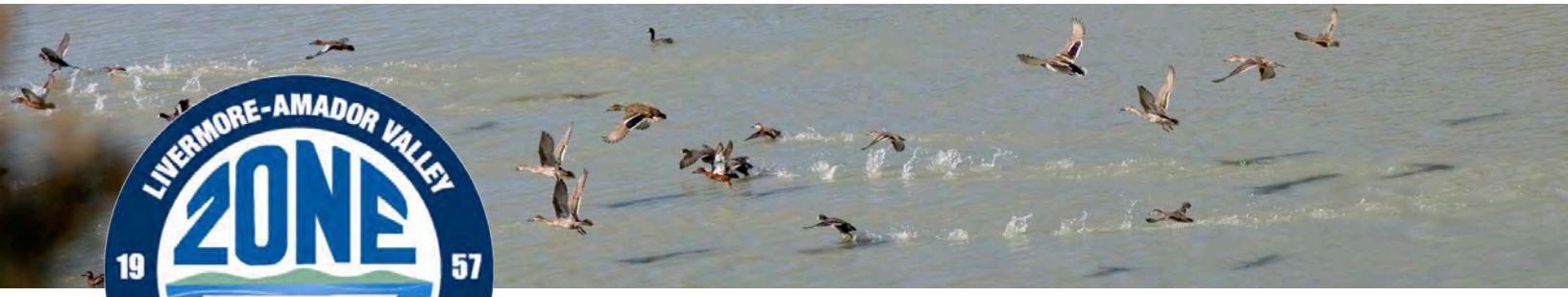
Preliminary Lake Use Evaluation for the Chain of Lakes



March 2014

Prepared by

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ZONE 7
ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
BOARD OF DIRECTORS

RESOLUTION NO 14-4347

INTRODUCED BY DIRECTOR QUIGLEY
SECONDED BY DIRECTOR PALMER

WHEREAS, a need was identified to develop and communicate a more formal lake use plan for the future Chain of Lakes and specifically, Lakes H, I, and Cope Lake for purposes of coordinating with external entities' planning efforts; and

WHEREAS, the Preliminary Lake Use Evaluation for the Chain of Lakes (Evaluation) was undertaken by Staff to create a list of potential uses and criteria for evaluating each use that can be updated in the future as new information becomes available; and

WHEREAS, the Evaluation generally does not preclude any given lake from distinct uses, but instead provides a tool for examining the benefits or impacts associated with a proposed use. Given the long period of lake transfers, uses of the lakes will be reconsidered over time to reflect any changes in regulations, water management needs, and other factors; and

WHEREAS, a list of potential uses, a proposed lake use evaluation methodology, and preliminary results have previously been presented at various meetings with the Zone 7 Water Resources Committee, Zone 7 Board, retailers, and Liaison Committee and comments have been incorporated into the Evaluation;

NOW, THEREFORE, BE IT RESOLVED, that the Board of Directors of Zone 7 of Alameda County Flood Control & Water Conservation District hereby accepts the "Preliminary Lake Use Evaluation for the Chain of Lakes" report and adopts the proposed near-term recommendations for Lakes H, I, and Cope Lake.

ADOPTED BY THE FOLLOWING VOTE:

AYES: DIRECTORS FIGURES, GRECI, MACHAEVICH, PALMER, QUIGLEY, RAMIREZ HOLMES, STEVENS

NOES: NONE

ABSENT: NONE

ABSTAIN: NONE

I certify that the foregoing is a correct copy of a Resolution adopted by the Board of Directors of Zone 7 of Alameda County Flood Control and Water Conservation District on February 19, 2014.

By: _____
President, Board of Directors

EXECUTIVE SUMMARY

The Chain of Lakes (COLs) is a series of former quarry lakes located in the heart of the Livermore-Amador Valley. Best described in the 1981 Specific Plan for Livermore Amador Valley Quarry Area Reclamation (LAVQAR), the COLs was envisioned as a large facility to be used for water management and related purposes by Zone 7 Water Agency (Zone 7). The COLs will ultimately consist of ten lakes, named Lakes A through I and Cope Lake, connected through a series of conduits. Over the years, various other potential uses of the lakes have been proposed or requested in conjunction with the planning activities of outside agencies.

The purpose of the Preliminary Lake Use Evaluation for the COLs is to identify which potential lake uses may be more suitable for individual former quarries—especially where conflicting proposed alternative uses may exist—and provide a framework for evaluating proposed uses as lakes are transferred to Zone 7 ownership. The evaluation generally does not preclude any given lake from distinct uses, but instead provides a tool for examining the benefits or impacts associated with a proposed use.

The uses evaluated were divided into Primary Uses and Secondary Uses:

- **Primary Uses** directly support Zone 7's mission of providing a reliable, high-quality water supply and effective regional flood protection.

- **Secondary Uses** are uses that have been requested by external entities (e.g., retailers, members of the public, recreation agencies) and are potentially compatible with Zone 7's Primary Uses of the lakes, but do not directly support Zone 7's mission.

Specific criteria were developed to evaluate the suitability of each lake use, broken down into the key defining attributes that a lake would need to support a given use (pros) and attributes that negatively impact its ability to support a given use (cons). Each pro or con was assigned a positive or negative point value, respectively, that reflected its importance to the function of the use. Point values from the criteria were summed to provide the score for each use and for each lake, allowing relative ranking of the lakes for each use. Lakes that scored greater than 50% of the maximum score were considered "more suitable" for a particular use.

Figure ES-1 summarizes the results of the evaluation. Note that surface water storage and conveyance is an assumed use for each of the lakes, and other uses would have to be considered with this in mind.

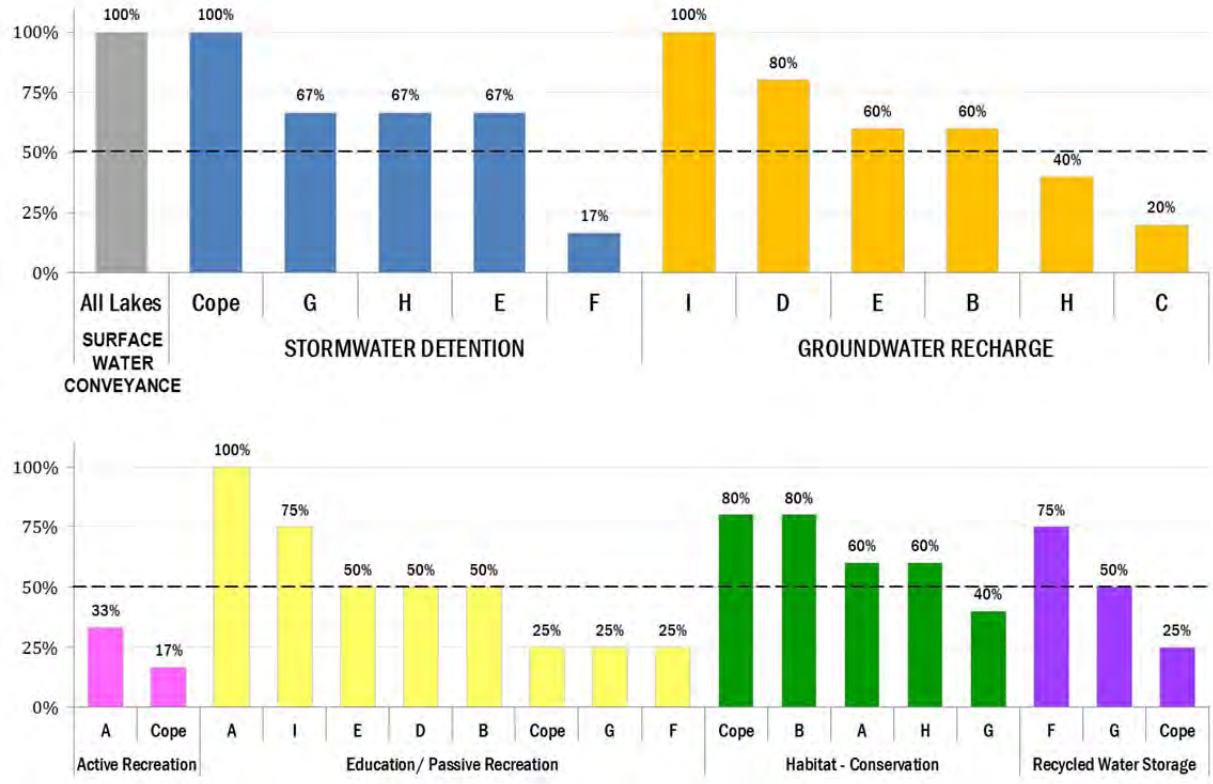

Figure ES-1. Summary of scores by Primary Use (top) and Secondary Use (bottom).

With the exception of active recreation, strong candidates emerged for most uses. However, some lakes may have scored high for multiple uses, which may or may not be compatible. A lake use compatibility matrix was developed for guidance, but actual compatibility will need to be determined when there is more specific information on site-specific conditions (e.g., hydrogeologic data) and on the design and operation associated with the uses being considered.

Zone 7 will continue to coordinate with Alameda County and the quarry operators/owners on the lakes still in active mining, in use for related operations, or undergoing reclamation; this will help ensure that the lakes will be suitable for water management activities, as intended, upon transfer. In the near-term, Zone 7's detailed planning efforts are primarily focused on Lake I and Cope Lake, which are already owned by Zone 7, and Lake H, which is anticipated to be transferred to Zone 7 within the next three years as reclamation is completed. These efforts will continue to be coordinated with the development of the EPSP.

Near-Term Recommendations

Lake I will be used for surface water storage and conveyance, and groundwater recharge, as originally designated in LAVQAR, given its high recharge capacity/connectivity with the groundwater basin. Lake I is a strong candidate for public education because of its location and, given its use, provides a powerful backdrop for educating the public about water management. Extension of trails around portions of Lake I is also possible.

Cope Lake has the highest potential for multi-beneficial use. Cope Lake is a strong candidate for stormwater detention and was one of only two lakes that rated a positive score for active recreation. Those two uses are potentially compatible, requiring some timing restrictions on the use of the lake for active recreation activities during the wet season. The design of the recreation facilities would also have to be carefully considered because of the fluctuating water levels. While it was one of three lakes that scored positively for recycled water storage, it scored the lowest. The other two lakes, F and G, may be more appropriate for this use and could be considered at a later time depending on timing of need and lake transfer; other off-chain pits in the COLs area may also be potential candidates.

Lake H also emerged as a potential candidate for stormwater detention. The east sides of Cope Lake and Lake H could be considered for preservation as a habitat corridor, allowing for wildlife to move between the riparian areas of the Arroyo Mocho and upland habitat. This would not conflict with the use of the lakes for stormwater detention or surface water storage and conveyance.

Figure ES-2 shows Lakes H and I, and Cope Lake, and the near-term recommended uses for these lakes.

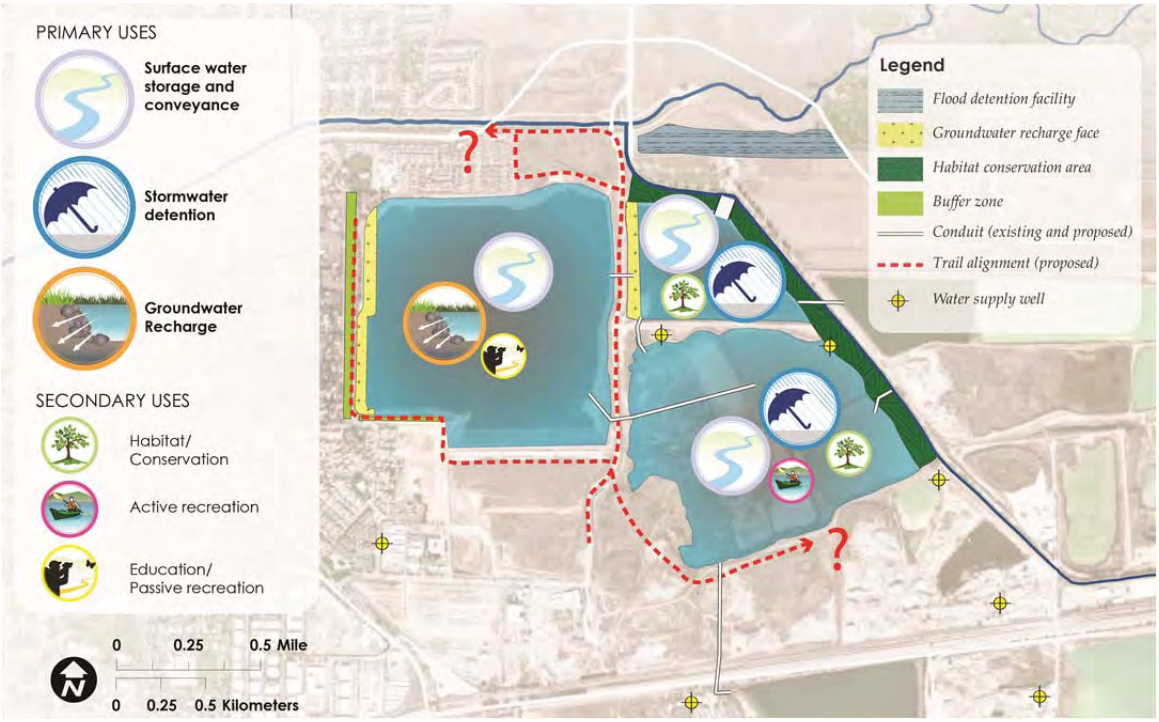

Figure ES-2. Map of near-term recommendations for Lakes H, I, and Cope.

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ACRONYMS

AF	Acre-feet
COLs	Chain of Lakes
DSRSD	Dublin San Ramon Services District
DVWTP	Del Valle Water Treatment Plant
EACCS	Eastern Alameda County Conservation Strategy
EBRPD	East Bay Regional Parks District
ECSP	El Charro Specific Plan
EPSP	East Pleasanton Specific Plan
LAVQAR	Livermore-Amador Valley Quarry Area Reclamation
Mft^3/day	million cubic feet per day
MOU	Memorandum of Understanding
msl	mean sea level
NPDES	National Pollutant Discharge Elimination System
PGC	Pleasanton Gravel Company
SMARA	Surface Mining and Reclamation Act
SMMP	Stream Management Master Plan
SMPs	Surface Mining Permits
SWP	State Water Project

1 Introduction

The Alameda County Flood Control and Water Conservation District, Zone 7 (Zone 7 Water Agency) supplies treated water to retailers serving about 220,000 people in Livermore, Pleasanton, Dublin, and, through special agreement with the Dublin San Ramon Services District, the Dougherty Valley area in San Ramon (Figure 1-1). This area is generally referred to as the Livermore-Amador Valley (Valley). Zone 7 supplies untreated irrigation water to some local vineyards, farms, and golf courses; provides flood protection to eastern Alameda County; and manages the local groundwater basin.

1.1 PURPOSE AND NEED

The Chain of Lakes (COLs) is a series of former quarry lakes located in the heart of the Livermore-Amador Valley (Figure 1-1). Best described in the 1981 Specific Plan for Livermore Amador Valley Quarry Area Reclamation (LAVQAR, Appendix A), the COLs were envisioned as a large water management facility to be used by Zone 7 Water Agency (Zone 7). The COLs will ultimately consist of ten lakes, named Lakes A through I and Cope Lake, connected through a series of conduits.

While LAVQAR (1981) designated overall uses for the COLs area, it also recognized the need for Zone 7 to have flexibility in determining the ultimate use and operation of the lakes for water management. The general vision is that Zone 7 would use the lakes for water management and related purposes. Water management includes but is not limited to groundwater recharge, surface water storage and conveyance, and flood protection. However, various potential uses of the lakes have been proposed or requested over the years in conjunction with the planning activities of outside agencies. Some examples include: the need for wet-weather storage of recycled water by Dublin San Ramon Services District (DSRSD) as described in DSRSD's Memorandum of Understanding (MOU) with Zone 7; requests for recreational amenities as part of the City of Pleasanton's East Pleasanton Specific Plan (EPSP); and various quarry operators' reclamation plan amendments.

The purpose of the Preliminary Lake Use Evaluation for the COLs (Evaluation) is to identify which potential lake uses may be more suitable for individual former quarries—especially where conflicting proposed alternative uses may exist—and provide a framework for evaluating proposed uses as lakes are transferred to Zone 7 ownership. In general, the Evaluation does not preclude any given lake from distinct uses, but instead provides a tool for examining the benefits or impacts associated with a proposed use. The Evaluation has evolved through consultations with Zone 7's Water Resources Committee, Board of

Directors, retailers, the Liaison Committee, the East Pleasanton Specific Plan Task Force, and the general public through the Board and Committee meetings (Appendix B).

Zone 7 currently owns Lake I and Cope Lake. Lake H becomes available to be deeded to Zone 7 when all reclamation is complete (within the next three years), and the other lakes will be transferred to Zone 7 as mining is completed over the next twenty to fifty years. ***Given the long period of transfers, uses of the lakes will be reconsidered over time to reflect any changes in regulations, water management needs, and other factors.***

The Evaluation is intended to serve as a road map of options for the future development of a COLs Master Plan. The Evaluation will be used as an interim planning tool to communicate Zone 7's intended uses of the COLs to other agencies and the public. The Evaluation also serves as a reference document, capturing key elements from various planning documents, studies, and other efforts. A list of references is included on relevant documents that provide more detailed information.

The following sections provide context for the development of this document, including an overview of the history of the COLs, a description of the COLs, and their potential uses. The report then presents the use evaluation process, including the methodology and results.

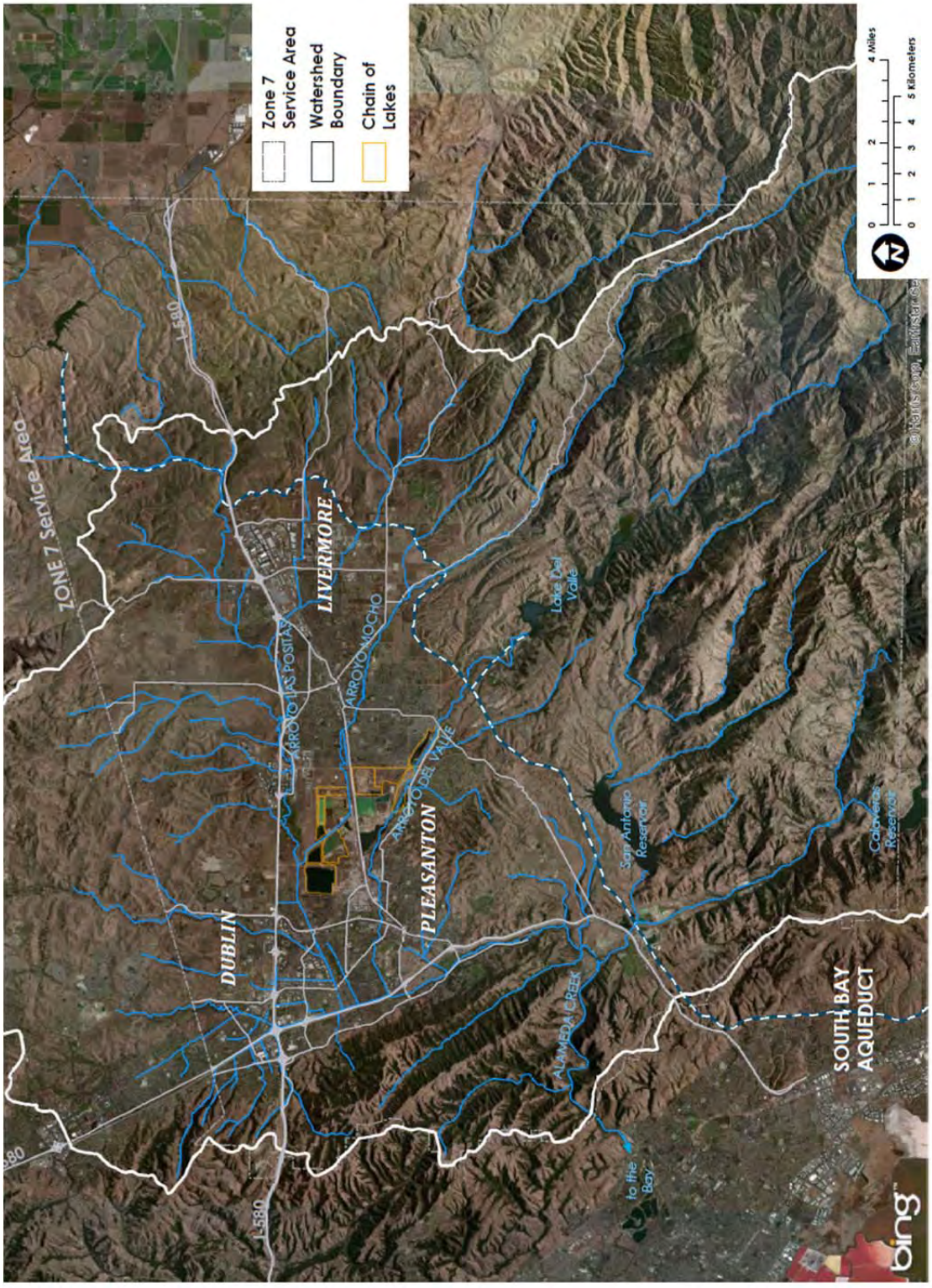

Figure 1-1. Location map.

2 Evolution of the Chain of Lakes

2.1 MINING HISTORY AND REGULATIONS

The mining of sands and gravels has been taking place in the Livermore-Amador Valley since the late 1800's, with large mining areas across the Valley floor, but generally located near the arroyos. Prior to 1956, mining permits were not issued for these activities. In the 1950's, Alameda County began to review the impacts of mining on local water supplies and adopted Ordinance 181 N.S. to create a permitting process. This early ordinance did not, however, address reclamation nor contamination issues.

In the mid-1960's, mining permits began to require more stringent protections for water resources and many required the creation of reclamation plans to accompany the permits; however, this was not standardized until the 1970's with the adoption of California's Surface Mining and Reclamation Act of 1975 (SMARA), which required reclamation plans for all mining operations conducted after January 1, 1976. Alameda County followed suit and adopted a new mining ordinance in 1977.

The Specific Plan for Livermore-Amador Valley Quarry Area Reclamation (LAVQAR) was adopted on November 5, 1981 (Appendix A). LAVQAR provides a roadmap for reclamation of the mining area to create the "Chain of Lakes" and defines the overall land uses for the lakes and the areas immediately surrounding them based on the planned land and water configurations for the various lakes (e.g., land and water surface elevations, areas, and volumes). Using LAVQAR as a base, the Zone 7-Quarry Owner/Operators agreements were negotiated in the late 1980's. Alameda County issued and continues to administer the required Surface Mining Permits (SMPs). The associated reclamation plans to the SMPs also rely heavily on LAVQAR for their content.

For a more detailed history of the COLs, see the Information Memorandum on 'Historical Narrative of Livermore-Amador Valley Mining and the Chain of Lakes' prepared by Mun Mar (2011) for presentation to the Zone 7 Board of Directors in April 2011 (Appendix C).

2.2 AGREEMENTS WITH QUARRY OPERATORS/OWNERS

There are both quarry owners and operators involved with the COLs, each with their own SMPs (Figure 2-1, Table 2-1, and Table 2-2). In 1987 and 1988, the three quarry owners/operators entered into agreements with Zone 7 as mandated by LAVQAR:

- Kaiser Contract (now Hanson Aggregates), January 21, 1987
- RMC Lonestar Contract (now CEMEX), March 28, 1988
- Pleasanton Gravel Company (PGC) Contract, April 20, 1988

The lakes being mined by Vulcan Materials are covered under Zone 7's contract with Pleasanton Gravel Company (PGC), the quarry owner. Lake H, owned by PGC, was operated by Hanson Aggregates and is included in both the PGC and Kaiser (Hanson Aggregates) contracts.

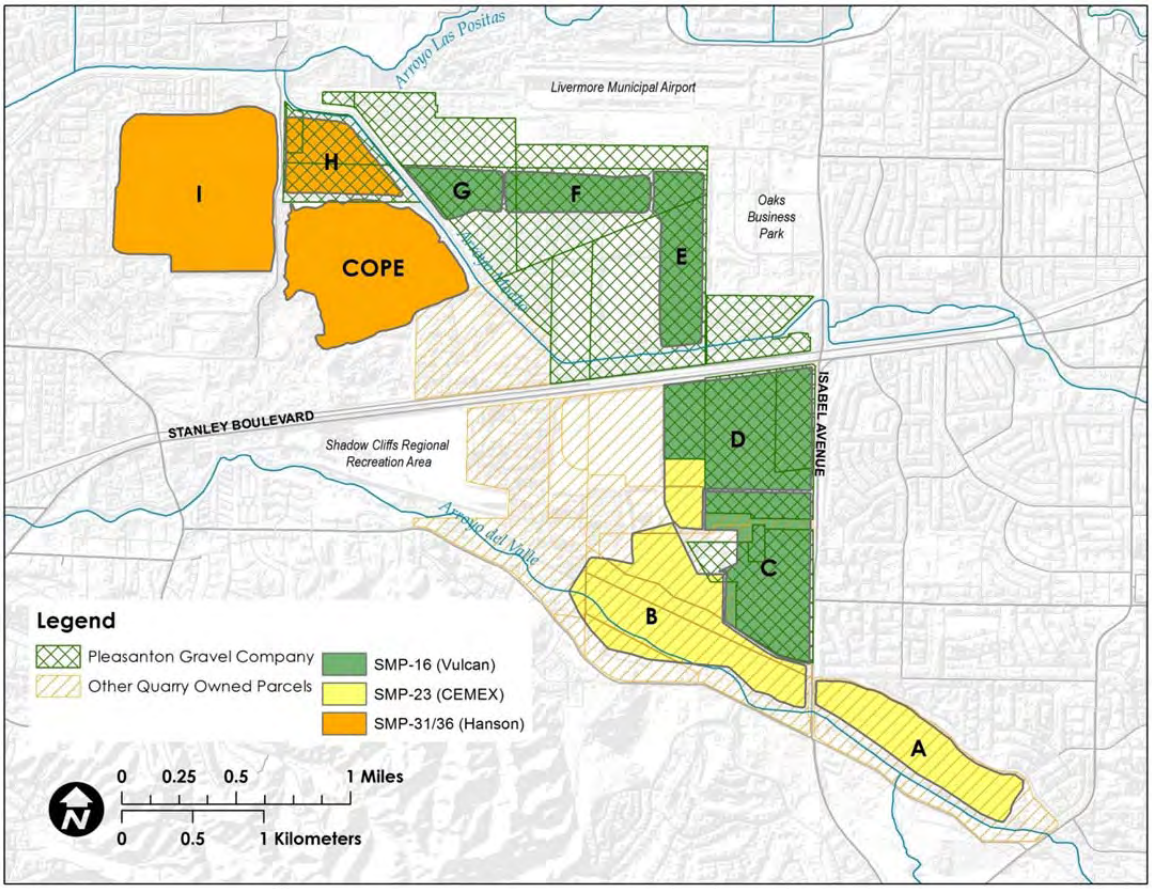

Figure 2-1. Map showing Surface Mining Permits (SMPs) by lake, and quarry ownership.

Table 2-1. Current Surface Mining Permits (SMPs) and status by lake.

Lake	SMP	Issued To	Status
A	SMP-23	CEMEX	Active mining
B			Active mining
C	SMP-16	Vulcan Materials	Active mining
D			Active mining
E			Active mining
F			Mining complete; reclamation pending
G			Mining complete; reclamation pending
H	SMP-31/36	Hanson Aggregates	Mining complete; reclamation pending; diversion structure to be installed*
I			Mining and reclamation complete
Cope			Mining and reclamation complete

** North, south, and east slopes of Lake I are under warranty.*

Table 2-2. Past and present owners/operators of the individual lakes.

Current Owner	Former Owner/s	Lake	Leasee*
CEMEX	Lonestar	A	n/a
		B	n/a
Pleasanton Gravel Company (PGC)	n/a	C	Vulcan Materials
		D	
		E	
		F	
		G	
		H**	Hanson Aggregates
Zone 7 Water Agency	Hanson Aggregates and Kaiser Sand & Gravel	I	n/a
		Cope	n/a

** Leasees operate under their own SMPs while leasing the property and mining rights.*

*** Transfer of Lake H was expected at the end of the original lease (late 2014). Due to incomplete reclamation at the site, the lease has been extended for one year to allow for final reclamation.*

In general, the terms and conditions of each agreement include the methods to handle dewatering (pumping out of groundwater and rainwater that enter the quarries), payments to compensate for water losses to the Valley during the mining periods, facilities (e.g., diversion structure, conduits) that will need to be constructed before the lake is handed over to Zone 7, responsibilities for coordination between the two parties, land grants, and guarantees. The facilities associated with each lake are described in Section 3.2 and shown on Figure 3-8). The Zone 7-quarry owners/operators agreements are included in the List of References and can be consulted for more details on the terms and conditions for each lake.

The SMPs originally issued in the 1980s are subject to periodic reviews by Alameda County, which administers SMARA on behalf of the State of California. Note that the contracts between Zone 7 and the respective quarry owners do not contain periodic review language. The permittees can also request amendments to the SMPs for consideration by the County. SMP-16 was issued to Vulcan for Lakes C, D, E, F, and G; SMP-23 to CEMEX for Lakes A and B; and SMP-31/36 to Hanson Aggregates for Lakes H and I (Table 2-1). In 2013, SMP-23 was reviewed by Alameda County and Zone 7. Based on the results of the review, the County required CEMEX to submit an amendment to the SMP-23 Reclamation Plan that addresses modifications to both Lakes A and B, as described in Section 3. Zone 7 is currently assessing the impacts of the proposed changes to the agency's long-term operations.

Currently, Lakes I and Cope have been transferred to Zone 7. Lake H is available for transfer at the end of the lease to Hanson Aggregates. The lease originally ended in late 2014. However, due to incomplete reclamation at the site, the lease has been extended to allow for final reclamation within three years. Transfer of the remaining lakes depends on completion of mining and reclamation activities.

3 Chain of Lakes Features

3.1 LOCAL SETTING

The Chain of Lakes (COLs) is located within the Alameda Creek watershed of the Livermore-Amador Valley, which is an east-west trending inland basin located in northeastern Alameda County (Figure 3-1). The Valley floor slopes gently west and southwest from elevations above 700 feet in the east, to 320 feet above mean sea level in the southwest. Surface waters from the Valley and surrounding northern portion of the Alameda Creek Watershed discharge to the Arroyo de la Laguna, one of the major tributaries to Alameda Creek. Tributaries to the Arroyo de la Laguna that run through or along the COLs area are the Arroyo las Positas, Arroyo Mocho, and Arroyo del Valle. Each of these creeks and arroyos deposited alluvium in the valley bottom where aggregate mining still occurs.

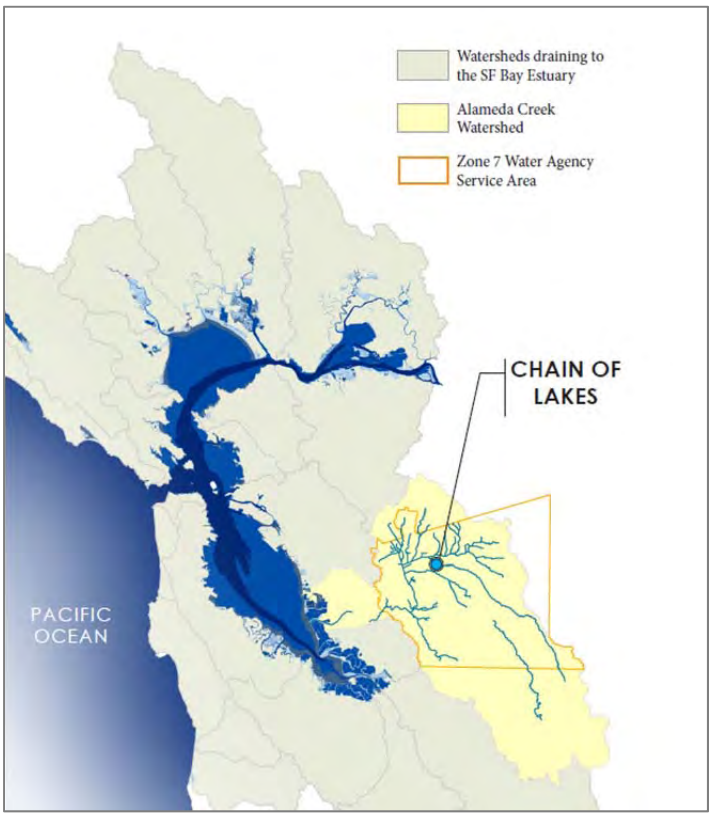

Figure 3-1. Map of the Alameda Creek watershed and the Zone 7 Water Agency Service Area.

Figure 3-2. Map of streams and major roadways in the Chain of Lakes area showing existing and future boundaries. (Source: Bing aerial imagery, 2010)

The COLs is located between Pleasanton and Livermore and provides a natural divide between the two cities. The COLs area is bounded to the east by Isabel Avenue/Highway 84 and the City of Livermore, to the south by the Arroyo del Valle, to the west by the City of Pleasanton, and to the north by Stoneridge Drive and West Jack London Boulevard. A major roadway, Stanley Boulevard, runs east-west through the center of the COLs (Figure 3-2).

