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Report of Waste Discharge: Leprino Foods Company/City of Lemoore Combined Effluent Discharge to the River Ranch

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Prepared for

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K/J Project No. 2065027*02

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Executive Summary

This Report of Waste Discharge describes a project proposed by Leprino Foods Company and the City of Lemoore (City) to reuse their combined treated wastewater as an irrigation water supply for approximately 2,416 acres of irrigated crop land in Kings County near Lemoore, California. This report provides background information about the two dischargers, the River Ranch land application area, the hydrogeologic setting, the proposed project, and an analysis to demonstrate that the project will comply with California's Policy for Protection of High Quality Waters (SRWCB 1968).

Leprino operates two facilities in the City of Lemoore that produce cheese and other dairy products. The wastewater from these facilities is treated before comingling with treated sanitary effluent from the City of Lemoore's wastewater treatment plant and disinfected to meet Title 22 standards for recycled water. The treated combined effluent from Leprino and the City is currently discharged to the Stone Ranch for reuse as irrigation water supply under Waste Discharge Requirements (WDR) Order No. R5-2019-0008.

The Proposed Project

The proposed project is for a combined effluent discharge of 7 million gallons per day (MGD) to be discharged to the 2,416-acre River Ranch which consists of the Stone Ranch and Nederend Property. This land application area is located approximately 5 miles west of the City; the Lemoore Naval Air Station is on the west, and the Crescent Bypass and South Fork of the Kings River are on the east.

The proposed project includes use of a) Leprino's and the City's existing wastewater treatment Facilities and combined effluent, b) an existing pipeline from Lemoore to the River Ranch, c) existing infrastructure to irrigate 2,416 acres of crop land, and d) a subsurface drainage collection system that discharges to evaporation basins. This report provides information about the capacity of the City (2 MGD) and Leprino (5 MGD) to treat the proposed treated effluent flows.

The River Ranch

The existing infrastructure at the River Ranch consists of irrigation ditches, subsurface interceptor drains, evaporation basins, a subsurface drainage collection system, irrigation supply wells, and tailwater ditches. The subsurface drainage system consists of drain lines installed beneath 1,900 acres of cropped land. Water collected in these drains flows by gravity to six collection sumps that are pumped to the evaporation basins. The sumps also collect flows from interceptor drains around the evaporation basins and interceptor drains along the Crescent Bypass and the South Fork of the Kings River. The 520 acres of the Nederend Property does not have subsurface drainage, but a Nederend Interceptor Drain will be completed in summer 2022 and will be located between the Nederend irrigated areas and the South Fork Kings River. The Nederend Interceptor Drain will be installed below the elevation of the river bottom and will collect lateral seepage from the irrigated areas and route it to the evaporation basins.

The quality of shallow groundwater beneath the River Ranch has been known to be poor since at least the early 1980s. In 1982, the Kings River Conservation District conducted a study in the Stone Ranch area to document the extent of shallow groundwater with salinity and boron levels too high to be used as an irrigation water supply. The owners of the Stone Ranch drilled boreholes to locate shallow groundwater supplies but did not complete wells because of the high levels of salinity in groundwater.

Water and Salt Balances for the Proposed Project

The proposed project consists of irrigating 2,416 acres of farmland that will be planted with triticale forage, triticale grain, cotton, corn, alfalfa, and tomatoes. Most of the acreage will have both summer and winter crops to maximize the acreage available for irrigation. Five management scenarios were evaluated as part of the water and salt balance analysis, including two crop mixes and three climate conditions (average, wet year, and 100-year return period annual precipitation).

The objective of the water and salt balance analysis was to determine potential impacts of the proposed discharge on three criteria: a) the agronomic suitability of root zone water supply and salinity; b) the capacity of the fields' acreage and evaporation basins capacity to manage the proposed combined effluent discharge of 7 MGD, and c) potential impacts of percolation and evaporation basin seepage on underlying shallow groundwater.

Agronomic Suitability. The irrigation schedules and blending of groundwater and combined effluent developed for the proposed project were designed to establish an appropriate leaching fraction to achieve suitable constituent levels in the crop root zone to manage drainage and crop health. In wet years (12.6 inches precipitation; Scenario 3), the root zone electrical conductivity (EC) is approximately 2,234 microSiemens per centimeter (µS/cm), boron is 0.5 milligrams per liter (mg/L), chloride is 257 mg/L and sodium is 323 mg/L. In average years (7.4 inches precipitation; Scenario 2), root zone EC is 3,308 µS/cm, boron is 0.79 mg/L, chloride is 381 mg/L, and sodium is 478 mg/L. These root zone concentrations are relatively common in the Lemoore area and crop health and yield can be maintained. The sodium levels could potentially affect the permeability of the soil, but there are facilities to add gypsum or sulfur to the irrigation water to mitigate this concern.

Capacity of the Proposed River Ranch Project. The proposed combined effluent flow of 7 MGD is an increase of 40 percent over the current permitted flow. The land application acreage increases 27 percent for the proposed project. Since the increased combined effluent flow will replace some of the supplemental groundwater used in the past, the hydraulic capacity of the field acreage will be sufficient to accommodate the additional combined effluent flow. The capacity of the evaporation basins to manage the proposed combined effluent discharge of 7 MGD was also evaluated and found to be sufficient even when the 100-year return period precipitation occurs.

Analysis of Potential Groundwater Impacts. Applicable Water Quality Objectives (WQOs) for the proposed project are available for: arsenic, boron, chloride, sodium, sulfate, total dissolved solids (TDS), and EC. WQOs for boron and sodium are established based on levels typically used to protect sensitive agricultural crops, though sensitive crops are not currently grown in the River Ranch area. WQOs for the remaining constituents are based on Title 22 MCLs.

Potential impacts of the proposed project on underlying shallow groundwater are addressed by comparing a) combined percolation beneath the cropped fields and evaporation basins seepage, and b) underlying groundwater quality. These are shown in the table below:

Constituent	Water Quality Objectives[(a)]	Flow Weighted Average Seepage/Percolate to Groundwater[(b)]	Groundwater Above the A-Clay[(c)]
EC, µS/cm	1,600	4,786	3,627 - 87,000
TDS, mg/L	1,000	1,924	2,827 - 84,450
Arsenic, µg/L	10	7.4	9.2 – 23
Boron, mg/L	0.75	1.1	5.2 - 90
Chloride, mg/L	500	551	151 - 6,900
Sodium, mg/L	115	692	240 - 23,100
Sulfate, mg/L	500	31.6	2,597 - 57,700

Notes:
(a) See Table 6-1.
(b) Results are shown for average climate conditions.
(c) Range includes recent samples from MW-1, MW-1R, MW-2, and MW-3.

The field soil water and salt balance calculations for percolation and EC were used to estimate percolate concentrations for other key constituents by assuming that these other constituents would have the same percentage concentration increase between combined effluent levels and percolate levels. The percolate and seepage flow not captured by the field drain lines or interceptor drains will reach underlying groundwater.

The groundwater quality above the A Clay is shown as a range. The lower end of the range was generally measured at monitoring well MW-2 and the upper end of the range was measured at either MW-1R or MW-3. The WQOs are less than the low end of the groundwater range for EC, TDS, boron, sodium, and sulfate. The arsenic and chloride WQOs are near the lower end of the groundwater range.

The average EC, chloride, and sodium levels in the percolate and seepage are within the range of levels measured in shallow groundwater but near the low end of the range. The percolate and seepage TDS, boron, arsenic, and sulfate concentrations are less than the low end of the range in shallow groundwater. Groundwater beneath the River Ranch already exceeds WQOs for many constituents and the proposed project percolate and seepage concentrations for four of the seven key constituents are less than the WQOs.

The proposed discharge is not expected to cause degradation to deeper groundwater between the A Clay and E Clay for two reasons. Most importantly, the A Clay has very low permeability that effectively separates the shallow groundwater from groundwater in the deeper zones, and water percolating beneath the irrigated areas and the evaporation basins seepage is not anticipated to reach the deeper groundwater beneath the A Clay. If the percolate does reach the deeper groundwater, the combined seepage and percolation water quality has similar water quality to that of the groundwater between the A and E clays.

Section 1: Introduction

This Report of Waste Discharge (RWD) has been prepared on behalf of Leprino Foods Company (Leprino) and the City of Lemoore (Lemoore or City) to support issuance of Waste Discharge Requirements (WDRs) for the discharge of up to 7 million gallons per day (MGD) of treated effluent consisting of a combination of Leprino process water and Lemoore sanitary wastewater. Leprino and Lemoore propose to blend the treated combined effluent with other irrigation water supplies and use the blended water supply to irrigate crops on a 2,416-acre area 5 miles west of the City of Lemoore. The River Ranch, owned by Leprino, consists of 2,416 acres of agricultural lands including the Stone Ranch (approximately 1,900 acres) and the adjacent Nederend Property (520 acres). This RWD refers to the entire property as “River Ranch” and describes the proposed project including an antidegradation analysis for the proposed discharge. A completed Form 200 is included as Appendix A.

1.1 Regulatory Background

In 1993, an Environmental Impact Report for the Stone Ranch Evaporation Basins was prepared and submitted to the California Regional Water Quality Control Board, Central Valley Region (CRWQCB). Resolution 93-155 and WDRs No. 93-156 were issued for the Evaporation Basins at the Stone Ranch. In 1997, the State Water Resources Control Board (State Water Board) adopted Resolution 97-09 that modified Order No. 93-156 to include additional monitoring. Between 1998 and 2019, the Stone Ranch Evaporation Basins were regulated under WDRs Order No. 98-229 (CRWQCB 1998).

Between 2002 and 2019, Leprino’s treated wastewater and the City’s treated effluent were conveyed via pipeline to the head of the Westlake Canal. The combined effluent discharge to the Westlake Canal was regulated under WDRs Order No. 96-050 (CRWQCB 1996).

In March 2018, a Time Schedule Order (TSO) Order No. R5-2018-0900 was issued by the CRWQCB that required the City and Leprino to come into compliance with Order No. 96-050 or submit a RWD to discharge to an alternate location. In June 2018, a RWD for the combined effluent discharge to the Stone Ranch was submitted to the CRWQCB (Kennedy Jenks 2018). On 8 February 2019, WDRs Order No. R5-2019-0008 were adopted by the CRWQCB and discharge of up to 5 MGD of combined effluent to the 1,900-acre Stone Ranch commenced in October 2019.

1.2 Involved Parties and Facilities

1.2.1 Leprino Foods Company

Leprino owns and operates two cheese production facilities within the City of Lemoore known as the Leprino West Plant and the Leprino East Plant. The Leprino West Plant is located at 351 North Belle Haven Drive and the Leprino East Plant is located at 490 F Street, both in Lemoore, California. The locations of the Leprino facilities are shown on the Project Location Map included as Figure 1-1.

The Leprino facilities in Lemoore process approximately 14 million pounds of milk per day to produce an average of 1.5 million pounds of mozzarella cheese per day (CES 2017). These facilities also produce whey protein and other lactose products. Leprino's facilities operate continuously, except for planned maintenance periods. Typically, production is active for 19 to 20 hours per day while clean-in-place (CIP) procedures are performed during the remaining 4 to 5 hours. CIP procedures are performed in accordance with the Pasteurized Milk Ordinance and inspected by the United States Food and Drug Administration (FDA) and California Department of Food and Agriculture (CDFA). On average, 3.0 MGD of process water are generated at the combined facilities as a result of processing and CIP activities. Leprino treats process water to high standards (see Section 2.1) and discharges the treated effluent to an existing pipeline that commingles Leprino's treated effluent with City of Lemoore treated sanitary effluent prior to disinfection and discharge.

1.2.2 City of Lemoore

The City of Lemoore has a population of approximately 27,000 residents. The City owns and operates a Wastewater Treatment Plant (WWTP) located at 1250 South 19th Avenue. The location of the WWTP is shown on Figure 1-1. The WWTP produces an average of 1.7 MGD of treated sanitary effluent that is commingled with approximately 3.0 MGD of Leprino's treated effluent, disinfected, and discharged.

1.2.3 The River Ranch

Leprino Foods Company owns the River Ranch which is located in the central San Joaquin Valley in Kings County, California, in Sections 27, 34, 35, Township 18S, Range 19E and Sections 2, 3, 10, and 11, Township 19S, Range 19E (Mount Diablo Base & Meridian). The River Ranch is located west of the City and east of the Lemoore Naval Air Station. The location of the River Ranch is shown on Figure 1-1. A map of the River Ranch, including the Stone Ranch and Nederend Property, showing the fields and surface water features is provided as Figure 1-2. The Assessor's Parcel Numbers (APNs) are shown in the table below:

River Ranch APNs
004-230-015-000
022-010-001-000
022-010-004-000
022-010-002-000
022-020-004-000
022-010-050-000
022-100-001-000
022-110-001-000
022-110-002-000
022-110-004-000
022-110-014-000
022-110-013-000
022-120-001-000

The Stone Ranch has operated as an agricultural enterprise since 1962. The existing infrastructure at the site consists of irrigation ditches, subsurface interceptor drains, evaporation basins, a subsurface drainage system, irrigation wells, and tailwater ditches. Figure 1-3 shows the subsurface drainage collection system including six sumps that collect drainage water and route it to the evaporation basins. Figure 1-4 shows the primary surface tailwater ditches at both the Stone Ranch and the Nederend Property.

The Nederend Property is adjacent to Stone Ranch and consists of 520 acres divided into four fields. The Nederend Property does not have subsurface drainage infrastructure but does have tailwater collection ditches to collect irrigation water reaching the end of the fields (Figure 1-4). The Nederend Property currently has an interceptor ditch between the irrigated areas and the South Fork Kings River. The Nederend Interceptor Drain will be installed in summer 2022 and will collect lateral subsurface flow. The existing Nederend Interceptor ditch will remain in place.

Figure 1-5 shows the conveyance system that collects process wastewater from Leprino's two facilities and wastewater from the City's WWTP. Leprino's treated process wastewater and Lemoore's treated effluent are combined at the WWTP and flow to the River Ranch in an existing 30-inch diameter pipeline. The pipeline crosses Highway 198 and flows north along the western boundary of a wetlands area owned by Leprino. The combined effluent enters distribution canals that supply irrigation water to the fields.

1.3 The Proposed Project

The proposed project will make beneficial reuse of treated combined effluent from Leprino's two facilities and the City's WWTP by using it for agricultural irrigation at the River Ranch. Leprino and Lemoore propose to discharge up to 7.0 MGD of treated combined effluent via the existing pipeline to 2,416 acres. An increased combined effluent flow limit is required to allow further production and processing of existing products manufactured at Leprino's facilities, accommodate production and further processing of alternative products, address the impacts of wet weather on combined effluent flows, and accommodate some growth of the City.

The increase in combined effluent discharge from 5 MGD to 7 MGD will rely on the added 520 acres of the Nederend Property to distribute the combined effluent for irrigation. In addition, the proposed crops will be double cropped or have a perennial crop requiring year-round irrigation. The combined effluent will be blended with groundwater or other suitable water supplies within the existing Stone Ranch irrigation canal system, and the blended water supply will be directly used for irrigation.

1.4 California Environmental Quality Act (CEQA) Compliance

On 3 January 1989, the City certified a Final EIR in accordance with the California Environmental Quality Act (CEQA), Public Resource Code section 21000 et seq. for operation of the City's WWTP. As a responsible agency under CEQA, the CRWQCB determined that the project as approved would not have a significant effect on water quality.

An Environmental Impact Report was prepared in 1993 for the operation and use of the tile drainage system and the evaporation basins at the Stone Ranch.

On 18 September 2018, the City adopted a Mitigated Negative Declaration for construction and operation of the new pipeline to carry the combined effluent to the Stone Ranch property for use as an irrigation supply. The Mitigated Negative Declaration determined that compliance with waste discharge requirements would ensure that the proposed project would not have a significant impact on water quality.

A CEQA review of the proposed project is underway with the CRWQCB as the lead agency, and is expected to be completed by summer 2022. Several Best Management Practices (BMPs) related to air quality, biology, hazardous materials, water quality, and traffic may be implemented as part of the proposed project's installation and operating activities.

1.5 Contents of the Document

Section 2 describes wastewater treatment practices for Leprino and the City and summarizes treated effluent water quality data. Pertinent regulatory limits and regulations are also discussed.

Section 3 describes the physical characteristics of the River Ranch.

Section 4 provides detailed information about hydrology and hydrogeology at the River Ranch.

Section 5 describes the proposed project and the water and salt balance analyses conducted to evaluate potential impacts to underlying groundwater.

Section 6 is the antidegradation analysis for the proposed project.

Section 2: Combined Effluent Characterization

This section describes wastewater treatment practices for Leprino and the City to provide a characterization of the treated combined effluent that will be discharged as part of the proposed project.

2.1 Leprino Effluent Characterization (EFF-002)

Process water from Leprino's two facilities is combined in equalization tanks that are located at the Leprino West Plant. The partially treated process water is conveyed through a 12,000-foot pipeline to a second Leprino treatment facility adjacent to the City's WWTP at 1250 South 19th Avenue, Lemoore, California 93245. At this location, the Leprino process water is further treated using two high rate activated sludge (HRAS) reactors utilizing two dissolved air flotation (DAF) units followed by three sequencing batch reactors (SBRs) and final filtration. Leprino's treated effluent is discharged to an existing pipeline and commingled with the City's treated sanitary effluent. A wastewater treatment process flow diagram is provided as Figure 2-1.

2.1.1 Flow and Water Quality of Leprino's Treated Effluent

Leprino monitors its treated effluent in accordance with MRP Order No. R5-2019-0008. Table 2-1 shows monthly effluent flows for October 2019 through September 2021; the average daily flow was 3 MGD. Average effluent quality data for the treated Leprino effluent for the same period are presented in Table 2-2 and the complete dataset of treated Leprino effluent water quality is contained in the R5-2019-0008 Quarterly Monitoring Reports prepared by J.M. Lord and submitted by Leprino Foods Company and the City of Lemoore (Quarterly Monitoring Reports) (J.M. Lord/Leprino 2019 – 2021). Average 5-day biochemical oxygen demand (BOD_5) is 6.1 milligrams per liter (mg/L), average boron is 0.4 mg/L, average chloride is 346 mg/L, and average sodium is 371 mg/L. Average Electrical Conductivity (EC) is 2,779 microSiemens per centimeter (µS/cm), and the average Sodium Adsorption Ratio (SAR) is 10.5. The average Total Dissolved Solids (TDS) is 1,580 mg/L, and average fixed dissolved solids (FDS) is 1,299 mg/L.

Information regarding chemicals used at the Leprino Facility for wastewater processing and treatment are provided in Appendix B (Trinity Consultants 2022).

2.1.2 Capacity of the Leprino Wastewater Treatment System

As part of the proposed project, Leprino plans to increase treated effluent flows from approximately 3 MGD (Table 2-1), up to 5 MGD. The current WDR (R5-2019-0008) establishes three treated effluent water quality limitations for the combined effluent (EFF-003):

Constituent	Annual Average	Monthly Average	Daily Maximum
BOD_5, mg/L		40	80
TSS, mg/L		40	80
FDS, mg/L	1,400		

BOD and total suspended solids (TSS) have monthly limitations of 40 mg/L and a daily maximum value of 80 mg/L. The FDS effluent limitation is 1,400 mg/L annual average.

The current WDR also sets loading rate specifications for land application of constituents in the combined effluent. The BOD_5 limit for land application is set at 100 pounds per acre per day (lb/Ac/day) calculated for the cycle average application rate between combined effluent irrigations. Total nitrogen (N) applied to an irrigated area, expressed as pounds per acre per year (lb/Ac/yr) must not exceed a 'reasonable agronomic rate.'

An evaluation of Leprino's wastewater treatment system was conducted in early 2022 by The Probst Group (Probst 2022). The evaluation addressed the capacity and performance of the Leprino wastewater treatment system by assuming that the City's wastewater treatment system will continue to perform as it currently does. The combined effluent limits that Leprino would need to meet were back-calculated from the combined effluent limits minus the City's recycled water discharge concentrations. This is a reasonable assumption given that the City has been treating their wastewater at flows at or above the 2 MGD flow rate proposed in this ROWD (see Section 2.2 for a review of the City's treatment system). It was also assumed that Leprino's constituent loading would not increase because Leprino does not currently have plans to increase the milk volume received at the facility. Leprino's request for an increased flow limit is to a) allow additional processing of existing and new products that will add unit operations requiring additional water for cleaning and sanitation, and b) address the impacts of wet weather on combined effluent flows.

The 2022 analysis performed by Probst assessed the capacity of the Leprino wastewater treatment system using BioWin® software and mathematical modeling. The findings of the Probst report are summarized below, and the Probst report is included in Appendix C (Probst 2022).

- **Equalization Basins**. The hydraulic retention time of the equalization basins is at the low end of the acceptable range.
- **High Rate Activated Sludge (HRAS) System**. The proposed increased flow from 3 to 5 MGD would reduce the hydraulic retention time from approximately 7.5 hours to 4.4 hours.
- **HRAS Dissolved Air Flotation Units (DAFs).** The solids loading to the DAFs, 7.4 pounds per square foot per hour (lb/ft^2/hr), is at the top of the recommended range (1 to 8 lb/ft^2/hr).
- **Sequential Batch Reactor (SBR) System**. The existing three SBRs and blowers align with general SBR design criteria and can handle the increased processing flow. Because the SBR decanter and surge tank capacity was identified as a potential limitation on treatment hydraulic capacity, Probst evaluated current cycle times at future flows. Probst determined that Leprino can increase SBR cycles from the current 2 cycles per day to 3 cycles per day to comfortably process the additional flow.

The conclusions and recommendations of the Probst analysis are:

- At 5 MGD flow, the Leprino treatment system will be operating at hydraulic capacity. The current aeration capacity is sufficient and Leprino does not plan to increase milk processing.
- Higher hydraulic loading will lower the retention time in the existing HRAS, and higher hydraulic loading to the DAF system could reduce DAF solids capture efficiency. Leprino may need to limit some HRAS wasting and may have to occasionally reseed the HRAS system with biomass from the SBRs, if required, to improve performance of the HRAS DAF system. [*Leprino currently implements both these practices*.]

- Although Leprino currently meets a dissolved oxygen level of 2 mg/L in the SBRs, if dissolved oxygen decreases, Total N may increase because nitrification of ammonia-N will decrease. Leprino can add additional aeration time in the SBR cycles and increase Solids Retention Time (SRT) to maintain ammonia removal. If Total N or TSS concentrations increase significantly, they should be lowered by using a solids filtration step after the SBRs. [*Leprino has a suitable filter already available onsite*].
- The Probst evaluation also recommends that additional pumps for SBR feed and surge tank effluent pumping be added for redundancy.

The evaluation confirms that Leprino can consistently meet the required effluent quality following the recommendations summarized in the Probst report (Appendix C). The analysis demonstrated that, at 7 MGD, Leprino's treatment system can produce treated effluent with a Total N concentration of 23 mg/L and a BOD_5 concentration of 279 mg/L.

Leprino's pipelines within their facilities are sized to accommodate peak flows and can therefore accommodate a 5 MGD flow. The pipelines from the equalization tanks to the WWTP are 16-inch and are sized for 3,500 gallons per minute (gpm) and can accommodate a 5 MGD flow. The blending pipeline from the City's and Leprino's WWTPs to the pump station is a 30-inch gravity line capable of being converted to a force main. The 24-inch pipeline from the combined effluent blending location to the River Ranch has a maximum hydraulic capacity of 7.3 MGD, which is sufficient to accommodate the proposed combined effluent flow of up to 7.0 MGD.

The following table shows the maximum BOD and Total N concentrations and 5 MGD flow at EFF-002 that could be land applied without exceeding land application loading limits assuming that the City's concentrations at 2 MGD flow (EFF-001) remain constant:

Constituent	2019-2021 Average at EFF-002[(a)]	EFF-002 Treated Concentration[(b)] at 5[(c)] MGD	Approximate Combined Effluent Loading[(d)] at 7[(e)] MGD
BOD, mg/L	6.1	279	0.35 lb/Ac/day[(e)]
Total Nitrogen, mg/L	5.5	23	260 lb/Ac/yr

Notes:

(a) Treated concentrations for 3 MGD flow at EFF-002.
(b) Treated concentrations based on Probst Evaluation (Appendix C).
(c) Treated concentrations for 5 MGD flow at EFF-002.
(d) Approximate loading on 2,416 Acres using City effluent and Leprino treated effluent (EFF-003).
(e) Assume a 15-day BOD_5 load and rest cycle for irrigation.

2.2 City of Lemoore Effluent Characterization (EFF-001)

The City provides wastewater treatment services for its 27,000 residents at the WWTP 1250 South 19th Avenue in Lemoore. The process for treatment of sanitary wastewater is shown on Figure 2-1 and consists of four aerated and unaerated lagoons. The City monitors the treated effluent for flow, pH, EC, BOD_5, TSS, Total Kjeldahl Nitrogen (TKN), nitrate as nitrogen (NO_3-N), nitrite as nitrogen, ammonia as nitrogen, Total N, arsenic, selenium, TDS, and general minerals.

2.2.1 Flow and Water Quality of the City's Treated Effluent

The City's effluent flow for October 2019 through June 2021 is shown in Table 2-1. Average effluent quality data for the treated sanitary effluent are presented in Table 2-3 (the complete data set is available in the Quarterly Monitoring Reports; J.M. Lord/Leprino 2019 – 2021). Average BOD_5 in the treated effluent is 69 mg/L, average EC is 1,137 µS/cm, TDS is 620 mg/L, average TSS is 67.8 mg/L.

The City's treated effluent meets California's Title 22 requirements for recycled water [CCR Title 22, Division 4, Chapter 3 Water Recycling Criteria (CCR 2014)]. These requirements are discussed further in Section 2.5.1. The City is expected to submit a Title 22 Recycled Water Report by mid-June, 2022. This report will address the City's capability to treat 2 MGD of wastewater so that, when combined with Leprino's treated wastewater, the combined effluent will meet Title 22 Disinfected Secondary Treated 23 recycled water standards. In addition, the report will address irrigation of tomato crops when the harvested crop undergoes pathogen reduction treatment as part of the tomato paste canning process.

2.2.2 Capacity of the City's Wastewater Treatment System

The City's WWTP currently consists of four ponds (Quad Knopf 2018; Carollo Engineers 2001). The WWTP headworks consists of a bar screen rated to handle peak flows of 10 MGD peak hourly flow and two 1.67 MGD influent pumps (Carollo 2001). The first two ponds are aerated and operate in parallel. According to Carollo, the next two ponds are partially aerated and are operated in series to settle solids (Carollo 2020). The ponds have a total acreage of 8.8 acres and a volume of 80 million gallons. With the existing aeration capacity of 755 horsepower and a 2 MGD flow, 14,000 pounds of BOD_5 can be treated daily (Carollo 2001). In 2020, Carollo recommended that the City consider updating older equipment for ease of operations, increase influent pump capacity, and determine whether biosolids should be removed from the existing ponds. These comments were in reference to the overall maintenance of the facility and did not address the capacity of the WWTP treatment system.

The 2020 Carollo Master Plan (Carollo 2020) stated that the City's flow and water quality could meet the requirements of the 2019 WDR. The effluent flow and water quality limitations (including land application area loading rates) are all set for the combined effluent (EFF-003), not specifically for the City's discharge.

2.3 Combined Effluent Flow and Water Quality (EFF-003)

The flow and water quality of Leprino and Lemoore combined effluent is monitored in accordance with WDR Order No. R5-2019-0008. The average monthly combined effluent flow of 4.6 MGD is shown in Table 2-1. Average water quality of the combined effluent is summarized in Table 2-4 and the complete dataset is provided in Appendix D. Based on the dataset from October 2019 through June 2021, average BOD_5 of the combined effluent is 8.2 mg/L, average EC is 2,269 µS/cm, average boron is 0.54 mg/L, average chloride is 261 mg/L, average sodium is 328 mg/L, average SAR is 12.8, average TDS is 1,149 mg/L and average FDS is 912 mg/L.

The average monthly combined effluent flow for October 2019 through June 2021 was 4.6 MGD (Table 2-1). The average flow from Leprino's facilities was 3 MGD and the average flow for the

City was 1.7 MGD (Figure 2-2). The proposed project is for a combined effluent flow of 7 MGD. Of this total, Leprino's flow will be up to 5 MGD and the City's flow will be up to 2 MGD.

2.4 Source Water Quality for the Leprino and Lemoore Facilities

The source water used in the Leprino Facilities is supplied by the City. Average source water quality data based on two annual samples collected at the Leprino West Plant between 2020 and 2021 are summarized in Table 2-5. TDS of the source water averaged 399 mg/L and EC averaged 853 µS/cm.

2.5 Regulatory Limits for Treated Effluent Water Quality

2.5.1 Recycled Water Regulations

The combined effluent includes the City's recycled water, which is regulated by the California Code of Regulations, Title 22, Division 4, Chapter 3: Water Recycling Criteria (CCR 2014). The State Water Resources Control Board Division of Drinking Water (DDW) administers the Title 22 Recycled Water Program, and the City currently operates their WWTP according to their Title 22 Engineering Report (Quad Knopf 2018).

The City currently discharges treated effluent that meets the requirements for Disinfected Secondary 23 Recycled Water. This category requires oxidation of influent wastewater, solids removal, and disinfection to meet a standard of Total Coliform less than a median concentration of 23 MPN/100 milliliters (ml) based on the last seven samples tested (MPN/100 ml is the most probable number of total coliform colonies per 100 ml). At this treatment level, recycled water may not be applied to food crops consumed by humans (except for orchards and vineyards provided that the recycled water does not contact the edible portion of the crop, or the edible portion undergoes pathogen-destroying treatment). This recycled water can be applied to animal feed crops or pasture but cannot be applied to public areas unless access is restricted.

The proposed project involves use of the combined effluent to irrigate non-food crops including alfalfa, winter wheat, cotton, and others; these crops are appropriate for reuse of the City's recycled water. In addition, tomatoes are proposed to be grown at River Ranch. The City's Title 22 Report (see Section 2.2.1) proposes irrigation of tomatoes with recycled water when the harvested crop is subjected to pathogen destroying heat treatment during the tomato paste canning process. In a review of heat treatment during tomato paste canning, the topic was evaluated by a) consulting with staff at State agencies (California Department of Public Health and CDFA), b) reviewing the Pathogen Destroying Processes employed by the cannery who would process the River Ranch tomato crops, and c) assessing the land application practices that would be employed when tomato crops are irrigated with combined effluent. A Technical Memorandum sent to the CRWQCB by Kennedy Jenks (Kennedy Jenks 2021a) that describes the result of the evaluation is attached as Appendix E.

If DDW approves of the proposal to use tomatoes irrigated with recycled water in tomato paste canning, the City and Leprino will request that tomatoes be included as an acceptable crop in new WDRs.

2.5.2 Basin Plan Effluent Discharge Limits

The Water Quality Control Plan for the Tulare Lake Basin (Basin Plan; CRWQCB 2018a) specifies discharge limits for both municipal and industrial discharges. Because salinity is an important issue in the Tulare Lake Basin, the following discharge limit was established for industrial wastewater (Basin Plan page IV:24-25, Point 5):

5. *Limit the increase in EC of a point source discharge to surface water or land to a maximum of 500 µmhos/cm. A lower limit may be required to assure compliance with water quality objectives.*

   An exception to this EC limit may be permitted for industrial sources when the discharger technically demonstrates that allowing a greater net incremental increase in EC will result in lower mass emissions of salt and in conservation of water, provided that beneficial uses are protected.

   An exception may also be permitted for food processing industries that discharge to land and exhibit a disproportionate increase in EC of the discharge over the EC of the source water due to unavoidable concentrations of organic dissolved solids from the raw food product, provided that beneficial uses are protected. Exceptions shall be based on demonstration of best available technology and best management practices that control inorganic dissolved solids to the maximum extent feasible.

   Cull fruits and wastes from food processing generally are voluminous and may have a high water content like winery wastes. Provision should be made for thin spreading of such materials on the fields, followed promptly by disking into the soil.

   An exception from the EC limit may also be permitted consistent with the Program for Exception from Implementation of Water Quality Objectives for Salinity.

For the source water used by the City and Leprino, the “source water EC + 500 µmho/cm” value is either 1,170 µS/cm or 1,536 µS/cm depending on which well water quality is used: 1,036 or 670 µS/cm. The average source plus 500 EC is 1,353 µS/cm (see Table 2-5).

2.5.3 Basin Plan Exceptions to EC Limits for Water Conservation Efforts and Limiting Overall Discharge of Salts

As described in the section above, the Basin Plan provides two exceptions to EC discharge limits for industrial dischargers, including one for water conservation and one for limiting overall discharge of salts. The following sections describe the proposed project’s eligibility for these exceptions:

Basin Plan Exception for Water Conservation. The first exception is for industrial sources who may discharge at higher EC levels if the EC is associated with water conservation measures that result in higher salinity loading in the Facility. Leprino qualifies for this exception based on its implementation of short-term and long-term measures that reduce the use of the City’s potable water in their facilities. Leprino has decreased its use of City source water supplies (with an average EC of 853 µS/cm and an average TDS of 399 mg/L) by treating and reusing process water within its facilities. The following projects related to water conservation have been implemented at Leprino’s Lemoore facilities:

1. **Reduction or Elimination of Wash Steps in Facility Clean-in-Place (CIP) Processes**. Facility staff have streamlined CIP standard operating procedures while complying with the Pasteurized Milk Ordinance, as well as FDA and CDFA requirements.

2. **Expanded Capacity and Higher Treatment Level of the Lactose Stream RO Units**. RO treatment is used to concentrate solids in the retentate; the permeate with no salt content is recycled in certain facility applications.

3. **Handwashing Water Use Reduction Project**. At the Lemoore West Plant, Leprino implemented a handwashing water reduction project by only using hot water in handwashing sinks and eliminating the use of cold water. Check valves were installed to prevent backflow of hot water, so it is always ready for use by users. It was estimated that this saves approximately 40,968 gallons of potable water per day.

4. **East Bay Municipal Utility District Disposal of High**ly**-Saline Waste.** Highly saline wastewater generated during milk processing is concentrated and transported to East Bay Municipal Utility District for treatment and disposal. This practice removes salt from the effluent discharge.

5. **Treatment and Reuse of Condensate of Whey from Milk Processing (COW water)**. COW water is separated from milk received at the facility and treated to meet food safety requirements for treated water reuse within the facility. Use of treated COW water directly replaces use of approximately 1.6 MGD of the City's potable water which has an average TDS of 399 mg/L.

   The overall water savings and salinity reduction achieved at the Leprino facilities are:

	COW Water Reuse, MGD	City Water Use Reduction	Salt Load (TDS) Reduction, lb/Day[(a)]
Lemoore West	0.95	17% [2015 – 2017]	3,275
Lemoore East	0.60	5% [2013 - 2017]	880
Total	**1.55 MGD**	**14.5%**	**4,155 lb/Day**

Note:

(a) Assume COW Water TDS is 50 mg/L.

Leprino has demonstrated that its facilities qualify for the water conservation exception to the Basin Plan effluent limit because they have implemented both water conservation and salt removal projects in its Lemoore facilities and the EC and salinity levels in their process water are a result of these beneficial water conservation efforts. In addition, the use of combined effluent for irrigation replaces irrigation with groundwater. This conserves groundwater resources which is also a benefit for sustainability of the City's groundwater supply.

Basin Plan Exception for Organic Dissolved Solids in Food Processing Wastewater. Food processing wastewater typically has elevated levels of organic dissolved solids that are volatile and degrade readily when wastewater is discharged to land. The TDS concentration is a measurement of all dissolved solids present in a sample, while the FDS concentration is a measurement of only the fixed dissolved solids. FDS is a more accurate representation of salinity in food processing wastewater because it is a measurement of the salt ions in a sample and does not include the organic (i.e., volatile) dissolved solids.

The table below provides a comparison of EC, TDS, and FDS levels in the combined effluent and the Leprino effluent. The FDS:TDS ratio for Leprino is 0.82. This indicates that 18 percent of the TDS, 284 mg/L, will be degraded during land application and will not affect salinity. When organic dissolved solids are present in food processing wastewater, EC is not a good measure of salinity; FDS more accurately quantifies the amount of salt in wastewater. Based on the information below, Leprino qualifies for the EC exemption for organic dissolved solids.

Wastewater Source	EC (µS/cm)	TDS (mg/L)	FDS (mg/L)	FDS:TDS Ratio
City Effluent	1,137	620	-	
Leprino Effluent	2,779	1,580	1,299	0.82
Combined Effluent	2,269	1,149	912	0.79

2.5.4 Recent Basin Plan Amendments

The Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) initiative was tasked to develop a Central Valley-wide Salt and Nitrate Management Plan (SNMP). The SNMP was used to develop a Central Valley-Wide Salt and Nitrate Control Program that was incorporated into the Central Valley Basin Plans via amendments that were adopted by the CRWQCB in May 2018 (Resolution R5-2018-0034; CRWQCB 2018b). The State Water Board adopted the Basin Plan Amendments in 2019 with Resolution 2019-0057 and the Office of Administrative Law approved the Basin Plan Amendments on 17 January 2020.

Several of the Basin Plan Amendments are relevant to the Leprino and Lemoore project proposed in this report:

1. The following changes were made to effluent limits for discharge (CRWQCB 2018b):

   Modify the Basin Plan in Chapter 4 Implementation under the heading "Discharges to Land" (Basin Plan, page IV-11), as follows:

   • The incremental increase in salts from use and treatment must be controlled to the extent that is reasonable, feasible and practicable.

   • Discharges to areas that may recharge to good quality ground waters shall not exceed an applicable boron water quality objective.

   • An exception from boron limits for discharges to land may be permitted consistent with the Program for Exception from Implementation of Water Quality Objectives.

   These changes to the Basin Plan affect the proposed project which discharges of combined effluent with elevated EC, boron, and other constituents in a location where the underlying groundwater has high levels of salts and boron that already exceed water quality objectives.

2. As part of the Basin Plan Amendments, the CRWQCB also modified the use of the Title 22 Recommended, Maximum Allowable, and Short-Term Maximum Contaminant Levels (MCLs) in decision making about regulatory compliance. The Title 22 MCLs are shown in Table 2-6 (after Table 64449B, CRWQCB 2018b) and in the following table:

Constituent	Recommended	Upper Secondary WQ Standards	Short-Term
TDS, mg/L	500	1,000	1,500
EC, µS/cm	900	1,600	2,200
Chloride, mg/L	250	500	600
Sulfate, mg/L	250	500	600

Section 3: The River Ranch Land Application Area

The River Ranch has approximately 2,416 acres of farmland located 5 miles west of the City and 1 mile east of the Lemoore Naval Air Station (LNAS; see Figure 1-1). The Crescent Bypass and the South Fork Kings River comprise the eastern boundary of the River Ranch. The primary land uses in the vicinity of the site are the LNAS and production agriculture.

The River Ranch has been farmed since the early 1980s, and has been used for forage crops, alfalfa, cotton, and corn since WDRs Order No. R5-2019-0008 was adopted in 2019. The Nederend Property is adjacent to Stone Ranch and has been cropped with forage crops for the last several years.

3.1 Soils Information

Gepford Clay and Lethent Clay Loam are the primary soil types at the River Ranch as shown on Figure 3-1 (USDA 2018). Properties of these soil types are summarized in Table 3-1. The Gepford Clay soil type is located on the eastern and southeastern portion of the River Ranch. It is a very deep, poorly drained clay formed in lacustrine sediments. The surface 38 inches have a clay texture. Interbedded strata of clay loam and loam are present between 38 and 60 inches. The available water storage capacity is 6.6 inches in the surface 60 inches and the limiting saturated hydraulic conductivity is 0.16 inches/hour (USDA 2018).

The Lethent Clay Loam soil type is located on the west side of the River Ranch and generally consists of very deep, moderately well drained soils overlain on alluvial fans. The surface 31 inches have a clay loam texture and sandy loam soil is present between 31 and 60 inches. The available water storage capacity is 4.8 inches in the surface 60 inches, and the saturated hydraulic conductivity is 0.09 inches/hour (USDA 2018). Based on auger holes advanced by CES at the site in November 2017, the surface soils at the site have a clay content ranging from 34 percent to 68 percent (CES 2017).

3.2 Regional Climate Information

The climate in the project area is similar to much of California's San Joaquin Valley and is characterized by hot, dry summers and cool, moist winters. Climate data were collected from the California Irrigation Management Information System (CIMIS) Stratford Station (CIMIS 2018) and are presented in Table 3-2. Average precipitation at this station for 1983 through 2021 is 7.4 inches per year (in/yr). Average reference evapotranspiration (ETo) is 61.7 in/yr for the same period. Table 3-2 also shows a typical wetter-than-average year (2010) with a total annual precipitation of 12.6 in/yr. The 100-year annual return precipitation, 25.3 inches, is calculated from the probability distribution of the annual precipitation dataset and distributed per month in the same proportion as average precipitation.

3.3 Subsurface Drainage, Tailwater Collection, Interceptor Ditches, and Sumps on the River Ranch

A drainage system, consisting of subsurface drain lines, subsurface interceptor drains, tailwater ditches, collection sumps, and pumps was installed at the Stone Ranch in 1984. Evaporation basins were installed in 1985 to evaporate the water collected in the drainage system collection sumps. This subsurface drainage collection system is still in use today and has been well maintained by the former ranch owner, who still manages the ranch even though it is now owned by Leprino.

This section provides a description of the subsurface drainage collection system and the tailwater collection system at the River Ranch. A series of sumps are used to collect the water and discharge it to evaporation basins.

3.3.1 Tailwater Management on the Stone Ranch

In 1983, a preliminary drainage investigation was performed at the Stone Ranch by J.M. Lord, Inc (J.M. Lord 1983b). This study included the installation of 25 temporary shallow groundwater observation wells at locations throughout the Stone Ranch. The results of this study showed very shallow groundwater conditions with depth to groundwater ranging from 1 to 3 feet below ground surface (bgs) in 1983. Based on the results of this study, the installation of a subsurface drainage system was recommended by J.M. Lord, Inc. to allow for adequate drainage of the irrigated areas to support crop growth.

The subsurface drain lines beneath the Stone Ranch irrigated areas are shown on Figure 1-3. The lateral spacing of the tile drains ranges from 420 feet to 850 feet apart and they are installed approximately 8 feet bgs (J.M. Lord 1984). The drain line spacing and depths for each field are shown in Table 3-3. The field drain lines discharge into six sumps distributed throughout the Stone Ranch. Flows collected in the sumps are pumped to the evaporation basins. The sumps are controlled by high and low water level sensors, and flow measurements are recorded at the sumps.

The subsurface interceptor drains are shown in blue on Figure 1-3 and the tailwater ditches are shown in dashed green on Figure 1-4. Smaller tailwater ditches are maintained throughout the property to control runoff. These ditches discharge to the larger collection ditches.

3.3.2 Tailwater Management on the Nederend Property

There is no subsurface drainage infrastructure installed beneath the Nederend Property. Excess water, if any, is removed using tailwater ditches that collect excess water at the end of the fields (Figure 1-4). Tailwater ditches convey excess water from the end of the field back to the head of the field where it is reapplied. This self-contained system is not connected to the Stone Ranch system and is shown in detail on Figure 3-2. This system has successfully been used by the current farmer for several years and there is not a need for subsurface drainage on the Nederend Property.

3.3.3 Subsurface Interceptor Drains on the River Ranch

The subsurface interceptor drains on the Stone Ranch and Nederend Property are shown on Figure 1-3. These drains are designed to limit potential subsurface flows to the east from the irrigated areas and the evaporation basins.

The interceptor drains are situated to collect subsurface flow in three specific areas:

- **Between the Stone Ranch and Crescent Bypass**. There are interceptor drains along the entire boundary between the Stone Ranch and Crescent Bypass (Figure 1-3). The North Interceptor, located along the eastern side of Field 27, the East Interceptor, located between the evaporation basins and the Crescent Bypass, and the Field 35 Interceptor on the eastern side of Field 35 collect subsurface flows from the Stone Ranch and discharge them to the evaporation basins.

- **Between the Nederend Property and the South Fork Kings River**. The Nederend Interceptor Drain will be located between the Nederend Property and the South Fork Kings River. This interceptor drain is currently being designed and construction is anticipated to be completed in summer 2022. This interceptor drain will also be connected to the evaporation basins.

- **On all Sides of the Evaporation Basins.** Interceptor drains were installed on all sides of the evaporation basins as part of initial construction of the system in the 1980s. Interceptor drains are in place north, south, east, and west of the basins to intercept lateral flow from the evaporation basins and fields and route it back to the sumps and evaporation basins. These interceptor drains were installed to approximately 8 feet bgs (J.M. Lord 1984) and serve to limit potential groundwater impacts associated with seepage from the basins. The East Interceptor Drain was historically disconnected from the sumps and evaporation basins, but will be will be reconnected in summer 2022. Historically, the East Tailwater Ditch between the evaporation basins and Crescent Bypass was used to intercept lateral flows from the evaporation basins (if any), as described in the 2018 RWD (Kennedy Jenks 2018).

The interceptor drains described above provide a boundary between the River Ranch and surface water (the Crescent Bypass and South Fork Kings River) to the east. These interceptor drains comprise a subsurface water collection barrier designed to prevent subsurface flows from moving to the east.

3.3.4 Drainage Collector Sumps

The network of collection sumps at the Stone Ranch are shown on Figure 1-3.

Table 3-4 shows monthly flows for the sumps between second quarter 2020 and third quarter 2021 for the existing Stone Ranch discharge. The monthly flows for all sumps range between 27 and 101 acre-feet (AF). The average monthly flow for second quarter 2020 through first quarter 2021 is 50.2 AF/month.

Table 3-5 shows measured water quality for the sumps for the same time period. Constituent levels in the sumps vary among the different sumps and among the seasons. The average EC for the six sumps ranged from 7,250 to 14,400 µS/cm, average TDS ranged from 5,370 to

12,330 mg/L, average chloride ranged from 360 to 900 mg/L, and average boron ranged from 10 to 20 mg/L. The sump water quality represents the water quality of flows into the evaporation basins.

As shown on Figure 1-3, the Nederend Sump will be installed in summer 2022 to convey water collected in the Nederend Interceptor Drain. This sump will convey collected flows, if any, to the evaporation basins.

