NOTE: If you wish to address the MWD Board of Directors during discussion of an agenda item, or during the PUBLIC FORUM, please complete a Speaker Request card (blue in color) and give it to the Board Secretary. Unless a detailed presentation of an agenda item is required by the Board of Directors, it is requested that each speaker limit comments to FIVE MINUTES. All testimony given before the Board of Directors is tape recorded.

AGENDA
BIG BEAR MUNICIPAL WATER DISTRICT

BOARD OF DIRECTORS
Regular Meeting
February 18, 2010

PLACE: Big Bear Municipal Water District
40524 Lakeview Drive, Big Bear Lake, CA 92315

Next Resolution Number: 2010- 02

OPEN SESSION: 1:00 P.M.

1. CALL TO ORDER

2. PLEDGE OF ALLEGIANCE

3. DISCUSSION AND ACTION ON CLOSED SESSION ITEMS

4. REPORTS
- A. General Manager
- B. Lake Manager
- C. Legal
- D. Committee
- E. Other

5. CONSENT CALENDAR
- A. Minutes of an Regular Meeting of February 4, 2010
- B. Warrant List Dated February 12, 2010 for $29,087.98
- C. Consider approval of a Resolution of the Board of Directors of Big Bear Municipal Water District supporting the nomination of Melody Henriques-McDonald to the Executive Committee of the Association of California Water Agencies Joint Powers Insurance Authority (ACWA/JPIA)
- D. Consider approval of a vote on Alternative Apportionment Formula for Special Districts for Fiscal Year 2010-11 and thereafter

6. BUSINESS
- A. Kayak rental businesses - Discussion and possible action

B. Consider approval of a proposal from Transtech Mapco for Big Bear Marina Contamination Remediation Design
C. TMDL Aquatic Plant Management Plan – Approve conceptual cost and responsibility sharing plan

7. PUBLIC FORUM

(The Board will receive comments from the public on items not on the agenda; no action is permitted on these items. Time set aside not to exceed 30 minutes total by all participants)

8. ANNOUNCEMENTS

9. DIRECTOR COMMENTS

10. CLOSED SESSION

Conference with Legal Counsel

1. Potential litigation – one case

11. ADJOURNMENT

NEXT MEETING: Open Session at 1:00 P.M.
Thursday, March 4, 2010
Big Bear Municipal Water District
40524 Lakeview Drive, Big Bear Lake, CA

MINUTES OF A REGULAR MEETING OF BIG BEAR MUNICIPAL WATER DISTRICT HELD ON THURSDAY, FEBRUARY 4, 2010

CALL TO ORDER

President Fashempour called the Open Session to order at 1:00 PM. Those in attendance included Director Eminger, Director Suhay, Director Smith, Director Murphy, General Manager Scott Heule, Lake Manager Mike Stephenson, and Board Secretary Vicki Sheppard.

REPORTS

General Manager, Scott Heule reported that yesterday he was interviewed on Channel 6, *Good Morning Big Bear*. He commented that he talked about fee schedules, ice safety, the District's new president, summer ramp hours, lake levels and fisheries. He reported that the surveillance cameras at the dam were down for several days explaining that Jim Weber worked with Byrd Electronics to get them back online on Monday. He stated that there was an electrical problem that needed resetting on the antennae pole at the observatory and that all is working well now. Mr. Heule commented that the hardware for equipping both ramps with surveillance cameras and point of sale computer capabilities is on hand. He added that when Marc (Computer Village) can get into the ramp buildings he is ready to install the equipment. He explained that there will be four cameras at each ramp; two will be placed inside the ramp office, one will be looking at the ramp and the other will be focused on the spike strips. He reported that recording equipment for the cameras will be located in a secure control box only accessible to Mike Stephenson and Travis Carroll. Director Suhay asked if these cameras are better than the ones at the dam. Mr. Stephenson reported that they supposedly are more exact being able to read a license plate on a car. He explained that they are motion activated and can begin recording 30 seconds before a vehicle approaches. Mr. Heule reported that each ramp, plus the counter in the District office, will be set up to scan bar codes on lake permits and use point of sale software to improve cash balancing and auditing. He added that both ramp offices will have a wireless router connected to a cellular phone line to "talk" to the District office server. He explained that the new point of sale hardware will only be black boxes, set up to send and receive District related employee email and run and report Lake Permit sales. Mr. Heule reported that the District has been advertising the seasonal positions for a couple weeks and the year-round position for almost a week. He commented that the response has been very good with more than 50 individuals turning in applications so far. He added that we will stop accepting applications for the seasonal positions next Friday. He explained that he will want to review the applications received so far for the year-round position before deciding if and when to stop accepting applications for that position.

Lake Manager, Mike Stephenson reported that he took a ride around the Lake to check on the facilities after the big storm. He explained that the docks took a little beating. He added that Jim Weber took a boat out and broke up some ice around the docks. He commented that the East Ramp didn't flood and the West Ramp is not damaged. He reported that Mr. Carroll saved a Patrol Boat from sinking by digging the snow out of it on several occasions. He added that the fish cages are okay. He reported that the office remodel will begin this coming Monday. Mr. Stephenson reported on the trip that he and Mr. Carroll took to Lake Mead explaining that it was a very worthwhile trip. He stated that they decontaminated boats with "solid mussels" on them, taking many hours to finish. He added that he and Mr. Carroll are now Certified Level 1 Quagga Inspector Trainers.

APPROVAL OF CONSENT CALENDAR

Upon a motion by Director Suhay, seconded by Director Murphy, the following consent items were unanimously approved:

- Minutes of an Adjourned Regular Meeting of January 25, 2010
- Warrant List Dated January 29, 2010 for $14,480.10

QUAGGA INITIATIVE UPDATE FOR SUMMER 2010 – REPORT (NO ACTION)

Travis Carroll, Lake Operations Supervisor, made a PowerPoint presentation updating the Board on the District's invasive species program and showing the Quagga Mussel outreach materials that will be used this season. He explained that non-registered permits will not be renewed through the mail this year (as they have been in the past) and showed the new post card explaining the new procedures for launching non-registered vessels. He reported on the new inspection card that boaters will carry with them. He explained about the use of the bar codes on the new permits. Mr. Carroll showed the new "Zap the Zebra" brochure. He displayed the new bands that will be placed on inspected boats so they can launch again without being re-inspected. He reported that each inspector will get a hat on completion of the class on March 30th.

DAM MAINTENANCE ACCESS BRIDGE REPORT – NO ACTION

Mr. Heule reported that he received an e-mail dated January 20th from Bryce Johnston (Caltrans) regarding Caltrans funding of replacement of the maintenance bridge. He explained that the message indicates that Mr. Johnston spoke with federal highway officials who helped provide funding for the new highway bridge project. He added that they are in agreement with the direction Caltrans is moving to build the maintenance bridge as a part of the new highway bridge project. He stated that Mr. Johnston wants to meet again to determine what contribution will be needed from the District. Mr. Heule explained that during previous conversations with Mr. Johnston he indicated that a change order maintenance bridge project will be more costly than if it were bid separately. He added that for planning purposes the Committee is assuming the construction cost for the maintenance bridge will be on the order of $1.4 million with $990,000 coming from Caltrans. Mr. Heule reported that Simon Wong submitted a proposal to complete the plans and specifications for the maintenance bridge construction as a change order to the existing contract for the highway bridge. He added that Simon Wong estimates that the work can be completed within about 12 weeks and the prices quoted will remain good for 12 months. He reported that the price for the engineering work comes to $138,000. Mr. Heule explained that including the railing study ($4,900) and the original "Advance Planning Study" ($13,200), the total engineering design costs for the maintenance bridge will come to $156,000. He stated that the Committee reviewed project costs assuming the $990,000 contribution from Caltrans, and concluded that it is likely that to complete the project the District might be paying on the order of $566,000 to complete the new maintenance bridge. He explained that the Facilities Committee would like to wait until the District has a written commitment from Caltrans regarding their participation before authorizing Simon Wong to proceed with the work outlined in their $138,000 proposal. Director Murphy asked what the weight of the existing bridge is commenting that he would think the old bridge weighs more than the new bridge will. Mr. Heule stated that that he doesn't know the weight adding that Rob Richardson, Flat Iron Construction, has some concerns with the weight of some of the components of the new maintenance bridge and their equipment's ability to lift it. He added that another meeting with Caltrans is needed. Director Murphy asked the timeframe for completing the new bridge. Mr. Heule stated possibly

in the fall of 2011. Director Suhay commented that he doesn't think the District should have to pay to take the old bridge off adding that he feels Caltrans should pay for it all or leave it as it is.

AUTHORIZE STAFF TO SOLICIT PROPOSALS FOR CEQA WORK FOR BIG BEAR MARINA DREDGE PROJECT

Mr. Heule reported that the Watershed/Lake Improvement Committee reviewed the project description and final dredge project layout prepared by Moffatt & Nichol for the Big Bear Marina Dredge project. He stated that the plan includes five priority numbered dredge areas. He commented that the project is a balanced cut and fill operation that will result in the extension of the peninsula on the west side of Big Bear Marina. He explained that Area 1 is 75 feet wide by 560 feet long immediately west of the peninsula; Area 2 is located inside the marina proper measuring 75 feet wide and about 520 feet long; Area 3 abuts the Area 1 dredge and Area 4 will provide navigable water during the lowest lake levels for operations of the fuel dock and rental offices at Big Bear Marina. Mr. Heule added that the design depth of all dredge areas is 18 feet below spillway elevation. He stated that although the Committee does not believe the District can afford the entire project as designed, the engineer is drafting specifications that will allow flexibility during the project bidding process to maximize the dredge based on the bid results. He explained that the entire project would remove 23,650 cubic yards of soil from the lake and use it to extend the peninsula at the marina. Mr. Heule commented that while Moffatt & Nichol is finalizing drawings and specifications, the District needs to complete environmental work on the project. He explained that Staff used the project description to draft the "Request For Proposal" to solicit proposals from a select group of consultants (RFP Consulting, Lilburn Corp. MWH Americas, Brown & Caldwell, Tom Dodson & Assoc.) to prepare the necessary EIR for the project, and providing staff is authorized to solicit this work, proposals will be ready for the Committee to review and make a recommendation for Board approval at the meeting on March 4, 2010. Mr. Heule reported that Mr. Stephenson will meet with MWH tomorrow to tour the Big Bear Marina site.

Director Suhay moved approval to authorize staff to solicit proposals for CEQA work for Big Bear Marina Dredge Project. Director Eminger seconded the motion.

Director Suhay inquired that if contamination is found in some areas, will the District be able to continue working in non-contaminated areas and will we keep checking contaminated areas until they are clear. Mr. Heule stated that the samples taken will allow lines to be drawn around areas of contamination (if they exist) so hopefully we will be able to work on other non-contaminated areas. Director Eminger asked how long the areas of contamination (if they exist) have been there. Mr. Stephenson stated that he believes they have been there for over 20 years.

Alan Sharp, Big Bear Marina, requested the District move the fish cages so he can have more free area to move snow during a big storm. He expressed his concern with some of the dredge areas (especially Areas 3, 4, 5) stating that certain areas are very important to their marina operation. Mr. Heule stated that the District has to have discretion, depending on the outcome of the sampling, and the proposal maximizes our flexibility. Mr. Stephenson stated that it is not that we don't want to do the entire project, however we need to have flexibility to work on areas when we can. Mr. Loran Hafen, Holloways Marina, asked if there is contamination found in one area, can the District work on other areas that don't have contamination. Mr. Heule stated that since we are working with another agency, we want to learn as much as we can and then decide the best way to proceed.

President Fashempour stated that the motion had been moved and seconded and she called for a vote. The motion was unanimously approved.

PUBLIC FORUM
No other comments were made

ANNOUNCEMENTS
Mr. Heule announced that on Monday, February 15, the office will be closed in observance of Presidents Day. He reported that at the Board meeting on February 18th a full discussion of the kayak rental business issue will be scheduled. He commented that he, along with President Fashempour and Director Suhay, will be traveling to Washington DC March 22nd through 25th. He stated that the ACWA Spring Conference will be taking place in Monterey May 4th through 7th adding that any Directors interested in attending should let him know.

DIRECTOR COMMENTS
Director Murphy commented that because of the recent storms, the creeks are flowing well. Director Eminger stated that he is looking forward to a good summer.

ADJOURNMENT
There being no further business, the meeting was adjourned at 1:54 P.M.