Most of the lakes are still being mined so the land use in the COLs area is designated as mining with future land use designated by the LAVQAR in areas not annexed into the cities. In areas under the jurisdiction of the surrounding cities, development has occurred adjacent to a few lakes (Figure 3-3). Residential areas are located on three sides of Lake I, on the north side of Lake A, south of Lake B, and east of Lakes C and D (separated from the lakes by Isabel Avenue). The Livermore Municipal Airport is located north of Lakes E, F, and G, which places these lakes, along with Lake H and portions of Lakes I and Cope, in the Airport Protection Area[1]. An office park exists (Oaks Business Park) east of Lake E and is being developed.

As described in the East Alameda County Conservation Strategy[2], the area contains a diverse array of habitat including grassland, riparian, open water and wetland. Natural communities encountered within Zone 7's boundaries include freshwater marsh, central coast riparian scrub, alkali meadow, and valley sink scrub in the upper reaches of Arroyo las Positas (Figure 3-4). There are also numerous special-status plant and wildlife species and special-status natural communities and habitats known to occur, or with a strong potential for occurrence, within the Valley. Steelhead and the California red-legged frog are two special-status wildlife species known to occur, or having a strong potential for occurrence, in Zone 7's Service Area. Generally, much of the natural habitat of the Valley has been reduced due to urban development. However, streams provide great opportunities for preserving and restoring the remaining habitat in the Valley.

[1] Livermore Executive Airport – Airport Land Use Compatibility Plan. Prepared by ESA for the Alameda County Community Development Agency. 2012. [Accessed at: http://www.acgov.org/cda/planning/generalplans/documents/LVK_ALUCP_082012_FULL.pdf]

[2] East Alameda County Conservation Strategy. Prepared by ICF International for the East Alameda County Conservation Strategy Steering Committee. 2010. [Accessed at: http://www.eastalco-conservation.org/documents.html].

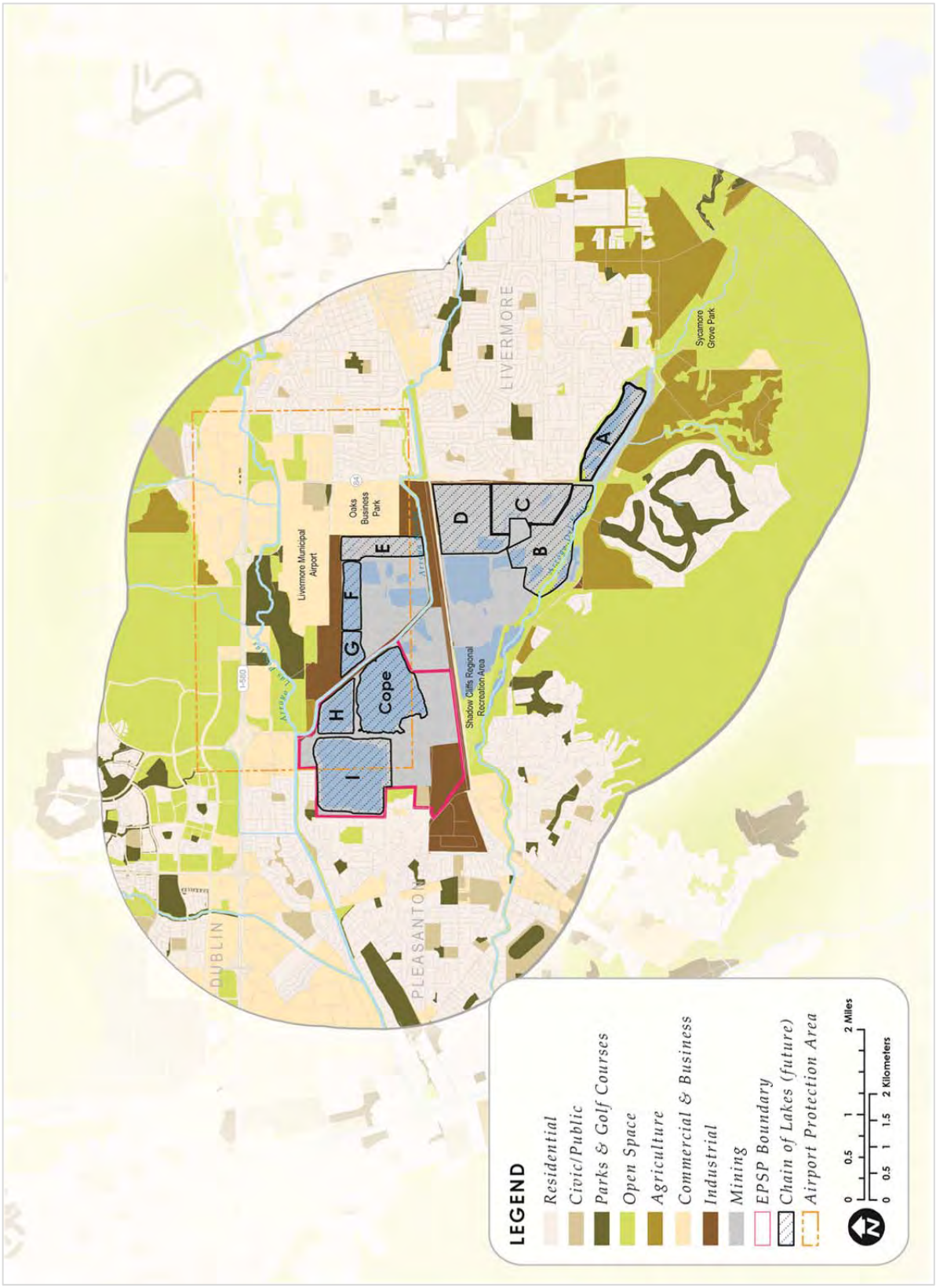

Figure 3-3. Map of land use within two miles of the Chain of Lakes area. (Source: 2013 Zone 7 land use mapping from available local land use plans.)

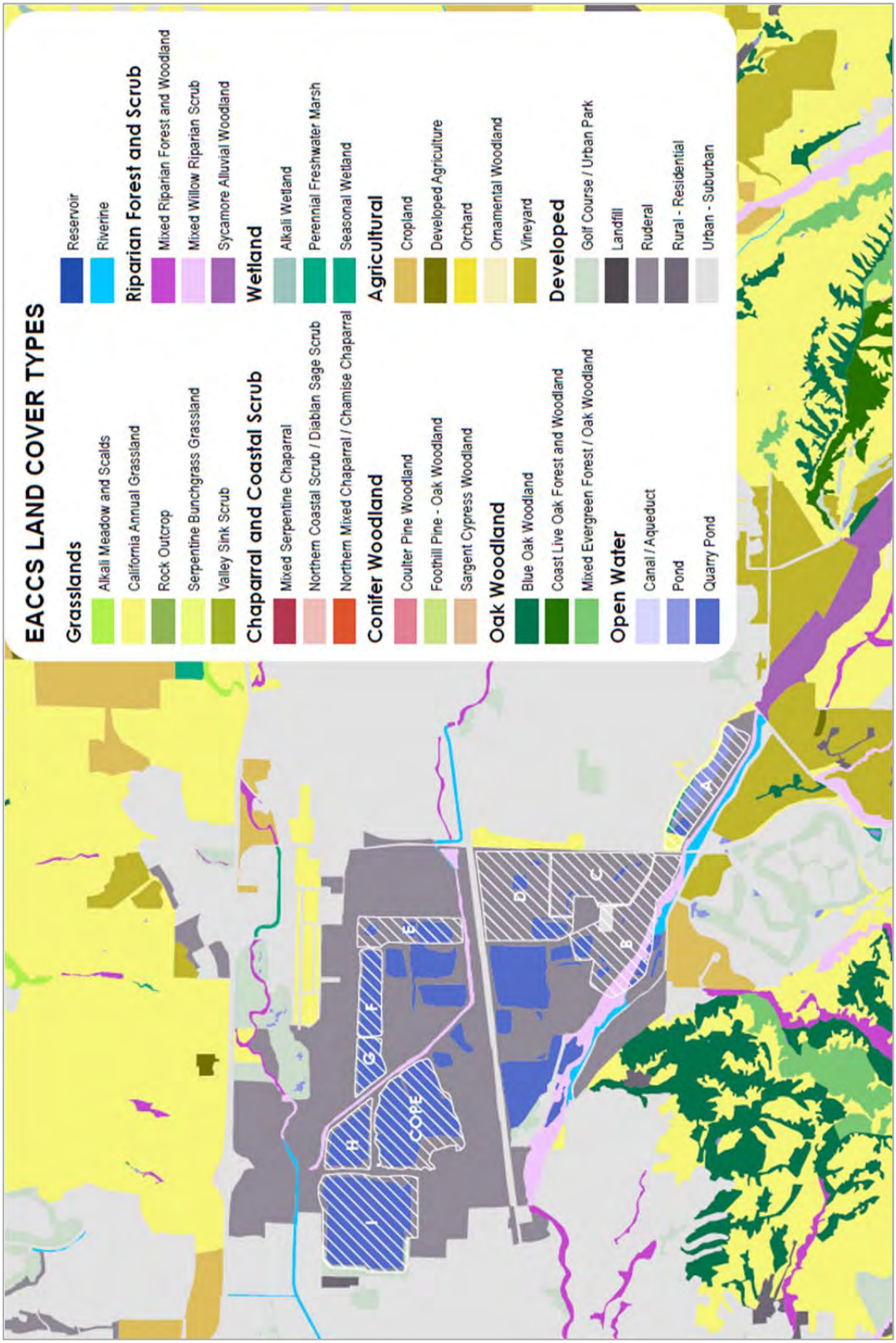

Figure 3-4. Map of environmental habitat in the Chain of Lakes area as identified in the East Alameda County Conservation Strategy (EACCS)[2].

In addition to habitat opportunities, the linear landscapes along the arroyos and flood protection channels in the Valley offer excellent opportunities for local park and recreation agencies to incorporate their trail projects with proposed channel improvements as described in Zone 7's 2006 Stream Management Master Plan[3]. There are several trails master plans in place that link parks, schools, and neighborhoods along the stream corridors that can be used as a basis for trail planning (Figure 3-5). [4,5,6,7,8]

The Livermore-Amador Valley groundwater basin lies beneath the Livermore Valley (Figure 3-6). The groundwater basin is divided into two classifications based on the value for groundwater use: the fringe sub-basins and the Main Basin. The Main Basin contains the highest-yielding aquifers and the best-quality water compared to the fringe sub-basins. Groundwater movement is generally from east to west. Within the Main Basin, there are four primary sub-basins as delineated by northwest-southeast trending fault lines: Castle, Bernal, Amador, and Mocho II.

The COLs is hydraulically connected to the Amador sub-basin. Natural recharge occurs through infiltration of rainfall directly into the basin or through the Arroyo Mocho and Arroyo del Valle. Zone 7 manages groundwater levels in the Main Basin through artificial recharge in those creeks. Imported water from the State Water Project or local water captured in Lake Del Valle is released from the South Bay Aqueduct or Lake Del Valle into the Arroyo Mocho and Arroyo del Valle. Additionally, recharge is planned to occur through the completed gravel mining pits. As will be discussed in more detail later, one of Zone 7's key objectives for the use of the COLs is enhancement of groundwater recharge.

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[3] Stream Management Master Plan. Prepared by RMC for Zone 7 Water Agency. 2006. [Accessed at: http://www.zone7water.com/final-smmp].

[4] East Bay Regional Park District Master Plan 2013. 2013.

[5] City of Dublin Bikeways Master Plan. Prepared by Fehr & Peers and RHAA for the City of Dublin. 2007. [Accessed at: http://www.ci.dublin.ca.us/DocumentCenter/Home/View/433]

[6] Pleasanton Pedestrian and Bicycle Master Plan. Prepared by Fehr & Peers and RHAA for the City of Pleasanton. 2010. [Accessed at: http://www.cityofpleasantonca.gov/pdf/pedbike-final-2010.pdf]

[7] City of Livermore Bikeways and Trails Master Plan. Prepared by Wilbur Smith Associates for the City of Livermore. 2002.

[8] LARPD (Livermore Area Recreation and Park District) Parks, Recreation and Trails Master Plan. Prepared by City of Livermore Community Development Department. 2008.

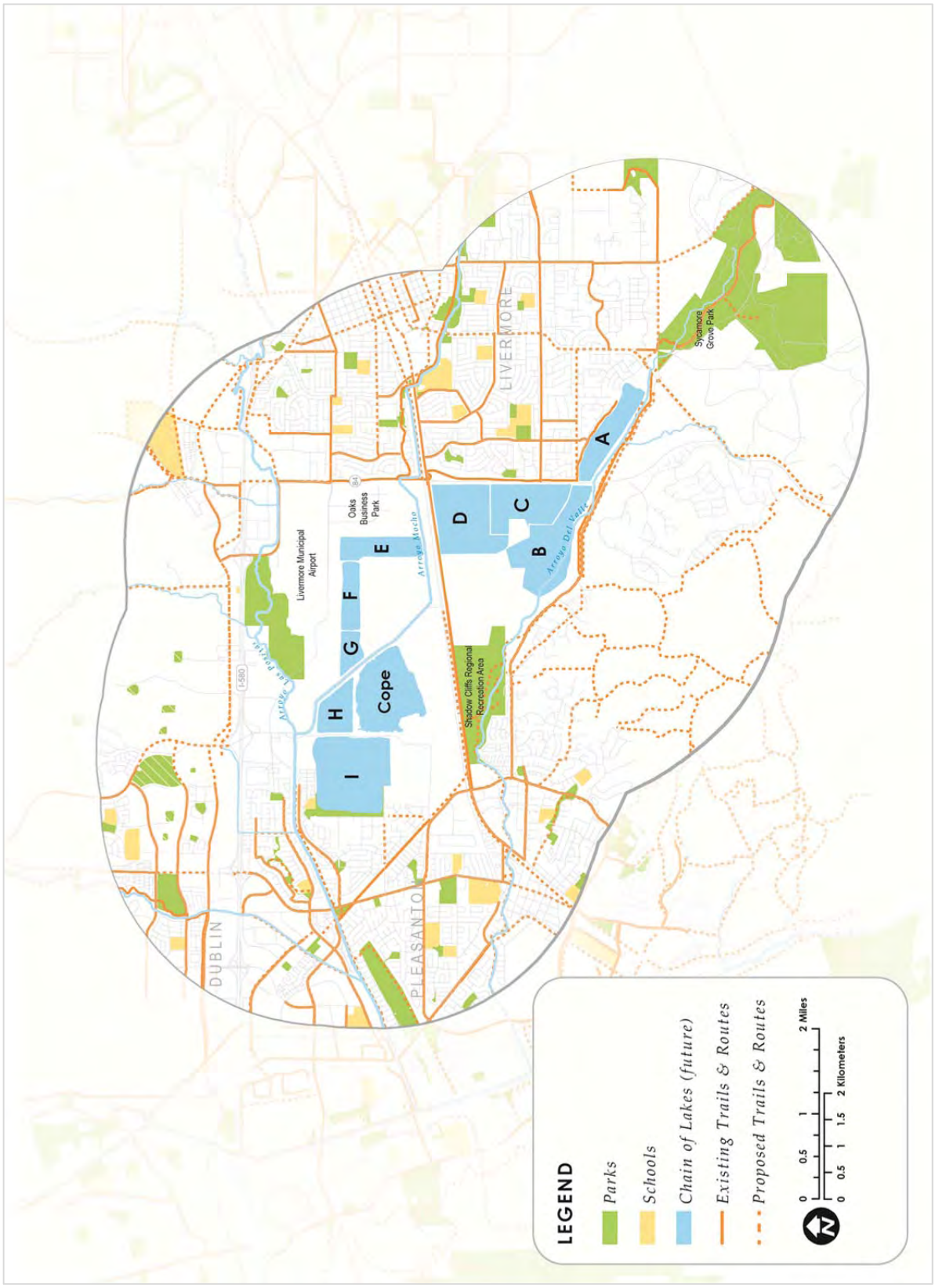


Figure 3-5. Map of existing and proposed trails relative to existing open space and schools within two miles of the Chain of Lakes area. [GIS data courtesy of local city planning departments]

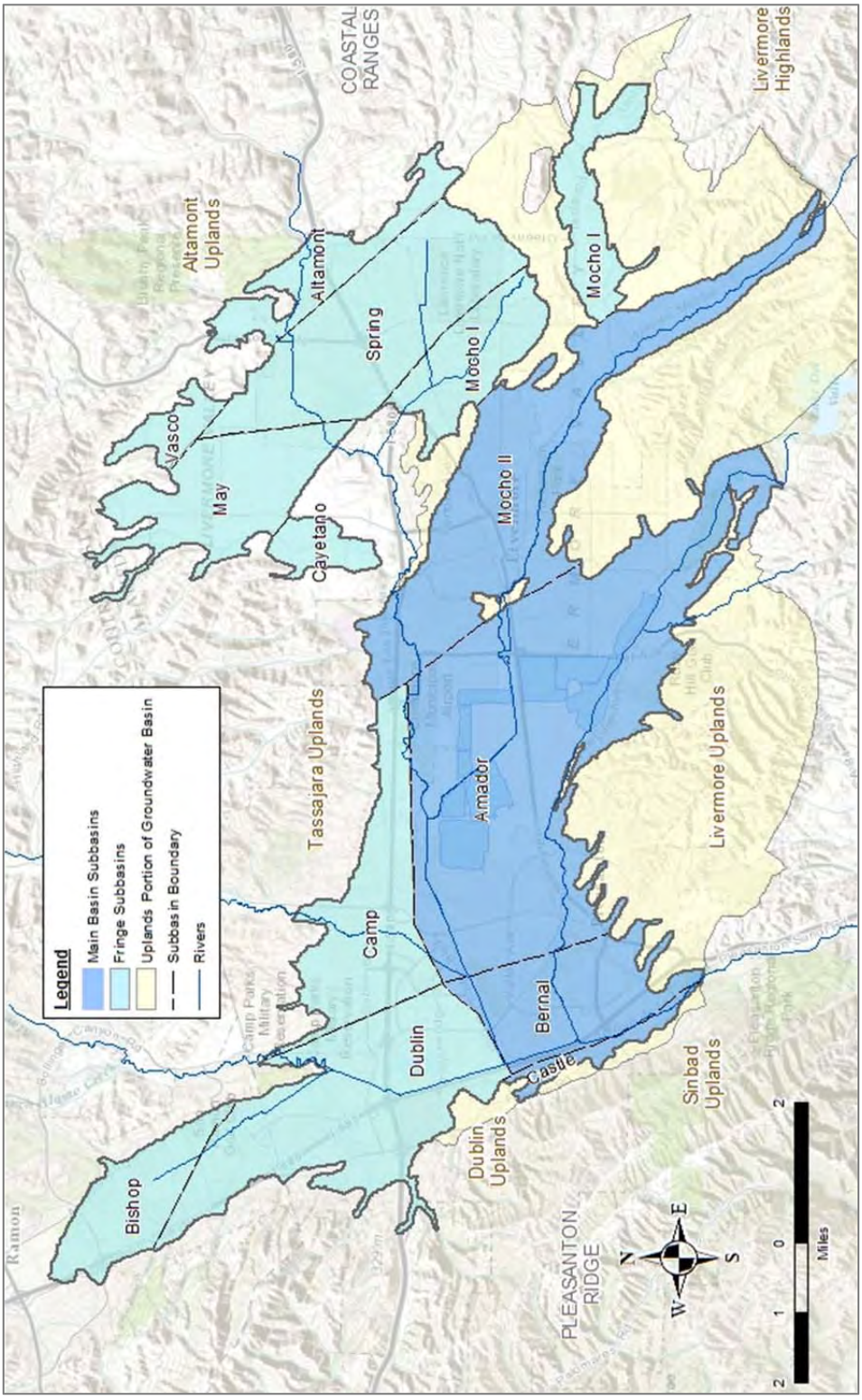


Figure 3-6. Map of the Livermore-Amador Valley Groundwater Basin. (Source: Zone 7 Annual Groundwater Monitoring Program [WY 2012][9])

[9] Annual Report for the Groundwater Management Program: 2012 Water Year. Zone 7 Water Agency. 2013.

3.2 CHAIN OF LAKES

There are nine lakes that are considered the COLs, namely Lakes A, B, C, D, E, F, G, H, and I. Cope Lake was offered to Zone 7 as an additional lake per agreement and was transferred to Zone 7's ownership in an "as-is" condition in 2003 bringing the total number of lakes available for ultimate use by Zone 7 to ten. Figure 3-7 shows a projected map of the ultimate COLs once mining is completed. It also indicates the locations of the existing/planned inflow and outflow conduits that connect the lakes, as well as a profile of the lakes with their projected ultimate land and water elevations upon reclamation. Figure 3-8 shows the existing and planned conduits, and other facilities such as wells and diversion structures.

The process of extracting and processing sand and gravel resources involves excavation of quarries that can be up to 300 feet deep, dewatering, use of surface water and groundwater, and discharge of fine grained sediments. Processing involves separating and sorting of different-sized gravels and sands. Some excavated pits are utilized as desiltation ponds where process water containing fine-grained sediments washed from larger gravels is stored and allowed to settle. An impermeable layer of fines forms on the bottom and sides of these desiltation pits, which can hydraulically isolate them from the groundwater basin and prevent recharge and. After excavation is complete, the pits/quarries are allowed to fill with groundwater and/or surface water.

In the Valley, sand/gravel mining generally terminates at a bottom clay layer where the extraction of gravel is no longer economically feasible; however, most of the quarry pits have, or will have, some type of connectivity to the adjacent aquifer, primarily through a portion of their respective sidewalls. The western faces of the pits are the focus of the planned groundwater recharge because the general movement of groundwater is from east to west within the Main Basin. The connection to the aquifer provides opportunities for groundwater recharge but also exposes the groundwater basin to evaporative losses. The following sections describe the individual lakes, with more information on their expected reclaimed conditions presented in Appendix D.

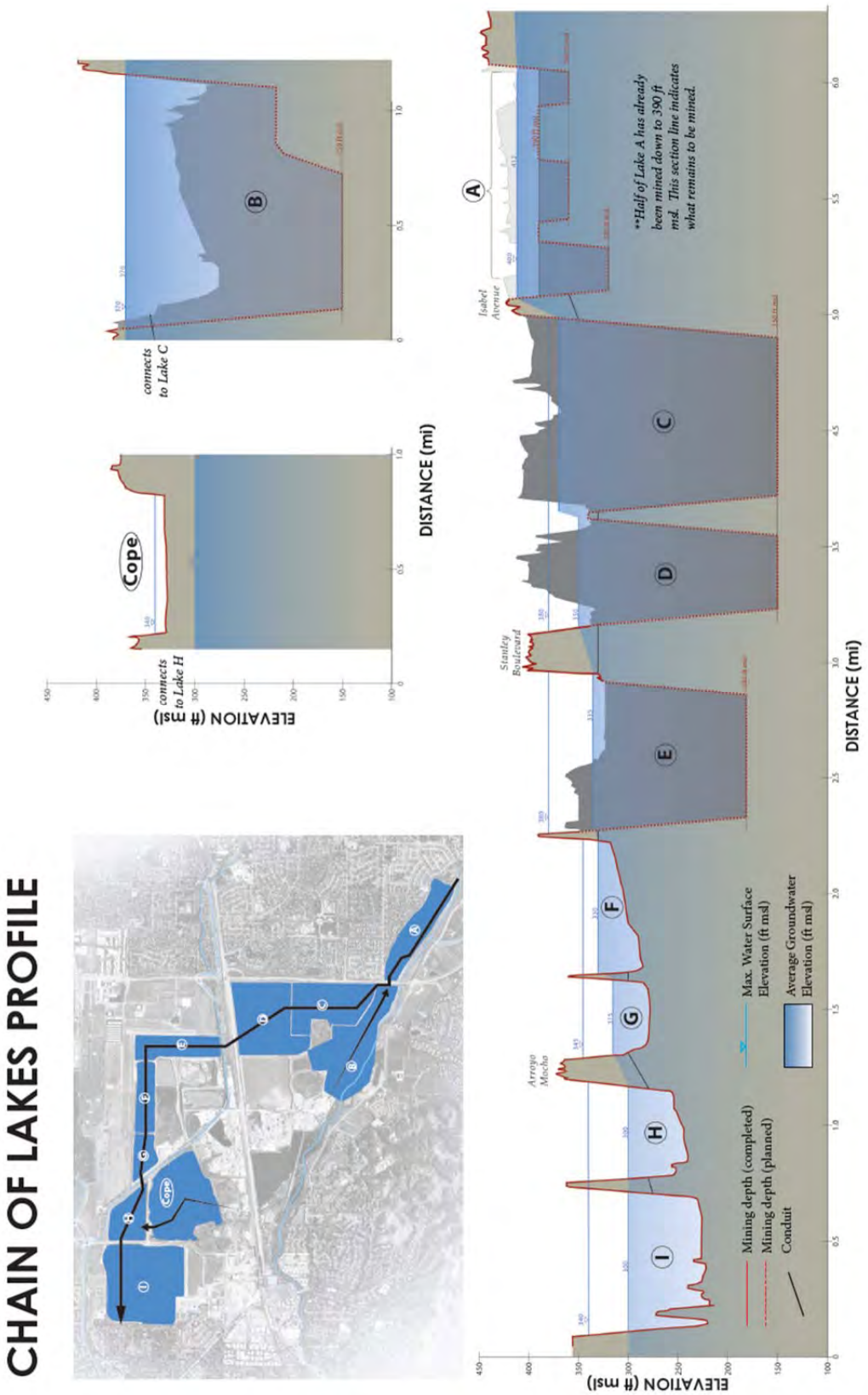


Figure 3-7. Chain of Lakes profile showing current and projected ground elevations, and associated conduits.

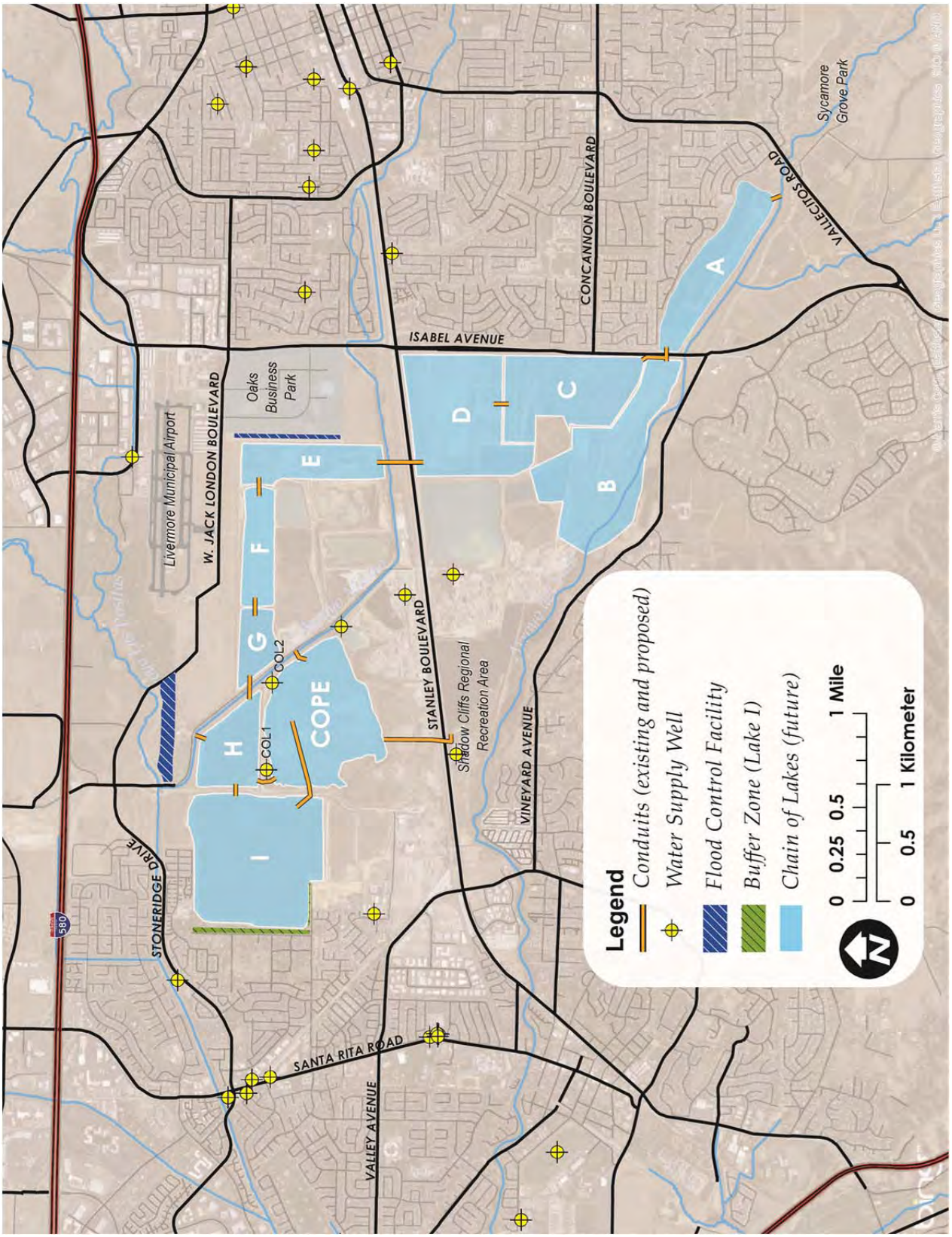
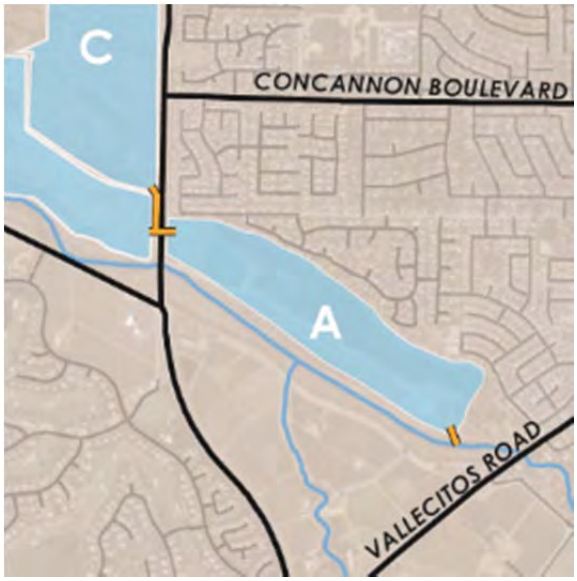


Figure 3-8. Future Chain of Lakes configuration showing existing and planned facilities.

3.2.1 Lake A



Lake A makes up the southeastern tail of the COLs and is the first lake in the chain for water conveyance. The SMP containing Lake A also includes a portion of the Arroyo del Valle, and the original SMP involves conveyance of the Arroyo del Valle through Lake A. Zone 7 has a water right for the Arroyo del Valle that is currently being perfected; the ability to divert Arroyo del Valle water into the COLs via Lake A during storm events is critical to this water right perfection process.

To facilitate the planned use of Lake A, Zone 7's March 1988 agreement with CEMEX (then Lonestar) requires the quarry operator to construct a diversion structure with the capacity of diverting the first 500 cfs of water (or more, depending on Zone 7's written request and payment of additional costs) from the Arroyo del Valle via Lake A into Lake C. CEMEX is also required to build various conduits and spillways that will convey water between Lakes A, B, and C. The conveyance facilities are required to be built before the property transfer of Lake A to Zone 7.

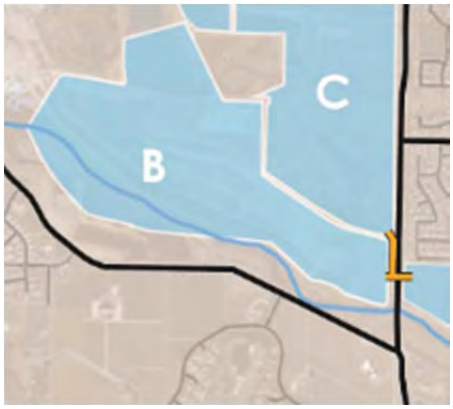
Mining in the Lake A area north of the current location of Arroyo del Valle began in the late 1990s. Mining continued until slope movement was observed in 2003 in a new development along the northeast section of Lake A. In 2009, the slope along this area was buttressed in a remedial action performed by CEMEX and agreed to by Alameda County, the City of Livermore, and Zone 7. This slope movement has raised questions about the overall stability of other slopes at Lake A and the hazards of continued mining as originally planned in CEMEX's SMP-23.

Since the 1988 agreement, various changes have been proposed to SMP-23 which encompasses Lakes A and B. Zone 7 is currently collaborating with Alameda County and CEMEX on an amendment to the SMP requested by CEMEX. In its June 2013 Reclamation Plan Amendment[10], CEMEX is proposing to continue mining in Lake A to simply accommodate the facilities required to meet SMP-23 and the agreement with Zone 7; this would result in a much smaller storage volume than originally planned in Lake A. While CEMEX proposes to continue to mine Lake B significantly beyond the original projected year of 2030 (possibly to 2058), there is a possibility that Lake A may be ready to be transferred to Zone 7 sooner than 2030. Furthermore, CEMEX is proposing to keep Arroyo del Valle

[10] Reclamation Plan Amendment: CEMEX SMP-23. Prepared by Spinardi Associates for CEMEX. Submitted to Alameda County. June 2013.

separate from Lakes A and B and realign a portion of the arroyo. The existing SMP-23 has Arroyo del Valle being conveyed directly into and through these lakes and not as a discrete streambed. Changing the alignment of the arroyo to be a separate streambed from the lakes will eliminate the spillways that were proposed between the lakes and will require redesign of the diversion structure from Arroyo del Valle via Lake A to Lake C. If the proposed amendment is approved, additional conduits to support the new lake configurations while still accommodating Zone 7's future water needs may be required.