3.4 Evaporation Basins

Three evaporation basins were installed at the Stone Ranch in 1984 and occupy approximately 200 acres along the Crescent Bypass (Figure 1-3). These basins are used to evaporate the drainage water collected from the field drain lines, interceptor drains, and some tailwater ditches on the Stone Ranch that discharge to the sumps. The existing tailwater drainage infrastructure on the Nederend Property is not connected to the evaporation basins, but the Nederend Interceptor Drain that will be installed in summer 2022 will discharge to the evaporation basins.

Table 3-6 shows the dimensions and storage capacity of the evaporation basins based on the design drawings for the basins (J.M. Lord 1984). The basins have 8:1 (horizontal:vertical) side slopes and the maximum depth from the top of berm to pond bottom is approximately 5.75 feet. The basins are designed to operate with 2 feet of freeboard and 3.75 feet of operating storage depth and a maximum storage capacity of approximately 230 MG (710 AF). In preparation for construction of the evaporation basins, a permeability test was performed within the footprint of the basin and the results showed a seepage rate of 1.0×10^{-6} centimeters per second (cm/s) (BSK 1983).

The Stone Ranch MRP (Order No. R5-2019-0008) requires that water levels in the evaporation basins be measured monthly. EC is measured in the basins on a monthly basis, water samples are collected quarterly and analyzed for four constituents (selenium, arsenic, boron, and molybdenum); and general minerals are analyzed annually. Monthly water storage is shown in Table 3-7 for 2020 to 2021. Total evaporation basin storage in the three basins ranged from a maximum of 571 AF in January and February 2021 to a minimum of 153 AF in May 2021. Table 3-7 also shows flow-weighted average EC levels in each of the basins based on the monthly measurements and water levels. EC levels in the basins ranged from 8,216 µS/cm to 35,674 µS/cm.

Table 3-8 shows evaporation basins water quality data for 2020 through 2021. Arsenic levels ranged from 13 micrograms per liter (µg/L) to 64 µg/L, selenium ranged from 12 µg/L to 35 µg/L, boron ranged from 10 mg/L to 80 mg/L, and molybdenum ranged from 130 µg/L to 1,100 µg/L.

3.5 Existing River Ranch Irrigation and Monitoring Wells

There are 12 onsite irrigation wells at the River Ranch that are used to provide additional irrigation water as needed to blend with the combined effluent discharge. The well uses and water quality are briefly described below and in more detail in Section 4.

Between 1992 and 2021, there was one groundwater monitoring well at the Stone Ranch (MW-1). In October 2021, MW-1 was properly abandoned and replaced with MW-1R, and two additional monitoring wells were also installed onsite (MW-2 and MW-3, see Section 3.4.4).

3.5.1 Irrigation Wells

The locations of the irrigation wells are shown on Figure 3-3. Table 3-9 shows well construction information and available well logs are provided in the 2018 RWD (Kennedy Jenks 2018). Six of these wells range in depth from 520 to 584 feet bgs. Well 19 was installed to 1,290 feet bgs, and Well 2 was installed to 220 feet bgs. Monthly flows for the wells in 2020 and 2021 are summarized in Table 3-10.

In general, the irrigation wells have elevated EC/TDS, SAR, chloride, boron, and sodium levels and are marginal for irrigation use. Groundwater from these wells is currently blended with the combined effluent and used to manage the SAR and EC in the applied water to maintain acceptable levels for crops. The 2020-2021 water quality for these wells is shown in Table 3-11. EC levels ranged from 710 μS/cm to 8,650 μS/cm, TDS ranged from 410 mg/L to 1,295 mg/L, chloride ranged from 45 mg/L to 140 mg/L, boron ranged from 1.6 mg/L to 2.5 mg/L, and the SAR ranged from 7.7 to 22.

3.5.2 Shallow Groundwater Monitoring Locations

This section describes the installation of past and current groundwater monitoring wells and piezometers. An analysis of the available data and site groundwater characterization is presented in Section 4.3.

3.5.2.1 Groundwater Monitoring Locations Installed Prior to September 2021

One shallow groundwater monitoring well, MW-1, was installed at the Stone Ranch in 1992. This well was located between the west and north evaporation basin cells (Figure 3-4). This well was installed to a total depth of 69 feet bgs and the screened interval was from 46 to 56 feet bgs (BSK 1992). Between 1993 and 2019, depth to groundwater and EC levels were monitored at this well on a quarterly basis, and an annual sample was analyzed for EC, general minerals, arsenic, boron, molybdenum, and selenium. Since the current WDRs were adopted in 2019, a more complete suite of analytes has been measured and reported.

Four arrays of piezometers were installed in 1992 around the Stone Ranch evaporation basins to a depth of 14 feet bgs. The locations of the arrays are shown on Figure 3-4. There are five piezometers in each array (20 piezometers total). Each array has at least one piezometer installed inside the footprint of an evaporation basin and below freeboard. Another piezometer is placed at the top of a levee adjacent to the pond. The remaining piezometers within each array are spaced along transects that cross berms, access roads, and irrigation supply canals. The individual piezometers within each array that are installed furthest from the evaporation basins are either in farmed fields or, in the case of piezometer array 1 (P-1), adjacent to the Crescent Bypass. Depth to groundwater and EC levels are monitored at all piezometers quarterly in accordance with MRP.

3.5.2.2 2021 Installation of Additional Monitoring Wells

After discussions with CRWQCB staff and managers, Leprino proposed to install additional monitoring wells to address needs for additional groundwater and subsurface characterization data for the River Ranch. During a site visit in August 2021, Kennedy Jenks used a downhole camera to inspect existing monitoring well MW-1 near the evaporation basins. The camera allowed a Professional Geologist to identify three locations near ground surface where the

2-inch PVC casing was damaged. The well screen was found to be partially obstructed in some locations and significantly damaged at other locations. A pipe or bailer was found resting at the bottom of the casing. The geologist recommended that well MW-1 be properly abandoned and replaced by another monitoring well close to MW-1.

Three well locations were selected to provide sufficient spatial variability to provide data to calculate groundwater flow direction and gradient. The locations of the three monitoring wells are shown on Figure 3-4. The location of MW-1R was selected so data from the new well could be used along with the existing nearly 30-year water quality dataset collected at MW-1. The location of MW-2 was selected on the western side of the River Ranch to provide groundwater quality data in this area. The location of MW-3 was selected in the Nederend Property, west of the South Fork Kings River to provide groundwater quality data beneath the Nederend Property.

A Monitoring Well Installation Work Plan was submitted to the CRWQCB on 9 September 2021 (Kennedy Jenks 2021b). The proposed plan was approved via a telephone conversation followed by a 23 September 2021 email from CRWQCB management (*email from Scott Hatton, CRWQCB, to Stuart Childs, Kennedy Jenks, 23 September 2021*). On 24 September 2021, Kennedy Jenks submitted a Memorandum to the CRWQCB addressing a question asked by CRWQCB management regarding the date for submittal of the Monitoring Well Installation Report (*Memorandum from Childs, McLeod, and Wild, Kennedy Jenks, to Scott Hatton, CRWQCB, 24 September 2021*).

On 23 September 2021, MW-1 was properly abandoned in accordance with County standards, and MW-1R was constructed nearby as a replacement. MW-2 was completed on 24 September 2021 and MW-3 was completed on 22 October 2021. Development of the three wells occurred on 29 October 2021. Monitoring well construction details for the new wells are provided in Table 3-12. The *River Ranch Monitoring Well Installation Report* describing installation, construction, sampling, and development methods of the new wells was submitted to the CRWQCB on 2 February 2022 (Kennedy Jenks 2022). The stratigraphy encountered in these wells and the data collected in the initial samples are discussed in Section 4.

3.6 Solids Monitoring

The Monitoring and Reporting Program requires that the City's biosolids (BIO-001) and Leprino's wastewater treatment solids (BIO-002) be characterized before being applied to land.

3.6.1 City Biosolids

For the City's biosolids, arsenic, lead, nickel, cadmium, mercury, selenium, copper, molybdenum, and zinc are analyzed for. Prior to land application, the City must demonstrate that the treated biosolids meet Class A or Class B pathogen reduction criteria.

The City has not land applied any solids from October 2019 through September 2021, so no samples were collected.

3.6.2 Leprino Solids Monitoring

For Leprino's solids, composite samples of solids are collected prior to land application. These samples are analyzed for total solids, total nitrogen, total phosphorus, total potassium, and metals (including arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc).

Table 3-13 summarizes the volume of Leprino solids applied to land between January 2020 and September 2021. The solids were applied during most months, primarily to two locations: the Verwey site and the Stone Ranch. According to the Quarterly Monitoring Reports, the Verwey field received approximately 25,000 wet tons of solids (measured before drying the sample) between January 2020 and September 2021. During the same period, the Stone Ranch received approximately 27,000 tons (J.M. Lord/Leprino 2019 – 2021).

Table 3-13 also summarizes key constituent levels in the solids. Total solids content averaged approximately 16 percent on a dry weight basis and the solids contained 4.6 percent total nitrogen. Metals content of the solids averaged 4.3 milligrams per kilogram (mg/kg), 4.3 mg/kg arsenic, 10 mg/kg copper, 3.4 mg/kg molybdenum, 4 mg/kg nickel, and 72 mg/kg zinc. Cadmium, mercury, and selenium were generally not detected above the laboratory reporting limits.

Section 4: Hydrology and Hydrogeology at the River Ranch

This section addresses the hydrology and hydrogeology in the vicinity of the River Ranch.

4.1 Surface Water Hydrology

Surface waters in the vicinity of the River Ranch include the South Fork Kings River and the Crescent Bypass of the Lower Kings River. The site lies within the Lower Kings River Hydrologic Area (No. 551.80). The Tulare Lake Basin Plan specifies the beneficial uses of the Kings River from Peoples Weir to Empire Weir No. 2 on the South Fork Kings River as agricultural supply, water contact and non-contact water recreation, warm freshwater habitat, wildlife habitat, and groundwater recharge (CRWQCB 2018a). When water resources are available, flow in the Kings River is controlled by releases from the Pine Flat Dam and is conveyed to several hundred thousand acres of farmland in the Tulare Lake Basin area (Summers 1983).

The Crescent Bypass is a man-made channel constructed in the 1930s between a control structure on the North Fork Kings River and the South Fork Kings River. The Crescent Bypass is a constructed, diked channel designed to convey flood waters to the Tulare Lake Basin under extreme flow conditions. It has been rarely used since 1969 (KRCD 2009). Field observations of the section of the Crescent Bypass in January and February 2018 and in July, September, and November 2021 indicated that there was standing water and minimal flow through a small channel approximately 3 feet wide and 3 inches deep. Based on review of historical photographs, there appears to be either minimal or no flow in this channel during most years.

The South Fork Kings River and the Crescent Bypass combine into a single channel immediately east of Field 35 of the River Ranch. Based on review of historical photographs, the South Fork Kings River channel appears to have water flow in most years when water is released from the Pine Flat Dam. At the confluence of the South Fork Kings River and the Crescent Bypass, flows in the South Fork Kings River appear to back up into the outlet of the Crescent Bypass. Kings River water may back up for a distance of as much as 1,500 feet during some years.

4.1.1 Surface Water Protection at the River Ranch

There are no direct connections between the River Ranch drainage collection system, irrigation system or tailwater collection system and the Crescent Bypass, South Fork Kings River, or the wetland area to the south.

The drainage collection system on the Stone Ranch consists of subsurface drain lines, subsurface interceptor drains, tailwater ditches, collection sumps, and pumps that were installed in 1984. Evaporation basins were installed in 1985 to evaporate the water collected in the drainage system collection sumps (Figure 1-3). The Nederend property does not have subsurface drainage collection features beneath the irrigated area, but the existing irrigation and tailwater collection system have been successfully used by the current farmer for many years (Figure 3-2). The Nederend Interceptor Drain will be installed between the Nederend Property and the South Fork Kings River in summer 2022.

The River Ranch drainage collection system was designed with interceptor drains to prevent lateral flow between the evaporation basins and irrigated areas and the nearby Crescent Bypass and South Fork Kings River. Figure 4-1 shows the elevations of the key surface water bodies and the drainage and interceptor features that collect water on the River Ranch. Elevations of the drainage and surface water features were obtained from a survey conducted in December 2021 by Quad Knopf & Associates (Quad Knopf 2022). The relative elevations of collection drains, groundwater, and surface water features on the River Ranch were compared to confirm that drainage water and groundwater on the River Ranch will be controlled before reaching surface water.

The upper graph on Figure 4-1 shows approximate elevations of the Crescent Bypass streambed, [193.6 feet above mean sea level (ft amsl)], the bottom of the evaporation basins (201 ft amsl), and the invert elevations of the subsurface interceptor drains (North Interceptor, West Interceptor, South Interceptor, East Interceptor, and Field 35 Interceptor). Groundwater elevations are also shown for observations between October/ November 2021 and January 2022 (dates are shown on the horizontal axis). Monitoring well MW-1R is spatially closest to the Crescent Bypass, MW-3 is closest to the South Fork Kings River, and MW-2 is approximately 1.5 miles west of the South Fork Kings River.

The interceptors are deeper than the 2021 and 2022 groundwater elevation levels and deeper than the evaporation basins. The North Interceptor, East Interceptor, and Field 35 Interceptor comprise a barrier between the evaporation basins and the Crescent Bypass (Figure 1-3). The interceptor elevations are also lower than the land application area ground surface and lower than the drain line depth on the irrigated areas.

The lower graph on Figure 4-1 shows approximate elevations of the South Fork Kings River streambed and the proposed invert elevation of the Nederend Interceptor Drain (Figure 1-3). The 2021 survey revealed that the existing 6-foot deep interceptor ditch on the Nederend property was approximately 2.6 feet shallower than the elevation of the adjacent river bottom. As a result, Leprino is in the process of installing an interceptor drain along the entire eastern boundary of the Nederend Property that will be below the elevation of the river. The existing Nederend Interceptor ditch will remain. Once complete in summer 2022, the Nederend Interceptor Drain will be deeper than the river bottom in order to intercept lateral flow, if any, between the irrigated areas on the Nederend Property and the South Fork Kings River.

The results of this assessment confirm that the interceptor drains on the Stone Ranch are designed and constructed to prevent lateral flow between the evaporation basins and irrigated areas and the nearby Crescent Bypass. The proposed construction of the Nederend Interceptor Drain that will be completed in summer 2022 will prevent lateral flow between the irrigated areas on the Nederend Property and the South Fork Kings River.

4.1.2 The Navy Ditch

The “Navy Ditch” runs from the Lemoore Naval Air Station through the Stone Ranch property north of the evaporation basins as shown on Figure 1-2. This ditch historically discharged to the Crescent Bypass, but the connection was blocked with an earthen dam in the late 1980s. No discharges occur from either the River Ranch to the Navy Ditch or from the Navy Ditch to the Crescent Bypass.

4.2 Geology and Hydrogeology

4.2.1 Stratigraphy and Geology in the Project Area

The River Ranch is located in the Kings Groundwater Basin 5-022.08 within the Tulare Lake Hydrologic Region (DWR 2016). In this area, the groundwater aquifers of importance reside in unconsolidated sediments above consolidated marine deposits (Croft and Gordon 1968). The oldest unconsolidated sediments are of Pliocene or Pleistocene age and are generally continental deposits. The older Pleistocene and younger Recent alluvium are formed in alluvial sediments from the Sierra Nevada in locations east of Lemoore. In the area near the central axis of the San Joaquin Valley, and in or adjacent to the Tulare Lakebed, lacustrine and marsh deposits comprise a larger percentage of the alluvial sediments than further to the east. In the area west of Lemoore, there may also be a component of alluvial material from the Coast Range. Croft and Gordon note that, due to the mixed depositional environment, the unconsolidated sediments in this area of the Central Valley are referred to as undifferentiated with respect to sediment source. In the area west of Lemoore, the proportion of lacustrine deposits results in finer textured sediments with different physical and geochemical properties than alluvium from the Sierra Nevada further to the east.

There are three primary clay layers beneath the site that restrict downward migration of groundwater. These layers are lacustrine deposits with very fine, clay-rich textures. A cross section showing the approximate locations of these clay layers is provided on Figure 4-2 (Summers 1983). The lacustrine clay layers are mapped as present in the project area:

- **A Clay.** The first layer, referred to as the “A Clay”, is approximately 60 to 100 feet bgs. Former groundwater monitoring well (MW-1) was installed in 1992 at the Stone Ranch on a berm and roadway between the north and west evaporation basin cells (Figure 3-4). This well was installed to a total depth of 69 feet bgs and a flexible wall permeability test was performed on a soil sample obtained from this depth. The results of this test indicate a vertical permeability of 5.2×10^{-8} cm/s in the A Clay (BSK 1992).

  Three monitoring wells (MW-1R, MW-2, and MW-3) were installed in September and October 2021 (Kennedy Jenks 2022). All borings were advanced into the A Clay so that the entire depth to the A Clay could be logged:

  - The boring for MW-1R was advanced through 15 feet of clays and silts underlain by poorly graded sand to 30 feet bgs. Beneath clay layers from 30 to 33.5 feet bgs, poorly graded sand was present to 50 feet bgs where the A Clay was encountered.
  - The boring for MW-2 encountered finer grained clay and clay-silt mixtures from the surface. There were three silty sand zones between 35 and 51 feet bgs. At 55 feet, stiff clay was encountered, and the boring was terminated in the A Clay at 65 feet bgs.
  - The MW-3 boring encountered clay and silty sand to 9 feet bgs, underlain by poorly graded sand to 38 feet with a clay layer between 34.5 and 36 feet bgs. Clays were encountered between 38 and 62 feet bgs.

- **C Clay.** The C Clay is approximately 250 to 300 feet bgs in the project area. The River Ranch has one irrigation well, Well 2, screened between the A Clay and C Clay.

- **E Clay.** The E Clay, equivalent to the Corcoran Clay, is located between 610 and 700 feet bgs. The majority of the River Ranch irrigation wells are completed in the zone between the C and E Clays. Irrigation Well 19 is completed below the E Clay.

In the area west of Lemoore and near the Tulare Lakebed, groundwater geochemistry is generally dominated by sodium and bicarbonate (Croft and Gordon 1968). Sodium, bicarbonate, and sulfate dominate the shallow groundwater in the project area. In some areas, often further to the west, groundwater geochemistry is sodium and sulfate dominated.

Shallow groundwater above the A Clay beneath the project area is of poor quality (discussed further in Section 4.3.2). There is no known beneficial use for the shallow groundwater; it cannot be used for municipal, domestic, industrial, or agricultural supply without extensive treatment to reduce high levels of EC, TDS, boron, chloride, sulfate, and sodium.

Shallow groundwater between the A Clay and E Clay is commonly used as an irrigation water supply in the area. For the wells at the River Ranch, water quality is described in Table 3-11. The range in key constituents is as follows:

Constituent	Range
EC,	710 – 8,650, µS/cm
TDS	410 – 1,295 mg/L
Chloride	45 – 140 mg/L
Boron	1.6 – 2.5 mg/L
SAR	7.7 - 22

The average combined effluent concentrations fall within the range of irrigation well concentrations for EC, TDS, and SAR. Combined effluent chloride is higher than the irrigation well range and combined effluent boron is lower than the irrigation well range.

Water underlying the C Clay and above the E Clay, is of marginal quality, but is used for irrigation supply at the Stone Ranch. The deeper confined groundwater beneath the E Clay can be beneficially used for municipal, agricultural, and industrial supply.

4.3 Site Groundwater Characterization

This section provides information regarding current and historical groundwater conditions beneath the Stone Ranch, and the results of recent monitoring data collected from new monitoring wells MW-1R, MW-2, and MW-3.

4.3.1 Groundwater Flow Direction in the Vicinity of the River Ranch

Regional groundwater flow in the deeper groundwater beneath the project area is to the southwest, towards the Tulare Lakebed (DWR 2006). This observation is based on deeper groundwater zones and does not address groundwater flow in the shallow groundwater zone above the A Clay.

4.3.2 Shallow Groundwater Flow Direction Beneath the River Ranch

Three groundwater studies have addressed groundwater flow direction above the A Clay beneath the River Ranch:

- In a 1982 study of the area (Summers 1983), the shallow groundwater above the A Clay is referred to as 'perched' because groundwater levels are nearer to ground surface than in nearby areas where the underlying A Clay is not present. The shallow groundwater flow direction in the vicinity of the River Ranch was found to be towards the southwest on the east side of the Crescent Bypass and towards the northeast on the west side of the Crescent Bypass.
- A 1983 study (JM Lord 1983b) found that the groundwater flow direction established by 25 shallow observation wells, indicated that the shallow groundwater was moving toward the east northeast. The depth to groundwater ranged from 1 to 4 feet bgs because the field drainage system had not yet been installed.
- Kennedy Jenks installed three shallow groundwater monitoring wells in 2021 (Kennedy Jenks 2022). Initial groundwater levels and elevations from MW-1R, MW-2, and MW-3 are summarized in Table 4-1. Water levels in all three new wells were measured during development on 29 October 2021. Levels were measured again in MW-1R and MW-2 on 2 November 2021 and in MW-2 and MW-3 on 10 November 2021. Groundwater levels at all three wells were measured again on 26 January 2022 by Dellavalle Laboratories, Inc. The groundwater depth at MW-1R was initially about 14 feet below top of casing (TOC) or 194.1 ft amsl. Water level at MW-1R increased to 195.5 ft amsl by January 2022. The water level in MW-2 was initially 6.8 feet below TOC or 204.7 ft amsl, and the water level elevation at each sampling event has decreased; the January 2022 measurement was 199.7 ft amsl. The water level in MW-3 was 6.7 feet below TOC, or 193.2 ft amsl at development and 192.7 ft amsl in January 2022.

Shallow groundwater elevations above the A Clay on 29 October 2021 are contoured on Figure 3-4. As shown on the figure, the elevations from the three wells show the groundwater gradient direction was to the northeast with a magnitude of 0.0016 feet/foot (8.46 feet/mile). In January 2022, the groundwater gradient direction was also to the northeast with a magnitude of 0.001 feet/foot (5.02 feet/mile).

4.3.3 Shallow Groundwater Quality in the Vicinity of the River Ranch

Shallow groundwater quality in the vicinity of the River Ranch has long been known to be saline and generally unsuitable for agricultural use (Summers 1983; *South Fork Kings River Drainage Study*). Summers explained that a low permeability clay layer at 60 to 90 feet bgs restricts drainage in the area (see Section 4.2.1). Summers further noted that the combination of evaporative concentration of salts during crop growth and restricted drainage result in both a shallow depth to groundwater and high salinity in the shallow groundwater. Previous investigations that have addressed poor groundwater quality at or near the River Ranch include:

1. 1986 and 1998 drainage sump TDS, EC, and boron data were collected as part of the *Department of Water Resources (DWR) San Joaquin Valley Drainage Monitoring Program* (DWR 1988, 2002). Figure 4-3 shows long-term (1988-1998) EC and boron measurements made at three sumps at or just west of the Stone Ranch. Table 4-2 summarizes TDS, EC,

boron, chloride, sodium, and sulfate measurements between 1986 and 1998 for five drainage sumps at or adjacent to the Stone Ranch. Average values for sump TDS, EC, and boron are as follows:

Average TDS (mg/L)		Average EC (µS/cm)		Average Boron (mg/L)	
1986	1998	1986	1998	1986	1998
25,896	18,486	24,247	19,636	26	30

The DWR monitoring results indicate high levels of TDS, EC, and boron. The dataset also indicates that the levels of TDS, EC, and sodium decreased by 19 to 29 percent between the 1986 and 1998 measurements.

2. A study of shallow groundwater conditions adjacent to Stone Ranch was conducted at or east of the Lemoore Naval Air Station in 2011 and 2012 (Wang 2013; *Shallow Saline Aquifer Monitoring at Naval Air Station Lemoore, Fresno and Kings County, California).* This study included temporary monitoring well locations at and adjacent to the River Ranch and demonstrated the saline nature of shallow groundwater in the area. Soil sampling at intervals below ground surface demonstrated that EC and TDS increased rapidly once the shallow groundwater beneath the site was reached. Figure 4-4 shows the locations of the wells from the Wang Study installed near or at the Stone Ranch. This figure also shows locations and water quality of 2017 auger hole groundwater grab samples. This information demonstrates the variability of TDS levels across the River Ranch.

3. In a 1988 report on the Stone Ranch Evaporation Basins (J.M. Lord 1988, Section V), the following observations were made regarding past attempts to find good quality shallow groundwater:

   "…The water is high in salts. However, the groundwater underlying the basin was known to be salty before the pond was constructed. In the 1970's the Stones [landowner] drilled two irrigation wells, one in the southeast corner of the basin and the other a half a mile west of the southwest corner of the basin. In both places the groundwater in the top 60 feet was found to be far too salty to be useful for irrigation..."

4. On 6 August 1993, the Final Environmental Impact Report for the Stone Ranch Evaporation Basins was adopted by the CRWQCB via Resolution 93-155 and WDRs No. 93-156 were issued (Finding 17, R5-2019-0008). The 1993 WDRs document the following concentrations and EC for the drainage sump discharges to the evaporation basins (Finding 5, Order No. 93-155) and the initial samples of groundwater from a monitoring well at the Stone Ranch installed in late 1992 (Finding 18, Order No. 93-155).

	TDS, mg/L	EC, µS/cm	Boron, mg/L
Sump Discharge			
Average:	17,435	17,575	20
Range:	7,100 – 34,100	8,660 – 35,000	8.3 - 38
MW-1			
Range:	60,000 – 63,000	51,500 – 53,500	47 - 64

Based on the results above, the CRWQCB found, in Finding 23 (Order No. 93-155), that the discharge complied with California's Policy for Protection of High Quality Waters (State Water Resources Control Board 1968). Finding 24 (Order No. 93-155) found the discharge is consistent with the Basin Plan and Findings 27, 28, and 30 (Order No. 93-155) conclude that the shallow groundwater "…*is not expected to supply a public water system*."

WDRs (Order No. 98-229) is based on or incorporated many of the 1993 findings mentioned above. Finding 23 (Order No. 93-155) states the following regarding shallow groundwater:

23. *The groundwater in the upper portion of the aquifer within one mile of the basin does not have the beneficial use of municipal. The TDS typically exceeds 3,000 mg/1 and the water contains excessive amounts of boron, chloride, sulfate, and sodium. This water cannot be used for municipal or domestic supply without extensive treatment, which is uneconomical when excellent quality surface water (from the California Aqueduct or Kings River) and good quality groundwater (below the "E" clay) are available. It is therefore not expected to ever supply a public water system.*

4.3.4 Shallow Groundwater Quality Beneath the River Ranch

Monitoring well MW-1 was installed in 1992 and was located between the northern and western cells of the evaporation basins. It was installed to a total depth of 69 feet bgs, with the screened interval from 46 to 56 feet bgs (BSK 1992). Water level and EC were monitored at MW-1 until this well was decommissioned in 2021. Historical water quality data including TDS, chloride, sodium, and boron concentrations from 1993 through 2021 at MW-1 are shown on Figure 4-5. EC measurements display consistent levels ranging between 37,000 µS/cm to 49,700 µS/cm with an overall decreasing trend since 1993. The historical dataset of water quality data collected from MW-1 from 1993 to 2018 is presented in Table 4-3. Between 1993 and 2021, TDS concentrations at MW-1 have ranged from 37,000 mg/L to 60,000 mg/L with an average of 49,233 mg/L. Chloride has ranged from 2,500 mg/L to 5,400 mg/L with an average of 3,303 mg/L. Boron has ranged from 22 mg/L to 57 mg/L with an average of 45 mg/L. Sodium has ranged from 1,600 mg/L to 17,200 mg/L with an average of 13,238 mg/L.

In accordance with the Stone Ranch MRP (R5-2019-0008), samples have been collected quarterly from MW-1 and analyzed for TDS, EC, pH, nitrate as nitrogen, nitrite as nitrogen, ammonia nitrogen, total N, arsenic, selenium, boron, calcium, chloride, iron, manganese, magnesium, potassium, sodium, sulfate, total alkalinity, bicarbonate, carbonate, hydroxide, and hardness until it was decommissioned in 2021. The dataset of recent water quality data collected from MW-1 from 2020 to 2021 is presented in Table 4-4.

New groundwater monitoring wells MW-1R and MW-2 were sampled on 2 November 2021, and new groundwater monitoring well MW-3 was sampled on 10 November 2021. A second sample was also collected from well MW-2 on 10 November 2021. More information on this sampling event is summarized in the *River Ranch Monitoring Well Installation Report* (Kennedy Jenks 2022). All three wells were sampled using low-flow methods and the results are summarized in Table 4-4. The dedicated tubing intake was placed at 16 feet bgs in wells MW-1R and MW-3 (in the shallow part of the permeable aquifer section). Two samples from two separate zones were collected from MW-2: a shallow sample collected from 18 feet bgs on 2 November 2021 and a deeper sample collected from 43 feet bgs on 10 November 2021.

Concentrations of key constituents from the sample collected at 16 feet bgs from MW-1R were higher than those from the sample collected from 52 feet bgs in the former well MW-1 in September 2021. The laboratory EC of 65,000 µS/cm at MW-1R was higher than the typical values from the former well MW-1 (average 41,714 µS/cm). Other cations and anions were also higher at MW-1R, as were alkalinity, hardness, and manganese. Total Oxidizable Nitrogen as Nitrogen (TON) was detected at 0.48 mg/L, similar to results collected at the former well MW-1.

Two samples were collected from MW-2 at 16 feet bgs and 43 feet bgs in November 2021. As summarized in Table 4-4, the concentrations of most analytes in the two samples were similar to each other and most were lower than results at MW-1R and MW-3. The TDS in both initial samples from MW-2 was 2,700 mg/L. The TON results at MW-2 were 8.6 mg/L and 14 mg/L. The TON was distinctly higher in the deeper sample and both TON results were higher than results at MW-1R and MW-3.

In the sample collected at 16 feet bgs in MW-3, the TDS, EC, and most other analyte concentrations were between the MW-1R and MW-2 results but closer to MW-1R. The TDS at MW-3 was 40,000 mg/L, more similar to the MW-1R result of 85,000 mg/L than the MW-2 result of 2,700 mg/L. The TON and TKN also more closely resembled MW-1R, with TON at 0.44 mg/L and 0.53 mg/L and the TKN in both samples at 1.7 mg/L.

Additional samples from all three wells were collected by Dellavalle Laboratories, Inc. on 26 January 2022, but low flow methods were not used. The partial results are summarized in Table 4-4. In the future, low-flow sampling methods will continue to be used for sampling of these wells.

4.3.5 Variations in Groundwater Quality Beneath the River Ranch

Information from the three new monitoring wells at the River Ranch demonstrate significant variability in both water level elevation and water quality. In Section 4.3.1, a marked difference in stratigraphy between monitoring well MW-2 and both MW-1R and MW-3 was noted.

Figure 4-1 shows that water levels in MW-1R and MW-3 varied by 1.3 feet in elevation between early November 2021 and late January 2022. During the same period, MW-2 consistently decreased and the total water level elevation change was approximately 5 feet. Well MW-2 is located adjacent to the canal system on the western side of the River Ranch that supplies blended combined effluent and groundwater to the fields. The large, consistent change in water level could be the result of some canal seepage during summer and fall followed by less seepage when the canal was largely empty during winter.

Water quality of samples collected at the monitoring wells also vary significantly among the wells. Wells MW-1R and MW-3 show the expected high salinity (EC, TDS, chloride, sodium, sulfate) common in the groundwater above the A-Clay in the area. TDS at MW-1R is greater than 80,000 mg/L and TDS at MW-3 is greater than 40,000 mg/L. TDS at MW-2 has ranged from 2,700 mg/L in November 2021 to 3,080 mg/L in late January 2020. The results of 2011 and 2012 sampling in the western portion of the River Ranch also showed spatial variation in TDS (Wang 2013).

MW-2 also has a higher average total nitrogen concentration (10.8 mg/L) than either MW-1R (5.1 mg/L) or MW-3 (3.2 mg/L). MW-2 is located upgradient of the other wells in a location surrounded by agricultural production; nitrogen levels may have been affected by upgradient agricultural practices. Leprino plans to continue evaluating water quality of the wells to identify factors that may affect water quality.

Section 5: The Proposed Project for Wastewater Irrigation

This section provides the design flows, constituent concentrations, and water management methods for the proposed project at the River Ranch. Water and salt balance calculations for the irrigated areas and evaporation basins are used to evaluate the suitability of five combined effluent irrigation scenarios. The analyses address agronomic suitability, the ability to manage the flow increase to 7 MGD on the increased land application acreage (2,416 acres), and potential groundwater impacts of the proposed project. A groundwater antidegradation analysis is presented in Section 6.

5.1 Design Wastewater Flow and Groundwater Blending

The proposed project describes management practices for the discharge of up to 7 MGD of combined effluent from the City and Leprino to the River Ranch. Treated effluent will then be combined with supplemental water from twelve existing irrigation supply wells or other suitable irrigation water supplies and used to irrigate crops on up to 2,416 acres of farmland. The proposed project addresses water supply blending, irrigation management and scheduling.

5.1.1 Design Wastewater Flow

An average monthly flow of up to 7.0 MGD of combined effluent is proposed to be discharged to the River Ranch. Based on flow measurements from 2019 to 2021, the current average flow of the combined effluent is 4.6 MGD, the City's average flow is 1.7 MGD, and Leprino's average flow is 3 MGD. For the proposed project, the monthly average maximum flow from the City will be 2.0 MGD and the monthly average maximum flow from Leprino will be 5.0 MGD. The water and salt balances shown in this section use 7.0 MGD of combined effluent as an input.

5.1.2 Groundwater Blending Methods

The River Ranch has an existing irrigation water distribution system that consists of a series of canals used to distribute irrigation water to the ranch fields. Figure 5-1 shows the layout of this irrigation canal system and the irrigation supply wells. The canal system is currently used for combined effluent delivery to Stone Ranch. The connections that will supply combined effluent to the Nederend Property in the future are not currently operational. Supplemental groundwater and combined effluent will be blended in the canal system and applied to the Stone Ranch cropped areas. The irrigation wells have differing pumping rates (Table 3-9) and water quality (Table 3-11). Well 19, which is completed below the E Clay, has good water quality and is used frequently. There are several wells with low EC and high SAR and other wells with high EC and low SAR. These wells can be used in pairs so that the good water quality of one well offsets the poorer quality of the other well. The consistent water quality of the combined effluent will be beneficial in balancing out the negative aspects of the other irrigation water supplies. Finally, there are facilities along the canals used to add gypsum or sulfur to irrigation water to correct potential effects of high sodium on soil permeability.

5.2 Field Soil Water and Salt Balances for the Cropped Fields

Water and salt balance models were developed for each of the cropping scenarios. A water and salt balance were also developed for the evaporation basins (see Section 5.3). Figure 5-2 shows a schematic of the inputs and outputs of the two models. The field soil water and salt balances are used to determine appropriate irrigation schedules for crops, including the need for percolation below the root zone to manage accumulated root zone salinity that can affect crop growth.

The proposed project includes an irrigation program for the combined effluent and groundwater that incorporates a number of crops and irrigation methods. This flexibility is necessary to allow combined effluent management practices to change in response to climate, markets for crops, availability of supplemental irrigation water, and other factors. Table 5-1 shows five crop, climate and irrigation management scenarios that are used to represent the range of conditions at the River Ranch. They are also used to assess the potential impacts of the proposed project.

Three climate conditions were used for the water and salt balances. Climate data, precipitation, and reference evapotranspiration were collected from the CIMIS Stratford Station with an average annual precipitation of 7.4 in/yr based on a 38-year dataset from 1983 to 2021 (Table 3-2; CIMIS 2021). The 2010 rainfall (12.6 in/yr) and reference evaporation from the Stratford station are used to represent a climate condition with above average rainfall (wet year). This annual precipitation amount is equivalent to an 8-year return period annual precipitation. One scenario was also developed using the 100-year return period annual precipitation to assess hydraulic loading on the land application areas and the evaporation basins.

Two cropping plans were evaluated for the proposed project. The first shows proposed cropping for 2022 when an emphasis is placed on having a maximum acreage planted during fall and winter. The scenarios are shown in Table 5-1 and described below:

- **Scenario 1:** This scenario uses average climate conditions with proposed 2022 cropping conditions that include 591 acres of triticale silage/ corn double crop, 151 acres of triticale grain winter crop, 322 acres of alfalfa (perennial), and 832 acres of cotton with a winter cover crop. On the Nederend property, this scenario has 286 acres of alfalfa and 234 acres of cotton with a winter cover crop. The total acreage for scenario is 2,416 acres.
- **Scenario 2:** This scenario uses average climate conditions with alternative 2022 cropping conditions that include the same cropped acreage as Scenario 1 except the 832 acres of cotton on the Stone Ranch are reduced to 538 acres and 294 acres of tomatoes and summer forage are included. The total acreage for this scenario is 2,416 acres. The tomato crops replace cotton because both these crops use drip irrigation systems. The tomato crops will be processed for tomato paste because the canning process meets Title 22 requirements for pathogen removal. The crops used in both Scenarios 1 and 2 may change the acreage used for various crops according to changing land management and crop market conditions.
- **Scenario 3:** This scenario uses the Scenario 1 cropping with above average, wet climate conditions (approximately 8-year return period precipitation).

- **Scenario 4:** This scenario uses the Scenario 2 cropping with above average, wet climate conditions (approximately 8-year return period precipitation).
- **Scenario 5:** This scenario uses 100-year return period annual climate conditions with the same cropping as Scenario 2.

Field soil water and salt balances are calculated simultaneously for each crop in the scenario evaluated. Simultaneous calculations are required so that the combined effluent can be apportioned among all the fields, as required. The components and calculation procedures for the field soil water and salt balances are:

- **Monthly Inputs:** Rainfall, combined effluent, and groundwater that are blended and applied as irrigation.
- **Monthly Outputs:** Crop evapotranspiration from the root zone and percolation below the root zone. For the purposes of this analysis, crop uptake of salts was not included in the calculation.
- **Soil Water and Salt Balance Equations.** The salt balance is calculated along with the soil water balance for each crop in a scenario. Both are mass balance equations and the calculating equations for each crop within a scenario are:

$$[SW1_{t1} + DR1] = SW1_{t0} + PPT + IRR1 - ET1$$

where

$SW1_{t1}$	Soil water storage for crop, current month (t1)
$SW1_{t0}$	Soil water storage for crop, previous month (t0)
PPT	Precipitation (effective)
IRR1	Irrigation of blended effluent and groundwater on crop
ET1	Crop evapotranspiration
DR1	Percolation below the crop root zone

The salt balance equation is as follows for each crop within a scenario:

$$C1_{t1} = \frac{SW1_{t0} * C1_{t0} + PPT * CP + IRR1 * CI1}{SW1_{t0} + PPT + IRR1 - ET1}$$

where

$C1_{t1}$	Soil water EC for crop, current month
$C1_{t0}$	Soil water EC for crop, previous month
CI1	Irrigation water EC
CP	Precipitation EC

- **Calculation of Percolation.** The first water balance equation shown is used to calculate the sum of soil water storage plus percolation. Each month, the inputs are added to the soil water stored at the beginning of the month and the evaporation is subtracted to calculate soil water storage and drainage at the end of the month. If the calculated soil water storage is greater than the storage capacity of the soil, then the soil is assumed to be at field capacity and the remaining water percolates below the root zone. As discussed in

Section 5.3.1, the percolate collected by the drain lines beneath the Stone Ranch is accounted for in the evaporation basin water balance.

Example soil water and salt balances for just two of the seven cropped areas in Scenario 2 are shown in Table 5-2. Scenario 2 is based on average climate conditions, 591 acres of triticale sileage/ corn double crop, 151 acres of triticale grain winter crop, 322 acres of alfalfa (perennial), 538 acres of cotton with a winter cover crop, and 294 acres of tomatoes/summer forage. On the Nederend property, this scenario has 286 acres of alfalfa and 234 acres of cotton with a winter cover crop. The total acreage for Scenario 2 is 2,416 acres. Table 5-2 shows the soil water and salt balances for the 591 acres of triticale sileage/corn double crop and the 294 acres of tomatoes/summer forage double crop.

The first column in Table 5-2 is the monthly time step. The second column is average effective rainfall in inches, which totals 6.2 in/yr (average total rainfall is 7.4 inches). The third column is evapotranspiration from the CIMIS Stratford Station, 61.7 in/yr. The fourth column is the monthly combined effluent flow of 7.0 MGD or 2,555 million gallons per year (MGY). The fifth column is the average EC of the combined effluent based on data collected between 2019 and 2021 (2,269 µS/cm).

The next section of Table 5-2 represents the soil water and salt balance for the triticale sileage and corn double cropped area (591 acres). The first column of this section is the net combined effluent irrigation in inches. This irrigation schedule incorporates an irrigation efficiency of 70 percent for flood irrigation. The second column is the net supplemental groundwater that will be blended with the combined effluent and applied to the crops. The third column shows the crop coefficients for triticale sileage and corn which is multiplied by the reference evapotranspiration to determine the actual evapotranspiration. The fourth column is the soil water balance calculation that consists of inputs from the previous month’s soil water storage and the net combined effluent and groundwater irrigation, minus the actual evapotranspiration (evapotranspiration multiplied by the crop coefficient). The maximum soil water storage capacity for the soil type on this field is 5.7 inches (USDA 2021). The fifth column is the amount of water in excess of the maximum soil water storage capacity that percolates through the root zone, in inches. The sixth column is the EC of the percolate at the base of the root zone. The components of this calculation include inputs from the previous month’s percolate EC, EC of the combined effluent, EC of the supplemental groundwater, and EC of rainfall on the cropped area. Percolate EC beneath the cropped area under this scenario ranges from 2,444 µS/cm in January to 7,992 µS/cm in May. The weighted average percolate EC is 2,704 µS/cm.

The final section of Table 5-2 shows the soil water and salt balance for the tomatoes/summer forage double crop (294 acres). The columns show similar information as the triticale sileage/corn water balance as described above. For the tomatoes/summer forage, the percolate EC ranges from 3,537 µS/cm in March to 12,933 µS/cm in September when the tomato crop has been harvested. The weighted average percolate EC is 4,709 µS/cm.

Table 5-3 shows the water and salt balance results for all seven of the cropped areas within Scenario 2, including the two cropped areas shown in Table 5-2. As shown in the third column of Table 5-3, between 27 and 34 inches of combined effluent is applied annually to the cropped areas. In addition, between 16 and 28 inches of supplemental groundwater is also applied. Percolation amounts beneath the cropped areas in this scenario range from 7.7 to 14 inches with an area-weighted average of 9.9 inches. The final column in Table 5-3 shows the percolate

EC for each of the cropped areas that ranges from 2,241 µS/cm on the 151 acres of triticale grain to 4,709 µS/cm on the tomatoes/summer forage cropped area. The flow weighted average percolate EC for this scenario is 3,308 µS/cm.

Table 5-4 shows the area weighted average percolate (in inches) and the flow weighted average percolate EC for each of the five scenarios. Percolate amount ranges from 8.7 inches for Scenario 1 to 22.6 inches for Scenario 5. Table 5-4 also shows the flow weighted average percolate EC for each of the five scenarios. Percolate EC ranges from 1,926 µS/cm for Scenario 5, to 3,308 µS/cm for Scenario 2. As expected, the percolate EC is lower for the wet climate scenarios than for those with average climate conditions. The complete soil water and salt balances for each of the five scenarios are provided in Appendix F.

5.3 Evaporation Basins Water and Salt Balance

Water and salt balances were also developed for the evaporation basins to assess capacity under varying climate conditions. The following sections describe the inputs and outputs to the evaporation basins water and salt balance.

- **Monthly Inputs:** The inputs to the evaporation basin water and salt balance are precipitation and flows collected in the sumps at the Stone Ranch that are discharged to the basins. The flow collected in the sumps includes water from the subsurface drain lines beneath the Stone Ranch Fields and flows from the subsurface interceptor drains. The subsurface drain lines collect percolating water from the crop root zone, as well as groundwater, depending on the depth to groundwater. The subsurface interceptors collect water from the subsurface drain lines, subsurface flows coming from the evaporation basins, and groundwater.
- **Monthly Outputs:** Outputs from the evaporation basins include evaporation and the vertical seepage through the bottom of the evaporation basins that is not collected by the interceptor drains on each side of the basins. It was assumed that water and salt seeping through the compacted 8:1 sidewalls of the evaporation basins would be captured by the interceptor drains around the sides of the basins.
- **Water and Salt Balance Equations:** The water and salt balances are mass balance equations calculated simultaneously. The water balance equation is:

$$Storage_{t1} = Storage_{t0} + Ppt + Inflow - Evap - Seep$$

where

$Storage_{t1}$	Evaporation basins water storage, current month (t1)
$Storage_{t0}$	Evaporation basins water storage, previous month (t0)
Ppt	Precipitation (effective)
Inflow	Sump flow into evaporation basins
Evap	Evaporation from the evaporation basins
Seep	Seepage from the evaporation basins

The salt balance equation is as follows:

$$CStore_{t1} = \frac{Store_{t0} * CStore_{t0} + Ppt * CPpt + Inflow * CIn - Seep * CStore_{t0}}{Store_{t0} + Ppt + Inflow - Evap - Seep}$$

where

$CStore_{t1}$	Evaporation basins concentration, current month
$CStore_{t0}$	Evaporation basins concentration, previous month
CIn	Concentration of sump inflow
CPpt	Concentration of precipitation

Implementation of the Evaporation Basin Water and Salt Balances. The water and salt balance for the evaporation basins uses the equations above but also incorporates the following assumptions and calculation procedures. The water and salt balance for the average climate condition is shown in Table 5-5 and the evaporation basin water and salt balances for average climate, wet year and 100-year climate conditions are provided in Appendix G.