NEXT MEETING Open Session at 1:00 P.M.
Thursday, February 18, 2010
Big Bear Municipal Water District
40524 Lakeview Drive, Big Bear Lake, CA

Vicki Sheppard
Secretary to the Board
Big Bear Municipal Water District

(SEAL)

Big Bear Municipal Water District
Computer & Manual Check Register
Current and History Files, After 01/29/10
Account 10010-00-001, Sessions 000000 to 001797

Active Sessions (Not Included in Report)
001760

Check	Payment / Vendor Information	Ck Date	Prity	Invoice	Session	Reference	Amount
Checking Account:	10010-00-001						
147791	ALLPRO / All Protection Alarm Co.	02/10/10	2	32781	001797	FACILMAINT	360.00
						ALLPRO Subtotal :	360.00
147792	ATT785 / AT&T	02/10/10	2	01242010	001797	PHONE-LDER	30.27
						ATT785 Subtotal :	30.27
147793	BANKSU / BANK SUPPLIES	02/10/10	2	1002610200	001797	OFFSUPPLE	268.95
						BANKSU Subtotal :	268.95
147794	BBDSPL / Big Bear Disposal	02/10/10	2	226044	001797	UTIL-MAIN	144.60
						BBDSPL Subtotal :	144.60
147795	BBL / City of Big Bear Lake	02/10/10	2	RV2010	001797	RV MAINT	282.70
						BBL Subtotal :	282.70
147796		02/10/10	2	2319	001797	FACILMAINT	3959.12
						BBL Subtotal :	3959.12
147797	BCSIGN / BEAR CITY SIGN COMPANY	02/10/10	2	JOB#1	001797	MARSHMITIG	65.25
						BCSIGN Subtotal :	65.25
147798	BVELEC / Bear Valley Electric	02/10/10	2	01252010	001797	UTIL-RAMPS	762.77
147798		02/10/10	2	01282010A	001797	UTIL-DAM	196.07
147798		02/10/10	2	01282010B	001797	UTIL-DAM	11.58
147798		02/10/10	2	01282010C	001797	UTIL-AERAT	762.28
147798		02/10/10	2	01282010D	001797	UTIL-MAIN	11.28
						BVELEC Subtotal :	1743.98
147799	BYRDIN / Byrd Industrial Electronics	02/10/10	2	111-10	001797	DAM MAINT	778.92
						BYRDIN Subtotal :	778.92
147800	COMSER / ComSerCo	02/10/10	2	MA50219206	001797	RDSVCCONT	255.00
						COMSER Subtotal :	255.00
147801	CONTAI / Container Storage Solutions	02/10/10	2	01072010	001797	MAINT-SHOP	108.75
						CONTAI Subtotal :	108.75
147802	CSBPUB / Dept Public Health Env Hlth S	02/10/10	2	IN0122008	001797	PERMITS	25.00
						CSBPUB Subtotal :	25.00
147803	CTTSPO / CT&T Sports	02/10/10	2	3581	001797	QUAGGAPRIN	1065.61

Big Bear Municipal Water District
Computer & Manual Check Register
Current and History Files, After 01/29/10
Account 10010-00-001, Sessions 000000 to 001797

Active Sessions (Not Included in Report)
001760

Check	Payment / Vendor Information	Ck Date	Prity	Invoice	Session	Reference	Amount
						CTTSPO Subtotal :	1065.61
147804	DIRCTV / DIRECTV	02/10/10	2	1180836432	001797	UTIL-RV	150.24
						DIRCTV Subtotal :	150.24
147805	DISH / Dish Network	02/10/10	2	02042010	001797	UTIL-MAIN	50.98
						DISH Subtotal :	50.98
147806	DMV / Department of Motor Vehicles	02/10/10	2	PO14165	001797	VESSELREGI	7376.00
						DMV Subtotal :	7376.00
147807	DWP / Department of Water and Power	02/10/10	2	01202010A	001797	UTIL-MAIN	30.32
147807		02/10/10	2	01202010B	001797	UTIL-MAIN	64.70
147807		02/10/10	2	01292010A	001797	UTIL-MAIN	73.60
147807		02/10/10	2	01292010B	001797	UTIL-MAIN	13.40
147807		02/10/10	2	01292010C	001797	UTIL-MAIN	44.15
147807		02/10/10	2	01292010D	001797	UTIL-RAMPS	113.70
147807		02/10/10	2	01292010E	001797	UTIL-RAMPS	17.87
						DWP Subtotal :	357.74
147808	GINOS / Gino's Tire & Wheel	02/10/10	2	12713	001797	ONROADMAIN	674.03
						GINOS Subtotal :	674.03
147809	GRZZLY / Grizzly	02/10/10	2	164015	001797	ICE	270.00
147809		02/10/10	2	164020	001797	QUAGGA	350.00
147809		02/10/10	2	527583	001797	PREEMPLOYM	546.60
147809		02/10/10	2	527635	001797	PREEMPLOYE	492.90
						GRZZLY Subtotal :	1659.50
147810	HAUPT / Ralph W. Haupt	02/10/10	2	2001	001797	PETRO-AUTO	72.77
147810		02/10/10	2	2011	001797	PETRO-AUTO	200.36
						HAUPT Subtotal :	273.13
147811	IDEARC / SUPERMEDIA LLC	02/10/10	2	02012010	001797	PHONE-MAIN	125.50
						IDEARC Subtotal :	125.50
147812	KBHR / KBHR-FM	02/10/10	2	18389	001797	PREEMPADV	102.00
147812		02/10/10	2	18452	001797	PREEMPADV	238.00
						KBHR Subtotal :	340.00
147813	LEMIEU / Lemieux & O'neill A Professional	02/10/10	2	20999M-126	001797	LEGALRETAI	3500.00
						LEMIEU Subtotal :	3500.00

Big Bear Municipal Water District
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001760

Check	Payment / Vendor Information	Ck Date	Prity	Invoice	Session	Reference	Amount
147814	MCOYBR / Mountain Water Company	02/10/10	2	17510	001797	UTIL-MAIN	25.25
						MCOYBR Subtotal :	25.25
147815	MOOREV / Victoria Moore	02/10/10	2	02092010	001797	SEMINAR	195.25
						MOOREV Subtotal :	195.25
147816	NAPA / McConnell Motor Parts Inc.	02/10/10	2	894628	001797	ONRDMAINT	53.38
147816		02/10/10	2	900935	001797	EQUIPMAINT	199.83
147816		02/10/10	2	901462	001797	ONRD MAINT	91.21
147816		02/10/10	2	901463	001797	ONRDMAINT	35.49
147816		02/10/10	2	902672	001797	ONRDMAINT	53.38
						NAPA Subtotal :	433.29
147817	PORTSU / PORT SUPPLY	02/10/10	2	9043224	001797	OSHA	29.78
147817		02/10/10	2	9045732	001797	OSHA	143.37
						PORTSU Subtotal :	173.15
147818	QUEST / Quest Technologies	02/10/10	2	251106	001797	PATROLMAIN	254.03
						QUEST Subtotal :	254.03
147819	ROTARY / Rotary Club of Big Bear Lake	02/10/10	2	CR-0012	001797	MEMBERSHIP	92.00
						ROTARY Subtotal :	92.00
147820	SAFELI / Safelite Glass Corp.	02/10/10	2	6154247313	001797	ONROADMAIN	601.21
						SAFELI Subtotal :	601.21
147821	SHEPPA / Victoria Sheppard	02/10/10	2	02092010	001797	SEMINAR	202.71
						SHEPPA Subtotal :	202.71
147822	UPS / UPS	02/10/10	2	F33Y11040	001797	SHIPPING	25.88
						UPS Subtotal :	25.88
147823	VALERO / Valero Marketing and Supply Co.	02/10/10	2	01192010	001797	PETRO-AUTO	551.26
						VALERO Subtotal :	551.26
147824	VERIZO / Verizon California	02/10/10	2	01252010	001797	PHONE-WS	36.72
						VERIZO Subtotal :	36.72
147825	VERONL / Verizon Online	02/10/10	2	62314290	001797	DSL-MAIN	159.95
147825		02/10/10	2	6311165	001797	DSL-CREEK	89.99
						VERONL Subtotal :	249.94
147826	VERWIR / Verizon Wireless	02/10/10	2	832534737	001797	PHONE-CELL	517.59

Big Bear Municipal Water District
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Account 10010-00-001, Sessions 000000 to 001797

Active Sessions (Not Included in Report)
001760

Check	Payment / Vendor Information	Ck Date	Prity	Invoice	Session	Reference	Amount
						VERWIR Subtotal :	517.59
147827	WAPMS / WAPMS	02/10/10	2	2010	001797	MEMBERSHIP	150.00
						WAPMS Subtotal :	150.00
147828	WATERE / Water Education Foundation	02/10/10	2	16081	001797	DIRECCONFR	1500.00
						WATERE Subtotal :	1500.00
147829	XEROX / Xerox Corporation	02/10/10	2	45890785	001797	COPIERLEAS	484.43
						XEROX Subtotal :	484.43
						Total For Check Account: 10010-00-001	29087.98
						Check Register Total :	29087.98

BIG BEAR MUNICIPAL WATER DISTRICT
REPORT TO BOARD OF DIRECTORS

MEETING DATE: February 18, 2010 ***AGENDA ITEM: 5C***

SUBJECT:

CONSIDER APPROVAL OF A RESOLUTION OF THE BOARD OF DIRECTORS OF BIG BEAR MUNICIPAL WATER DISTRICT SUPPORTING THE NOMINATION OF MELODY HENRIQUES-MCDONALD TO THE EXECUTIVE COMMITTEE OF THE ASSOCIATION OF CALIFORNIA WATER AGENCIES JOINT POWERS INSURANCE AUTHORITY (ACWA/JPIA)

RECOMMENDATION:

The General Manager and the Administrative Committee (Directors Fashempour & Suhay) recommend approval of this resolution.

DISCUSSION/FINDINGS:

The District received a request from the San Bernardino Valley Water Conservation District to support their nomination of one of their Directors to the JPIA Executive Committee (see attached). In order to maintain the good will and cooperation of the Conservation District the Committee is recommending the Board approve a resolution of support for Melody Henriques-McDonald for the JPIA position. This District has supported Ms. McDonald's previous nominations to the JPIA Executive Committee. Approval of the attached resolution is therefore recommended.

OTHER AGENCY INVOLVEMENT: None

FINANCING: None

Submitted by: Scott Heule, General Manager

SBV WATER CONSERVATION DISTRICT
OUR NAME IS OUR MISSION

SAN BERNARDINO VALLEY WATER CONSERVATION DISTRICT
Established 1932

1630 West Redlands Boulevard, Suite A
Redlands, CA 92373-8032
(909) 793-2503
Fax: (909) 793-0188

P.O. Box 1839
Redlands, CA 92373-0581
Email: info@sbvwcd.dst.ca.us
www.sbvwcd.dst.ca.us

January 29, 2010

John Eminger
Big Bear Municipal Water District
P.O. Box 2863
Big Bear Lake, CA 92315-2863

Dear Mr. Eminger,

The Board of Directors of the San Bernardino Valley Water Conservation District has nominated its Director, Melody A. McDonald, for a position on the ACWA/JPIA Executive Committee. Enclosed is a certified copy of SBVWCD Resolution No. 454, nominating Mrs. McDonald for ACWA/JPIA's Executive Committee.

Melody, as a Director for the SBVWCD is presently the representative for the ACWA/JPIA Board of Directors. Melody currently serves on the ACWA/JPIA Executive Committee, Personnel Committee, Building & Property Ad Hoc Committee, is Vice Chair of the Property Program Subcommittee, past Chair of the Liability Program Subcommittee, and past Vice-Chair of the Workers Compensation Program Subcommittee. Melody also serves on ACWA's State Legislative, Water Management, and Groundwater Committees. She pursues all her duties with a strong sense of commitment and dedication. Enclosed is her "Statement of Qualifications."

Please consider Mrs. McDonald, by adopting the concurring resolution of her nomination. Enclosed is a sample concurring resolution for your consideration in support of Melody McDonald's nomination. Since time is of the essence, and this will require Board action, please include for Board consideration on the agenda for your next Board meeting.

Please send a certified copy to:

ACWA/JPIA
Attention: Sylvia Robinson
5620 Birdcage Rd. Ste.200
Citrus Heights, CA 95610

and

SBV Water Conservation District
Attention: Shanae Smith
1630 W. Redlands Blvd., Ste "A"
PO Box 1839
Redlands, CA 92373-8032

This resolution must be received by ACWA/JPIA no later than Friday March 19, 2010.

Sincerely,

R. Robert Neufeld
General Manager

Attachments

BOARD OF DIRECTORS: Richard W. Corneille, Clare Henry Day, Arnold L. Wright, John Longville, David E. Raley, Melody McDonald
GENERAL MANAGER: R. Robert Neufeld

Melody
Henriques-McDonald

P.O. BOX 30197
SAN BERNARDINO, CA 92413

(909) 864-8476 res.
(909) 748-7094 wk.
(909) 499-5175 cell.
(909) 748-7132 fax

Seeking Re-Election to:

Executive Committee
Of the
ACWA/JPIA

ASSOCIATIONS

Member, Board of Directors of the San Bernardino Valley Water Conservation District (Elected)

Member, Executive Committee ACWA/JPIA (Elected)

Past Chair, Liability Program Subcommittee

Director, ACWA/Joint Powers Insurance Authority

Past Chair & Vice-Chair, Workers Compensation Program Subcommittee

Voting Member, Association of the San Bernardino County Special Districts

Co-Chair, Santa Ana River Wash Area Coordinated Planning Activities

Member, Western Coalition of Arid States (WESTCAS)

Member, California Women for Agriculture (CWA)

Past Member, Board of Directors ACWA

Past Chair, Water Management Certification Subcommittee

Past Member, California Water Quality Control Board, Santa Ana Region

CURRENT EMPLOYMENT

Broker/Associate, Century 21 Lois Lauer Realty

PROFESSIONAL ASSOCIATIONS

Redlands Association of Realtors

ORGANIZATIONS AND SOCIETIES

Highland Chamber of Commerce
San Bernardino Chamber of Commerce

EDUCATION

San Gorgonio High School, 1976
Western Real Estate School, 1989
Graduate, Special Districts Board Management Institute, 1997

RESOLUTION NO. 454

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE SAN BERNARDINO VALLEY WATER CONSERVATION DISTRICT

NOMINATING ITS ACWA/JPIA BOARD MEMBER TO THE EXECUTIVE COMMITTEE

OF THE ASSOCIATION OF CALIFORNIA WATER AGENCIES
JOINT POWERS INSURANCE AUTHORITY ("ACWA/JPIA")

WHEREAS, this District is a member district of the ACWA/JPIA that participates in all three of its Programs: Liability, Property, and Workers' Compensation; and

WHEREAS, the Bylaws of the ACWA/JPIA provide that in order for a nomination to be made to ACWA/JPIA's **Executive Committee,** the member district must place into nomination its member of the ACWA/JPIA Board of Directors for such open position;

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the San Bernardino Valley Water Conservation District that its member of the ACWA/JPIA Board of Directors, Melody McDonald, be nominated as a candidate for the **Executive Committee** for the election to be held on May 3, 2010.

BE IT FURTHER RESOLVED that the ACWA/JPIA staff is hereby requested, upon receipt of the formal concurrence of five other member districts to effect such nomination.

BE IT FURTHER RESOLVED that the District Secretary is hereby directed to transmit a certified copy of this resolution to the ACWA/JPIA at 5620 Birdcage Street, Suite 200, Citrus Heights, California 95610-7632, forthwith.

ADOPTED this 13th day of January, 2010.