3.2.2 Lake B



Lake B is located northwest of Lake A, also along the Arroyo del Valle. There is active mining in Lake B currently. This lake was originally envisioned as an overflow lake into which water could be diverted if Lake C needed to be drained for maintenance. Consequently, in the Zone 7/CEMEX agreement, CEMEX is required to build a conduit between Lake B and Lake C for this purpose.

In its June 2013 Reclamation Plan Amendment[10], CEMEX is proposing to deepen Lake B to a final depth of elevation of 150 feet msl, a significant change from the originally-approved depth elevation of 340 feet msl (Figure 3-9). CEMEX is also changing the original planned footprint of Lake B, moving the extent of the lake farther north. The proposed revised footprint of Lake B is reflected in the figures shown in this document. These changes are being examined to determine what impacts they could have on Zone 7's future operations such as:

- Mining deeper in Lake B will increase its penetration into the lower aquifers of the groundwater basin. As part of the current mining operations, groundwater is extracted to allow access to the gravel. Mining deeper into the lower aquifers will require more groundwater extraction than the original mining depth. After mining is complete, pumping will cease and groundwater levels will be allowed to return to normal. Mining deeper into the lower aquifer that is used for water supply production could provide an opportunity to recharge that aquifer directly. However, if the design of the lake does not allow for storage capacity to add surface water for groundwater recharge then the groundwater in the lower aquifer would be exposed to evaporation without an additional benefit.
- The proposed depth of Lake B will penetrate an aquifer that is connected to drinking water wells and has not previously been exposed to evaporative losses.
- A lowered spillway in the current proposal by CEMEX at the western end of Lake B could result in lost groundwater from overflow of the lake into the Arroyo del Valle in years with average or higher than average groundwater.

- During the years of active mining, which may extend to 2058, additional dewatering required to mine deeper could result in additional groundwater losses from the lower aquifer over an extended period of time.

This evaluation made certain assumptions with respect to the proposed amendment in order to help evaluate the impacts. To evaluate the uses of Lakes A and B, the proposed changes to SMP-23 were assumed to be approved. The lake uses therefore take into account Zone 7's understanding of how these lakes would be configured and what conveyance facilities would be built in order to make them operate as proposed.

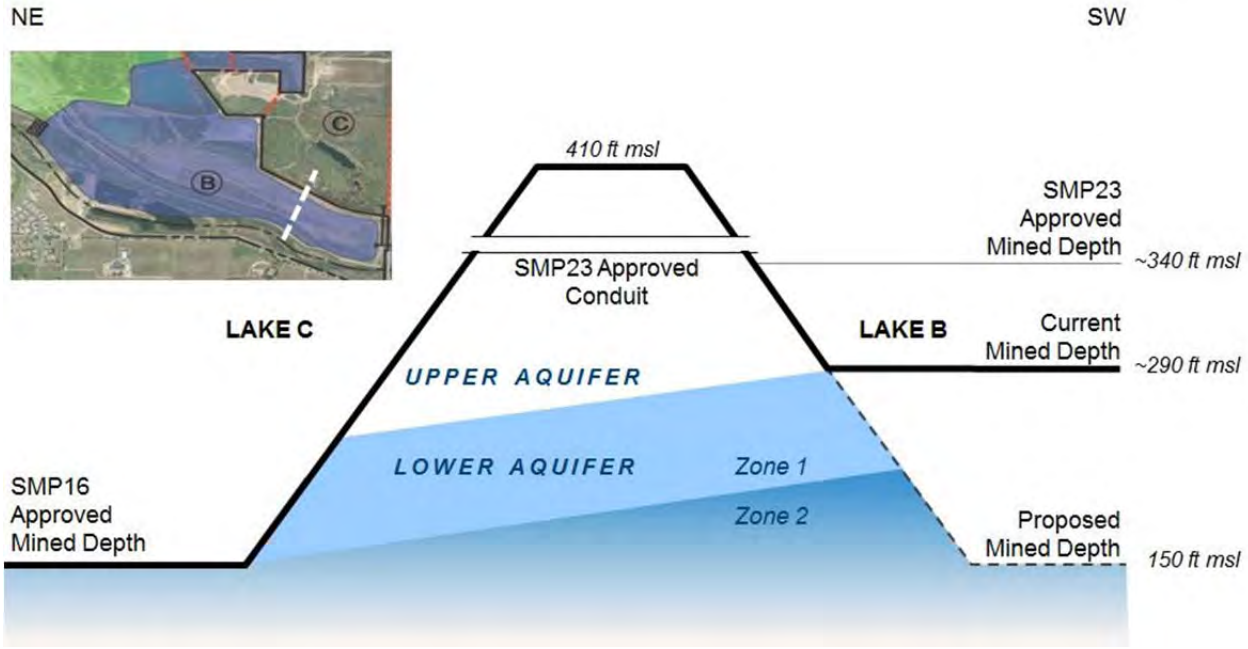


Figure 3-9. Proposed modifications to Lake B (CEMEX Reclamation Plan Amendment, June 2013).

3.2.3 Lake C

Lake C is located between Arroyo Mocho and Arroyo del Valle in the southern portion of the COLs. It is bordered by Isabel Avenue (Highway 84)to the east, Lake D to the north, and Lake B to the south. There is an area of reclaimed, previously-mined land to the west.

Lake C is being actively mined. Vulcan, which leases Lake C, has indicated that mining is likely to continue through 2058 due to economic/market conditions. This means that Lake C—along with D, E, F, F, G—may not be available for use by Zone 7 for another 40+ years, which would have major impacts on Zone 7's water management operations. An

amendment to SMP-16 that covers Lakes C and D was submitted to Alameda County in 2004. An Environmental Impact Report (EIR), including a geotechnical and hydrologic investigation, was undertaken prior to approval of the amendment and was reviewed by Zone 7. The amendment allows for Lakes C and D to be mined to 150 feet msl into the lower aquifer. A hydrostratigraphic study was conducted in 2011 by Zone 7 to investigate the recharge potential for Lakes C and D; the results of the study suggest that Lakes C and D can be effective recharge lakes, especially for recharging water into the upper portion of the lower aquifer.[11]

A conduit is planned between Lakes C and D. The depth of this conduit is not identified in the amended SMP-16. A berm is identified separating Lakes C and D. The quarry operators have indicated that they may request moving the location of the berm or even eliminating the berm altogether. This request would need to be evaluated and supported by Zone 7 and approved by Alameda County.

3.2.4 Lake D

Lake D is located south of Arroyo Mocho and north of Lake C. It is bordered on two sides by two major roadways: Isabel Avenue (Highway 84) to the east and Stanley Boulevard to the north. A silt pond is located to the west of Lake D. This pond is currently being used for settling out fines from the groundwater removed during mining. This pond is proposed to be backfilled as part of the reclamation process at the end of mining per the SMP.

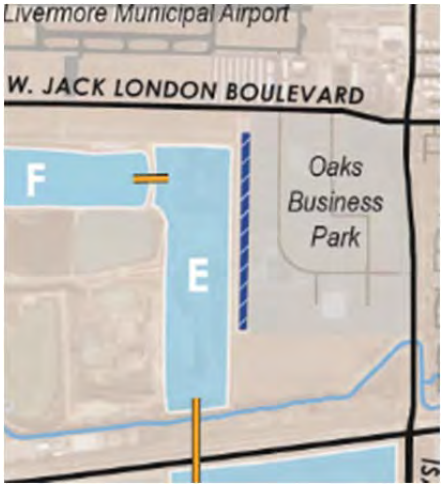
Lake D is being actively mined. As mentioned in the previous section, the amendment to SMP-16 allows for Lake D to be mined to 150 feet msl. The majority of Lake D is being mined under SMP-16 by Vulcan. However, the southwestern portion of the lake is being mined by CEMEX under SMP-23.

A tunnel runs beneath Stanley Boulevard between Lake D to the south and Lake E to the north. Currently the tunnel is used to convey gravel from the mining operations south of Stanley to the Vulcan processing plant. In the future, a 42-inch diameter conduit will be installed to convey water from Lake D to Lake E.

3.2.5 Lake E

Lake E is bordered by the Arroyo Mocho on its southern end. The area to the west is within the area being mined under SMP-16. The area to the north has the potential to be mined under a separate SMP but is not actively being mined at this time. A flood protection facility (detention basin) is located directly east of Lake E and is currently being used by the Oaks

[11] Hydrostratigraphic Investigation of the Aquifer Recharge Potential for Lakes C and D of the Chain of Lakes. Zone 7 Water Agency. May 2011.



Business Park that is located adjacent to the facility. The Livermore Municipal Airport is located due north of Lake E. Lakes E, F, G, and H (as well as portions of Lakes I and Cope) are all located within the Airport Protection Area[1]. These lakes are also near the Federal Emergency Management Agency (FEMA) floodplain.[12]

Lake E is being actively mined. Under SMP-16, Vulcan intends to mine Lake E to the top of the clay layer that divides the upper and lower aquifers. However, a hydrogeological investigation conducted in 2004 to support Vulcan's Application for Amendment of SMP-16 found that the clay separating the upper and lower aquifers was thin or absent in some locations, including beneath portions of Lake E[13]. Vulcan may use this information as a basis to request that parts of Lake E be mined down to 180 feet msl. In addition to the conduit between Lakes D and E, a conduit will be installed between Lakes E and F prior to the transfer of Lake E to Zone 7.

Lake E was considered in the SMMP[3] as a potential lake for stormwater detention.

3.2.6 Lake F

Lake F is west and north of the majority of Lake E and east of Lake G. The area to the south is within the area being mined under SMP-16. A portion of land to the north of Lake F and south of the Livermore Municipal Airport has the potential to be mined under a separate SMP but is not actively being mined at this time.

Extraction of gravel has been completed at this lake in the mid-1990s; however, Vulcan is currently using this lake for water storage and de-silting. When the mining operations are completed, Vulcan will remove silt to the mined depth of approximately 290 ft msl as approved in SMP-16. A conduit will be installed between Lakes F and G. Currently the berm between these lakes is below the water levels in these lakes and they are acting as one lake.

Lake F was considered in the SMMP[3] as a potential lake for stormwater detention.

3.2.7 Lake G

Lake G is bordered by a private road on its west side and Lake F on its east side. The areas to the north and south are both designated for gravel mining.

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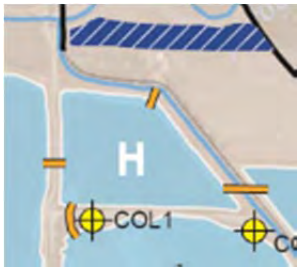
[12] FEMA Flood Map Service Center. [Accessed at: http://msc.fema.gov]
[13] Final Report: Pleasanton Quarry Hydrogeologic Data Evaluation. Prepared by Brown and Caldwell for Vulcan Materials. 2004.

Extraction of gravel has been completed at this lake in the late 1980s; however, Vulcan is still using this lake for water storage. There is a berm separating Lakes F and G but it is lower than the top of bank for the remainder of these lakes. At this time, the water level in the lakes is above the berm and they are acting as one lake. This berm will be raised as part of reclamation. Hanson Aggregates installed a conduit from Lake H halfway to Lake G. Vulcan will need to continue this conduit the rest of the way to Lake G.

Lake G was identified in the SMMP[3] as a potential lake for stormwater detention. A study was also completed in 2002 that evaluated the potential use of Lake G for recycled water storage[14].

3.2.8 Lake H



Lake H is bordered by the Arroyo Mocho on its northern and eastern sides, by a private road on its western side, and by Cope Lake on its southern side. Two Zone 7 emergency/drought water supply wells (COL 1 and COL 2) are located between Lakes H and Cope. These wells were put in service in 2010 and have a combined capacity of 9 million gallons per day (mgd). An additional water supply well is planned for installation north of Lake H in 2015.

Lake H is included in the City of Pleasanton's East Pleasanton Specific Plan (EPSP). This planning effort is expected to be completed in 2014. The EPSP boundary (see Figure 4-1) includes Lakes H, I, and Cope and a surrounding area of approximately 390 acres that was not included in the General Plan adopted in 2009 by the City of Pleasanton. See Appendix E for more information on the EPSP development process.

The extraction of gravel was completed at this lake in the late 1980s at a depth elevation of 240 msl. Lake H is currently under lease to Hanson Aggregates from PGC. The lease was anticipated to expire in late 2014, but has been extended to complete reclamation at the site within three years. Hanson Aggregates is working on completing their final reclamation. Under the terms of the 1988 PGC contract, this includes construction of a diversion structure to divert the first 100 cfs of water from the Arroyo Mocho into Lake H for water management purposes. The diversion structure is expected to be in service by 2015. A conduit between Lakes H and G is also included in the 1988 PGC contract. Hanson Aggregates has installed a portion of the conduit from Lake H to the half-way point between Lakes H and G. Vulcan will need to complete the conduit to Lake G as part of their reclamation.

[14] Hydrogeologic and Geotechnical Preliminary Investigation: Lake G, Alameda County, California. Prepared by Geocon Consultants, Inc. for Zone 7 Water Agency. 2001.

Lake H was identified in the SMMP[3] and the El Charro Specific Plan[15] for potential use for regional flood protection as a stormwater detention basin.

3.2.9 Lake I

Lake I is bordered by a private road on its eastern side, by residential development on the western half of the areas to the north and south, and by the "buffer zone" to the west. The buffer zone is an area owned and used by Zone 7 for groundwater monitoring, but is maintained by the City of Pleasanton as a public park/trail under a license agreement. The existing license agreement between the City of Pleasanton and Zone 7 was amended to include a trail segment between the buffer zone and the southwestern corner of Lake I in 2013. As previously mentioned, Lake I is part of the EPSP area. The non-developed areas north and south of Lake I will be developed as determined in the final EPSP, which currently proposes that the land areas be designated as office campus and public park.

Mining activities at Lake I ceased in December 2001. The lake was mined to approximately elevation 205 feet msl at its deepest area (average at 220 feet msl) and ground surface is roughly elevation 360 feet msl. A 30-inch conduit between Lakes H and I was installed prior to the lake being transferred to Zone 7. A design for a pump station or conduit between Cope Lake and Lake I is being evaluated. This would allow more flexibility to move water between the lakes and allow for the draining of these lakes for maintenance purposes through the transfer of water to adjacent lakes.

LAVQAR (Appendix A) identified Lake I as a recharge lake. The lake was mined with the intention of leaving the western sidewall as a recharge face. Lake I is the most downgradient lake in the COLs. The goal of the COLs, as described in LAVQAR, is to divert water into Lake A and convey it through the chain to Lake I for recharge of the groundwater basin. Zone 7's Stoneridge well is approximately 2,000 ft to the northwest and the Mocho wellfield is approximately 4,200 ft west of this recharge face. The Zone 7 emergency/drought water supply wells (COL 1 and COL 2) are located directly east of Lake I. The designation of Lake I as a recharge lake is maintained in the Evaluation based on the original design of the COLs in LAVQAR.

[15] El Charro Specific Plan. Prepared by EDAW/AECOM for the City of Livermore. Adopted July 2007. http://www.cityoflivermore.net/citygov/cd/planning/charro.asp

3.2.10 Cope Lake

Cope Lake is bordered on the east by the Arroyo Mocho, the west by a private road, on the north by Lake H, and on the south by Vulcan's active mining operations as well as an area preliminarily identified in the EPSP for industrial use.

Mining activities at Cope Lake ceased in 1980. Cope Lake was mined in discrete sections in depths up to 110 feet from ground surface, but was slowly filled over the years from silt deposition from washwater from the aggregate washing process. Some divisions between these former sections are still visible today when water elevations are below the elevation of the dividing berms. The depth of silt accumulation ranges from approximately 65 feet of silt in the southwest to approximately 40 feet of silt in the northeast. This silt accumulation provides a seal from the groundwater basin. The sediment-laden washwater entered the pit from the southwestern portion, filling that area with fines; this portion is now a shallow delta area with a gentler slope than the other sides of the lake.

A conduit exists between Cope Lake and Lake H. The conduit is in need of repair so caps were installed at both ends of the conduit until it can be repaired or replaced. A pipeline running from Cope Lake to Shadow Cliffs was operated by Hanson Aggregates when active mining was taking place. This pipeline is currently not being used. If it were to be reactivated, sections would need to be repaired or replaced. In 2013, Vulcan's discharge pipeline system was extended so that they can now discharge groundwater extracted as part of their mining operations into Cope Lake. The discharge water will continue to meet the same water quality standards set in their current National Pollutant Discharge Elimination System (NPDES) permit that allows them to discharge to the Arroyo Mocho.

The use of Cope Lake as a stormwater detention facility for regional flood protection purposes was identified in the SMMP[3]. In addition, a study conducted by Zone 7 in 2002 evaluated the use of Cope Lake for the storage of recycled water[16].

[16] Preliminary Geotechnical Engineering and Geologic Investigation: Cope Lake Tertiary Water Storage Project. Prepared by Geocon Consultants, Inc. for Zone 7 Water Agency. July 2002.

4 Potential Uses for the Chain of Lakes

Zone 7 Water Agency (Zone 7) is the wholesale water supplier to the Livermore-Amador Valley, providing untreated water to agricultural customers and treated water to four retailers and a number of direct retail customers for municipal and industrial (M&I) use. Zone 7 also serves as the area's flood protection agency, as well as the manager of the Valley's groundwater basin. In fulfilling all of its roles, Zone 7's strategy is built upon an integrated regional water management approach. Ultimately, the Chain of Lakes (COLs) is envisioned to be the lynch pin of Zone 7's regional water management activities. However, the COLs also has the potential to serve a myriad of other local and regional beneficial uses.

A full suite of potential (planned or proposed/requested) uses was developed based on guiding and other planning documents that either specifically or generally described uses for the COLs or the surrounding area, direction from Zone 7's Board of Directors, and requests by external agencies. However, not all uses align directly with Zone 7's mission, and not all uses are appropriate for evaluation at this time. As with the Stream Management Mater Plan (SMMP)[3], this study attempts to identify options, relative merits and drawbacks, and needs for funding partners. The focus is on the short term (5-10 years). This section describes the potential uses and vetting process for determining the lake uses appropriate for consideration in this Evaluation.

4.1 SOURCES OF INFORMATION

Guiding and planning documents were reviewed to generate a list of potential uses for each of the lakes. Several internal and external, local and regional plans either directly or indirectly identify potential uses or priorities for an individual lake, the COLs, or the COLs area including the surrounding land. Over the years, external agencies and other stakeholders have also requested that certain uses be considered or avoided. These various sources of information are described further below.

GOVERNING DOCUMENTS AND AGREEMENTS

The documents below have been adopted by the Alameda County Board of Supervisors or the Zone 7 Board and reflect Zone 7's official policies; these documents therefore provide the main framework for the consideration of potential uses.

- The **LAVQAR Specific Plan** (adopted by the Alameda County Board of Supervisors on November 5, 1981, Appendix A) identified water conveyance, water storage,

groundwater recharge, water quality management, and stormwater detention/flood protection as primary uses; and aquaculture and recreation as compatible with the primary uses for the COLs. LAVQAR identifies Lake I as the primary groundwater recharge lake, and describes the diversion of water from Arroyo del Valle through Lake A to Lake C.

- Zone 7 and Dublin San Ramon Services District (DSRSD) entered into a **Memorandum of Understanding** in 2004[17] regarding the evaluation of potential recycled water storage in the COLs area.

- The 2005 **Well Master Plan** describes Zone 7's current and future well operations. Though the plan does not specifically address lake use, the current and future locations of well facilities in the COLs area should be taken into consideration when evaluating potential uses for the lakes.

- The 2006 **Stream Management Master Plan (SMMP)**[3] was a road map for achieving the goals and objectives for stream management in the Valley through build-out of local agency general plans in a cost-effective and environmentally-effective manner. Forty-five projects were developed as part of the SMMP. The SMMP emphasizes the role of the COLs in regional flood protection through stormwater detention and considers the potential use of Cope Lake, and Lakes H, G, F, and E for this use.

- Zone 7 is a member of the Steering Committee that developed the **East Alameda County Conservation Strategy (EACCS)**[2] in 2010**,** which describes a framework for prioritizing, protecting and enhancing sensitive areas and habitats in the region—including in the COLs area (habitat and conservation).

EXTERNAL PLANNING DOCUMENTS

A number of external planning documents have been developed to guide planning at the local and regional level. These documents include *proposed* land use for the areas surrounding the COLs as part of a regional strategy.

- These plans[4] describe existing and proposed trails for pedestrians and bicycles: **East Bay Regional Parks District (EBRPD) Master Plan** (2013); **City of Livermore Bikeways and Trails Master Plan** (2002); **City of Pleasanton Community Trails Master Plan** (1993) (revised April 2002); **Livermore Area Recreation and Parks District Parks, Recreation and Trails Master Plan** (2008); and **Pleasanton Pedestrian and Bicycle Master Plan** (2010).

[17] Memorandum of Understanding between Dublin San Ramon Services District and Zone 7 for Cooperative Effort Regarding Groundwater Demineralization and Storage within the Livermore-Amador Valley. April 20, 2004.

- The **Livermore Executive Airport Land Use Compatibility Plan**[1] finalized in August 2012 is intended to encourage compatibility between the Livermore Municipal Airport and the various land uses of the surrounding area.

- The City of Livermore developed the **El Charro Specific Plan (ECSP)**[15]**.** The City of Livermore entered into an agreement with Zone 7 in 2010[18] to develop flood management measures that would remove most of the ECSP area from the 100-year flood plain. The proposed improvements include an overbank barrier and a diversion/conveyance facility along the Arroyo Las Positas channel in Livermore that would convey flood waters from Arroyo Las Positas to the COLs for stormwater detention.

- The **East Pleasanton Specific Plan (EPSP)** is currently under development and addresses land use planning for approximately 390 acres surrounding Lakes H, I and Cope (areas not included in 2009 City of Pleasanton General Plan) (Figure 4-1). For more details on the EPSP process, see Appendix E. As the current and future owner of Lakes H, I and Cope, Zone 7 is working with the City of Pleasanton in developing an EPSP that is consistent with Zone 7's intended water resource management uses of those lakes and provides maximum public benefits and protection. Suggested uses for the COLs area include recreation (trails around the lakes and parks) and "Destination Use"[19].

Figure 4-1. East Pleasanton Specific Plan (EPSP) boundary.

[18] Agreement between City of Livermore and Zone 7 Alameda County and Flood Control Water Conservation District for the El Charro Specific Plan Area Flood Protection Improvements. December 15, 2010.

[19] Draft EPSP (March 2013): "Commercial or public facilities that are specifically suited for the lakefront site on which the designation is shown, for example a restaurant, retreat, conference facility, interpretive center, etc."

OTHER REQUESTS

In addition to the aforementioned planning documents and agreements, stakeholders (e.g., Zone 7 directors, general members of the public, developers) have requested additional uses be considered for the COLs through public meetings, informal communication, etc. The list of suggested uses included:

- Public education
- Treatment wetlands
- Wetlands habitat
- Active recreation: water sports (kayaking, water skiing, swimming), soccer fields (seasonally inundated)
- Passive recreation: bird watching, walking/biking trails, picnicking, boardwalk (seasonally inundated)
- Aquaculture
- Hatcheries
- Agriculture (e.g., vineyards)

4.2 POTENTIALLY SUITABLE USES EVALUATED IN THIS REPORT

After reviewing and refining the list of potential uses from the sources described in the previous section, seven uses were ultimately considered in this Evaluation (Table 4-1). The uses were divided into Primary Uses and Secondary Uses:

- **Primary Uses** directly support Zone 7's mission of providing a reliable, high-quality water supply and effective regional flood protection.

- **Secondary Uses** are uses that have been requested by external entities (e.g., retailers, members of the public, recreation agencies) and are potentially compatible with Zone 7's Primary Uses of the lakes, but do not directly support Zone 7's mission.

Other uses have been suggested for consideration (e.g., aquaculture, hatcheries) and will be considered at a later time on a case-by-case basis after the major Primary and Secondary Uses have been evaluated.

Table 4-1. Potential lake uses considered for the Preliminary Lake Use Evaluation.

POTENTIAL USE			DESCRIPTION
PRIMARY USES	Stormwater detention		Capture of stormwater and/or flood water (e.g., from a 100-year flood event) for flood protection.
	Groundwater recharge		Recharge of the Main Basin with surface water from Arroyo Del Valle diversions, SWP water, or other sources.
	Surface water storage and conveyance		Storage and conveyance of surface water for recharge or later treatment and direct delivery.
SECONDARY USES	Recycled water storage		Seasonal storage of recycled water for use during the dry season.
	Habitat/ Conservation		Protected or enhanced wildlife habitat/habitat corridor.
	Active recreation		Recreational activities that involve potential body-contact with the lake or its slopes (e.g., swimming, non-motorized boating, fishing).
	Public education/ Passive recreation		Recreational activities that do not involve body contact with the lake (e.g., bird-watching, trails, kiosks, a visitor center).

Additionally, two of the quarry agreements (Hanson Aggregates and PGC) contain a reversionary clause, which states that the transferred quarry lands will revert to the ownership of the dedicating quarry owners should Zone 7 cease to use the lakes for water management purposes. The agreement between Zone 7 and PGC states that the right of reversion can be triggered if "any of the property conveyed to Zone 7 not be used by Zone 7 solely for water management and related purposes throughout the first twenty-five years following conveyance." The lakes that are owned by PGC and therefore under the reversionary clause are lakes C, D, E, F, G, and H. Lakes A and B contain no reversionary language in their agreement.

5 Lake Use Evaluation

5.1 OVERVIEW

In evaluating uses, a variety of factors were considered including existing conditions, relative cost and impacts of converting to that use, and constraints (such as MOUs, adopted Master Plans, existing contracts, etc.).

Specific criteria were developed to evaluate the suitability of each lake use identified in Section 4. Each use was broken down into the key defining attributes that a lake would need to support a given use (pros). Conversely, lake attributes that negatively impact its ability to support a given use were also identified (cons). Each pro or con was assigned a positive or negative point value, respectively, that reflected its importance to the function of the use. Point values from the criteria were summed to provide the final score for each use and for each lake, allowing relative ranking of the lakes for each use. Lakes that scored greater than 50% of the maximum score were considered "more suitable" for a particular use.

The final scores reflect the ***relative suitability*** of each lake for a particular use; however, this evaluation is ***not intended to preclude any uses at this time***. Given the long period of lake transfers, uses of the lakes will be reconsidered over time to reflect any changes in regulations, water management needs, and other factors. Generally, the lakes were evaluated individually; future evaluations will consider the benefits of combining lakes for certain uses.

To address some of the uncertainty inherent in a long planning horizon, the evaluation process relied on several key assumptions:

1. **Identified Uses.** Lake use designations identified in Governing Documents and Agreements (Section 4) were adhered to. For example, the prescribed use of Lake I as the key groundwater recharge facility would not change from its designation in the LAVQAR. Furthermore, if a use was deemed incompatible with an already designated use, it was precluded from further evaluation at this time.

2. **Primary and Secondary Uses.** Primary Uses receive priority over Secondary Uses. Furthermore, Secondary Uses do not directly support Zone 7's mission and will therefore be considered only if compatible with Zone 7's Primary Use(s) of a given lake. Secondary Uses would also require an external agency to fund and implement.

3. **Evaluation "As Is."** Lakes that have already been turned over to Zone 7 were considered in their existing condition (or with minor modifications). All other lakes were evaluated based on their expected condition at the time of transfer. This includes the assumption that all planned facilities included in the SMPs will be built as part of reclamation, and all Zone 7 planned facilities will be built as well.

As noted in the LAVQAR, Zone 7 will own and be responsible for the water areas of the COLs and the immediate perimeter. Consequently, the ***uses considered are primarily associated with the water areas and their perimeters***; adjacent land uses will be considered separately.

The following two sections describe the evaluation of the Primary and Secondary Uses, the criteria, and the results for each use. Section 5.4 provides an overall summary of the results.

5.2 SCORING – PRIMARY USES

5.2.1 Surface Water Storage and Conveyance

In accordance with LAVQAR, all of the lakes have been planned for surface water storage and conveyance; therefore, all lakes were considered equally suitable for this use and no scoring process was undertaken.

5.2.2 Stormwater Detention

One of the primary water management uses identified for the COLs is flood protection through temporary stormwater detention. Although the 2006 SMMP estimated that approximately 5,000 acre-feet (AF) of temporary stormwater detention would help reduce peak downstream flows during a 100-year event by about 30 percent, Zone 7 staff is currently updating the SMMP, and the estimated storage need might change. This updated analysis will not be completed by the time this planning-level evaluation is done. Consequently, this evaluation assumed that at least 5,000 AF of storage would be needed to temporarily detain stormwater from the Arroyo Las Positas, the Arroyo Mocho, or both.[20] After detention, this evaluation also assumed that stormwater would be slowly released into the Arroyo Mocho after peak flows had passed.

CRITERIA

To evaluate the suitability of a lake for stormwater detention, a variety of features was considered. Features that support the cost-effective capture and release of stormwater

[20] Note that flood flows along the Arroyo Del Valle are regulated by the Del Valle Dam, and areas along Arroyo Del Valle are not susceptible to flooding; therefore, the Arroyo Del Valle was not included in this evaluation.

were assigned positive scores. As noted above, the release of detained stormwater into the Arroyo Mocho after a storm event per the SMMP[3] is assumed. Being adjacent to the Arroyo Mocho is therefore a key consideration as this will reduce the amount of facilities—and associated costs—required. Having an available storage capacity at 75% or greater of 5,000 AF would allow capture of most, if not all, of the projected stormwater needs, also reducing facility requirements and costs as a second lake would not be required. Finally, if a lake is adjacent to the Arroyo Mocho or Arroyo Las Positas floodplain, the facilities and costs necessary to capture stormwater would be reduced.

Features that make a lake less suitable for stormwater detention were assigned a negative score. For example, any impediments (e.g., structures such as roads and railroad tracks or other lake/s) between Arroyo Mocho and the lake would add infrastructure and costs. In addition, storm flows contain high quantities of sediment. Sediment could clog recharge faces, requiring maintenance to restore recharge capacity. To reflect this, negative scores were therefore assigned in inverse proportion to the scores of each lake under "Groundwater Recharge".

RESULTS

Table 5-1 below presents the list of criteria, the highest possible score assigned to each criterion, and the scoring assigned to each lake for stormwater detention.

The results indicate that Cope Lake is highly suitable for stormwater detention, followed by Lakes G, H, and E which scored the same (Figure 5-1). If Cope Lake is used, an additional lake may be needed to make up the storage volume shortfall; Cope Lake has a storage volume of approximately 4,400 AF so an additional 600 AF of storage may be needed. As previously noted, the required storage volume, and lakes used for stormwater detention, will be revised based on the revised analysis associated with the planned update of the SMMP. Engineering factors, including the potential use of multiple lakes (e.g., one for de-silting and one for storage), will also be taken into consideration as stormwater facility alternatives are evaluated as part of the planned SMMP update.

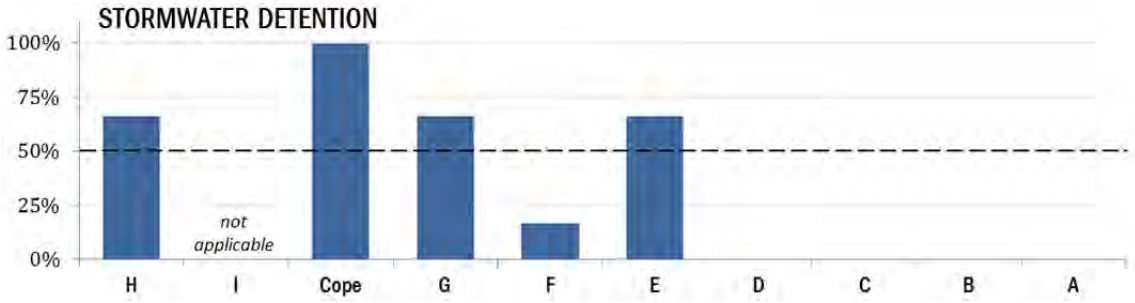


Figure 5-1. Stormwater detention scores by lake (>50% is considered more suitable).

Table 5-1. Evaluation criteria and scoring for stormwater detention.