- **Salt Balances are Conducted for EC**. The mass balance for salts is based on EC because recent measured EC data for the sumps was available for 2020-2021.
- **Climate Conditions**. Three climate conditions were used for the water and salt balances. Climate data, precipitation, and reference evapotranspiration, were collected from the CIMIS Stratford Station with an average annual precipitation of 7.4 in/yr based on a 38-year dataset from 1983 to 2021 (Table 3-2; CIMIS 2021). The 2010 rainfall (12.6 in/yr), approximately equivalent to 8-year return period annual precipitation, and reference evaporation from the Stratford station are used to represent a climate condition with above average rainfall (wet year). An evaporation basin water and salt balance was also developed using the 100-year return period annual precipitation to assess hydraulic loading on the land application areas and the evaporation basins. Methods developed by DWR were used to convert precipitation to effective rainfall. This conversion is generally used to correct rainfall amount on cropland where small rainfall amounts are likely to evaporate before entering the soil (MacGillivray and Jones 1989). The same principles apply to rainfall on the levees and freeboard areas of the evaporation basins.
- **Evaporation Rate Correction**. Water losses due to evaporation from the evaporation basins are decreased when the salinity level in the basins is concentrated. An experimental dataset relating TDS to percentage reduction in evaporation rate (Kokya and Kokya 2008) was used to develop the regression lines shown in the upper graph of Figure 5-3. The linear regression relationship for experimental TDS concentrations between 0 mg/L and 150,000 mg/L TDS was used to adjust the evaporation rate from the evaporation basins. TDS in the evaporation basins was calculated using a TDS to EC ratio of 0.94 based on sumps data for 26 measured TDS and EC pairs (Figure 5-3).
- **Evaporative Surface Area.** The evaporative surface area of the basins varies as a function of the amount of water in the ponds. This area was calculated monthly using a volume/area rating curve that was developed based on evaporation pond design drawings (J.M. Lord 1988) and areal measurements using ArcGIS software.
- **Inflows from the Drainage Collection Sumps.** The actual drainage sump flows and EC were compiled from R5-2019-0008 Quarterly Monitoring Reports (J.M. Lord/Leprino 2019 – 2021). Actual monthly sump flows from April 2020 through September 2021 were compiled and averaged; the 2020 and 2021 average monthly sump flow of 50.2 AF/month was used for the water balance calculations. The flow collected in the sumps includes some water collected in the subsurface drain lines beneath the Stone Ranch Fields, as well as

groundwater and flows from the subsurface interceptor drains that were in operation in 2020 and 2021.

The proposed construction of the Nederend Interceptor Drain that will be completed in summer 2022 will prevent lateral flow between the irrigated areas on the Nederend Property and the South Fork Kings River. An estimate of flow for the Nederend Interceptor Drain was made based on evaluation of flow data for existing sumps and interceptor drains at Stone Ranch that serve similar purposes (including Sump 27, the North Interceptor Drain, and the Field 35 Interceptor). The estimates also incorporated the length of the collection lengths of the interceptor drains. It was estimated that the Nederend Interceptor Drain would contribute an additional 5.9 AF/year of flow to the evaporation basins. The East Interceptor Drain was not connected to the evaporation basins in 2020 and 2021. An additional 2.2 AF/month of interceptor flow was added to the evaporation basins to estimate the amount that may be contributed from this drain. Leprino plans to connect the East Interceptor Drain in summer 2022 and any collected flow will be routed back to the evaporation basins.

- **Seepage**. The basin seepage rate [1.0 x 10^{-6} centimeters per second (cm/s)] is based on permeability tests conducted by BSK Associates in the evaporation basins at the time of construction (BSK 1983) and may have decreased over time. The seepage surface area was conservatively assumed to be the basal area of the three basins: 176 acres. This is based on the assumption that water and salt seeping through the compacted 8:1 sidewalls will be captured by the interceptor drains around the sides of the basins.

The evaporation basin water and salt balance is shown in Table 5-5. The first column represents the monthly time step of the water and salt balance. The second column shows the effective rainfall in AF. The maximum surface area of the basins and berms (197 acres) was used for the calculation of total rainfall into the basins. The third column shows the evaporation in AF after adjusting the evaporation rate for salinity levels in the evaporation basins. The fourth column shows the inflow from the drainage collection sumps including estimated flows for the East Interceptor Drain and Nederend Interceptor Drain (58.2 AF/month). The fifth column is the estimated evaporation basins seepage.

The sixth column shows the monthly storage in the evaporation basins, calculated using inputs of the previous month's storage volume, monthly inputs from effective rainfall and flow from the collection sumps, and monthly outputs of adjusted evaporation and seepage. For the scenario shown in Table 5-5, the evaporation basins storage volume ranged from a minimum of 0 AF in the summer to a maximum of 177 AF in March, well below the maximum capacity of 710 AF. The seventh column shows the evaporation basin surface area that varies based on the storage in the basins. This surface area was used to calculate the adjusted evaporation from the surface of the basins each month.

The eighth column shows the collection sump EC that is based on average EC data measured in the sumps between 2020 and 2021. Inputs to the sumps include percolate collected in the drain lines beneath the cropped areas, and shallow groundwater collected in the field drain lines and interceptor drains.

The final column in Table 5-5 shows the evaporation basins EC calculated as a flow-weighted average of EC levels in the evaporation basins during the previous month, rainfall EC (4 µS/cm) and the collection sump EC, minus the seepage EC. Under this scenario, evaporation basins

EC ranges from a minimum of 17,076 µS/cm in January to a maximum of 300,000 µS/cm in the summer when the storage volume in the evaporation basins is lowest. The 300,000 µS/cm value is the largest value allowed in the model and occurs when the basins are almost dry or completely dry. The calculated EC when the ponds are nearly dry is extremely high. The limit of 300,000 µS/cm was set so that some of the salt precipitated in the empty basins would be accounted for when the basins begin to fill. The flow weighted average EC in the evaporation basins under average climate conditions is 28,241 µS/cm. The weighted average seepage EC (32,539 µS/cm) is shown just below the evaporation basins EC.

5.4 Analysis of Proposed Project Alternatives

The water and salt balance calculations described in Section 5.2 and 5.3 were used to evaluate five proposed project scenarios; summary results are presented in Table 5-4, and the individual balances are provided in Appendices F and G. The five scenarios address three climate alternatives (average, wet year, and 100-year) and two cropping alternatives with and without tomatoes. The climate alternatives were used to assess the effects of the known variability in precipitation and evapotranspiration.

The average and range of annual land application loading rates for Nitrogen, BOD, and TDS for the five scenarios and seven crops to be used on the River Ranch were:

Constituent and Units	Average[(a)]	Range[(a)]
Total N, lb/Ac/yr	210	190 – 240
TDS, lb/Ac/yr	14,440	12,760 – 17,050
BOD_5, lb/Ac/day[(b)]	0.40	0.35 – 0.52

Notes:
(a) Based on detailed results for each scenario and crop (Appendix F).
(b) Maximum BOD_5 loading was calculated using the maximum monthly application of combined effluent assuming two irrigations per month and a cycle length of 15 days.

The primary points of analysis for the proposed project alternatives address a) agronomic suitability and adequate irrigation supply to control root zone salinity for crop health; b) percolate flow and water quality that reaches underlying groundwater beneath the River Ranch and c) the overall ability to increase combined effluent flow from 5.0 to 7.0 MGD and increase acreage from 1,900 acres to 2,416 acres without adversely impacting groundwater.

The proposed project scenarios evaluated above result in an array of irrigation and drainage management practices that can be successfully applied at the Stone Ranch. The analysis addresses the following factors:

Agronomic Suitability. The irrigation schedules and blending of the combined effluent with groundwater were developed to establish an appropriate leaching fraction to achieve suitable constituent levels in the crop root zone. The field water and salt balance analyses reported above confirm that the irrigation schedules and groundwater blending methods result in root zone EC conditions that will result in good crop production.

The following table shows concentrations of other key constituents in percolate. Potential effects of EC, TDS, chloride, and sodium loadings are controlled by maintaining adequate soil moisture and leaching. Boron and sulfate concentrations are also acceptable. Effects of sodium on SAR are controlled by additions of gypsum or sulfur applied as needed by the farm manager. The arsenic concentrations in percolate are lower than water quality standards and are not known to affect the crops proposed for the River Ranch. A recent study of arsenic uptake by vegetable crops indicates that tomatoes concentrate arsenic in roots and not in the fruit (McBride 2013).

Weighted Average Percolate Water Quality

Scenario	EC (µS/cm)	TDS (mg/L)	Arsenic (µg/L)	Boron (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Sulfate (mg/L)
1	3,051	1,226	4.7	0.7	351	441	20
2	3,308	1,330	5.1	0.8	381	478	22
3	2,234	898	3.4	0.5	257	323	15
4	2,332	937	3.6	0.6	268	337	15
5	1,926	774	3.0	0.5	222	278	13

Percolate Flow and Water Quality. The percolate flow not captured by the field drain lines will reach underlying groundwater. The percolate concentrations of sodium and chloride are much lower than historical groundwater monitoring results beneath the River Ranch (Table 4-3) and initial results for MW-1R and MW-3 (Table 4-4). Initial groundwater salinity results from MW-2 are similar to the percolate water quality shown above.

Capacity of the Proposed River Ranch Project. The water and salt balance analyses of the land application areas and evaporation basins indicate that the combined effluent flow increase to 7 MGD (a 40 percent increase) can be accommodated by expanding the land application area by 27 percent and decreasing the application of supplemental groundwater which is replaced by combined effluent irrigation. The proposed crop scenarios for 2022 have also incorporated cropping practices that maximize the planted acreage during the winter months. This increases water consumption during periods with lower evapotranspiration.

The capacity of the evaporation basins for the proposed cropping scenarios was evaluated using the evaporation basins water and salt balance results. Figure 5-4 shows monthly evaporation basins storage for the three climate conditions evaluated. During average climate conditions (Scenarios 1 and 2), storage in the evaporation basins remains below approximately 175 AF. The maximum storage capacity of the evaporation basins is 710 AF. Under wet year conditions or 100-year return period annual climate conditions, the evaporation basin storage will be greater, but will remain less than approximately 440 AF during the rainy season.

Section 6: Antidegradation Analysis of the Proposed Project

State Water Resources Control Board Resolution 68-16, *Policy for Protection of High Quality Waters* (SWRCB 1968; also referred to as the Antidegradation Policy), requires that the CRWQCB regulate the discharge of waste materials to maintain the high quality of waters of the State. WDRs for facilities such as the River Ranch must ensure that beneficial uses of groundwater are not unreasonably affected. In addition, the facility must meet a standard of Best Practicable Treatment or Control (BPTC) for discharged wastes.

The proposed project consists of an expansion of the discharge of combined effluent from the City and Leprino to the River Ranch. The proposed project includes an increase in land application acreage from 1,900 acres to 2,416 acres and an increase in combined effluent flow from 5.0 MGD to 7.0 MGD. The majority of the agricultural area (1,900 acres) has an existing network of subsurface drain lines that collect percolation, evaporation pond seepage, and shallow groundwater. The water collected in these drain lines is pumped to evaporation basins. The remaining 520 acres of agricultural area does not have subsurface drain lines, but irrigation and tailwater are well managed to support successful crop production.

6.1 Beneficial Uses and Water Quality Objectives

The existing Stone Ranch WDRs (Order No. R5-2019-0008) address beneficial uses for both surface water and groundwater in the following two Findings:

> *58. Stone Ranch is in the southwestern corner of the Kings Groundwater Basin 5-237 within the Tulare Lake Hydrologic Region. The Basin Plan identifies the following beneficial uses of groundwater in the basin: municipal (MUN); agricultural (AGR); and industrial service supply (IND).*
>
> *60. Stone Ranch lies within the Lower Kings River Hydrologic Area (No. 551.80). The Basin Plan specifies beneficial uses of the Kings River from Peoples Weir to Empire Weir No. 2 on the South Fork as agricultural supply (AGR), water contact recreation (REC-1); non-contact water recreation (REC-2); warm freshwater habitat (WARM); wildlife habitat (WILD); and groundwater recharge (GWR).*

The existing Stone Ranch WDRs (Order No. R5-2019-0008) address WQOs in findings 60 through 71 (CRWQCB 2019). The WQOs for the River Ranch project are shown in the second column of Table 6-1 for the following constituents: EC, TDS, arsenic, boron, chloride, sodium, and sulfate. The proposed values for chloride, sulfate, TDS, and EC are based on upper secondary Title 22 MCLs, and the arsenic value is a Title 22 primary MCL.

WQOs for boron and sodium are established based on levels typically used to protect sensitive crops. Tomatoes have some sensitivity to EC levels in soil, are semi-tolerant to sodium, and tolerant to boron (Ayers and Westcot 1985).

6.2 Potential Impacts to Surface Water

When the Stone Ranch drain lines and evaporation basins were installed in 1984 and 1985, there were hydraulic connections between the Stone Ranch drainage collection system and the

Crescent Bypass. These connections were removed or sealed in the late 1980s. The Stone Ranch has subsurface and surface water collection infrastructure along the east side of the Ranch that collects subsurface flows and routes them back to the evaporation basins. The North Interceptor, East Interceptor, and Field 35 Interceptor collectively comprise a barrier between the evaporation basins and the Crescent Bypass (Figure 1-3) and intercept lateral flow. The construction of the Nederend Interceptor Drain will be completed in summer 2022 and is designed to prevent lateral flow between the irrigated areas on the Nederend Property and the South Fork Kings River.

The Crescent Bypass does not routinely receive water from the North Fork of the Kings River. As mentioned in Section 4.1, flood flows were released into the Crescent Bypass only twice between 1969 and 2008 (KRCD 2009). Field observations of the Crescent Bypass in 2018 and in 2021 indicated that there was standing water and minimal flow through a small channel approximately 3 feet wide and 3 inches deep.

6.3 Potential Impacts to Groundwater

Potential impacts on groundwater by both percolation below the crop root zone and seepage beneath the evaporation basins were quantified using water and salt balances to estimate the potential effects of the proposed project.

Percolation Beneath the River Ranch Fields. The field soil water and salt balance calculations for percolate EC were used to estimate percolate concentrations for other key constituents. The ratio of percolate EC to the blended EC of the combined effluent was used to estimate the amount of TDS, arsenic, boron, chloride, sodium, and sulfate in the percolate for each model scenario. It was assumed that these other constituents would have the same percentage increase between combined effluent levels and percolate levels. This estimation method provides conservatively high results because no effects of soil storage or crop uptake of constituents are considered. Boron and arsenic are known to be adsorbed by soil and sodium concentrations are affected by cation exchange on soil particles (Bohn et al. 2001).

The results of the estimation procedure for percolation below the root zone are shown in the following table. The first column shows the key constituents, and the next two columns show the average water quality for the two irrigation sources: combined effluent and irrigation wells on the River Ranch. The fourth column shows the range in percolate water quality for the five scenarios evaluated in Section 5. The final column shows the range of groundwater quality based on data collected from monitoring wells at the River Ranch. The minimum levels in groundwater do not meet the WQOs for EC, TDS, boron, sodium, and sulfate. Based on the available groundwater quality data for these constituents, the groundwater beneath the River Ranch is not suitable for MUN or AGR uses. It is unknown whether groundwater meets the MCL for arsenic because the groundwater measurements were not detected above the laboratory reporting limit. The lower end of the groundwater chloride range is lower than the WQO but the upper end of the range is an order of magnitude higher than the WQO.

Constituent	Water Quality: Combined Effluent	Irrigation Wells	Percolate	Groundwater Above the A-Clay
EC, µS/cm	2,269	2,598	1,926 – 3,308	3,627 - 87,000
TDS [FDS], mg/L	912	863	774 – 1,330	2,827 - 84,450
Arsenic, µg/L	3.5	1.8	3.0 – 5.1	9.2 - 23
Boron, mg/L	0.54	1.9	0.5 – 0.8	5.2 - 90
Chloride, mg/L	261	79	222 – 381	151 - 6,900
Sodium, mg/L	328	259	278 – 478	240 - 23,100
Sulfate, mg/L	15	301	13 – 22	2,597 - 57,700

Note: See Table 6-1.

The range in percolate water quality is based on the five model scenarios with differing combinations of climate and cropping. The lowest concentrations percolating below the root zone occurred for Scenario 5 which modeled with the largest annual precipitation. The range in groundwater quality represents the relatively low concentrations at monitoring well MW-2 and the higher concentrations at MW-1, MW-1R, and MW-3.

When the upper end of the percolate water quality range is compared with the lower end of the groundwater quality range, percolate would not adversely affect the groundwater levels of EC, TDS, arsenic, boron, and sulfate. The percolate concentrations of chloride and sodium overlap with the low end of the groundwater quality range. The percolate water quality would have minimal impact on underlying groundwater quality. The shallow groundwater in the project area is variable and already exceeds water quality objectives at most locations.

Seepage Beneath the Evaporation Basins. The evaporation basins receive flows from the network of subsurface drain lines on the majority of the River Ranch (1,900 acres) that collect irrigated area percolation, some evaporation pond seepage, and shallow groundwater. The water quality discharged to the evaporation basins and evaporative concentration of salts that occurs in the basins result in high concentrations of salts and boron.

The calculations for the evaporation basins shown in Table 6-2 demonstrate the effect of evaporative concentration in the basins compared to the irrigated area percolate EC. The first column of Table 6-2 shows the climate condition, while the second and third columns show the seepage amount and the weighted average evaporation basin seepage EC. Collection of shallow groundwater in the drain line system causes the incoming sump water to have higher EC than the percolate from the fields. The seepage volume is, however, much smaller because it only comes from the 200 acres of evaporation basins. As a result, the EC of the combined percolate and evaporation basin seepage shown in the last column is more similar to the percolate EC than the seepage EC.

Table 6-2: Evaporation Basin Seepage and River Ranch Field Percolate

	Weighted Average Seepage		Irrigated Area Percolate			Weighted Average Percolate/Seepage
Climate Condition	Flow (AF/Year)[(a)]	EC (µS/cm)[(b)]	Percolate (AF/Year)	EC (µS/cm)	Percolate Scenario	EC[(c)] (µS/cm)
Average	106	32,539	1,986	3,308	Scenario 2	4,786
Wet Year	121	28,548	3,091	2,332	Scenario 4	3,321
100-Year	182	40,011	4,554	1,926	Scenario 5	3,390

Notes:
(a) AF/Year = Acre Feet per year
(b) µS/cm = MicroSiemens per centimeter.
(c) Flow weighted average of percolate EC and evaporation basin seepage EC.

Combined Percolate and Seepage Loading to Groundwater. The results for seepage and percolate EC in Table 6-2 were used to estimate the water quality of other constituents. Table 6-3 shows the key water quality constituents in the first column, the flow weighted average seepage/percolate levels in the second column, and the shallow groundwater quality in the third column. The ratio of weighted average EC to the blended EC of the combined effluent was used to estimate the concentrations of TDS, arsenic, boron, chloride, sodium, and sulfate.

The flow weighted average EC, chloride, and sodium are within the range of levels in shallow groundwater. The TDS, boron, arsenic, and sulfate levels are less than the low end of the range in shallow groundwater.

Constituent	Flow Weighted Average Seepage/Percolate to Groundwater	Groundwater Above the A-Clay
EC, µS/cm	4,786	3,627 - 87,000
TDS, mg/L	1,924	2,827 - 84,450
Arsenic, µg/L	7.4	9.2 - 23
Boron, mg/L	1.1	5.2 - 90
Chloride, mg/L	551	151 - 6,900
Sodium, mg/L	692	240 - 23,100
Sulfate, mg/L	31.6	2,597 - 57,700

Note: See Table 6-3.

Potential Impacts on Deeper Groundwater. Impacts of the proposed project on deeper groundwater can be addressed by evaluating the stratigraphy beneath the River Ranch and comparing the water quality beneath the A Clay with the combined effluent.

The proposed discharge is not expected to cause degradation to groundwater between the A Clay and E Clay because the A Clay has very low permeability (5.2×10^{-8} cm/s, see Section 4.2.1). The same argument applies to the potential for the proposed project to impact groundwater beneath the E Clay. The E clay is thicker than the A Clay and was deposited in a similar depositional environment. This A Clay and E Clay both create a barrier to downward flow in the project area.

Before 2019, the primary irrigation water source for the Stone Ranch came from irrigation wells completed between the A and E Clays. When the combined effluent discharge began, the flow partially replaced the use of the irrigation wells. A comparison of the average water quality of the combined effluent with the average water quality for irrigation wells completed between the A Clay and E Clay is shown in the table below.

Constituent	Combined Effluent[(a)]	Groundwater Between the A and E Clays[(b)]
EC, µS/cm	2,269	2,328
TDS [FDS][(c)], mg/L	912	773
Arsenic, µg/L	3.5	4.1
Boron, mg/L	0.54	1.8
Chloride, mg/L	261	67
Sodium, mg/L	328	238
Sulfate, mg/L	15	259

Notes:
(a) Combined effluent average 2019 - 2021.
(b) Average of water quality at irrigation wells: 2, 6, 14, 15, 17, 18 based on data collected in 2020 - 2021.
(c) FDS shown for combined effluent, TDS is shown for groundwater.

The concentrations in the combined effluent are lower than the groundwater quality levels between the A Clay and E Clay for EC, arsenic, boron, and sulfate. The FDS concentration in the combined effluent (912 mg/L) is greater than the TDS concentration in deeper groundwater (773 mg/L). The chloride concentration in the combined effluent (261 mg/L) is higher than the deeper groundwater concentration of 67 mg/L, and the sodium concentration in the combined effluent (328 mg/L) is higher than the deeper groundwater concentration of 238 mg/L. The use of combined effluent to replace a portion of the irrigation water as part of the proposed project will have a negligible effect on the water quality of the blended water used to irrigate the River Ranch, and the water quality of percolate beneath the land application areas (LAAs) and the seepage beneath the evaporation basins will not be significantly affected. The A Clay is a low permeability barrier to downward flow in the project area, preventing vertical flow of poorer quality shallow groundwater into the zone beneath the A Clay.

6.4 Benefits of the Project for People of California

The proposed project will benefit the people of California in a number of ways including:

- The discharge of the City's and Leprino's treated effluent at the River Ranch will provide a secure, long-term method of wastewater management for both Leprino and the City.
- Leprino will be able to continue to operate two facilities in Lemoore and will continue to be an important employer in the area.
- The existing effluent reuse project at the Stone Ranch (WDRs Order No. R5-2019-0008) beneficially reuses industrial process wastewater and municipal wastewater to grow crops in an area that would be otherwise be fallowed or irrigated primarily with groundwater. The proposed project will expand this existing agricultural operation while using far less groundwater and surface water for irrigation supply, conserving valuable water resources.

- The contract farmer for the River Ranch, Stone Land Company, provides full-time jobs for 75 local people who work at a number of farm locations in and around the Tulare Lake Basin. A 20-person weeding crew, local consultants, farm support staff, and other specialty employees work at the River Ranch on a part-time basis.
- The presence of Leprino's processing facilities creates a demand for milk that will continue to provide local area dairies with a stable customer for their milk supply. In turn, the dairies will maintain agricultural jobs and the resulting strong market for goods and services.
- Leprino's two Lemoore facilities employ approximately 1,400 full time employees. Available information suggests that these two facilities have an annual economic impact of approximately $4.2 billion, including approximately $85 million in direct payroll and about $10 million in local and state taxes. In addition, the two facilities support over 100 individual dairies in the local area and the associated jobs at each of those dairies.

6.5 Use of Best Practicable Treatment or Control Methods

The City of Lemoore and Leprino both practice BPTC at their wastewater treatment facilities:

City of Lemoore. The City operates a WWTP that uses wastewater treatment to discharge effluent that meets treatment and disinfection standards for secondary treated recycled water. This allows reuse of the effluent for a variety of purposes including replacement of groundwater or surface water used for irrigation.

Leprino. Process water from the two Leprino facilities is combined in equalization tanks and treated using two high rate activated sludge reactors followed by two dissolved air flotation units, two sequencing batch reactors, and final filtration before it is combined with the City's treated sanitary effluent. This treated effluent is suitable for use as an irrigation water supply that can replace groundwater and surface water supplies.

Leprino has also implemented process water reuse programs in their facilities. These efforts result in water conservation by replacing use of the City's groundwater supply by their treated water. When reuse of COW water is included, the recycled flows average 1.2 MGD.

6.6 Summary

This Report of Waste Discharge describes a project proposed by Leprino Foods Company and the City of Lemoore to reuse up to 7.0 MGD of combined treated wastewater as an irrigation water supply for approximately 2,416 acres of crop land at the River Ranch near Lemoore, California. The proposed project is an expansion of the existing project authorized under WDRs Order No. R5-2019-0008. The 2019 WDRs authorized discharge of 5.0 MGD of combined effluent to 1,900 acres. This project expands the existing project to 7.0 MGD and 2,416 acres. This report provides background information about the City and Leprino discharges, information about the River Ranch, the hydrogeologic setting, the proposed project, and a groundwater impacts analysis to demonstrate that the project will comply with California's Policy for Protection of High Quality Waters (SRWCB 1968).

The proposed project includes use of Leprino's and the City's existing wastewater treatment facilities, and existing infrastructure to irrigate 2,416 acres of crop land, collect percolation beneath the fields, and discharge drainage flows to evaporation basins. Up to 7 MGD of treated combined effluent will be blended with supplemental groundwater supplies and used to irrigate crops.

The River Ranch is underlain by saline shallow groundwater that is separated from underlying groundwater supplies that are used for irrigation water supply by a low permeability clay layer (the A Clay). The shallow groundwater above the A Clay has long been known to be of very poor quality (Summers 1983). DWR conducted drainage water quality studies in the 1980s and 1990s that confirmed this (Table 4-2; DWR 1988, 2002).

The proposed project was evaluated using several irrigation management and climate alternatives for the discharge. Two cropping alternatives were evaluated for the 2,416 acres of farmland:

a) One cropping alternative (used for Scenarios 1 and 3) utilizes 591 acres of triticale silage/ corn double crop, 151 acres of triticale grain winter crop, 608 acres of alfalfa, and 1,066 acres of cotton/winter cover.
b) The second cropping alternative (used for Scenarios 2, 4, and 5) utilizes the same crops as above except the 1,066 acres of cotton/winter cover are reduced to 772 acres and 294 acres of tomatoes followed by summer forage are included.

Three climate alternatives were evaluated:

a) Average annual precipitation of 7.4 in/yr based on a 38-year dataset from 1983 to 2021 (Table 3-2; CIMIS 2021).
b) 2010 rainfall (12.6 in/yr) was used to represent a climate condition with above average rainfall (wet year).
c) 100-year return period annual precipitation to assess hydraulic loading on the land application areas and the evaporation basins.

The objective of the water and salt balance analyses was to determine potential impacts of the discharge on underlying shallow groundwater. Two discharges to underlying groundwater were evaluated:

a) The fraction of field percolation not captured in the drainage collection system that discharges to underlying groundwater.
b) A portion of the percolation below the crop root zone is captured by the subsurface drainage systems and routed to the evaporation basins. Seepage from the bottom of the evaporation basins is a second discharge to underlying groundwater.

The water and salt balance results were evaluated using three criteria: the agronomic suitability of root zone water and salinity, the impacts of percolation and evaporation basin seepage on underlying shallow groundwater, and the capacity of the evaporation basins to accept the drainage flows. Potential impacts of the proposed project on underlying groundwater are addressed by comparing the water quality of percolation beneath the cropped fields and seepage from the evaporation basins to the water quality of underlying groundwater.

Table 6-3 demonstrates that constituent levels in combined evaporation basins seepage and percolation from the land application area fall within the range of shallow groundwater quality or are less than shallow groundwater quality. The shallow groundwater in the project area is variable and already exceeds water quality objectives at most locations.

The proposed discharge is not expected to cause degradation to groundwater between the A Clay and E Clay for two reasons. First, the A Clay has very low permeability that separates the shallow groundwater from groundwater in the deeper zones. Second, the combined effluent and the water quality for irrigation wells that tap groundwater have very similar water quality. The use of combined effluent to replace some groundwater will not change the water quality of the shallow groundwater which already does not meet water quality objectives.

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Tables

Table 2-1: Total and Average Daily Flow for Leprino, City of Lemoore, and Combined Effluent[a]

Month	City Flow (EFF-001) Total Flow (Gallons)	City Flow (EFF-001) Average Daily Discharge (MGD)[c]	Leprino Flow (EFF-002) Total Flow (Gallons)	Leprino Flow (EFF-002) Average Daily Discharge (MGD)	Combined Flow (EFF-003)[b] Total Flow (Gallons)	Combined Flow (EFF-003)[b] Average Daily Discharge (MGD)
October-19	39,858,070	1.33	95,009,013	3.2	32,650,760[d]	1.1[d]
November-19	56,373,216	1.88	92,517,544	3.1	148,890,760	5.0
December-19	55,080,000	1.78	95,158,666	3.1	150,328,666	4.8
January-20	61,320,000	1.98	91,529,204	3.0	152,849,204	4.4
February-20	47,198,000	1.70	81,778,520	2.9	128,976,520	4.4
March-20	50,040,000	1.78	90,682,855	3.1	142,502,855	4.8
April-20	58,570,000	1.96	90,684,033	3.0	146,121,535	4.9
May-20	54,340,000	1.79	95,773,883	3.0	144,948,600	4.2
June-20	38,510,000	1.42	85,582,934	2.9	123,804,000	4.1
July-20	54,510,000	1.78	91,158,472	2.9	139,920,000	4.5
August-20	46,420,000	1.54	93,936,769	3.0	134,259,000	4.3
September-20	48,160,000	1.77	88,151,815	2.9	136,043,000	4.5
October-20	54,790,000	1.76	91,806,834	3.0	143,154,000	4.6
November-20	47,010,000	1.63	89,915,752	3.0	137,350,000	4.6
December-20	54,690,000	1.76	91,612,499	3.0	144,472,000	4.7
January-21	54,230,000	1.75	95,536,026	3.1	151,394,000	4.9
February-21	52,800,000	1.89	83,397,820	3.0	136,518,001	4.9
March-21	55,676,461	1.80	88,570,887	2.9	149,156,000	4.8
April-21	50,390,000	1.68	84,057,894	2.8	139,138,000	4.6
May-21	50,330,000	1.62	89,262,095	2.9	145,089,000	4.7
June-21	45,250,000	1.51	82,531,455	2.8	132,813,000	4.4
July-21	42,740,000	1.38	87,638,837	2.8	135,124,900	4.4
August-21	42,150,000	1.36	81,703,947	2.6	118,424,000	4.1
September-21	50,520,000	1.68	82,141,922	2.7	136,808,000	4.6
Average	**50,456,489**	**1.7**	**89,172,487**	**2.9**	**139,916,741**	**4.6**

Notes:

(a) Based on data collected from October 2019 through September 2021 in accordance with MRP Order No. R5-2019-0008.

(b) Combined flow data comes from a separate flow meter. The sum of EFF-001 and EFF-002 do not exactly equal EFF-003 due to minor losses.

(c) MGD = million gallons per day

(d) EFF-003 total flow for October may not include the entire month. This value is excluded from the average calculation.

Table 2-2: Leprino Treated Effluent Flow and Water Quality[a]

Parameter	Units	Average
Average Daily Flow [b]	*MGD [c]*	*3.0*
pH[d]	-	7.6
Electrical Conductivity (EC)[d]	µS/cm[e]	2,779
Biochemical Oxygen Demand (BOD_5)[f]	mg/L[g]	6.1
Total Suspended Solids (TSS)[f]	mg/L	11
Total Kjeldahl Nitrogen[h]	mg/L	2.5
Nitrate as Nitrogen[h]	mg/L	3.3
Nitrite as Nitrogen[h]	mg/L	0.5
Ammonia as Nitrogen[h]	mg/L	0.5
Total Nitrogen [h]	mg/L	5.5
Total Dissolved Solids (TDS)[h]	mg/L	1,580
Fixed Dissolved Solids (FDS)[h]	mg/L	1,299
Arsenic[i]	µg/L[j]	2.6
Selenium[i]	µg/L	1.6
Sodium Absorption Ratio[i]	-	10.5
Alkalinity as CaCO3[i]	mg/L	775.5
Bicarbonate as HCO3[i]	mg/L	769
Carbonate as CO3[i]	mg/L	13
Hardness (Total)[i]	mg/L	143
Boron[i]	mg/L	0.4
Calcium[i]	mg/L	62
Chloride[i]	mg/L	346
Iron[i]	mg/L	0.20
Magnesium[i]	mg/L	13.4
Manganese[i]	mg/L	0.02
Potassium[i]	mg/L	182
Sodium[i]	mg/L	371
Sulfate[i]	mg/L	13.5

Notes:

(a) Based on data collected between October 2019 through September 2021 in accordance with MRP Order No. R5-2019-0008.

(b) Monitored Continuously in accordance with MRP Order No. R5-2019-0008.

(c) MGD = million gallons per day

(d) Monitored Weekly in accordance with MRP Order No. R5-2019-0008.

(e) µS/cm = micro Siemens per centimeter

(f) Monitored Monthly in accordance with MRP Order No. R5-2019-0008.

(g) mg/L = milligrams per liter

(h) Monitored Quarterly in accordance with MRP Order No. R5-2019-0008.

(i) Monitored Annually in accordance with MRP Order No. R5-2019-0008.

(j) µg/L = micrograms per liter

Table 2-3: City of Lemoore Treated Effluent Flow and Water Quality[a]

Parameter	Units	Average
Average Daily Flow [b]	*MGD* [c]	*1.4*
pH[d]	-	7.9
Electrical Conductivity (EC)[d]	µS/cm[e]	1,137
Biochemical Oxygen Demand (BOD_5)[d]	mg/L[f]	69.0
Total Suspended Solids (TSS)[d]	mg/L	67.8
Total Kjeldahl Nitrogen[g]	mg/L	45.6
Nitrate as Nitrogen[g]	mg/L	ND[h]
Nitrite as Nitrogen[g]	mg/L	ND
Ammonia as Nitrogen[g]	mg/L	34
Total Nitrogen[g]	mg/L	45.6
Alkalinity as CaCO3[i]	mg/L	370
Bicarbonate as HCO3[i]	mg/L	423
Carbonate as CO3[i]	mg/L	<1.0
Hardness (Total)[i]	mg/L	27
Arsenic[i]	µg/L[j]	<0.01
Selenium[i]	µg/L	<0.02
Total Dissolved Solids[i]	mg/L	620
Boron[i]	mg/L	0.81
Calcium[i]	mg/L	7.0
Chloride[i]	mg/L	113
Iron[i]	mg/L	0.24
Magnesium[i]	mg/L	2.3
Manganese[i]	mg/L	0.03
Potassium[i]	mg/L	14.3
Sodium[i]	mg/L	183
Sulfate[i]	mg/L	28.7

Notes:

(a) Based on data collected between October 2019 through September 2021 in accordance with MRP Order No. R5-2019-0008.

(b) Monitored Continuously in accordance with MRP Order No. R5-2019-0008.

(c) MGD = million gallons per day

(d) Monitored Weekly in accordance with MRP Order No. R5-2019-0008.

(e) µS/cm = micro Siemens per centimeter

(f) mg/L = milligrams per liter

(g) Monitored Quarterly in accordance with MRP Order No. R5-2019-0008.

(h) ND = not detected above laboratory reporting limit

(i) Monitored Annually in accordance with MRP Order No. R5-2019-0008.

(j) µg/L = micrograms per liter

Table 2-4: Combined Effluent Flow and Water Quality[a]

Parameter	Units	Average
Average Daily Flow [b]	*MGD [c]*	*4.1*
pH[d]	-	7.5
Electrical Conductivity (EC)[d]	µS/cm[e]	2,269
Total Coliform Organisms[f]	MPN/100 mL[g]	15.2
Biochemical Oxygen Demand (BOD_5)[h]	mg/L[i]	8.2
Total Suspended Solids (TSS)[h]	mg/L	20.7
Total Kjeldahl Nitrogen[h]	mg/L	18.7
Nitrate as Nitrogen[h]	mg/L	2.7
Nitrite as Nitrogen[h]	mg/L	0.5
Ammonia as Nitrogen[h]	mg/L	10.8
Total Nitrogen[h]	mg/L	21.9
Total Dissolved Solids (TDS)[h]	mg/L	1,149
Fixed Dissolved Solids (FDS)[h]	mg/L	912
Arsenic[j]	µg/L[k]	3.5
Selenium[j]	µg/L	1.4
Sodium Adsorption Ratio (SAR)[j]	-	12.8
Alkalinity as CaCO3[j]	mg/L	635
Bicarbonate as HCO3[j]	mg/L	634
Carbonate as CO3[j]	mg/L	< 1.0
Hardness (Total)[j]	mg/L	116
Boron[j]	mg/L	0.54
Calcium[j]	mg/L	36
Chloride[j]	mg/L	261
Iron[j]	mg/L	0.4
Magnesium[j]	mg/L	8.4
Manganese[j]	mg/L	1.2
Potassium[j]	mg/L	107
Sodium[j]	mg/L	328
Sulfate[j]	mg/L	15

Notes:

(a) Based on data collected between October 2019 through September 2021 in accordance with MRP Order No. R5-2019-0008.

(b) Monitored Continuously in accordance with MRP Order No. R5-2019-0008.

(c) MGD = million gallons per day

(d) Monitored Weekly in accordance with MRP Order No. R5-2019-0008.

(e) µS/cm = micro Siemens per centimeter

(f) Monitored Daily in accordance with MRP Order No. R5-2019-0008.

(g) MPN/100 mL = most probable number per 100 milliliters

(h) Monitored Monthly in accordance with MRP Order No. R5-2019-0008.

(i) mg/L = milligrams per liter.

(i) Monitored Quarterly in accordance with MRP Order No. R5-2019-0008.

(k) µg/L = micrograms per liter

Table 2-5: Source Water Quality for the Leprino West Plant[a]

Parameter	Units	Average
Electrical Conductivity (EC)	µS/cm[b]	853
Total Dissolved Solids (TDS)	mg/L[c]	399
Nitrate (NO3-N)	mg/L	0.75
Alkalinity as $CaCO_3$	mg/L	226
Total Hardness as $CaCO_3$	mg/L	4.0
Bicarbonate as $CaCO_3$	mg/L	210
Carbonate as $CaCO_3$	mg/L	15.5
Hydroxide as $CaCO_3$	mg/L	-[d]
Boron	mg/L	0.48
Calcium	mg/L	1.45
Chloride	mg/L	52.5
Iron	mg/L	0.14
Magnesium	mg/L	<0.1[e]
Manganese	mg/L	<0.02
Potassium	mg/L	< 1.10
Sodium	mg/L	154
Sulfate	mg/L	16.6

Notes:

(a) Based on 2 annual samples collected at the Leprino West Plant between 2020 and 2021.

(b) µS/cm = micro Siemens per centimeter

(c) mg/L = milligrams per liter

(d) - = Not Sampled

(e) <X = result below the laboratory reporting limit

Table 2-6: Title 22 Recommended, Maximum Allowable, and Short Term MCLs[a]

Constituent	Recommended	WQ Standards	Short Term
TDS[b], mg/L[c]	500	1,000	1,500
EC[d], μmho/cm[e]	900	1,600	2,200
Chloride, mg/L	250	500	600
Sulfate, mg/L	250	500	600

(a) Source: CCR Table 64449-B

(b) TDS = Total Dissolved Solids

(c) mg/L = milligrams per liter

(d) EC = Electrical Conductivity

(e) μmho/cm = micromhos per centimeter

Table 3-1: Soil Properties at the River Ranch

	Percentage of Stone Ranch and Nederend Area	Available Soil Water Capacity Inches/60 inches	Saturated Hydraulic Conductivity, Inches/Hour	Soil Texture Inches depth: Texture
Gepford Clay, Partially Drained	51%	6.6	0.16	0-38: Clay 38-60: Loam - Clay Loam strata
Lethent Clay Loam	49%	4.8	0.09	0-31: Clay Loam 31-60: Sandy Loam

Source:

Web Soil Survey USDA, 2021. https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Table 3-2: Climate Information for the Project Area[a]

Month	Average Precipitation (Inches)	2010 Precipitation (Wet Year) (Inches)	100-Year Annual Return Precipitation[b] (Inches)	Average Evapotranspiration (Inches)
January	1.5	3.2	5.1	1.2
February	1.3	1.6	4.5	2.2
March	1.2	0.3	4.1	4.1
April	0.5	1.0	1.7	6.1
May	0.3	0.2	1.2	8.1
June	0.0	0.0	0.1	9.0
July	0.0	0.0	0.1	9.1
August	0.1	0.0	0.2	8.1
September	0.1	0.0	0.4	6.2
October	0.6	0.6	2.1	4.2
November	0.5	1.3	1.7	2.2
December	1.2	4.4	4.1	1.2
Total:	**7.4**	**12.6**	**25.3**	**61.7**

Notes:

(a) Data from California Irrigation Management Information System (CIMIS) Stratford Station (1983 - 2021).

(b) 100-Year precipitation is calculated from the probability distribution of the annual precipitation data, and distributed per month in the same proportion as average precipitation.

Table 3-3: Field Drain Line Spacing and Depth[a][b]

Field ID	Tile Drain Spacing (Feet)	Approximate Tile Drain Depth (Feet bgs)
Field 35	Perimeter drains around field ~ 1,200 feet field width	8 ft bgs at Sump 35 invert
Field 34W	**790**	West Interceptor ~ 10 ft bgs Field drains: 8 ft bgs at Sump 34 invert
Field 27	**850**	Field 27S Interceptor: 9 ft bgs at Sump 27 invert
Field 11	**500-600**	8.5 ft bgs at Sump 11 invert
Field 3NW Field 3NE	**420 - 680**	8.5 ft bgs at Sump 3 invert
Field 3SW Field 10NW	**470**	8 ft bgs at Sump 10 invert
Field 3SE Field 10NE	**660**	8 ft bgs at Sump 10 invert

Notes:

(a) Source: J.M. Lord, Inc. (J.M. Lord, 1984). Stone Land Co. – River Ranch, Subsurface Drainage Construction Plans. 1984.

(b) See Figure 1-3.

ft bgs = feet below ground surface

Table 3-4: Monthly Sump Flow for 2020-2021[a]

Date	Sump Flow (AF per month)[b] Sump 3N	Sump 3-10	Sump 11	Sump 27	Sump 34	Sump 35	Total
Apr-20	21.2	20.7	12.3	9.9	14.8	1.8	**81**
May-20	29.7	18.4	12.5	12.3	21.2	7.1	**101**
Jun-20	27.5	17.8	12.0	10.9	21.2	0.0	**90**
Jul-20	18.2	22.8	5.4	10.2	6.9	9.7	**73**
Aug-20	13.2	22.2	7.0	8.9	9.5	0.3	**61**
Sep-20	7.4	17.3	4.8	6.9	2.1	0.0	**38**
Oct-20	1.9	8.8	3.0	3.9	9.8	0.1	**27**
Nov-20	8.4	12.7	11.0	2.6	11.9	0.1	**47**
Dec-20	13.9	17.5	4.2	0.0	5.9	0.0	**42**
Total:	**141.3**	**158.0**	**72.3**	**65.7**	**103.3**	**19.1**	**560**
Jan-21	5.6	11.7	2.5	0.0	9.6	0.0	**29**
Feb-21	8.1	15.6	1.1	7.2	15.1	1.2	**48**
Mar-21	10.4	16.9	1.0	12.2	14.9	0.6	**56**
Apr-21	21.2	18.1	0.9	9.8	12.5	0.48	**63**
May-21	11.9	20.0	0.5	8.1	11.5	0.61	**53**
Jun-21	5.7	14.5	4.3	5.2	8.5	0.52	**39**
Jul-21	5.2	17.4	11.3	4.1	6.1	0.07	**44**
Aug-21	4.9	15.8	9.5	2.1	0.0	0.00	**32**
Sep-21	3.2	18.8	2.5	1.1	4.7	0.00	**30**
Total:	**76.3**	**148.7**	**33.6**	**49.9**	**83.0**	**3.5**	**395**

Month	Average Sump Flow (AF per month)
Jan	29.5
Feb	48.3
Mar	56.1
Apr	71.8
May	76.9
Jun	64.1
Jul	58.7
Aug	46.7
Sep	34.4
Oct	27.4
Nov	46.7
Dec	41.5
Average	**50.2**

Notes:

(a) Based on data collected between April 2020 through September 2021 in accordance with MRP Order No. R5-2019-0008.