President, Board of Directors

ATTEST:

Secretary

RESOLUTION NO. 2010-02

RESOLUTION OF THE BOARD OF DIRECTORS OF BIG BEAR MUNICIPAL WATER DISTRICT, COUNTY OF SAN BERNARDINO, SUPPORTING THE NOMINATION OF MELODY HENRIQUES-MCDONALD TO THE EXECUTIVE COMMITTEE OF THE ASSOCIATION OF CALIFORNIA WATER AGENCIES JOINT POWERS INSURANCE AUTHORITY (ACWA/JPIA)

WHEREAS, Big Bear Municipal Water District is a member of the ACWA/JPIA, and

WHEREAS, the Bylaws of the ACWA/JPIA provide that in order for a nomination to be made to ACWA/JPIA's Executive Committee, five member districts must concur with the nominating district, and

WHEREAS, another ACWA/JPIA member district, the San Bernardino Valley Water Conservation District has requested that this district concur in its nomination of its member of the ACWA/JPIA Board of Directors to the Executive Committee of the ACWA/JPIA;

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Big Bear Municipal Water District that this District concurs with the nomination of Melody Henriques-McDonald of San Bernardino Valley Water Conservation District to the Executive Committee of the ACWA/JPIA.

BE IT FURTHER RESOLVED that the District Secretary is hereby directed to transmit a certified copy of this resolution to the ACWA/JPIA at 5620 Birdcage Street, Suite 200, Citrus Heights, CA 95610-7632, forthwith.

ADOPTED this 18th day of February, 2010

_____
Paula Fashempour, President

_____
Vicki Sheppard, Secretary to the Board

(SEAL)

BIG BEAR MUNICIPAL WATER DISTRICT
REPORT TO BOARD OF DIRECTORS

MEETING DATE: February 18, 2010 ***AGENDA ITEM: 5D***

SUBJECT:

CONSIDER APPROVAL OF A VOTE ON ALTERNATIVE APPORTIONMENT FORMULA FOR SPECIAL DISTRICTS FOR FISCAL YEAR 2010-11 AND THEREAFTER

RECOMMENDATION:

The General Manager and the Administrative Committee (Directors Fashempour & Suhay) recommend approval.

DISCUSSION/FINDINGS:

After receiving many comments LAFCO has drafted an alternative apportionment formula that they believe distributes costs more appropriately (see attached). Smaller agencies will pay less and large agencies will pay more. In our case our obligation drops from $10,000 per year to $5,000. The Committee recommends approval of the change.

OTHER AGENCY INVOLVEMENT: None

FINANCING: Savings to the District of $5,000 per year

Submitted by: Scott Heule, General Manager

LOCAL AGENCY FORMATION COMMISSION

215 North "D" Street, Suite 204 • San Bernardino, CA 92415-0490
(909) 383-9900 • Fax (909) 383-9901
E-mail: lafco@lafco.sbcounty.gov • www.sbclafco.org

Established by the State of California to serve the Citizens, Cities, Special Districts and the County of San Bernardino

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ANGELA M. SCHELL
Deputy Clerk to the Commission

REBECCA LOWERY
Deputy Clerk to the Commission

LEGAL COUNSEL

CLARK H. ALSOP

DATE: JANUARY 26, 2010

FROM: LAFCO SPECIAL DISTRICT MEMBERS:
Kimberly Cox, Regular Member,
James Curatalo, Regular Member; and
Robert Smith, Alternate Member

TO: ALL INDEPENDENT SPECIAL DISTRICTS IN SAN BERNARDINO COUNTY

SUBJECT: VOTE ON ALTERNATIVE APPORTIONMENT FORMULA FOR SPECIAL DISTRICTS FOR FISCAL YEAR 2010-11 AND THEREAFTER

Attached for your consideration is an alternative formula to apportion the costs of LAFCO as required by Government Code Section 56381. Over the past several years many of you have contacted us to discuss the mechanism for annually apportioning these costs and expressing your concern regarding the process.

Attached to this letter is a proposed modification to that formula, which we believe provides for a more equitable distribution of the cost. However, in order to change this apportionment process, State law requires that a quorum of districts which represents a majority of the population of the districts must cast their ballot in support for the change to take place.

By distribution of this letter we are requesting that your district review and vote on the proposed modified formula. Attached is the ballot for that purpose. In order to allow for the use of the modified formula in next year's appropriation process we will need to conduct the balloting expeditiously.

THE DEADLINE FOR RECEIPT OF THE BALLOTS IN THE LAFCO OFFICE, BY FAX OR MAIL IS 5:00 P.M. MARCH 1, 2010.

The voting instructions for this selection are as follows:

1. The proposed formula would establish four tiers for payment. The calculation which follows identifies "Total Revenue" which is to be determined by the most current State Controller's Report available prior to adoption of the LAFCO budget. A copy of the Distribution using the current year is attached. The proposed formula identifies the tiers as follows:

   a.) Those Districts with Total Revenue of more than $50,000,000 shall pay $30,000.

   b.) Those Districts with Total Revenue of between $20,000,000 to $50,000,000 shall pay $20,000.

   c.) Those Districts with Total Revenue of between $5,000,000 to $20,000,000 shall pay $10,000.

   d.) Those Districts with Total Revenue of Between $2,000,000 to $5,000,000 shall contribute an amount not to exceed $5,000.

   e.) Healthcare (Hospital) Districts shall be limited to payment of $1,500 regardless of Total Revenue.

   f.) Those Districts with Total Revenues of less than $2,000,000 shall be apportioned an amount to be determined by the ratio of each District's Total Revenues as compared to the Total Revenues whose share does not exceed the $5,000.

2. The vote shall be cast as directed by the Board of Directors of the District through consideration at a Board Hearing and a roll call vote.

3. Twenty-six (26) ballots are required to be received to establish a quorum.

The completed ballot is to be mailed or faxed to:

Kathleen Rollings-McDonald, Executive Officer
Local Agency Formation Commission
215 N. D St., Suite 204
San Bernardino, CA 92415-0490
Fax Number (909) 383-9901

Please contact one of us if you have any questions or concerns regarding this selection procedure. You may also contact the LAFCO Executive Officer at the address listed above, by e-mail at lafco@lafco.sbcounty.gov, or by phone at (909) 383-9900 with questions.

BALLOT

ALTERNATIVE FUNDING FORMULA FOR THE INDEPENDENT SPECIAL DISTRICTS' SHARE OF LAFCO COSTS FOR FISCAL YEAR 2010-11 AND THEREAFTER

The _____
(Name of District)

has reviewed and considered the proposed modification in funding formula for the independent districts' share of the LAFCO cost for Fiscal Year 2010-11 and thereafter, and hereby casts its vote as indicated below.

In order for the proposed modification to be successful it must receive affirmative votes from 26 or more independent special districts, which represent a majority of the population within the County. If the change is successful it will remain in effect unless superseded by a different alternative selected by the districts at a future election. In the event there is no quorum reached or support from a majority of the districts representing a majority of the population is not reached, then no change shall be made for the apportionment formula.

Approve the Proposed Modified Formula -- Four Tiers with Caps

YES _____ **NO** _____

I, _____, do hereby certify that at its regularly
(Name of President or Designee of District)

scheduled meeting of _____, the Board of Directors voted to select the alternative marked above by the following vote:

AYES:

NOES:

ABSENT:

ABSTAIN:

_____
District President/Authorized Board Member

Dated: _____

Special Districts Allocation
Plan Year 2009-10

District Name	Total Revenues FY 06-07	PROPOSED Cost Allocation	PROPOSED Allocation Percentage	CURRENT Cost Allocation	CURRENT Allocation Percentage
Yucca Valley Airport	$ 23,251.00	$ 34.24	0.01%	$ 96.10	0.03%
Yermo Community Services	$ 52,891.00	$ 77.89	0.02%	$ 218.61	0.06%
Barstow Heights Community Services	$ 62,773.00	$ 92.44	0.03%	$ 259.46	0.08%
Mojave Desert Resource Conservation	$ 75,950.00	$ 111.84	0.03%	$ 313.92	0.09%
Apple Valley Foothill County Water	$ 128,836.00	$ 189.72	0.06%	$ 532.51	0.15%
Twentynine Palms Cemetery	$ 164,124.00	$ 241.69	0.07%	$ 678.36	0.20%
Thunderbird County Water	$ 180,723.00	$ 266.13	0.08%	$ 746.97	0.22%
Big River Community Services	$ 180,783.00	$ 266.22	0.08%	$ 747.22	0.22%
Daggett Community Services	$ 203,591.00	$ 299.81	0.09%	$ 841.49	0.24%
Newberry Community Services	$ 204,115.00	$ 300.58	0.09%	$ 843.65	0.24%
Apple Valley Heights County Water	$ 253,726.00	$ 373.64	0.11%	$ 1,048.71	0.30%
Juniper-Rivera County Water	$ 302,556.00	$ 445.54	0.13%	$ 1,250.53	0.36%
Mariana Ranchos County Water	$ 429,749.00	$ 632.85	0.18%	$ 1,776.25	0.52%
Barstow Cemetery	$ 435,663.00	$ 641.55	0.19%	$ 1,800.70	0.52%
Morongo Valley Community Services	$ 444,235.00	$ 654.18	0.19%	$ 1,836.13	0.53%
Baker Community Services	$ 586,739.00	$ 864.03	0.25%	$ 2,425.13	0.70%
Rim of the World Recreation and Park	$ 889,032.00	$ 1,309.18	0.38%	$ 3,674.58	1.07%
Inland Empire Resource Conservation	$ 1,262,026.00	$ 1,858.45	0.54%	$ 5,216.25	1.51%
Bighorn Desert Veiw Water Agency	$ 1,325,709.00	$ 1,952.23	0.57%	$ 5,479.46	1.59%
Arrowbear Park County Water	$ 1,385,339.00	$ 2,040.04	0.59%	$ 5,725.93	1.66%
Chino Basin Water Conservation	$ 1,993,775.00	$ 2,936.02	0.85%	$ 8,240.73	2.39%
West Valley Vector Control	$ 2,295,663.00	$ 3,380.58	0.98%	$ 9,488.51	2.75%
San Bernardino Valley Water Conservation	$ 2,394,208.00	$ 3,525.70	1.02%	$ 9,895.82	2.87%
Big Bear Airport	$ 2,523,657.00	$ 3,716.32	1.08%	$ 10,000.00	2.90%
Helendale CSD	$ 2,887,646.00	$ 4,252.33	1.23%	$ 10,000.00	2.90%
Barstow Fire Protection	$ 3,173,852.00	$ 4,673.80	1.36%	$ 10,000.00	2.90%
Crestline Village Water	$ 3,456,254.00	$ 5,000.00	1.45%	$ 10,000.00	2.90%
Big Bear Municipal Water	$ 4,378,679.00	$ 5,000.00	1.45%	$ 10,000.00	2.90%
Crest Forest Fire Protection	$ 4,410,374.00	$ 5,000.00	1.45%	$ 10,000.00	2.90%
Joshua Basin Water	$ 5,065,192.00	$ 10,000.00	2.90%	$ 10,000.00	2.90%
Running Springs Water	$ 5,530,887.00	$ 10,000.00	2.90%	$ 10,000.00	2.90%
Twentynine Palms County Water	$ 5,741,856.00	$ 10,000.00	2.90%	$ 10,000.00	2.90%
Crestline Lake Arrowhead Water Agency	$ 6,593,616.00	$ 10,000.00	2.90%	$ 10,000.00	2.90%
Apple Valley Fire Protection	$ 7,147,097.00	$ 10,000.00	2.90%	$ 10,000.00	2.90%
Hesperia Recreation and Park	$ 7,645,051.00	$ 10,000.00	2.90%	$ 10,000.00	2.90%
Phelan Piñon Hills Community Services District	$ 7,681,841.00	$ 10,000.00	2.90%	$ 10,000.00	2.90%
Hi-Desert County Water	$ 10,902,639.00	$ 10,000.00	2.90%	$ 10,000.00	2.90%
Big Bear City Community Services	$ 13,176,338.00	$ 10,000.00	2.90%	$ 10,000.00	2.90%
Monte Vista Water	$ 14,810,050.00	$ 10,000.00	2.90%	$ 10,000.00	2.90%
Lake Arrowhead Community Services	$ 15,476,303.00	$ 10,000.00	2.90%	$ 10,000.00	2.90%
Bear Valley Community Hospital	$ 14,537,717.00	$ 1,500.00	0.44%	$ 500.00	0.15%
San Bernardino Mountains Community Hospital	$ 14,735,151.00	$ 1,500.00	0.44%	$ 500.00	0.15%
West Valley Water District	$ 18,429,109.00	$ 10,000.00	2.90%	$ 10,000.00	2.90%
Yucaipa Valley Water	$ 20,615,294.00	$ 20,000.00	5.80%	$ 10,000.00	2.90%
East Valley Water	$ 22,686,179.00	$ 20,000.00	5.80%	$ 10,000.00	2.90%
Chino Valley Independent Fire	$ 25,644,883.00	$ 20,000.00	5.80%	$ 10,000.00	2.90%
Mojave Water Agency	$ 44,808,923.00	$ 20,000.00	5.80%	$ 10,000.00	2.90%
Hi-Desert Memorial Hospital	$ 50,187,212.00	$ 1,500.00	0.44%	$ 500.00	0.15%
Cucamonga County Water	$ 62,861,847.00	$ 30,000.00	8.70%	$ 20,000.00	5.80%
San Bernardino Valley Municipal Water	$ 65,583,666.00	$ 30,000.00	8.70%	$ 20,000.00	5.80%
Inland Empire Utilities Agency	$ 78,050,812.00	$ 30,000.00	8.70%	$ 20,000.00	5.80%
Grand Total	**$ 554,017,582.00**	**$ 344,637.00**	100.00%	**$ 344,637.00**	100.00%

Methodology

Hospitals - $1,500 applied

Revenues above $50 million - $30,000 applied and the reported revenues are deducted from the formula

$20 million to $50 million - $20,000 applied and the reported revenues are deducted from the formula

$5 million to $20 million - $10,000 applied and the reported revenues are deducted from the formula

$2 million to $5 million - $5,000 cap and the reported revenues are deducted from the formula

Below $2 million - proportional balance

BIG BEAR MUNICIPAL WATER DISTRICT
REPORT TO BOARD OF DIRECTORS

MEETING DATE: FEBRUARY 18, 2010 ***AGENDA ITEM: 6A***

SUBJECT: **KAYAK RENTAL BUSINESS – DISCUSSION AND POSSIBLE ACTION**

RECOMMMENDATION:

The Operations Committee and General Manager recommend that the Board receive this report and solicit additional comments from marina operators and kayak rental business owners and then provide direction to Staff.

