**21,088**	**663.3**
	63	3,874	318	60	3,689	354	TBR			98	3	184		
1/1/2017								**81,877**	**725.8**				**20,806**	**662.9**
TOTALS:		**45,736**	**12,315**		**43,558**	**14,724**	**4,314**			**3,481**		**2,178**		

* Mean daily flow for the month in cubic feet per second.

** Evap. Losses estimated from long term pan evaporation data at Nacimiento and San Antonio Reservoirs.

NOTES:

1. Nacimiento Reservoir storage capacity 377,900 acre feet.
2. San Antonio Reservoir storage capacity 335,000 acre feet.
3. Reservoir Operations Committee may make release considerations for fish spawn and holiday periods to benefit recreation.
4. Shaded areas represent periods when elevations are influenced by inflow/runoff; releases may include flood control releases.
5. Preliminary Schedule assumes no inflow to reservoirs after May 1st.
6. "NWP Diversions" are San Luis Obispo County - Nacimiento Water Project conveyance facilities diversions. Max. allowable diversions for water year (Oct. 1 - Sept. 30) are 15,750 ac-ft. To Be Reported (TBR)
7. NACIMIENTO "NWP Diversions" do not include lakeside water use which is estimated at approximately 1,750 acre feet per year.

Memorandum	HOLLENBECK CONSULTING

Project:	Interlake Tunnel Project	Project No:	2014-003
Subject:	Nacimiento Low Level Outlet Maximum Velocity Evaluation	Date:	14 SEP 2016

TO: Chris Moss, P.E., Senior Water Resources Engineer
Monterey County Water Resources Agency

FROM: John R. Hollenbeck, P.E.

SUBJECT: Recommended Maximum Velocity in Low Level Outlet at Nacimiento Dam

Background

The Monterey County Water Resources Agency (MCWRA) owns and operates Nacimiento Dam located in San Luis Obispo County, California. The dam, built circa 1957, has a 54-inch inside diameter steel conduit to serve as the dam's low level outlet. The conduit is encased in structural concrete, and has an internal cement mortar lining (CML) specified to be ½-inch thick; therefore, the finished inside diameter of the low level outlet is 53-inches. The construction specifications indicate that the CML shall be field-applied machine troweled lining meeting the AWWA C205-41[1] standard specifications titled "Cement-Mortar Protective Coating for Steel Water Pipe of Sizes 30 Inches and Over".

The conduit conveys water from the reservoir to hydraulic facilities at the toe of the dam. The hydraulic facilities include: a two-unit powerhouse for regulating releases through hydroelectric generating turbines, and a six-valve energy dissipating structure used at times that the hydroelectric unit is offline. The powerhouse, designed by R.W. Beck and Associates, was installed circa 1987, whereas the six-valve energy dissipating structure is original with the dam's construction, circa 1957. The operations and maintenance manual for the hydroelectric plant [**Ref 1**] suggests that the maximum velocity in the low level outlet shall be less than 30 feet per second (fps) when the hydroelectric plant is operating. The low level outlet rating curve is presented on the Bechtel Drawing 61-A-200, and is reproduced herein as **Table 1**. The corresponding velocity for each of these rating points is also presented.

TABLE 1. Low Level Outlet Rating, Nacimiento Dam

Low Level Outlet Rating (cfs)	Nacimiento Reservoir Elevation (ft-NGVD29)	Velocity (fps)
0	670	0.0
240	677	15.7
305	680	19.9
350	683	22.8
380	692	24.8
425	710	27.7
470	730	30.7
540	770	35.2
585	800	38.2

Purpose

MCWRA requests Hollenbeck Consulting (HC) to research the maximum velocity through CML steel conduits, and present a recommended acceptable maximum velocity for the Nacimiento Low Level Outlet based on this research.

Research on Maximum Velocity in Cement-mortar Lined Steel Conduits.

Literature research from the HC technical library was performed to gain an understanding of the recommended maximum velocity for CML steel conduits. HC also contacted a few experts in the area of steel conveyances. **Table 2** presents a summary of these results.

[1] Note that in 1951, AWWA removed the field-applied specifications for CML and created a new specification, AWWA C602, Cement-mortar Lining of Water Pipelines In-Place, 4-inches and Larger.

TABLE 2. Recommendations on Maximum Velocity in Cement-mortar Lined Steel Conduits

Cited Reference	Recommended Maximum Velocity (quoted where appropriate)
Nacimiento Hydroelectric Project Operation and Maintenance Manual, R. W. Beck and Associates, August 1987.	"To prevent accelerated deterioration of the lining, velocities are kept below 30 fps during power operation …"
AWWA C205-00, Cement-mortar Protective Lining and Coating for Steel Water Pipe 4-inches and Larger (shop applied)	"Flow Velocity. Cement-mortar linings perform best when flow velocities are in normal ranges. When the flow velocity exceeds approximately 20 ft/s, special studies may be required to determine the suitability of this type of lining material."
Chapter 5 – Steady Flow in Closed Conduits, Civil Engineering Guidelines for Planning and Designing Hydroelectric Developments, ASCE/EPRI, 1989.	"Design velocities are usually in the range of 10 to 20 ft/s, with most below 15 ft/s, when based on the cost of construction versus the value of the energy lost due to friction." [note: this was within a section discussing concrete-lined power conduits, and did not specifically mention cement-mortar lined conduits]
Mr. Henry Bardakjian, Ameron International (retired), task group member on AWWA Manual M11, Fourth Edition (Steel Pipe – A Guide for Design and Installation), and Chairman for AWWA C205-00, Cement-mortar Protective Lining and Coating for Steel Water Pipe 4-inches and Larger (shop applied), just to mention a few.	"In plant piping sometimes velocities up to 30 fps have been used. For higher velocities, you have to watch for cavitation even for bare steel.[2]"
Mr. Dick Stutsman, Pacific Gas and Electric Company (retired), Chairman of ASCE Manuals and Reports on Engineering Practice No. 79 – Steel Penstocks, 1993.	"… the maximum velocity for that project should be in the 20 fps range."
Water Pipe Design Manual, Northwest Pipe Company	"Cement-mortar linings perform best when flow velocity is 20 feet per second or less."
Section 10 – Corrosion Prevention and Control, ASCE Manuals and Reports on Engineering Practice No. 79 – Steel Penstocks, Richard D. Stutsman, Chairman, 1993.	"…that water velocities do not exceed 20 feet per second."
Section 10 – Corrosion Prevention and Control, ASCE Manuals and Reports on Engineering Practice No. 79 – Steel Penstocks, John H. Bambei, Chairman, 2011 (DRAFT).	High Water Velocities: "… on flatter profiles, cement-mortar lining may be applicable provided that the velocity does not exceed 20 feet per second and there are not large volumes of transported sands and gravels."