(b) AF per Month = Acre-Feet per Month

Table 3-5: Sump Water Quality for 2020-2021[a]

Parameter	Electrical Conductivity[b]	Total Dissolved Solids[b]	Arsenic[b]	Selenium[b]	Molybdenum[b]	Boron[b]	Calcium[c]	Chloride[c]	Iron[c]	Magnesium[c]	Manganese[c]	Potassium[c]	Sodium[c]	Sulfate[c]	Alkalinity[c]	Bicarbonate[c]	Carbonate[c]	Hardness[c]
Units	µS/cm[d]	mg/L[e]	µg/L[f]	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L as CaCO3[g]
Sump 3																		
Q1 2020	7,400	7,300	12	<10[h]	650	18	290	400	0.73	170	0.047	2.0	2,400	5,800	560	560	<15	1,400
Q2 2020	11,000	8,200	11	<4	740	18	320	350	0.099	190	<0.25	11	2,600	8,600	330	330	<3.0	1,600
Q3 2020	10,000	7,700	12	ND[i]	690	17	-	-	-	-	-	-	-	-	-	-	-	-
Q4 2020	11,000	7,500	16	5	700	19	-	-	-	-	-	-	-	-	-	-	-	-
Q1 2021	9,500	6,500	10	4.7	530	16	310	400	1.0	160	0.052	7.9	2,100	5,900	350	350	<3.0	1,400
Q2 2021	11,000	12,000	14	5.4	680	18	-	-	-	-	-	-	-	-	-	-	-	-
Q3 2021	9,300	6,100	15	6.6	730	15	-	-	-	-	-	-	-	-	-	-	-	-
Sump 3-10																		
Q1 2020	7,500	3,800	<10	<10	210	10	190	430	0.25	110	0.024	<2.0	1,100	3,600	400	400	<15	920
Q2 2020	5,900	3,600	7.7	3.8	250	10	190	210	0.12	120	0.031	2.2	1,200	3,300	360	360	<3.0	950
Q3 2020	5,100	3,700	9.9	2.6	260	8.2	-	-	-	-	-	-	-	-	-	-	-	-
Q4 2020	8,000	5,900	6.9	11	270	15	-	-	-	-	-	-	-	-	-	-	-	-
Q1 2021	8,600	6,100	8.7	4.9	370	15	210	370	0.091	140	0.11	2.5	1,900	4,900	370	370	<3.0	1,100
Q2 2021	13,000	12,000	8.7	0.8	510	24	-	-	-	-	-	-	-	-	-	-	-	-
Q3 2021	9,700	5,700	7.2	10	460	23	-	-	-	-	-	-	-	-	-	-	-	-
Sump 11																		
Q1 2020	13,000	12,000	<10	19	760	25	400	540	<0.03	310	0.064	4.1	3,600	8,700	440	440	<3.0	2,300
Q2 2020	14,000	11,000	7	6.4	760	22	410	590	0.039	280	<0.25	5.5	3,500	10,000	300	300	<3.0	2,200
Q3 2020	15,000	14,000	ND	ND	690	22	-	-	-	-	-	-	-	-	-	-	-	-
Q4 2020	14,000	11,000	7	15	640	22	-	-	-	-	-	-	-	-	-	-	-	-
Q1 2021	13,000	8,600	7	3.5	530	19	380	490	0.46	250	0.13	4.6	2,900	7,900	290	290	<3.0	2,000
Q2 2021	15,000	15,000	<10	11	670	24	-	-	-	-	-	-	-	-	-	-	-	-
Q3 2021	13,000	13,000	12	13	800	22	-	-	-	-	-	-	-	-	-	-	-	-
Sump 27																		
Q1 2020	8,100	6,600	<10	<10	220	7.9	280	550	<0.03	310	1.2	9.3	1,500	4,100	440	440	<3.0	2,000
Q2 2020	6,600	4,300	5.6	3.9	230	6.9	290	330	0.63	240	0.76	6.4	1,200	3,700	410	410	<3.0	1,700
Q3 2020	6,700	4,600	5.8	5.6	250	7.2	-	-	-	-	-	-	-	-	-	-	-	-
Q4 2020	9,600	5,900	7.7	4.4	290	9.6	-	-	-	-	-	-	-	-	-	-	-	-
Q1 2021	4,200	2,800	8.4	4.5	260	6.1	79	220	0,6	51	0.035	2.9	880	1,500	590	590	<15	410
Q2 2021	8,300	8,000	7.9	5.5	200	8.7	-	-	-	-	-	-	-	-	-	-	-	-
Q3 2021	6,900	4,800	11	6.4	300	8.6	-	-	-	-	-	-	-	-	-	-	-	-

Table 3-5: Sump Water Quality for 2020-2021[a]

Parameter	Electrical Conductivity[b]	Total Dissolved Solids[b]	Arsenic[b]	Selenium[b]	Molybdenum[b]	Boron[b]	Calcium[c]	Chloride[c]	Iron[c]	Magnesium[c]	Manganese[c]	Potassium[c]	Sodium[c]	Sulfate[c]	Alkalinity[c]	Bicarbonate[c]	Carbonate[c]	Hardness[c]
Units	µS/cm[d]	mg/L[e]	µg/L[f]	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L as CaCO3[g]
Sump 34																		
Q1 2020	7,500	4,300	<10	<10	310	13	200	390	0.11	130	0.076	2.4	1,600	3,700	570	570	<15	1,000
Q2 2020	14,000	8,700	6.6	4.1	500	24	380	730	0.34	300	<0.25	6.7	3,500	11,000	500	500	<3.0	2,200
Q3 2020	17,000	15,000	ND	ND	580	28	-	-	-	-	-	-	-	-	-	-	-	-
Q4 2020	18,000	17,000	9	9.2	520	29	-	-	-	-	-	-	-	-	-	-	-	-
Q1 2021	15,000	14,000	6.2	4	480	24	300	730	0.27	330	0.12	9.6	3,800	9,200	490	490	<3.0	2,100
Q2 2021	15,000	15,000	<10	<10	390	25	-	-	-	-	-	-	-	-	-	-	-	-
Q3 2021	6,400	4,800	<10	<10	220	13	-	-	-	-	-	-	-	-	-	-	-	-
Sump 35																		
Q1 2020	13,000	7,000	<10	13	140	13	170	1,000	0.93	420	2.5	5.6	2,900	6,400	400	400	<3.0	2,100
Q2 2020	15,000	9,900	7.2	<4	140	13	190	1,100	0.45	460	2.9	8.6	3,400	11,000	410	410	<3.0	2,300
Q3 2020	4,800	3,200	10	2.7	140	4.7	-	-	-	-	-	-	-	-	-	-	-	-
Q4 2020	7,100	4,900	7.8	4	140	7.2	-	-	-	-	-	-	-	-	-	-	-	-
Q1 2021	7,900	5,800	7.2	<2.0	120	7.6	140	590	1.8	200	2.3	5.1	1,700	4,400	420	420	<3.0	1,200
Q2 2021	7,100	6,300	6.5	3.6	110	6.9	-	-	-	-	-	-	-	-	-	-	-	-
Q3 2021	3,000	1,900	14	<2.0	98	3.2	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

(a) Based on data collected between January 2020 through September 2021 in accordance with MRP Order No. R5-2019-0008.

(b) Monitored Quarterly in accordance with MRP Order No. R5-2019-0008

(c) Monitored Annually in accordance with MRP Order No. R5-2019-0008

(d) µS/cm = microSiemen per centimeter

(e) mg/L = milligrams per liter

(f) ug/L = micrograms per liter

(g) mg/L as CaCO3 = milligrams per liter as Calcium Carbonate

(h) <X = result not detected above laboratory reporting limit, where X is the reporting limit

(i) ND = result not detected above the laboratory reporting limit

Table 3-6: Dimensions and Storage Capacity of the Evaporation Basins[a]

Basin	Maximum Water Storage at Bottom of Freeboard (AF)[b]	Surface Area at Bottom of Freeboard (Acres)	Surface Area at Top of Freeboard (Acres)	Depth at Top of Freeboard (Acres)
All Basins	712	188	197	5.75

Notes:

(a) Source: J.M. Lord, Inc. (J.M. Lord, 1984). Stone Land Co. – River Ranch, Subsurface Drainage Construction Plans. 1984.

(b) AF = Acre Feet

Table 3-7: Monthly Evaporation Basin Water Depth, Storage, and EC for 2020-2021[(a)]

	Evaporation Basin Water Depth (Feet)[(b)]			Evaporation Basin Storage (Ac-Ft)[(c)]				Evaporation Basin EC (µS/cm)[(d)]			
Date	North	East	West	North	East	West	Total	North	East	West	Weighted Average
Jan-20	1.15	1.00	0.75	74	60	49	183	20,430	6,960	11,010	13,498
Feb-20	2.25	2.00	1.75	145	120	115	380	20,520	7,010	9,750	13,000
Mar-20	3.50	3.50	3.25	226	210	214	649	20,320	7,060	11,300	13,069
Apr-20	1.50	1.75	1.25	97	105	82	284	27,530	12,200	17,940	19,091
May-20	2.50	1.75	2.00	161	105	132	398	31,390	13,920	20,800	23,282
Jun-20	2.50	2.75	2.50	161	165	164	490	31,830	16,950	23,050	23,889
Jul-20	1.85	1.95	2.00	119	117	132	368	31,700	18,200	24,500	24,836
Aug-20	2.25	1.75	2.00	145	105	132	382	NS[(e)]	NS	NS	NS
Sep-20	2.25	2.25	2.00	145	135	132	411	NS	NS	NS	NS
Oct-20	2.00	2.00	2.00	129	120	132	380	NS	NS	13,100	4,532
Nov-20	2.25	2.00	2.25	145	120	148	413	45,310	34,790	26,940	35,674
Dec-20	2.25	2.25	2.25	145	135	148	428	43,080	29,850	19,510	30,761
Jan-21	3.00	3.00	3.00	194	180	197	571	38,300	27,700	17,800	27,871
Feb-21	3.00	3.00	3.00	194	180	197	571	35,400	12,100	25,000	24,466
Mar-21	2.50	2.50	2.50	161	150	164	475	24,220	NS	NS	8,216
Apr-21	1.80	1.10	0.20	116	66	13	195	35,200	29,600	15,200	31,961
May-21	1.70	0.50	0.20	110	30	13	153	38,580	29,140	16,730	34,848
Jun-21	1.30	0.70	0.90	84	42	59	185	19,900	30,700	20,100	22,411
Jul-21	0.70	0.60	0.50	45	36	33	114	54,550	41,710	34,670	44,766
Aug-21	0.80	0.60	0.80	52	36	53	140	52,410	58,980	55,070	55,093
Sep-21	0.50	0.80	0.70	32	48	46	126	44,000	55,000	51,000	50,729

Notes:

(a) Source: City of Lemoore and Leprino Foods Company, Quarterly Monitoring Reports (2020, 2021).

(b) Depth from evaporation basin pond staff gauge reading.

(c) Ac-Ft = Acre Feet

(d) EC = Electrical Conductivity. µmho/cm = microSiemen per centimeter

(e) NS = not sampled

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Table 3-8: Evaporation Basins Water Quality, 2020 to 2021[a]

Parameter	Arsenic[b]	Selenium[b]	Molybdenum[b]	Boron[b]	Calcium[c]	Chloride[c]	Iron[c]	Magnesium[c]	Manganese[c]	Potassium[c]	Sodium[c]	Sulfate[c]	Alkalinity[c]	Bicarbonate[c]	Carbonate[c]	Hardness[c]
Units	µg/L(d)	µg/L	µg/L	mg/L[e]	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L as CaCO3[f]
North																
Q1 2020	13	35	820	58	390	1,700	<0.30[g]	840	<0.10	<20	9,100	20,000	290	<3	260	4,400
Q2 2020	<20	<20	750	52	410	800	0.58	710	<0.10	28	8,100	21,000	300	<3.0	250	3,900
Q32020	<20	<20	990	69	900	2,300	0.13	860	0.12	59	18,000	29,000	340	<3.0	270	5,800
Q42020	21	21	610	77	380	2,400	9.7	790	0.88	84	12,000	26,000	610	390	220	4,200
Q1 2021	37	34	560	61	390	2,600	1.7	790	0.55	67	9,900	21,000	490	220	270	4,200
Q2 2021	46	33	320	80	-[h]	-	-	-	-	-	-	-	-	-	-	-
Q3 2021	110	<100	1,100	87	-	-	-	-	-	-	-	-	-	-	-	-
East																
Q1 2020	15	12	130	10	180	720	1.1	140	0.17	90	2,700	5,900	450	280	170	1,000
Q2 2020	<20	<20	240	15	210	800	0.40	210	<0.10	95	3,400	11,000	320	99	220	1,400
Q32020	33	<20	350	27	580	1,200	0.19	330	0.076	160	9,100	13,000	290	38	250	2,800
Q42020	47	13	420	52	430	1,700	9.8	470	0.37	140	8,800	19,000	290	290	<3.0	3,000
Q1 2021	52	<20	330	39	380	1,300	0.55	420	0.25	97	6,600	19,000	380	220	160	2,700
Q2 2021	64	25	180	51	-	-	-	-	-	-	-	-	-	-	-	-
Q3 2021	120	50	980	120	-	-	-	-	-	-	-	-	-	-	-	-
West																
Q1 2020	18	19	750	29	360	830	0.86	290	<0.10	41	4,700	8,400	310	23	290	2,100
Q2 2020	30	<20	730	35	450	980	1.7	350	<0.10	58	5,600	12,000	360	80	280	2,600
Q32020	27	<20	1,000	51	980	1,300	1.4	480	0.047	90	14,000	20,000	260	<3.0	240	4,400
Q42020	32	12	290	33	240	1,100	3.5	290	0.15	99	4,700	6,100	590	460	140	1,800
Q1 2021	26	<20	310	19	220	570	1.9	180	<0.10	48	2,700	7,200	360	3	280	1,300
Q2 2021	28	<20	320	46	-	-	-	-	-	-	-	-	-	-	-	-
Q3 2021	140	<100	890	150	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

(a) Based on data collected between January 2020 through September 2021 in accordance with MRP Order No. R5-2019-0008.

(b) Monitored Quarterly in accordance with MRP Order No. R5-2019-0008.

(c) Monitored Annually in accordance with MRP Order No. R5-2019-0008.

(d) µg/L = micrograms per liter

(e) mg/L = milligrams per liter

(f) mg/L as CaCO3 = milligrams per liter

(g) <X = result not detected above laboratory reporting limit, where X is the reporting limit

(h) - = not sampled

Table 3-9: Irrigation Well Construction Details[a]

Irrigation Well ID[b]	Installation Date	Total Depth (Ft bgs)[c]	Screened Interval Depth (Ft bgs)	Estimated Pumping Rate (gpm)[d]
Well 2	Jan 1978	220	180 - 220	500
Well 6	Jan 1967	584	116 - 584[e]	500
Well 14	Dec 2001	520	280 - 410 420 - 520	700
Well 15	Apr 2003	530	280 - 380 390 - 530	500
Well 17	Apr 2009	540	300 - 540	1,500
Well 18	May 2009	540	300 - 540	1,500
Well 19	Dec 2009	1290	1080 - 1150 1170 - 1270	2,500
Well 20	Feb 2018	560	320 - 560	800

Notes:

(a) Well construction information from state well logs (Kennedy Jenks, 2018).

(b) Well locations shown on Figure 3-3.

(c) ft bgs = feet below ground surface

(d) gpm = gallons per minute

(e) Screened interval end depth assumed, actual depth not available on well log.

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Table 3-10: Irrigation Well Monthly Flows, 2020-2021[(a)]

Month	Irrigation Well Pumping Rate (AF[(b)] /month)								
	Well 2	Well 6	Well 14	Well 15	Well 17	Well 18	Well 19	Well 20	Total
Jan-20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Feb-20	1.7	0.0	0.0	3.0	2.8	0.0	6.5	0.0	**14.0**
Mar-20	0.0	0.0	0.0	12.7	1.2	0.0	5.3	23.0	**19.2**
Apr-20	0.0	26.3	0.0	0.0	0.0	0.6	1.8	135.5	**28.7**
May-20	1.9	73.4	0.0	0.3	0.3	22.1	11.1	163.7	**109.0**
Jun-20	6.5	28.3	0.0	0.0	0.0	11.7	0.0	36.2	**46.5**
Jul-20	0.0	13.0	0.0	0.0	0.0	0.0	0.0	17.7	**13.0**
Aug-20	0.0	32.4	0.0	0.0	0.0	0.0	0.0	0.0	**32.4**
Sep-20	51.3	2.5	0.0	0.0	0.0	4.6	0.0	0.0	**58.4**
Oct-20	48.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**48.6**
Nov-20	33.2	0.0	0.0	0.0	0.0	56.8	0.0	57.3	**90.0**
Dec-20	59.5	0.0	0.0	0.0	1.3	57.5	0.0	0.0	**118.4**
Jan-21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Feb-21	5.9	35.5	0.0	0.0	0.0	0.0	2.6	0.6	**44.0**
Mar-21	3.3	38.2	0.0	0.0	4.1	51.7	0.8	103.1	**98.0**
Apr-21	6.7	50.9	0.0	0.0	75.5	38.9	0.9	58.8	**172.9**
May-21	4.6	16.9	0.0	0.0	19.5	9.1	0.3	19.6	**50.4**
Jun-21	4.3	19.3	0.0	0.0	66.9	43.1	57.4	58.1	**191.1**
Jul-21	69.9	27.9	0.0	0.0	102.0	50.7	94.4	72.5	**344.9**
Aug-21	93.9	42.4	0.0	0.0	98.6	34.7	95.1	55.4	**364.6**
Sep-21	17.2	1.1	0.0	0.0	25.4	0.0	35.7	0.0	**79.4**
2020 Total (AF/year)	**203**	**176**	**0**	**16**	**6**	**153**	**25**	**433.4**	**578**
2021 Total[(c)] (AF/year)	**206**	**232**	**0**	**0**	**392**	**228**	**287**	**368.1**	**556**

Notes:

(a) Based on data collected between January 2020 through September 2021 in accordance with MRP Order No. R5-2019-0008.

(b) AF = acre-feet

(c) Total for the first 9 months of 2021.

Table 3-11: Irrigation Well Water Quality, 2020-2021[a]

Irrigation Well ID[b]	EC[c] (µS/cm)[d]	TDS[e] (mg/L)[f]	Arsenic (µg/L)[g]	Selenium (µg/L)	Boron (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Iron (µg/L)	Magnesium (mg/L)	Manganese (µg/L)	Nitrate-N (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Sulfate (mg/L)	SAR[h]	Alkalinity (mg/L as CaCO3[i])	HCO3[j] (mg/L as CaCO3)	CO3[k] (mg/L as CaCO3)	Hardness (mg/L as CaCO3)
Well 2	1,150	730	<2.0[l]	<2.0	1.9	24	70	0.31	4.4	0.06	<0.23	<2.0	245	195	12.6	315	300	27	76
Well 6	1,800	1,200	4.1	<2.0	1.9	81	140	0.10	8.3	0.13	<0.23	<2.0	330	505	9.4	230	230	3	235
Well 14	730	440	<2.0	<2.0	1.6	4	37	0.09	0.7	0.02	<0.23	<2.0	175	35	22.1	290	255	35	12
Well 15	710	410	<2.0	<2.0	2	4	36	0.06	0.6	0.01	<0.23	<2.0	160	32	21	260	230	38	11
Well 17	8,650	1,295	<2.0	<2.0	2.5	117	74	0.05	13	0.10	<0.23	<2.0	315	675	7.7	87	205	250	345
Well 18	930	565	<2.0	<2.0	1.7	7	45	0.08	4.8	0.04	<0.23	<2.0	200	114	15.6	285	260	25	37
Well 19	1,100	690	<2.0	<2.0	1.6	20	86	1.38	3.5	0.05	<0.23	2.5	245	101	13.4	335	335	26	65
Well 20	1,300	850	<2.0	<2.0	2	34	68	0.06	7.3	0.10	<0.23	<2.0	270	300	11.0	270	260	9	120

Notes:

(a) Average of two annual samples collected in 2020 and 2021 in accordance with Monitoring and Reporting Program R5-2019-0008.

(b) Well locations shown on Figure 3-3.

(c) EC = Electrical Conductivity

(d) µS/cm = microSiemen per centimeter

(e) TDS = Total Dissolved Solids

(f) mg/L = milligrams per liter

(g) µg/L = micrograms per liter

(h) SAR = Sodium Absorption Ratio, calculated in accordance with the Monitoring and Reporting Program R5-2019-008.

(i) mg/L as CaCO3 = mg/L as Calcium Carbonate

(j) HCO3 = Bicarbonate

(k) CO3 = Carbonate

(l) <X = Constituent not detected above the reporting limit, where X is the reporting limit.

Table 3-12: Groundwater Monitoring Well Construction Details

Monitoring Well	Date Constructed	Total Depth of Borehole (ft bgs)[a]	Depth of Screened Interval[b] (ft bgs)	Depth Interval of Sand Filter Pack (ft bgs)	Depth Interval of Bentonite Seal (ft bgs)	Depth of Bottom of Grout Seal[c] (ft bgs)	Top of Casing Elevation (ft AMSL)[d]	Location	
								Northing[e]	Easting[e]
MW-1R	9/23/2021	60	13.1-43.1	12-54	10-12[f]	10	208.30	2001286.33	6298376.79
MW-2	9/24/2021	65	14.8-44.8	14-51	12-14[g]	37	211.45	1993337.49	6295029.46
MW-3	10/22/2021	62	12.5-42.5	10.8-47	10-10.8[h]	10	199.88	1995252.29	6302172.99

Notes:

(a) ft bgs = feet below ground surface

(b) Casing and screen composed of 2-inch SCH 40 PVC, 0.010-inch slot size.

(c) Grout composed of neat cement.

(d) AMSL = above mean sea level

(e) Northing and Easting coordinates are for CCS83(2017.50), Zone 4. Coordinates were surveyed by QK Inc. (Kennedy Jenks, 2022).

(f) Bentonite seal in base of borehole 54 - 60 ft. bgs

(g) Bentonite seal in base of borehole 51 - 60 ft. bgs

(h) Bentonite seal in base of borehole 47 - 62 ft. bgs

Table 3-13: Monthly Solids Land Application Amounts and Constituent Analysis, 2020 - 2021[a]

Tons of Solids Shipped(b)						Constituent Analysis													
Month-Year	Verwey	Stone Lands	Goat Land	Grange ville	Total	Sample Date	Total Solids (%)	Total N (%)[c]	Total Phosphorus (%)	Total Potassium (%)	Arsenic (mg/kg)[d]	Cadmium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Zinc (mg/kg)
Jan-20	1,764	0	0	0	1,764	1/23/20	71.0	6.0	5.0	0.3	8.3	<0.52[e]	19.0	<2.8	<0.016	1.4	4.4	<9.8	84.0
Feb-20	2,040	114	0	0	2,154	2/18/20	14.8	1.0	0.5	0.1	2.7	<0.052	2.0	0.5	<0.016	3.5	3.5	4.0	<10
Mar-20	2,114	0	0	0	2,114	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Apr-20	2,564	0	0	0	2,564	-	-	-	-	-	-	-	-	-	-	-	-	-	-
May-20	2,153	0	0	0	2,153	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jun-20	2,073	0	0	0	2,073	6/18/20	15.6	6.3	5.0	0.5	6.3	<0.52	NS[f]	7.6	<0.016	3.1	4.9	<9.8	NS
Jul-20	3,443	980	0	0	4,423	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aug-20	0	0	700	5,060	5,760	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sep-20	0	0	0	8,460	8,460	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oct-20	0	6,780	0	0	6,780	10/27/20	16.5	5.0	6.2	0.4	<0.4	0.3	14.0	<0.41	<0.016	3.9	6.3	2.2	112.0
Nov-20	459	2,269	0	0	2,728	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dec-20	954	1,580	0	0	2,534	12/7/20	17.5	5.8	4.0	0.3	<0.4	0.1	9.0	<0.41	<0.016	3.2	3.1	<0.98	51.0
Jan-21	957	1,740	0	0	2,697	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Feb-21	1,559	440	0	0	1,999	2/8/21	15.5	6.6	4.2	0.3	<2.0	<0.26	9.0	<2.0	<0.016	3.4	2.6	<4.9	65.0
Mar-21	1,023	1,200	0	0	2,223	3/8/21	15.6	6.4	4.9	0.4	<2.0	0.3	7.8	<2.0	0.0	3.4	2.5	<4.9	54.7
Apr-21	465	2,290	0	0	2,755	4/5/21	17.1	6.2	5.7	0.4	<2.0	<0.26	7.5	<2.0	0.0	3.8	2.4	<4.9	62.4
May-21	508	2,528	0	0	3,036	5/3/21	15.5	6.3	5.7	0.4	<2.0	<0.26	8.3	<2.0	<0.016	3.7	5.6	<4.9	71.6
Jun-21	738	1,960	0	0	2,698	6/7/21	14.8	6.6	4.2	0.4	<2.0	<0.26	12.0	<2.0	<0.016	4.3	2.8	<4.9	90.0
Jul-21	694	1,980	0	0	2,674	7/13/21	15.9	1.0	0.7	0.1	3.8	ND[f]	12.0	1.0	ND	3.4	2.9	3.5	79
Aug-21	506	2,000	0	0	2,506	8/2/21	14.8	1.0	0.8	0.1	1.5	0.1	10.0	0.4	NS[f]	3.3	2.0	1.2	8
Sep-21	874	1,360	0	0	2,234	9/13/21	16.2	1.0	1.0	0.1	2.9	ND	11.0	ND	ND	4.2	3.9	ND	110

Notes:

(a) Source: Quarterly Monitoring Reports (J.M. Lord, 2020; 2021). Laboratory reports not available for third quarter 2021.

(b) Monthly solids applied on land application areas in tons; Samples reported on a wet weight basis.

(c) % = percentage, dry weight basis

(d) mg/kg = milligrams per kilogram dry weight

(e) < X = sample result less than the reporting limit, where X is the reporting limit

(f) NS: Not sampled. ND: not detected above method reporting limit.

Table 4-1: Shallow Groundwater Elevations at MW-1R, MW-2, and MW-3

Well ID	Measuring Point Elevation[a] (ft AMSL)[b]	Groundwater Measurement Date	Depth to Groundwater (ft bgs)[c]	Groundwater Elevation (ft AMSL)
MW-1R	208.30	10/29/2021	13.99	194.31
	208.30	11/2/2021	14.18	194.12
	208.30	1/26/2022[d]	12.84	195.46
MW-2	211.45	10/29/2021	6.79	204.66
	211.45	11/2/2021	7.31	204.14
	211.5	11/10/2021	8.05	203.40
	211.5	1/26/2022[d]	11.73	199.72
MW-3	199.88	10/29/2021	6.70	193.18
	199.88	11/10/2021	5.89	193.99
	199.88	1/26/2022[d]	7.19	192.69

Notes:

(a) "Measuring Point" denotes the Top of Casing. Surveyed 8 December 2021 by Quad Knopf, Inc. (Kennedy Jenks, 2022).

(b) "ft AMSL" denotes feet above mean sea level.

(c) "ft bgs" denotes feet below ground surface.

(d) Measured by Dellavalle on 1/26/2022.

Table 4-2: TDS, EC, Boron, Sodium, Chloride, and Sulfate at Five Sumps Near the River Ranch[a]

Station(b)	Average TDS[c] (mg/L)[d]		Average EC[e] (µS/cm)[f]		Average Boron (mg/L)		Average Sodium (mg/L)		Average Chloride (mg/L)	Average Sulfate (mg/L)	Average Arsenic (µg/L)[g]
	1986	1998	1986	1998	1986	1998	1986	1998	1986	1986	1986
VGD-4406	27,244	18,500	25,233	18,700	31	33	6,909	4,820	1,662	15,711	8.3
VGD-4806	27,100	-	26,000	-	24	-	6,710	-	1,820	15,800	2.0
VGD-5412	16,360	12,025	16,367	13,775	18	22	3,959	3,348	1,023	9,449	3.4
VGD-3906	32,878	24,933	29,389	26,433	32	35	8,442	7,323	2,188	19,822	9.9
VGD-5509[h]	4,130	-	4,650	-	2.3	-	610	-	274	2,150	3.0
Average[h]	**25,896**	**18,486**	**24,247**	**19,636**	**26**	**30**	**6,505**	**5,164**	**1,673**	**15,196**	**5.9**
% Decrease 1986-1998[h][i]	**29%**		**19%**		**-14%**		**21%**				

Notes:

(a) Source:

- Department of Water Resources (DWR, 1998). *San Joaquin Valley Drainage Monitoring Program 1986 – District Report. July 1988.*
- Department of Water Resources (DWR, 2002). *San Joaquin Valley Drainage Monitoring Program 1998 – District Report. July 2002.*

(b) Station Locations are in the vicinity of or on Stone Ranch.

(c) TDS = Total Dissolved Solids.

(d) mg/L = milligrams per liter.

(e) EC = Electrical Conductivity.

(f) µS/cm = microSiemen per centimeter.

(g) µg/L = micrograms per liter.

(h) Sump VGD-5509 was only measured in 1986 and was excluded from the averages and calculation of percentage decrease.

(i) Percentage decrease in concentration between 1986 and 1998. A negative number indicates an increase.

Table 4-3: Shallow Groundwater Quality from MW-1, 1993 - 2018

Sample Date	TDS[a]	EC[c]	Boron	Chloride	pH	Sodium	Sulfate as SO_4	Calcium	Magnesium	Potassium	Alkalinity as CaCO3	Bicarb. as CaCO3	Carbonate as CaCO3	Hydroxide as CaCO3	Hardness as CaCO3	Arsenic	Iron	Manganese	Copper	Zinc	Molybdenum	Silver	Selenium	Uranium
	(mg/L)[b]	(µS/cm)[d]	(mg/L)	(mg/L)		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(µg/L)[e]	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(µg/L)	(µg/L)
1993	60,000	49,500	55	3,500	7.7	17,000	37,300	460	1,800	30	429	523	ND[f]	ND	8,600	0.065	ND	1.3	ND	ND	0.038	-	ND	ND
1994	58,700	49,700	57	4,400	8	17,200	35,400	470	1,800	ND	433	528	ND	ND	8,600	ND	0.52	0.89	ND	-	0.44	-	-	-
1995	58,000	48,000	53	4,300	7.7	1,600	33,000	390	160	17	430	520	ND	ND	1,600	ND	5.2	0.59	ND	ND	0.44	-	0.6	0.03
1996	58,000	49,000	-	4,100	7.6	15,000	38,000	460	1,700	26	470	580	ND	ND	8,200	ND	3.5	0.81	ND	ND	0.62	-	0.46	0.02
1997	57,000	47,000	48	4,100	7.9	15,000	36,000	410	1,400	31	420	420	ND	ND	6,800	ND	6.1	1.1	ND	ND	0.5	-	ND	24
1998	58,000	47,000	22	3,600	7.6	17,000	35,000	360	1,300	20	430	430	ND	ND	6,200	NR	5.6	0.95	ND	ND	0.5	-	ND	27
1999	55,000	49,000	36	3,600	7.78	16,000	33,000	310	1,100	20	420	420	ND	ND	5,200	NR	5.9	0.86	ND	ND	0.7	-	ND	21
2000	54,000	47,000	48	3,300	7.5	15,000	32,000	450	1,500	33	420	420	<1.0[g]	<1.0	7,300	<20	6.8	1.1	<0.10	<0.1	<0.1	<0.02	<0.4	ND
2001	38,000	37,000	33	4,700	8	11,000	20,000	200	1,800	ND	2200	2200	ND	ND	7,900	NS	8	0.2	ND	ND	1	-	1.54	1100
2002	56,000	45,000	46	3,200	7.7	13,000	32,000	460	1,500	ND	420	420	ND	ND	7,300	ND	ND	ND	ND	ND	1.8	-	0.32	-
2003	51,000	38,000	41	2,900	7.7	14,000	30,000	360	930	18	420	420	ND	ND	4,700	ND	3.5	0.79	ND	ND	0.7	-	0.517	-
2004	56,000	42,000	49	3,000	7.7	14,000	31,000	480	1,600	ND	440	440	ND	ND	7,800	ND	11	1.6	ND	ND	0.64	-	-	-
2005	54,000	42,000	49	3,200	7.7	15,000	32,000	440	1,400	22	450	450	ND	ND	6,900	50	6.9	2	ND	ND	0.67	-	-	-
2006	40,000	40,000	56	3,200	7.8	15,000	33,000	480	1,600	<2.0	430	430	<1.0	<1.0	7,800	25	13	3.3	<0.050	<0.050	0.62	<0.010	0.15	-
2007	48,000	37,000	48	3,100	7.9	14,000	32,000	390	1,300	42	430	430	ND	ND	6,300	ND	6.1	1.1	ND	ND	0.57	-	-	-
2008	45,000	37,000	50	2,500	8	13,000	28,000	380	1,100	22	400	400	ND	ND	5,500	31	2.7	0.93	ND	ND	0.44	-	-	-
2009	43,000	40,000	47	5,400	7.5	14,000	32,000	400	1,300	24	310	310	ND	ND	6,400	12	31	3.3	ND	ND	0.16	-	0.2	-
2010	48,000	41,000	49	2,800	7.9	13,000	32,000	410	1,300	33	440	440	<3.0	<3.0	6,400	9.9	6.0	1.1	<0.050	<0.050	0.59	<0.010	-	-
2011	45,000	41,000	43	3,200	7.8	13,000	31,000	350	1,200	25	400	400	<3.0	<3.0	5,900	15	6.8	1.2	<0.050	<0.050	0.51	<0.010	79	-
2012	48,000	38,000	51	3,100	7.8	6,800	28,000	400	1,300	27	420	420	<3.0	<3.0	6,500	12	7.7	1.2	<0.050	<0.050	0.59	<0.010	110	
2013	47,000	37,000	44	2,800	7.7	13,000	29,000	380	1,200	37	430	430	<3.0	<3.0	5,900	<20	6.9	1.0	<0.050	<0.050	0.57	<0.010	0.20	-
2014	45,000	37,000	43	2,600	7.8	13,000	27,000	410	1,200	28	380	380	<3.0	<3.0	6,100	9.2	3.2	0.9	<0.050	<0.050	0.54	<0.010	-	-
2015	44,000	42,000	41	3,600	7.6	12,000	35,000	450	1,400	22	390	390	<3.0	<3.0	6,700	8.9	8.3	1.1	<0.50	<0.50	0.54	<0.10	0.20	-
2016	45,000	42,000	41	2,900	7.8	16,000	29,000	480	1,300	34	380	380	<3.0	<3.0	6,700	<10	4.2	1.1	<0.50	0.055	0.56	<0.010	0.65	-
2017	44,000	41,000	43	2,900	7.8	16,000	29,000	490	1,300	28	380	380	<3.0	<3.0	6,500	<10	6.1	1.2	<0.050	<0.050	0.6	<0.010	-	-
2018	46,000	40,000	40	2,900	7.8	13,000	30,000	460	1,400	33	410	410	ND	ND	6,900	ND	3.3	0.96	ND	ND	0.58	-	0.2	-

Notes:

(a) TDS = Total Dissolved Solids

(b) mg/L = milligrams per liter

(c) EC = Electrical Conductivity

(d) µS/cm = microSiemen per centimeter

(e) µg/L = micrograms per liter

(f) ND = not detected above the laboratory reporting limit

(g) <X = sample result less than the reporting limit, where X is the reporting limit

Table 4-4: Shallow Groundwater Quality at MW-1, MW-1R, MW-2, and MW-3

Well	Sample Date	TDS[a] (mg/L)[b]	EC[c] (µS/cm)[d]	Boron (mg/L)	Chloride (mg/L)	pH	Sodium (mg/L)	Sulfate as SO_4 (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Alkalinity as $CaCO_3$ (mg/L)	Bicarb. as CaCO3 (mg/L)	Carbonate as $CaCO_3$ (mg/L)	Hydroxide as $CaCO_3$ (mg/L)	Hardness as $CaCO_3$ (mg/L)	Arsenic (Diss.) (µg/L)[e]	Iron (mg/L)	Manganese (mg/L)	Copper (mg/L)	Zinc (mg/L)	Molybdenum (mg/L)	Silver (mg/L)	Selenium (Diss.) (µg/L)	Uranium (µg/L)	Nitrate as N (mg/L)	Total Ox. Nitrogen as N (mg/L)	Langelier Index	MBAS[f] (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Nitrogen (mg/L)
MW-1	1/1/20	37,000	41,000	NS	2,800	7.6	12,000	29,000	480	1,400	26	380	380	<3.0[g]	<3.0	7,200	<10	8.6	1.3	<0.5	48		<0.1	48		-[h]	-	-	-	-	-
MW-1	4/1/20	44,000	42,000	48	2,700	7.7	13,000	28,000	460	1,400	<20	380	380	<3.0	<3.0	7,100	<20	26	1.2	<5	<5		<1	<20		-	-	-	-	-	-
MW-1	7/1/20	47,000	43,000	46	2,800	7.8	13,000	30,000	620	1,300	51	380	380	<3.0	<3.0	6,800	<20	15	1.1	<0.05	<2.5		<0.5	32		-	-	-	-	-	-
MW-1	10/1/20	47,000	41,000	NS	2,800	7.8	10,000	29,000	290	780	22	360	360	<3.0	<3.0	3,900	9.2	17	0.86	<0.05	0.25		<0.01	39		-	-	-	-	-	-
MW-1	1/1/21	47,000	41,000	44	2,900	7.8	12,000	29,000	460	1,400	25	340	340	<3.0	<3.0	6,800	23	11	1.2	<0.5	0.92		<0.1	32		-	-	-	ND[g]	-	-
MW-1	4/1/21	52,000	43,000	42	2,700	-	12,000	26,000	270	840	25	400	400	<3.0	<3.0	4,100	<20	6.0	0.77	0	0		0	28		-	-	1.4	<0.050	-	-
MW-1 - 52 ft.[h, i]	9/1/21	36,000	44,000	44	2,900	7.6	13,000	28,000	430	1,400	37	430	430	<3.0	<3.0	6,900	<10	8.4	1	<0.05	<0.05		<0.01	27		< 22.6[j]	0.47	1.1	<0.5	1.2	1.7
MW-1R- 16 ft.[h]	11/2/21	85,000	65,000	98	6,300	7.5	23,000	46,000	610	4,000	<100	990	990	<15	<15	18,000	<100	3.2	13	<2.5	<2.5		<0.5	<100		<23	0.48	1.4	<0.1	3.0	3.5
MW-1R Dellavalle	1/26/22	83,900	109,000	82.7	7,500	7.4	23,200	69,400	584	3,580	75	1,000	1,000	<1	<1.0	4,160	<40	<0.10	11	<0.05	0.052		-	<40		<0.1	-	-	-	6.66	6.7
MW-2 - 16 ft.[h]	11/2/21	2,700	3,400	5.1	160	7.7	220	2,100	570	83	<100	81	81	<3.0	<3.0	1,800	<10	<1.5	<0.50	<2.5	<2.5		<0.5	<10		8.8	8.6	0.69	<0.05	<1.0	8.6
MW-2 - 43 ft.[h]	11/10/21	2,700	3,300	4.9	160	7.8	210	3,700	530	76	<2	78	78	<3	<3	1,600	<20	0.5	<0.01	<0.05	<0.05		<0.01	<20		8.4[j]	14	0.7	<0.05	<1.0	14
MW-2 Dellavalle	1/26/22	3,080	4,180	5.58	132	7.8	291	1,990	574	90	1	84	84	<1	<1.0	663	<10	<0.10	<0.02	<0.05	<0.05		-	<10		7.9	-	-	-	<1.0	9.8
MW-3- 16 ft.[h]	11/10/21	40,000	39,000	30	3,800	7.4	12,000	30,000	450	1,800	28	400	400	<3	<3	8,400	<200	14.0	10	<0.05	0.21		<0.01	<200		38.4[j]	0.44	0.78	<0.05	1.7	2.14
MW-3 Dellavalle	1/26/22	48,100	64,500	38.9	4,190	7.3	13,500	43,600	535	1,930	44	404	404	<1	<1.0	2,470	<40	0.8	7.81	<0.05	<0.05		-	<40		<0.1	-	-	-	4.26	4.26

Notes:

(a) TDS = Total Dissolved Solids

(b) mg/L = milligrams per liter

(c) EC = Electrical Conductivity

(d) µS/cm = microSiemen per centimeter

(e) µg/L = micrograms per liter

(f) MBAS = Methylated Blue Activated Substance

(g) "<" and "ND" = not detected above the laboratory reporting limit

(h) Sample collected using low-flow methods; intake depth in feet below ground surface indicated.

(i) Well overdrilled and decommissioned on 21 September 2021.

(j) Reported as Nitrate-Nitrate by laboratory and converted to Nitrate-N in table.

Table 5-1: Cropping and Irrigation Management Scenarios for the Proposed Project[(a)]

Scenario ID	Scenario Description	Climate Condition	Stone Ranch, Acres					Nederend, Acres		Total Acres
			Triticale Sileage/ Corn	Triticale Grain	Alfalfa	Cotton	Tomatoes/ Summer Forage	Alfalfa	Cotton	
1	2022 Cropping Conditions (No Tomatoes) (Average Climate)	Average	591	151	322	832	0	286	234	2,416
2	2022 Cropping Conditions (with Tomatoes) (Average Climate)	Average	591	151	322	538	294	286	234	2,416
3	2022 Cropping Conditions (No Tomatoes) (Wet Year)	Wet Year	591	151	322	832	0	286	234	2,416
4	2022 Cropping Conditions (with Tomatoes) (Wet Year)	Wet Year	591	151	322	538	294	286	234	2,416
5	2022 Cropping Conditions (with Tomatoes) (100-Year Climate)	100-Year	591	151	322	538	294	286	234	2,416

Note:

(a) Figure 3-5 shows the 2022 cropping conditions.

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Table 5-2: Example Soil Water and Salt Balance for Cropped Fields (Scenario 2 Example)

					Triticale Sileage/ Corn (591 Acres)						Tomatoes/ Summer Forage (294 Acres)					
Month	Effective Rainfall[a] (Inches)	Evapotran-spiration[b] (Inches)	Leprino/ Lemoore Combined Effluent[c] (MG/Month)[d]	Combined Effluent EC[e] (µS/cm)[f]	Net Combined Effluent Irrigation[f] (Inches)	Net Supp'l Irrigation[g] (Inches)	Crop Coeff.	Soil Water[h] (Inches)	Percolate Amount[i] (Inches)	Percolate EC[j] (µS/cm)	Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	1.4	1.2	217	2,269	3.5	0.0	0.8	5.7	4.7	2,444	1.9	0.0	0.4	5.7	2.8	4,830
February	1.2	2.2	196	2,269	1.9	0.0	0.9	5.7	1.6	2,620	2.0	0.0	0.4	5.7	2.4	3,935
March	1.0	4.1	217	2,269	4.0	0.0	1.0	5.7	1.8	3,348	3.2	0.0	0.4	5.7	2.5	3,537
April	0.3	6.1	210	2,269	4.0	0.0	1.0	3.9	0.0	5,671	1.1	0.1	0.5	4.2	0.0	5,331
May	0.2	8.1	217	2,269	0.0	1.5	0.4	2.4	0.0	7,992	4.0	3.1	0.7	5.7	0.1	5,344
June	0.0	9.0	210	2,269	2.2	4.0	0.7	2.3	0.0	6,108	2.9	6.1	0.9	5.7	0.9	5,618
July	0.0	9.1	217	2,269	2.3	5.9	0.9	2.3	0.0	4,790	2.9	6.2	1.0	5.7	0.0	6,636
August	0.0	8.1	217	2,269	3.0	5.1	1.0	2.3	0.0	4,534	2.9	5.2	1.0	5.7	0.0	7,505
September	0.1	6.2	210	2,269	4.0	2.1	1.0	2.3	0.0	5,256	0.0	2.4	0.8	3.2	0.0	12,933
October	0.4	4.2	217	2,269	0.0	1.3	0.4	2.3	0.0	4,742	2.0	0.0	0.5	3.5	0.0	12,594
November	0.4	2.2	210	2,269	3.0	0.0	0.4	4.8	0.0	3,372	2.0	0.0	0.4	5.0	0.0	9,332
December	1.1	1.2	217	2,269	2.8	0.0	0.7	5.7	2.8	2,775	2.0	0.0	0.4	5.7	1.9	6,549
Total:	**6.2**	**61.7**	**2,555**		**30.7**	**19.9**			**10.8**	*2,704*	**26.8**	**23.1**			**10.7**	*4,709*
					1 January Soil Water (Inches):			5.7		2,775	1 January Soil Water (Inches):			5.7		6,549

Water Balance Parameters

Lemoore/Leprino Flow (MGD)[k]:	7.0
Irrigation Efficiency[l]:	0.7 - 0.9
Soil Water Capacity (Inches)[m]:	4.8 - 5.7

Notes:

(a) Effective rainfall based on MacGillivray and Jones, DWR 1989.

(b) Reference evapotranspiration data from CIMIS Stratford Station (1983 - 2021).

(c) Proposed project combined effluent flow (7.0 mgd).

(d) MG/Month = millions of gallons per month

(e) Combined effluent EC concentration (2019 - 2021).

(f) µS/cm = micro Siemens per centimeter

(g) Net combined effluent irrigation, includes irrigation efficiency of 0.7 for flood irrigation or 0.9 for drip irrigation.

(h) Soil calculation consists of inputs from the previous month's soil water storage, the net combined effluent and groundwater irrigation, less the actual evapotranspiration (evapotranspiration multiplied by the crop coefficient).

(i) Total amount of water percolating through the root zone (in excess of the soil water capacity)

(j) Electrical Conductivity of the percolate

(k) MGD = Million gallons per day

(l) Irrigation efficiency for flood irrigation is 0.7, it is 0.9 for drip irrigation on the tomatoes and cotton

(m) Source: Web Soil Survey (USDA, 2018). https://websoilsurvey.sc.egov.usda.gov/

Table 5-3: Salt and Water Balance Results for Scenario 2

Crop(a)	Acres	Net Combined Effluent[b] (Inches)	Supplemental Water[c] (Inches)	Percolation[d] (Inches)	Percolate EC[e] (µS/cm)[f]
		Scenario 2: 2022 Cropping (With Tomatoes) - Average Climate			
Triticale Sileage/ Corn	591	31	20	11	2,704
Triticale Grain	151	30	16	14	2,241
Cotton/Winter Cover	538	27	23	7.7	4,256
Alfalfa	322	33	28	9.3	2,924
Tomatoes/ Summer Forage	294	27	23	11	4,709
Alfalfa Nederend	286	34	28	11	2,822
Cotton/Winter Cover Nederend	234	29	23	8.8	4,186
Total:	**2,416**				
Weighted Average[g]:				**9.9**	**3,308**

Notes:

(a) Figure 3-5 shows the 2022 cropping conditions.

(b) Net combined effluent applied to the land application area in inches. Includes irrigation efficiency of 0.7 for flood irrigation or 0.9 for drip irrigation.

(c) Net supplemental water (groundwater) applied to the land application area in inches. Includes irrigation efficiency of 0.7 for flood irrigation or 0.9 for drip irrigation.

(d) Total amount of water percolating through the root zone (in excess of the soil water capacity).

(e) The Annual percolate Electrical Conductivity (EC) is weighted based on the monthly percolate amount.

(f) µS/cm = microSiemens per centimeter

(g) The weighted average percolation amount is weighted based on field acreage.
The weighted average percolate Electrical Conductivity (EC) is weighted based on the percolate amount.

Table 5-4: Summary of Percolate Amount and Percolate EC for Five Scenarios

		Area-Weighted Average Percolate[a] (Inches)	Percolate Flow Weighted Average Percolate EC[b] (µS/cm)[c]
1	2022 Cropping (No Tomatoes) (Average Climate)	8.7	3,051
2	2022 Cropping (with Tomatoes) (Average Climate)	9.9	3,308
3	2022 Cropping (No Tomatoes) (Wet Year)	13.7	2,234
4	2022 Cropping (with Tomatoes) (Wet Year)	15.4	2,332
5	2022 Cropping (with Tomatoes) (100-Yr Wet Climate)	22.6	1,926

Notes:

(a) The weighted average percolation amount is weighted based on field acreage.

(b) The weighted average percolate Electrical Conductivity (EC) is weighted based on the percolate amount for each crop.