DISCUSSION/FINDINGS:

Vessel Rental Businesses – After participating in the Board Workshop on this issue in October 2009 the Operations Committee meet two additional times with representatives of the marinas. Kayak rental businesses have also been a topic at their regular committee meetings on three occasions. As a result of their deliberations and discussions the Committee is satisfied that enough information regarding the issue of vessel rental businesses has been gathered and evaluated and are confident that their interpretation of District obligations can be considered by the full Board of Directors at a regular meeting. The Committee believes strongly that the District is responsible to the Public and the landowners in Big Bear Valley to make the lake accessible to the public and to encourage its use by the public. They also note that it is the District's responsibility to manage recreation use of the lake. Marinas help the District carry out this responsibility by providing the public with easy access to boat rentals, fuel, slip rentals, in some cases launch facilities, bait and tackle and food and snacks at their respective landing sites. Marina's do not have a universal right to control all commercial activities currently occurring or ones that might occur on the Lake in the future.

The Operations Committee believes public access and use needs to be a very high priority consideration for any decision the District makes. Additionally, the Committee notes that the District has consulted two attorneys to help interpret the marina contracts to be sure of the Districts obligations. Both attorneys conclude that the Districts jurisdiction begins and ends at the high water line of the lake. Therefore, the Operations Committee finds that when commercial operations occur below the high water line the District has jurisdiction and a permit from the District or marina partnership should be required. If the business operation occurs above the high water line the District has no jurisdiction.

Businesses in town renting kayaks or any other kind of vessel are not conducting commercial operations below the high water line; therefore the District has no jurisdiction over their operations. Non-marina businesses that rent vessels for use on the lake are prohibited from launching them or training rental customers on the water. If they want to provide that service they will need to partner with a marina or secure a permit from the District.

If the Board determines that the interpretation and conclusions of the Operations Committee as described above are valid, the Committee will work with the General Manager to draft paperwork language to manage the process. Some clean up language in District regulations might also be necessary for consideration by the Board at a later date.

OTHER AGENCY INVOLVEMENT: None

FINANCING: None

Submitted by: Scott Heule, General Manager

BIG BEAR MUNICIPAL WATER DISTRICT
REPORT TO BOARD OF DIRECTORS

MEETING DATE: JANUARY 7, 2010 ***AGENDA ITEM: 6B***

SUBJECT: **CONSIDER APPROVAL OF A PROPOSAL FROM TRANSTECH MAPCO FOR BIG BEAR MARINA CONTAMINATION REMEDIATION DESIGN**

RECOMMMENDATION:

The General Manager and the Watershed/Lake Improvement Committee recommend approval of this proposal.

DISCUSSION/FINDINGS:

Proposal from Transtech-MAPCO - In response to a request from the General Manager, Transtech-MAPCO submitted a scope of work and cost proposal to prepare engineering plans, specifications and construction documents for the ground water remediation trench at Big Bear Marina (attached). Their work is needed in order to get the project approved by the Regional Water Quality Control Board and constructed this coming spring. The proposed estimated cost for the work is $6,050. The Committee is recommending that the work be authorized.

OTHER AGENCY INVOLVEMENT: None

FINANCING: Reimbursement from the State Leaking Underground Storage Tank Fund.

Submitted by: Scott Heule, General Manager

TRANSTECH
MAPCO

January 26, 2010

To: Big Bear Municipal Water District
P.O. Box 2863
40524 Lakeview Dr.
Big Bear Lake, Ca. 92315

Attn: Mr. Scott Huele

The following represents our estimate for engineering, design, and construction documents for a proposed mitigation of a gasoline detection area onsite at APN No. 308-141-06. Based upon the information given to me and the scope of work required, my Engineering staff has indicated that an estimated 50 hours work time would be sufficient to complete the requested construction documents.
This will be broken down as follows:

20 hours cad drafting assigned @ $100/hr.....$2,000.00
30 hours Engineering time assigned @ $135/hr.....$4,050.00
(1 initial site visit, 1 meeting, design, review, approvals, coordination & signatures of construction documents).

Estimated total.....$6,050.00

We would utilize the Aerial Topographical map provided by you from Hicks & Hartwick Engineering, as a base topographical map & datum. We would also be working with and coordinating with your Geologist, Mr. Chuck Kendal of Kendal/Adams Group, Inc.

We are available to begin the project at any convenient time that works with your schedule.

Thank you for the opportunity to present this estimate to you and we look forward to working with you on your project.

If this estimate is acceptable to you we can prepare a contract detailing the scope of work and project description with a more detailed timeline that works with your requirements.

Sincerely,

Bob Carlisle
Mapco-Transtech
Big Bear Lake Office
cc: Dave Ragland, Transtech RCE

BIG BEAR MUNICIPAL WATER DISTRICT
REPORT TO BOARD OF DIRECTORS

MEETING DATE: February 18, 2010 ***AGENDA ITEM: 6C***

SUBJECT:

TMDL AQUATIC PLANT MANAGEMENT PLAN APPROVE CONCEPTUAL COST AND RESPONSIBILITY SHARING PLAN

RECOMMENDATION:

The Watershed/Lake Improvement Committee and the General Manager recommend approval in concept of the cost and responsibility sharing plan described in the Draft TMDL Aquatic Plant Management Plan.

DISCUSSION/FINDINGS:

One of the outstanding documents required by the TMDL is an aquatic plant management plan. Erika Saad prepared one version as part of the Proposition 13 Grant a few years ago. It included management schemes for both Eurasian Water Milfoil as well as Tamarisk. Tim Moore has edited the earlier version for use in the TMDL efforts. In summary, the plan describes three types of aquatic weed monitoring and how the monitoring work and invasive weed control will get accomplished. The plan describes an annual reconnaissance survey specific to planning for herbicide treatment applications. Two other surveys are described that would be completed every three years and in much greater detail than the reconnaissance work. As summarized in the table on Page 39 of the attached document the plan identifies the District as the responsible party only for performing the reconnaissance effort and annual weed treatments. The TMDL Dischargers would be responsible for funding and managing the triennial surveys with the District providing on the water logistical support and office space and computer equipment for the consultant to use to download data and processing prior to his submittal to the Task Force. This approach keeps the District involved in anything happening on the water but obligates the TMDL Dischargers to fund their share of the monitoring and reporting portion. The Committee recommends that the Board approve the cost and responsibility sharing concept described in the rough draft of the plan and wait until the document has been finalized to formally approve the plan.

OTHER AGENCY INVOLVEMENT: None

FINANCING: Annual ongoing costs for the reconnaissance survey of approximately $3500.

Submitted by: Scott Heule, General Manager

Management Plan To Control Noxious and Nuisance Aquatic Plants in Big Bear Lake

SUBMITTED TO:

SANTA ANA REGIONAL WATER QUALITY CONTROL BOARD

SUBMITTED BY:

Big Bear Lake TMDL Task Force

in partial fulfillment of requirements specified in:

Task 6c in Resolution R8-2006-0023

and

NPDES Permit No. CAS618036 (1/29/2010)

DRAFT: February 8, 2010

Acknowledgements

This plan was adapted from a similar document submitted to the Santa Ana Regional Wat
Quality Control Board in partial fulfillment of California grant agreement No. 04-204-558-0. Th
previous plan was prepared by

Dr. Harry Gibbons
Tetra Tech, Inc.
1420 Fifth Avenue, Suite 550
Seattle, WA 98101
206.728.9655

&

Ms. Erika Godwin-Saad
Big Bear Municipal Water District
40524 Lakeview Drive
Big Bear Lake, CA 92315
909.866.5796
615.579-3281

TABLE OF CONTENTS (to be inserted)

1.0 INTRODUCTION

Big Bear Lake is a man-made irrigation reservoir that resulted from the construction of Bear Valley Dam in 1884. The reservoir is located in the San Bernardino Mountains of Southern California at an elevation of about 6,700 feet. Since 1977, when the Big Bear Municipal Water District ("District") was formed to stabilize water levels, the primary purpose of the lake has shifted to providing recreational opportunities and aquatic habitat. The District promotes and maintains various recreational amenities, including fishing, boating, swimming, skiing, aquatic habitat, wildlife sanctuary, water quality protection, flood control, shore patrol and other essential public services

[INSERT MAP]

Native aquatic plant communities are an integral part of the lake environment as they provide food, shelter, and nesting sites for many fish, waterfowl and smaller animals. Rooted aquatic plants also stabilize shorelines, reduce sediment suspension, and improve water quality by absorbing excess nutrients from the water column (Gibbons, et al., 1999).

Invasive aquatic vegetation can create nuisance conditions by altering the structure of the lake's ecosystem. In particular, noxious freshwater weeds can crowd-out native plants thereby destroying aquatic habitat. Invasive plants spread rapidly and create dense monocultural canopies that result in decreased water mixing, reduced oxygen exchange and increase nutrient cycling (AERF, 2005). The scientific literature clearly supports the value of maintaining diverse aquatic and semi-aquatic ecosystems. A healthy community of native aquatic plants supports fish and wildlife by providing habitat, food, breading areas, water oxygenation and refuge from predators (AERF, 2005).

It is well-established that the excessive growth of invasive aquatic plants also impairs recreational opportunities in Big Bear Lake (TMDL Technical Report, 2005) . Large stands of noxious species such as Eurasion Water Milfoil and Coontail foul boat propellers, restrict access to shoreline swimming and interfer with sport-fishing activities.

Therefore, it is in the best interest of both the public and the environment to establish and implement a plan to reduce the adverse effects of nuisance and noxious aquatic plants in Big Bear Lake to the maximum extent practicable. The goal of this document is to describe that plan.

1.1 Objectives

In 1998, Big Bear Lake was added to California's list of impaired waterbodies due to excessive invasive aquatic plant species.[1] The scientific evidence supporting this decision was summarized in a special study published by the Santa Ana Regional Water Quality Control Board in 1994.[2] Working collaborative with stakeholders throughout the watershed, the Regional Board initiated several years of intensive studies to better understand the relationship between water quality and the emergence of noxious aquatic plant species in Big Bear Lake.[3]

In 2005, the Regional Board adopted a Total Maximum Daily Load (TMDL) to protect the water designated beneficial uses in Big Bear Lake. The TMDL established specific regulatory targets for the eradication of nuisance and noxious aquatic weeds. The TMDL also enacted targets for minimum acceptable levels of coverage by native plant species in the lake. (see Table 1).

[INSERT TABLE 1: TMDL Response Targets]

The TMDL requires dischargers in the Big Bear Lake watershed to develop and implement a plan describing the specific means by which the aforementioned targets will be achieved. The plan must evaluate the applicability of various in-lake treatment technologies to control noxious and nuisance aquatic plants. The plan must include a description of the monitoring needed to track plant diversity, coverage and biomass. The plan must also describe how the resulting data will be used to assess compliance with the numeric targets identified in the TMDL.

1
2
3

In January, 2010 the Regional Board enacted similar requirements in the NPDES permit governing stormwater discharges in the Big Bear Lake watershed. That permit obligates the dischargers to submit a draft plan by February XX, 2010. This document is intended to fulfill that requirement.

The Aquatic Plant Management Plan (APMP) is one of several initiatives to improve water quality and protect beneficial uses in Big Bear Lake. Other plans and efforts are underway to reduce the internal and external nutrient loads that indirectly encourage the growth of invasive plant species. The focus of the APMP is on describing the more direct measures that will be used to eradicate nuisance and noxious aquatic weeds in the lake.

1.2 *Problem Statement*

Big Bear Lake is an important water supply reservoir and recreational resource. It is moderately productive in terms of nutrient concentration, planktonic algae, and vascular aquatic plants, both rooted and non-rooted. Until 2004, two aquatic macrophytes, Eurasian Watermilfoil (*Myriophyllum spicatum*, EWM) and Coontail (*Ceratophyllum demersum*) dominated the shorelines and littoral zone of Big Bear Lake and directly interfered with many of the lake's recreational beneficial uses. Aquatic plant interference with recreational uses was evidenced by the number of calls received by the BBMWD from lake users and dock owners complaining about problems caused by aquatic plants. Prior to the summer of 2003, BBMWD staff indicated that the BBMWD received two to three phone calls each day during the summer from dock owners complaining about the presence of aquatic plants (Sheila Hamilton, personal communication). Examples of other problems reported included: 1) propellers of boats and jet skis entangled or clogged by aquatic plants, 2) swimmers entangled in aquatic plants and 3) fishing impeded by aquatic plants. The impact of excessive aquatic plant growth on other beneficial uses of the lake is more ambiguous. Dense aquatic macrophyte beds can negatively impact lake water quality characteristics (e.g., dissolved oxygen, temperature).

In the early 1970's, the noxious and invasive aquatic plant, Eurasian Watermilfoil, began to interfere with recreational uses of the lake. Although a native aquatic plant in California, Coontail was also deemed a nuisance and invasive plant species as it also developed into extremely dense stands in the lake. Both Eurasian Watermilfoil and Coontail continued to expand and displace the native/natural aquatic plant communities within the lake system. By the summer of 2000, an aquatic plant vegetation survey determined that 781 acres of the 2,971 surface acre lake exhibited excessive growth of EWM and Coontail (ReMetrix, 2001).

In 2002 and 2003, large-scale aquatic herbicide applications designed to target EWM and Coontail were successful in significantly reducing the aerial coverage and relative density of these aquatic plants. During the 2004 growing season, the prior aquatic herbicide treatments combined with extremely low lake levels (i.e., -17 feet below full pool) enabled Curlyleaf pondweed (*Potamogeton crispus)* to become the dominate plant within the lake. Then, in the winter of 2005, record amounts of rainfall delivered 39,000 acre-ft of water to Big Bear Lake and essentially re-filled the waterbody. However, an aquatic plant survey in 2005 discovered that EWM was re-establishing in many locations throughout Big Bear Lake. From these and other observations, it was concluded that EWM as well as other aquatic plants may require a continuous management program in order to protect the beneficial uses of the lake. Since then, annual surveys indicate that regular herbide treatments have reduced Eurasion Water Milfoil to 288 acres in 2008 and 183 acres in 2009.