Stormwater Detention

Criteria	Highest Possible Score	H	I	Cope	G	F	E	D	C	B	A
PROS											
Adjacent to floodplain[a]	1	1		1	1	1	1	0	0	0	0
Average available storage capacity at >=75% of 5,000 AF[b]	1	0		1	0	0	1	1	0	0	0
Adjacent to Arroyo Mocho[c]	4	4		4	4	0	4	0	0	0	0
CONS											
Impediments between arroyo and lake[d]	0	0		0	-1	N/A	0	N/A	N/A	N/A	N/A
Degradation of recharge capacity	0	-1		0	0	0	-2	-2	-1	-2	0
TOTAL SCORES (points)	**6**	**4**	**N/A**	**6**	**4**	**1**	**4**	**-1**	**-1**	**-2**	**0**
TOTAL SCORES (%)		67%	N/A	100%	67%	17%	67%	0%	0%	0%	0%

Notes:

a. Adjacent to the Arroyo Mocho or the Arroyo Las Positas floodplain (able to take water from those arroyos)

b. 5,000 AF is the estimated maximum capacity that would be required during a 100-year flood event. Assumed GW level at 300 ft for H, I and Cope.

c. Adjacent to the Arroyo Mocho for purposes of releasing detained water.

d. Impediments between the lake and the Arroyo Mocho include roadways, railroad tracks, berms, other lake/s.

e. Degradation of recharge capacity

0 = <20% score on groundwater
-1 = 20-50% score on groundwater
-2 = >50% score on groundwater

N/A = designated recharge lake/s are not considered for stormwater detention

5.2.3 Groundwater Recharge

Another of the primary water management uses identified for the COLs is groundwater recharge. The concept of the COLs was originally established to provide mitigation for the removal of aquifer material through gravel mining. When areas overlying the Main Basin are mined for sands and gravels and reclaimed with less permeable substrate, the flow of groundwater in those areas is restricted. The lakes, on the other hand, are left open and expose the groundwater aquifer to evaporative losses. Furthermore, during mining, groundwater seepage into the open pits needs to be pumped out; while some of this water is captured by the quarry operations in other pits and returned to the groundwater basin, some is lost through mining discharges to the arroyos. To counter these effects, surface water from other locations can be introduced into the lakes to replace the groundwater which is lost through evaporation. Water can also be added to replenish the groundwater basin through groundwater recharge either through streambeds or lakes. In order for groundwater recharge in a lake to take place, two things are required: 1) a connection to the groundwater basin must be present and 2) enough water needs to be added to create a vertical head to "push" the water into the aquifer.

CRITERIA

In order to evaluate the suitability of each lake for groundwater recharge, a groundwater recharge capacity was calculated. The groundwater recharge capacity (Q) was calculated by multiplying the estimated area of recharge face (A) by the groundwater gradient (I) and the hydraulic conductivity of the aquifer (K) (Appendix F).

The recharge potential was calculated in million cubic feet per day (Mft^3/day). Scores were assigned for ranges of recharge potential, with scores increasing as the recharge potential increased. Note that the calculated recharge potential is used simply to provide relative ranking of the lakes for this Evaluation; the actual recharge potential can differ significantly based on site-specific conditions at the time of lake transfer or adjustments to assumed estimated factors (Appendix F).

A second criterion was the ability to add surface water for recharge. A point was assigned if the lake has an active storage volume greater than or equal to 1,000 AF. The active storage volume is considered to be the volume of the lake below the maximum operating level and above the estimated average, post-mining groundwater surface elevation.

Four of the lakes (B, C, D, and E) have the potential to be mined below the upper aquifer and into the lower aquifer, which is used as water supply. Being able to recharge the lower aquifer directly could prove to be an additional advantage if the lake is suitable for groundwater recharge (high recharge potential and storage capacity). For example, a study

indicated that Lakes C and D can be effective recharge lakes[21]. However, access to the lower aquifer can also be a detriment because it exposes the lower aquifer to evaporation and potential contamination. While the scoring did not account for lower aquifer access, this factor will be considered in future evaluations.

RESULTS

Table 5-2 presents the list of criteria, the highest possible score assigned to each criterion, and the score assigned to each lake for groundwater recharge.

The preliminary results indicate that Lake I would be the most suitable recharge lake, which is consistent with its designation in governing documents. Lake D ranked second highest for groundwater recharge suitability and Lakes B and E ranked third. These findings will be refined in future evaluations based on additional site-specific hydrogeologic investigations and/or actual data/measurements.

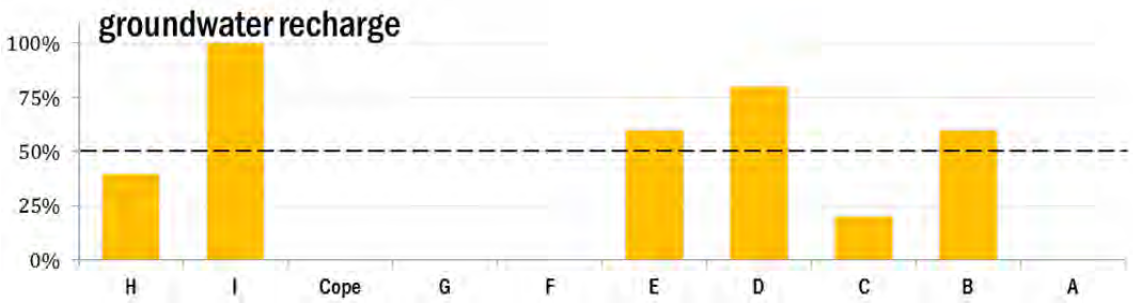


Figure 5-2. Groundwater recharge scores by lake (>50% is considered more suitable).

[21] Zone 7 Water Agency. 2011. Hydrostratigraphic Investigation of the Aquifer Recharge Potential for Lakes C and D of the Chain of Lakes, Livermore, California.

Table 5-2. Evaluation criteria and scoring for groundwater recharge.

Groundwater Recharge Criteria	Highest Possible Score	H	I	Cope	G	F	E	D	C	B	A
PROS											
Groundwater recharge potential[a]	4	1	4	0	0	0	2	3	1	3	0
Active storage volume[b]	1	1	1	0	0	0	1	1	0	0	0
CONS											
TOTAL SCORES (points)	**5**	**2**	**5**	**0**	**0**	**0**	**3**	**4**	**1**	**3**	**0**
TOTAL SCORES (%)		40%	100%	0%	0%	0%	60%	80%	20%	60%	0%

Notes:

a. Groundwater recharge potential:
- 0 = <25 million cubic feet per day (Mft3/d)
- 1 = 25-50 million cubic feet per day (Mft3/d)
- 2 = 50-100 million cubic feet per day (Mft3/d)
- 3 = 100-150 million cubic feet per day (Mft3/d)
- 4 = >150 million cubic feet per day (Mft3/d)

b. Active storage volume:
- 0 = 0-1000 acre-ft
- 1 = >1000 acre-ft

5.3 SCORING - SECONDARY USES

5.3.1 Recycled Water Storage

As noted in Section 4.1, Zone 7 and DSRSD entered into a Memorandum of Understanding[17] in 2004 regarding the evaluation of potential recycled water storage in the COLs area. In 2013 (Dave Requa, *pers. comm.*), DSRSD indicated that the agency will require a storage yield of 900-1,200 acre-feet (AF) after any losses due to evaporation, etc. in approximately five to ten years depending on how recycled water implementation projects evolve. Depending on weather conditions, recycled water storage would begin in late February or early March and drawdown would occur between late June to mid-August, a similar season to stormwater detention needs. For this evaluation, it was assumed that the recycled water diverted for storage would be of landscape-irrigation quality (disinfected tertiary-treated)[22], as currently practiced in the Valley.

CRITERIA

To account for required headspace, accumulation of precipitation, and a safety factor, a minimum required storage capacity of 2,000 AF was assigned; lakes with storage capacity greater than 2,000 AF were given a point in the evaluation. The lining condition of the lake was also considered; because of the potential for recycled water to have water quality impacts on the groundwater basin, a lake was given one or two points depending on the extent to which the lake is already sealed off from the groundwater basin by the time it is transferred to Zone 7. The organic matter content of recycled water makes it susceptible to algal growth and resulting odor issues during warm weather; therefore, lakes that were more distant from the urban interface were considered more suitable for this use than other lakes.

To protect the water quality of the Valley's water supply, lakes within 300 feet of a water supply facility (i.e., wells, Arroyo del Valle diversion structure) were assigned two negative points. Based on the California Well Standards[23] for the placement of wells relative to a potential pollution or contamination source and consideration of local conditions, this distance appears to provide protection for both municipal and domestic water supply wells and was applied in this evaluation. Furthermore, lakes that have a recharge potential are considered less suitable for this use because of potential water quality impacts to the groundwater basin and potential for losses of recycled water. Negative scores were

[22] Title 22, Division 4, Chapter 3, Article 3, Section 60304 (Use of Recycled Water for Irrigation).
[23] California Well Standards: Bulletin 74-81 and Bulletin 74-90. Department of Water Resources. 1981 and 1990. [Accessed at: http://www.water.ca.gov/groundwater/well_info_and_other/california_well_standards/well_standards_content.html]

therefore assigned in inverse proportion to the scores of each lake under "Groundwater Recharge." Note that Lake I, which is a designated recharge lake, was not considered for recycled water storage. Finally, because recycled water storage is relatively incompatible with surface water storage and conveyance, lakes that are not easily isolated from the other lakes were assigned a negative point. Recycled water would have potential water quality impacts on surface water quality.

RESULTS

Table 5-3 presents the list of criteria, the highest possible score assigned to each criterion, and the scoring assigned to each lake for recycled water storage.

Lakes F, G, and Cope were the only lakes that scored positively for this use, with Lake F scoring highest (Figure 5-3). Note that recycled water storage, as defined here, may conflict with the Primary Uses of surface water storage and conveyance, stormwater detention, and groundwater recharge. If a lake such as Lake F is used for recycled water storage, the planned conduits for surface water conveyance should be reconfigured so that water is transported directly from Lake E to Lake G, resulting in additional pipeline and operation costs.

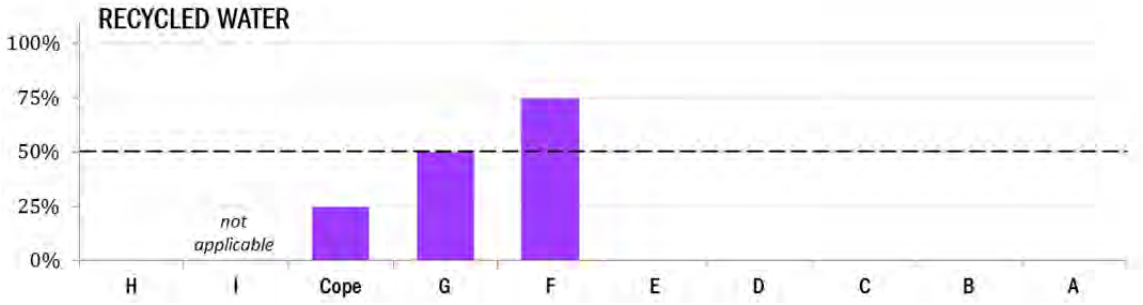


Figure 5-3. Recycled water storage scores by lake (>50% is considered more suitable).

Table 5-3. Evaluation criteria and scoring for recycled water storage.

Recycled Water Storage Criteria	Highest Possible Score	H	I	Cope	G	F	E	D	C	B	A
PROS											
Total storage capacity at >=2,000 AF[a]	1	0		1	1	1	1	1	1	0	0
Lake lining[b]	2	0		2	1	2	0	0	0	0	0
Distant from urban interface	1	0		0	1	1	0	0	0	0	0
CONS											
Proximity to a water supply facility[c]	0	-2		-2	0	0	0	0	0	0	-2
Groundwater recharge potential[c]	0	-1		0	0	0	-2	-2	-1	-1	0
Not easily isolated from other lakes	0	-1		0	-1	-1	-1	-1	-1	0	-1
TOTAL SCORES (points)	**4**	**-4**	**N/A**	**1**	**2**	**3**	**-2**	**-2**	**-1**	**-1**	**-3**
TOTAL SCORES (%)		0%	N/A	25%	50%	75%	0%	0%	0%	0%	0%

Notes:

a. According to DSRSD, they will require storage with a yield (after any losses due to evaporation, etc.) of 900-1,200 AF. Depending on weather conditions, recycled water storage would begin in late February or early March and drawdown anytime between late June to mid-August.

b. Lake lining
- 0 = lake is unlined
- 1 = lake is partially lined
- 2 = lake is fully lined

c. Proximity to a water supply facility
- 0 = greater than 300 ft from any water supply facility
- -1 = within 300 ft of a water supply facility

c. Groundwater recharge potential
- 0 = 0-20% score on groundwater
- -1 = 20-50% score on groundwater
- -2 = >50% score on groundwater

N/A = designated recharge lake/s are not considered for recycled water storage

5.3.2 Active Recreation

As defined here, active recreation includes any activity that involves or could result in body-contact with the lake, including activities on the slopes. Examples include: non-motorized boating, fishing, swimming, etc. The use of the lakes for active recreation is not a water management use nor would it directly support Zone 7's mission. However, the lakes provide a unique feature to the area and maximizing public benefits is desirable to Zone 7 and the community. This section is intended to evaluate the potential for multiple uses of the lakes. As noted previously, this Evaluation makes the assumption that all necessary facilities would be installed, operated, and maintained by an agency other than Zone 7. That agency would assume all costs and liability for the recreation activities. Any recreational activities would need to maintain public safety, not interfere with water management or the operation of Zone 7 facilities, and protect water quality.

CRITERIA

The criteria that were considered in the evaluation of active recreation are public safety, accessibility, and protection of water quality and anticipated operations.

All of the lakes are former quarry pits, and as such the slopes were designed for that purpose rather than public access. Most of the quarry slopes were mined with a final slope of 2:1. This results in very steep slopes that are not conducive to safe, active recreation activities. Some of the lakes do have sections with gentler slopes that make them more accessible. The slopes at each of the lakes were evaluated and the linear distance of slope that was less than or equal to 3:1 (i.e., gentler than 3:1) was tabulated. A point value was assigned based on a range of linear feet. Because of the importance of this criterion, for both safety and usability, there were two points possible. One point was given for 1,000 to 2,000 linear feet of gentle slope and two points were given for more than 2,000 linear feet. As a comparison, the beach at Shadow Cliffs is approximately 2,600 linear feet and has a slope of approximately 15:1.

In addition to having gentler slopes, a point was given if a lake has an existing safe access point to the water such as an existing boat ramp or roadway to the water. Lake I has an engineered boat ramp for emergency access. Lake H has a non-engineered roadway that goes most of the way to the water. Although Cope Lake has large areas of gently sloping sides, no formal access point exists. Access along Cope Lake would need to have additional geotechnical analysis performed to determine acceptable areas.

Access to the lake for the general public was also considered in this Evaluation. If the lake is close to an existing or planned park it was given a point as there may already be some existing facilities such as parking or trail access. A point was assigned to lakes that are close to an urban interface. For this evaluation, urban interface refers to developed land adjacent to the lake, or land proposed for development (e.g., through the EPSP process). Parking is

also important for public access; therefore, a point was given for lakes with adjacent land potentially suitable for future parking (Figure 3-3).

Negative points were assigned to lake features that make them less suitable for active recreation due to public safety, operational, or water quality concerns. These include slope hazards such as un-engineered rip rap or in-lake hazards such as abandoned mining debris. There may also be operational challenges at some of the lakes such as fluctuating water levels, especially in lakes used for stormwater detention, or operational facilities such as diversion structures that could create a public hazard or incompatible use (Figure 3-8). Water quality is a very important consideration for Zone 7 so a sliding scale was used for this criterion. One point was deducted if there is a potential for surface water impact and two points were deducted if the groundwater recharge score was greater than 20% indicating connection to the groundwater. If the lake is a designated recharge lake, as is the case for Lake I, the lake was not considered for active recreation.

RESULTS

Table 5-4 below presents the list of criteria, the highest possible score assigned to each criterion, and the scoring assigned to each lake for active recreation.

The results indicate that Cope Lake and Lake A are the only lakes where active recreation would potentially be suitable as they were the only lakes to score above zero.

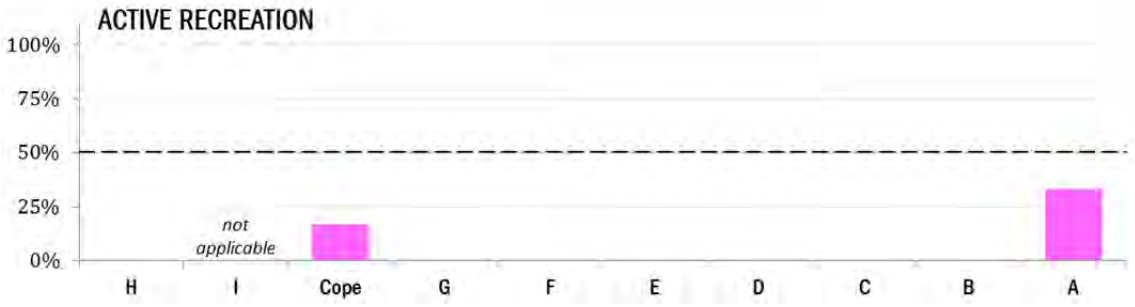


Figure 5-4. Active recreation scores by lake (>50% is considered more suitable).

Table 5-4. Evaluation criteria and scoring for active recreation.

Active Recreation Criteria	Highest Possible Score	H	I	Cope	G	F	E	D	C	B	A
PROS											
Proximity to existing or planned park	1	0		1	0	0	0	0	0	0	1
Proximity to urban interface	1	0		1	0	0	0	1	1	1	1
Slope easy to traverse (less than 2:1 gradient) [a]	2	0		2	0	0	0	0	0	0	0
Existing safe access ramp to the water in at least one location	1	1		0	0	0	0	0	0	0	1
Existing vehicular access and adjacent area for future parking	1	1		1	1	1	1	0	0	0	1
CONS											
Slope hazards (e.g., riprap, debris)	0	-1		-1	0	0	0	0	0	0	0
In-lake hazards	0	0		-1	-1	0	0	0	0	0	0
Operational challenges	0	-1		-1	0	0	0	0	0	0	-1
Potential for adverse water quality impacts [b]	0	-2		-1	-1	-1	-2	-2	-1	-2	-1
TOTAL SCORES (points)	**6**	**-2**	**N/A**	**1**	**-1**	**0**	**-1**	**-1**	**0**	**-1**	**2**
TOTAL SCORES (%)		0%	N/A	17%	0%	0%	0%	0%	0%	0%	33%

Notes:

a. Slopes less than 2:1 are scored as follows:

0 = <1,000 linear feet
1 = 1,000 to 2,000 linear feet
2 = >2,000 linear feet

b. Potential for adverse water quality impacts

0 = no potential impact
-1 = potential for surface water impact;
-2 = potential for groundwater impact (groundwater score is >20%)

N/A = designated recharge lake/s are not considered for active recreation

5.3.3 Education/Passive Recreation

The COLs provides a unique opportunity for community education and passive recreation. When fully operational the lakes will be available for various water management uses including surface water conveyance, groundwater recharge, and flood protection, which uniquely provide a venue for communicating to the public the overall water management system within the Valley. Some lakes may be dedicated to one use and others may have multiple uses. There may also be the potential to add trails connecting to a larger trail system (Figure 3-5), which would allow the public to see these lakes in operation as part of the Zone 7 water management system. As with active recreation, any facilities such as trails and vista points proposed for passive recreation would need to be installed, operated, and maintained by an agency other than Zone 7. That agency would also need to assume all costs and liability for such recreation activities and coordinate closely with Zone 7 on educational messaging.

For this evaluation, education and passive recreation include kiosks, vista points, bird watching, and trails. A more formal educational center could be located in the COLs area, but more analysis would be necessary in regards to suitability and location for a structure, parking, and vehicular access. In addition, while some of the lakes could accommodate trails, there are areas where trails would not be recommended due to conflicts with existing or planned water management facilities, public safety or habitat concerns.

CRITERIA

The most important criteria in this evaluation were accessibility, public or environmental safety, and operational conflicts. In order for a lake to be suitable for education/passive recreation it needs to be accessible. Existing vehicular access (and space for future parking) would therefore confer an advantage. It would also be desirable for the lake to be close to an urban interface. For this evaluation, urban interface refers to developed land adjacent to the lake, or land proposed for development (e.g., through the EPSP process). Having an existing or planned educational facility close to the lake, which would facilitate use of the lake for education/passive recreation, was also considered a positive feature. Currently Lake I is the only lake with a school nearby. Having a trail close to the lake would coincide with the lake's accessibility, and potentially facilitate the formation of longer trail loops for passive recreation (Figure 3-5). A trail exists west of Lake I and another one is planned on the south side of Lake I. There are also existing trails along Lakes A and B, just east of Lake E and on the north side of Lake D along Stanley Avenue.

The advantages of a lake for use for education/passive recreation were balanced against potential conflicts with environmental or safety concerns, and interference with existing or planned Zone 7 facilities (Figure 3-8).

RESULTS

Table 5-5 below presents the list of criteria, the highest possible score assigned to each criterion, and the scoring assigned to each lake for education/passive recreation.

The results indicate that Lakes A and I would be the most suitable candidates for education/passive recreation.

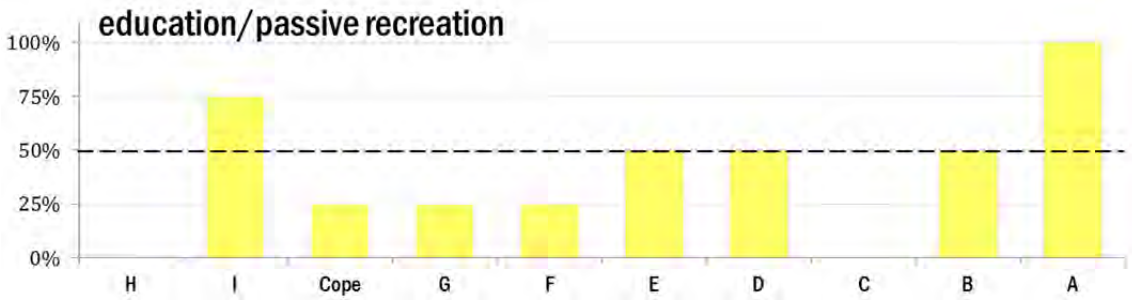


Figure 5-5. Education/passive recreation scores by lake (>50% is considered more suitable).

Table 5-5. Evaluation criteria and scoring for education/passive recreation.

Education/Passive Recreation

Criteria	Highest Possible Score	H	I	Cope	G	F	E	D	C	B	A
PROS											
Existing vehicular access and adjacent area for future parking	1	1	1	1	1	1	1	0	0	0	1
Proximity to urban interface	1	0	1	1	0	0	0	1	1	1	1
Proximity to existing or planned educational facility/park	1	0	1	1	0	0	0	0	0	0	1
Proximity to existing trail	1	0	1	0	0	0	1	1	0	1	1
CONS											
Potential conflict with environmental or safety concern [a]	0	-1	-1	-1	0	0	0	0	-1	0	0
Potential conflict with existing or planned facilities	0	-1	0	-1	0	0	0	0	0	0	0
TOTAL SCORES (points)	4	-1	3	1	1	1	2	2	0	2	4
TOTAL SCORES (%)		0%	75%	25%	25%	25%	50%	50%	0%	50%	100%

Notes:
Education would include kiosks along trails or possible vista points.

a. Examples:

- high traffic maintenance roads (Lake H and Cope Lake),
- insufficient bank width to accommodate an access trail (Lake C),
- insufficient bank width to accommodate maintenance vehicles and trail access (Lake I)

5.3.4 Habitat /Conservation

The COLs has a diverse suite of habitats that accommodates multiple wildlife species, as well as a green-space buffer between the cities of Livermore and Pleasanton. The East Alameda County Conservation Strategy (2010)[2] was developed to preserve endangered species by creating a shared vision among Zone 7, the cities, regulatory permitting agencies, and key community groups for long-term habitat protection in eastern Alameda County. Of the priority habitats presented in EACCS, "riparian forest and scrub" is present at the COLs, and was considered for protection as part of this evaluation. In addition to riparian habitat, emergent vegetation at the margins of lakes and wetlands can be high productivity zones and provide cover for water fowl and other wildlife.

Beyond preserving patches of desired habitat, movement is essential to wildlife survival, and unbroken corridors that facilitate the movement of animals between habitats are important to the health of wildlife populations and overall ecosystem function. Existing development can be a barrier to wildlife movement and introduce pest species (e.g., raccoons, rats, feral cats) that can harass or prey on preferred wildlife. Roads, development, or other impediments can block these natural movement patterns and lead to losses of species and critical ecosystem services. For this evaluation, a habitat corridor is a strip of land that aids in the movement of species between one of the lakes and adjacent riparian habitat, or between one of the lakes and upland habitat.

The quarries are situated where alluvial fan deposits such as gravel and silts were historically placed by the Arroyo Mocho or the Arroyo del Valle as they flowed into or through the Valley. As such, some of the lakes are adjacent to the present day arroyos and the associated riparian habitat. Species such as the California red-legged frog can move overland between river and pond habitat. The western pond turtle, though primarily an aquatic species, utilizes terrestrial upland habitat for both nesting and overwintering. Those are just two examples of species that would benefit from continuous habitat corridors through the COLs area.

Lakes that are adjacent to riparian habitat were considered more suitable for the preservation of a habitat corridor. Existing habitat was calculated by measuring linear feet at top of slope directly adjacent (without any major impediments) to riparian habitat (riparian woodland, riparian scrub, or riverine habitat) as mapped through EACCS or identified biological surveys prepared for Zone 7[24]. Lakes were scored on linear length of bank adjacent to a riparian area or an area with gentle slopes for a maximum of four points.

Though many species can traverse steep slopes, for the purposes of this evaluation, gentler slopes (3:1 or less) were prioritized as more suitable for wildlife to transition between a

[24] Biological reconnaissance report: Chain of Lakes site. Prepared by Padres Associates, Inc. for Zone 7 Water Agency. 2008.

lake and nearby upland areas. In addition, slope was used as a proxy for available shoreline habitat. Lakes were scored on linear length of bank adjacent to areas with gentler slopes for a maximum of one point.

Proximity to an urban interface would degrade habitat quality and was therefore assigned negative points. Lakes were scored on linear length of bank adjacent to urban development (e.g., industrial or residential areas, or major roads). Proposed EPSP development was also included. Deductions were assigned based the degree of urban influence along the lake's perimeter.

RESULTS

Table 5-6 presents the criteria, highest possible score and ranking of the lakes for habitat corridor/conservation use.

Cope Lake and Lakes A, B, and H are the strongest candidates for habitat conservation or potential for a habitat corridor (Figure 5-6). Cope Lake had the highest amount of perimeter adjacent to riparian habitat. Nearly the entire lake is ringed with riparian scrub habitat and the eastern lake face is adjacent to the Arroyo Mocho. However, the southern face will be adjacent to industrial development per the EPSP. The entire south face of Lake B is adjacent to the Arroyo del Valle and its riparian habitat, and only a very small portion of its perimeter is adjacent to urban development. However, its slopes will be steep. Similar to Lake B, the entire south face of Lake A is adjacent to the Arroyo del Valle; however, Lake A lacked sufficient gentle slopes to score higher and has a high degree of urban influence on its north face. Lake H scored well as its eastern face is adjacent to the Arroyo Mocho. Though its western face is delineated by a private road, Lake H is largely isolated from urban interference. A limitation of Lake H is that it also lacks sufficient gentle slopes.

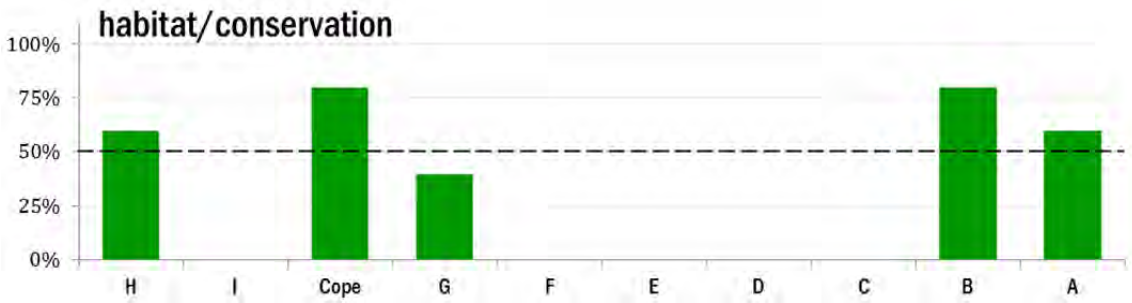


Figure 5-6. Habitat/conservation scores by lake (>50% is considered more suitable).

Table 5-6. Evaluation criteria and scoring for habitat/conservation.

Habitat Corridor - Conservation

Criteria	Highest Possible Score	H	I	Cope	G	F	E	D	C	B	A
PROS											
Adjacent to riparian habitat[a]	4	3	0	4	2	0	1	0	0	4	4
Slope easy to traverse (less than 2:1 gradient)[b]	1	0	1	1	0	0	0	0	0	0	0
CONS											
Proximity to urban interface[c]	0	0	-2	-1	0	0	-1	-1	-1	0	-1
TOTAL SCORES (points)	**5**	**3**	**-1**	**4**	**2**	**0**	**0**	**-1**	**-1**	**4**	**3**
TOTAL SCORES (%)		60%	0%	80%	40%	0%	0%	0%	0%	80%	60%

Notes:

a. Existing habitat was calculated by measuring linear feet at top of slope directly adjacent (without any major impediments) to riparian habitat (riparian woodland, riparian scrub, or riverine habitat). Points were assigned as follows:

0 - no adjacent riparian habitat
1 - 0 to 1,500 linear feet
2 - 1,500 to 3,000 linear feet
3 - 3,000 to 4,500 linear feet
4 - >4,500 linear feet

b. Slopes less than 2:1 are scored as follows:

0 = 0-1,000 linear feet
1 = >1, 000 linear feet

c. Proximity to urban interface was calculated by measuring the linear feet at top of slope that is adjacent to urban development or a major road. Proposed EPSP development is also included. Points were assigned as follows:

0 = <25% of perimeter
-1 = 25-50% of perimeter
-2 = >50% of perimeter

5.4 SUMMARY OF RESULTS

Figure 5-7 summarizes the results of the evaluation. Note that surface water storage and conveyance is an assumed use for each of the lakes, and other uses would have to be considered with this in mind.

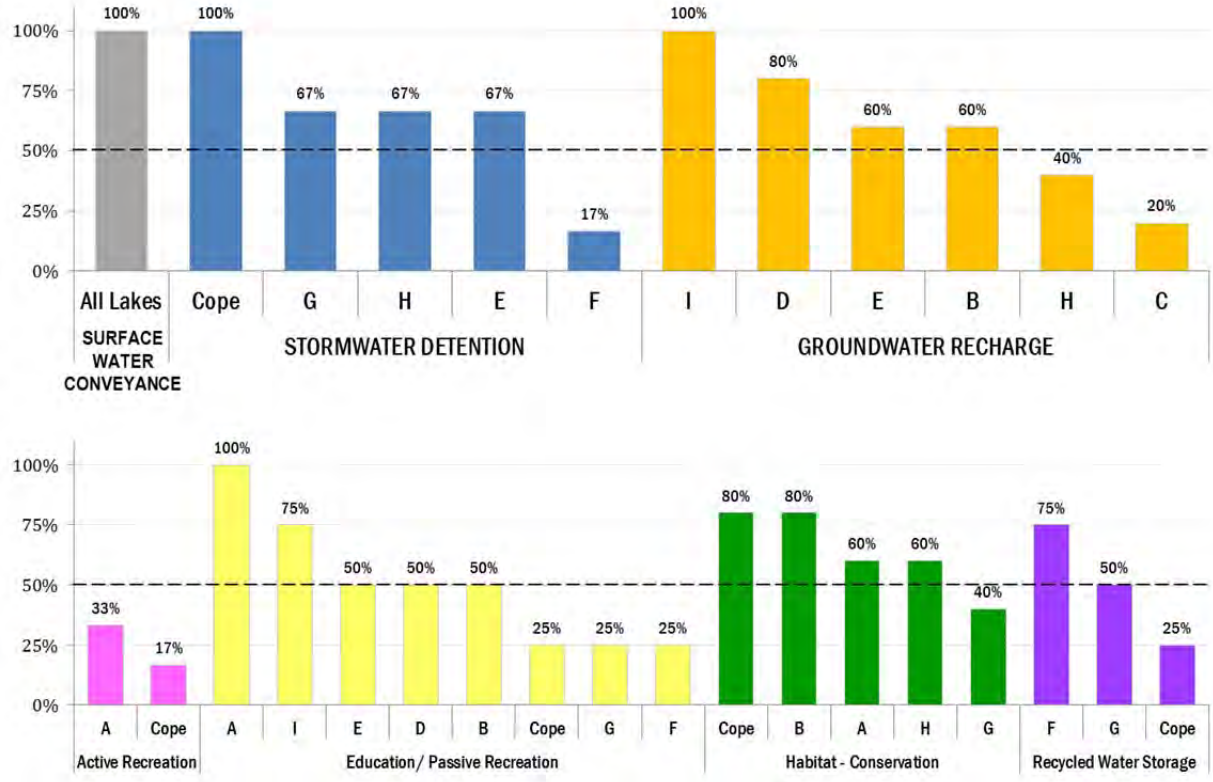


Figure 5-7. Summary of scores by Primary Use (top) and Secondary Use (bottom).

5.4.1 Use Compatibility

With the exception of active recreation, strong candidates emerged for most uses. However, some lakes may have scored high for multiple uses, which may or may not be compatible. Table 5-7 lists the various uses and indicates which uses are *generally* incompatible, potentially compatible, or incompatible.