(c) µS/cm = microSiemens per centimeter

Table 5-5: Evaporation Basins Water and Salt Balance (Average Climate)

Month	Effective Rainfall[a] (AF)[b]	Adjusted Evaporation[c] (AF)	Flow From Collection Sumps[d] (AF)	Evaporation Basin Seepage[e] (AF)	Evaporation Basin Storage[f] (AF)	Evaporation Basin Surface Area[g] (Acres)	Collection Sump EC[h] (µS/cm)[i]	Evaporation Basin EC[j] (µS/cm)
January	23	17	58.2	15	139	175	9,991	18,999
February	20	30	58	14	173	176	9,991	17,076
March	17	57	58	15	176	177	9,991	18,624
April	5	85	58	15	140	177	11,144	26,035
May	3	112	58	15	73	176	11,144	53,121
June	0	123	58	15	0	175	11,144	300,000
July	0	123	58	0	0	173	9,330	300,000
August	0	110	58	0	0	173	9,330	300,000
September	1	84	58	0	0	173	9,330	300,000
October	6	58	58	0	7	173	11,472	300,000
November	6	29	58	0	42	173	11,472	65,219
December	19	16	58	15	90	174	11,472	27,600
Total:	**102**	**844**	**699**	**106**		**Weighted Average:**	*10,529* [k]	*28,241* [k]

Weighted Average Seepage EC[l], µS/cm: *32,539*

Notes:

(a) Effective rainfall based on MacGillivray and Jones, DWR 1989.

(b) AF = Acre Feet

(c) Evaporation adjusted based on salinity levels in pond.

(d) Flow from collection sumps at the Stone Ranch. Inputs include percolate from cropped fields collected in drain lines, shallow groundwater collected in the drain lines, and flow collected in the interceptor drains.

(e) Evaporation basin seepage estimated based on seepage rate of 1.0×10^{-6} cm/s (BSK, 1983).

(f) Evaporation basin storage based on inputs of previous month's storage, collection sump flow and rainfall; outputs of seepage and evaporation.

(g) Evaporation basin surface area calculated from storage using rating curve developed based on J.M. Lord 1983 evaporation basin design drawings.

(h) Electrical Conductivity (collection sump)

(i) µS/cm = microseimen per centimeter

(j) Electrical Conductivity (evaporation basins)

(k) Flow weighted average EC weighted based on volume in storage.

(l) Flow weighted average seepage EC weighted based on seepage volume.

Table 6-1: Comparison of Combined Effluent Water Quality, Percolate, and Groundwater

Constituent	Proposed Water Quality Objectives	Combined Effluent[a]	Percolate Water Quality[b]	Flow-Weighted Irrigation Well Water Quality[c]	Groundwater Above the A-Clay[d]	Groundwater Between the A and E Clays[e]
EC, µS/cm	1,600[f]	2,269	1,926 - 3,308	2,598	3,627 - 87,000	2,328
TDS [FDS], mg/L	1,000[f]	912	774 - 1,330	863	2,827 - 84,450	773
Arsenic, µg/L	10[g]	3.5	3.0 - 5.1	1.8	9.2 - 23[i]	4.1
Boron, mg/L	0.75[h]	0.54	0.5 - 0.8	1.9	5.2 - 90	1.8
Chloride, mg/L	500[f]	261	222 - 381	79	151 - 6,900	67
Sodium, mg/L	115[h]	328	278 - 478	259	240 - 23,100	238
Sulfate, mg/L	500[f]	15	13 - 22	301	2,597 - 57,700	259

Notes:

(a) Combined effluent average 2019 - 2021.

(b) Range shown from Scenarios 1-5. For TDS, arsenic, boron, chloride, sodium and sulfate the ratio of percolate EC to combined effluent EC was used to estimate levels of other constituents.

(c) Flow weighted average irrigation well water quality based on average 2020-2021 water quality and flows.

(d) Range Includes average of last two 2021 samples at MW-1 prior to destruction, two samples at MW-1R in Nov. 2021 and Jan. 2022, three samples at MW-2 in Nov 2021 and Jan. 2022, and two samples at MW-3 in Nov. 2021 and Jan. 2022.

(e) Average of water quality at irrigation wells: 2, 6, 14, 15, 17, 18 based on data collected in 2020 - 2021.

(f) California Code of Regulations Title 22 MCL - (Upper Secondary WQ Standard).

(g) California Code of Regulations Title 22 Maximum Contaminant Limit (MCL).

(h) This level protects sensitive crops grown in the area. (Ayers and Westcot 1985)

(i) Only two of the 14 sampling events for 2020 through January 2022 had detections of arsenic. Four of the samples without detections had method reporting limits of 10 µg/L, the MCL for arsenic.

Table 6-2: Evaporation Basin Seepage and River Ranch Field Percolate

	Weighted Average Seepage		Irrigated Area Percolate			
Climate Condition	Flow[a] (AF/Year)[b]	EC[c] (µS/cm)[d]	Percolate[e] (AF/Year)	EC[f] (µS/cm)	Percolate Scenario	Flow Weighted Average EC to Groundwater[g] (µS/cm)
Average	106	32,539	1,986	3,308	Scenario 2	4,786
Wet Year	121	28,548	3,091	2,332	Scenario 4	3,321
100-Year	182	40,011	4,554	1,926	Scenario 5	3,390

Notes:

(a) Evaporation basin seepage in acre-feet per year (see Appendix G).

(b) AF/Year = Acre-Feet per year

(c) Weighted average evaporation basin seepage Electrical Conductivity (EC) (see Appendix G). Weighted based on seepage amount.

(d) µS/cm = microSiemens per centimeter

(e) Irrigated area percolate amount in acre-feet per year using scenario shown (see Table 5-4).

(f) Irrigated area percolate EC weighted based on the percolate amount (see Table 5-4).

(g) Weighted average EC to groundwater calculated using 1) evaporation basin seepage and EC, and 2) irrigated area percolate and EC.

Table 6-3: Comparison of Weighted Average Seepage/Percolate Water Quality to Shallow Groundwater

Constituent	Weighted Average Water Quality for Seepage and Percolate[(a)]	Groundwater Above the A-Clay[(b)]
EC, µS/cm	4,786	3,627 - 87,000
TDS, mg/L	1,924	2,827 - 84,450
Arsenic, µg/L	7.4	9.2 - 23[(c)]
Boron, mg/L	1.1	5.2 - 90
Chloride, mg/L	551	151 - 6,900
Sodium, mg/L	692	240 - 23,100
Sulfate, mg/L	31.6	2,597 - 57,700

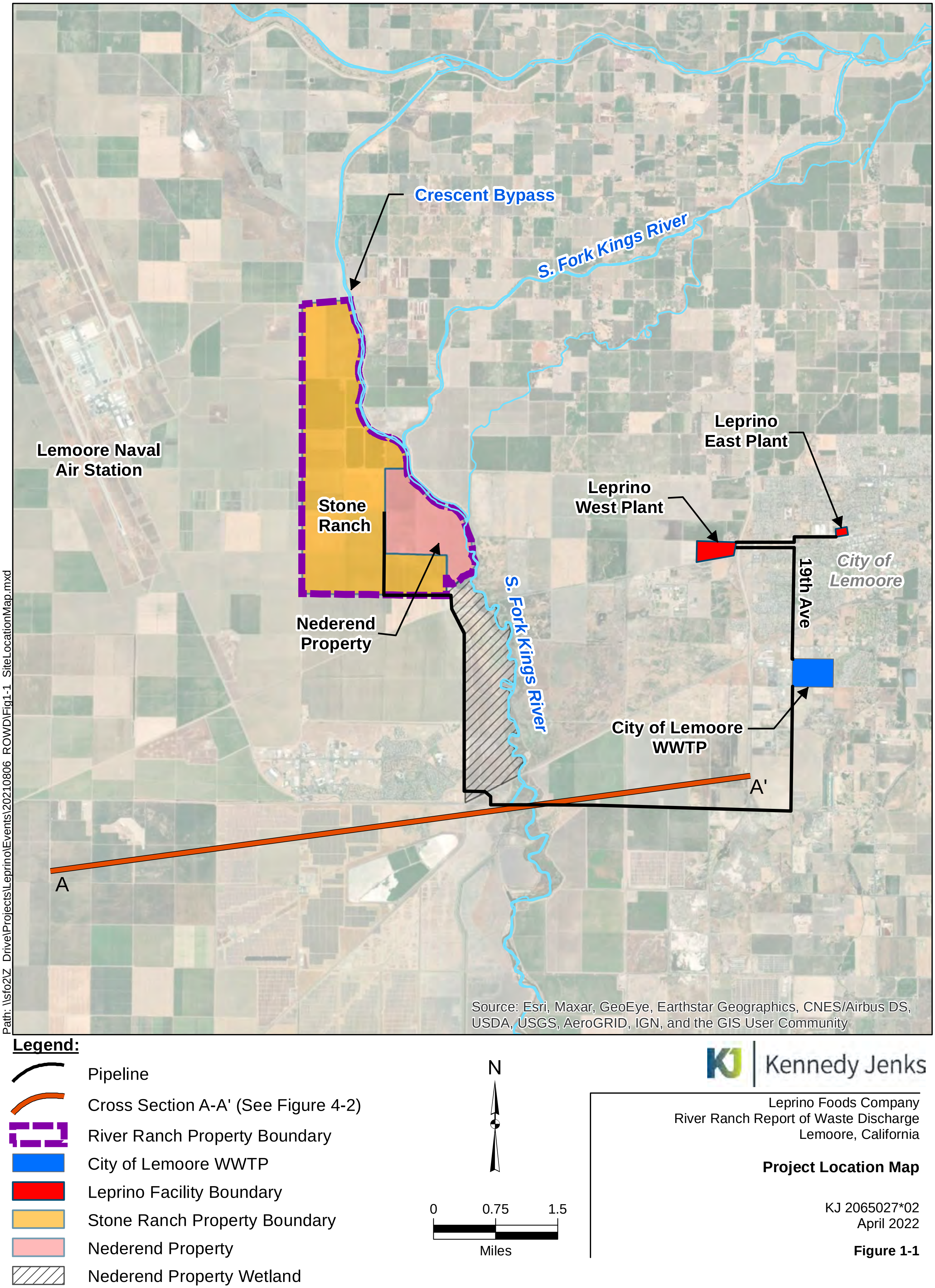
Notes:

(a) Results are shown for average climate conditions. Weighted average water quality for evaporation basin seepage and irrigated area percolate. For TDS, arsenic, boron, chloride, sodium and sulfate the ratio of percolate EC to combined effluent EC was used to estimate levels of other constituents.

(b) Range Includes average of last two 2021 samples at MW-1 prior to destruction, two samples at MW-1R in Nov. 2021 and Jan. 2022, three samples at MW-2 in Nov. 2021 and Jan. 2022, and two samples at MW-3 in Nov. 2021 and Jan. 2022.

(c) Only two of the 14 sampling events for 2020 through January 2022 had detections of arsenic. Four of the samples without detections had method reporting limits of 10 µg/L, the MCL for arsenic.

Figures



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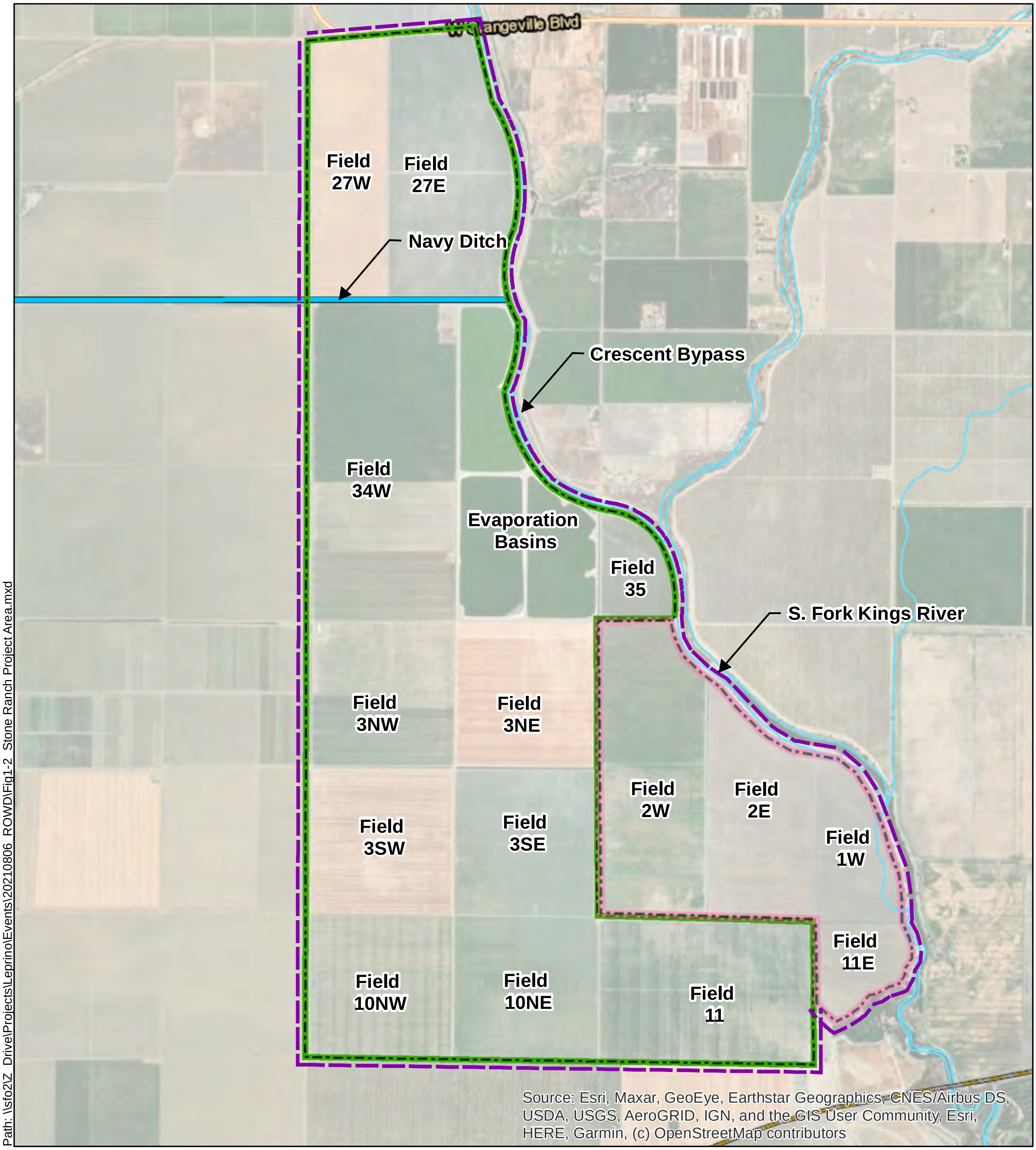
Leprino Foods Company
River Ranch Report of Waste Discharge
Lemoore, California

Project Location Map

KJ 2065027*02
April 2022

Figure 1-1



Path: \\sfo2\Z Drive\Projects\Leprino\Events\20210806 ROWD\Fig1-2 Stone Ranch Project Area.mxd

Legend:

- River Ranch Property Boundary
- Nederend Property Boundary
- Stone Ranch Property Boundary
- Navy Ditch

N

0 1,250 2,500

Feet

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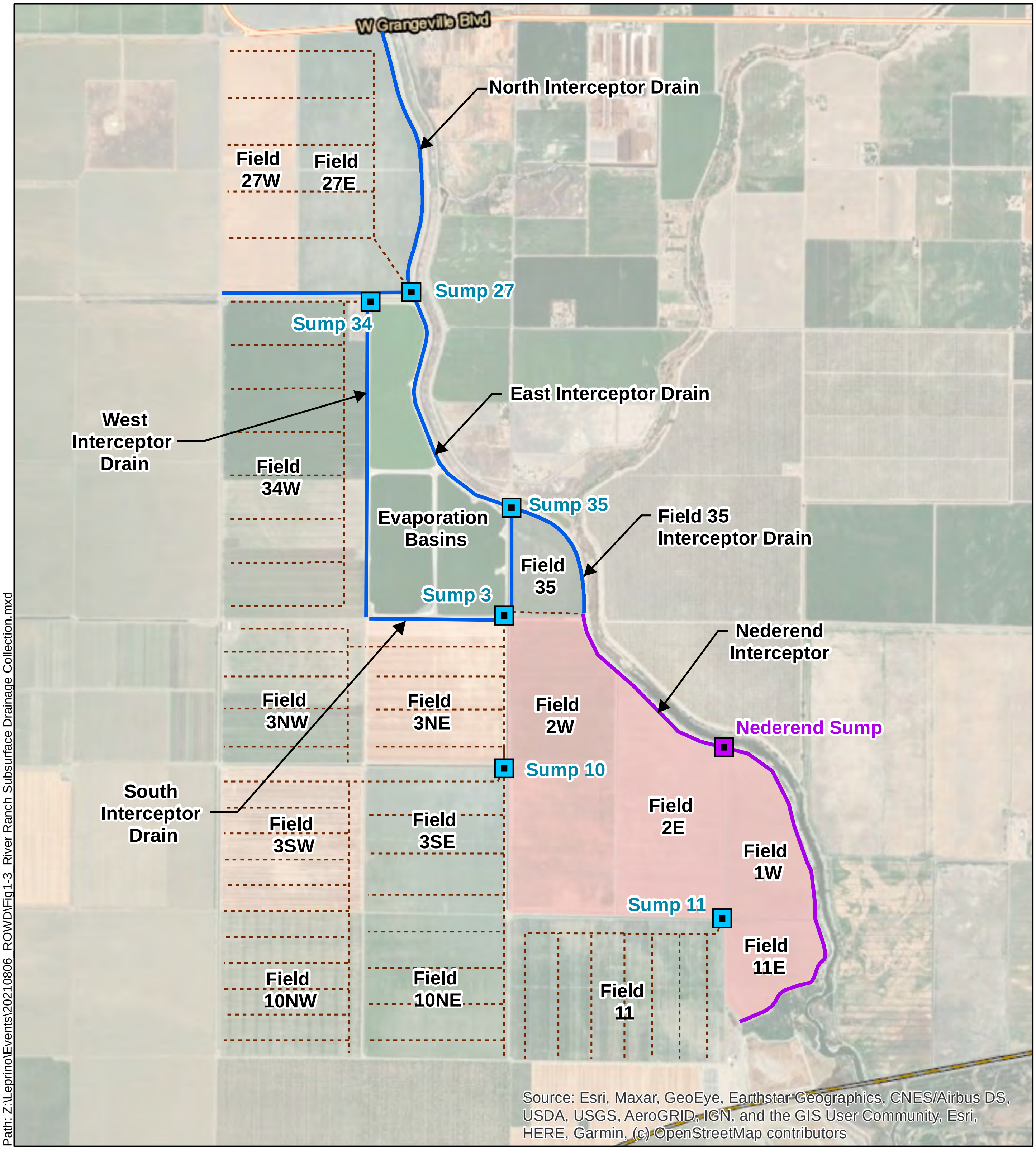
River Ranch Report of Waste Discharge
Lemoore, California

River Ranch Project Area

KJ 2065027*02
April 2022

Figure 1-2



Path: Z:\Leprino\Events\20210806_ROWD\Fig1-3_River Ranch Subsurface Drainage Collection.mxd

Legend:

- Sumps
- Nederend Sump
- Tile Drain Lines
- Subsurface Interceptor Drains
- Subsurface Interceptor Drain to be Constructed Spring 2022
- Nederend Property

N

0 1,250 2,500

Feet

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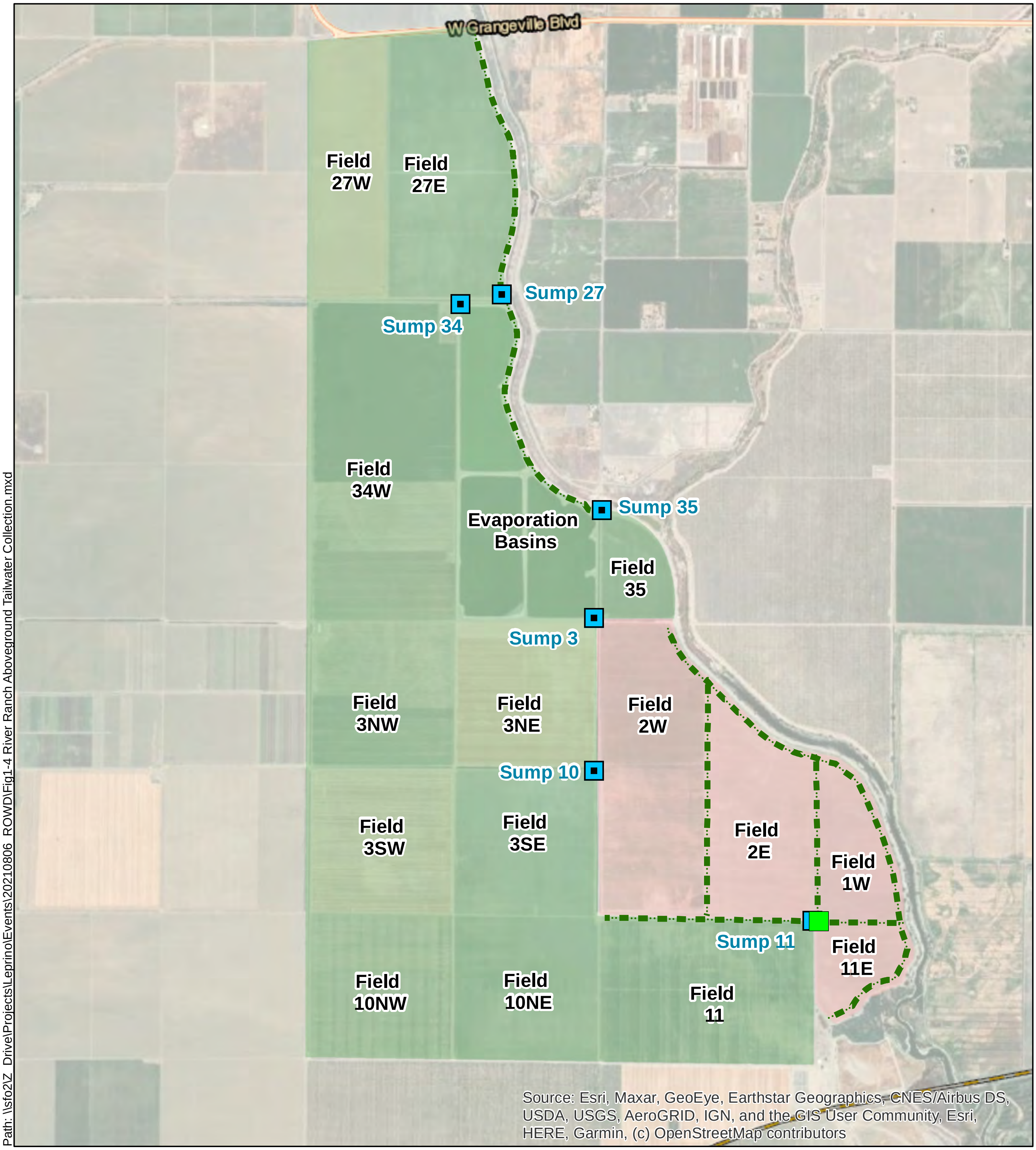
River Ranch Report of Waste Discharge
Lemoore, California

River Ranch Subsurface Drainage Collection System

K/J 2065027*02
April 2022

Figure 1-3



Legend:

- Nederend Lift Station
- Sumps
- Tailwater Ditches
- Stone Ranch Property Boundary
- Nederend Property

N

0 1,250 2,500

Feet

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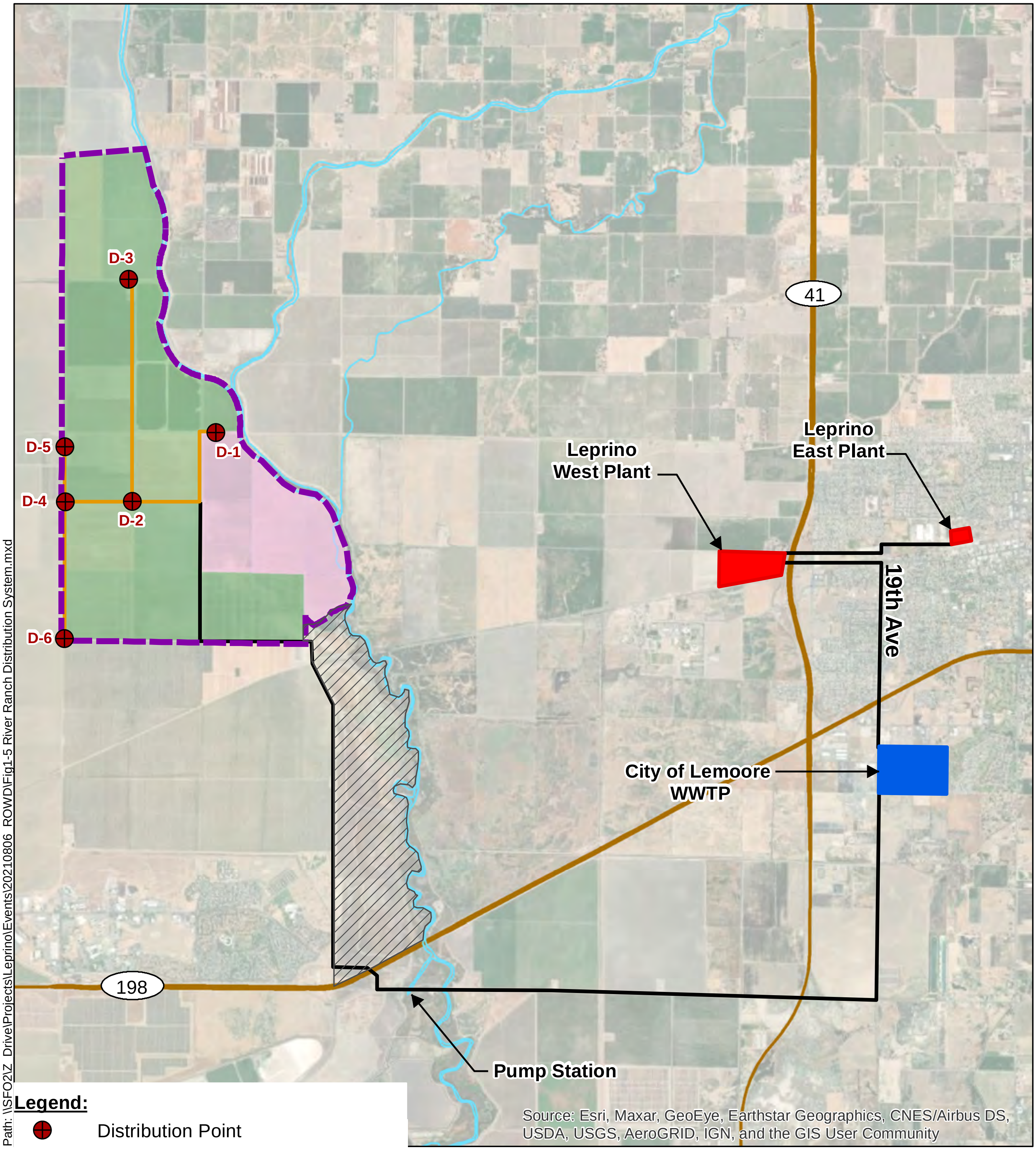
River Ranch Report of Waste Discharge
Lemoore, California

River Ranch Aboveground Tailwater Collection System

KJ 2065027*02
April 2022

Figure 1-4



Path: \\SFO2\Z_Drive\Projects\Leprino\Events\20210806_ROWD\Fig1-5 River Ranch Distribution System.mxd

Legend:

- Distribution Point
- Wetland Area
- City of Lemoore WWTP
- Leprino Facility Boundary
- Nederend Property Boundary
- Stone Ranch Property Boundary
- River Ranch Property Boundary
- Existing Distribution System Pipeline
- Existing Pipeline

N

0 0.5 1
Miles

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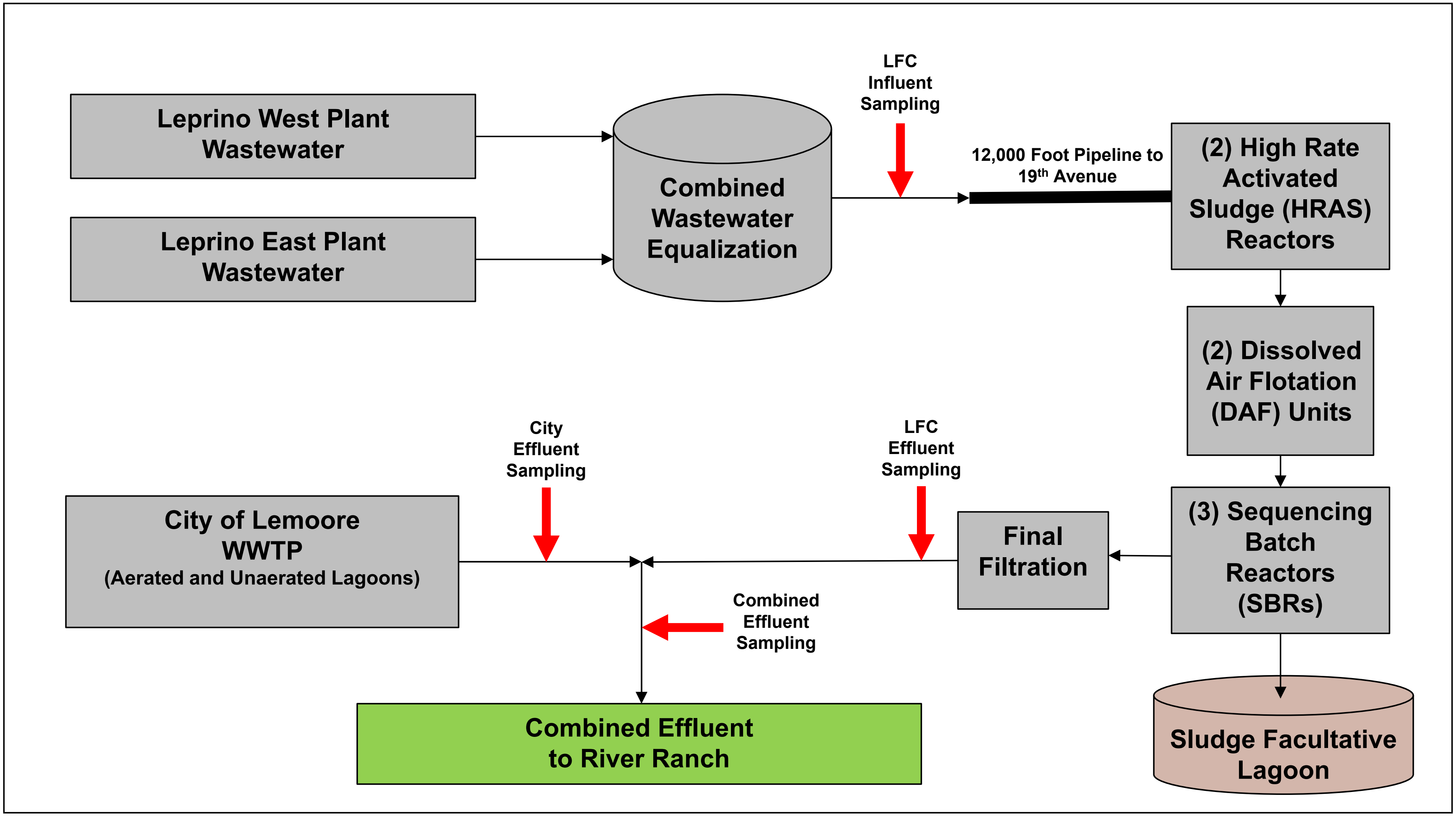
River Ranch Report of Waste Discharge
Lemoore, California

Stone Ranch Water Distribution System

KJ 2065027*02
April 2022

Figure 1-5



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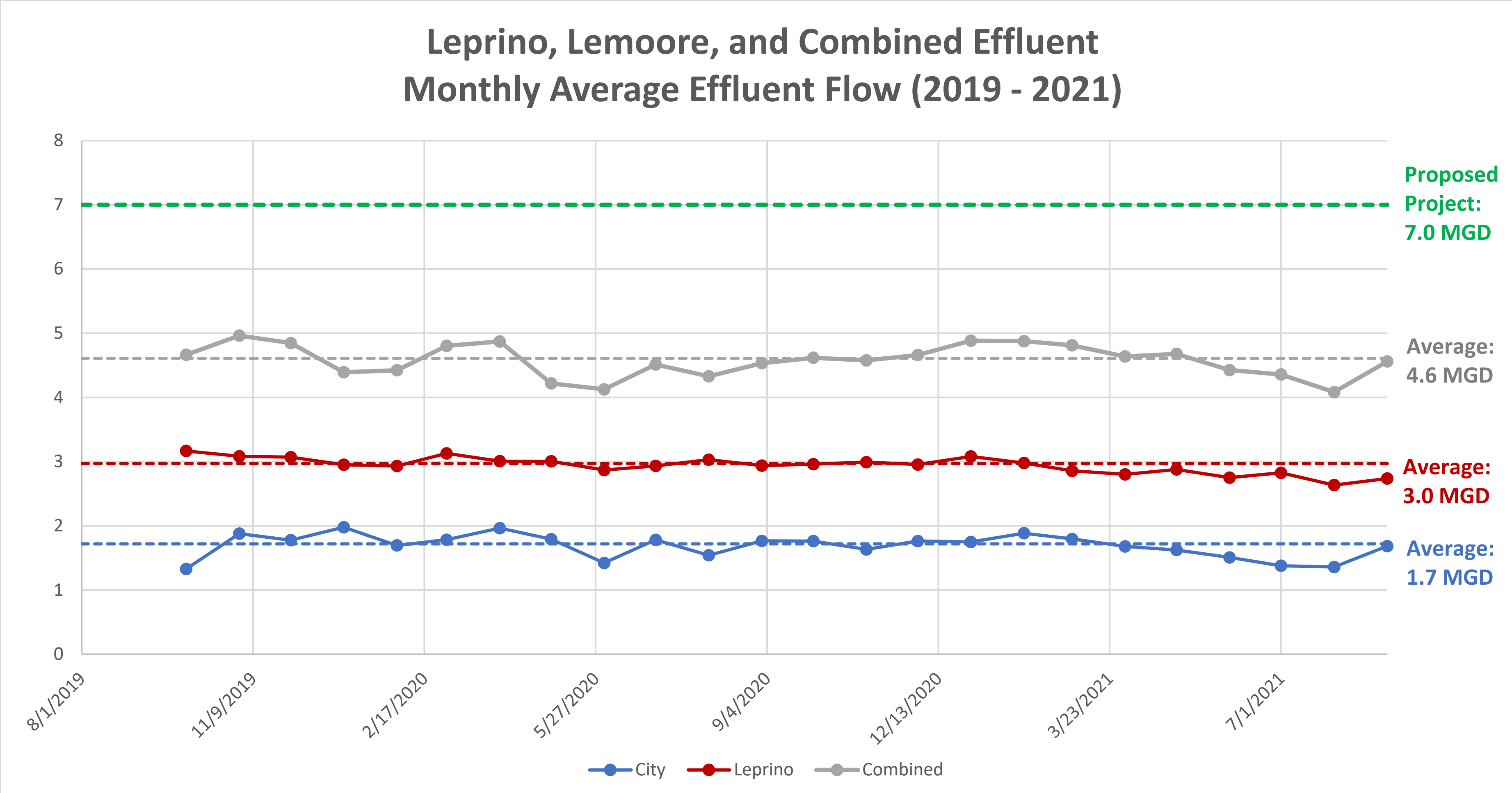
River Ranch Report of Waste Discharge
Lemoore, California

Wastewater Treatment Process Flow Diagram

KJ 2065027*02
April 2022

Figure 2-1



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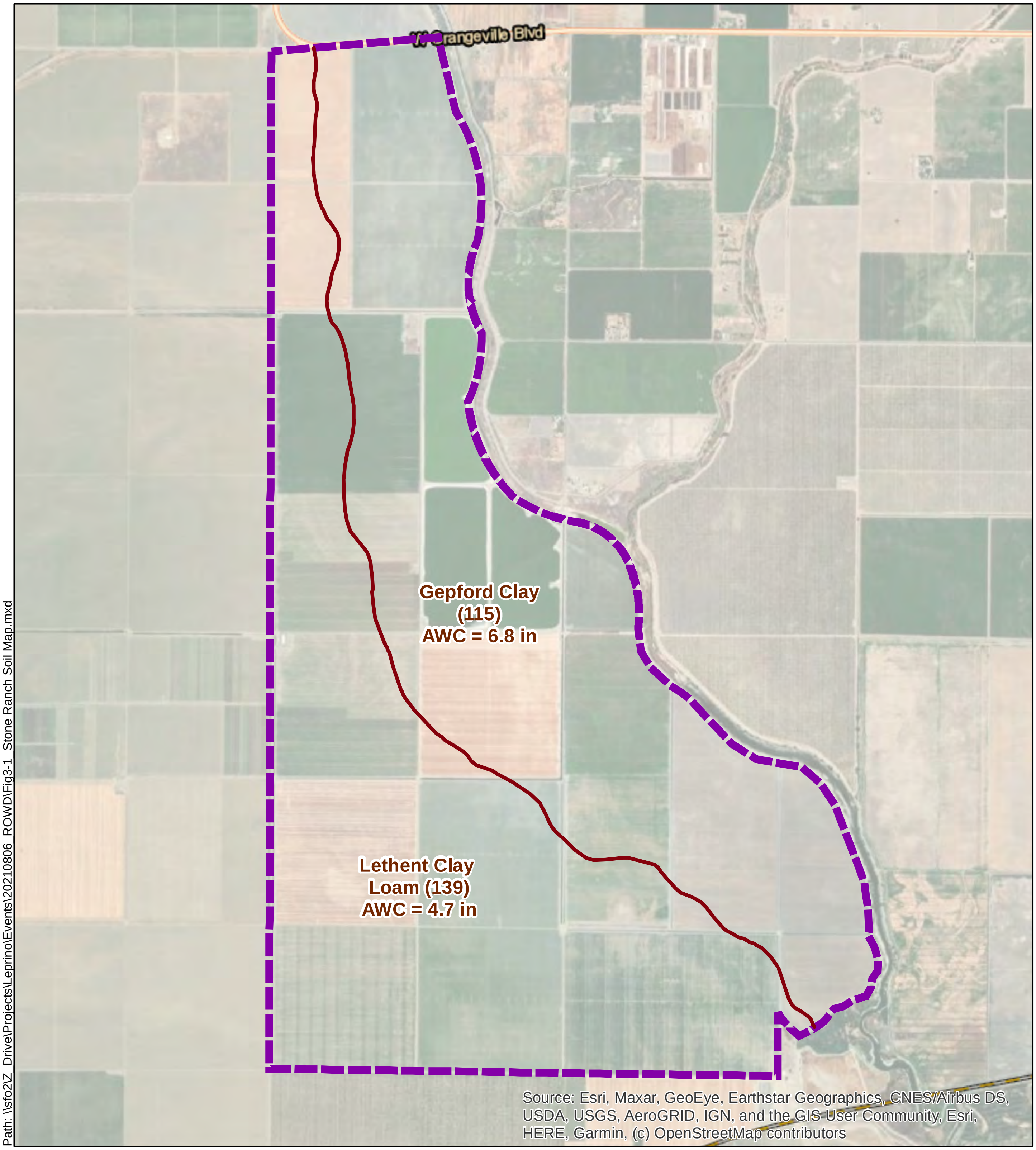
River Ranch Report of Waste Discharge
Lemoore, California

Leprino, Lemoore, and Combined Effluent Monthly Average Effluent Flow (2019 - 2021)

KJ 2065027*02
April 2022

Figure 2-2



Legend:

- River Ranch Property Boundary
- Stone Ranch Property Boundary
- Nederend Property Boundary
- Soil Type Boundary

Notes:

(1) 139 = Lethent Clay Loam
(2) 115 = Gepford Clay
(3) AWC = Available Soil Water Capacity (inches)

Source: Web Soil Survey (USDA, 2018).
https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

N

0 1,250 2,500
Feet

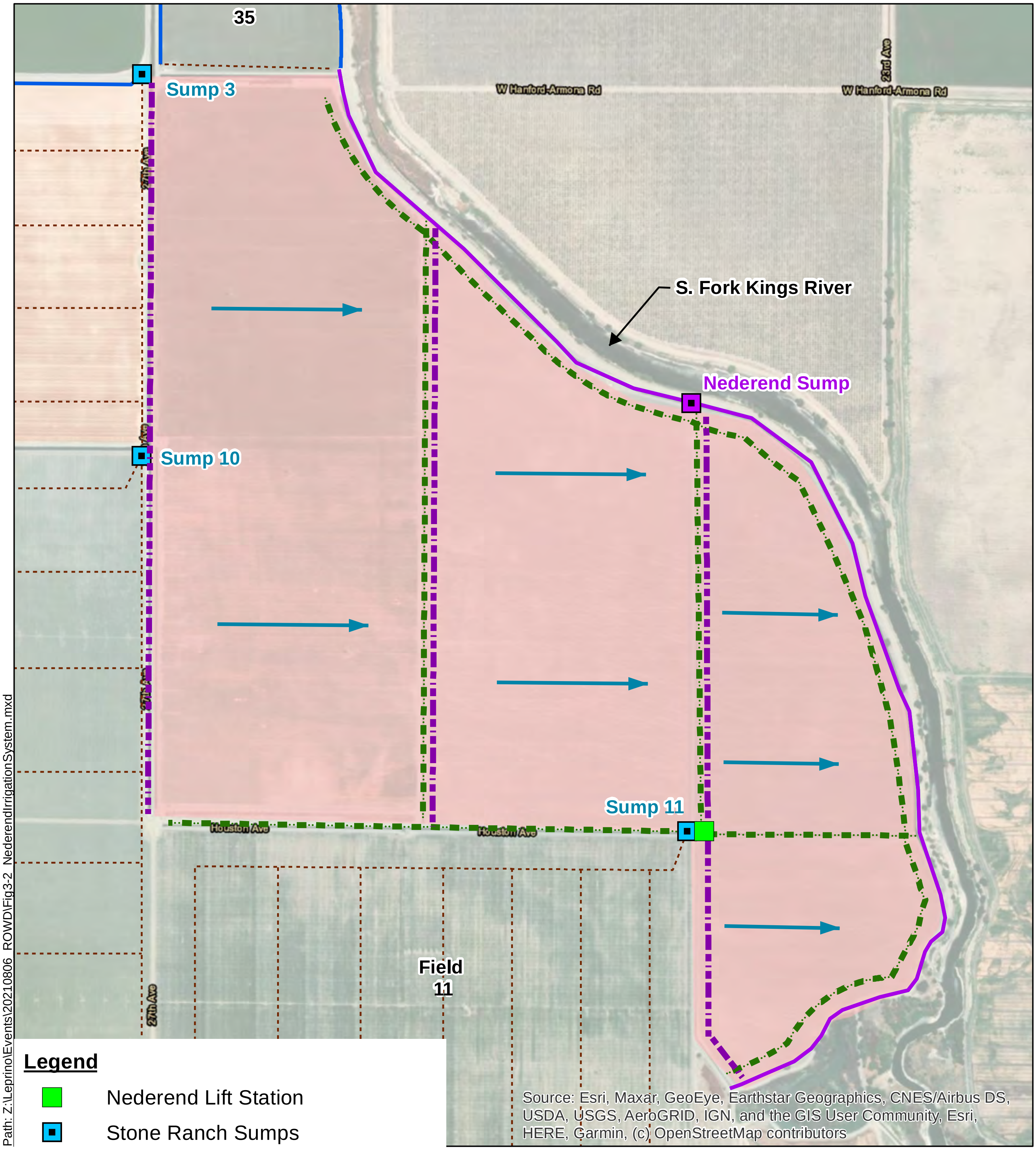
Kennedy Jenks

Leprino Foods Company
River Ranch Report of Waste Discharge
Lemoore, California

River Ranch Soil Map

KJ 2065027*02
April 2022

Figure 3-1



Path: Z:\Leprino\Events\20210806 ROWD\Fig3-2 NederendIrrigationSystem.mxd

Legend

- Nederend Lift Station
- Stone Ranch Sumps
- Nederend Sump
- Tailwater Ditches
- Tile Drain Lines
- Subsurface Interceptor Drains
- Subsurface Interceptor Drain to be Constructed Spring 2022
- Irrigation Ditches
- Nederend Property

N

0 500 1,000

Feet

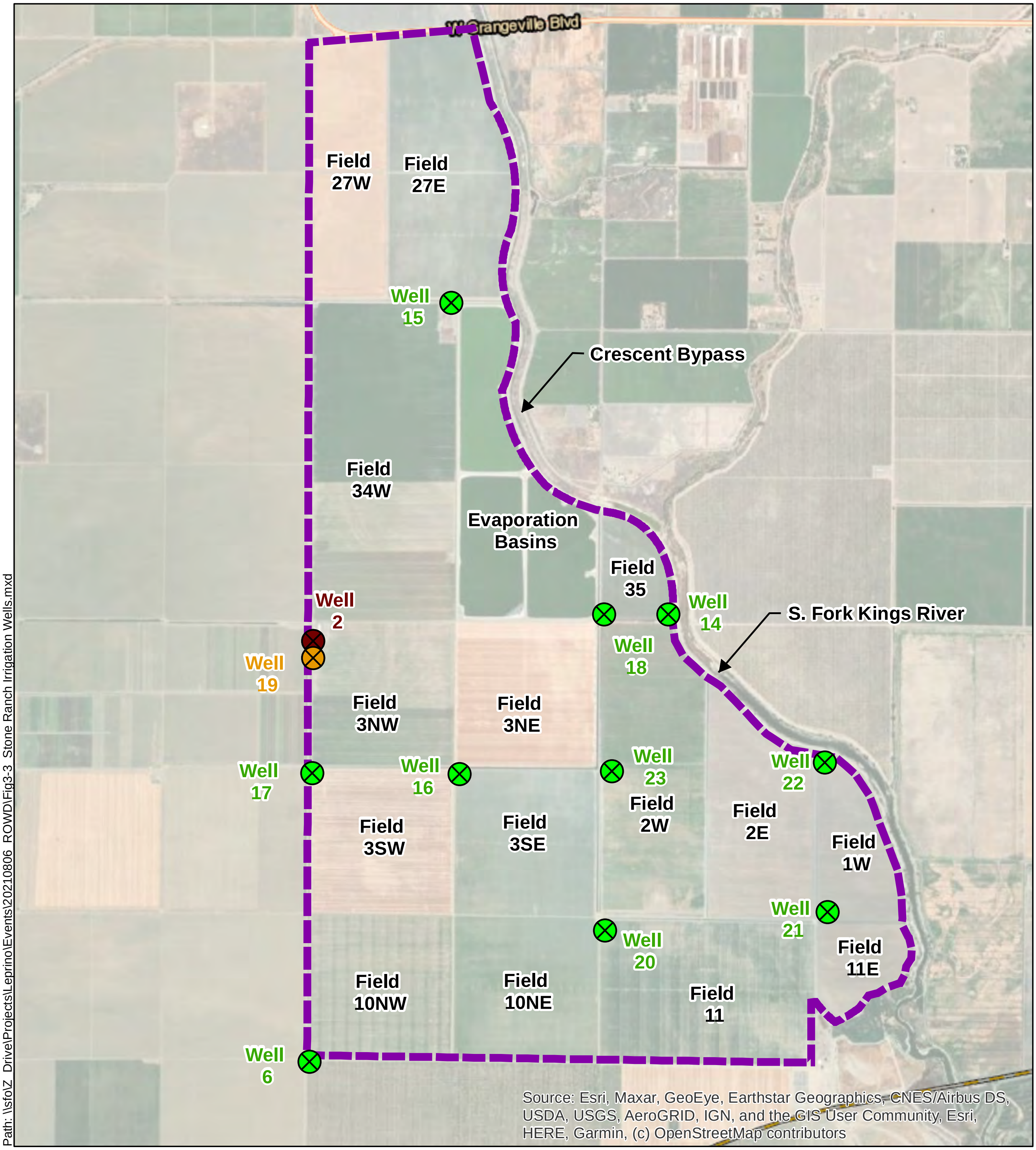
Kennedy Jenks

Leprino Foods Company
River Ranch Report of Waste Discharge
Lemoore, California

Nederend Property
Irrigation System

K/J 2065027*02
April 2022

Figure 3-2



Path: \\sfo\Z Drive\Projects\Leprino\Events\20210806 ROWD\Fig3-3 Stone Ranch Irrigation Wells.mxd

Legend:

- Well 19 (1,290 Ft bgs)
- Well 2 (220 Ft bgs)
- Stone Ranch Irrigation Wells (510 - 584 Ft bgs)
- River Ranch Property Boundary

N

0 1,250 2,500
Feet

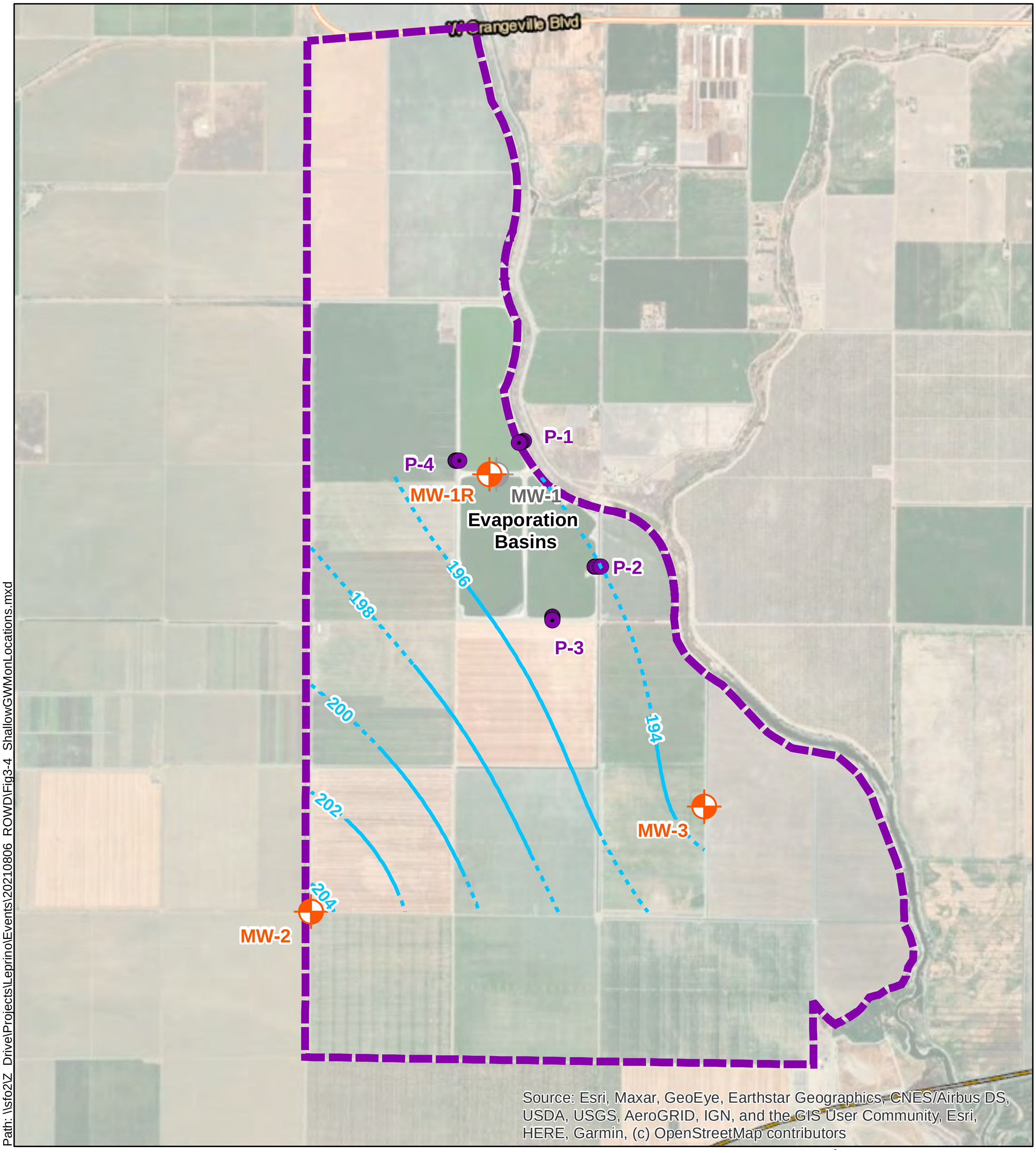
Kennedy Jenks

Leprino Foods Company
River Ranch Report of Waste Discharge
Lemoore, California

River Ranch Irrigation Wells

KJ 2065027*02
April 2022

Figure 3-3



Path: \\sfo2\Z_Drive\Projects\Leprino\Events\20210806_ROWD\Fig3-4_ShallowGWMonLocations.mxd

Legend:

Monitoring Well Locations

Monitoring Well MW-1 (Destroyed)

Piezometer Array Locations

Groundwater Elevation Contours (Dashed where Inferred)

River Ranch Property Boundary

Note: Piezometer levels are not included in the groundwater elevation contours.