The short-term aquatic plant control/management efforts are specifically directed at Eurasian Watermilfoil. The long-term aquatic plant management goals will include efforts to support recolonization of the lake by native plant species. The primary means by which re-vegetation will occur is through the use of aquatic herbicide application(s) to control the overgrowth of noxious aquatic plant species. Modern herbicides are highly selective and target only the EWM without harming desirable native species. This will provide the space necessary for the recovery of native aquatic plant species.

2.0 BACKGROUND

This section provides an overview of the nuisance and noxious aquatic plants recently and historically observed in and around Big Bear Lake, the historical aquatic plant management efforts, a waterbody description of Big Bear Lake, and a discussion of recent lake water quality status.

2.1 Emergent and Aquatic Plant Species Known to Exist in Big Bear Lake

According to Leidy (2006), the historical record indicates that several aquatic plants, including both Eurasian Watermilfoil and Coontail, were common in Bear Valley Reservoir (now Big Bear Lake) prior to and during the height of resort development in the valley. Specifically, Parish (1917) noted that Eurasian Watermilfoil and Coontail were present in abundance. The shallow impoundment that comprised the Bear Valley Reservoir created optimum conditions for the dispersal of aquatic plants. Therefore, the expansion of aquatic macrophytes occurred long before there was any significant development in the watershed (Leidy, 2005).

A 1979 report by the California Department of Fish & Game provides early documentation regarding the aquatic plant species observed and the overall status of aquatic plants in Big Bear Lake (Siegfried *et al.*, 1979). In the 1977 to 1978 time period, a total of eight (8) aquatic plant species were identified in Big Bear Lake. With the exception of Eurasian Watermilfoil and Curlyleaf Pondweed, each of the aquatic plant species identified were considered native to Southern California (Hickman, ed., 1993). Table 2 provides a list of the species identified and where reported, the corresponding dry biomass measurements made. The report indicates that in the 1970's, Eurasian Watermilfoil (*Myriophyllum spicatum*) and Coontail (*Ceratophyllum demersum*) were present in Big Bear Lake in abundance. The study did not include a quantitative biomass evaluation of Coontail, but clearly stated that at that time Coontail dominated the aquatic macrophyte community of the lake over all other species (Siegfried *et al.*, 1979).

TABLE 2. 1977-1978 AQUATIC PLANT SPECIES AND BIOMASS IN BIG BEAR LAKE

Species	Common Name	Dry Biomass (g/m^2)	Native or Exotic (c)
Ceratophyllum demersum	Coontail/Hornwort (a)	Most Abundant (b); Biomass not Measured	Native
Potamogeton filiformis	Slender-leaved pondweed (a)(d)	304.2	Native to California, but not native to Bear Valley
Elodea Canadensis	American elodea (a)	114.8	Native
Myriophyllum spicatum	Eurasian Watermilfoil	74.7	Exotic. Native to Eurasia
Myriophyllum sibiricum	Northern Water Milfoil (a)	Identified in the Report; Biomass not Measured	Native to California, but not native to Bear Valley
Potamogetan crispus	Curlyleaf pondweed	47.5	Exotic. Native to Eurasia
Polygonum amphibium var. emersum	Swamp knotweed (a)	Not Identified in the Report	Native
Polygonum amphibium var. stipulaceum	Smartweed	Identified in the Report; Biomass not Measured	Native

Notes:
(a) These plants are considered native aquatic plant species in Southern California (Jepson Manual), but not necessarily Bear Valley.
(b) Was observed as the most abundant aquatic plant in Big Bear Lake, although no attempt to measure biomass were made.
(c) Re-created and referenced from Table 3 in Leidy (2006).
(d) Leidy (2006) proposed a possibility for mis-identification of *Potamogeton filiformis*.

A 2005 aquatic plant survey conducted by AquaTechnex, LLC in Big Bear Lake identified the following aquatic plant species and relative abundance as shown in Table 3.

TABLE 3. 2006 AQUATIC PLANT SPECIES AND RELATIVE DISPERSION IN BIG BEAR LAKE

Species	Common Name	Relative Dispersion	Native or Exotic (b)
Ceratophyllum demersum	Coontail/Hornwort (a)	1 of 300 pts	Native
Potamogeton filiformis	Slender-leaved pondweed (a)(c)	97 of 300 pts	Native to California, but not native to Bear Valley
Elodea canadensis	American elodea (a)	6 of 300 pts	Native
Myriophyllum spicatum	Eurasian Watermilfoil	Found in the lake, but not reported with native plant survey results.	Exotic. Native to Eurasia
Myriophyllum sibiricum	Northern Milfoil (a)	Not observed, but potentially also present in Big Bear Lake	Native to California, but not native to Bear Valley
Potamogetan crispus	Curlyleaf pondweed	16 of 300 pts	Exotic. Native to Eurasia
Polygonum amphibium var. emersum	Swamp knotweed (a)	Not observed by the survey	Native
Polygonum amphibium var. stipulaceum	Smartweed (a)	56 of 300 pts	Native
Chara sp. (d)	Chara	27 of 300 pts	Native/ Macro-algae

Notes:
(a) These plants are considered native aquatic plant species in California (Jepson Manual), but not necessarily Bear Valley.
(b) Re-created and referenced from Table 3 in Leidy (2006).
(c) Leidy (2006) suggested a possibility for mis-identification.
(d) Chara is not a vascular aquatic plant, but is a macro-algae.

The 2005 aquatic plant survey indicates that the same aquatic plant taxa present in Big Bear Lake almost three decades ago are still present today. However, the early aquatic herbicide applications (i.e., those in 2002 and 2003) and the water level fluctuations (2004 vs. 2005) shifted the relative abundance of certain aquatic plant species. This shift was the desired outcome of the aquatic herbicide applications.

A recent report by Leidy (2006) suggests that some ambiguity regarding species composition exists. Specifically, Leidy (2006) indicates that a mis-identification may have occurred for the *Potamogetan filiformis* (Slender-leaved pondweed). Using the Jepson Manual, the Leidy report (2006) also identifies two other species of pondweeds that are native to the Bear Valley (i.e., *Potamogeton natans* and *Potamogeton pectinatus*), but which were not noted by the Siegfried *et al.*, 1979 study or the 2005 AquaTechnex, LLC survey. Additionally, Leidy's research and review of historical documents infers that Northern Water Milfoil (*Myriophyllum sibiricum*) could potentially be present in Big Bear Lake. Finally, there also appears to be some potential confusion regarding the variety of *Polygonum amphibium* (Swamp knotweed vs. Smartweed) found in Big Bear Lake. According to Leidy (2006), both varieties are potentially present. The observations of Leidy (2006) suggests that historically there is potentially some uncertainty about aquatic plant species identification, however, this plan will resolve these problems by providing for the collection of voucher samples in conjunction with the aquatic plant monitoring efforts.

Coontail and the exotic species, Eurasian Watermilfoil, have been present in Big Bear Lake since the early 1900's. Coontail and EWM have been present in nuisance and invasive densities since the 1970's. Prior to aquatic herbicide applications, aquatic plant monitoring efforts and aquatic plant harvesting records indicated that the percent dominance of EWM had substantially increased from 1978 to 2001. Aquatic herbicide applications in 2002 and 2003 specifically targeted EWM and Coontail and reduced their percent dominance relative to other aquatic plants. Other aquatic plant taxa can be important indicators of stressed or recovering conditions, particularly the pondweeds (*Potamogeton* spp.) and waterweeds (*Elodea canadensis*). According to the Jepson Manual (Hickman, ed., 1993), *Potamogeton crispus* is "uncommon" in California and must be considered non-native. Curlyleaf pondweed is more indicative of eutrophic conditions, compared to the other pondweed species and often attains nuisance densities in lake in which it becomes established (Dr. Mary Ellen Harris, personal communication).

The recently identified (2005) submersed aquatic plant communities throughout Big Bear Lake are presently limited to the presence of only six different species of aquatic plants. Submersed aquatic macrophytes included: 1) Eurasian Watermilfoil, 2) Coontail, 3) American Elodea (*Elodea canadensis*), 4) Curlyleaf Pondweed (*Potamogeton crispus*), 5) Slender-leaf Pondweed (*Potamogeton filiformis*) and 6) Smartweed (*Polygonum amphibium var. stipulaceum)*. Waterstargrass has been identified in the recent past (2001, 2002), but was not identified by the 2005 aquatic plant survey. A list of emergent and aquatic plants in and around Big Bear Lake is provided from the plant species list provided by Leidy (2006) in Attachment 1 of this document. It is expected that similar comprehensive surveys will be needed approximately every 5 years to reassess the relative abundance of desirable and undesirable aquatic plant species.

2.2 Historical Aquatic Plant Management Efforts

Beginning in the early 1980's, the Big Bear Municipal Water District (BBMWD) implemented an Aquatic Plant Harvesting Program to control problems resulting from excessive aquatic plant growth. At the height of the aquatic plant harvesting program, the BBMWD operated up to four aquatic weed harvesters and one Aquamog for the purposes of removing aquatic weeds from the lake during the growing season (i.e., from May to September). The Aquatic Plant Harvesting Program could cut and maintain a maximum of approximately 240 to 250 acres of aquatic plants each growing season. Each harvester could hold two to three tons (wet weight) of harvested aquatic plants per trip so that a range of 1,500 to 4,500 wet tons of plant material would be mechanically removed from Big Bear Lake each year. Harvesting efforts were focused in areas of high recreational use, such as public boat launch ramps and private docks.

As time passed, it became apparent that harvesting efforts were no longer sufficient to protect the lake's recreational beneficial uses directly affected by the non-native and nuisance aquatic macrophytes (EWM and Coontail). By the year 2000, the BBMWD harvesting records indicated that the combined presence of Eurasian Watermilfoil and Cootail constituted 94 percent of the total aquatic plant biomass found in the lake. Further, these aquatic plants occupied 781 acres of the lake's littoral zone, which is approximately 91 percent of the entire littoral zone and more than 25 percent of the total surface area (normalized to full pool) of Big Bear Lake (ReMetrix, 2001). Note: For purposes of this estimation, the total littoral zone area is assumed to be 850 acres of lake bottom for water depths ranging from 0 to 18 feet at full pool.

The littoral zone is defined as "the shallow zone along the shore of a lake; that portion of a water body extending from the shoreline lakeward to the greatest depth occupied by rooted aquatic plants" (Holdren, C., W. Jones, and J. Taggart. 2001). Recent hydroacoustic aquatic plant data clearly showed that aquatic plants in Big Bear Lake occupy water depths from 0 to 18 feet, and that the most dense stands of aquatic macrophytes are located in water depths ranging from 0 to 10 feet. Additionally, in 2002, estimates of average aquatic plant biomass were high, ranging from 306 g/m^2 to 651.9 g/m^2 during the growing season. Again, nearly all of this biomass was due to the dense stands of either EWM and/or Coontail.

The BBMWD understood that an alternative means of reducing the excessive growth of non-native (i.e., Eurasian Watermilfoil) and nuisance (i.e., Coontail) aquatic plant species could be achieved by the proper use of an aquatic herbicide. Application of an aquatic herbicide would result in a substantial reduction in the biomass of the targeted non-native and nuisance aquatic plants. In 2002, the BBMWD initiated a campaign to reduce the presence of Eurasian Watermilfoil (*Myriophyllum spicatum*) and Coontail (*Ceratophyllum demersum*) through aquatic herbicide applications to select areas of Big Bear Lake. The aquatic herbicide treatment technology selected was a fluridone-based aquatic herbicide formulation known as SONAR®.

The 2002 Aquatic Herbicide Application treated a total of 270 littoral zone acres of Eurasian Watermilfoil and Coontail. The 2003 Aquatic Herbicide Application treated an additional 144 littoral zone acres of these same plants, for a total of 414 acres treated in two consecutive years. Additionally, aquatic macrophyte hydroacoustic survey data and biomass samples were collected both prior to and after aquatic herbicide applications so that treatment success could be evaluated. Unfortunately, these aquatic plant monitoring data were generally limited to only herbicide-treated areas of the lake.

Pre- and post-treatment assessments of aquatic plant biomass surveys were performed within the aquatic herbicide treatment areas. These pre- and post-treatment vegetation assessments demonstrated the success of aquatic plant herbicide applications in treated areas of Big Bear Lake. As mentioned previously, the results indicated that plant species composition did not change much in a short-term period, despite vegetation control measures and water level changes. However, the changes in biomass and percent dominant plant species (by dry weight) were dramatic for pre- and post-treatment comparisons. The overall biomass of the invasive and nuisance species decreased by at least 85 percent within all herbicide treatment areas. The exotic species, the EWM, and the nuisance species, Coontail were clearly the dominant species prior to treatment, and the least dominant post-treatment. Increases in the presence and biomass of the Curlyleaf Pondweed (*Potamogeton crispus*) were observed in 2004 (319h Report, 2004). However, Curlyleaf Pondweed is also an exotic, non-native aquatic macrophyte. In addition, a 2005 lake-wide survey of aquatic plants discovered that EWM was still present in Big Bear Lake and that its re-growth was occurring in many areas of the lake.

This discovery led the BBMWD to conclude that efforts to eradicate and control EWM must be continued into the future. Since 2008, a new herbicide (Renovate OTF) has proven to be effective to reduce dense stands of Eurasion Water Milfoil. During the summer of 2009, 183 surface acres were treated and the nuisance plant conditions were eliminated for the remainder of the recreational season. Additional control measures may be needed to prevent some native species, such as Coontail, from creating nuisance conditions.

2.3 Big Bear Lake Watershed and Lake Characteristics

The Big Bear Lake watershed drainage basin encompasses 37 square miles of area and includes Big Bear Lake as well as 10 to 20 ephemeral or perennial streams. Precipitation, in the form of snowfall, rainfall, and surface runoff is the sole source of water supply to the watershed, and therefore, to the lake. Due to a strong rain shadow effect, precipitation varies significantly across the Big Bear Lake watershed with the western end of the watershed receiving an average of 36 inches a year, while the eastern end receives an average of 12 inches a year.

The United States Forest Service (USFS) is the largest landowner in the Big Bear Lake watershed. In addition to USFS lands, other dominant land uses identified for the watershed include resort, residential, and high density urban. Table 4 provides a detailed distribution of land uses (with pervious and impervious areas) within the watershed.