Several other technical documents by AWWA, Corps of Engineers, United States Bureau of Reclamations, to name a few, were also consulted, but the search of the document did not locate reference to maximum design velocity.

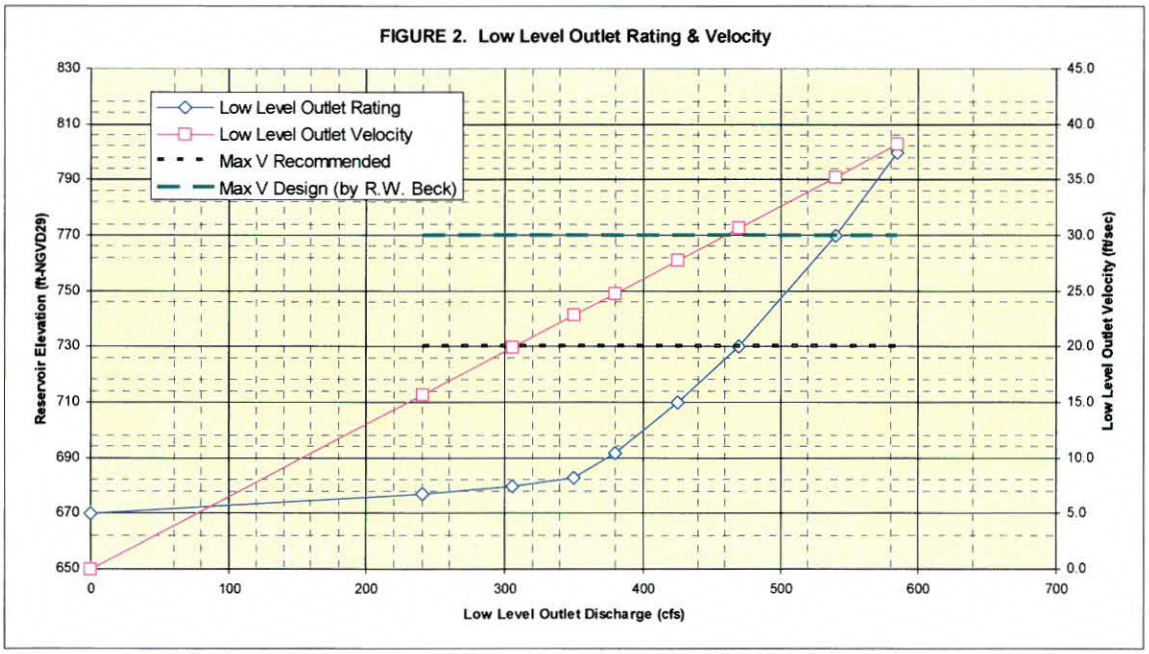
Conclusion and Recommendation

The author of this technical memorandum began work on this assignment with a presumption that the maximum velocity should be in the order of 20 fps based on past work experiences. The literature research, for the most part, confirms that 20 fps is the standard for the industry. The actual operation of the low level outlet at the dam suggests that the CML conduit has routinely experienced velocities in excess of 20 fps. **Figure 1** presents the rating of the low level outlet and the flow velocity within the outlet at these

[2] Mr. Bardakjian's personal e-mail communication to the author suggests that plant piping some times has velocities up to 30 fps. He was asked what he meant by "plant piping" but did not provide a response.

rating points. Superimposed on this graphic are the 20 fps threshold that is recommended within the cited literature and the 30 fps threshold cited in the hydroelectric power plant's operations and maintenance manual. It is common for variations in maximum-reported values for design parameters, so the 20- to 30-fps range does appear to be the upper limits for this low level conduit. MCWRA has nearly 60 years' experiences of this conduit in operation at times where the velocity exceeds 20 fps with no reported damage to the CML. Since most research literature suggests 20 fps as a maximum, in particular the AWWA C205-00 specification[3], it would suggest that the velocity of the low level outlet should be limited to a maximum of 20 fps.

Based on the longevity of conduit performance with no reported issues, a maximum velocity of no more than 30 fps appears acceptable; however, based on accepted engineering references, it is recommended that MCWRA consider limiting the low level outlet conduit velocity to a maximum of 20 fps if such operations meet conservation release goals.



References

1. Section II – Project Description, Nacimiento Hydroelectric Project Operation and Maintenance Manual, R. W. Beck and Associates, August 1987.

[3] AWWA C205-00 is for shop-applied linings. The AWWA C602-00 standard for field-applied linings was reviewed and determined that it does not contain a maximum velocity recommendation.