N

0 1,250 2,500

Feet

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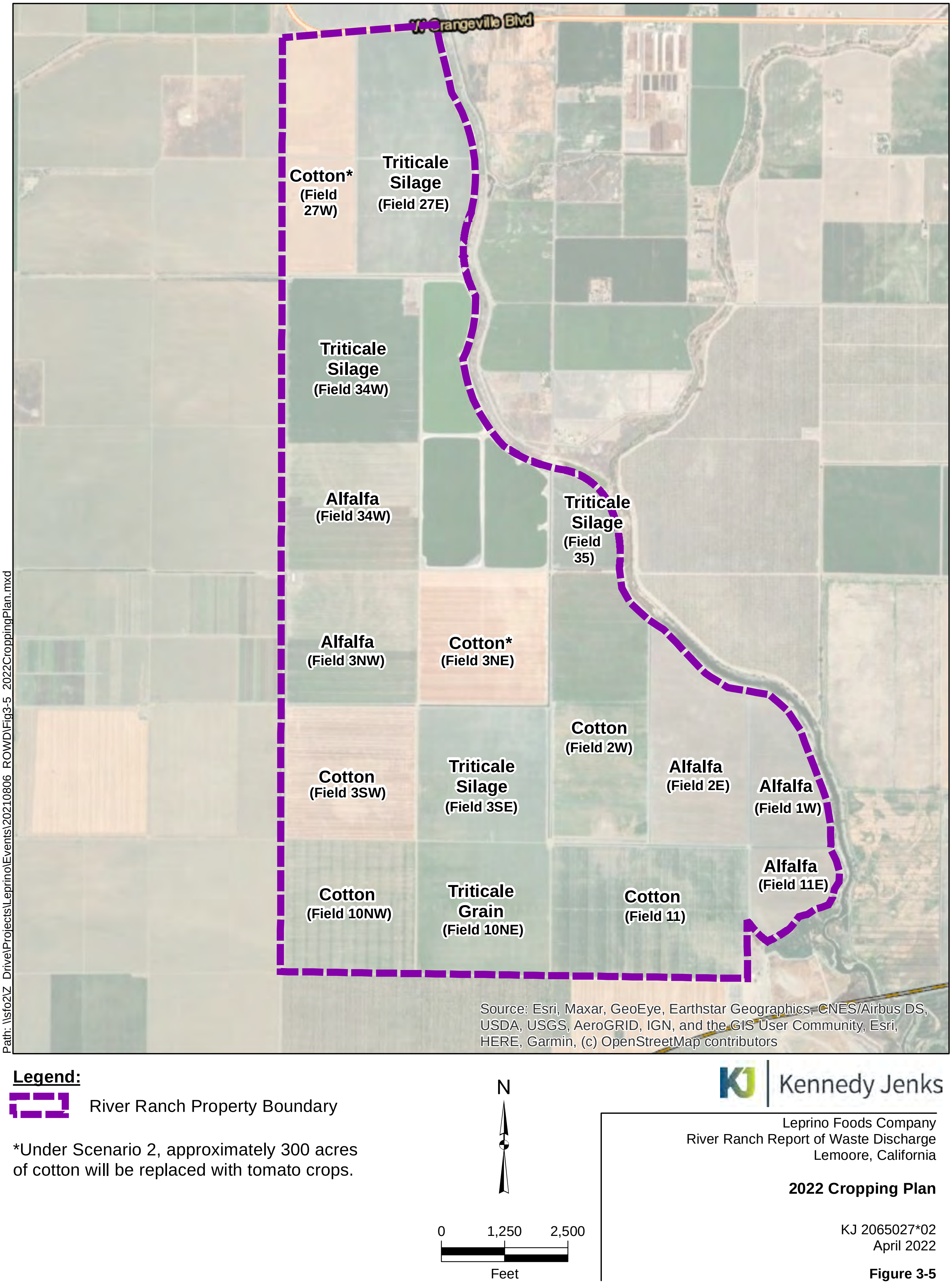
Leprino Foods Company
River Ranch Report of Waste Discharge
Lemoore, California

Shallow Groundwater Monitoring Locations and Groundwater Elevation (29 October 2021)

KJ 2065027*02
April 2022

Figure 3-4



Legend:

River Ranch Property Boundary

*Under Scenario 2, approximately 300 acres of cotton will be replaced with tomato crops.

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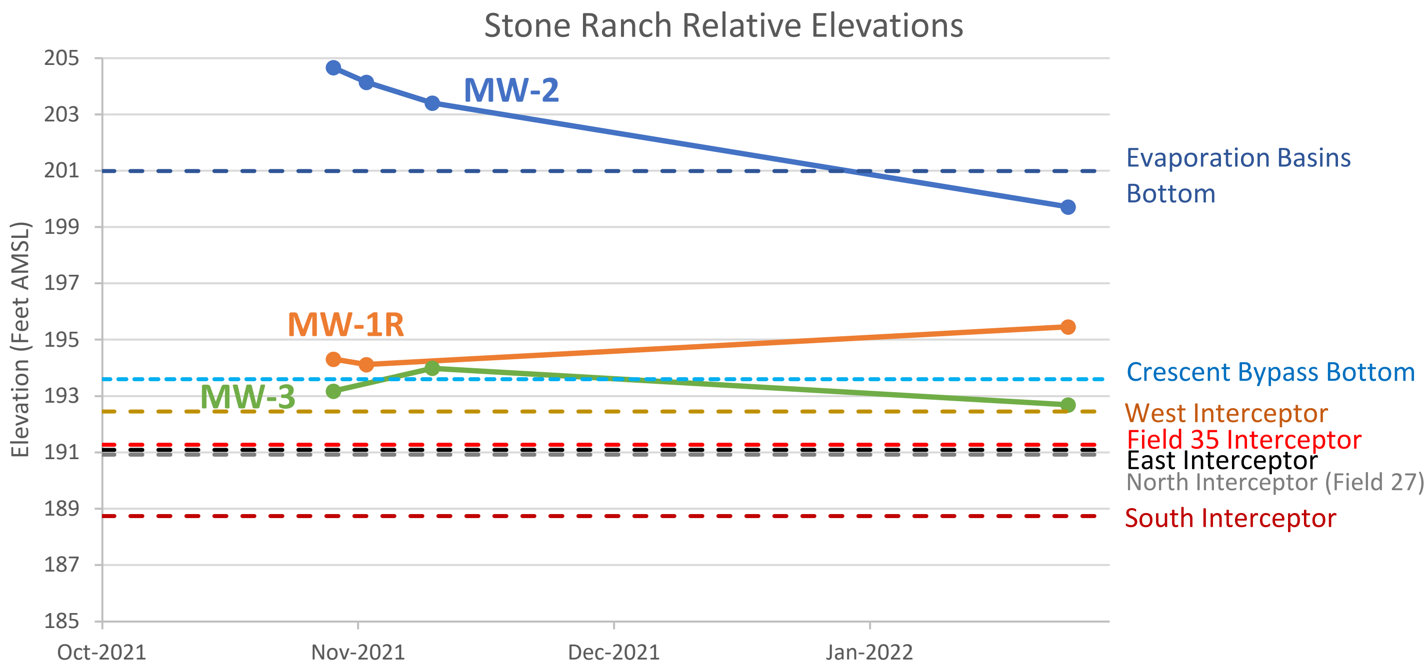
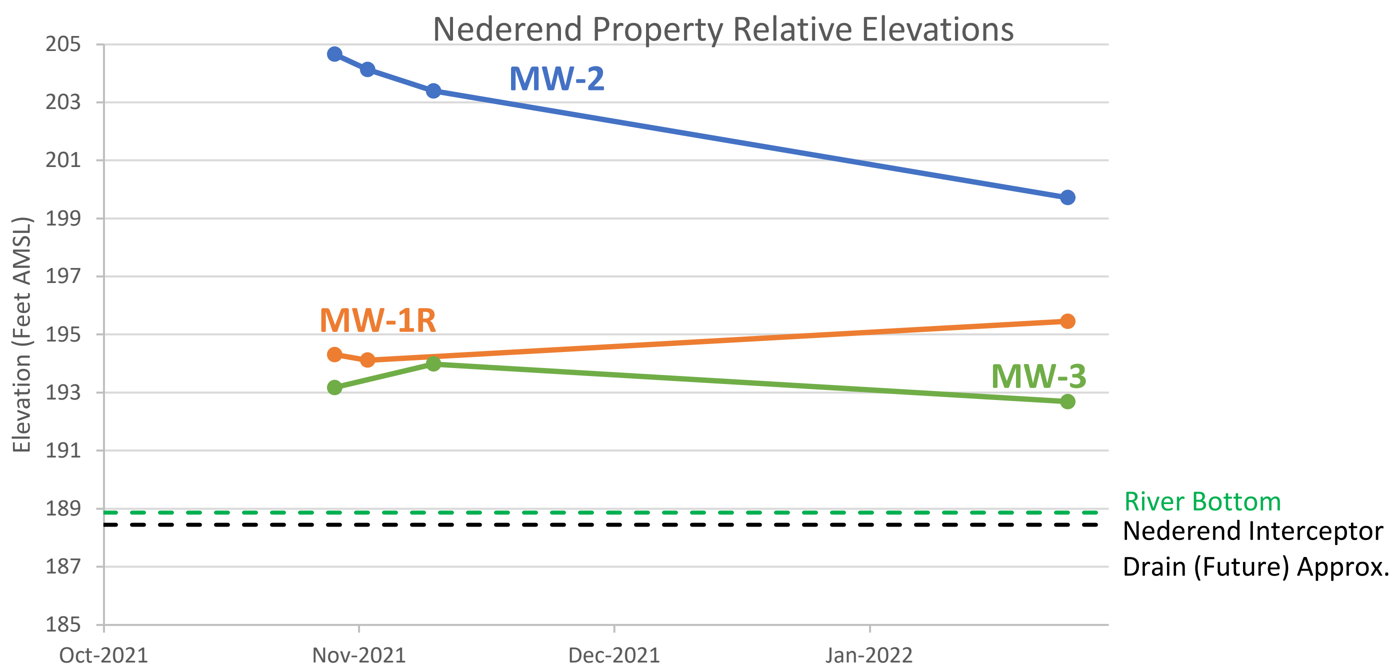
Leprino Foods Company
River Ranch Report of Waste Discharge
Lemoore, California

2022 Cropping Plan

KJ 2065027*02
April 2022

Figure 3-5





Kennedy Jenks

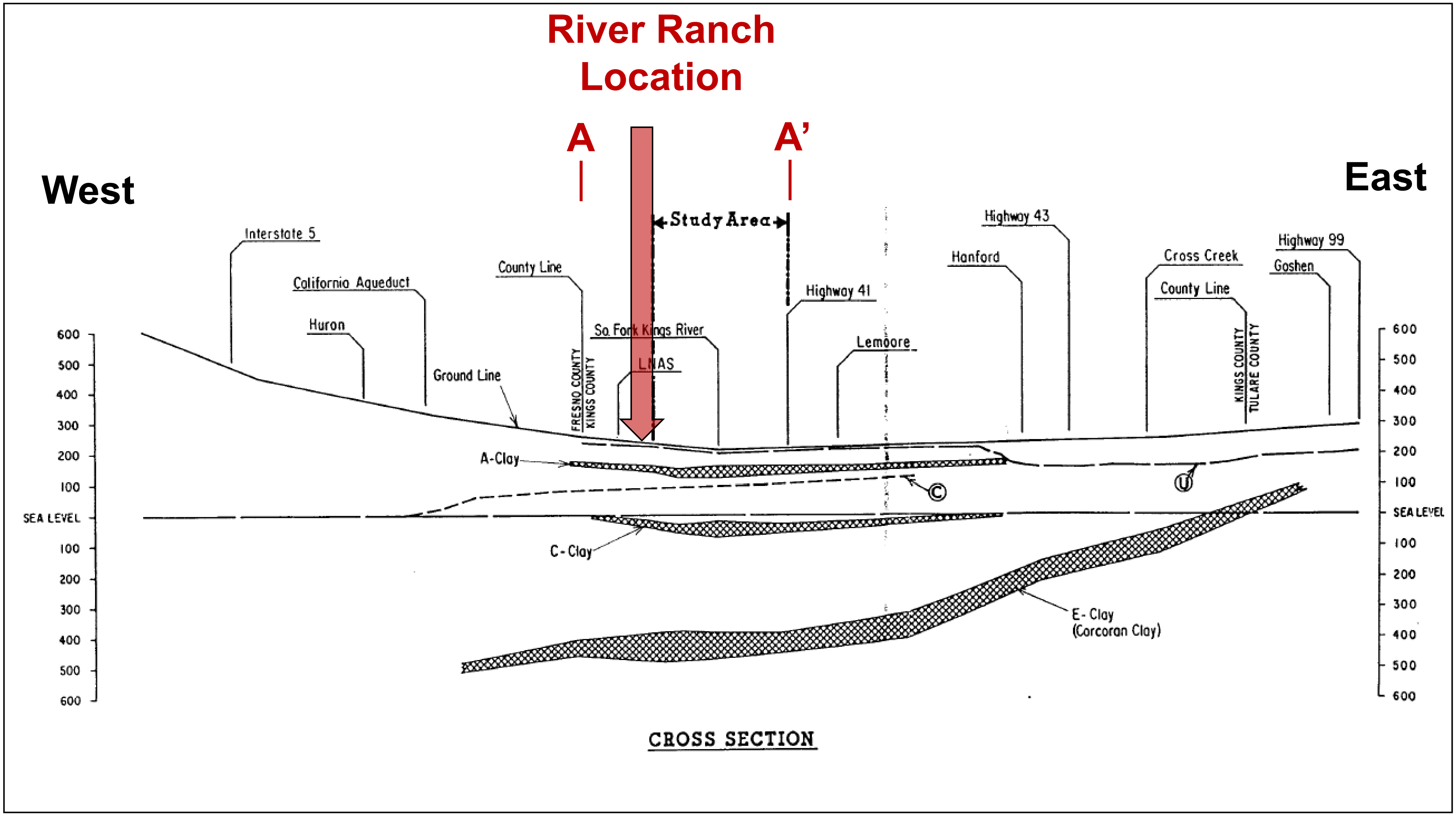
Note: East Interceptor Drain elevation was estimated based on average of the elevation of the North Interceptor Drain and the Field 35 Interceptor Drain.

Leprino Foods Company
River Ranch Report of Waste Discharge
Lemoore, California

Elevations of Key Features at the River Ranch

KJ 2065027*02
April 2022

Figure 4-1



Source: Summers, Joseph B. (Summers, 1983). *South Fork Kings River Drainage Study*. Kings River Conservation District. June 1983.

Note:

(a) Location of Cross-Section A-A' is shown on Figure 1-1.

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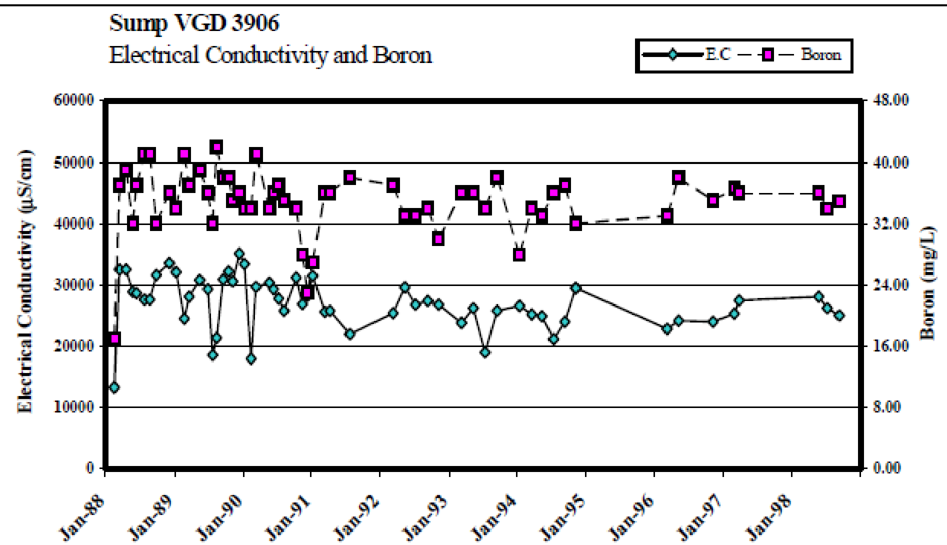
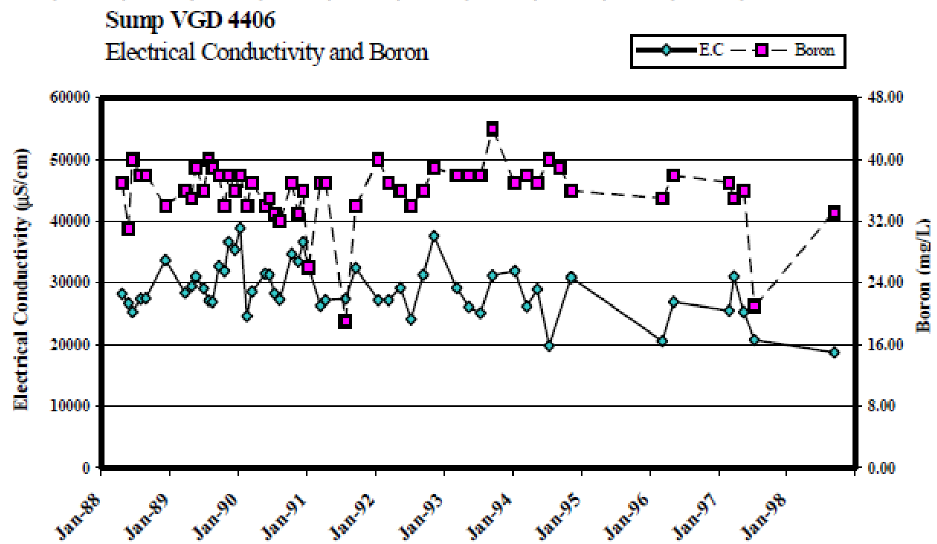
Leprino Foods Company
River Ranch Report of Waste Discharge
Lemoore, California

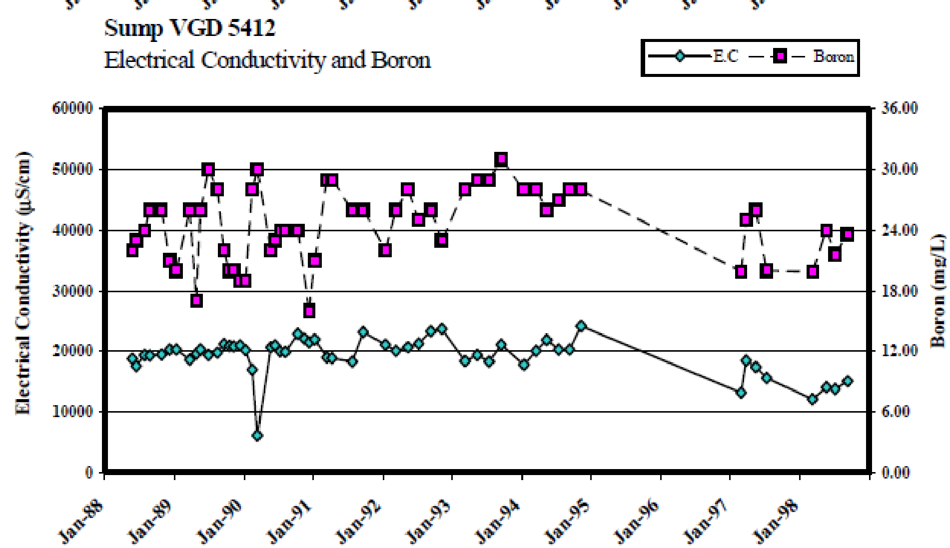
Stratigraphy Beneath the River Ranch

KJ 2065027*02
April 2022

Figure 4-2







\\KJAZFILE01\sfocad\Projects\S-Proj\2020\2065027.02_Leprino-Stone-Ranch-ROWD\Reports\ROWD\Figures

Source: Department of Water Resources (DWR, 2002). *San Joaquin Valley Drainage Monitoring Program 1998 – District Report.* July 2002.

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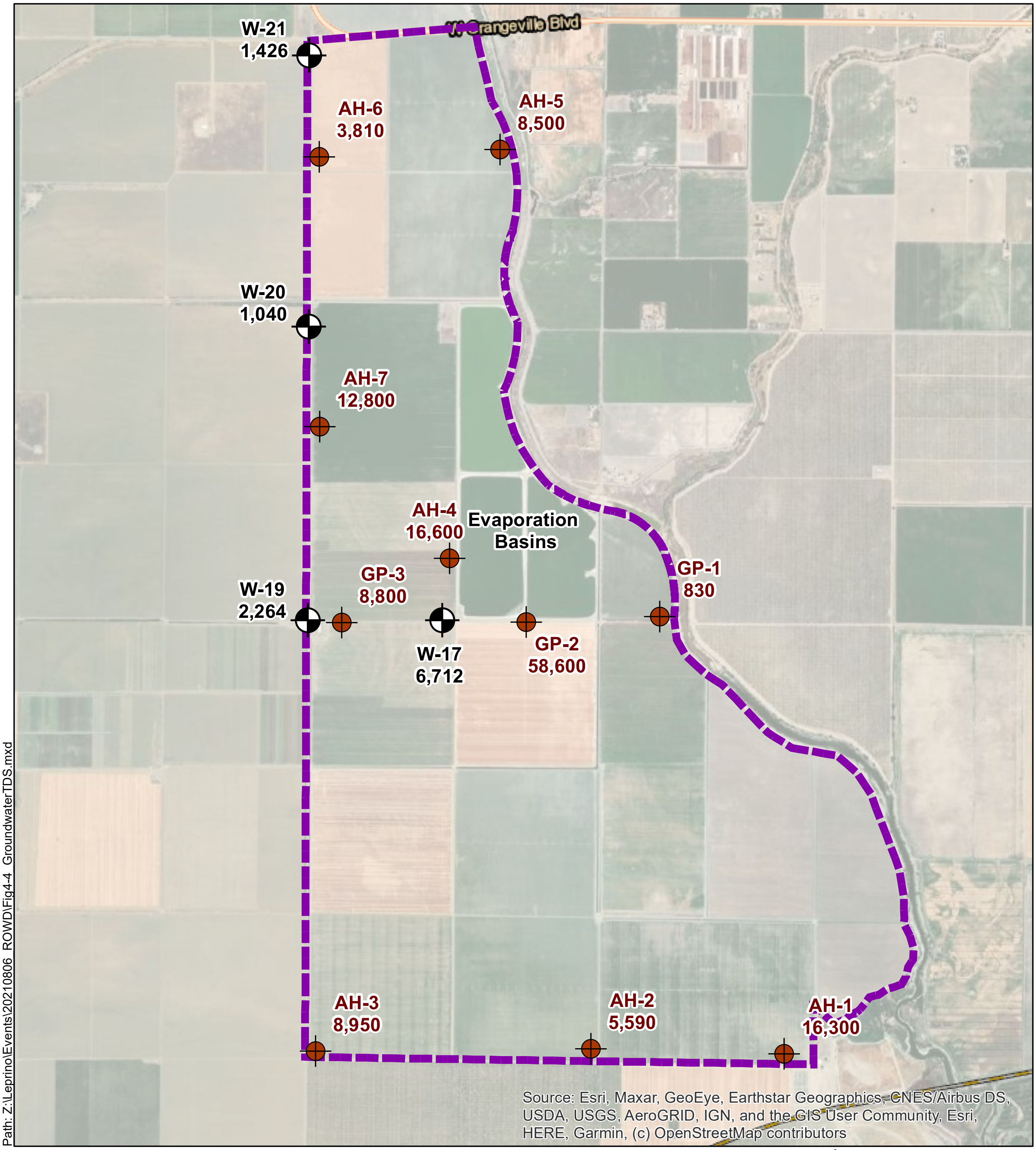
Leprino Foods Company
River Ranch Report of Waste Discharge
Lemoore, California

Electrical Conductivity and Boron at Sumps VGD-3906, VGD-4406, VGD-5412

KJ 2065027*02
April 2022

Figure 4-3



Path: Z:\Leprino\Events\20210806 ROWD\Fig4-4 GroundwaterTDS.mxd

Legend:

Temporary Wells TDS (Wang, 2013)

Nov 2017 Auger Hole TDS (CES, 2017)

River Ranch Property Boundary

Notes:
a) TDS = Total Dissolved Solids. All TDS samples have units of milligrams per liter (mg/L)
b) Wang well TDS values are averages of samples collected 2011-2012.

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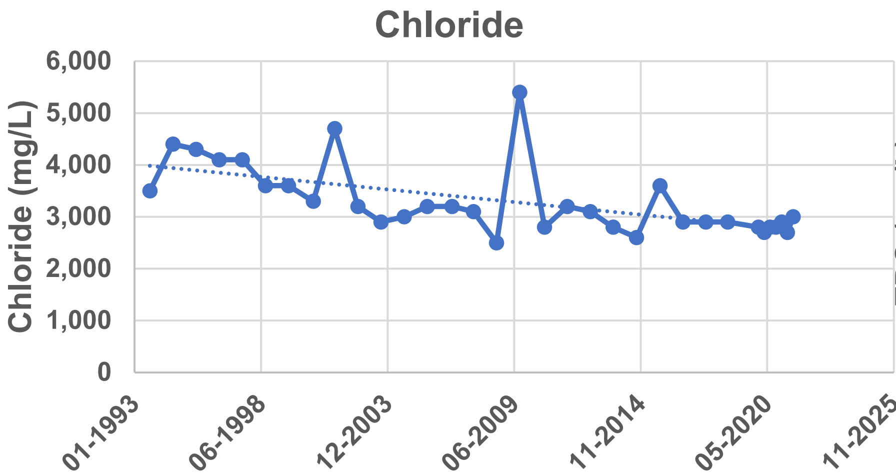
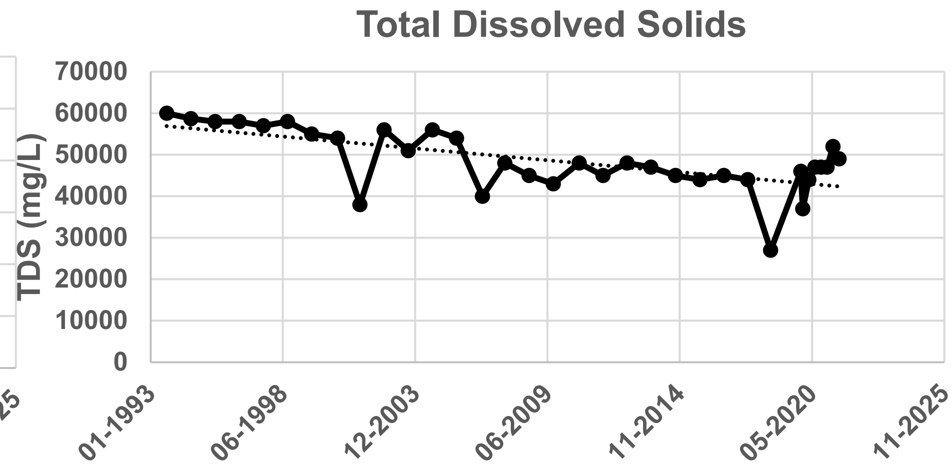
Leprino Foods Company
River Ranch Report of Waste Discharge
Lemoore, California

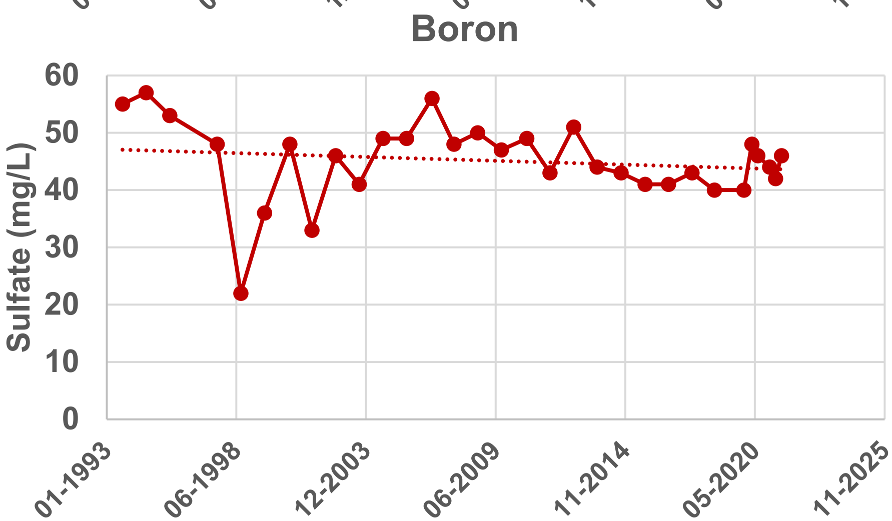
Shallow Groundwater Monitoring Locations and TDS Concentrations (mg/L)

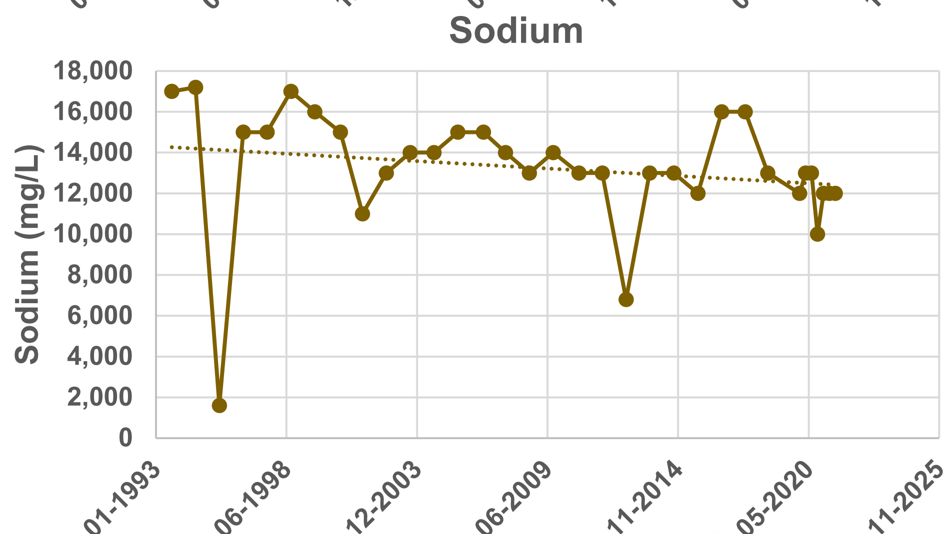
K/J 2065027*02
April 2022

Figure 4-4









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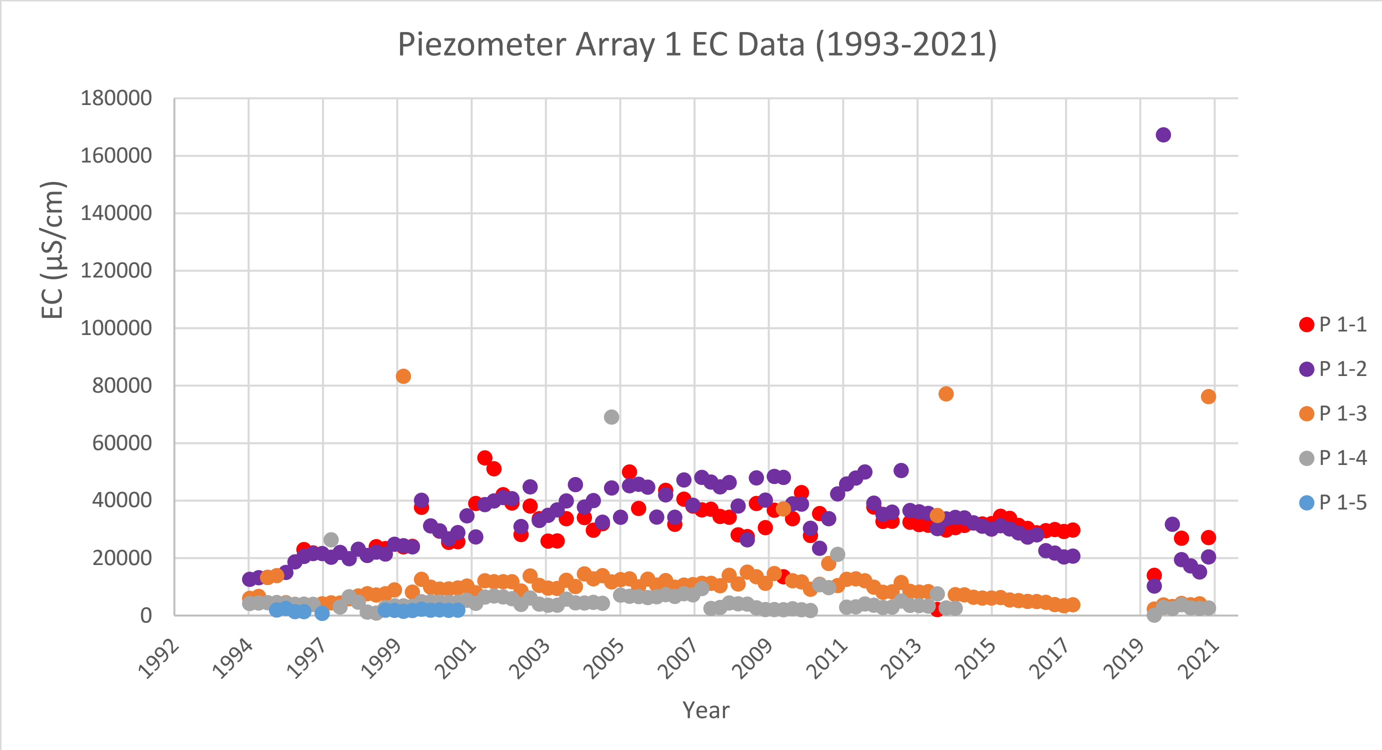
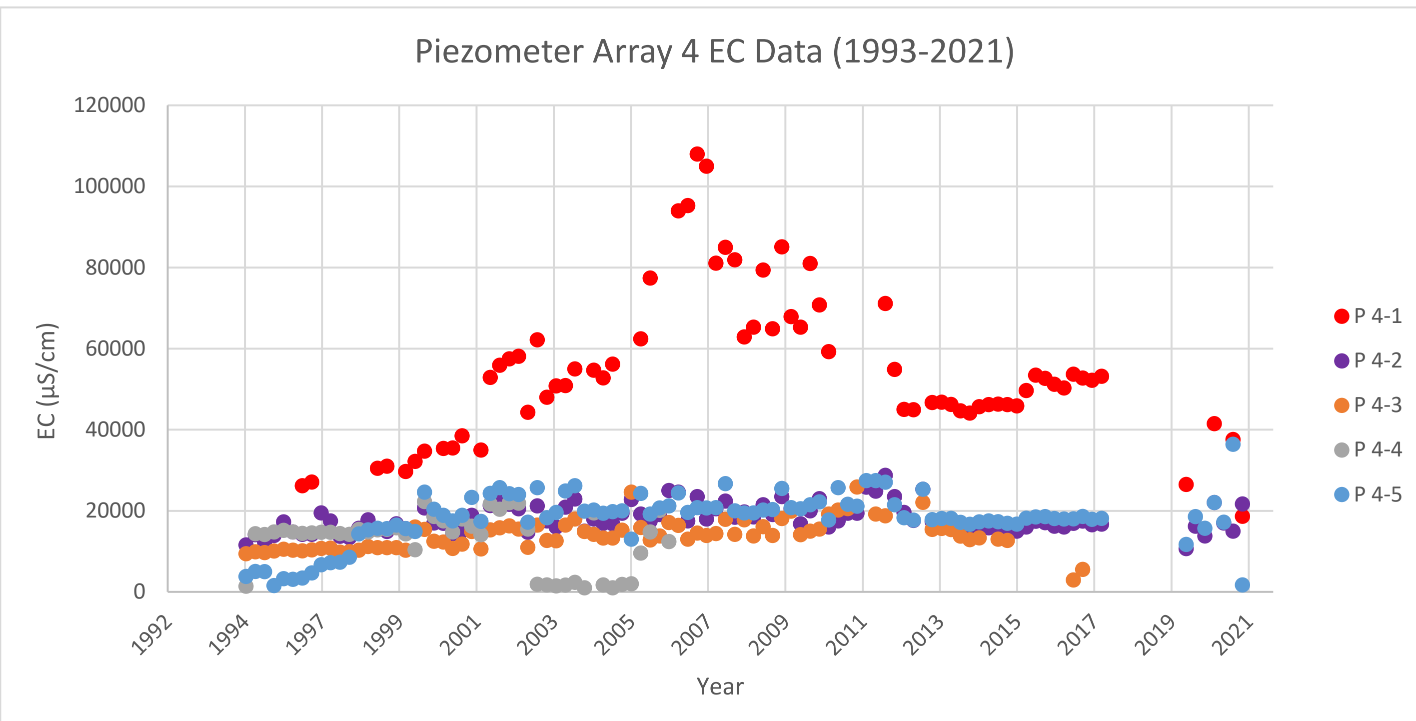
Leprino Foods Company
River Ranch Report of Waste Discharge
Lemoore, California

MW-1 Water Quality
(1993 - 2021)

KJ 2065027*02
April 2022

Figure 4-5



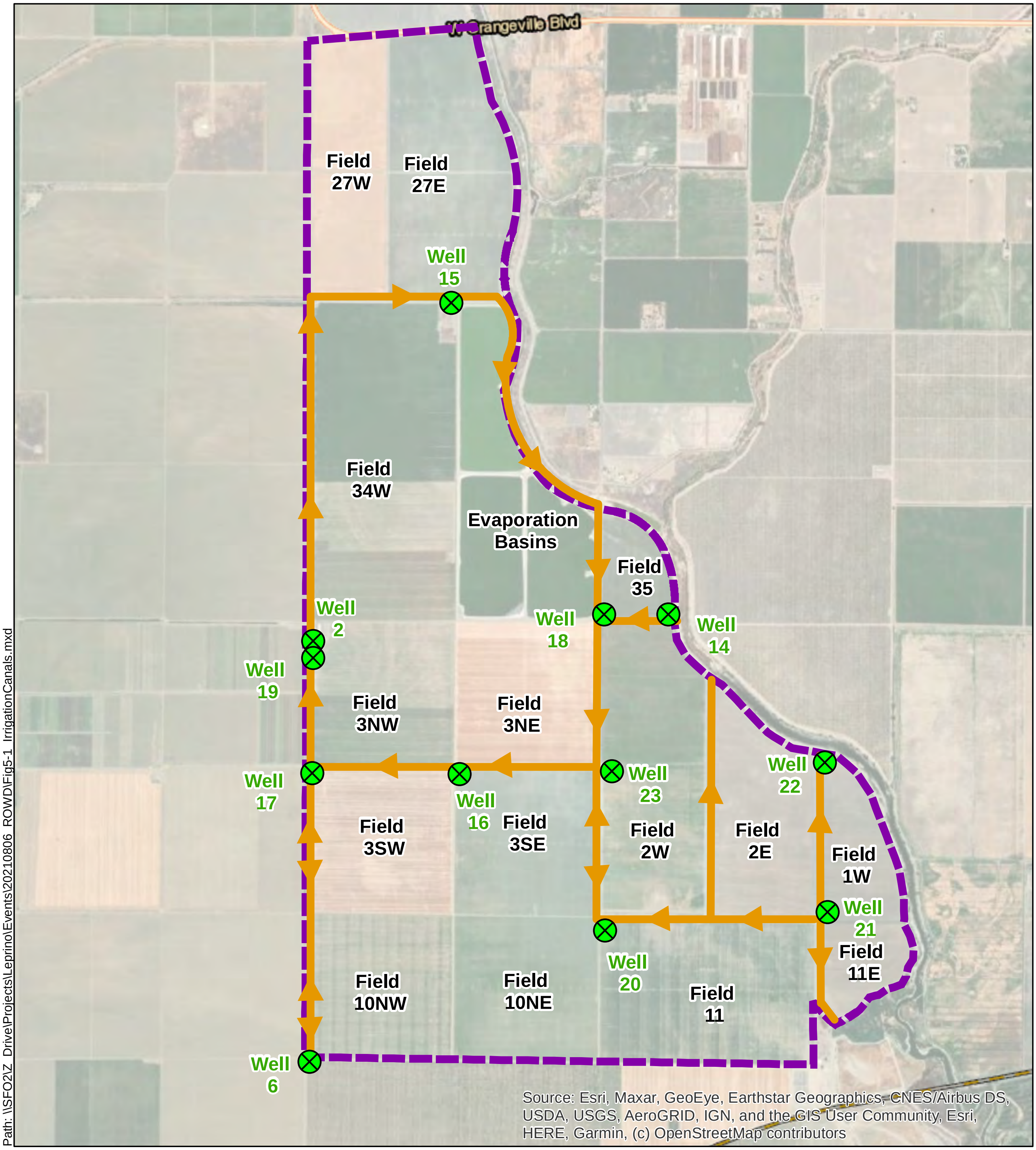


Leprino Foods Company
River Ranch Report of Waste Discharge
Lemoore, California

Electrical Conductivity at Piezometer Arrays 1 and 4 (1993 - 2021)

K/J 2065027*02
April 2022

Figure 4-6



Path: \\SFO2\Z_Drive\Projects\Leprino\Events\20210806_ROWD\Fig5-1_IrrigationCanals.mxd

Legend:

- Stone Ranch Irrigation Wells
- Irrigation Canals
- River Ranch Property Boundary

N

0 1,250 2,500
Feet

Note: See Figure 1-4 for the Nederend Irrigation System. The Nederend Irrigation System is not currently connected to the larger Stone Ranch.