TABLE 4. Impervious & Pervious Land Use Distributions in the Watershed (a)

AREA (acres)				
Land Use Types	Impervious	Pervious	Total	% of Watershed
Forest North (b)	38	7,595	7,633	32.9
Forest South (b)	35	6,876	6,911	29.8
Resort	35	669	704	3.0
Residential	580	3,287	3,867	16.7
HDU (c)	644	644	1,288	5.5
Watershed contributory area	1,302	19,071	20,403	87.9
Big Bear Lake	-	-	2,808	12.1
Total Watershed	1,332	19,071	23,211	100

Notes:
(a) Re-created from the Nutrient TMDL Document (Regional Board, 2005).
(b) Forest North refers to forested land facing north, while Forest South refers to forested land facing south.
(c) HDU = High Density Urban

Big Bear Lake is approximately 7 miles in length (depending on water level) and approximately 0.5 mile in width. The length of the waterbody is oriented in a west-east direction. During maximum (full) pool, water level of the lake has a surface elevation of 6,743.2 ft, a water surface area of approximately 2,971 acres and maximum lake storage of about 73,320 acre-feet (af). A summary of lake characteristics is given in Table 5.

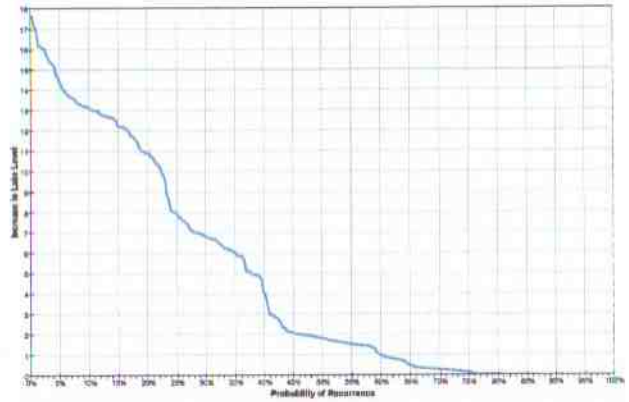
TABLE 5. Big Bear Lake Characteristics (a)

Lake Elevation	6,743.2 feet
Lake Length	7 miles
Average Lake Width	0.5 miles
Shoreline	22 miles
Maximum Depth at Dam	72.33 feet
Maximum Lake Storage Capacity	73,320 acre-feet
Mean Depth at Maximum Pool	24.7 feet
Average Lake Storage Capacity	58,500 acre-feet/year
Mean Depth at Average Pool	19.7 feet
Big Bear Valley Length	12.5 miles
Average Inflow	17,300 acre-feet/year
Average Outflow at Dam	5,510 acre-feet/year
Average Evaporation Rate	11,300 acre-feet/year
Hydraulic Retention Time (b)	11 years

Notes:
(a) Re-created from the Nutrient TMDL Document (Regional Board, 2005).
(b) HRT = average lake storage capacity/average outflow at dam.

Eighty percent of the time, the Big Bear Lake water level is less than five (5) feet down from full pool (see Fig. 1).[4] In average rainfall years, the lake level is maintained so that it fluctuates no more than plus or minus 5 feet. But, during prolonged drought periods, the lake level can drop as much as 17 feet below full pool.

Fig 1: Lake Level Recurrence Frequency



[4] Cite Watermaster Report

2.4 Big Bear Lake Water Quality

Research literature indicates that aquatic plants play a role in nutrient cycling in lakes and reservoirs. Barko and James (1997) have stated that submerged macrophytes are unique among rooted aquatic vegetation because they link the sediment with overlying water and that this linkage has important implications for nutrient cycling. Given the ecological significance of nitrogen and phosphorus in aquatic systems and the importance of sediment in supplying nitrogen and phosphorus to submerged macrophytes, it is potentially important to consider the effects of macrophyte growth on the availability of nutrients as well as their significance as a nutrient source and nutrient sink within the system. The available water quality data for Big Bear Lake are briefly summarized below. Although it is not the intent of this Plan to address the relationship between water quality and aquatic macrophytes, the water quality data are described herein to provide a basic overview of water quality conditions within Big Bear Lake. Therefore, this summary is provided for informational purposes only.

More intensive water quality monitoring of Big Bear Lake was initiated in June 2001. At that time, the water level and corresponding water volume of Big Bear Lake were in a state of decline. Due to an extended period of drought in Southern California, lake water levels steadily declined from June 2001 until approximately November 2004. In June of 2001, lake level was about 7.0 ft below full pool (lake surface elevation of 6,743 feet). By the end of August 2002, lake level was almost 13 ft below full pool, and at the end of August of 2003, lake level decreased to 14 ft below full pool. By the end of the summer of 2004, lake levels had decreased to approximately 17 ft below full pool. Decreasing lake levels affected lake water quality measurements as constituents became more concentrated in the available water volume. Then, in the winter of 2004-2005, record amounts of rain fell within the Big Bear Lake watershed and an estimated 39,600 acre-ft of water inflow was received by Big Bear Lake. At the end of the summer of 2005, water level was restored to approximately only 3 ft below full pool and a water volume of 64,275 acre-ft, respectively. The immense water volume received by the lake served to dilute water quality constituent concentrations.

Concurrent with lake water level fluctuations, the BBMWD was conducting lake management activities that also had an effect on lake water quality. In 2002 and 2003, aquatic herbicide applications were performed that substantially reduced the aquatic plant biomass in Big Bear Lake. Then in 2004, a full-scale alum application was conducted. The full-scale alum application was employed as a direct phosphorus mitigation measure to both bind and precipitate bio-available phosphorus in the water column and to control the release of nutrient phosphorus from the lake sediments. The impact and effectiveness of the full-scale alum treatment on sediment nutrient release rates and water quality concentrations were described in the report entitled, *Big Bear Lake 2004 Full-Scale Alum Application* (BBMWD, June 2005) and again re-described in the sediment report prepared by Anderson and Wakefield-Schmuck (2006).

In Big Bear Lake, water quality monitoring is conducted at established open-water main lake sampling stations. The water quality station identifications and sample types for Big Bear Lake are as follows:

- Dam – MWDL1 or TMDL Site No. 1 – Photic Zone Composite
- Dam – MWDL1 or TMDL Site No. 1 - Discrete bottom
- Gilner Point – MWDL2 or TMDL Site No. 2 – Photic Zone Composite
- Gilner Point – MWDL2 or TMDL Site No. 2 - Discrete bottom
- Mid Lake Middle – MWDL6 or TMDL Site No. 6 – Photic Zone Composite
- Mid Lake Middle – MWDL6 or TMDL Site No. 6 - Discrete bottom
- Stanfield Middle – MWDL9 or TMDL Site No. 9 – Photic Zone Composite
- Stanfield Middle – MWDL9 or TMDL Site No. 9 - Discrete bottom

Water quality data collected during the extended drought which ended in the winter of 2004-5 reflect what is considered to be a critical condition of the lake from a management perspective. Decreasing lake levels affected lake water quality measurements as constituents became more concentrated in the water volume due to the combined influence of evaporation, sediment-water recycling, and decreased flushing rate.

Water quality in Big Bear Lake varies spatially and seasonally. Spatially, the highest median levels of total phosphorus, total nitrogen, chlorophyll *a*, total suspended solids (TSS), volatile suspended solids (VSS), and pH were observed at the shallow, eastern end of the lake. In contrast, the highest median total dissolved nitrogen, ammonia-nitrogen and nitrate-nitrite levels were generally observed in the deeper, western end of the lake. These spatial trends were observed for 2001, 2002, and 2003 water quality data. The observed spatial trends for the water quality constituents appear to generally correspond with prevailing lake conditions. At the eastern end of the lake, the higher levels of total phosphorus, total nitrogen, chlorophyll a, TSS, VSS, and pH were likely attributed to the presence of shallower water, a greater degree of vertical mixing resulting in increased entrainment of nutrients and sediment re-suspension, which in turn give rise to more eutrophic conditions. The reverse spatial trend in median ammonia-nitrogen and nitrate-nitrite levels are attributed to the higher sediment release rates for ammonia-nitrogen in the deeper lake waters due to the focusing of degradable material near the dam (Kirby, 2005). Interpretation of lake water quality data for 2004 was affected by conduct of the full-scale alum application on the lake. The 2004 full-scale alum treatment involved the application of liquid aluminum sulfate to over 1,300 acres of lake surface area. Sediment nutrient release rates (sediment flux rates) strongly indicate that the alum treatment was successful in reducing the release of phosphorus from lake sediments. The more recent water quality data (2004 and 2005) demonstrate the influence of water volume on several of the nutrient water quality parameters measured. In photic zone samples, total and dissolved phosphorus as well as total nitrogen and total dissolved nitrogen were almost 50 percent lower in 2005 (lake water volume 60,000+ acre-feet) compared to the levels observed in 2004 (lake water volume ~30,000 acre-feet). Tables 6 and 7 present a summary of the growing season median nutrient results for Big Bear Lake. Although, the influence of water volume is not always clearly evident, it should be kept in mind that many other variables might be impacting the interpretation of water quality results. For example, a comparison of the 2003 and 2004 growing season median level for phosphorus forms, in light of water volume, is not possible since the full-scale alum application occurred in 2004. Additionally, nutrient water quality concentrations may have been influenced by the presence and/or absence of aquatic plants and the degree of water inflow for a preceding winter. Lake water quality data collected in 2005 reflects the water quality condition of Big Bear Lake under almost full pool conditions, one year after an alum application.

TABLE 6. GROWING SEASON MEDIAN PHOSPHORUS LEVELS (NEEDS UPDATE)

PARAMETERS	Units	August Lake Vol. (acre-ft)	In-Lake Main Sites	Main In-Lake TMDL Stations			
				Dam Site No. 1	Gilner Pt. Site No. 2	Mid-Lake Site No. 6	Stanfield Site No. 9
Photic Zone Samples							
May - October							
2001 - Total Phosphorus	µg/L	50,742	57.0	43.0	41.0	55.0	66.0
2002 - Total Phosphorus	µg/L	39,943	40.0	37.0	37.0	47.0	64.0
2003 - Total Phosphorus	µg/L	37,219	64.0	54.0	63.0	67.0	102.0
2004 - Total Phosphorus	µg/L	31,750	60.0	48.5	52.5	61.0	100.5
2005 - Total Phosphorus	µg/L	64,275	37.5	31.0	31.5	33.5	52.0
2001 - Dissolved Phosphorus	µg/L	50,742	19.5	24.0	16.0	21.0	17.0
2002 - Dissolved Phosphorus	µg/L	39,943	17.5	17.0	17.0	19.0	18.0
2003 - Dissolved Phosphorus	µg/L	37,219	28.0	28.0	28.0	30.0	28.0
2004 - Dissolved Phosphorus	µg/L	31,750	23.5	22.5	23.5	24.0	33.0
2005 - Dissolved Phosphorus	µg/L	64,275	12.0	11.0	11.0	11.5	18.5
2001 - Orthophosphate (PO_4-P)	µg/L	50,742	6.5	5.0	8.0	7.0	6.0
2002 - Orthophosphate (PO_4-P)	µg/L	39,943	5.0	5.0	6.0	5.0	1.5
2003 - Orthophosphate (PO_4-P)	µg/L	37,219	5.5	7.0	7.0	4.0	4.0
2004 - Orthophosphate (PO_4-P)	µg/L	31,750	3.0	1.5	1.5	2.3	3.0
2005 - Orthophosphate (PO_4-P)	µg/L	64,275	5.0	4.5	4.5	5.0	6.0

TABLE 7. GROWING SEASON MEDIAN NITROGEN LEVELS (NEEDS UPDATE)

PARAMETERS	Units	August Lake Vol. (acre-ft)	In-Lake Main Sites	Main In-Lake TMDL Stations			
				Dam Site No. 1	Gilner Pt. Site No. 2	Mid-Lake Site No. 6	Stanfield Site No. 9
Photic Zone Samples	□	□					
May - October	□	□					
2001 - Total Nitrogen	µg/L	50,742	1,192	1,016	1,073	1,195	1,288
2002 - Total Nitrogen	µg/L	39,943	1,114	1,065	1,078	1,133	1,266
2003 - Total Nitrogen	µg/L	37,219	1,364	1,292	1,363	1,470	1,679
2004 - Total Nitrogen	µg/L	31,750	1,426	1,354	1,395	1,467	1,631
2005 - Total Nitrogen	µg/L	64,275	845	797	805	849	920
	□	□					
2001 - Dissolved Nitrogen	µg/L	50,742	876	916	868	869	882
2002 - Dissolved Nitrogen	µg/L	39,943	918	918	903	932	958
2003 - Dissolved Nitrogen	µg/L	37,219	1,065	1,100	1,052	1,071	1,093
2004 - Dissolved Nitrogen	µg/L	31,750	1,126	1,125	1,147	1,121	1,128
2005 - Dissolved Nitrogen	µg/L	64,275	676	664	662	663	689
	□	□					
2001 - Nitrate-Nitrite	µg/L	50,742	5.0	8.0	5.0	2.5	2.5
2002 - Nitrate-Nitrite	µg/L	39,943	2.5	2.5	2.5	5.0	2.5
2003 - Nitrate-Nitrite	µg/L	37,219	2.5	2.5	2.5	2.5	2.5
2004 - Nitrate-Nitrite	µg/L	31,750	2.5	3.8	2.5	2.5	2.5
2005 - Nitrate-Nitrite	µg/L	64,275	2.5	2.5	2.5	2.5	2.5
	□	□					
2001 - Ammonia-Nitrogen	µg/L	50,742	50	100	60	38	35
2002 - Ammonia-Nitrogen	µg/L	39,943	15	34	22	12	11
2003 - Ammonia-Nitrogen	µg/L	37,219	27	64	28	23	19
2004 - Ammonia-Nitrogen	µg/L	31,750	27	52	47	14	16
2005 - Ammonia-Nitrogen	µg/L	64,275	18	27	20	18	14
	□	□					

To date, the water quality results for Big Bear Lake suggest that water volume has a substantial impact on water quality. Furthermore, the degree of water volume will control whether or not the lake will be well-mixed and polymictic or able to vertically stratify for a period of time. This in turn, will affect both photic zone and bottom discrete concentrations of nutrients. Seasonal peaks in phosphorus species, total nitrogen, and chlorophyll *a* occur during the late summer and fall. Seasonal peaks for most of the water quality constituents were much more pronounced in 2003 than in either 2001 or 2002. This may have been due to the continued decline in lake water levels and/or due to the consecutive years of aquatic herbicide treatment (2002 and 2003 aquatic herbicide application) resulting in a decrease in the nutrient sink that the plants and periphytic algae would have provided. In 2002, the seasonal peak in nitrate-nitrite levels appeared to coincide with the snow melt season in the watershed and suggest external loading as the primary source of this inorganic nitrogen source to the lake. Although surface runoff to the lake appeared somewhat limited at this time (based on tributary observations), nitrate-nitrite may have been transported to the lake through lateral subsurface flow and leaching from surrounding soils. Seasonal trends in ammonia-nitrogen levels in the lake appeared to increase with increasing water temperatures, and a relatively higher concentration found in bottom discrete samples versus photic zone composite samples suggesting that the organic decomposition in the sediments are the primary source of this nutrient to the lake.