- "**Incompatible**" indicates a conflict based on regulations, public health concerns, agreements, etc.
- "**Potentially compatible**" indicates that there will need to be special considerations in the design (e.g., placement of facilities) and operation (e.g., timing) to accommodate the multiple uses proposed.
- "**Compatible**" uses pose no identified conflicts and in fact may be complementary.

Table 5-7 is intended to serve as a framework for considering multiple uses for a specific lake at this high-level planning phase.

Actual compatibility will need to be determined when there is more specific information on site-specific conditions (e.g., hydrogeologic data) and on the design and operation associated with the uses being considered. For the purposes of this evaluation, the quality of the recycled water proposed for storage was assumed to be the level appropriate for landscape irrigation, as currently practiced in the Valley.

Table 5-7. Lake use compatibility matrix.

		STRM-STOR	GWR-RCHG	SURF-STOR	RW-STOR	HAB-CORR	REC-ACT	EDUC/ REC-PAS
PRIMARY USES	STRM-STOR		○	○	×	✓	○	✓
	GWR-RCHG	○		✓	×	✓	○	✓
	SURF-STOR	○	✓		×	✓	○	✓
SECONDARY USES	RW-STOR	×	×	×		✓	×	✓
	HAB-CORR	✓	✓	✓	✓		○	○
	REC-ACT	○	○	○	×	○		✓
	EDUC/ REC-PAS	✓	✓	✓	✓	○	✓	

STRM-STOR = stormwater detention, GWR-RCHG – groundwater recharge, SURF-STOR = surface water storage and conveyance, RW-STOR = recycled water storage, HAB-CORR = habitat corridor, REC-ACT = active recreation, EDUC/REC-PAS = education/passive recreation.

× = incompatible, ○ = potentially compatible, ✓ = compatible

Stormwater can carry a high sediment load, which could affect groundwater recharge operations. During the wet season, a lake used for stormwater detention would need

sufficient capacity for storage; depending on the size of the lake, there may be insufficient capacity to store both surface water supply and stormwater. Since detained stormwater would need to be released back into the Arroyo Mocho under the current SMMP[3], stormwater detention and recycled water storage was considered incompatible. To allow active recreation in a lake used for stormwater detention, recreation facilities would need to be designed so that they can handle fluctuating water levels. Recreational use during the wet season would also have to be restricted. Finally, public access to the stormwater diversion and pumpback facilities would have to be restricted to ensure that public safety is not compromised and that Zone 7 operation is not disrupted.

Use of a lake for groundwater recharge indicates that there is direct access to the groundwater basin. *Direct* contact between recycled water intended for landscape irrigation and the Main Basin may need to be limited because of water quality degradation and public health concerns[25]. Active recreation was not considered for Lake I, because it is a designated recharge lake and water quality is of utmost concern; however, active recreation can be considered for the other lakes with more limited recharge capacities.

Surface water stored in the COLs will serve as the source of groundwater recharge and might be made available as a future raw water supply for the Del Valle Water Treatment Plant (DVWTP). For water quality protection, some secondary uses such as recycled water storage and certain types of active recreation (e.g., motorized boating) may not be allowed on a lake used as a water supply.

Active recreation that involves body contact would be prohibited in a lake used for recycled water storage based on regulations and public health concerns. Use of stored recycled water for body-contact recreation would require additional treatment and/or strict pathogen monitoring[26].

Habitat/conservation use would be located along the lake perimeters and is generally compatible with other uses. However, potential disturbances of protected species from excessive public access and domestic animals may need to be considered.

5.4.2 Results for Each Lake

The following figures (Figure 5-8 through Figure 5-17) present the results for each lake, highlighting the potential for multiple uses that could be considered as the lakes are turned over to Zone 7.

Figure 5-18 and Figure 5-19 show a summary of the lakes found suitable for Primary Uses and Secondary Uses, respectively.

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[25] The California Department of Public Health is developing regulations that address groundwater replenishment (recharge) for aquifers designated as sources of drinking water using recycled water from domestic wastewater sources.

[26] Title 22, Division 4, Chapter 3, Article 3, Section 60305 (Use of Recycled Water for Impoundments).

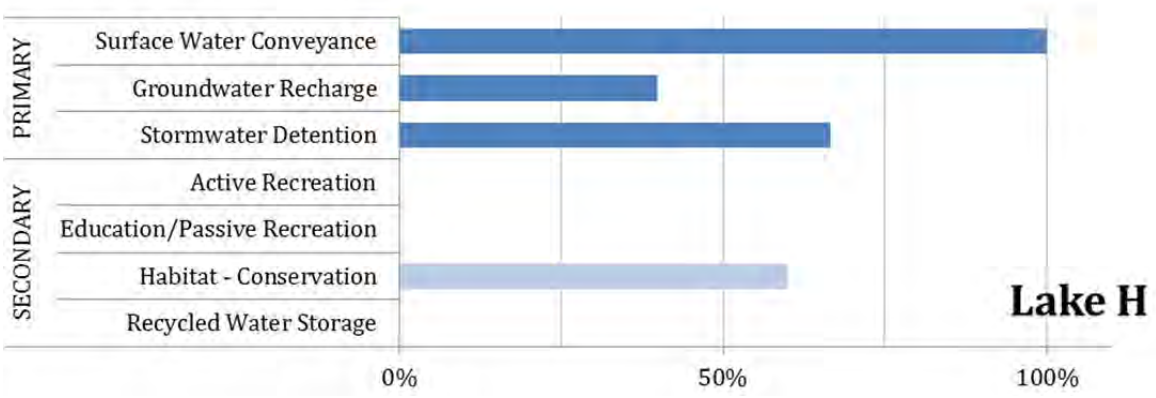

Figure 5-8. Scoring results for Lake H.

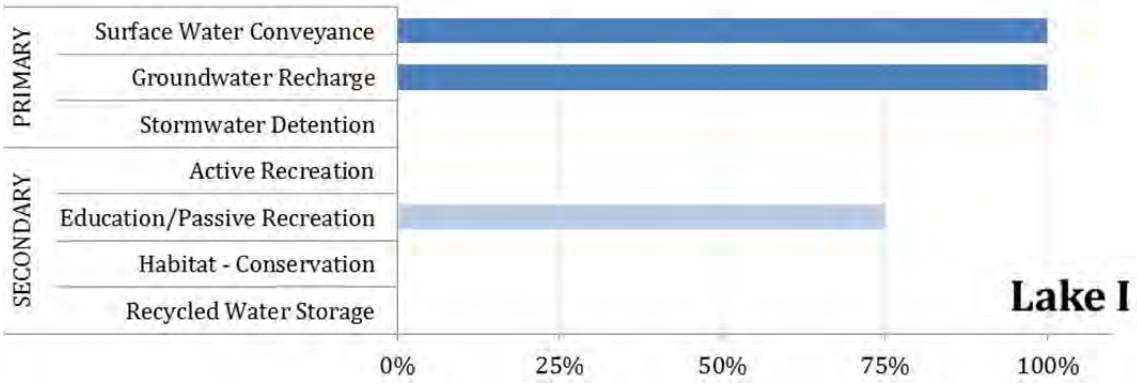

Figure 5-9. Scoring results for Lake I.

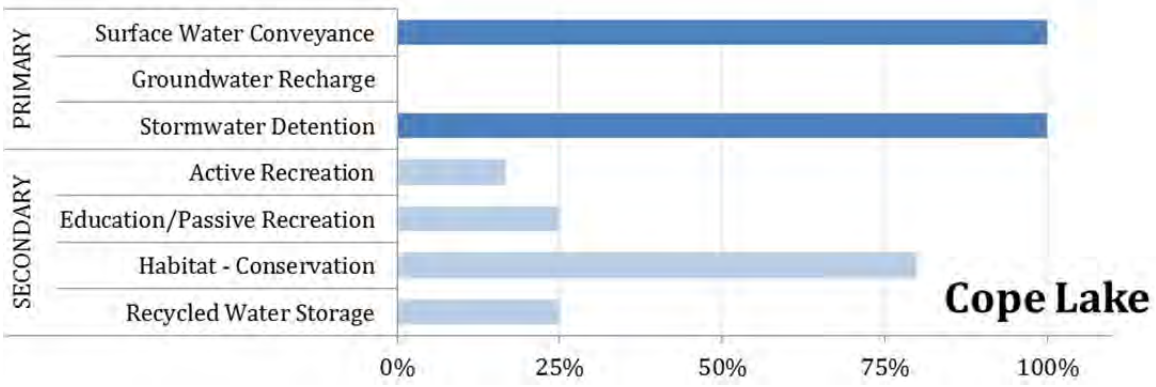

Figure 5-10. Scoring results for Cope Lake.

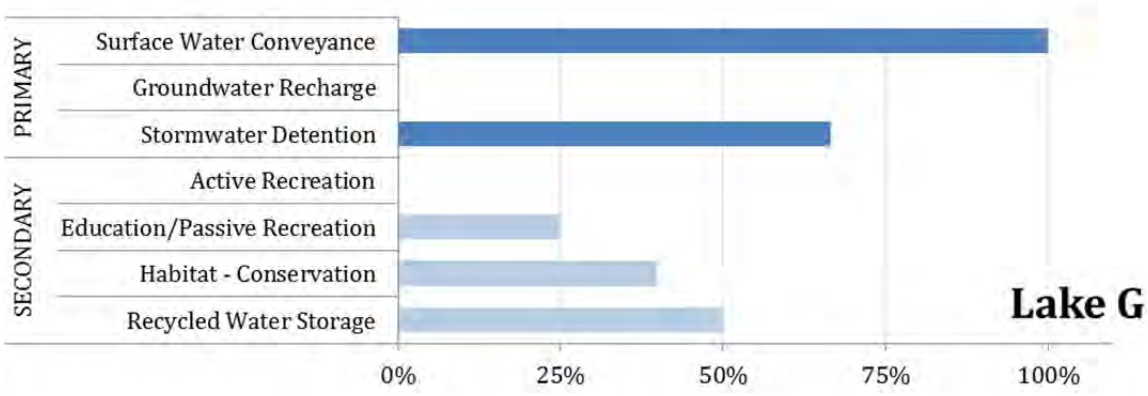

Figure 5-11. Scoring results for Lake G.

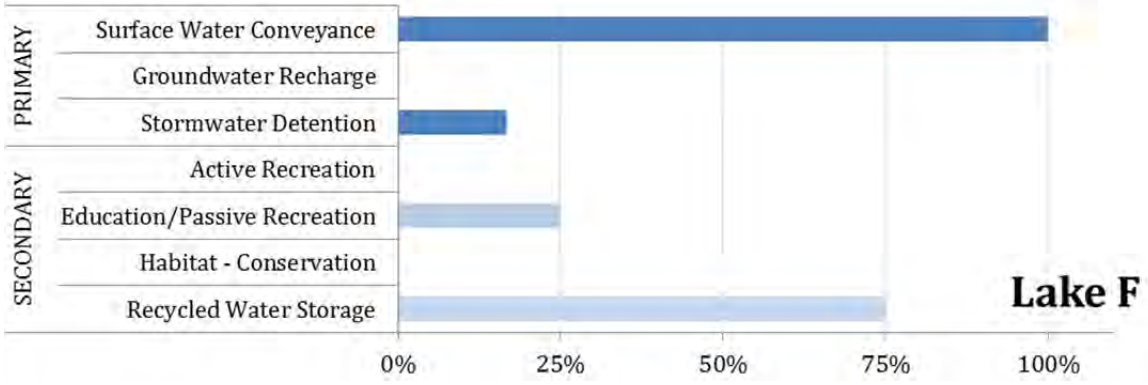

Figure 5-12. Scoring results for Lake F.

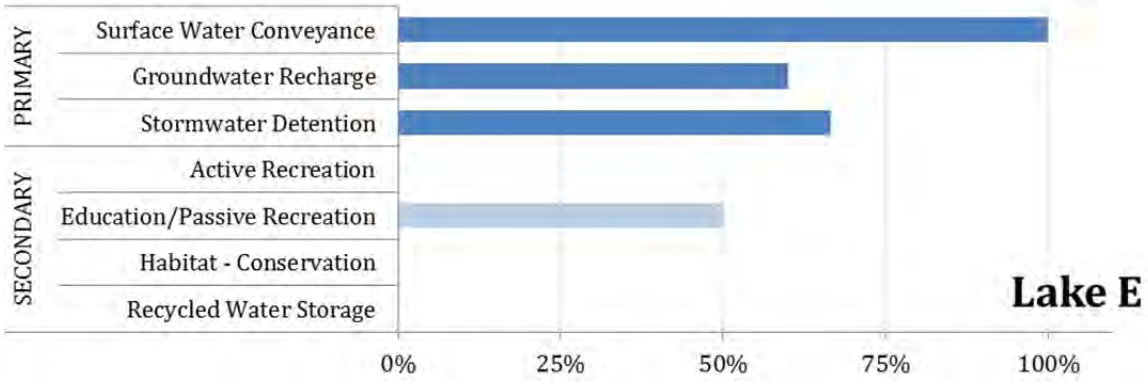

Figure 5-13. Scoring results for Lake E.

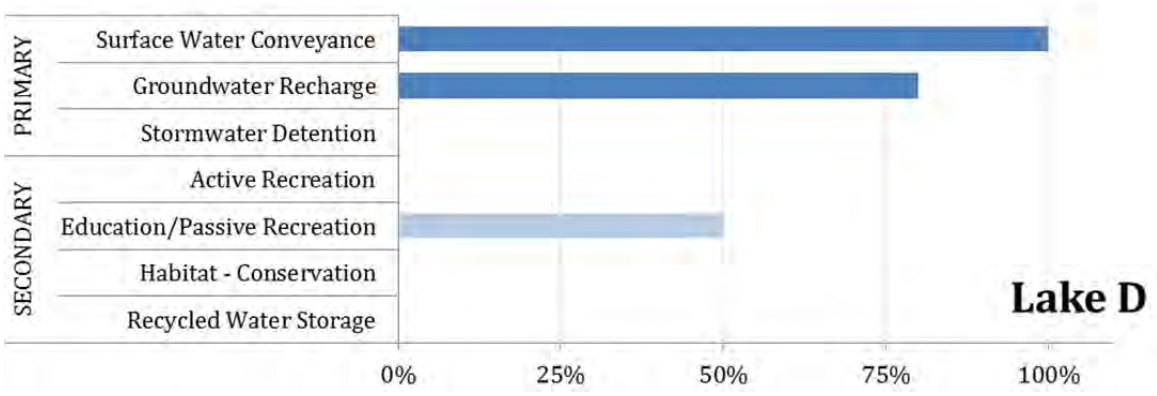

Figure 5-14. Scoring results for Lake D.

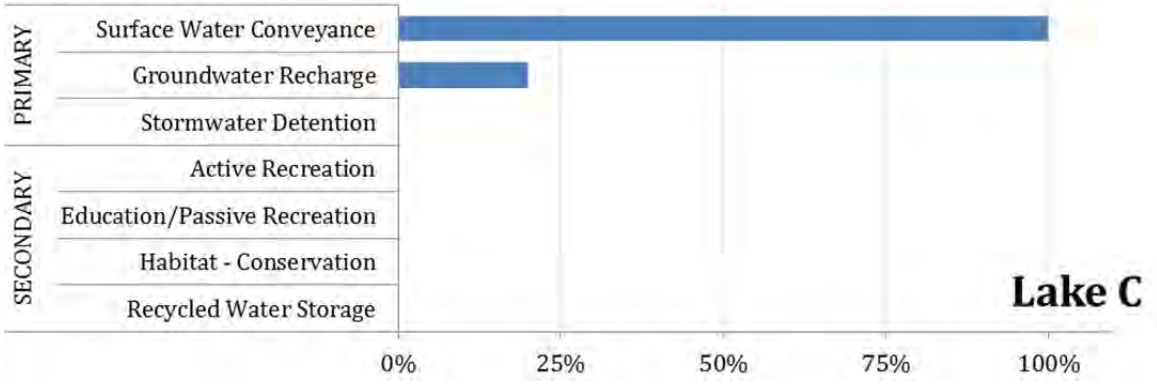

Figure 5-15. Scoring results for Lake C.

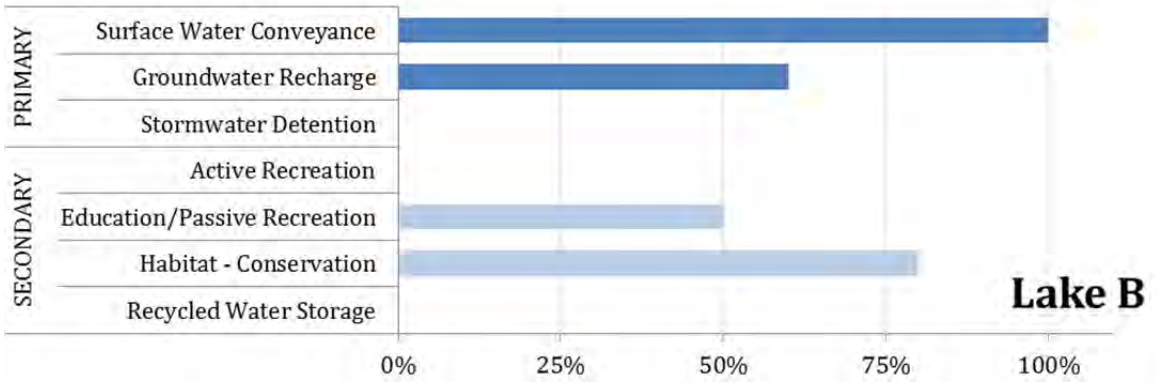

Figure 5-16. Scoring results for Lake B.

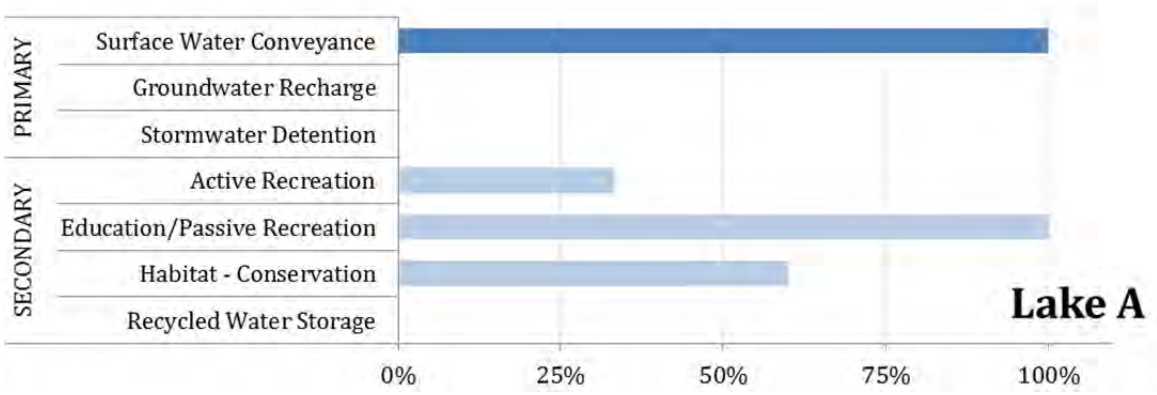

Figure 5-17. Scoring results for Lake A.

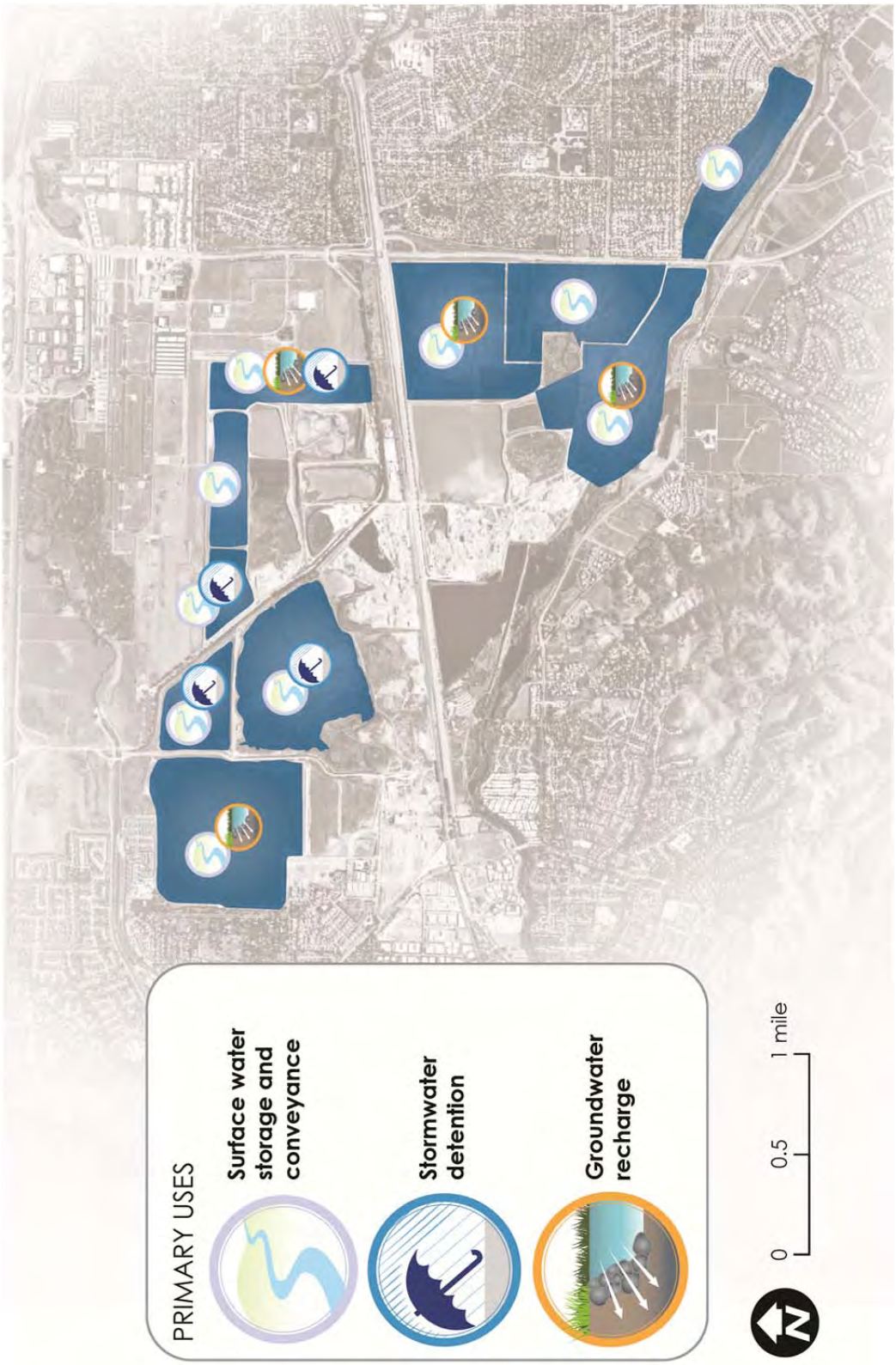

Figure 5-18. Summary map of potential Primary Uses by lake.

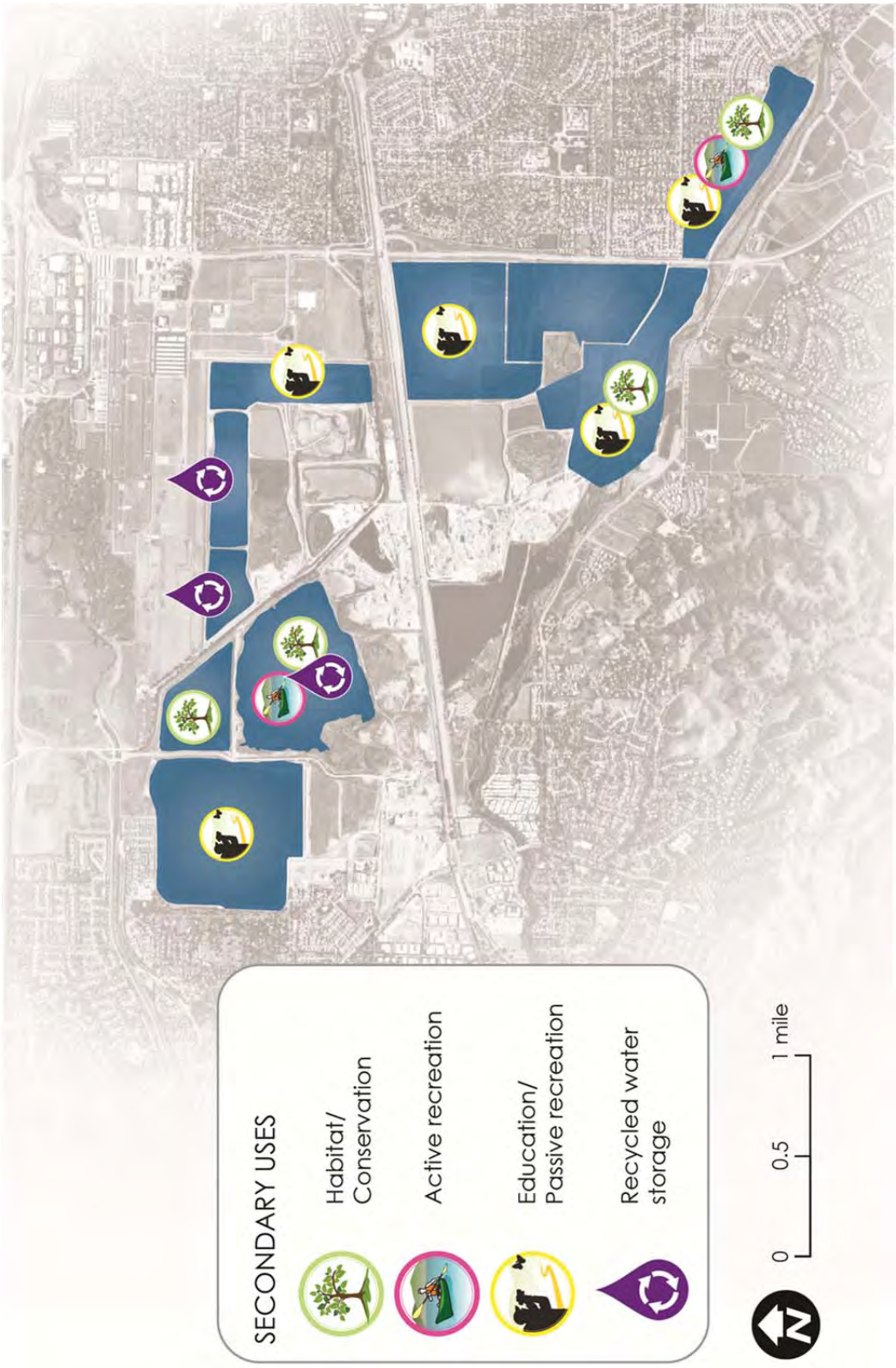

Figure 5-19. Summary map of potential Secondary Uses by lake.

6 Conclusion

The purpose of the Evaluation is to determine the relative suitability of each lake for a particular use for planning purposes based on its expected condition at the time of transfer to Zone 7 or its existing/planned condition if already owned by Zone 7 (i.e., Lakes I and Cope). Engineering improvements and other additional investments could make a lake more suitable for a particular use than is currently reflected in the Evaluation. Given the long period of lake transfers, uses of the lakes will be reconsidered over time to reflect any changes in regulations, water management needs, and other factors. The lakes were evaluated individually; future evaluation will consider the benefits of combining lakes for certain uses. Finally, the Evaluation relied on existing data (e.g., geotechnical, hydrogeologic) and generalized assumptions as described in Chapters 3, 4, 5 and Appendix D; *additional data will be needed and considered as particular uses are proposed for specific locations either by Zone 7 or by external entities*.

Zone 7 will continue to coordinate with Alameda County and the quarry operators/owners on the lakes still in active mining, in use for related operations, or undergoing reclamation; this will help ensure that the lakes will be suitable for water management activities, as intended, upon transfer. In the near-term, Zone 7's detailed planning efforts are primarily focused on Lake I and Cope Lake, which are already owned by Zone 7, and Lake H, which is anticipated to be transferred to Zone 7 near the end of 2014. These efforts will continue to be coordinated with the development of the EPSP.

Lake I will be used for surface water storage and conveyance, and groundwater recharge, as originally designated in LAVQAR, given its high recharge capacity/connectivity with the groundwater basin. Lake I is a strong candidate for public education because of its location and, given its use, provides a powerful backdrop for educating the public about water management. Extension of trails around portions of Lake I is also possible.

Cope Lake is a strong candidate for stormwater detention per the SMMP and this evaluation and was one of only two lakes that rated a positive score for active recreation. Those two uses are potentially compatible, requiring some timing restrictions on the use of the lake for active recreation activities during the wet season. The design of the recreation facilities would also have to be carefully considered because of the fluctuating water levels.

Lake H also emerged as a potential candidate for stormwater detention; this potential use will be further considered in the planned SMMP update. The east sides of Cope Lake and Lake H could be considered for preservation as a habitat corridor, allowing for wildlife to

move between the riparian areas of the Arroyo Mocho and upland habitat. This would not conflict with the use of the lakes for stormwater detention or surface water storage and conveyance.

Figure 6-1 shows the three lakes and near-term recommendations for their use.

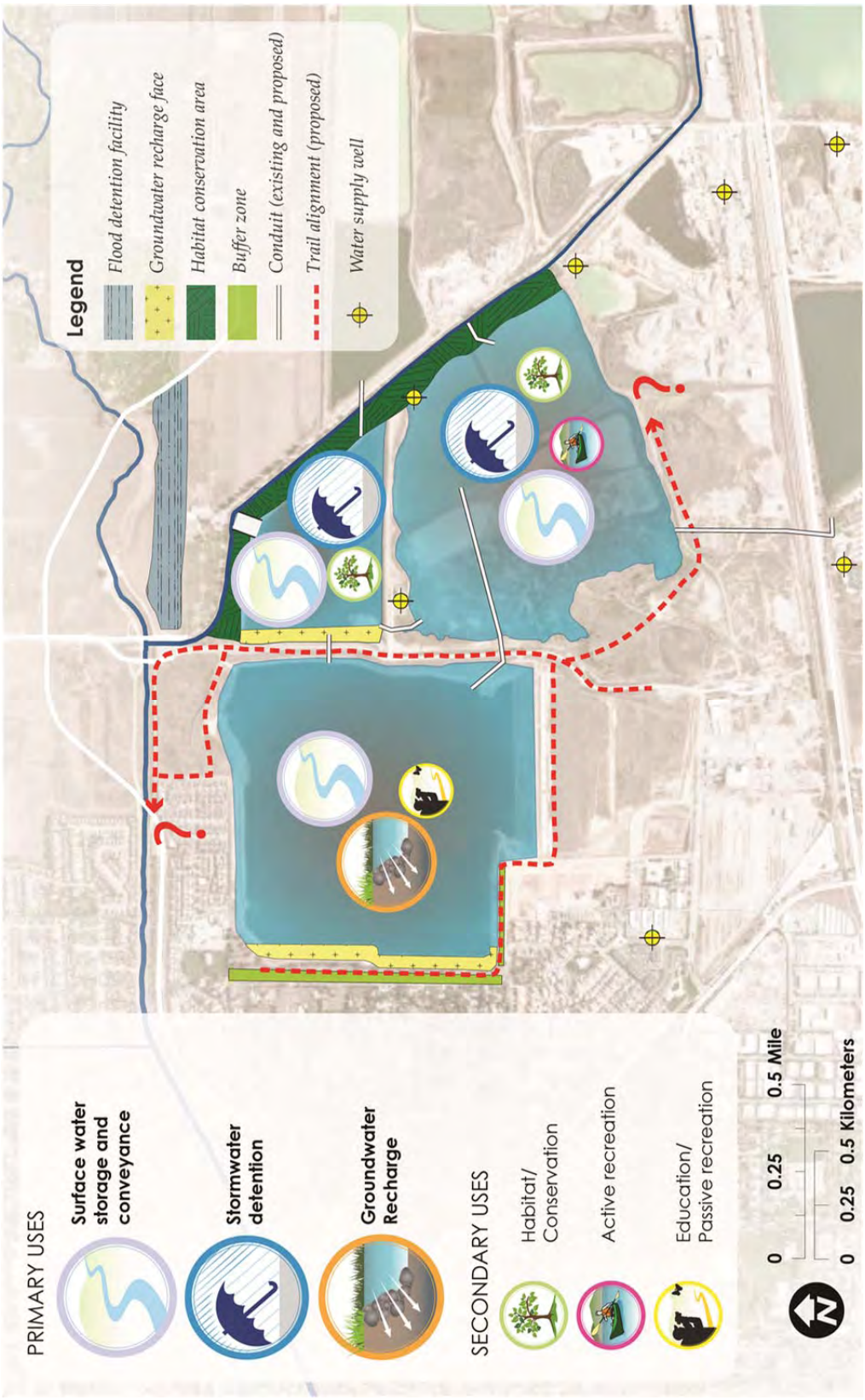

Figure 6-1. Map of near-term recommendations for Lakes H, I, and Cope.

7 List of Key References

7.1 PLANNING DOCUMENTS

Specific Plan for Livermore-Amador Valley Quarry Area Reclamation (LAVQAR). Prepared for the Alameda County Board of Supervisors. November 5, 1981.