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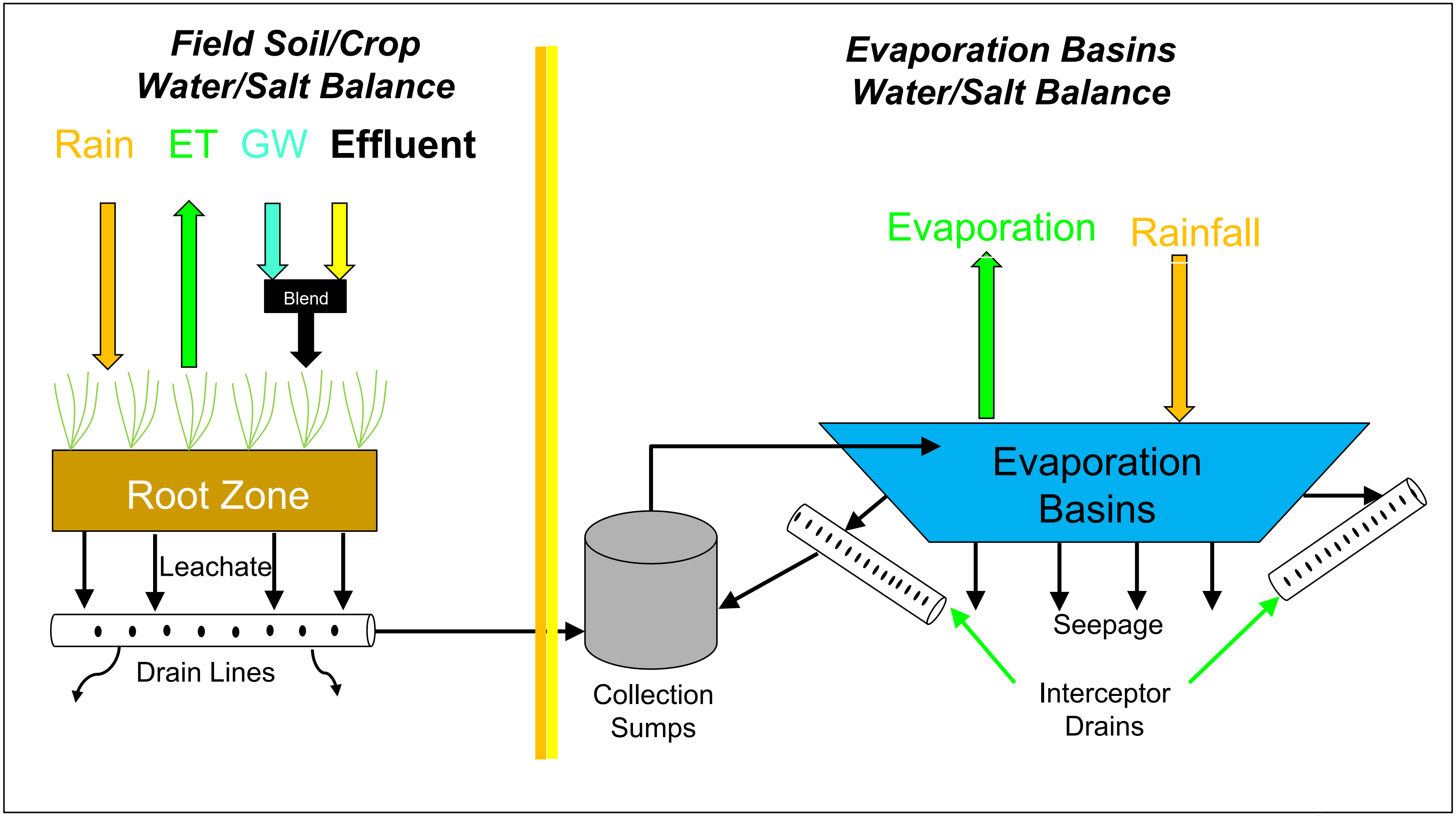
Leprino Foods Company
River Ranch Report of Waste Discharge
Lemoore, California

River Ranch Irrigation Canal Map

KJ 2065027*02
April 2022

Figure 5-1



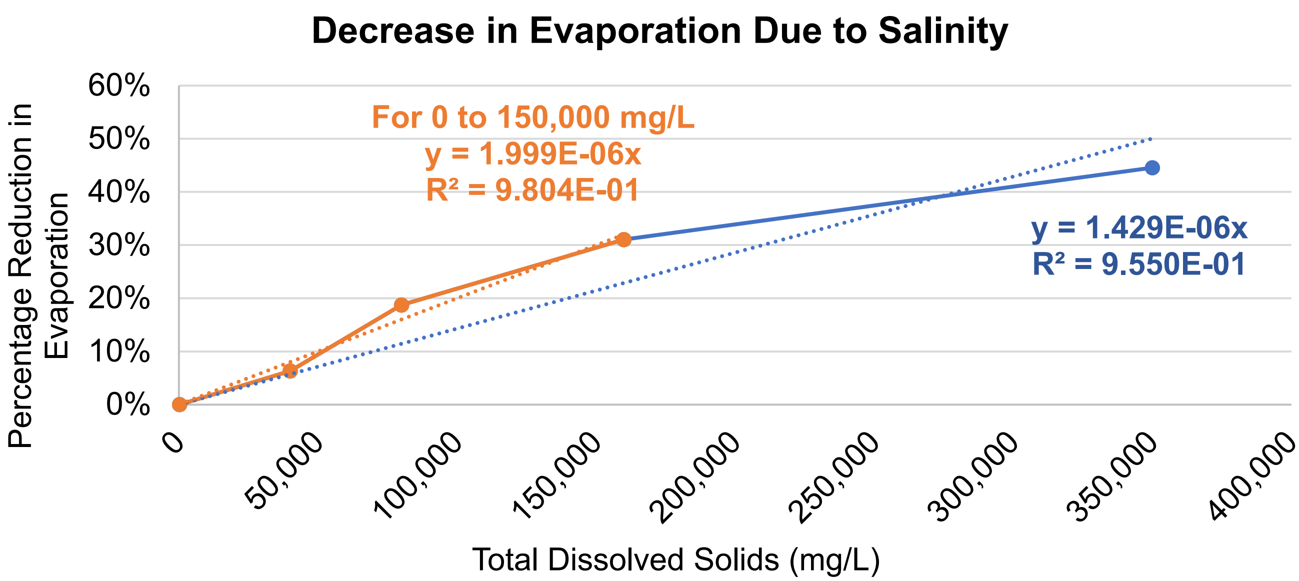
Kennedy Jenks

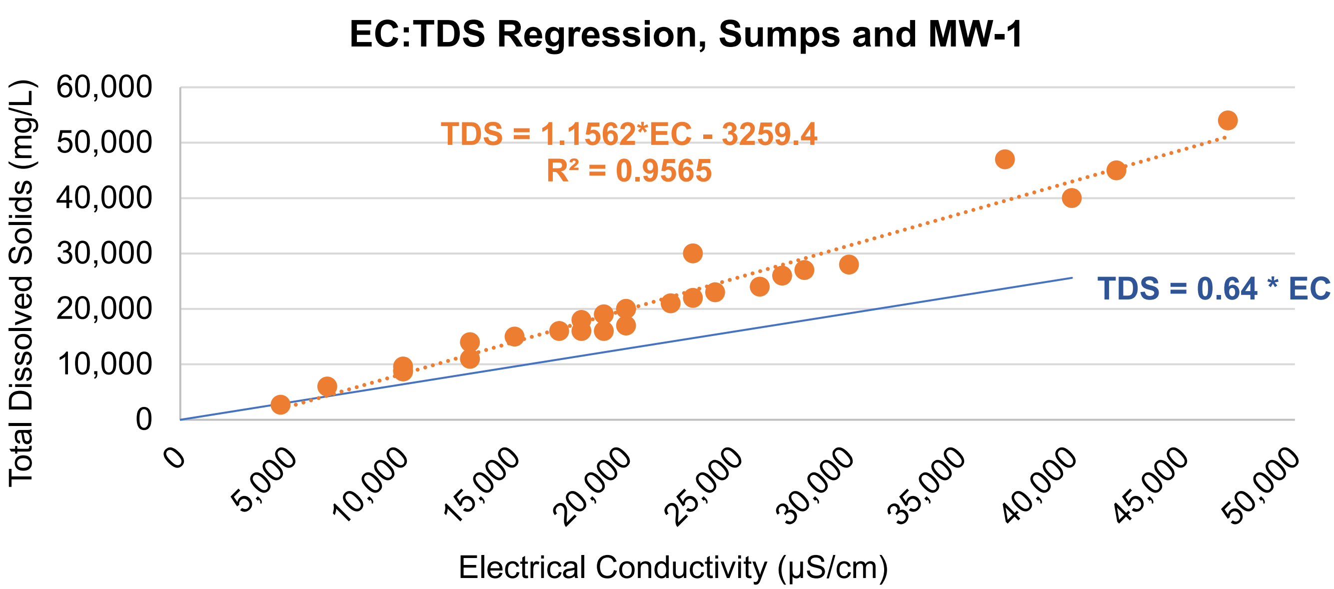
Leprino Foods Company
River Ranch Report of Waste Discharge
Lemoore, California

Water and Salt Balance Model Schematic for the Cropped Fields and Evaporation Basins

KJ 2065027*02
April 2022

Figure 5-2





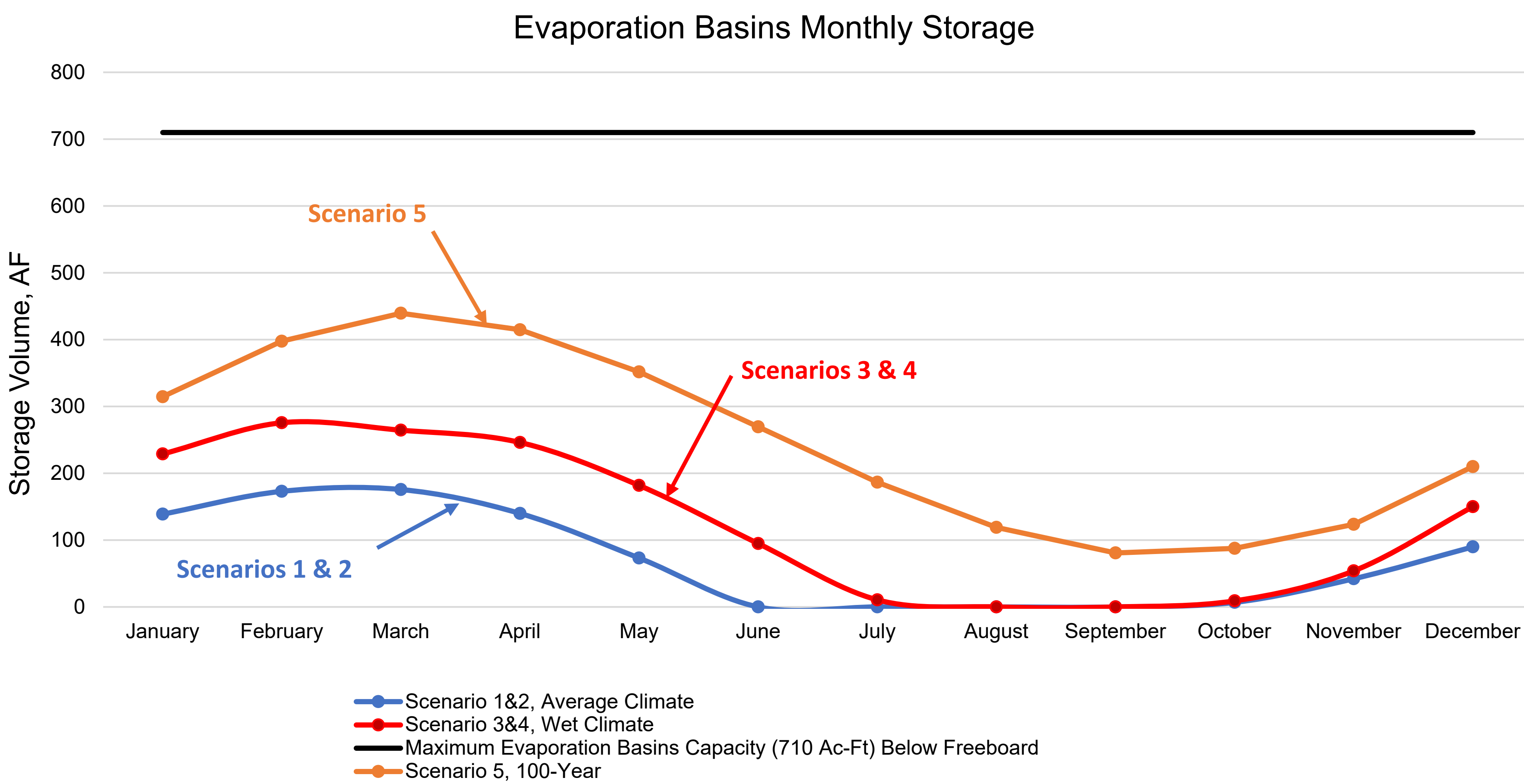
Kennedy Jenks

Leprino Foods Company
Stone Ranch Report of Waste Discharge
Lemoore, California

Evaporation Basin TDS Relationships

KJ 2065027*02
April 2022

Figure 5-3



Leprino Foods Company
River Ranch Report of Waste Discharge
Lemoore, California

Evaporation Basins Storage for Proposed Project Scenarios

K/J 2065027*02
April 2022

Figure 5-4

Appendix A

Form 200

INTRODUCTION

This application package constitutes a Report of Waste Discharge (ROWD) pursuant to California Water Code Section 13260. Section 13260 states that persons discharging or proposing to discharge waste that could affect the quality of the waters of the State, other than into a community sewer system, shall file a ROWD containing information which may be required by the appropriate Regional Water Quality Control Board (RWQCB).

This package is to be used to start the application process for all waste discharge requirements (WDRs) and National Pollutant Discharge Elimination System (NPDES) permits* issued by a RWQCB except:

1. Those landfill facilities that must use a joint Solid Waste Facility Permit Application Form, California Integrated Waste Management Board Form E-1-77; and

2. General WDRs or general NPDES permits that use a Notice of Intent to comply or specify the use of an alternative application form designed for that permit.

This application package contains:

1. Application/General Information Form for WDRs and NPDES Permits [Form 200 (10/97)].

2. Application/General Information Instructions.

Instructions

Instructions are provided to assist you with completion of the application. If you are unable to find the answers to your questions or need assistance with the completion of the application package, please contact your RWQCB representative. The RWQCBs strongly recommend that you make initial telephone or personal contact with RWQCB regulatory staff to discuss a proposed new discharge before submitting your application. The RWQCB representative will be able to answer procedural and annual fee related questions that you may have. (See map and telephone numbers inside of application cover.)

All dischargers regulated under WDRs and NPDES permits must pay an annual fee, except dairies, which pay a filing fee only. The RWQCB will notify you of your annual fee based on an evaluation of your proposed discharge. Please do NOT submit a check for your first annual fee or filing fee until requested to do so by a RWQCB representative. Dischargers applying for reissuance (renewal) of an existing NPDES permit or update of an existing WDR will be billed through the annual fee billing system and are therefore requested NOT to submit a check with their application. Checks should be made payable to the State Water Resources Control Board.

Additional Information Requirements

A RWQCB representative will notify you within 30 days of receipt of the application form and any supplemental documents whether your application is complete. If your application is incomplete, the RWQCB representative will send you a detailed list of discharge specific information necessary to complete the application process. The completion date of your application is normally the date when all required information, including the correct fee, is received by the RWQCB.

***NPDES PERMITS:** If you are applying for a permit to discharge to surface water, you will need an NPDES permit which is issued under both State and Federal law and may be required to complete one or more of the following Federal NPDES permit application forms: Short Form A, Standard Form A, Forms 1, 2B, 2C, 2D, 2E, and 2F. These forms may be obtained at a RWQCB office or can be ordered from the National Center for Environmental Publications and Information at (513) 891-6561

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

INSTRUCTIONS

Instructions for completing the application/report of waste discharge general information form for: waste discharge requirements/ NPDES permit.

If you have any questions on the completion of any part of the application, please contact your RWQCB representative. A map of RWQCB locations, addresses, and telephone numbers is located on the reverse side of the application cover.

I. FACILITY INFORMATION

You must provide the factual information listed below for ALL owners, operators, and locations and, where appropriate, for ALL general partners and lease holders.

A. ***FACILITY:*** Legal name, physical address including the county, person to contact, phone number, and email at the facility. (NO P.O. Box numbers. If no address exists, use street and nearest cross street).

B. ***FACILITY OWNER:*** Legal owner, address, person to contact, phone number, and email. Also include the owner's Federal Tax Identification Number.

Owner Type: Check the appropriate owner type. The legal owner will be named in the WDRs/NPDES permit.

C. ***FACILITY OPERATOR (The agency or business, not the person):*** If applicable, the name, address, person to contact, telephone number, and email for the facility operator. Check the appropriate Operator Type. If identical to B. above, enter "same as owner".

D. ***OWNER OF THE LAND:*** Legal owner of the land(s) where the facility is located, address, person to contact, and phone number. Check the appropriate Owner Type. If identical to B. above, enter "same as owner".

E. ***ADDRESS WHERE LEGAL NOTICE MAY BE SERVED:*** Address where legal notice may be served, person to contact, and phone number. If identical to B. above, enter "same as owner".

Address where annual fee invoices should be sent, person to contact, and phone number. If identical to B. above, enter "same as owner".

F. ***BILLING ADDRESS:*** Address where annual fee invoices should be sent, person to contact, and phone number. If identical to B. above, enter "same as owner".

II. TYPE OF DISCHARGE

Mark the appropriate box to describe whether the waste will be discharged to: Land or Surface Water.

Check the appropriate box(es) which best describe the activities at your facility.

Hazardous Waste: If you check the Hazardous Waste box, STOP and contact a representative of the RWQCB for further instructions.

Landfills: A separate form, APPLICATION FOR SOLID WASTE FACILITY PERMIT/WASTE DISCHARGE REQUIREMENTS, California Integrated Waste Management Board Form E-1-77, may be required. Contact a RWQCB representative to help determine the appropriate form for your discharge.

III. LOCATION OF THE FACILITY

- Enter the Assessor's Parcel Number(s) (APN), which is located on the property tax bill. The number can also be obtained from the County Assessor's Office. Indicate the APN for both the facility and the discharge point.
- Enter the Latitude of the entrance to the proposed/existing facility and of the discharge point. Latitude and longitude information can be obtained from a U.S. Geological Survey quadrangle topographic map. Other maps may also contain this information.
- Enter the Longitude of the entrance to the proposed/existing facility and of the discharge point.

IV. REASON FOR FILING

NEW DISCHARGE OR FACILITY: A discharge or facility that is proposed but does not now exist, or that does not yet have WDRs or an NPDES permit.

CHANGE IN DESIGN OR OPERATION: A material change in design or operation from existing discharge requirements. Final determination of whether the reported change is material will be made by the RWQCB.

CHANGE IN QUANTITY/TYPE OF DISCHARGE: A material change in characteristics of the waste from existing discharge requirements. Final determination of whether the reported change would have a significant effect will be made by the RWQCB.

CHANGE IN OWNERSHIP/ OPERATOR: Change of legal owner of the facility. Complete Parts I, III, and IV only and contact the RWQCB to determine if additional information is required.

WASTE DISCHARGE REQUIREMENTS UPDATE OR NPDES PERMIT REISSUANCE: WDRs must be updated periodically to reflect changing technology standards and conditions. A new application is required to reissue an NPDES permit which has expired.

OTHER: If there is a reason other than the ones listed, please describe the reason on the space provided. (If more space is needed, attach a separate sheet.)

V. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

It should be emphasized that communication with the appropriate RWQCB staff is vital before starting the CEQA documentation and is recommended before completing this application. There are Basin Plan issues which may complicate the CEQA effort, and RWQCB staff may be able to help in providing the needed information to complete the CEQA documentation.

Name the Lead Agency responsible for completion of CEQA requirements for the project, i.e., completion and certification of CEQA documentation.

Check YES or NO. Has a public agency determined that the proposed project is exempt from CEQA? If the answer is YES, state the basis for the exemption and the name of the agency supplying the exemption on the space provided. (Remember that, if extra space is needed, use an extra sheet of paper, but be sure to indicate the attached sheet under Section VII. Other.)

Check YES or NO. Has the "Notice of Determination" been filed under CEQA? If YES, give the date the notice was filed and enclose a copy of the Notice of Determination and the Initial Study, Environmental Impact Report, or Negative Declaration. If NO, check the box of the expected type of CEQA document for this project, and include the expected date of completion using the timelines given under CEQA. The date of completion should be taken as the date that the Notice of Determination will be submitted. (If not known, write "Unknown")

VI. OTHER REQUIRED INFORMATION

To be approved, your application MUST include a COMPLETE characterization of the discharge. If the characterization is found to be incomplete, RWQCB staff will contact you and request that additional specific information be submitted.

This application MUST be accompanied by a site map. A USGS 7.5' Quadrangle map or a street map, if more appropriate, is sufficient for most applications.

VII. OTHER

If any of the answers on your application form need further explanation, attach a separate sheet. Please list any attachments with the titles and dates on the space provided.

VIII. CERTIFICATION

Certification by the owner of the facility or the operator of the facility, if the operator is different from the owner, is required. The appropriate person must sign the application form.

Acceptable signatures are:

1. for a corporation, a principal executive officer of at least the level of senior vice-president;

2. for a partnership or individual (sole proprietorship), a general partner or the proprietor;

3. for a governmental or public agency, either a principal executive officer or ranking elected/appointed official.

Discharge Specific Information

In most cases, a request to supply additional discharge specific information will be sent to you by a representative of the RWQCB. If the RWQCB determines that additional discharge specific information is not needed to process your application, you will be so notified.

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

I. FACILITY INFORMATION

A. FACILITY:

Name Leprino Foods Company

Address 351 North Belle Haven Drive

City/County/State/Zip Code Lemoore, Kings County, CA, 93245

Contact Person Tim Hutcheson (Western Region Technical Director)

Telephone Number (559) 925-7360 Email thutcheson@leprinofoods.com

B. FACILITY OWNER:

Name Leprino Foods Company

Address 1830 West 38th Avenue

City/State/Zip Code Denver, CO 80211

Contact Person Tim Hutcheson (Western Region Technical Director)

Telephone Number (559) 925-7360 Email thutcheson@leprinofoods.com

Federal Tax ID 84-0500292

Owner Type (*Mark one*):

☐ Individual ☑ Corporation ☐ Governmental Agency ☐ Partnership

☐ Other: ______

C. FACILITY OPERATOR (The agency or business, not the person):

Name Leprino Foods Company

Address 351 North Belle Haven Drive

City/State/Zip Code Lemoore, CA, 93245

Contact Person Tim Hutcheson (Western Region Technical Director)

Telephone Number (559) 925-7360 Email thutcheson@leprinofoods.com

Operator Type (*Mark one*):

☐ Individual ☑ Corporation ☐ Governmental Agency ☐ Partnership

☐ Other: ______

D. OWNER OF THE LAND

Name Leprino Foods Company

Address 1830 West 38th Avenue

City/State/Zip Code Denver, CO 80211

Contact Person Tim Hutcheson (Western Region Technical Director)

Telephone Number (559) 925-7360 Email thutcheson@leprinofoods.com

Owner Type (*Mark one*):

☐ Individual ☑ Corporation ☐ Governmental Agency ☐ Partnership

☐ Other: ______

E. ADDRESS WHERE LEGAL NOTICE MAY BE SERVED

Address 1830 West 38th Avenue

City/State/Zip Code Denver, CO 80211

Contact Person Tim Hutcheson (Western Region Technical Director)

Telephone Number (559) 925-7360 Email thutcheson@leprinofoods.com

F. BILLING ADDRESS

Address 351 North Belle Haven Drive

City/State/Zip Code Lemoore, CA, 93245

Contact Person Tim Hutcheson (Western Region Technical Director)

Telephone Number (559) 925-7360 Email thutcheson@leprinofoods.com

II. <u>TYPE OF DISCHARGE</u>

Check Type of Discharge(s) Described in this Application:

☑ **Waste Discharge to Land** ☐ **Waste Discharge to Surface Water**

Check all that apply:

☐ Animal or Aquacultural Wastewater	☐ Land Treatment Unit
☐ Animal Waste Solids	☐ Landfill (*see instructions*)
☐ Biosolids/Residual	☐ Mining
☐ Cooling Water	☐ Storm Water
☑ Domestic/ Municipal Wastewater Treatment and Disposal	☐ Surface Impoundment
☐ Dredge Material Disposal	☐ Waste Pile
☐ Hazardous Waste (*see instructions*)	☐ Wastewater Reclamation
☑ Industrial Process Wastewater	☐ Other, *please describe* ______

III. LOCATION OF THE FACILITY

Describe the physical location of the facility:

1. Assessor's Parcel Number(s)
   - Facility: River Ranch (See ROWD)
   - Discharge Point: River Ranch (022-100-001-000)
2. Latitude
   - Facility: 36°16'51.38"N (Leprino WWTP)
   - Discharge Point: 36°18'24.08"N (River Ranch)
3. Longitude
   - Facility: 119°47'55.58"W (Leprino WWTP)
   - Discharge Point: 119°53'14.07"W (River Ranch)

IV. REASON FOR FILING

Check all that apply:

- ☐ New Discharge or Facility
- ☐ Change in Design or Operation
- ☑ Change in Quantity/Type of Discharge
- ☐ Changes in Ownership/Operator (see instructions)
- ☐ Waste Discharge Requirements Update or NPDES Permit Reissuance
- ☐ Other: ____________________

V. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

Name of Lead Agency California Regional Water Quality Control Board, Central Valley Region

Has a public agency determined that the proposed project is exempt from CEQA?

☐ Yes ☑ No

If yes, state the basis for the exemption and the name of the agency supplying the exemption on the line below:

____

____

Has a "Notice of Determination" been filed under CEQA?

☐ Yes ☑ No

If Yes, enclose a copy of the CEQA document, Environmental Impact Report (EIR), or Negative Declaration. If No, identify the expected type of CEQA document and expected date of completion.

Expected CEQA Documents: ☐ EIR ☐ Negative Declaration

Expected CEQA Completion Date: Spring 2022

VI. OTHER REQUIRED INFORMATION

Please provide a COMPLETE characterization of your discharge. A complete characterization includes, but is not limited to, design and actual flows, a list of constituents and the discharge concentration of each constituent, a list of other appropriate waste discharge characteristics, a description and schematic drawing of all treatment processes, a description of any Best Management Practices (BMPs) used, and a description of disposal methods.

Also include a site map showing the location of the facility and, if you are submitting this application for an NPDES permit, identify the surface water to which you propose to discharge. Please try to limit your maps to a scale of 1:24,000 (7.5' USGS Quadrangle) or a street map, if more appropriate.

VII. OTHER

Attach additional sheets to explain any responses which need clarification. List attachments with titles and dates below:

See Report of Waste Discharge

You will be notified by a representative of the RWQCB within 30 days of receipt of your application. The notice will state if your application is complete or if there is additional information you must submit to complete your Application/Report of Waste Discharge, pursuant to Division 7, Section 13260 of the California Water Code.

VIII. CERTIFICATION

"I certify under penalty of law that this document, including all attachments and supplemental information, were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Print Name Lance FitzSimmons Title Exec VP-Supply Chain-Leprino Foods Co

Signature Lance K. FitzSimmons Date 5/4/2022

FOR OFFICE USE ONLY

Date Form 200 Received:	Letter to Discharger:	Fee Amount Received:	Check #:

California Environmental Protection Agency
Bill of Rights for Environmental Permit Applicants

California Environmental Protection Agency (Cal/EPA) recognizes that many complex issues must be addressed when pursuing reforms of environmental permits and that significant challenges remain. We have initiated reforms and intend to continue the effort to make environmental permitting more efficient, less costly, and to ensure that those seeking permits receive timely responses from the boards and departments of the Cal/EPA. To further this goal, Cal/EPA endorses the following precepts that form the basis of a permit applicant's "Bill of Rights."

1. Permit applicants have the right to assistance in understanding regulatory and permit requirements. All Cal/EPA programs maintain an Ombudsman to work directly with applicants. Permit Assistance Centers located throughout California have permit specialists from all the State, regional, and local agencies to identify permit requirements and assist in permit processing.
2. Permit applicants have the right to know the projected fees for review of applications, how any costs will be determined and billed, and procedures for resolving any disputes over fee billings.
3. Permit applicants have the right of access to complete and clearly written guidance documents that explain the regulatory requirements. Agencies must publish a list of all information required in a permit application and of criteria used to determine whether the submitted information is adequate.
4. Permit applicants have the right of timely completeness determinations for their applications. In general, agencies notify the applicant within 30 days of any deficiencies or determine that the application is complete. California Environmental Quality Act (CEQA) and public hearing requests may require additional information.
5. Permit applicants have the right to know exactly how their applications are deficient and what further information is needed to make their applications complete. Pursuant to California Government code Section 65944, after an application is accepted as complete, an agency may not request any new or additional information that was not specified in the original application.
6. Permit applicants have the right of a timely decision on their permit application. The agencies are required to establish time limits for permit reviews.
7. Permit applicants have the right to appeal permit review time limits by statute or administratively that have been violated without good cause. For state environmental agencies, appeals are made directly to the Cal/EPA Secretary or to a specific board. For local environmental agencies, appeals are generally made to the local governing board or, under certain circumstances, to Cal/EPA. Through this appeal, applicants may obtain a set date for a decision on their permit and, in some cases, a refund of all application fees (ask boards and departments for details).
8. Permit applicants have the right to work with a single lead agency where multiple environmental approvals are needed. For multiple permits, all agency actions can be consolidated under a lead agency. For site remediation, all applicable laws can be administered through a single agency.
9. Permit applicants have the right to know who will be reviewing their application and the time required to complete the full review process.

State of California
Regional Water Quality Control Board

APPLICATION/REPORT OF WASTE DISCHARGE GENERAL INFORMATION FORM FOR WASTE DISCHARGE REQUIREMENTS OR NPDES PERMIT

I. FACILITY INFORMATION

A. FACILITY:

Name City of Lemoore Wastewater Treatment Facility

Address 1250 South 19th Avenue

City/County/State/Zip Code Lemoore, Kings County, CA, 93245

Contact Person Nathan Olson (City Manager)

Telephone Number (559) 924-6744 Email citymanager@lemoore.com

B. FACILITY OWNER:

Name City of Lemoore

Address 711 W Cinnamon Dr

City/State/Zip Code Lemoore, CA 93245

Contact Person Nathan Olson (City Manager)

Telephone Number (559) 924-6744 Email citymanager@lemoore.com

Federal Tax ID 94-6000355

Owner Type (*Mark one*):

☐ Individual ☐ Corporation ☑ Governmental Agency ☐ Partnership

☐ Other:

C. FACILITY OPERATOR (The agency or business, not the person):

Name City of Lemoore

Address 711 W Cinnamon Drive

City/State/Zip Code Lemoore, CA 93245

Contact Person Nathan Olson (City Manager)

Telephone Number (559) 924-6744 Email citymanager@lemoore.com

Operator Type (*Mark one*):

☐ Individual ☐ Corporation ☑ Governmental Agency ☐ Partnership

☐ Other:

D. OWNER OF THE LAND

Name City of Lemoore

Address 711 W Cinnamon Drive

City/State/Zip Code Lemoore, CA 93245

Contact Person Nathan Olson (City Manager)

Telephone Number (559) 924-6744 Email citymanager@lemoore.com

Owner Type (*Mark one*):

☐ Individual ☐ Corporation ☑ Governmental Agency ☐ Partnership

☐ Other: __________

E. ADDRESS WHERE LEGAL NOTICE MAY BE SERVED

Address 711 W Cinnamon Drive

City/State/Zip Code Lemoore, CA 93245

Contact Person Nathan Olson (City Manager)

Telephone Number (559) 924-6744 Email citymanager@lemoore.com

F. BILLING ADDRESS

Address 711 W Cinnamon Drive

City/State/Zip Code Lemoore, CA 93245

Contact Person Nathan Olson (City Manager)

Telephone Number (559) 924-6744 Email citymanager@lemoore.com

II. TYPE OF DISCHARGE

Check Type of Discharge(s) Described in this Application:

☑ **Waste Discharge to Land** ☐ **Waste Discharge to Surface Water**

Check all that apply:

☐ Animal or Aquacultural Wastewater	☐ Land Treatment Unit
☐ Animal Waste Solids	☐ Landfill (*see instructions*)
☐ Biosolids/Residual	☐ Mining
☐ Cooling Water	☐ Storm Water
☑ Domestic/ Municipal Wastewater Treatment and Disposal	☐ Surface Impoundment
☐ Dredge Material Disposal	☐ Waste Pile
☐ Hazardous Waste (*see instructions*)	☐ Wastewater Reclamation
☑ Industrial Process Wastewater	☐ Other, *please describe* __________

III. LOCATION OF THE FACILITY

Describe the physical location of the facility:

1. Assessor's Parcel Number(s)

   Facility: City of Lemoore WWTP (024-052-080-000)

   Discharge Point: River Ranch (022-100-001-000)

2. Latitude

   Facility: 36°16'51.38"N (City of Lemoore WWTP)

   Discharge Point: 36°18'24.08"N (River Ranch)

3. Longitude

   Facility: 119°47'55.58"W (City of Lemoore WWTP)

   Discharge Point: 119°53'14.07"W (River Ranch)

IV. REASON FOR FILING

Check all that apply:

- ☐ New Discharge or Facility
- ☐ Change in Design or Operation
- ☑ Change in Quantity/Type of Discharge
- ☐ Changes in Ownership/Operator (see instructions)
- ☐ Waste Discharge Requirements Update or NPDES Permit Reissuance
- ☐ Other: __________

V. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

Name of Lead Agency California Regional Water Quality Control Board, Central Valley Region

Has a public agency determined that the proposed project is exempt from CEQA?

☐ Yes ☑ No

If yes, state the basis for the exemption and the name of the agency supplying the exemption on the line below:

____

____

Has a "Notice of Determination" been filed under CEQA?

☐ Yes ☑ No

If Yes, enclose a copy of the CEQA document, Environmental Impact Report (EIR), or Negative Declaration. If No, identify the expected type of CEQA document and expected date of completion.

Expected CEQA Documents: ☐ EIR ☐ Negative Declaration

Expected CEQA Completion Date: Spring 2022

VI. OTHER REQUIRED INFORMATION

Please provide a COMPLETE characterization of your discharge. A complete characterization includes, but is not limited to, design and actual flows, a list of constituents and the discharge concentration of each constituent, a list of other appropriate waste discharge characteristics, a description and schematic drawing of all treatment processes, a description of any Best Management Practices (BMPs) used, and a description of disposal methods.

Also include a site map showing the location of the facility and, if you are submitting this application for an NPDES permit, identify the surface water to which you propose to discharge. Please try to limit your maps to a scale of 1:24,000 (7.5' USGS Quadrangle) or a street map, if more appropriate.

VII. OTHER

Attach additional sheets to explain any responses which need clarification. List attachments with titles and dates below:

See Report of Waste Discharge

You will be notified by a representative of the RWQCB within 30 days of receipt of your application. The notice will state if your application is complete or if there is additional information you must submit to complete your Application/Report of Waste Discharge, pursuant to Division 7, Section 13260 of the California Water Code.

VIII. CERTIFICATION

"I certify under penalty of law that this document, including all attachments and supplemental information, were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Print Name Nathan Olson Title City Manager

Signature [signature] Date 2/28/22

FOR OFFICE USE ONLY

Date Form 200 Received:	Letter to Discharger:	Fee Amount Received:	Check #:

California Environmental Protection Agency
Bill of Rights for Environmental Permit Applicants

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Appendix B

Leprino Chemical Usage Information

Trinity Consultants

4900 California Ave, Ste 420A, Bakersfield, CA 93309 / P 661.282.2200 / F 661.427.0703 / **trinityconsultants.com**

VIA ELECTRONIC MAIL

February 25, 2022

Mr. Richard Csillag
Plant Environmental Manager
Leprino Foods Company
351 N. Belle Haven Dr.
Lemoore, CA 93245
rcsillag@leprinofoods.com

RE: 2022 CUPA Plan
Project No: 220505.0003

Dear Richard:

For your records, please find enclosed the 2022 CUPA Plans that Trinity Consultants prepared for Leprino Foods Lemoore West facility and the Wastewater Treatment Plant (WWTP). The 2022 CUPA Plan is ready to be submitted by Leprino Foods by March 1, 2022 in CERS.

If you have any questions or comments, please do not hesitate to call me at (661) 282-2200 x1957.

Sincerely,

TRINITY CONSULTANTS

Tiffany Wang
Senior Consultant

Attachment

PROJECT REPORT
2022 CUPA Plan

Leprino Foods Company / WWTP

Prepared By:

Tiffany Wang – Senior Consultant
Ashley Moreno – Associate Consultant

TRINITY CONSULTANTS
4900 California Ave., Suite 420A
Bakersfield, CA 93309
(661) 282-2200

February 2022

Project 220505.0003

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1. FACILITY INFORMATION

Site Identification

Leprino Foods Company- Waste Water Treatment Plant
1250 S 19th Ave
Lemoore, CA 93245
County
Kings

CERS ID
10412464
EPA ID Number
CAL000279534

Submittal Status

This was a ***Draft*** submittal as of 2/23/2022; Last updated by *Tony Phan* on 2/22/2022 3:40 PM

Hazardous Materials

Does your facility have on site (for any purpose) at any one time, hazardous materials at or above 55 gallons for liquids, 500 pounds for solids, or 200 cubic feet for compressed gases (include liquids in ASTs and USTs); or is regulated under more restrictive inventory local reporting requirements (shown below if present); or the applicable Federal threshold quantity for an extremely hazardous substance specified in 40 CFR Part 355, Appendix A or B; or handle radiological materials in quantities for which an emergency plan is required pursuant to 10 CFR Parts 30, 40 or 70?	**Yes**

Underground Storage Tank(s) (UST)

Does your facility own or operate underground storage tanks?	**No**

Hazardous Waste

Is your facility a Hazardous Waste Generator?	**Yes**
Does your facility treat hazardous waste on-site?	**No**
Is your facility's treatment subject to financial assurance requirements (for Permit by Rule and Conditional Authorization)?	**No**
Does your facility consolidate hazardous waste generated at a remote site?	**No**
Does your facility need to report the closure/removal of a tank that was classified as hazardous waste and cleaned on-site?	**No**
Does your facility generate in any single calendar month 1,000 kilograms (kg) (2,200 pounds) or more of federal RCRA hazardous waste, or generate in any single calendar month greater than 1 kg (2.2 pounds) of RCRA acute hazardous waste; or generate more than 100 kg (220 pounds) of spill cleanup materials contaminated with RCRA acute hazardous waste.	**No**
Is your facility a Household Hazardous Waste (HHW) Collection site?	**No**

Excluded and/or Exempted Materials

Does your facility recycle more than 100 kg/month of excluded or exempted recyclable materials (per HSC 25143.2)?	**No**
Does your facility own or operate ASTs above these thresholds? Store greater than 1,320 gallons of petroleum products (new or used) in aboveground tanks or containers.	**No**
Does your facility have Regulated Substances stored onsite in quantities greater than the threshold quantities established by the California Accidental Release prevention Program (CalARP)?	**No**

Additional Information

No additional comments provided.

California Environmental Reporting System (CERS) — Business Owner Operator

Facility/Site

Leprino Foods Company- Waste Water Treatment Plant
1250 S 19th Ave
Lemoore, CA 93245

CERS ID
10412464

Submittal Status

This was a ***Draft*** submittal as of 2/23/2022; Last updated by *Tony Phan* on 2/22/2022 3:40 PM

Identification

Leprino Foods Company

Operator Phone	Business Phone	Business Fax
(559) 925-7368	(559) 925-7368	(303) 209-5586

Beginning Date	Ending Date	

Dun & Bradstreet	SIC Code	Primary NAICS
788781123	2022	311513

Facility/Site Mailing Address

351 N Belle Haven De
Lemoore , CA 93245

Primary Emergency Contact

Richard Csillag
Title
Plant Environmental Manager

Business Phone	24-Hour Phone	Pager Number
(559) 925-7368	(317) 750-5394	NA

Owner

Leprino Foods Company
(559) 925-7300
351 N Belle Haven Dr
Lemoore, CA 93245

Secondary Emergency Contact

Joseph Herrud
Title
Director Env

Business Phone	24-Hour Phone	Pager Number
(303) 480-2894	(303) 859-8923	NA

Billing Contact

Leprino Foods Company
(303) 480-2400 accountspayable@leprinofoods.com
351 N Belle Have Dr.
Lemooore, CA 93245

Environmental Contact

Richard Csillag
(559) 925-7368 rcsillag@leprinofoods.com
1250 S 19th Ave
Lemoore, CA 93245

Name of Signer	Signer Title	Document Preparer
Aman Das	Vice President/Plant Manager	Richard Csillag

Additional Information

Locally-collected Fields

Some or all of the following fields may be required by your local regulator(s).