Despite the lake's polymictic nature, weak thermal stratification does occur during the spring and summer months. This weak thermal stratification is significant enough to limit exchange between surface and bottom waters within the lake. This results in the low dissolved oxygen levels in the deeper waters of the lake. Lake conductivity measurements appeared to respond to precipitation inflows. During the snow melt/spring runoff and wet season, lake conductivity measurements tended to decrease. This demonstrates the importance of dilution and flushing rate on the water quality of the lake, especially during low inflow years.

The highest water temperatures at all of the main lake monitoring stations were observed in July and August of each year. By the first to middle of September, water temperatures would usually begin to decline for Big Bear Lake, reflecting the impact of the lake's elevation on the seasonal cycle observed for water temperatures. As expected, the lowest concentrations of dissolved oxygen generally occurred during the summer or early fall. However, there were several occasions when low dissolved oxygen concentrations were observed in May and June. The findings suggest that dissolved oxygen level is a function of both water temperature and the oxygen demand of the hypolimnion and sediments due to organic decomposition.

2.5 Pilot Programs to Eradicate Eurasion Water Milfoil

In Big Bear Lake, the interference of excessive aquatic plant growth on the recreational beneficial uses of Big Bear Lake was managed by performing a pilot application of aquatic herbicides over two years (2002 and 2003). The aquatic herbicide applications, in conjunction with decreased lake water levels, were shown to effectively control the excessive aquatic macrophyte growth and substantially decrease the amount of plant biomass occupying the littoral zone (BBMWD, 2004). However, the extensive plant biomass reductions also eliminated a storage reservoir for nutrients during the growing season (BBMWD, 2004). Aquatic plant removal also increased entrainment of nutrients, thus contributing to an increase in water column nutrient concentrations. Finally, the use of aquatic herbicides released a significant amount of nutrient-rich organic materials (in the form of decaying plant tissues) to the water column and lake sediments (Berkowitz and Anderson, 2005). In turn, these actions could have resulted in increased nutrient availability and more frequent algal blooms. Each of the above management measures acted to shift the lake's steady state equilibrium from a clear, aquatic macrophyte-dominated system toward a more turbid, algal-dominated system. Therefore, additional control measures will likely be needed to reduce nutrient releases from lake-bottom sediments. These measures are described in a separate plan to be submitted to the Regional Board in April, 2010.

3.0 NOXIOUS AND NUISANCE AQUATIC PLANT MONITORING PROGRAM

A systematic means of monitoring the status of aquatic plants in Big Bear Lake is a critical component for measuring the success of the APMP. Long-term aquatic plant monitoring data regarding aquatic plant locations, species composition, relative density and relative percent abundance are needed to develop adaptive management.

3.1 Aquatic Plant Monitoring Approach

A comprehensive survey will be performed to characterize the abundance, diversity and relative percent coverage of aquatic vegetation in Big Bear Lake. The Monitoring Program will utilize three stages of monitoring. These stages are: Stage 1 - Littoral Circumventing, Stage 2 – Littoral Transecting, and Stage 3 - Management-specific Monitoring. These stages are described in greater detail below (see Section 3.4). In short, Stage 1, Littoral Circumventing provides for aquatic plant monitoring parallel to the shoreline of the lake. Stage 2, Littoral Transecting provides for aquatic plant monitoring perpendicular to the lake shoreline. The combined use of Stage 1 and Stage 2 aquatic plant monitoring provides a systematic and repeatable means for assessing the overall status of aquatic plants in Big Bear Lake. Stage 3 monitoring provides a means for locating specific plants of interest (i.e. Eurasion Water Milfoil). For all aquatic plant point observations, the GPS coordinates, lake surface elevation, water depth, aquatic plant species, plant relative density, and relative plant abundance will be recorded. In addition, voucher samples of each aquatic plant species identified by Stage 1 and Stage 2 surveys will be taken for taxonomic identification verification. Voucher specimens will be sent to the U.S. Army Corps of Engineers, Lewisville, Texas or U.C. Davis for verification. After verification, voucher specimens will be returned to the BBMWD to provide an aquatic plant library of species found within the lake.

3.3 Aquatic Plant Monitoring Schedule

The comprehensive lake vegetation survey will be performed every three years at the peak of the growing season . In addition to the triennial comprehensive surveys, an annual Stage 3 reconnaissance-level survey will be performed each spring to identify areas that require herbicide treatment. Regular lake patrols and data from public call logs will be used to schedule follow-on spot treatments throughout the summer months.

More frequent surveys are unnecessary because the lake ecosystem changes very slowly. Moreover, the proposed schedule fits well with the TMDL triennial review process. Baseline surveys were performed in 2006. Therefore, the next comprehensive analysis will be conducted in the summer of 2010. The results will be submitted to the Regional Board as part of the next annual report due in February of 2011.

The dischargers named in the TMDL will be responsible for contracting the comprehensive lake vegetation surveys (Stage 1 and Stage 2 sampling and the BBMWD will provide on the water support services and office/computer use to the consultant for data processing). BBMWD will be responsible for performing the annual reconnaissance-level pre-treatment surveys, conducting the daily lake patrols and recording the public call logs. In addition, BBMWD will be responsible for maintaining all the records required by the California Department of Pesticide Regulation related to the herbicide applications.

3.4 Aquatic Plant Monitoring Parameters

Stage 1 Littoral Circumventing is simply the point visual observation of aquatic plants through use of a single rake sample or visual observation tube at 1.5 m water depth approximately every 100 m parallel to the shoreline. Since the perimeter of the Big Bear Lake shoreline averages 30,000 m in distance, observations taken at every 100 m parallel to the shoreline will result in approximately 300 points of observation. At every visual observation point, the following will be recorded:

- Sample date and sample time;
- Location of each sampling point by GPS coordinates;
- Water depth and lake surface elevation;
- Presence or absence of aquatic plants;
- Aquatic plant species (if plants are present);
- Relative aquatic plant density (if plants are present); and,
- Relative percent abundance of each aquatic plant species.

If aquatic plants are present, each aquatic plant species found on the rake sampling device will be identified, and relative plant densities assessed. Relative plant densities will be assessed by determining the number of plant stems captured by a single rake sample. Relative plant density will be defined as low when 1 to 2 vertical stems are collected from the sediment per rake sample, moderate at 3 to 6 stems per rake sample, high at 7 to 10 stems per rake sample and saturated at 10 or more stems per rake sample. Note: In the case of *Elodea canadensis* (common Elodea) the relative plant density should be related to area of sediment visible from viewer because of that plant's growth characteristic. Therefore, low density would be more than 75% of sediment surface visible, moderate at 50% sediment surface visible, high at 25% of the sediment surface visible and saturated at less than 25% of sediment surface visible from viewer. If the plants have canopied and have extensive growths on the water surface, as is often the case for EWM, that area shall be classified as saturated.

After relative percent density is determined, the relative percent abundance of each species will also be recorded. When there are 10 or fewer stems retrieved by the rake sampler, relative abundance will be determined by counting the number of stems of a given species and then dividing by the total number of stems observed. When there are more than 10 stems per rake sample, the relative abundance will be determined simply by estimating the species stem count distribution in 10 percent increments. The process of determining relative aquatic plant abundance should be fairly simple based on the low number of species observed within the lake over the past two decades. If species cannot be identified at the time of sampling, a sample will be obtained for later identification with the appropriate plant keys.

should be noted that relative aquatic plant density and abundance information can later be ranslated to numbers that correspond to area coverage. For example, a single rake will sample known surface area (approximately 0.2 to 0.3 m^2 area). Similarly, the viewing area at 1.5 m vater depth is approximately 0.3 m^2 when using a 0.15 m viewing tube. The information ssociated with each rake sample, can then be converted to a square meter area.

he recorded GIS data will adhere to the following protocols:

1. GPS data will be collected using a Global Positioning System (GPS) unit with differential correction using a satellite-based augmentation system (SBAS). Corrected GPS measurements will be within 1-meter (m) horizontal accuracy.
2. GPS data will be reported using NAD83 datum coordinates (decimal degrees, five (5) decimal places), northing, easting, and UTM Zone 11. Other information recorded will include sample date, time, water depth (m), aquatic plant species, relative aquatic plant density, and relative species abundance.
3. GPS data will be post-processed and converted into a geographic information system (GIS) shapefile compatible with an ArcGIS 9.X Platform. All metadata shall compiled with FGDC standards.
4. Post-processed ASCII format file containing aquatic plant transect data, GIS compatible shapefile with metadata will be produced.
5. Raw survey notes recorded during survey shall be included in metadata file.

Stage 2 Littoral Transect monitoring will be conducted by first locating a station previously established by the Stage 1, Littoral Circumventing monitoring. Transect lines will be spaced approximately 400-m to 500-m apart and run perpendicular to the lake shoreline. Observation points along the transect lines will record the same aquatic plant data as recorded during Stage 1 efforts and will be collected at the 1.5 m, 2.5 m, 3.5 m, and 4.5 m water depths. Data at the 1.5 m water depth point will not be re-collected (as it was already collected during the Stage 1 efforts however, the GPS coordinates will be used to locate the starting point of each transect line. The length of each transect line (i.e., from the 1.5 m data point to 4.5 m data point) will be influenced by the slope of the lake bottom. Shorter transect lengths will indicate steeper lake bottom slopes, while longer transect lengths will reflect lake bottom slopes more gentle in nature. The littoral transect monitoring will provide approximately 75 separate transect lines for Big Bear Lake. Again, the same aquatic plant information will be recorded at each observational station as described in the Stage 1 sampling. At every sample rake point and/or visual observation point, the following will be recorded:

- Sample date and sample time;
- Location of each sampling point by GPS coordinates;
- Water depth and lake surface elevation;
- Presence or absence of aquatic plants;
- Aquatic plant species (if plant are present);
- Relative aquatic plant density (if plants are present); and,
- Relative percent abundance of each aquatic plant species.

If aquatic plants are present, each aquatic plant species found on the rake sampling device will be identified, and relative plant densities assessed. Relative plant densities will be assessed by determining the number of plant stems captured by a single rake sample. Relative plant density will be defined as low when 1 to 2 vertical stems are collected from the sediment per rake sample, moderate at 3 to 6 stems per rake sample, high at 7 to 10 stems per rake sample and saturated at 10 or more stems per rake sample. Note: In the case of *Elodea canadensis* (common Elodea) the relative plant density should be related to area of sediment visible from viewer because of that plant's growth characteristic. Therefore, low density would be more than 75% of sediment surface visible, moderate at 50% sediment surface visible, high at 25% of the sediment surface visible and saturated at less than 25% of sediment surface visible from viewer. If the plants have canopied and have extensive growths on the water surface, as is often the case for EWM, that area shall be classified as saturated.

After relative percent density is determination, the relative percent abundance of each species will also be recorded. When there are 10 or fewer stems retrieved by the rake sampler, relative abundance will be determined by counting the number of stems of a given species divided by the total number of stems observed. When there are more than 10 stems per rake sample, the relative abundance will be determined simply by estimating the species stem count distribution in 10 percent increments. The process of determining relative aquatic plant abundance should be fairly simple based on the low number of species observed within the lake over the past two decades.

It should be noted that relative aquatic plant density and abundance information can later be translated to numbers that correspond to area coverage. For example, a single rake will sample a known surface area (approximately 0.2 to 0.3 m^2 area). Similarly, the viewing area at 1.5 m water depth is approximately 0.3 m^2 when using a 0.15 m viewing tube. The information associated with each rake sample, can then be converted to a square meter area.

The recorded GIS data will adhere to the following protocols:

1. GPS data associated with transects will be collected using a Global Positioning System (GPS) unit with differential correction using a satellite-based augmentation system (SBAS). Corrected GPS measurements will be within 1-meter (m) horizontal accuracy.
2. GPS data will be reported using NAD83 datum coordinates (decimal degrees, five significant figures), northing, easting, UTM Zone 11. Other information recorded will include sample date, time, water depth (m), aquatic plant species, relative aquatic plant density, and relative species abundance.
3. Observations will be collected from the 2.5-m, 3.5-m, and 4.5-m water depths along each transect. In addition, secchi disk depth will be recorded at the 4.5-m depth.
4. GPS data will be post-processed and converted into a geographic information system (GIS) shapefile compatible with an ArcGIS 9.X Platform. All metadata shall compiled with FGDC standards.
5. Post-processed ASCII format file containing aquatic plant transect data, GIS compatible shapefile with metadata will be produced. This file will also include data on the length of each transect from the 1.5-m starting point to the 4.5-m ending point.
6. Raw survey notes recorded during survey shall be included in metadata file.

Aquatic Plant Biomass Sub-Sampling

After the completion of Stage 1 and Stage 2 aquatic plant monitoring, aquatic plant total biomass samples will be collected at 24 randomly selected sampling points. The 24 total biomass sampling points will be randomly selected based upon the distribution of relative plant density categories (i.e., low, moderate, high, and saturated). For example, if 50% of the monitoring points were categorized as low relative plant density and the remaining 50% of the monitoring points were categorized as high relative plant density, then 12 total biomass samples would be randomly selected from the monitoring points labeled as low relative plant density and the other 12 samples from points labeled as high relative plant density. Total biomass samples will be collected using the quantitative rake sampling method. Both wet and dry mass measurements will be recorded. The purpose for collecting the total biomass data is to ensure the ability to estimate nutrient loads from aquatic plant senescence in the future.