City of Livermore Bikeways and Trails Master Plan. Prepared by Wilbur Smith Associates for the City of Livermore. 2002.

Management Plan for Lakes H, I, and Cope Lake. Prepared by Stetson Engineers Inc. for Zone 7 Water Agency. June 2004.

Stream Management Master Plan. Prepared by RMC for Zone 7 Water Agency. August 2006. http://www.zone7water.com/final-smmp

City of Dublin Bikeways Master Plan. Prepared by Fehr & Peers and RHAA for the City of Dublin. 2007. [Accessed at: http://www.ci.dublin.ca.us/DocumentCenter/Home/View/433]

El Charro Specific Plan. Prepared by EDAW/AECOM for the City of Livermore. Adopted July 2007. http://www.cityoflivermore.net/citygov/cd/planning/charro.asp

LARPD (Livermore Area Recreation and Park District) Parks, Recreation and Trails Master Plan. Prepared by City of Livermore Community Development Department. 2008.

East Alameda County Conservation Strategy. Prepared by ICF International for the East Alameda County Conservation Strategy Steering Committee. October 2010. http://www.eastalco-conservation.org/documents.html

Pleasanton Pedestrian and Bicycle Master Plan. Prepared by Fehr & Peers and RHAA for the City of Pleasanton. 2010. [Accessed at: http://www.cityofpleasantonca.gov/pdf/pedbike-final-2010.pdf]

Livermore Executive Airport – Airport Land Use Compatibility Plan. Prepared by ESA for the Alameda County Community Development Agency. August 2012.

East Bay Regional Park District Master Plan 2013. 2013.

East Pleasanton Specific Plan (under development as of January 2014). Draft documents can be accessed at http://www.cityofpleasantonca.gov/business/planning/eastpleasanton/draftdocuments.html

7.2 AGREEMENTS BETWEEN ZONE 7 AND QUARRY OPERATORS

Agreement Between Zone 7 of the Alameda County Flood Control and Water Conservation District and Kaiser Sand and Gravel Company. January 21, 1987.

Agreement Between Zone 7 of the Alameda County Flood Control and Water Conservation District and RMC Lonestar. March 28, 1988.

Agreement Between Zone 7 of the Alameda County Flood Control and Water Conservation District and Pleasanton Gravel Company. April 20, 1988.

7.3 OTHER AGREEMENTS

Memorandum of Understanding between Dublin San Ramon Services District and Zone 7 for Cooperative Effort Regarding Groundwater Demineralization and Storage within the Livermore-Amador Valley. April 20, 2004.

Agreement between City of Livermore and Zone 7 Alameda County and Flood Control Water Conservation District for the El Charro Specific Plan Area Flood Protection Improvements. December 15, 2010.

7.4 SURFACE MINING PERMITS

Surface Mining Permit and Reclamation Plan SMP-16 (October 11, 1983) and subsequent amendments.

Surface Mining Permit and Reclamation Plan SMP-23 (April 6, 1987) and subsequent amendments.

Application for Reclamation Plan Amendment: CEMEX SMP-23. Prepared by Spinardi Associates. Submitted to Alameda County. June 2013.

Surface Mining Permit and Reclamation Plan SMP-31/36 (1991) and subsequent amendments.

7.5 STUDIES

Hydrogeologic and Geotechnical Preliminary Investigation Lake G. Prepared by Geocon Consultants, Inc. for Zone 7 Water Agency. November 2001.

Preliminary Geotechnical Engineering and Geologic Investigation: Cope Lake Tertiary Water Storage Project. Prepared by Geocon Consultants, Inc. for Zone 7 Water Agency. July 2002.

Alternative Conceptual Layouts for a Combination Treatment Wetland and Storage Reservoir at Cope Lake Memo. Prepared by Stetson Engineers for Zone 7 Water Agency. January 9, 2003.

Biological Reconnaissance Report: Chain of Lakes site. Prepared by Padres Associates, Inc. for Zone 7 Water Agency. 2008.

Hydrostratigraphic Investigation of the Aquifer Recharge Potential for Lakes C and D of the Chain of Lakes. Zone 7 Water Agency. May 2011.

Water Supply Evaluation. Zone 7 Water Agency. July 2011.

7.6 OTHERS

Historical Narrative of Livermore-Amador Valley Mining and the Chain of Lakes. Prepared by Mun J. Mar, Consultant, for Zone 7 Water Agency. Presented to the Administrative Committee. March 31, 2011.

APPENDIX A

Specific Plan for Livermore-Amador Valley Quarry Area Reclamation (LAVQAR)

ALAMEDA COUNTY PLANNING DEPARTMENT

399 Elmhurst Street, Hayward, California 94544 (415) 881-6401

August 1, 1985

Mun Mar, Zone 7
Don Kahler, Rhodes-Jamieson
Ralph Mitchell, Lone Star Industries
Jim Dahl, Kaiser Sand & Gravel

Gentlemen:

The Specific Plan for Livermore-Amador Valley Quarry Area Reclamation was adopted by the Alameda County Board of Supervisors on November 5, 1981. The Plan governs mining and reclamation activities of the three operators, Rhodes-Jamieson, Lone Star, and Kaiser. Section VII, Implementation, of the Plan provides that contracts are to be entered into between each operator and Zone 7 to effectuate water management aspects of the plan. To date, none of these contracts have been executed.

Section VII of the Plan also provides that periodic reviews of the Plan may be made by the Planning Commission and Board of Supervisors when deemed necessary. The Planning Commission is Lead Agency and coordinator to ensure the Specific Plan is carried out. As such, it is of great concern that nearly four years have elapsed since approval of the Plan without a key element of its implementation in place.

Preliminary to a possible review of the Specific Plan, we are requesting that the operators, either individually or jointly, and Zone 7 submit to this Department a history of contract negotiations, including pertinent dates and issues, and an explanation of what the current position of each party is relative to points of disagreement. It is hoped that this matter can be clarified and resolved as soon as possible.

Very truly yours,

William H. Fraley
Planning Director

WHF/PD/pd

Doc. 0837D/p.10

SPECIFIC PLAN FOR
LIVERMORE-AMADOR VALLEY QUARRY AREA RECLAMATION

ADOPTED NOVEMBER 5, 1981
ALAMEDA COUNTY BOARD OF SUPERVISORS

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MAPS

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SPECIFIC PLAN

FOR

LIVERMORE-AMADOR VALLEY QUARRY RECLAMATION

I. PURPOSE

Pursuant to California Government Code, Sections 65450 et. seq., this Specific Plan is to execute, add precision to, and become a part of the General Plan of the County of Alameda for that 3,820 acre area designated for "Sand and Gravel Quarry" use between Pleasanton and Livermore in the Livermore-Amador Valley Planning Unit General Plan, adopted November 3, 1977.

II. SPECIFIC PLAN COMPONENTS

The Specific Plan consists of the following components:

1. General and specific objectives;
2. Three maps (Plates 1-3) which represent staging plans depicting land and water configurations in the Quarry Area for the years 1995, 2010, and 2030;
3. A profile (Plate 4) of the Chain of Lakes system depicting land and water surface elevations;
4. A map (Plate 5) showing final elevations of reclaimed land areas;
5. Seven charts (Tables 1-7) tabulating 2030 land and water areas and volumes, categories and structural capabilities of land generated by reclamation, and land use acreages for the years 1995, 2010, and 2030;
6. Explanatory text;
7. Policies applying to the Quarry Area and activities conducted therein; and
8. Implementation methods.

III. GENERAL OBJECTIVES

The general objectives of this Specific Plan are:

1. To enable the competing resources of land, water, and sand and gravel to be utilized with a minimum of conflict and disruption;
2. To plan for reclamation, productive reuse, and rehabilitation of the Quarry Area;
3. To mitigate adverse effects of mining;
4. To satisfy requirements of the State Surface Mining and Reclamation Act of 1975 and the Alameda County Surface Mining Ordinance;

5. To provide a coordinated plan for arrangement of mining-produced land and water masses into a coherent, flexible form, reflecting interrelatedness of geology, hydrology, land use, and other factors throughout the Quarry Area.

IV. SPECIFIC OBJECTIVES

1. To mitigate alteration/impedance of groundwater movement and storage due to mining operations.

2. To mitigate exposure of groundwater to evaporative losses due to mining operations.

3. To mitigate exposure of groundwater to increased risk of quality degradation due to surface exposure as a result of mining operations.

4. To provide uninterrupted and undiminished satisfactory water quantity and quality in the upper aquifer of the mined area for beneficial uses.

5. To provide conditions to allow economic mining of sand and gravel resources benefitting the San Francisco Bay region.

6. To provide a surface water storage and transmission system to replace a portion of the existing subsurface system to mitigate mining impacts and enhance the ability to utilize, develop, and manage the water resources of the Livermore-Amador Valley for public benefit.

7. To provide land areas capable of productive use and with minimum residual hazards.

8. To provide flexibility sufficient to allow for changes in the Specific Plan in response to changes in future conditions, information, needs, technology, plans, or priorities.

9. To provide a framework concerning the future of the Quarry Area to help planning and decision making in the Livermore-Amador Valley.

V. EXPLANATORY TEXT

1. Background

Mining of sand and gravel in the Livermore-Amador Valley began prior to 1900. As larger areas and volumes of sand and gravel were removed, the need for a permit system to regulate quarrying became apparent. In 1956 the County of Alameda adopted Ordinance 181 N.S. Early permits were issued in 1956-57 for large portions of the Quarry Area. Reclamation was generally not provided for in that era. Ordinance 181 N.S. did prohibit pollution or contamination of usable water-bearing strata. The early permits, as well as all later ones, limited mining to the uppermost aquifer (the gravel deposits serve as aquifers—storage and transmission areas for groundwater). More recent permits, beginning in 1965, contained more explicit language protecting water resources and reclamation plans were also required. Attempts by individual operators to produce viable reclamation plans failed because the water resources in the Quarry Area are interconnected and interdependent in terms of storage and flow and cannot be maintained

satisfactorily within the artificial boundaries of quarry permits. Recognizing this, the quarry operators agreed to a joint effort to develop a master reclamation plan to address all the problems within the entire 3,820 acre area designated for quarry use by the Alameda County General Plan. The operators' master plan is, for the most part, intended to provide reclamation for past, present, and future mining. Without reclamation, mining in the Quarry Area has the potential to further block the flow of groundwater from southeast to northwest, to further interfere with storage and recharge of groundwater, and to create unusable and/or unsafe pits and land areas. The master reclamation plan prepared by the operators was intended to address these problems. In 1975, the State of California adopted the State Surface Mining and Reclamation Act of 1975, requiring reclamation plans for all mining operations conducted after January 1, 1976. In 1977, Alameda County adopted a new Surface Mining Ordinance updating the 1956 Quarry Ordinance and incorporating reclamation requirements.

Currently, the operators in the Quarry Area are Kaiser Sand and Gravel, Lone Star Industries, and Rhodes-Jamieson. This Specific Plan and subsequent reclamation plans are obligations that run with land areas regardless of ownership/operator.

2. Specific Plan: Water Areas

The key concept in the master reclamation plan is the shaping of pit areas, which would eventually contain water, into a "chain of lakes" during the course of mining over the 50-60 year period that sand and gravel reserves are expected to last in the Quarry Area. The chain of lakes would provide a surface water storage and conveyance system to replace a portion of the pre-existing subsurface water storage and conveyance system feeding the groundwater basin. Connecting conduits between the lakes and structures necessary to capture and carry local runoff waters would be provided by the operators at no cost to the public through the local (Zone 7) water management agency. At the conclusion of mining, water from Arroyo del Valle will be capable of diversion into the chain of lakes, and a by-pass channel for that watercourse will also be provided to maintain downstream flows necessary to Zone 7 and Alameda County Water District. Diversion from the Arroyo Mocho into the lower portion of the chain of lakes would be made available earlier (about 2000-2010) to Zone 7 by Kaiser Sand and Gravel and Rhodes-Jamieson. The end-state configuration is shown on Plate 3. Plates 1 and 2 show the configurations projected for 1995 and 2010, respectively. The end-state profile (section) of the chain of lakes is shown on Plate 4.

The following are other important features of the chain of lakes:

- Overburden materials will be used by the operators to line the eastern or northern faces of Lakes E, F, G, and H, as shown on the Plates. In this manner, barriers to groundwater intrusion into the lakes would be created to retard lower quality waters from seeping into the main basin. Operationally, this would allow groundwater levels to be maintained at different elevations than those in the lakes with less fear of water quality degradation.

- Lakes J and K are not necessary for operation of the chain of lakes, and are designated as areas where mining is optional. If mined, Lake J could be an extension of Shadow Cliffs Regional Park. If mined, Lake K could be available to capture polluted runoff water from urban development, acting independently of the groundwater basin.

- Water from Arroyos del Valle and Mocho (and possibly Las Positas and other waters) will be diverted into the chain of lakes.

- After storage and conveyance via the chain of lakes, water would percolate into the ground through the exposed aquifer at the west face of Lake I.

- Buffer strips, 25' wide interior and exterior access areas, except as shown on the Plan maps, encircle the lakes to minimize pollution potential and maximize security and safety of the area.

- Conduits between lakes will be 30" diameter, with the exception of that between Lake D and Lake E, which will be 42".

- The diversion structure from Arroyo del Valle within Lake A into Lake C will be capable of diverting at least the first 500 cubic feet per second of flow from the Arroyo.

- The diversion structure from Arroyo Mocho into Lake H will be capable of divering at least the first 100 cubic feet per second of flow from the Arroyo.

- The operators will dedicate to Zone 7, at no cost, all lakes comprising the chain of lakes, all exterior perimeter areas, sufficient interior perimeter areas to provide a minimum 25' wide access, and appurtenant levees, conduits, and diversion structures.

3. Specific Plan: Land Areas

Land areas reclaimed upon completion of mining will reflect results of mining operations and construction of the chain of lakes. Land areas will be of four types, distinguishable on the basis of their formation and their physical characteristics, as summarized in Table 4. They are:

- Earth Fill: Overburden is placed in depleted pits creating land areas with a finished surface elevation above anticipated levels of the surrounding water areas. During placement, the overburden is compacted to meet engineering criteria so that few geologic or structural constraints exist upon development of any kind. The Staging Plans (Plates 1 and 2) depict these areas and the Available Land Use, Plate 3, denotes these areas as potentially capable of supporting "Class 1" development, including agriculture, aquaculture, recreation, industrial, commercial, and residential.

- Settling Ponds: Fine silts and clays separated from saleable aggregate by washing gradually settle out of the wash water in settling ponds. The filled ponds, which are principally made up of finer materials, may take many years to consolidate. The resulting land areas are not capable of supporting heavy structures and could be subject to flooding. These areas would be potentially suitable for "Class 3" development, including agriculture, aquaculture, and recreation. Generally, these areas will have final ground surfaces elevations well below natural ground level.

- Capped Settling Ponds: After the waste material in the settling pond has consolidated sufficiently, the resulting land area can be capped with a layer of 5 to 10 feet of overburden material. This capping adds to the structural stability of the soil and may permit use for industrial structures. Each area must be analyzed to determine its suitability for any particular use. These areas have been designated on Plate 3 as potentially suitable for "Class 2" development, including agriculture, aquaculture, recreation, and industry.

- Undisturbed Earth: Significant portions of the Quarry Area are shown as not to be mined. These areas are designated potentially capable of supporting "Class 1A" development, with the same potential uses as "Class 1" development.

The policies contained in these Specific Plan will serve to guide future decisions concerning actual land use modifications. The above categories merely indicate the major physical constraints on land use; many other factors must be taken into account before determining ultimate uses.

4. Specific Plan: Staging

Staging is defined as the sequence of operations involved in mining and reclamation. The mining operation calls for planning a logical sequence of operations to gain maximum efficiency and minimize production costs; reclamation is most efficiently performed concurrently to minimize earthmoving. A reclamation plan, therefore, flows directly from a mining plan. Staging in the Quarry Area has been developed and is presented to provide reference points as to reclamation progress, to permit planning for future land and water capabilities and to ensure the feasibility of carrying out the Specific Plan.

In order to determine the rate of staging progress, an estimate of future aggregate production must be made. It has been assumed that sales will average 6,500,000 tons annually, gradually increasing to 8,500,000 tons over a 20-year period and maintaining that rate until depletion in about the year 2030. This estimate forms the basis for the interim staging plans of 1995 (Plate 1) and 2010 (Plate 2). At the base-line year of 1976, active quarrying took place north and south of, and generally close to, Stanley Boulevard. Mining will generally proceed further away from Stanley Boulevard, while backfilling unused settling pond dry-out, dike and levee construction, and conduit and diversion structure installation, all take place concurrently to reclaim areas according to plan for which mining has been completed. Tables 5, 6, and 7 quantify the acreages of the various land and water types shown in map form on Plates 1, 2, and 3.

Detailed sequencing/staging will be the responsibility of each operator to conform to the plans contained herein.

VI. POLICIES

1. The Alameda County Planning Commission shall be the Lead Agency and coordinator to ensure that the Specific Plan is carried out. Reclamation plans of each operator will be enforced by Building Inspection Department of the Alameda County Public Works Agency, pursuant to the Alameda County Surface Mining Ordinance.

2. Maximum flexibility in reclamation planning is desirable. The Specific Plan way be reviewed as deemed necessary by the Board of Supervisors and Planning Commission, and may be altered pursuant to State Law. Normally, review of the Specific Plan, if required, would be co-ordinated with the scheduled periodic review of individual reclamation plans within limitations of conditions existing at those times. Operators shall pay to the County the actual cost of reviews of the Specific Plan if initiated by the operators.

3. For the purposes of the Specific Plan, reclamation shall be defined as in the Alameda County Surface Mining Ordinance, with the additional requirement that mining impacts on water resources of the Livermore-Amador Valley basin be mitigated.

4. The reclamation plans to be submitted by each operator shall show details of facilities to be built, shall define each component of reclamation and the estimated cost of each reclamation component so that the guarantee required by #5 can be estimated. A staging plan for completing each component and area and detailed sequencing of reclamation shall also be submitted as part of the reclamation plans. Components of reclamation shall be substantially the same for each operator, shall be limited to work that is exclusively related to reclamation, and shall be accounted for by the operators and verified by the County.

5. Each operator shall provide security for the timely performance of reclamation requirements by one of the following methods, as shall be determined by the Planning Commission at the time it acts on individual reclamation plans.

    1. A bond or bonds by one or more duly authorized corporate sureties; or

    2. An escrow account acceptable to the County into which shall be deposited an amount per ton excavated during the period since the last deposit equal to the total estimated cost of the components of the reclamation, plus contingencies, divided by the estimated total saleable tons of aggregates to be mined from the operator's property, and against which the operator shall receive credit for reclamation work completed during such period; or

    3. A combination of the two types of security described above.

    The burden of proof shall be on the individual operator to show that surety other than an escrow account will be sufficient to ensure progressive, complete, reclamation and that reclamation progress can be monitored to ensure the surety would become readily available should reclamation lag unacceptably.

6. Levees and dikes constructed as part of the water management system shall be guaranteed by the constructing operator (s) for 5 years after construction, and maintained in a sound and acceptable condition until dedicated to Zone 7. Water Conveyance structures (conduits, appurtenances, diversion structures, etc.) will be guaranteed for 2 years after construction, and maintained in a sound and acceptable condition until dedication to Zone 7 and further guaranteed for one year after acceptance of dedication by Zone 7 if more than one-half the 2-year guarantee period has expired. All other reclamation features shall be guaranted by the operators for 2 years after completion of the component.

7. Each operator, or its successor, shall explicitly commit itself to reclamation of its own lands to carry out the overall reclamation concept, as may be modified through periodic review.

8. The operators shall pay for their fair share of the following studies or reviews necessary to demonstrate viability of their proposal in an amount to be fixed by the Planning Commission. The "fair share" shall be in proportion to the extent to which the study or review is necessary to address impacts of mining or reclamation in each operator's mining area. Studies or reviews to which this policy shall apply are as follows:

   - A routing study showing how water would be routed through the chain of lakes including interfaces with the groundwater basin and how the system would be operated under a number of hypothetical conditions (wet year, dry year, flood, drought, etc.).

   - A study of hydrology near Stanley Boulevard to demonstrate whether the area is critical for recharge of lower aquifers and to justify placement of inert material in an area shown for water on the approved Q-76 reclamation plan.

   - A study to demonstrate imperviousness and stability of pits and dikes under uplift pressures.

   - Monitoring of water levels and quality necessary to determine the potential effects on mining and water resources.

   - A study to demonstrate viable techniques for re-establishing agriculture on low-lying reclaimed lands.

9. No water rights shall be abridged due to the reclamation concept.

10. A field inspection program shall be developed by the County and the operators, and inspection shall be provided as needed to ensure proper construction techniques in critical phases of reclamation. Operators shall pay the actual cost of such inspections.

11. The operators shall dedicate to Zone 7, upon terms mutually acceptable to the operators and Zone 7, all water areas and necessary supporting land areas to operate the chain of lakes in the public interest. The right of the public to manage and use water resources of the chain of lakes and area groundwater undiminished with respect to quantity and quality shall be expressly asserted and any otheruses permitted in said areas shall be compatible with said right.

12. Water areas may be used by Zone 7 for water conservation, water transmission, groundwater recharge, flood control and water quality management. Water areas may also be used for recreation, fish farming, and other productive uses to the extent such uses would be compatible with the first-named uses.

13. Land areas may appropriately be used for mining, mining-related industry in conjunction with ongoing mining, agriculture, open space, and watershed uses. New or expanded uses in the Quarry Area shall be allowed only upon securing Zoning Approval to ensure compatibility with the Specific Plan and reclamation of the area. Reclaimed land should be capable of supporting beneficial uses. No uses shall be permitted which may unacceptably pollute the lakes.

14. Land areas necessary to support or protect water uses shall be shown in detail on reclamation plans of each operator. Minimum 25 foot widths shall be shown around all lakes with larger areas as may be needed for support facilities around critical areas such as conduits. Minimum 50 foot setbacks shall be shown from all existing public streets.

15. If El Charro Road becomes a public street, its alignment shall be coordinated with the appropriate public agencies.

16. Any expansion of Shadow Cliffs Regional Park shall be coordinated with East Bay Regional Park District.

17. Final side slopes of pits shall be governed by provisions of the Alameda County Surface Mining Ordinance.

18. The reclamation plans to be submitted by each operator shall indicate how drainage is to be provided for all land areas which will not pollute the lakes.

19. The reclamation plans to be submitted by each operator shall include provisions to retain on site all overburden and soils necessary to complete said plans. Contracts to supply overburden shall be honored only if signed prior to September 21, 1981.

20. Approval of this Specific Plan implies no commitment by the County to approval of surface mining permits for those portions of the quarry area not under permit.

21. In the event that the individual operator's ability to comply with its obligations under this Specific Plan, as it may be modified as provided herein, is demonstrably prevented or substantially impaired by any governmental action or inaction which prohibits or materially restricts the operator's conduct of its mining operation, or by any other cause or occurrence reasonably beyond the operator's control, including acts of God, the operator and the County shall negotiate in good faith to reach agreement on a revised reclamation plan within the general framework of the County's reclamation expectations and the operator's economic expectations under the Specific Plan and individual reclamation plan as such expectations existed prior to the occurrence of such event.

VII. IMPLEMENTATION

1. Reclamation Plans

Pursuant to the requirements of the State Surface Mining and Reclamation Act of 1975, and the Alameda County Surface Mining Act, each operator must submit a reclamation plan for all mining conducted after January 1, 1976. The three operators in the Quarry Area will be submitting their detailed reclamation plans, to conform to this Specific Plan, as soon as possible after this Specific Plan is adopted. Once approved, the reclamation plans of each operator will be enforced by the County of Alameda Building Official, to ensure that reclamation is being completed according to the staging plans and timetables and appropriate specifications. The Building Official has the power to issue a stop work order if compliance with reclamation plans is not achieved. Chronic failure to carry out reclamation plans can, under the ACSMO, be cause for revocation of surface mining permits.

Each reclamation plan will include a requirement that reclamation be guaranteed by each operator. The Planning Commission will determine the most satisfactory type of guarantee at the time it acts upon each reclamation plan.

2. Specific Plan

Under State law, a Specific Plan sets land uses in a precise manner. Zoning must conform to the Specific Plan. Non-compliance with the maps and other information in this Specific Plan which serves to specify reclamation requirements is treated the same way as non-compliance with the General Plan or zoning. The County has the ability to seek judicial remedy and force compliance. If problems develop, either with the Plan as adopted or due to unforeseen circumstances, the Plan can be modified to ensure continuation of coordinated reclamation efforts in the Quarry Area. At such times, the operators' individual reclamation plans would be modified accordingly. Authority exists under State law to adopt new ordinances as may be necessary to ensure implentation of a Specific Plan.

3. Contracts

The operators are entering into contracts with Zone 7 of Alameda County Flood Control and Water Conservation District under which the operators agree to cause effectuation of the water management aspect of the plan, binding upon their properties and operations. As a contract, all remedies at law pertinent to breaches of contract are available to Zone 7. Included in the contract terms is an agreement that, over and above such normal remedies, specific performance is necessary to furnish adequate remedy of any breach.

The contracts specify facilities which each operator will construct and dedicate to Zone 7 in terms of location, size, and capabilities. Preparation and design of plans and specifications will be done in consultation with, and approved by Zone 7. Inspection of construction will be carried out by Zone 7. Levees and dikes will be guaranteed for 5 years and water conveyance structures (conduits, appurtenances, diversion structures, etc.) for 2 years after construction, and maintained in a sound and acceptable condition until dedication to Zone 7. For the water conveyance structures, the operators will further quarantee the integrity of the structures for one year after acceptance of dedication by Zone 7 if more than 1/2 of the 2-year guarantee period has expired. As an option to the operators constructing and guaranting such facilities, they may enter into a contract with Zone 7 whereby they deposit sufficient funds to cover the estimated costs of construction of the required facilities.

The operators will cooperate with Zone 7 in a monitoring program to determine effects of mining on quality and quantity of groundwaters and vice versa. Terms of the contracts are binding upon Zone 7 and all successors of the present operators in the Quarry Area.

4. Reviews

Under policies of this Specific Plan, periodic reviews may be made by the Planning Commission and Board of Supervisors when they deem it necessary. Under the Alameda County Surface Mining Ordinance, review of each operator's reclamation plan is required at 5-year minimum intervals. The purpose of such reviews is to provide for changes in the reclamation plans in response to changed conditions or unforeseen circumstances. Under a review,

plans could be changed to guarantee the integrity of the water resources and land areas if present concepts prove infeasible or inadequate. In addition, reclamation costs will be refined and updated and the guarantees revised accordingly.

5. Responsibilities

Under this Specific Plan, responsibilities are clearly defined within the existing framework of law, public agencies, and procedures. In summary:

- The Alameda County Planning Commission is the Lead Agency and coordinator to ensure the Specific Plan is carried out. The Planning Commission is also the action agency for surface mining permits and reclamation plans as well as most land/water use issues.

- The Building Official is the enforcement agency that ensures compliance with reclamation plans, and is also responsible for inspection of mining and reclamation and issuance of annual progress reports on same.

- Zone 7 of Alameda County Flood Control and Water Conservation District is responsible for ensuring that water resources of the Livermore-Amador Valley are not adversely affected by mining. Zone 7 is also responsible for inspection of water management facilities constructed by the operators. Zone 7 will accept the water management facilities and operate them when ready.

- Each mining operator in the Quarry Area is responsible for ensuring that its own operations do not adversely affect water resources and that land and water areas are reclaimed as quickly as possible to a usable condition which is readily adaptable for alternate uses, and no danger to public health or safety is created. Each operator is responsible for explicit commitment to reclamation of its own lands as necessary to carry out the overall reclamation concept, for guarantees that reclamation as detailed in individual plans will occur, and for individual warrantees for reclamation. Essential components of the overall reclamation concept transcending individual plans shall be identified and each operator shall participate in completion of these elements of reclamation in an equitable manner as may be determined by the operators, Zone 7 and the County of Alameda. Each operator is responsible for bearing the public cost of inspection and review of its own reclamation. Each operator is responsible for dedication of its water management facilities to Zone 7.

TABLE 1

COMPARISON OF LAND AND WATER AREAS

2030 LAND USE ACREAGES

Category	
Undisturbed Land	930 acres
Regenerated Land	1480
Water Area	1410 **
Total	3820 acres

*See Table 7, p. 40, 1977 Reclamation Plan

**Includes chain of lakes plus Lakes J and K

TABLE 2

2030 WATER AREAS AND VOLUMES

(Approximate)*

LAKE	ELEVATION (feet)	AREA (acres)	ACTIVE VOLUME (ac. ft.)	DEAD VOLUME (ac. ft.)	TOTAL VOLUME (ac. ft.)
A	385	165	7.900	----	7.900
B	360	147		2,000	2,000
C	380	156	6,820	1,980	8,800
D	380	261	15,520	8,330	23.850
E	360	71	1,908	62	1,970
F	350	56	2,450	----	2,450
G	340	59	3,870	----	3,870
H	330	100	6,820	----	6,820
I	320	326	26,480	----	26,480
CHAIN OF LAKES		1,341	71,768	12,372	84,140
J**	330	90		4,400	4,400
K**	360	44		1,600	1,600
TOTAL		1,475	71,768	18,372	90,140

*NOTE: Lakes A and B are now proposed to be connected by a conduit, therefore, Lake B Storage will be mostly Active Volume. Other figures are subject to change.

**NOTE: Excavation of areas specified as Lakes J and K is optional.

TABLE 3

ESTIMATED VOLUME OF CAPTURABLE UNREGULATED FLOW IN ARROYO MOCHO AND CAPTURABLE REGULATED FLOOD CONTROL RELEASES FROM LAKE DEL VALLE INTO ARROYO DEL VALLE AT VICINITY OF SAND AND GRAVEL MINING AREA

A. Capturable unregulated flow in Arroyo Mocho in Livermore based on 22-year USGS record from 1913 to 1930 and 1965 to 1968.

Diversion Rate cubic feet per second (cfs)	Average Annual Volume Diverted acre-feet (AF)
10	1000
50	1800
100	2100
200	2500

B. Capturable regulated flood control releases from Lake Del Valle into Arroyo Del Valle based on USGS records from 1969 through 1980.

Diversion Rate cubic feet per second (cfs)	Average Annual Volume Diverted acre-feet (AF)
200	2800
500	4900
1000	6200

TABLE 4

LAND CATEGORIES, DEVELOPMENT CLASSES AND POTENTIAL USE

CATEGORY	FILL MATERIAL	IDENTIFICATION	POTENTIAL USES
Undisturbed	Native earth in place	Development Class 1A	Agriculture* Recreation Industrial Commercial Residential
Earth Fill	Overburden or interbedded clay	Development Class 1	Agriculture* Recreation Industrial Commercial Residential
Capped Settling Pond	Fine silts and clays capped with overburden and clay	Development Class 2	Agriculture* Recreation Industrial
Settling Pond	Fine silts and clays (washout)	Development Class 3	Agriculture* Recreation
Earth Fill (low elevation)	Overburden or interbedded clay	Development Class 3A	Agriculture* Recreation

*Including aquaculture

TABLE 5

1995 LAND USE ACREAGES

CATEGORY		USES	OUTSIDE QUARRY AREA	INSIDE QUARRY AREA	TOTAL ACRES
Undisturbed Land		Development Class 1A	5	2,220	2,225
Regenerated Land	Earth Fill	Development Class 1	265	218	1,058
	Capped Settling Pond	Development Class 2		128	
	Settling Pond			447	
Working Pit		Mining		162	162
Water		Recreation	90		335
		Process Water		215	
		Other Water		30	
		TOTAL ACRES	360	3,820	4,180

TABLE 6
2010 LAND USE ACREAGES

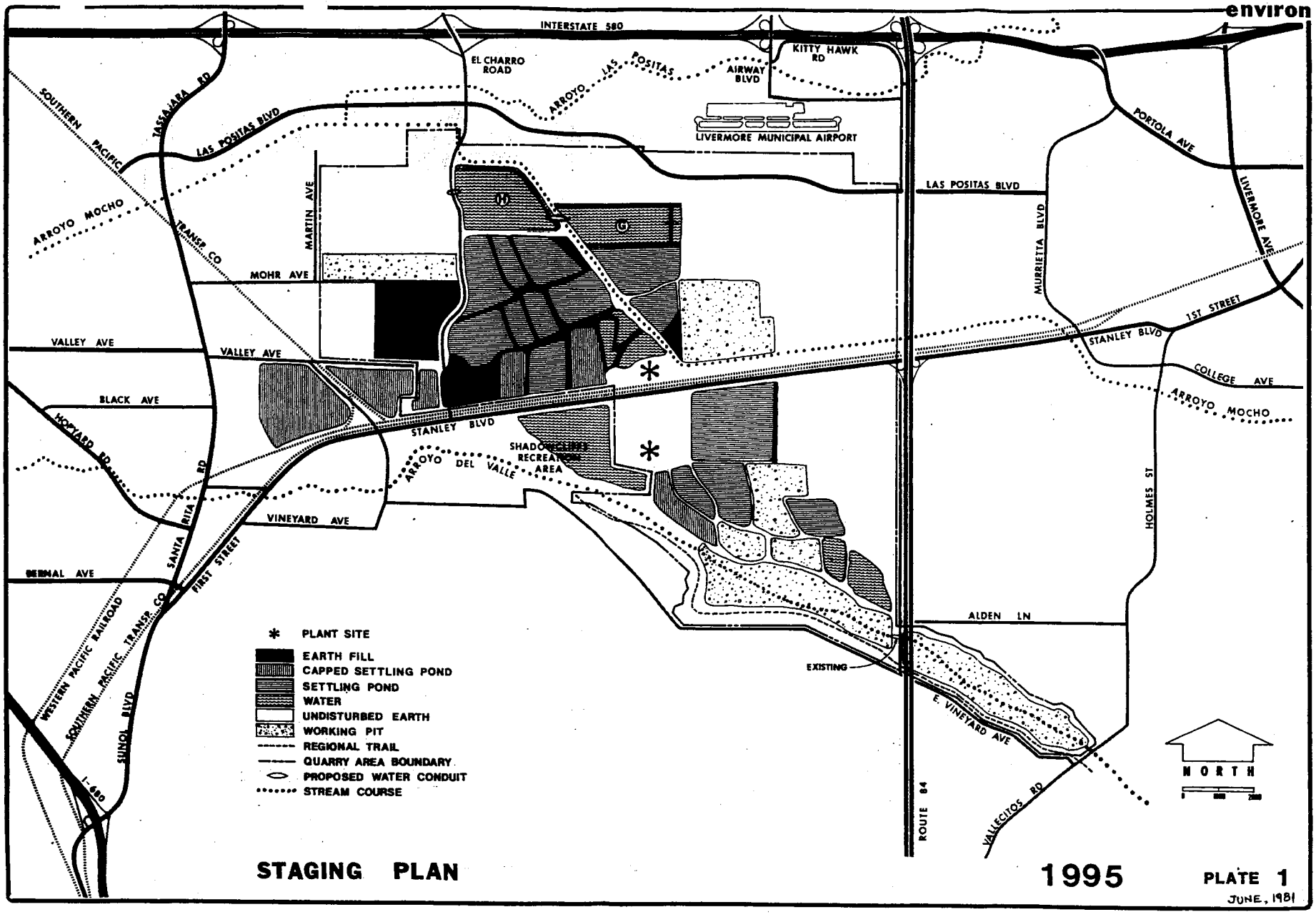
CATEGORY		USES	OUTSIDE QUARRY AREA	INSIDE QUARRY AREA	TOTAL ACRES
Undisturbed Land		Development Class 1A	5	1,697	1,782
Regenerated Land	Earth Fill	Development Class 1	265	236	1,337
	Capped Settling Pond	Development Class 2		204	
	Settling Pond	Development Class 3		632	
Working Pit		Mining		462	462
Water		Recreation	90		679
		Water Management		414	
		Process Water		145	
		Other Water		30	
		TOTAL ACRES	360	3,820	4,180

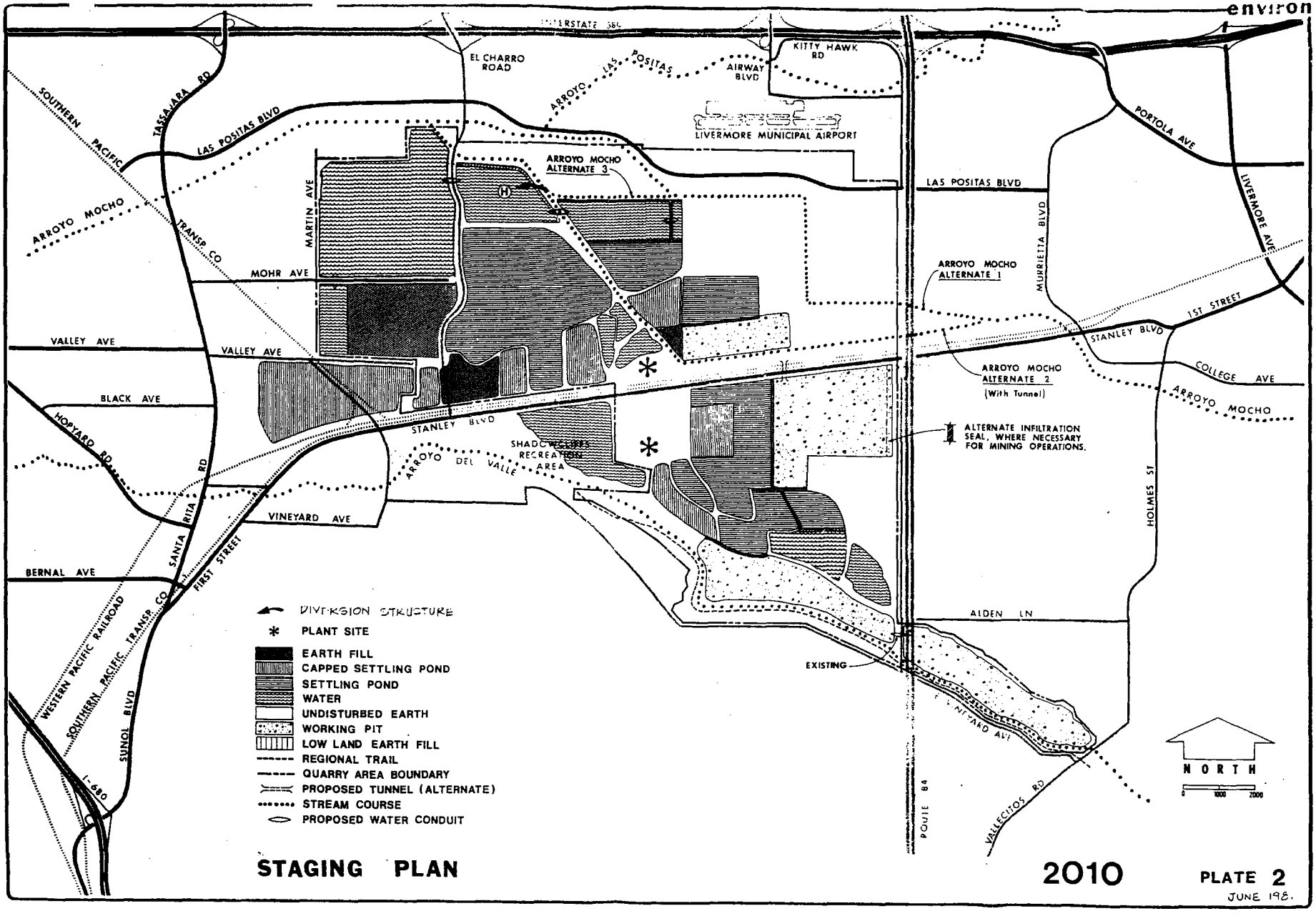
TABLE 7A

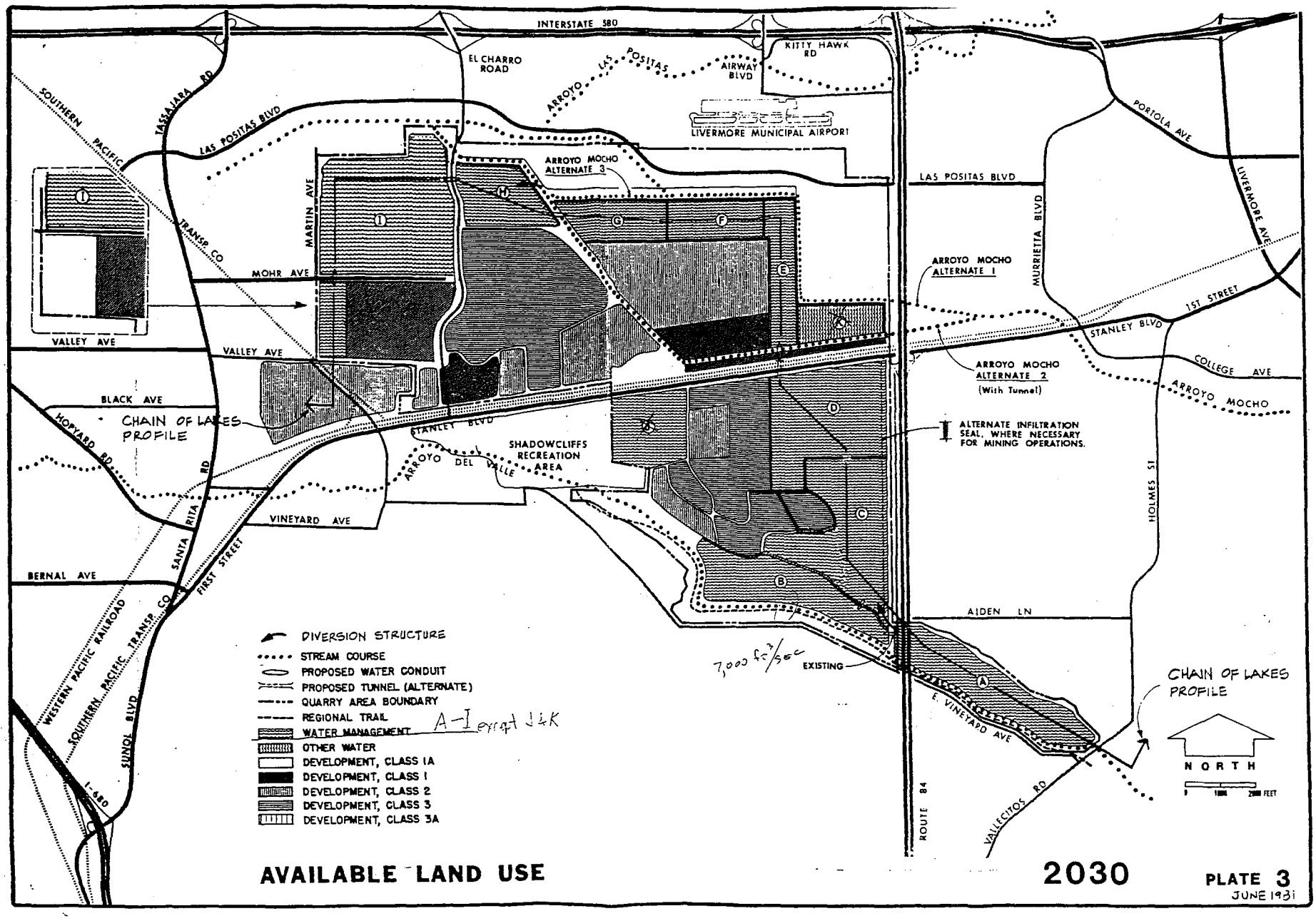
2030 LAND USE ACREAGES - PLAN C

CATEGORY		USES	OUTSIDE QUARRY AREA	INSIDE QUARRY AREA	TOTAL ACRES
Undisturbed Land		Development Class 1A	5	930	935
Regenerated Land	Earth Fill	Development Class 1	265	437	1,745
	Capped Settling Pond	Development Class 2		470	
	Settling Pond	Development Class 3		573	
Water		Recreation	90	90	1,500
		Water Management		1,276	
		Other Water		44*	
		TOTAL ACRES	360	3,820	4,180

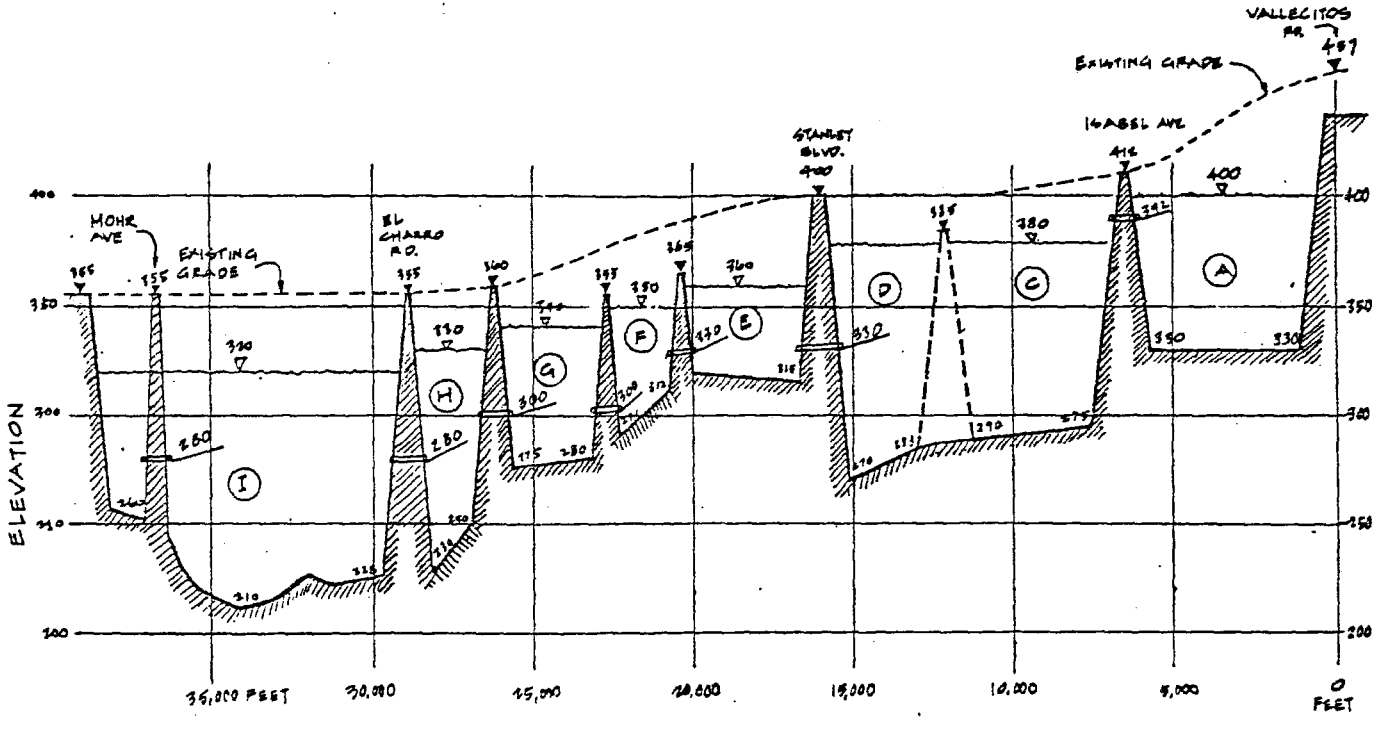
*Lake K - Dry pit except when used for holding pond for polluted or silt-laden waters.


environ
INTERSTATE 580
EL CHARRO ROAD
KITTY HAWK RD
AIRWAY BLVD
ARROYO LAS POSITAS
LIVERMORE MUNICIPAL AIRPORT
PORTOLA AVE
LIVERMORE AVE
LAS POSITAS BLVD
MURRIETTA BLVD
1ST STREET
STANLEY BLVD
COLLEGE AVE
ARROYO MOCHO
SOUTHERN PACIFIC TRANSP CO
TASSAJARA RD
LAS POSITAS BLVD
ARROYO MOCHO
MARTIN AVE
MOHR AVE
VALLEY AVE
VALLEY AVE
BLACK AVE
HOPYARD RD
SANTA RITA RD
VINEYARD AVE
BERNAL AVE
FIRST STREET
SUNOL BLVD
I-680
WESTERN PACIFIC RAILROAD
SOUTHERN PACIFIC TRANSP CO
ARROYO DEL VALLE
SHADOW CLIFFS RECREATION AREA
HOLMES ST
ALDEN LN
EXISTING
E. VINEYARD AVE
ROUTE 84
VALLECITOS RD
NORTH
PLANT SITE
EARTH FILL
CAPPED SETTLING POND
SETTLING POND
WATER
UNDISTURBED EARTH
WORKING PIT
REGIONAL TRAIL
QUARRY AREA BOUNDARY
PROPOSED WATER CONDUIT
STREAM COURSE
STAGING PLAN
1995
PLATE 1
JUNE, 1981


environ
INTERSTATE 580
EL CHARRO ROAD
KITTY HAWK RD
AIRWAY BLVD
ARROYO LAS POSITAS
LIVERMORE MUNICIPAL AIRPORT
PORTOLA AVE
LIVERMORE AVE
SOUTHERN PACIFIC
TASSAJARA RD
LAS POSITAS BLVD
ARROYO MOCHO
TRANSP CO
MARTIN AVE
ARROYO MOCHO ALTERNATE 3
MOHR AVE
MURRIETTA BLVD
ARROYO MOCHO ALTERNATE 1
1ST STREET
STANLEY BLVD
VALLEY AVE
VALLEY AVE
BLACK AVE
ARROYO MOCHO ALTERNATE 2 (With Tunnel)
COLLEGE AVE
ARROYO MOCHO
HOPYARD RD
STANLEY BLVD
ALTERNATE INFILTRATION SEAL, WHERE NECESSARY FOR MINING OPERATIONS.
SHADOW CLIFFS RECREATION AREA
ARROYO DEL VALLE
SANTA RITA RD
VINEYARD AVE
HOLMES ST
FIRST STREET
BERNAL AVE
DIVERSION STRUCTURE
PLANT SITE
EARTH FILL
CAPPED SETTLING POND
SETTLING POND
WATER
UNDISTURBED EARTH
WORKING PIT
LOW LAND EARTH FILL
REGIONAL TRAIL
QUARRY AREA BOUNDARY
PROPOSED TUNNEL (ALTERNATE)
STREAM COURSE
PROPOSED WATER CONDUIT
ALDEN LN
EXISTING
VINEYARD AVE
WESTERN PACIFIC RAILROAD
SOUTHERN PACIFIC TRANSP. CO
SUNOL BLVD
I-680
POUTE 84
VALLECITOS RD
NORTH
0
1000
2000
STAGING PLAN
2010
PLATE 2
JUNE 198.


INTERSTATE 580
EL CHARRO ROAD
ARROYO LAS POSITAS
AIRWAY BLVD
KITTY HAWK RD
LIVERMORE MUNICIPAL AIRPORT
SOUTHERN PACIFIC
TASSAJARA RD
LAS POSITAS BLVD
ARROYO MOCHO ALTERNATE 3
PORTOLA AVE
LIVERMORE AVE
MARTIN AVE
MOHR AVE
TRANSP CO
VALLEY AVE
ARROYO MOCHO ALTERNATE 1
MURRIETTA BLVD
1ST STREET
STANLEY BLVD
COLLEGE AVE
ARROYO MOCHO ALTERNATE 2
(With Tunnel)
ARROYO MOCHO
BLACK AVE
CHAIN OF LAKES PROFILE
HOPYARD RD
SHADOWCLIFFS RECREATION AREA
ARROYO DEL VALLE
ALTERNATE INFILTRATION SEAL, WHERE NECESSARY FOR MINING OPERATIONS.
HOLMES ST
VINEYARD AVE
SANTA RITA RD
FIRST STREET
BERNAL AVE
WESTERN PACIFIC RAILROAD
SOUTHERN PACIFIC TRANSP CO
SUNOL BLVD
I-680
AIDEN LN
7,000 ft³/sec
EXISTING
E. VINEYARD AVE
ROUTE 84
VALLECITOS RD
CHAIN OF LAKES PROFILE
NORTH
0 1000 2000 FEET
DIVERSION STRUCTURE
STREAM COURSE
PROPOSED WATER CONDUIT
PROPOSED TUNNEL (ALTERNATE)
QUARRY AREA BOUNDARY
REGIONAL TRAIL
WATER MANAGEMENT
OTHER WATER
DEVELOPMENT, CLASS 1A
DEVELOPMENT, CLASS 1
DEVELOPMENT, CLASS 2
DEVELOPMENT, CLASS 3
DEVELOPMENT, CLASS 3A
A-1 errata 14K
AVAILABLE LAND USE
2030
PLATE 3
JUNE 1981

PROPOSED FLOW LINE ELEVATIONS FOR WATER MANAGEMENT CONDUITS



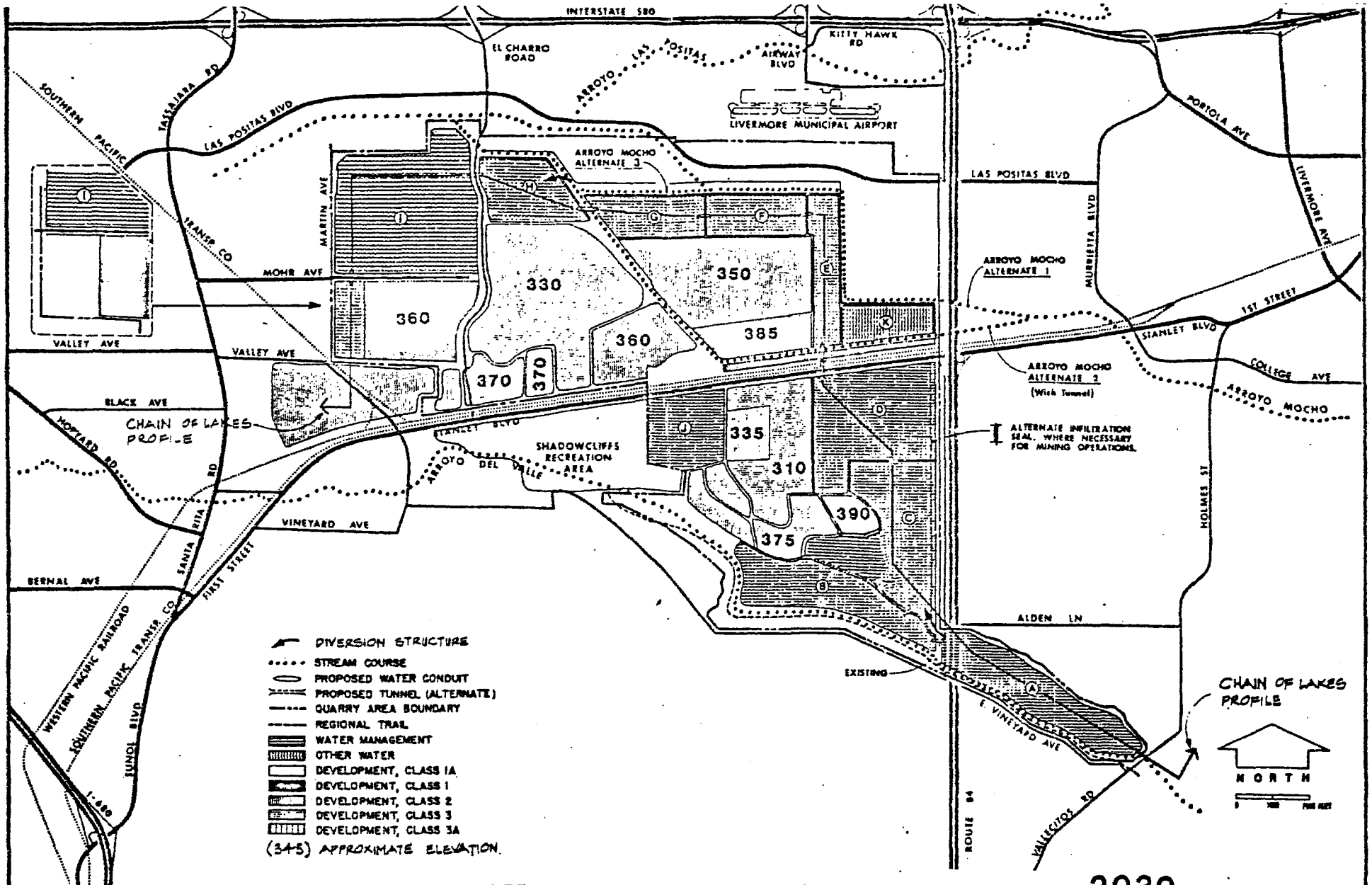
▽ = MAXIMUM WATER SURFACE LEVEL

CHAIN OF LAKES PROFILE

SEE 2030 PLAN FOR LOCATION OF PROFILE

HORIZ = 1" = 4000'
VERT = 1" = 60'

PLATE 4
AUG. 1981



AVAILABLE LAND USE, APPROXIMATE MAXIMUM LAND SURFACE ELEVATIONS

2030

PLATE 5

AUG. 1981

APPENDIX B

Preliminary Lake Use Evaluation Planning Timeline

- A list of potential uses and a proposed lake use evaluation methodology were presented to the Zone 7 Water Resources Committee (WRC) in February, March, and September 2013 and the Zone 7 Board in April and June 2013.
- Zone 7 also met with retailer staff in April 2013 and the Liaison Committee in May 2013 to provide an overview of the COLs planning process and solicit feedback.
- In response to comments received at the various meetings, staff refined the list of potential uses and the criteria of evaluation.
- In September and October 2013, preliminary findings were presented to the Water Resources Committee and the Zone 7 Board, respectively. The evaluation was further refined based on comments from the WRC and the Zone 7 Board, retailers, and various sections at Zone 7.
- The draft final report was presented to the WRC in January 2014. The WRC recommended that this item be presented to the full Board at the February 2014 Board Meeting for (1) acceptance of the draft final report, and (2) to adopt near-term recommendations for Lakes I, H, and Cope.
- The draft final report was presented to the full Board at the February 2014 Board Meeting where (1) the draft final report was accepted, and (2) near-term recommendations for Lakes I, H, and Cope were adopted (Resolution No. 14-4347).

APPENDIX C

Informational Memorandum: Historical Narrative of Livermore-Amador Valley Mining and the Chain of Lakes (2011)

Informational Memorandum ITEM NO. 7

Presented to the Administrative Committee

Date: March 31, 2011

To: Jill Duerig, General Manager

From: Mun J. Mar, Consultant

Subject: Historical Narrative of Livermore-Amador Valley Mining and the Chain of Lakes

INTRODUCTION:

The Chain of Lakes Project has been officially under construction since 1981 when the Board of Supervisors of Alameda County adopted the "Specific Plan for Livermore-Amador Valley Quarry Area Reclamation" on November 5, 1981. This Project is being built by the mining of sand and gravel in the Livermore-Amador Valley. The original 3 companies involved in this endeavor were Kaiser Sand and Gravel, Lonestar and Pleasanton Gravel Company. There was actually a 4th company, Cal Rock, which Pleasanton Gravel acquired.

At the time of its inception, it was estimated that the Chain of Lakes would be completed around the year 2030. The final completion date would, of course, depend on the Bay Area demand for sand and gravel. The 2030 completion date was based on the pre-1980 total annual production of 4-6 million tons of sand and gravel. The larger producer was Kaiser Sand and Gravel, followed by Pleasanton Gravel Company and Lonestar. Total production capacity of the 3 active sand and gravel producers was 8 million tons per year.

The mining area is located in the center of the Valley, bound by the City of Livermore to the east, the City of Pleasanton to the west, Interstate 580 to the north and Vineyard Avenue to the south. The sand and gravel removed or extracted from this mining area are processed and used for construction purposes throughout the San Francisco Bay Area. The removed sand and gravel were also the media that stored/held water in the ground from which water can be pumped and put to beneficial uses. Such uses include municipal, industrial and agricultural.

To mine the sand and gravel, pits would be opened by the removal of overburden material. The overburden material would be used to fill exhausted pits and the reclaimed lands would become available for many land uses. However, these reclaimed areas became underground blockades to any subsurface flow of groundwater.

Prior to the importation of supplemental water supply into the Valley in the 1960's via the South Bay Aqueduct of the California State Water Project, pumped groundwater met all water supply needs of the Valley. As more and more groundwater was pumped for beneficial uses, it became more and more apparent that the groundwater basin was going into overdraft, which was the reason Zone 7 contracted with the State of California for water entitlements from the State Water Project in 1962. It also became more apparent that surface mining of sand and gravel was altering the groundwater resource in a very adverse way, not only with the removal of the water storage media but also the groundwater that entered into the mining area. The entering water had to be removed from the mining pits to facilitate the harvesting operation. The dewatering operation resulted in discharging the water to waste when it

exceeded the amounts needed for processing the mined materials. Additionally, evaporative losses were identified as the ultimate negative result with the exposure of the groundwater basin to the atmosphere. Actually overdraft was helpful for the Quarry Operators as they had less water problems. In its goal to replenish a depleting groundwater resource Zone 7's water operations induced a greater water management problem for the mining operations.

The issue that emerged was whether sand and gravel production should cease to avoid the massive alteration to the groundwater basin or whether there was accommodation for both the mining of sand and gravel, a needed resource, and the managing of the groundwater basin. Consultations with quarry operators' representatives and various staff members of the Alameda County Planning Department, which had land use authority over the unincorporated mining area, eventually brought forth the aforesaid "Specific Plan for Livermore-Amador Valley Quarry Area Reclamation." The Specific Plan required that contractual agreements be made between each Quarry Operator and Zone 7 for the future operation of the Chain of Lakes for water management purposes as a mitigation measure to offset the mining impacts on the groundwater basin. The extensive negotiating sessions between Zone 7 and each of the three quarry operators produced executed agreements in the late 1980's for the transfer of the ownership of the completed components of the Chain of Lakes to Zone 7 for its use.

THE DEVELOPMENT OF THE PLAN FOR THE CHAIN OF LAKES AS A WATER MANAGEMENT FACILITY:

In the early 1970's, Kaiser Sand and Gravel had proposed landfill in the exhausted sand and gravel pits after the material was mined to handle the garbage that would be generated in the Bay Area for years to come. Simply speaking, it was sand and gravel out, garbage in. They started to go through the permit process in 1970-71. The Zone was opposed to such a proposal. The propriety of placing all the potential Bay Area garbage in the center of Valley's valuable ground water resource was unacceptable to the Zone, especially when less impacting alternative sites were available. Disapproval of it was the Zone's position. The Zone's objection was not sustained at any level of the approval process including the San Francisco Bay Regional Water Quality Control Board. They expected the concerns could and would be mitigated with proper containment and monitoring. The Zone appealed the Regional Board's approval before the State Water Resources Control Board claiming that the Regional Board's decision was improper and inappropriate in light of the potential irreparable harm that such a project could have on the valuable and irreplaceable groundwater resource in Livermore Valley. Simply put, the Zone asked, "Why take a chance when there were other alternatives with much less potential risk?" The State Board sided with the Zone. Kaiser filed suit.

By the time the court rendered a favorable decision for Kaiser, the three quarry operators had already embarked on a more coordinated reclamation plan for the entire mining area. A proposed Chain of Lakes through the mining area after all the sand and gravel were removed was presented in January 1977. Environ, the consulting firm comprising the engineering firm of Bissell and Karn and others, developed and submitted the proposed plan on behalf of the 3 mining companies, namely Kaiser, Lonestar and Rhodes and Jamieson (also known as Pleasanton Gravel Co.). They fully understood that subsurface groundwater movement was impeded during and after the sand and gravel material was removed thus exposing the groundwater to evaporative losses. In other words, it was recognized that the quantity and quality ground water as well as the storage basin during and after the 50-year mining period would be substantially altered and suitable remedies were needed. And therefore, a plan was essential to coordinate the 3 separate mining programs so that the finish product would be a Chain of Lakes, fully capable of storing and transporting water by gravity. There would then be a surface system to replace the subsurface one. Water can thereby reach the western portion of the ground water basin from which the Zone and the City of Pleasanton pump. It was advanced as an offset to the adverse effects of mining and a future facility for Zone 7 to store and transport water.

After the County Planning Department issued the draft environmental impact report and received public comments, an alternative reclamation plan, a supplement to the original 1977 plan, was presented in April 1980. It effectively reduced the amount of water surface from 2,160 acres to around 1,200 acres thus reducing the potential annual evaporation significantly. There was a corresponding increase in the amount of usable land area although certain of the reclaimed land would be lower in elevation, thus placing some limitations on its ultimate land use.

Meet and confer sessions jointly and at times singly with representatives of the 3 sand and gravel producers took many years to come to a mutual consensus of the major issues and then to develop acceptable contract terms and conditions. This effort can be classified as being the utmost of importance but there was no real urgency since building out the Chain of Lakes would take so many years compared to the less important but urgent matter of everyday activities for both the Quarry Operators and the Zone. This lag in negotiations wasn't an issue since forward progress, however slow, was being made.

In a nutshell, these were the agreed long-term impacts of mining on the groundwater resource:

1. Groundwater storage media was removed,

2. Exposed groundwater was lost through evaporation and,

3. Adjacent groundwater storage capacity was reduced due to inflow into the mined pits and evaporative losses.

And this was the agreed mitigation of those impacts:

> Mining would include the construction of a Chain of Lakes, which would be given to Zone 7. The Zone would then have a storage and conveyance facility to divert and store excess runoff during wet periods to replace the annual evaporative losses and maintain levels in the Chain of Lakes so that the storage capability in the groundwater basin outside the mined area could be more fully utilized. It is a huge tradeoff but a beneficial one for both Zone 7 and the Quarry Operators. For the Zone, it would come into possession of a storage and conveyance system that is comparable in size (in fact larger) and function as Lake Del Valle. For the Operators, mitigation of the adverse effects of mining would be transferred to Zone 7 and the Quarry Operators would be done.

However, there was the immediate matter of inflow into the mining pits from adjacent groundwater. The Zone had embarked on a groundwater recharge program when SBA water became available in 1962 to overcome the existing overdraft. Groundwater levels were on the rise. This induced more groundwater inflow into the mining pits thus elevating the amount of dewatering necessary to mine the sand and gravel. To solve this problem the Operators and the Zone agreed to the following 3 objectives to be accomplished during the mining period:

1. Preserve Zone 7's ability to maintain water quality and quantity within the groundwater basin of the Valley from which water is and will be withdrawn for municipal and other beneficial uses.