Stage 3 Management-Specific Monitoring. Stage 3 monitoring will employ a visual reconnaissance and, if needed, a point-intercept method, to better document the locations and surface area coverage of Eurasion Water Milfoil. The location and relative aquatic plant density information will then be used to make decisions regarding the location of treatment areas via the use of map polygons (See Section 5.0). The areal size of the polygon and average water depth within the polygon treatment area will provide the information needed for aquatic herbicide applications.

If utilized, the objective of the point-intercept approach for aquatic plants is to generate point observation measurements at regularly spaced locations within a given area. For Big Bear Lake, the suggested spacing interval will be approximately every 20-m horizontally within the 5m-depth (18-feet) contour. These points can be found in the field using GPS and GIS equipment. Under Stage 3 monitoring, areas located for EWM eradication and control efforts will most likely be dominated by EWM. All GPS coordinates and geographic information system (GIS) shapefiles will be managed as already described.

3.5 Equipment

Equipment required for the emergent and aquatic plant monitoring efforts include the following:

- GPS Unit with software downloadable to GIS format;
- Standard Rake Sampler (15-inches in length);
- One View Tube;
- Boat; and
- Miscellaneous field supplies.

Design of the quantitative rake sampler will follow Gibbons and Gibbons, 1985 or similar device.

3.6 Data Management

For aquatic plant monitoring, all of the field information will be overlaid on the most recent bathymetric map for Big Bear Lake for mapping and analysis purposes. All data will be captured when taking the GPS coordinates. Data dictionaries will be created in the Trimble DGPS unit used for field locations. The data collected will be directly downloaded for use into the GIS after post-processing of the GPS coordinates. A map will then be produced that shows aquatic plant species and locations as well as aquatic plant relative density information.

The selected contractor for aquatic plant monitoring activities will provide the monitoring results in both hard copy and electronic formats. All data will also be available in Microsoft® Excel spreadsheets.

Ultimately, the Big Bear Lake Beneficial Use map and/or priority management/regulatory areas will also be overlaid on the aquatic plant maps to highlight areas in need of aquatic plant management action.

4.0 AQUATIC PLANT NUMERICAL INDEX

In an attempt to develop a tool to aid in future aquatic plant management decisions as well as track the relative environmental habitat value of aquatic plant communities, a preliminary Aquatic Plant Numerical Index (APNI) system was developed. This Aquatic Plant Numerical Index utilizes the data collected during aquatic plant monitoring under Stage 1 and Stage 2 efforts and translates that data to numerical values to allow an unbiased means of assessing the need for aquatic plant management activities in the lake. The index is based on presence or absence of native or non-native species, relative species composition, and relative density as described in the monitoring protocol given in the previous section.

Although coverage area can also be incorporated into this type of aquatic plant index, for Big Bear Lake the potential littoral zone area is highly variable from location to location due to water level fluctuations from year to year (see TetraTech, 2004). A vertical variation of 17 feet below normal full pool elevation leads to littoral area instability within a given location and transitional plant community structure. Most importantly, the vertical instability of the water surface elevation makes year-to-year comparison based on area difficult. To overcome this variability in euphotic littoral area, two aquatic plant index numbers will be produced. One will use data collected following the Stage 1 littoral circumventing monitoring method and the other from the Stage 2 littoral transect monitoring method. Aquatic plant index based on Stage 1 data will characterize the shoreline community and an aquatic plant index based on Stage 2 data will characterize the shallow bays within the lake. This will allow relative assessment of aquatic plant community structure and environmental habitat status independent of area.

The index number is calculated by assigning a number value to the collected field data at each observation station (see Table 8). The series of numbers in Table 8 is totaled to produce the index number at that location or observation station. To calculate an average index number within a specific zone, the index number is added to every index number within the zone of interest and then divided by the number of observation locations used to generate an average index number for that zone. "Zones of interest" will be established using GIS systems and during the process of evaluating the utility of the Aquatic Plant Numerical Index. At this time, it is anticipated that "zones of interest" will be established within Boulder Bay, Metcalf Bay, Grout Bay, the eastern side of Eagle Point. "Zones of interest" will also be established along rectangular stretches adjacent to the Big Bear Lake shoreline.

TABLE 8. Aquatic Plant Index Value Assignments

Data	Species Value	Composition Value	Density Value
Species			
Plants Present	1		
Plants Absent	0		
Native	1 if present, 0 if absent	1 if present, 0 if absent	0 if absent, 1 if between 1 and 2 stems per rake sample, 2 if between 3-6 stems per rake sample, 3 if between 7-10 stems per rake sample, and 4 if more then 10 stems per rake sample.
Non-Native	0 if absent, 2 if present	0 if absent, and 1 if 5% or less, 2 if 5-25%, 3 if 25-50%, and 4 if more than 50% of the plant community composition	0 if absent, 1 if between 1 and 2 stems per rake sample, 2 if between 3-6 stems per rake sample, 3 if between 7-10 stems per rake sample, and 4 if more then 10 stems per rake sample

Table 9 presents an example of the numerical index assignment and calculation based on Stage 1 or Stage 2 monitoring for a good habitat aquatic community and one that would be prioritized for management action.

TABLE 9. Examples of Aquatic Plant Index Calculation

Balanced Aquatic Plant Community				
Data	Species Value	Composition Value	Density Value	Total Values
Species				
Present	1			1
Absent	0			0
Native	1	1	1	3
Non-Native	0	0	0	0
Index Number				4
Aquatic Plant Community in need of management action				
Data	Species Value	Composition Value	Density Value	Total Values
Species				
Present	1			1
Absent	0			0
Native	1	1	1	3
Non-Native	2	4	4	9
Index Number				13

Using the preliminate Aquatic Plant Numerical Index approach, the threshold for aquatic plant management action is based on the presence and density of non-native species and the adverse impacts that native plants may have on recreational lake uses when plant densities become too dense. If utilized in the future, this preliminary Aquatic Plant Numerical Index will be modified to incorporate the Beneficial Use Map.

Under the preliminary index system, the non-native plant presently of concern within Big Bear Lake is Eurasian Watermilfoil (*Myriophyllum spicatum*). However in the future, management of other non-native and native aquatic plant species may be necessary depending on their locations and densities as well. For example, although not currently a problem in Big Bear Lake, the native Coontail (*Ceratophyllum demersum*) may again attain nuisance status and require management activities.

Table 10 provides an example of the preliminary Aquatic Plant Numerical Index relationship to potential aquatic plant management actions for a specific targeted zone. Again, if this preliminary Aquatic Plant Numeric Index is determined to be a valuable management tool, this index will likely be modified to account for lake beneficial uses and priority beneficial use zones.

TABLE 10. Aquatic Plant Index Number versus Management Actions

Index Number	Management Action
0	Consider introduction of native aquatic plants
1-4	No action
5	Control action if index score due to non-native plants
6	Control action needed but low priority
7-9	Control action necessary
10-13	Immediate control with maximum intensity

Stage 1 and Stage 2 aquatic plant monitoring data will be input into the index so that it may be used on a trial basis. Additionally, if the Aquatic Plant Numeric Index is found useful, it may be modified or refined in the future. In addition to incorporating the Beneficial Use Map of Big Bear Lake, the Aquatic Plant Numeric Index may be reworked to include other variables or indicators of aquatic plant management needs. Finally, other means of assessing aquatic plant interference with the lake's recreational uses will include: 1) keeping records of the number of people that require lake patrol assistance due to aquatic plants, 2) documenting complaints about lake navigability, and 3) documenting complaints from dock owners.

5.0 AQUATIC PLANT ERADICATION/CONTROL STRATEGIES

Eurasian watermilfoil is a submersed, rooted, perennial dicot that is submersed except for the upper flower-bearing portions. Native to Eurasia and North Africa, the history of the spread of this species in the United States is unclear due to its initial confusion with a phenotypically similar species, Northern milfoil (*M. sibiricum*). According to AERF (2005), this plant is now considered one of the worst aquatic weeds in North America. Eurasian watermilfoil is a highly aggressive invasive aquatic species. Its rapid growth rate enables this milfoil to cover water surfaces and form thick underwater stands. Such rapid growth displaces the native vegetation over a few years. EWM is tolerant of low water temperatures and can begin spring growth earlier than other aquatic plants. EWM spreads by the dispersal of plant fragments into water currents in lakes and reservoirs.

5.1 Eradication & Control Treatment Technologies

This nationally pervasive and potentially detrimental noxious aquatic weed has been intensively studied to identify effective control techniques (CDA, 2000; AERF, 2005). The treatment technologies currently utilized for Eurasion Water Milfoil include the following:

Mechanical – Mechanical control of Eurasion Water Milfoil has been identified as a short- to medium-term strategy deployed for small to moderate infestations. Mechanical controls established for EWM include: 1) Hand pulling, 2) Harvester, 3) Rototiller and 4) Cutter. The advantages of using harvesters are that it immediately opens up harvested areas and removes the upper canopy and shade-producing portion of the plants. However, a disadvantage of harvesting is that fragments of Eurasion Water Milfoil are left in the water and these fragments contribute to the re-growth and re-spreading of the plant. Secondly, the literature shows that harvesting impacts fish and insect populations by removing them in the harvested plant material. Thirdly, cutting plant stems too close to the bottom of the lake results in re-suspension of sediments and nutrients. Finally, the operation of harvesters is a fairly expensive endeavor. The BBMWD utilized both harvesters and rototiller control methods for over 20 years. Despite their long history of efforts using these methods, Eurasion Water Milfoil continued to expand in the lake. Also, the BBMWD has verified the expenses associated with harvesting activities.

hysical – Methods of physical control used for Eurasion Water Milfoil include employment of:) Benthic Barriers, 2) Dredging, 3) Drawdown, and 4) Shading. The use of benthic barriers nd/or shading is limited by both size, treating no more than 1.0 acre per site, and the absence f selectivity. Dredging is extremely expensive, while drawdown is counter to the BBMWD's verall lake management mission.

erbicide – According to the AERF (2005), the use of herbicides for the control of invasive and uisance plant species represents one of the most widely used and effective management ptions available. Specifically, herbicide control of aquatic weeds is often the first step in a ng-term integrated control program. Further, no herbicide product can be labeled for aquatic se if it has more than one in a million chance of causing significant harmful effects to human ealth, wildlife, or the environment (AERF, 2005).

here are many herbicides available for the control of EWM. Since EWM is a dicot, it is menable to selective control using herbicides that specifically target this group. Aquatic erbicides used in Big Bear Lake against EWM include various formulations of Sonar (active ngredient = Fluridone) and Renovate OTF (active ingredient = Triclopyr). These aquatic erbicides are classified as systemic herbicides. Systemic herbicides are translocated hroughout the plant and are slower acting, but they often result in mortality of the entire plant. Sonar formulations can be selective for EWM alone, however, in order to achieve selectivity for EWM alone, herbicide application rates and plant responses must be examined on a site-specific basis. Fortunately, according to the Sonar manufacturer (SePro), EWM is one of the most sensitive aquatic plant species controlled by this product. Attachment 2 provides the Sonar formulation product labels. These product labels provide information regarding the aquatic plants controlled by this herbicide. Unlike Sonar formulations, Renovate OTF is selective for EWM alone, independent of the applied dosage. Other plant taxa found in Big Bear Lake are not adversely affected by treatment with this product. Attachment 3 provides the product label for Renovate OTF.

5.2 Non-Native Plant Eradication/Control Objectives and Approach

The main purpose of the Aquatic Plant Management Plan is the continued eradication of Eurasion Water Milfoil. BBMWD will rely on aquatic herbicides to achieve this objective. The aquatic herbicide used will most likely be a Sonar formulation or Renovate OTF. The BBMWD has the necessary National Pollutant Discharge Elimination System (NPDES) permits required for the application of each of these herbicides. EWM treatment areas will be established after the completion of aquatic plant monitoring activities. Treatment areas will be limited to those locations found to be almost exclusively dominated by EWM with high relative density values. If Sonar is used (but will most likely be Renovate OTF) this approach would minimize the impact of Sonar to sensitive native aquatic plant species (e.g., Common Elodea and Coontail). If Renovate OTF is used, sensitivity of native aquatic plant species should not be an issue, as Renovate OTF is selective for EWM only in Big Bear Lake. All aquatic herbicide applications will be performed in accordance with applicable individual or General NPDES permit specifications by or under the direct supervision of a State licensed applicator.

6.0 ADAPTIVE RESPONSE ON PLANT MANAGEMENT STRATEGIES

Ultimately, aquatic plant control is needed for Big Bear Lake to: 1) protect recreational, aquatic life, and wildlife beneficial uses, 2) enhance aquatic habitat that has been degraded by shifts in native plant community structure and/or 3) reduce the density of aquatic plants that lead to water quality declines, such as lowering of dissolved oxygen, or physical densities that limit shelter and food gathering.

In the future, the approach to controlling nuisance and noxious aquatic plants in Big Bear Lake will be influenced in part by the large littoral area of the lake and historical plant coverage. The large littoral zone area in need of management leads to the use of herbicides as the most cost effective methodology to manage the aquatic plants in the lake. However, the aquatic plant management approach will need to be refined so that when needed, control of EWM alone can be achieved and acceptable approaches for the control of native nuisance aquatic plant species may be developed.

Because one goal of the Nutrient TMDL program is to limit EWM to less than 5% of the aquatic plant community in the lake, control of EWM will always be a high priority for managing recreational resources in the lake. This Big Bear Lake Aquatic Plant Management Plan will incorporate the use of a Beneficial Use Map previously developed by BBMWD.

7.0 Schedule of Deliverables

#	Description	Due Date	Responsible Agency
1	Comprehensive Aquatic Vegetation Survey (including voucher specimens, data collection, analysis and reporting and integrating results with 3D map)	Every 3 years beginning in August, 2010. Results submitted with annual report beginning in February, 2011	TMDL Dischargers
2	Pre-Treatment Reconnaissance-Level Survey (including GIS mapping)	Annually in spring	BBMWD
3	Aquatic Herbicide Applications (including required permits, product, personnel, and DPR reporting)	Annually in late spring and bi-weekly spot treatment throughout the growing season.	BBMWD
4	TMDL Annual Reports and Effectiveness Assessments	Annually beginning in February, 2011	TMDL Dischargers
5	Mechanical Weed Harvesting	As needed	BBMWD

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