2. Provide manageable groundwater levels within the mining area in the Valley that will permit reasonable economic mining of sand and gravel from owned or leased reserves without major alteration to the current mining methods.

3. Provide a water management tool through the creation of a Chain of Lakes, as set forth in the aforesaid Specific Plan for Livermore-Amador Valley Quarry Area.

NEGOTIATED AGREEMENTS:

Kaiser Sand and Gravel was the first to have an executed agreement with Zone 7 followed by RMC Lonestar (the successor company of Lonestar) and then lastly, by Pleasanton Gravel Co.

The terms and conditions of each contract were generally the same; however, the methods to handle dewatering and payments for "water loss to the Valley" during the mining period were different. A summary of a few examples of parts of the agreements follows:

Quarry Operator	**Date of Agreement**	**Zone 7 Board Resolution**	**Period of Expected Completion**
Kaiser Sand and Gravel	1/21/87	1233	2000-2010
RMC Lonestar	3/29/88	1292	2010-2020
Pleasanton Gravel Company	4/20/88	1293	2020-2030

The payment and property transfer features of the Kaiser Agreement are:

1. Zone 7 to be paid 1.5 cents/ton of sand and gravel sold on an annual basis. (Zone 7 to use such funds for future purchase of water.)

2. Kaiser was not limited to the amount of discharged water leaving the Valley. (Measures were to be taken to eliminate or reduce the outflow volume.)

3. Kaiser to grant Zone 7 Lake I of the Chain of Lakes and certain adjacent areas, particularly the "buffer zone", which is the area between the western edge of Lake I and Martin Avenue.

4. Kaiser to grant Zone 7 their de-silting pond (Cope Lake), which is approximately 250 acres, for flood control and water management purposes.

As for Lonestar, the payment and property transfer features are:

1. Lonestar to pay for any discharged water leaving the Valley. The basis of payment is 110% of the unit prevailing Variable OMP&R cost component of the State DWR charges times the volume of discharged water.

2. Lonestar to grant Zone 7 all of Lakes A and B and certain adjacent areas.

Similarly, Pleasanton Gravel Company (PGC) features include:

1. Zone 7 to be paid 1.5 cents/ton of sand and gravel sold. Such payments would be terminated when the cumulative total payments equaled Kaiser's total payments (at the completion of Kaiser's operations, which has occurred as of this writing.) It was payment for water leaving the Valley as a result of PGC's operations.

2. PGC's discharged water leaving the Valley may not exceed Kaiser's cumulative total without payment to Zone 7. Discharged water leaving the Valley in excess of that limit and any excess occurring subsequent to Kaiser's mining period will be paid for at 110% of the Zone's Prevailing Unit Variable OPM&R cost component times the volume. (Same as Lonestar's with Zone 7 determining the amount and billing on a monthly basis.)

3. PGC to grant Zone 7 Lakes C, D, E, F, G and H. Lake H to be granted upon Kaiser's completion of mining and grant of Lake I to Zone 7 by Kaiser.

4. PGC to grant Zone 7 a de-silting pond near Lakes E, F, and G in the event it meets certain conditions.

The different payment methods as summarized above show how each Operator opted to compensate Zone 7 for water that Zone 7 had recharged into the groundwater basin. This is groundwater removed by the Operator and discharged to waste into the arroyos. The agreed net cost to Zone 7 for the water was the Variable OMP&R cost component of the annual water bill from the State. Lonestar elected to reimburse the Zone for any water discharged and wasted from the Valley on the basis of the Variable OMP&R with a 10% add-on for administrative cost. Kaiser wanted to pay for their discharged water on the basis of a tonnage fee on sand and gravel mined and sold. This issue took some time to resolve and eventually was done when the grant of Cope Lake to Zone 7 was included. PGC opted for a combination.

By no means should the above be construed as all of the main points of each agreement. What is expressed above is merely to show that each operator had its own way of dealing with certain issues and that their individual solutions are in fact different. The agreements in themselves are the proper and legal working document and should be understood in its entirety and total context.

The table of contents in the PGC Agreement includes:

Definitions and Recitals
Objectives
Improvement Obligations of PGC
Plans and Specifications
PGC to Maintain Lakes and Levees
Grants and Reservations
Monitoring
Control of Groundwater Levels
Payments by PGC
Successor; Recording
Indemnity
Insurance
No Bonding
Specific Performance
Changes in Specific Plan
Force Majeure
Miscellaneous

The other two agreements contain the same and/or similar content headings and it is well for each and every succeeding Zone 7 contract administrator to become completely familiar with the differences and sameness in each agreement. For example, only as to the Kaiser Agreement is there a side letter dated January 15, 1987 from the Zone to Kaiser regarding certain clarifications. Conversely, one same condition in each Agreement is the required execution and recordation of a Memorandum of Agreement. That was to insure that any successors and assigns, prior to change of title would be on notice that there are encumbrances on each of the properties identified by Alameda County Assessor's Parcel numbers.

The Kaiser memorandum was recorded on Nov 1, 1988, Series No. 88-278584.

The Lonestar memorandum was recorded on June 15, 1989, Series No. 89-161287.

The PGC memorandum was recorded on March 24, 1989, Series No. 89-081504.

IMPLEMENTATION OF AGREEMENT:

While finalizing the agreements came to an end, it was also a start of a new beginning for the Zone and the three Quarry Operators. Instead of being adversaries, the agreements made the Zone and each quarry operator partners in a long-term endeavor to see to it that the Chain of Lakes is completed and operational. At that point in time, the Zone will have in its possession a huge physical facility to help it to manage and develop additional water resources for the benefit of the Livermore-Amador Valley.

At various stages of the construction of the Chain of Lakes, The Zone would need to prepare operational plans for the various segments of the Chain of Lakes as these segments become available. Other than the initial need to deal with quantities of discharged water and payments as required by the agreements, little effort was required in long range planning as to the progressive utilization of the Chain of Lakes. That began to change in the late 1990's when consensus and cooperative effort was needed for a sand and gravel conveyance tunnel under Stanley Blvd. and the railroad tracks. The tunnel would potentially become the conduit or be the liner for a smaller conduit to convey water from Lake D to Lake F. Additionally, Kaiser's operations were nearing completion with Zone 7 soon to become owner of Lake I and possibly Lake H in addition to the Cope Lake de-silting pond of nearly 250 acres in size.

Attached, as Exhibit A, is a schematic of the proposed Chain of Lakes in its final completed form. On August 24, 2000, a meeting was held among Zone 7 Staff to discuss the Chain of lakes and how it might be operated. The minutes of that meeting are attached as Exhibit B to illustrate the kind of brain storming that will be necessary to develop more detailed operational plans and contingency plans for the Chain of Lakes and/or segments thereof in the future.

CONCLUSION:

Once mining is completed the Zone would come into possession of a completely secured series of lakes, interconnected with controllable conduits, for the conveyance and storage of water. Additionally, there should be a sizable fund from fees collected to purchase extra water to replace some of what was lost in years past. Additional to the water supply management capability is the potential for flood control and the maintenance of the Zone's Flood Control channels. Cope Lake might be developed for flood detention. There will be an area set aside for Zone 7 outside PGC's lakes that could be useful for disposal of silt materials removed from the Zone's flood control channels. Such materials can also be placed in Cope Lake.

Hopefully, this narrative will be helpful to those on the Zone 7 Board and Staff, who will be administering the contracts to ensure all terms and conditions, will be met. That in itself can span at least another career or two, since the last lake(s) will not be available to the Zone for another 20 years or when the last truck loaded with the last grains of sand and gravel leaves the Valley.

Exhibit A

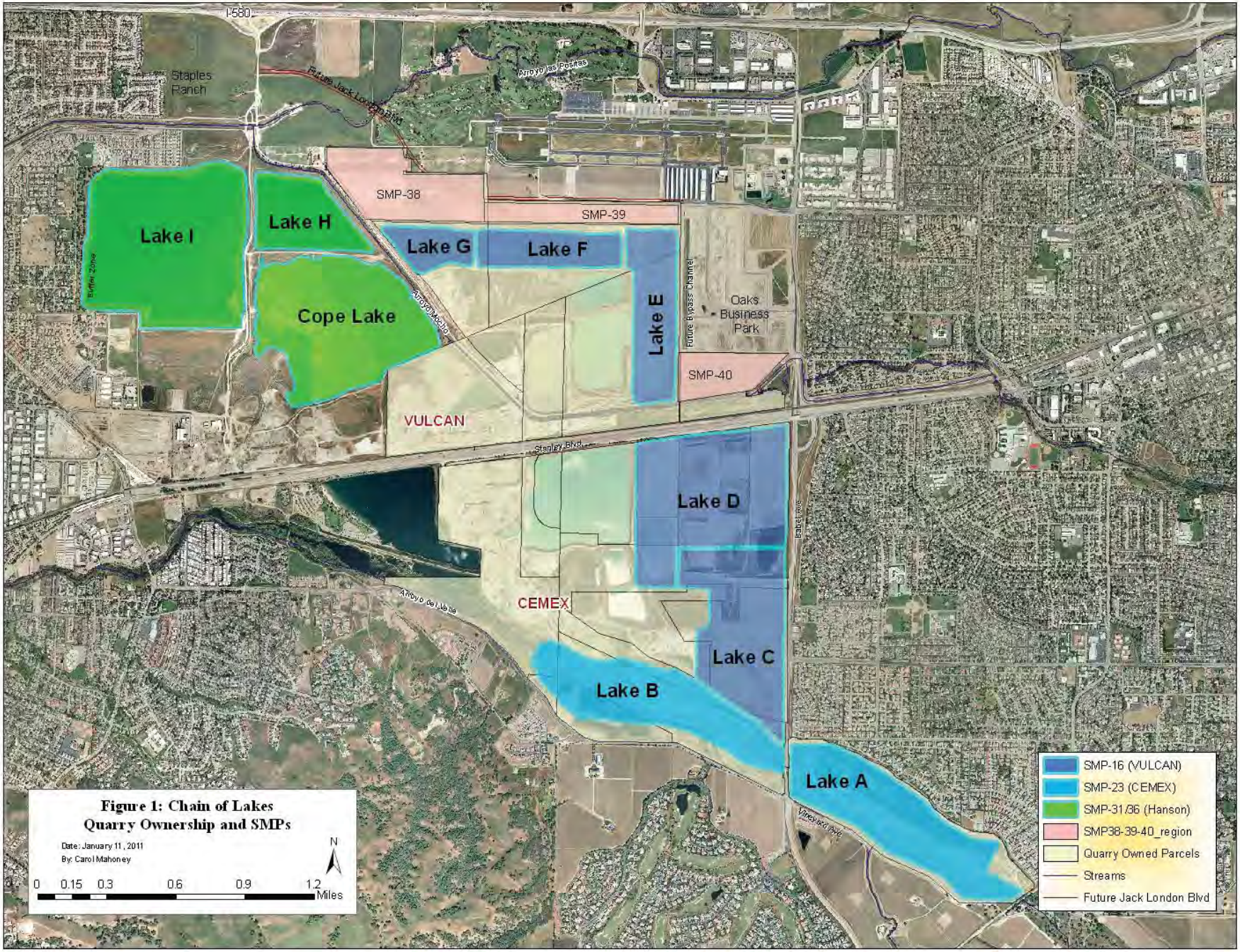

I-580
Staples Ranch
Future Jack London Blvd
Arroyo las Positas
SMP-38
SMP-39
Lake I
Lake H
Lake G
Lake F
Lake E
Buffer Zone
Cope Lake
Arroyo Mocho
Future Bypass Channel
Oaks Business Park
SMP-40
VULCAN
Stanley Blvd
Lake D
Isabel Ave
Arroyo del Valle
CEMEX
Lake C
Lake B
Lake A
Vineyard Ave
SMP-16 (VULCAN)
SMP-23 (CEMEX)
SMP-31/36 (Hanson)
SMP38-39-40_region
Quarry Owned Parcels
Streams
Future Jack London Blvd
Figure 1: Chain of Lakes
Quarry Ownership and SMPs
Date: January 11, 2011
By: Carol Mahoney
N
0 0.15 0.3 0.6 0.9 1.2
Miles

Exhibit B

Meeting with Mun Mar, Former General Manager, Zone 7
Chain of Lakes Discussion
24 August 2000

Attendees:
Mun Mar
Ed Cummings
Ken Henneman
YK Chan
Terry Anderson
Steven Ellis

Chain of Lakes

Ed wanted to clarify bullet point #3 in Terry's Draft Tech. Memo. No. 1 (attached) - per Ed, Hanson (Kaiser) say that they have submitted a geotech report concerning slope stabilization and that they are set on 2:1. However, some at Zone 7 think that this issue can be revisited and possibly changed (flatter slopes).

Mun stated that the agreement with the mining companies are general. The 2:1 slopes are based on Ala. Co. Planning studies. The County accepted 2:1 for flood control channels. Geotech reports show that 2:1 is adequate (1:1 was adequate in some cases, except for safety concerns). The County ordinance states 2:1.

The Specific Plan was approved by the County and is revisited every five years.

Mun stated that the west face of Lake I is already mined, they cannot make it any flatter. Martin Ave. set-backs are 200-300 feet, part of the dedication to Zone 7. This allows room for Zone 7 to work the face, clean silt, etc. Set-back is measured from top of cut.

Mun stated that it is written in Zone 7's agreement with the mining companies - they are required to grant certain lands to Zone 7, but Zone 7 is not required to accept the Chain-of-Lakes. At the time the agreements were mad, it looked as though it would be a good idea. Lake Del Valle cost nearly $30 million. There are certain costs involved (maintenance & operation) but what might the benefits be (groundwater recharge, peak flood flows, etc.).

Mun then gave a conceptual look at what was planned for 2030. All the mining pits are completely mined, the 500 cfs diversion structure on the Arroyo Valle is in place, and all conduits are in place. Typical operation might be: on October 1st, Lakes D&C are down to dead storage. Lake A is diverting 500 cfs (approx. 20,000 af/yr) into Lake C. Active storage in Lakes C&D is 22,000 af. Lakes C&D are used for decanting, they regulate flows into Lake E (very little storage, basically a wide channel). Flow then proceeds into Lake F, then to Lake G, and then to Lakes H&I. If at some point the west face of Lake I clogs up (not repairable), then a

possible scenario is to put in a water treatment plant adjacent to the NW corner of Lake I (space reserved for WTP/office/etc. in agreement). This treatment plant could take water from Lake I, treat it, and put into the distribution system.

Mun stated that we have shared water rights with ACWD. We would most likely have to change our permit to modify the amount - 250 to 500 cfs - and location - Lake A. We can also capture released imported water - recharge releases.

Mun then changed focus to the present or near-term staging of what will be happening in the mining area as areas become available. Hanson/Kaiser will be first to finish mining, then Lonestar, and finally Vulcan (Pacific Aggregates/Jamieson/CalMat). Lake H is owned by Jamieson, but was leased to Kaiser. Jamieson has sold off El Charro Rd., the Arroyo Mocho, and the plant site. There is a provision under the agreement for the inclusion of Cope Lake for water management purposes. Any other use by Zone 7 - homes, new office site, etc. - and it would revert back to Hanson/Kaiser. Possible uses for Cope Lake would be silt disposal or diversion pond off the Mocho. Kaiser has agreed to a 100cfs diversion off the Mocho into Lake H. *Zone 7 needs to find determine what will happen to Cope Lake once it is filled up to a reclaimable level with silt - will it revert back to Hanson/Kaiser?* The areas that Zone 7 will receive are those areas that are below ground level, ie. have not been reclaimed.

Ed stated that Zone 7 is in the driver's seat for Cope Lake. Hanson/Kaiser will be out in three years. If they want to make any changes to their plans, they will have to work with Zone 7.

There is a possibility that Hanson/Kaiser's plant could be used to process materials from either/both Lonestar and Vulcan. They would need Zone 7's buy-in or agreement to make such a change in their operations.

Lake I and Cope will come to us in the next three years, form Hanson/Kaiser. Lake H should come to us in that same time frame from Jamieson (Pac. Agg./CalMat/Vulcan), but the timing is up to Jamieson. Jamieson could deed Lakes E, F, & G to us before 2030, if we need them.

Ed stated that Zone 7 should find out when Jamieson (Pac. Agg./CalMat/Vulcan) will be finished mining north of Stanley Blvd.

A conduit is needed between Lakes H and I. Mun had provisions for a 30" conduit. The issue of set-backs was brought up. Mun said that the set-backs are a requirement of the City or County Planning Departments, they could require deeper set-backs. Around 1980-1985, the agreement was modified to allow for a clay lining for the n'ly sides of Lakes G, F, & E and the e'ly side of Lake E (and D & C?). There is a 200 foot set-back for the west side of Lake I only. The other lakes have provisions for a 25-foot wide access road provision.

The stretch of the Arroyo Mocho through the mining area is under-sized. The Q_{100} is 5000 cfs, the channel would have to be wider or lined to carry this flow. Currently the channel can and has

overflowed (recent damage to Stanley Blvd.). Jamieson has not been allowed to widen/deepen the channel to carry more water *(Fish and Game?)*. Instead of widening the Mocho, one thought is to divert Mocho flows into Lake E near Isabel Ave., to detain peak flood flows. There is also the possibility of diverting Arroyo las Positas flows into Lake F or G. If we implemented any of these ideas, the diversion structures into the Lakes and back into the streams would be at Zone 7 expense. The only diversion structure required by contract is the one from the Mocho into Lake H (or possibly Cope Lake if we prefer). *Is the size of the diversion adequate?* We could start recharge operations soon. Zone 7 would have to reactivate our permit for Water Rights Diversion on the Mocho. If we divert into Cope Lake first, then we need to place a conduit from Cope into Lake H.

Mun mentioned that there is also a partially reclaimed site in the Jamieson property (Pac. Agg./CalMat/Vulcan) that will be deeded to Zone 7 for a possible silt disposal site.

Tunnel from Lake D to E

The project concerning this tunnel has been going on for about five years. The original elevation of the conduit was to be around 330, but the new proposal has the tunnel at about 350 to 360. Vulcan is proposing to house the 42-inch conduit for Zone 7 in their 12-foot diameter tunnel. Mun cautioned that the Vulcan is designing their tunnel to convey materials from south of Stanley to their plant, not as a conduit for the future Chain of Lakes. Mun thought that it might be possible for Vulcan to place a siphon inside of their tunnel. This arrangement might be easier to maintain, than a conduit placed 30+ feet lower. A possible scenario would be to place the invert of the tunnel at the maximum operating water level of Lake E. *Is this tunnel in the best interest of the Zone? If not, what can be done to make it so?*

Ed stated that Zone staff needs to meet and discuss why we are reviewing the tunnel, and what we are going to do.

Mun confirmed that in the agreement(s) with the mining companies, Zone 7 will obtain R/Ws, easements, etc. because we will need the easement in the long term.

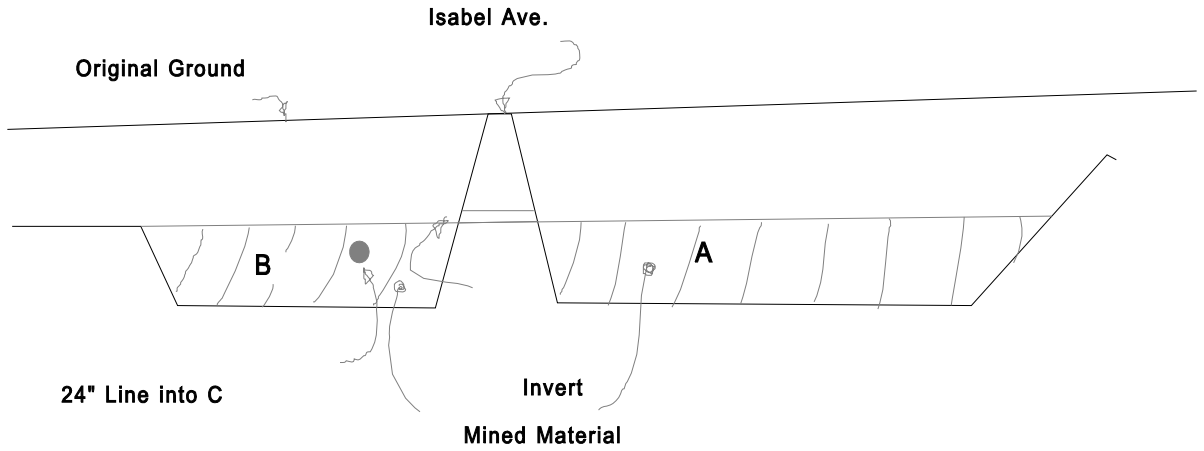
Tunnel/siphon project was not proposed by Vulcan, it was forwarded by Mun. Could it possibly benefit both the Zone and Vulcan. Would a siphon be a better alternative than a deeper conduit (maintenance, repairs, etc.)? Do we want to place the tunnel at the maximum water level (to be used as a spillway)? Is the conduit in tunnel going to be a reasonable alternative - cost, repairs, maintenance, operation, etc.?

Projects Completed / To Be Completed

Completed:
Lake H to G Conduit - ½ complete, Hanson/Kaiser's portion from Lake H, half-way to Lake G.

To Be Completed:
Lake G to H Conduit - ½ form G to H; to be done by Vulcan (Pac. Agg./Jamieson/CalMat)
Lake H to I Conduit - to be done by Hanson/Kaiser
Lake D to E Conduit - to be done by Vulcan (Pac. Agg./Jamieson/CalMat)
Mocho Diversion Into Lake H (or Cope) - to be done by Hanson/Kaiser
Arroyo Valle Diversion Into Lake A (500 cfs) - to be done by Lonestar
Other Items

There is a proposal to place a pipe from Lake B to C in case we need to drain Lake C. The design for the diversion from Lake A to C is on file (see Dennis or Pete).



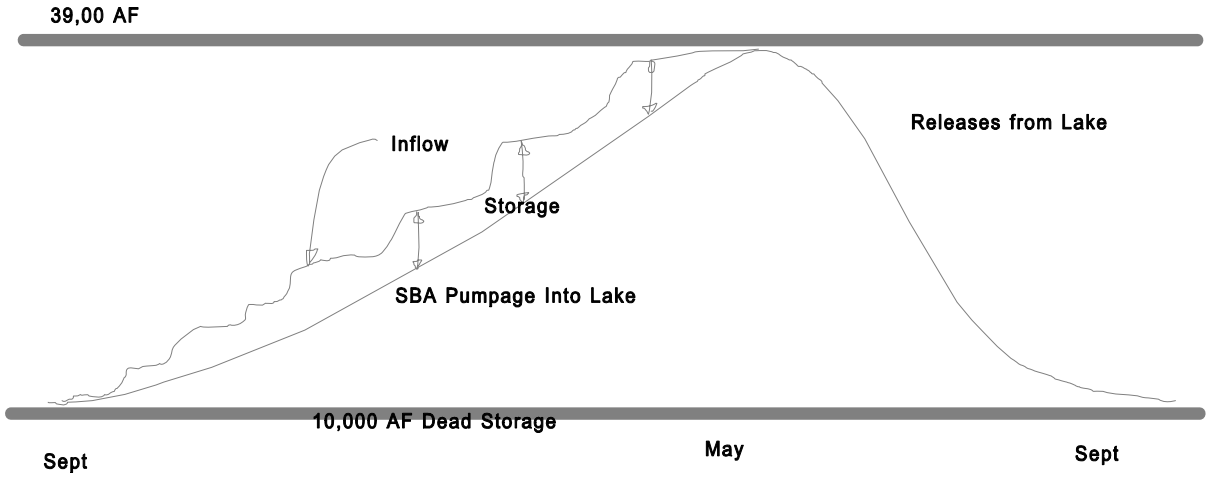
Mun thinks that recreational uses most likely not compatible with the Chain of Lakes, except for possibly Lake B. Trails ight be compatible. They have already been provided for along Martin Ave. (Mun thinks this was a bad idea). Alameda County Public Works Road Dept. Needs to be involved - they own Isabel Ave. Mun does not believe that the Zone needs to involve the Division of Safety of Dams (Ken Henneman and YK think we will). The Zone should also look at recycled water possibilities. The zone needs to look at the proposed conduit sizes to determine if they meet our needs.

Operation

Lake D to E - 42" pipe at 5 cfs = 10,000 AF operating 6-months out of year. The Zone will peel the water off first. Ed asked if there had been past talks with ACWD about our future plans? Mun said no. Mun said the original plan for Del Valle Reservoir was to have about 30,000 AF of active storage. The following dates may not be exact (within a week or two). The lake should be at maximum level on May 1. The lake is then drawn down to supply the needs of the contractors. The initial concept of the Chain of Lakes was to transfer storage from Lake Del Valle into the Chain. The water Zone 7 diverts into Lake C will not be additional water, it will be our stored water, which we would "lose" if we did not use it by September (Labor Day).

Per e-mail message from Mun:

Steve, the May 1 date is what I said that the Zone's water had to be out, otherwise it reverts to the State and becomes SWP water since the State needs to have a full tank to begin supplementing the max. flow of SBA during the peak summer months. More accurately it is to occur sometime in the month of May but no later than June l and the water level in DV has to be down to min. pool after labor day but no later than Oct. l. at which point demand will theoretically be less than max flow and the excess flow goes into Lake Del Valle.



Water diverted (500 cfs) will not be additional water, it will be our stored water which we would lose if we did not use it. The storage water in the above sketch is Zone 7's stored water. It must be used by May 1, or we lose it.

The recharge rate of the west face of Lake I is 23 cfs per David Lunn. A rough calculation of the amount of water that can pass from Lake H to I is as follows:

30" dia. pipe ~ $6ft^2$
velocity = 5-6 fps
6 sq.ft. X 5 fps = 30 cfs
30 cfs X 2 AF/cfs = 60 AF/d
60 AF/d X 30 dy/mon. = 1800 AF/mon.
1800 AF/mon. X 6 mon./yr = 10,800 AF/year

ACTION ITEMS:

Meeting Minutes - Terry/Steven
Document Search - Ken/Terry
Mtg With Quarry Operators - Ed, YK, Ken, Terry, Larry Appelton, Mun, etc.

APPENDIX D

Estimated Reclaimed Lake Conditions

Future Chain of Lakes Estimated Areas and Volumes

	UNITS	LAKE									
		A	B	C	D	E	F	G	H	I	Cope
Top of Slope Elevation	ft msl	420	380	400	400	390	355	355	360	360	360
Total Depth Elevation	ft msl	320	150	150	150	180	286	280	240	220	290
Maximum Water Surface Elevation	ft msl	410	370	380	380	380	345	345	340	340	340
Maximum Surface Area	ac	118	220	160	210	89	62	38.5	80	286	204
Average Groundwater Elevation	ft msl	412	370	370	350	335	330	315	300	300	NA
Average Groundwater Volume	ac-ft	4,537	33,000	23,000	29,000	6,600	1,600	940	3,000	16,000	NA
Historical Low Groundwater Elevation	ft msl	325	265	245	220	220	220	220	210	220	NA
Historical Low Groundwater Volume	ft msl	50	13,500	7,000	7,500	800	-	-	-	-	NA
Dead Volume	ac-ft	513	29,000	16,900	25,000	6,500	200	475	1,750	NA	NA
Total Volume	ac-ft	4,537	35,300	24,000	35,000	10,320	2,500	2,000	5,900	26,800	4,500
Average Active Volume	ac-ft	-	-	1,000	6,000	3,720	900	1,060	2,900	10,800	4,500
Historical Low Total Storage	ac-ft	4,487	21,800	17,000	27,500	9,520	2,500	2,000	5,900	26,800	4,500
Historical Low Active Volume	ac-ft	4,024	6,300	7,100	10,000	3,820	2,300	1,525	4,150	26,800	4,500
Inflow Conduit Elevation	ft msl	390	355	350	330	330	330	300	279	275.9	NA
Exiting Conduit Diameter	inches	72	72	30	42	30	30	30	30	NA	NA
Upstream Connecting Lake		NA	A/C	A/B	C	D	E	F	G	H	NA
Outflow Conduit Elevation	ft msl	360	350	330	330	330	300	300	280	NA	NA
Downstream Connecting Lake		C	C	D	E	F	G	H	I	NA	NA
Mining Permit		SMP-23	SMP-23	SMP-16	SMP-16	SMP-16	SMP-16	SMP-16	SMP-31 (14)	SMP-31	SMP-31

Assumptions:

- All lakes will be operated with a minimum of 10 feet of freeboard
- All depths stated in each SMP will be attained
- The SMP-23 Reclamation Plan Amendment will be approved for the revised depths
- The water pipeline running beneath the Hanson Haul Road restricts maximum water elevations in Lakes H, I, and Cope to elevation 340 feet msl.
- The water pipeline running beneath the Hanson Haul Road is the only existing facility that will restrict lake level operations.
- Active volume is storage above conduit outlets or average groundwater level (whichever is higher) and below the maximum water surface elevation.
- Average Groundwater Elevation is estimated using historic water elevation data from nearby monitoring wells and average groundwater gradient map generated estimating post-mining conditions
- Dead Volume is calculated below outflow conduits.
- Maximum water surface elevation is the water elevation that allows a minimum of 10 feet of freeboard (greater if there are additional restrictions that need to be considered).
- The conduit between Lake A and Lakes B and C will be designed to allow water to be transmitted from A directly into either B or C, and also allowing water to move between B and C.

APPENDIX E

East Pleasanton Specific Plan Development

The City of Pleasanton adopted their General Plan in 2009. Lakes H, I and Cope and a surrounding area of approximately 390 acres were not included in that plan. Planning for this area of Pleasanton is being covered under the East Pleasanton Specific Plan (EPSP). The City of Pleasanton formed a Task Force in 2012 to assist in this planning effort. The Task Force consists of property owners, City Commissioners, neighborhood representatives, and At-Large-Representatives, and operates under the guidance of the City of Pleasanton Planning staff and their consultants.

The EPSP Task Force began monthly meetings in August 2012. Preliminary Studies of the EPSP area have been conducted and presented to the Task Force by the City of Pleasanton's consultants to provide general background information. In addition, studies have been conducted to evaluate opportunities and constraints, traffic, environmental conditions, and market assessment to determine economic feasibility of certain types of development. A community workshop was held in September 2012 to solicit input from the public on the character they would like to see for the area and any particular land uses they would or would not like to see in the area.

In March 2013, to further the discussion of land use for the EPSP area, the City of Pleasanton's consultant developed three alternatives for development of the EPSP area based on input received from the Task Force and the public. In each of the alternatives, most of the development is shown in the southern portion of the EPSP area. In all three of the proposed alternatives, Zone 7 property was shown as either water or "open space", a park was shown encroaching into Zone 7's property at the southwestern portion of Cope Lake, and the property owned by Lionstone adjacent to Zone 7's supply well COL No. 1 (between Lakes H and Cope) was shown as a "Destination Use". The term "Destination Use" is defined as "commercial or public facilities that are specifically suited for the lakefront site on which the designation is shown, for example a restaurant, retreat, conference facility, interpretive center, etc."

Zone 7 took the opportunity at the March 2013 EPSP Task Force meeting to remind the Task Force members of Zone 7's existing and planned water resource management facilities

and operations at Lakes H, I, and Cope. Zone 7 also reiterated that any public access to Zone 7 property would require an agreement approved by Zone 7's Board of Directors with a partnering agency (such as the City of Pleasanton or the East Bay Regional Parks District), in which the agency would take on the cost of operation, maintenance, and liability associated with such public access. This information was also conveyed to the City of Pleasanton Planning Commission and City Council during public meetings where the EPSP was discussed.

Over the remainder of 2013, the EPSP Task Force continued to meet monthly working towards meeting the City of Pleasanton's goal of producing the Draft EPSP and Draft Environmental Impact Report (EIR) by the first quarter of 2014. The alternatives were further refined and while some proposed trails and recreational facilities are shown on Zone 7 property it is noted that it is subject to Zone 7 review and approval of the Zone 7 Board. As noted in the 'Introduction', one of the objectives of completing this Preliminary Lake Use Evaluation is to have a basis for providing input into external planning activities such as the EPSP and ensure that Zone 7 water resource management requirements are protected. To this end, Zone 7—with the Board's direction—will continue to engage with the City of Pleasanton and other stakeholders on the EPSP development process.

APPENDIX F

Groundwater Recharge Capacity - Assumptions

The groundwater recharge capacity (Q) was calculated by multiplying the area of recharge face (A) by the groundwater gradient (I) and the hydraulic conductivity of the aquifer (K).

- **Gravel recharge face (A):**
  - square feet of exposed gravel providing unimpeded recharge in the preferred downgradient direction (additional recharge in other directions not included)
  - existing overburden not included
  - only gravel faces exposed below the low-permeability reclaimed pits included
- **Groundwater gradient (I):**
  - for consistency, gradient calculated for the maximum operating level of the lake to the estimated post-mining average groundwater level approximately 20 feet downgradient of the lake
  - maximum operating lake level set at 10 feet below the top of slope unless other operating constraints exist (e.g., water supply pipeline between Lakes H, I, and Cope, which restricts the lake elevations in that area to elevation 340)
- **Hydraulic conductivity (K):**
  - assumed 198.5 ft/day for all the lakes (value used as part of the hydraulic evaluation of Lakes H and I, and included in the Management Plan for Lakes H, I, and Cope produced by Stetson [2004])