Property Owner

Leprino Foods Company
Phone
(303) 480-2400
Mailing Address
1830 W 38th Ave
Denver, CO 80211

Assessor Parcel Number (APN)

Number of Employees
1080

Facility ID
FA0004168

2. HAZARDOUS MATERIALS INVENTORY

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10412464**
Facility Name	**Leprino Foods Company- Waste Water Treatment Plant**	**Map Location 1**		Facility ID	**FA0004168**
	1250 S 19th Ave, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Caustic Soda CAS No 1310-73-2	**Gallons** State: Liquid Type: Mixture	**6100** Storage Container: Aboveground Tank Days on Site: 365	**6000**	5490 Pressue: Ambient Temperature: Ambient	0 Waste Code	- Physical Corrosive To Metal - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Sodium Hydroxide Water Soidum Chloride	50 % 48 % 3 %		1310-73-2 7732-18-5 7647-14-5

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10412464**
Facility Name	**Leprino Foods Company- Waste Water Treatment Plant**	**Map Location 2**		Facility ID	**FA0004168**
	1250 S 19th Ave, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Bleach CAS No 7681-52-9	**Gallons** State: Liquid Storage Container: Aboveground Tank Type: Mixture Days on Site: 365	**3400**	**1700**	3060 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Sodium Hypochlorite Sodium Hydroxide Water	13 % 3 % 85 %		7681-52-9 1310-73-2 7732-18-5
	Nitric Acid CAS No 7664-93-9	**Gallons** State: Liquid Storage Container: Aboveground Tank Type: Mixture Days on Site: 365	**900**	**900**	810 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Nitric Acid Water	30 % 70 %	✓ 	7697-37-2 7732-18-5

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10412464**
Facility Name	**Leprino Foods Company- Waste Water Treatment Plant**		**Map Location 3**	Facility ID	**FA0004168**
	1250 S 19th Ave, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Hydrofloc 714E CAS No Map: 3	**Gallons** State: Liquid Type: Mixture	**2750** Storage Container: Tote Bin Days on Site: 365	**275**	2475 Pressue: Ambient Temperature: Ambient	Waste Code					
	Hyperfloc CE 1950 CAS No Map: 3	**Gallons** State: Liquid Type: Mixture	**3575** Storage Container: Tote Bin Days on Site: 365	**275**	3220 Pressue: Ambient Temperature: Ambient	Waste Code					

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10412464**
Facility Name	**Leprino Foods Company- Waste Water Treatment Plant**	**Map Location 4**		Facility ID	**FA0004168**
	1250 S 19th Ave, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Hyperfloc CB 413 CAS No	**Gallons** State: Liquid Type: Mixture	**6000** Storage Container: Aboveground Tank Days on Site: 365	**6000**	5400 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Respiratory Skin Sensitization - Health Serious Eye Damage Eye Irritation	Ferric chlroide	75 %		7705-08-0

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10412464**
Facility Name	**Leprino Foods Company- Waste Water Treatment Plant**		**Map Location 5**	Facility ID	**FA0004168**
	1250 S 19th Ave, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Hyperfloc CE 1950	**Gallons**	**275**	**275**	250						
	CAS No	State: Liquid	Storage Container: Tote Bin		Pressue: Ambient	Waste Code					
	Map: 5	Type: Mixture	Days on Site: 365		Temperature: Ambient						
	Hyperfloc CE 714	**Gallons**	**275**	**275**	250						
	CAS No	State: Liquid	Storage Container: Tote Bin		Pressue: Ambient	Waste Code					
		Type: Mixture	Days on Site: 365		Temperature: Ambient						

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	Leprino Foods Company	Chemical Location	CERS ID	10412464
Facility Name	Leprino Foods Company- Waste Water Treatment Plant	Map Location 6	Facility ID	FA0004168
	1250 S 19th Ave, Lemoore 93245		Status	Draft

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities Max. Daily	Quantities Largest Cont.	Quantities Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only) Component Name	% Wt	EHS	CAS No.
	Hydrivail 623 CAS No	**Gallons** State: Liquid Storage Container: Tote Bin Type: Mixture Days on Site: 365	**275**	**275**	250 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Reproductive Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Glycols Benzoic Acid Butylphenyl Methylporpional 1,4-Dioxacycloheptadecane-5,17-dione	20 % 5 % 1 % 1 %		9036-19-5 120-51-4 80-54-6 105-95-3
	Hydrofloc 714E CAS No	**Gallons** State: Liquid Storage Container: Tote Bin Type: Mixture Days on Site: 365	**275**	**275**	250 Pressue: Ambient Temperature: Ambient	Waste Code					
	Hyperfloc CE 6044 CAS No	**Gallons** State: Liquid Storage Container: Tote Bin Type: Mixture	**3300**	**275**	2970 Pressue: Ambient Temperature: Ambient	Waste Code					
	Hyperfloc CE 714 CAS No Map: 6	**Gallons** State: Liquid Storage Container: Tote Bin Type: Mixture Days on Site: 365	**1375**	**275**	1240 Pressue: Ambient Temperature: Ambient	Waste Code					
	Oasis 904 CAS No	**Gallons** State: Liquid Storage Container: Tote Bin Type: Mixture Days on Site: 365	**1650**	**275**	1485 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Respiratory Skin Sensitization - Health Serious Eye Damage Eye Irritation	Alcohol Ethoxylate Benzalkonium Chloride Fragrance	8 % 3 % 3 %		68551-12-2 68424-85-1 Proprietary

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	Leprino Foods Company	Chemical Location		CERS ID	10412464
Facility Name	Leprino Foods Company- Waste Water Treatment Plant		Map Location 7	Facility ID	FA0004168
	1250 S 19th Ave, Lemoore 93245			Status	Draft

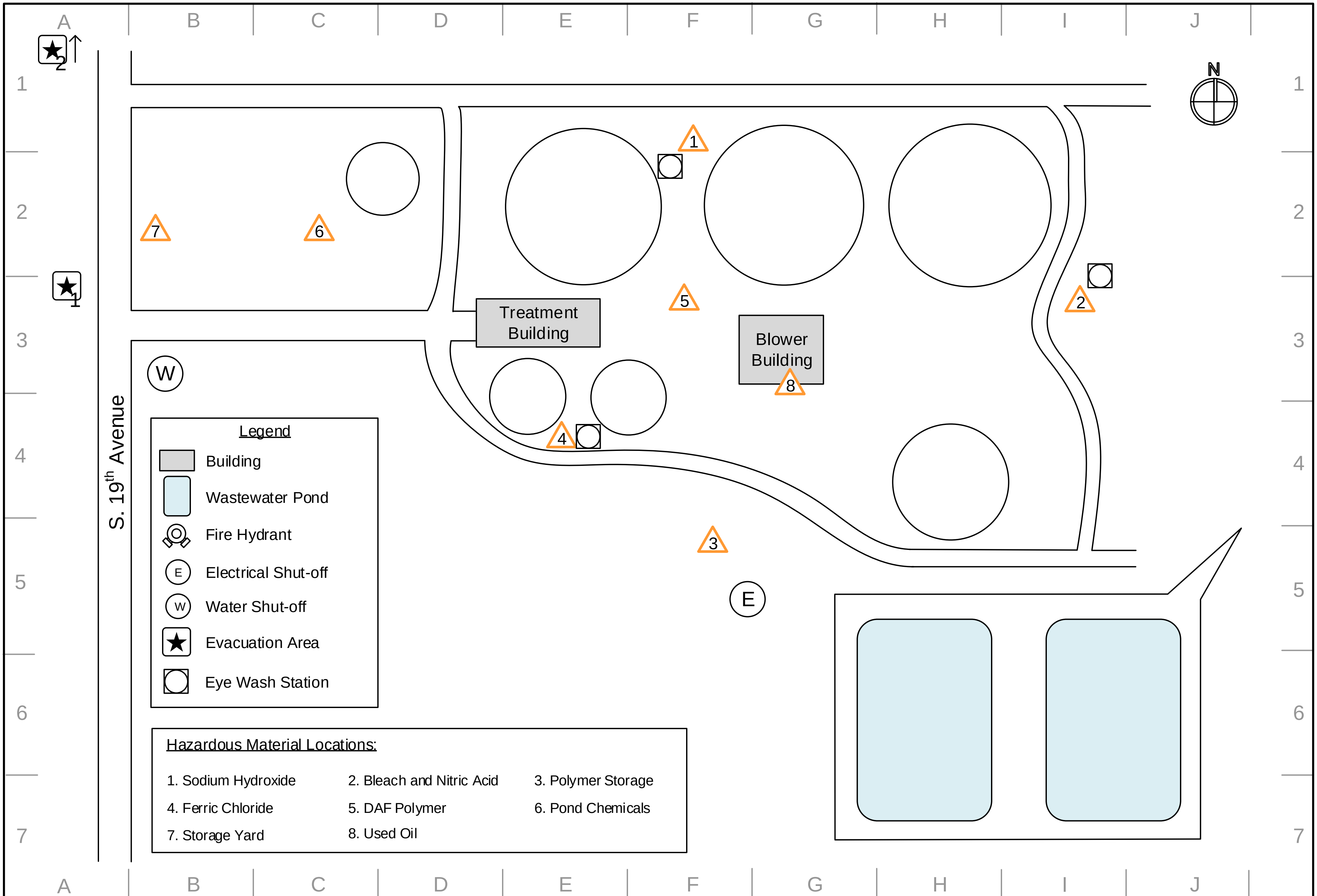
DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Largest Cont.	Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Hyperfloc CE 6044 CAS No	**Gallons** State: Liquid Storage Container: Tote Bin Type: Mixture	**550**	**275**	495 Pressue: Ambient Temperature: Ambient	Waste Code					
	Oasis 904 CAS No	**Gallons** State: Liquid Storage Container: Tote Bin Type: Mixture Days on Site: 365	**275**	**275**	250 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Respiratory Skin Sensitization - Health Serious Eye Damage Eye Irritation	Alcohol ethoxylate Benzalkonium chlroide Fragrance	8 % 3 % 3 %		68551-12-2 68424-85-1 Proprietary

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10412464**
Facility Name	**Leprino Foods Company- Waste Water Treatment Plant**		**Map Location 8**	Facility ID	**FA0004168**
	1250 S 19th Ave, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Largest Cont.	Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
DOT: 3 - Flammable and Combustible Liquids	**Alpet D2** CAS No	**Gallons** State: Liquid Type: Mixture	**55** Storage Container: Plastic/Non-metalic Drum Days on Site: 365	**50**	50 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable - Health Serious Eye Damage Eye Irritation	Ethanol Isopropyl Alcohol	76 % 10 %		64-17-5 67-63-0
	Mobil Recirculating Oil CAS No	**Gallons** State: Liquid Type: Mixture	**55** Storage Container: Steel Drum Days on Site: 365	**55**	50 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable	2-PENTANOL, 4-METHYL-, HYDROGEN PHOSPHORODITHIOATE, ZINC SALT NAPHTHALENESULFONIC ACID, DINONYL-, CALCIUM SALT	1 % 1 %		2215-35-2 57855-77-3
	Rags CAS No 65996-61-4	**Gallons** State: Solid Type: Pure	**110** Storage Container: Steel Drum	**55**	100 Pressue: Ambient Temperature: Ambient	Waste Code					
	USED OIL CAS No Map: 8	**Gallons** State: Liquid Type: Waste	**275** Storage Container: Steel Drum Days on Site: 365	**275**	250 Pressue: Ambient Temperature: Ambient	0 Waste Code	- Physical Flammable	USED OIL	100 %		

3. FACILITY SITE MAP



Prepared By: Trinity Consultants

Prepared For: Leprino Foods

Leprino Foods
1250 S. 19th Ave.
Lemoore, CA 93245

Description: 19th Street Wastewater Plant HMBP Map

Scale: 1"=~115'

Rev Date	Revision Notes
2/25/19	Trinity developed site map for 2019 HMBP
2/26/21	Trinity updated site map for 2021 HMBP
2/10/22	Trinity updated site map for 2022 HMBP

4. EMERGENCY RESPONSE / CONTINGENCY PLAN

CALIFORNIA ENVIRONMENTAL REPORTING SYSTEM (CERS)

CONSOLIDATED EMERGENCY RESPONSE / CONTINGENCY PLAN

Prior to completing this Plan, please refer to the INSTRUCTIONS FOR COMPLETING A CONSOLIDATED CONTINGENCY PLAN

FACILITY ID # A1.	CERS ID # A2. 10412464	DATE OF PLAN PREPARATION/REVISION (MM/DD/YYYY) A3. 04/01/2020

BUSINESS NAME *(Same as Facility Name or DBA - Doing Business As)* A4.
Leprino Foods Company - Wastewater Treatment Plant

BUSINESS SITE ADDRESS A5.
1050 S 19th Ave

BUSINESS SITE CITY A6. Lemoore	CA	ZIP CODE A7. 93245

TYPE OF BUSINESS (e.g., Painting Contractor) A8. Cheese Manufacturing	INCIDENTAL OPERATIONS (e.g., Fleet Maintenance) A9.

THIS PLAN COVERS CHEMICAL SPILLS, FIRES, AND EARTHQUAKES INVOLVING (Check all that apply): A10.
■ 1. HAZARDOUS MATERIALS; ■ 2. HAZARDOUS WASTES

INTERNAL FACILITY EMERGENCY RESPONSE WILL OCCUR BY (Check all that apply): B1.
■ 1. CALLING PUBLIC EMERGENCY RESPONDERS (e.g., 9-1-1)
☐ 2. CALLING HAZARDOUS WASTE CONTRACTOR
☐ 3. ACTIVATING IN-HOUSE EMERGENCY RESPONSE TEAM

In the event of an emergency involving hazardous materials and/or hazardous waste, all facilities must IMMEDIATELY:
1. Notify facility personnel and evacuate if necessary in accordance with the Emergency Action Plan (Title 8 California Code of Regulations §3220);
2. Notify local emergency responders by calling 9-1-1;
3. Notify the local Unified Program Agency (UPA) at the phone number below; and
4. Notify the State Warning Center at (800) 852-7550.

Facilities that generate, treat, store or dispose of hazardous waste have additional responsibilities to notify and coordinate with other response agencies. Whenever there is an imminent or actual emergency situation such as an explosion, fire, or release, the Emergency Coordinator must follow the appropriate requirements for the category of facility and type of release involved:
1. Title 22 California Code of Regulations §66265.56. Emergency Procedures for generators of 1,000 kilograms or more of hazardous waste in any calendar month.
2. Title 22 California Code of Regulations §66265.196. Response to Leaks or Spills and Disposition of Leaking or Unfit-for-Use Tank Systems.
3. Title 40 Code of Federal Regulations §302.6. Notification requirements for a release of a hazardous substance equal to or greater than the reportable quantity.
4. Title 22 California Code of Regulations §66262.34(d)(2) and Title 40 Code of Federal Regulations §262.34(d)(5)(ii) for generators of less than 1000 kilograms of hazardous waste in any calendar month.

Following notification and before facility operations are resumed in areas of the facility affected by the incident, the Emergency Coordinator shall notify the local UPA and the local fire department's hazardous materials program, if necessary, that the facility is in compliance with requirements to:
1. Provide for proper storage and disposal of recovered waste, contaminated soil or surface water, or any other material that results from an explosion, fire, or release at the facility; and
2. Ensure that no material that is incompatible with the released material is transferred, stored, or disposed of in areas of the facility affected by the incident until cleanup procedures are completed.

EMERGENCY RESPONSE PHONE NUMBERS:		
	AMBULANCE, FIRE, POLICE AND CHP	9-1-1
	CALIFORNIA STATE WARNING CENTER (CSWC)/CAL OES	(800) 852-7550
	NATIONAL RESPONSE CENTER (NRC)	(800) 424-8802
	POISON CONTROL CENTER	(800) 222-1222
	LOCAL UNIFIED PROGRAM AGENCY (UPA)	C1. (559) 854-1411
	OTHER (Specify): C2. Hanford Hospital	C3. (559) 582-9000
NEAREST MEDICAL FACILITY / HOSPITAL NAME:	C4. Adventist Health Community Care	C5. (559) 924-7711

AGENCY NOTIFICATION PHONE NUMBERS:		
	CALIFORNIA DEPT. OF TOXIC SUBSTANCES CONTROL (DTSC)	(916) 255-3545
	REGIONAL WATER QUALITY CONTROL BOARD (RWQCB)	C6. (559) 445-5116
	U.S. ENVIRONMENTAL PROTECTION AGENCY (US EPA)	(800) 300-2193
	CALIFORNIA DEPT. OF FISH AND WILDLIFE (CDFW)	(916) 358-2900
	U.S. COAST GUARD (USCG)	(202) 267-2180
	CAL OSHA	(916) 263-2800
	CAL FIRE OFFICE OF THE STATE FIRE MARSHAL (OSFM)	(916) 323-7390
	OTHER (Specify): C7.	C8.
	OTHER (Specify): C9.	C10.

INTERNAL FACILITY EMERGENCY COMMUNICATIONS OR ALARM NOTIFICATION WILL OCCUR BY (Check all that apply): C11.

- [x] 1. VERBAL WARNINGS;
- [ ] 2. PUBLIC ADDRESS OR INTERCOM SYSTEM;
- [x] 3. TELEPHONE;
- [ ] 4. PAGERS;
- [ ] 5. ALARM SYSTEM;
- [ ] 6. PORTABLE RADIO

NOTIFICATIONS TO NEIGHBORING FACILITIES THAT MAY BE AFFECTED BY AN OFF-SITE RELEASE WILL OCCUR BY (Check all that apply): C12.

- [ ] 1. VERBAL WARNINGS;
- [ ] 2. PUBLIC ADDRESS OR INTERCOM SYSTEM;
- [x] 3. TELEPHONE;
- [ ] 4. PAGERS;
- [ ] 5. ALARM SYSTEM;
- [ ] 6. PORTABLE RADIO

EMERGENCY COORDINATOR CONTACT INFORMATION: C13.

PRIMARY EMERGENCY COORDINATOR NAME: Richard Csillag PHONE NO.: (559) 925-7368 PHONE NO.: (317) 750-5394

ALTERNATE EMERGENCY COORDINATOR NAME: Chase Vanni PHONE NO.: (559) 925-7568 PHONE NO.: (559) 853-8394

- [ ] Check if additional Emergency Coordinator contact and address information is available onsite or by calling PHONE NO.:

Note: If more than one alternate emergency coordinator is designated, attach a list in order of responsibility.

D. EMERGENCY CONTAINMENT AND CLEANUP PROCEDURES

Check the applicable boxes to indicate your facility's procedures for containing spills and preventing and mitigating releases, fires and/or explosions.

D1.

- [x] 1. MONITOR FOR LEAKS, RUPTURES, PRESSURE BUILD-UP, ETC.;
- [x] 2. PROVIDE STRUCTURAL PHYSICAL BARRIERS (e.g., Portable spill containment walls, built-in berms);
- [ ] 3. PROVIDE ABSORBENT PHYSICAL BARRIERS (e.g., Pads, spill pigs, spill pillows);
- [ ] 4. COVER OR BLOCK FLOOR AND/OR STORM DRAINS;
- [ ] 5. LINED TRENCH DRAINS AND/OR SUMPS;
- [ ] 6. AUTOMATIC FIRE SUPPRESSION SYSTEM;
- [ ] 7. ELIMINATE SOURCES OF IGNITION FOR FLAMMABLE HAZARDS;
- [ ] 8. STOP PROCESSES AND/OR OPERATIONS;
- [ ] 9. AUTOMATIC / ELECTRONIC EQUIPMENT SHUT-OFF SYSTEM;
- [ ] 10. SHUT OFF WATER, GAS, ELECTRICAL UTILITIES;
- [x] 11. CALL 9-1-1 FOR PUBLIC EMERGENCY RESPONDER ASSISTANCE AND/OR MEDICAL AID;
- [x] 12. NOTIFY AND EVACUATE PERSONS IN ALL THREATENED AND/OR IMPACTED AREAS;
- [ ] 13. ACCOUNT FOR EVACUATED PERSONS IMMEDIATELY AFTER EVACUATION;
- [ ] 14. PROVIDE PROTECTIVE EQUIPMENT FOR ON-SITE EMERGENCY RESPONSE TEAM;
- [ ] 15. REMOVE CONTAINERS AND/OR ISOLATE AREAS;
- [ ] 16. HIRE LICENSED HAZARDOUS WASTE CONTRACTOR;
- [ ] 17. USE ABSORBENT MATERIAL FOR SPILL CONTAINMENT;
- [ ] 18. VACUUM SUCTION USING APPROPRIATE VACUUM (e.g., Intrinsically safe) FOR SPILL CONTROL AND/OR CLEANUP;
- [ ] 19. DECONTAMINATE PERSONNEL AND EQUIPMENT WITHIN DESIGNATED AREA AND DISPOSE OF WASTEWATER AS HAZARDOUS WASTE;
- [ ] 20. PROVIDE SAFE TEMPORARY STORAGE OF HAZARDOUS WASTE GENERATED DURING EMERGENCY ACTIONS;
- [ ] 21. OTHER (Specify): D2.

E. FACILITY EVACUATION

THE FOLLOWING ALARM SIGNAL(S) WILL BE USED TO BEGIN EVACUATION OF THE FACILITY (Check all that apply): E1.

- [ ] 1. BELLS;
- [ ] 2. HORNS/SIRENS;
- [x] 3. VERBAL (i.e., Shouting);
- [ ] 4. OTHER (Specify): E2.

THE FOLLOWING LOCATION(S) WILL BE USED FOR AN EMERGENCY ASSEMBLY AREA(S) (e.g., Parking lot, street corner): E3.

Note: The Emergency Coordinator must account for all onsite employees and visitors after evacuation.

EVACUATION ROUTE S AND ALTERNATE EVACUATION ROUTES ARE DESCRIBED AS FOLLOWS: E4.

- [ ] 1. WRITTEN PROCEDURES DESCRIBING ROUTES, EXITS, AND ASSEMBLY AREAS;
- [ ] 2. EVACUATION MAP(S) DEPICTING ROUTES, EXITS, AND ASSEMBLY AREAS;
- [x] 3. OTHER (Specify): training E5.

Note: Evacuation procedures and/or maps should be posted in visible facility locations and must be included in the Contingency Plan.

F. ARRANGEMENTS FOR EMERGENCY SERVICES

ADVANCE ARRANGEMENTS FOR LOCAL EMERGENCY SERVICES (Check one of the following): F1.

- [x] 1. HAVE BEEN DETERMINED NOT NECESSARY;
- [ ] 2. THE FOLLOWING ARRANGEMENTS HAVE BEEN MADE (Specify): F2.

Note: Advance arrangements with local fire and police departments, hospitals, state and local emergency response teams, and/or emergency services contractors should be made for your facility, if necessary. Large Quantity Generators must describe arrangements in the Contingency Plan.

G. EMERGENCY EQUIPMENT

Check the applicable boxes to list emergency response equipment available at the facility, identify the location(s) where the equipment is kept, and indicate the equipment's capability, if applicable.

TYPE	EQUIPMENT AVAILABLE G1.	LOCATION G2.	CAPABILITY G3.
EXAMPLE	☒ *CHEMICAL PROTECTIVE GLOVES*	*SPILL RESPONSE KIT*	*SINGLE USE, OIL RESISTANT ONLY*
Safety and First Aid	1. ▣ CHEMICAL PROTECTIVE SUITS, APRONS, AND/OR VESTS	East Blower Room/Safety Cabinet	
	2. ▣ CHEMICAL PROTECTIVE GLOVES	East Blower Room/Safety Cabinet	
	3. ▣ CHEMICAL PROTECTIVE BOOTS	East Blower Room/Safety Cabinet	
	4. ▣ SAFETY GLASSES, GOGGLES, AND FACE SHIELDS	East Blower Room/Safety Cabinet	
	5. ☐ HARD HATS		
	6. ☐ AIR-PURIFYING RESPIRATORS		
	7. ☐ SELF-CONTAINED BREATHING APPARATUS (SCBA)		
	8. ▣ FIRST AID KITS	Lab Restroom	
	9. ▣ PLUMBED EYEWASH FOUNTAIN AND/OR SHOWER	Lab Main Sink	
	10. ☐ PORTABLE EYEWASH KITS AND/OR STATION		
	11. ☐ OTHER		
Fire Fighting	12. ▣ PORTABLE FIRE EXTINGUISHERS	Blower Buildings, and Lab	
	13. ☐ FIXED FIRE SUPPRESSION SYSTEMS AND/ OR SPRINKLERS		
	14. ☐ FIRE ALARM BOXES		
	15. ☐ OTHER		
Spill Control and Clean-Up	16. ▣ ALL-IN-ONE SPILL KIT	East Blower Building	
	17. ☐ ABSORBENT MATERIAL		
	18. ☐ CONTAINER FOR USED ABSORBENT		
	19. ☐ BERM AND/OR DIKING EQUIPMENT		
	20. ☐ BROOM		
	21. ☐ SHOVEL		
	22. ☐ VACUUM		
	23. ▣ EXHAUST HOOD	Lab	
	24. ☐ SUMP AND/OR HOLDING TANK		
	25. ☐ CHEMICAL NEUTRALIZERS		
	26. ☐ GAS CYLINDER LEAK REPAIR KIT		
	27. ☐ SPILL OVERPACK DRUMS		
	28. ☐ OTHER		
Communi-cations and Alarm Systems	29. ▣ TELEPHONES (e.g., Cellular)	Buildings	
	30. ☐ INTERCOM AND/OR PA SYSTEM		
	31. ▣ PORTABLE RADIOS	Personnel	
	32. ☐ AUTOMATIC ALARM CHEMICAL MONITORING EQUIPMENT		
Other	33. ☐ OTHER		
	34. ☐ OTHER		

H. EARTHQUAKE VULNERABILITY

Identify areas of the facility that are vulnerable to hazardous materials releases due to seismic motion. These areas require immediate isolation and inspection.

VULNERABLE AREAS (Check all that apply): H1.	LOCATIONS (e.g., Shop, outdoor shed, lab): H2.
☒ 1. HAZARDOUS MATERIALS AND/OR WASTE STORAGE AREAS ☐ 2. PROCESS LINES AND PIPING ☒ 3. LABORATORY ☒ 4. WASTE TREATMENT AREA	

Identify mechanical systems vulnerable to releases / spills due to earthquake-related motion. These systems require immediate isolation and inspection.

VULNERABLE SYSTEMS AND/OR EQUIPMENT (Check all that apply): H3.	LOCATIONS: H4.
☒ 1. SHELVES, CABINETS AND/OR RACKS ☒ 2. TANKS AND SHUT-OFF VALVES ☐ 3. PORTABLE GAS CYLINDERS ☐ 4. EMERGENCY SHUT-OFF AND/OR UTILITY VALVES ☐ 5. SPRINKLER SYSTEMS ☐ 6. STATIONARY PRESSURIZED CONTAINERS (e.g., Propane tank)	Treatment building, blower building, office, tanks

I. EMPLOYEE TRAINING

Employee training is required for all employees and/or contractors handling hazardous materials and/or hazardous wastes during normal and/or emergency operations. Most facilities will need to submit a separate Training Plan. However, your CUPA may accept this section as the Training Plan for some small facilities.
Employee training plans may include the following content:

- Applicable laws and regulations;
- Emergency response plans and procedures;
- Safety Data Sheets;
- Hazard communication related to health and safety;
- Methods for safe handling of hazardous substances;
- Hazards of materials and processes (e.g., fire, explosion, asphyxiation);
- Hazard mitigation, prevention and abatement procedures;
- Coordination of emergency response actions;
- Notification procedures for local emergency responders, CUPA, Cal OES, and onsite personnel;
- Communication and alarm systems;
- Personal protective equipment;
- Use and maintenance of emergency response equipment and supplies (e.g. Fire extinguishers, respirators, spill control materials);
- Decontamination procedures;
- Evacuation procedures and evacuation staging locations;
- Identification of facility areas, equipment, and systems vulnerable to earthquakes and other natural disasters.
- OTHER (Specify):

Check the applicable boxes below to indicate how the employee training program is administered.

☒ 1. FORMAL CLASSROOM ☐ 2. VIDEOS ☐ 3. SAFETY MEETINGS ☐ 4. STUDY GUIDES / MANUALS I1.
☐ 5. OTHER (Specify): I2.
☐ 6. NOT APPLICABLE SINCE FACILITY HAS NO EMPLOYEES
☐ 7. CHECK IF A SEPARATE EMPLOYEE TRAINING PLAN IS USED AND UPLOADED TO CERS AS A PDF DOCUMENT I3.
☐ 8. CHECK IF EMPLOYEE TRAINING IS COVERED BY THE ABOVE REFERENCED CONTENT AND OTHER DOCUMENTS ONSITE I4.

EMPLOYEE TRAINING FREQUENCY AND RECORDKEEPING TRAINING MUST BE:

- Provided initially for new employees as soon as possible following the date of hire. New employees should not work in an unsupervised position that involves hazardous materials handling and/or hazardous waste management without proper training;
- Provided within six months from the date of hire for new employees at a large quantity generator;
- Ongoing and provided at least annually;
- Amended prior to a change in process or work assignment;
- Given upon modification to the Emergency Response/Contingency Plan.

Large Quantity Generator Training: Large quantity generators (1,000 kg or more) must retain written plan and documentation of employee training which includes:

- A written description of the type and amount of both initial and ongoing training that will be given to persons filling each job position having responsibility for hazardous waste management and/or emergency response.
- The name, job title and job description for each position at the facility related to hazardous waste management.
- Current employee training records must be retained until closure of the facility and former employee training records must be retained for at least three years after termination of employment.

Small Quantity Generator Training: Small quantity generators (less than 1,000 kg) must include basic hazardous waste management and emergency response procedures but a written employee training plan and training records are not required. In order to show that the facility has met the small quantity generator employee training requirement, an employee training plan and training records may be made available.

Hazardous Materials Business Plan Training: Businesses must provide initial and annual employee training that includes the content referenced above. The training may be based on the job position and training records must be made available for a period of at least three years.

J. LIST OF ATTACHMENTS

Check one of the following: J1.
☒ 1. NO ATTACHMENTS ARE REQUIRED; or
☐ 2. THE FOLLOWING DOCUMENTS ARE ATTACHED: J2.

PROJECT REPORT
2022 CUPA Plan

Leprino Foods Company / West Plant

Prepared By:

Tiffany Wang – Senior Consultant
Ashley Moreno – Associate Consultant

TRINITY CONSULTANTS
4900 California Ave., Suite 420A
Bakersfield, CA 93309
(661) 282-2200

February 2022

Project 220505.0003

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1. FACILITY INFORMATION

California Environmental Reporting System (CERS) — Business Activities

Site Identification

Leprino Foods Company
351 North Belle Haven Drive
Lemoore, CA 93245
County
Kings

CERS ID
10410073
EPA ID Number
CAL000279534

Submittal Status

This was a ***Draft*** submittal as of 2/23/2022; Last updated by *Tony Phan* on 2/22/2022 3:41 PM

Hazardous Materials

Does your facility have on site (for any purpose) at any one time, hazardous materials at or above 55 gallons for liquids, 500 pounds for solids, or 200 cubic feet for compressed gases (include liquids in ASTs and USTs); or is regulated under more restrictive inventory local reporting requirements (shown below if present); or the applicable Federal threshold quantity for an extremely hazardous substance specified in 40 CFR Part 355, Appendix A or B; or handle radiological materials in quantities for which an emergency plan is required pursuant to 10 CFR Parts 30, 40 or 70?	**Yes**

Underground Storage Tank(s) (UST)

Does your facility own or operate underground storage tanks?	**No**

Hazardous Waste

Is your facility a Hazardous Waste Generator?	**Yes**
Does your facility treat hazardous waste on-site?	**No**
Is your facility's treatment subject to financial assurance requirements (for Permit by Rule and Conditional Authorization)?	**No**
Does your facility consolidate hazardous waste generated at a remote site?	**No**
Does your facility need to report the closure/removal of a tank that was classified as hazardous waste and cleaned on-site?	**No**
Does your facility generate in any single calendar month 1,000 kilograms (kg) (2,200 pounds) or more of federal RCRA hazardous waste, or generate in any single calendar month greater than 1 kg (2.2 pounds) of RCRA acute hazardous waste; or generate more than 100 kg (220 pounds) of spill cleanup materials contaminated with RCRA acute hazardous waste.	**No**
Is your facility a Household Hazardous Waste (HHW) Collection site?	**No**

Excluded and/or Exempted Materials

Does your facility recycle more than 100 kg/month of excluded or exempted recyclable materials (per HSC 25143.2)?	**No**
Does your facility own or operate ASTs above these thresholds? Store greater than 1,320 gallons of petroleum products (new or used) in aboveground tanks or containers.	**Yes**
Does your facility have Regulated Substances stored onsite in quantities greater than the threshold quantities established by the California Accidental Release prevention Program (CalARP)?	**Yes**

Additional Information

No additional comments provided.

Facility/Site

Leprino Foods Company
351 North Belle Haven Drive
Lemoore, CA 93245

CERS ID
10410073

Submittal Status

This was a ***Draft*** submittal as of 2/23/2022; Last updated by *Tony Phan* on 2/22/2022 3:41 PM

Identification

Leprino Foods Company

Operator Phone	Business Phone	Business Fax
(559) 925-7377	(559) 925-7300	(303) 209-6040

Beginning Date	Ending Date	
Dun & Bradstreet	**SIC Code**	**Primary NAICS**
102142804	2022	

Facility/Site Mailing Address

351 North Belle Haven Drive
Lemoore, CA 93245

Primary Emergency Contact

Aman Das
Title
Plant Manager

Business Phone	24-Hour Phone	Pager Number
(559) 925-7305	(530) 383-6037	NA

Owner

Leprino Foods Company
(303) 480-7300
1830 West 38th Avenue
Denver, CO 80211-2200

Secondary Emergency Contact

Tim Hutcheson
Title
Technical Director

Business Phone	24-Hour Phone	Pager Number
(559) 925-7360	(559) 469-6560	

Billing Contact

Leprino Foods Company
(559) 925-7300
351 North Belle Haven Drive
Lemoore, CA 93245

Environmental Contact

Richard Csillag
(559) 925-7368 rcsillag@leprinofoods.com
351 North Belle Haven Drive
Lemoore, CA 93245

Name of Signer	Signer Title	Document Preparer
Aman Das	Vice President/Plant Manager	Richard Csillag

Additional Information

Locally-collected Fields

Some or all of the following fields may be required by your local regulator(s).

Property Owner

Leprino Foods Company
Phone

Mailing Address
1830 West 38th Avenue
Denver, CO 80211-2200

Assessor Parcel Number (APN)

Number of Employees
961

Facility ID
FA0002923

2. HAZARDOUS MATERIALS INVENTORY

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 1**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Biohazard CAS No Map: 1	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**55**	**55**	50 Pressue: Ambient Temperature: Ambient	Waste Code					
	Universal Waste CAS No	**Pounds** State: Solid Storage Container: Box Type: Mixture Days on Site: 365	**2500**	**2500**	2250 Pressue: Ambient Temperature: Ambient	Waste Code					
	Used Oil CAS No 70514-12-4	**Gallons** State: Liquid Storage Container: Tote Bin Type: Pure Days on Site: 365	**220**	**55**	200 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Carcinogenicity - Health Reproductive Toxicity - Health Skin Corrosion Irritation - Health Respiratory Skin Sensitization - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity - Health Aspiration Hazard - Health Germ Cell Mutagenicity				
DOT: 9 - Misc. Hazardous Materials	**Used Oil Filters (Drained)** CAS No Map: 1	**Gallons** State: Liquid Storage Container: Steel Drum, Tote Bin Type: Mixture Days on Site: 365	**1045**	**250**	945 Pressue: Ambient Temperature: Ambient	Waste Code 223		Waste Petroleum Hydrocarbons	100 %		Mixture

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	Leprino Foods Company	Chemical Location		CERS ID	10410073
Facility Name	Leprino Foods Company	Map Location 10		Facility ID	FA0002923
	351 North Belle Haven Drive, Lemoore 93245			Status	Draft

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Propane	**Gallons**	**20000**	**10000**	10000		- Physical Flammable	Propane	80 %		74-98-6
	CAS No	State: Liquid	Storage Container: Aboveground Tank		Pressue: > Ambient	Waste Code	- Physical Gas Under Pressure	Propene	20 %		115-07-1
	Map: 10	Type: Mixture	Days on Site: 365		Temperature: Ambient		- Health Simple Asphyxiant	Ethane	6 %		74-84-0
								Butane	5 %		106-97-8
								Isobutane	3 %		75-28-5

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 11**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Diesel CAS No 68476-34-6 Map: 11	**Gallons** State: Liquid Storage Container: Aboveground Tank Type: Pure Days on Site: 365	**500**	**500**	450 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable - Health Carcinogenicity - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Specific Target Organ Toxicity - Health Aspiration Hazard	Diesel no. 2	100 %		68476-34-6
	Gasoline CAS No Map: 11	**Gallons** State: Liquid Storage Container: Aboveground Tank Type: Mixture Days on Site: 365	**450**	**300**	405 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable - Health Carcinogenicity - Health Reproductive Toxicity - Health Skin Corrosion Irritation - Health Specific Target Organ Toxicity - Health Aspiration Hazard - Health Germ Cell Mutagenicity	Gasoline Toluene Hexane Xylene Octane	80 % 15 % 15 % 12 % 9 %		86290-81-5 108-88-3 96-14-0 1330-20-7 111-65-9

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	Leprino Foods Company	Chemical Location		CERS ID	10410073
Facility Name	Leprino Foods Company	Map Location 12		Facility ID	FA0002923
	351 North Belle Haven Drive, Lemoore 93245			Status	Draft

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Largest Cont.	Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	FMO-150-AW-ISO CAS No 8042-47-5 Map: 12	**Gallons** State: Liquid Type: Pure	**110** Storage Container: Steel Drum Days on Site: 365	**55**	100 Pressue: Ambient Temperature: Ambient	Waste Code		White mineral oil (petroleum)	90 %		8042-47-5
	Gear Oil CAS No	**Gallons** State: Liquid Type: Pure	**55** Storage Container: Steel Drum Days on Site: 365	**55**	50 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable	2-PENTANOL, 4-METHYL-, HYDROGEN PHOSPHORODITHIOATE, ZINC SALT	1 %		2215-35-2
								NAPHTHALENESULFONIC ACID, DINONYL-, CALCIUM SALT	1 %		57855-77-3
	USED OIL CAS No waste Map: 12	**Gallons** State: Liquid Type: Waste	**55** Storage Container: Steel Drum Days on Site: 365	**55**	50 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable - Health Respiratory Skin Sensitization	USED OIL	100 %		

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 13**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Sulfuric Acid CAS No Map: 13	**Gallons** State: Liquid Storage Container: Aboveground Tank Type: Pure Days on Site: 365	**6000**	**6000**	5400 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Sulfuric Acid	96 %		7664-93-9

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 14**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Alpet D2 (UN 1987) CAS No Map: 14	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**385**	**55**	350 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable - Health Serious Eye Damage Eye Irritation	Ethanol Isopropyl alochol	70 % 8 %		64-17-5 67-63-0
	Alpet E2 CAS No Map: 14	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**605**	**55**	545 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Isopropyl Alcohol 4-chloro-3, 5 xylenol Glycerin Triclosan	7 % 2 % 1 % 1 %		67-63-0 88-04-0 56-81-5 3380-34-5
	Alpet E3 CAS No Map: 14	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**220**	**55**	200 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable	Ethyl alcohol Isopropyl alcohol	71 % 7 %		64-17-5 67-63-0
	Calcium Chloride CAS No Map: 14	**Gallons** State: Liquid Storage Container: Aboveground Tank Type: Days on Site: 365	**9100**	**9100**	8190 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Acute Toxicity - Health Skin Corrosion Irritation - Health Respiratory Skin Sensitization - Health Serious Eye Damage Eye Irritation				
	Caustic Potassium 45% UN1814 CAS No Map: 14	**Gallons** State: Liquid Storage Container: Tank Inside Building, Steel Drum Type: Mixture Days on Site: 365	**8150**	**8000**	7335 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Acute Toxicity - Health Respiratory Skin Sensitization - Health Serious Eye Damage Eye Irritation - Health Hazard Not Otherwise Classified	Water Potassium Hydroxide	50 % 50 %		7732-18-5 1310-58-3

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	Leprino Foods Company	Chemical Location		CERS ID	10410073
Facility Name	Leprino Foods Company	Map Location 14		Facility ID	FA0002923
	351 North Belle Haven Drive, Lemoore 93245			Status	Draft

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities Max. Daily	Largest Cont.	Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only) Component Name	% Wt	EHS	CAS No.
DOT: 8 - Corrosives (Liquids and Solids)	**Chlorine Dioxide** CAS No Map: 14	**Gallons** State: Liquid Type: Storage Container: Plastic/Non-metalic Drum Days on Site: 365	**55**	**55**	50 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Acute Toxicity - Health Skin Corrosion Irritation - Health Respiratory Skin Sensitization - Health Serious Eye Damage Eye Irritation	Chlorine Dioxide	0 %		10049-04-4
	Cling No 153 CAS No Map: 14	**Gallons** State: Liquid Type: Mixture Storage Container: Tote Bin Days on Site: 365	**900**	**300**	810 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Phosphoric Acid C(10-16)-Alkylbenzenesulfonic Acid Polyethylene Glycol Phenyl Ether Phosphate Secondary Alcohol Ethoxylate	35 % 10 % 5 % 5 %		7664-38-2 68584-22-5 39464-70-5
	D Scale CAS No Map: 14	**Gallons** State: Liquid Type: Mixture Storage Container: Steel Drum Days on Site: 365	**275**	**55**	250 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Tetrasodium EDTA Sodium Hydroxide	50 % 3 %		64-02-8 1310-73-2
	Defoamer No 553 CAS No Map: 14	**Gallons** State: Liquid Type: Mixture Storage Container: Tote Bin Days on Site: 365	**600**	**300**	540 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Respiratory Skin Sensitization - Health Serious Eye Damage Eye Irritation	Alochols, C6-10, ethoxylated propoxylated Sodium Cumenesulfonate	35 % 10 %		68987-81-5 28348-53-0

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 14**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Detbuild No 394 CAS No Map: 14	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**275**	**55**	250 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Skin Corrosion Irritation - Health Respiratory Skin Sensitization - Health Serious Eye Damage Eye Irritation	Potassium 4-Dodecylbenzene Sulfonate Triethanolamine Dodecylbenzene Sulfonate Triethanolamine	20 % 10 % 5 %		14564-74-0 27323-41-7 102-71-6
	Dictate No 465 CAS No Map: 14	**Gallons** State: Liquid Storage Container: Steel Drum, Tote Bin Type: Mixture Days on Site: 365	**4215**	**250**	3795 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Carcinogenicity - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Propionic Acid Sulfuric Acid Phosphoric Acid Decanoic Acid Pelargonic Acid	10 % 10 % 9 % 3 % 3 %		79-09-4 7664-93-9 7664-38-2 334-48-5 112-05-0
	Enhance CAS No Map: 14	**Gallons** State: Liquid Storage Container: Tote Bin Type: Pure Days on Site: 365	**900**	**300**	810 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Ethylene diamine tetraacetic acid tetrasodium salt sodium hydroxide	30 % 3 %	✓ ✓	64-02-8 1310-73-2
	Enrich No 299 chlorinated alkaline CAS No Map: 14	**Gallons** State: Liquid Storage Container: Aboveground Tank, Tote Bin Type: Mixture Days on Site: 365	**9500**	**9200**	8550 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Sodium Hydroxide Sodium Hypochlorite Proprietary	10 % 5 % 10 %		1310-73-2 7681-52-9 Proprietary

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 14**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
DOT: 9 - Misc. Hazardous Materials	**Enzyterge No. 400** CAS No Mixture	**Gallons** State: Liquid Storage Container: Plastic/Non-metalic Drum Type: Mixture Days on Site: 365	**55**	**55**	50 Pressue: Ambient Temperature: Ambient	0 Waste Code	- Health Respiratory Skin Sensitization - Health Serious Eye Damage Eye Irritation	Secondary Alcohol Ethoxylate Triethanolamine Dodecylbenzene Sulfonate Sodium Formate Protease Enzyme Protein	10 % 10 % 5 % 3 %		84133-50-6 27323-41-7 141-53-7 9014-0-1
	Floor Quat No. 318 CAS No Map: 14	**Gallons** State: Solid Storage Container: Fiber Drum, Tote Bin Type: Mixture Days on Site: 365	**1350**	**450**	1215 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Reproductive Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Sodium Tetraborate Decahydrate Sodium Tetraborate Pentahydrate	40 % 40 %		1303-96-4 12179-04-3
	Grease X No 567 CAS No Map: 14	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**165**	**55**	150 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Diethylene Glycol Monobutyl Ether Sodium Xylene Sulfonate Potassium Hydroxide Secondary Alcohol Ethoxylate Potassium Silicate	15 % 10 % 5 % 5 % 3 %		112-34-5 1300-72-7 1310-58-3 84133-50-6 1312-76-1
	Guardian CAS No Map: 14	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**330**	**270**	300 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Alkyl (60% C14, 30% C16, 5% C12, 5% C18) dimethyl benzyl ammonium choride Alkyl dimethyl ethyl benzyl ammonium chloride (C12-14) Benzyl Chloride	5 % 5 % 0 %		68391-01-5 85409-23-0 100-44-7
	Hydricleanse No 325 CAS No	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**110**	**55**	100 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Proprietary Proprietary	65 % 45 %		Proprietary Proprietary

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 14**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Hydrite MBS 7330 CAS No Map: 14	**Gallons** State: Liquid Type: Mixture Storage Container: Plastic/Non-metalic Drum Days on Site: 365	**1320**	**330**	1190 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Magnesium Bisulfite	30 %		13774-25-9
	Perasan A CAS No Map: 14	**Gallons** State: Liquid Type: Mixture Storage Container: Steel Drum Days on Site: 365	**220**	**55**	200 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Oxidizer - Physical Organic Peroxide - Physical Corrosive To Metal - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Hydrogen Peroxide Acetic Acid Peroxyacetic Acid	26 % 4 % 6 %		7722-84-1 64-19-7 79-21-0
	Phosphoric Acid 35% CAS No 7664-38-2 Map: 14	**Gallons** State: Liquid Type: Pure Storage Container: Tote Bin Days on Site: 365	**10330**	**10000**	9300 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Phosphoric acid	35 %		7664-38-2
	Pro Oxine Chlorite solution CAS No 7758-19-2 Map: 14	**Gallons** State: Liquid Type: Pure Storage Container: Steel Drum Days on Site: 365	**110**	**55**	100 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Sodium chlorite water	8 % 92 %		7758-19-2 7732-18-5

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org. **Leprino Foods Company**
Facility Name **Leprino Foods Company**
351 North Belle Haven Drive, Lemoore 93245

Chemical Location **Map Location 14**

CERS ID **10410073**
Facility ID **FA0002923**
Status **Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Max. Daily	Largest Cont.	Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Component Name	% Wt	EHS	CAS No.
	Relief CAS No Map: 14	**Gallons** State: Liquid Storage Container: Tote Bin Type: Mixture Days on Site: 365	**825**	**275**	745 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Serious Eye Damage Eye Irritation	D-Glucopyranose, oligomeric, decy octyl glycosides Polyethylene glycol, propoxylated	20 % 5 %		68515-73-1 9003-11-6
	Sentinel No 473 CAS No Map: 14	**Gallons** State: Liquid Storage Container: Steel Drum, Tote Bin Type: Mixture Days on Site: 365	**1230**	**300**	1110 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Phosphoric Acid Alkyl(50%C14,40%C12,10%C16) dimethyl benzyl ammonium chloride Octyl decyl dimethyl ammonium chloride Alcohols, C12-14 secondary, ethoxylated Ethyl Alcohol	35 % 10 % 5 % 5 % 3 %		7664-38-2 68424-85-1 32426-11-2 84133-50-6 64-17-5
	Sodium Hypochlorite CAS No Map: 14	**Gallons** State: Liquid Storage Container: Aboveground Tank, Tote Bin Type: Mixture Days on Site: 365	**4090**	**3100**	3685 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Sodium hypochlorite Sodium hydroxide Water	13 % 3 % 81 %		7681-52-9 1310-73-2 7732-18-5
	Sterilex Disinfectant CAS No Map: 14	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**275**	**55**	250 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	hydrogen peroxide Alkyl dimethyl ethyl benzyl ammonium chloride Alkyl (C12,C14,C16) Dimethyl Benzyl Ammonium Chloride	7 % 4 % 4 %		7722-84-1 85409-23-0 68391-01-5
	Sterilex Ultra Activator CAS No Map: 14	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**330**	**55**	300 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Sodium carbonate Potassium carbonate Tetrasodium ethylenediaminetetraacetate	6 % 6 % 5 %		497-19-8 584-08-7 64-02-8

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**		**Map Location 14**	Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Surge No 407 CAS No 1310-73-2 Map: 14	**Gallons** State: Liquid Type: Pure Storage Container: Aboveground Tank, Tote Bin Days on Site: 365	**12425**	**12150**	11185 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Sodium Hydroxide	55 %		1310-73-2
	Tempest 810 CAS No Map: 14	**Gallons** State: Liquid Type: Mixture Storage Container: Steel Drum, Tote Bin Days on Site: 365	**1340**	**300**	1210 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	2-butoxyethanol Secondary alcohol ethoxylate	15 % 15 %		111-76-2 84133-50-6
	Tempest No. 810 CAS No MIXTURE Map: 14	**Gallons** State: Liquid Type: Mixture Storage Container: Plastic/Non-metalic Drum Days on Site: 365	**1340**	**300**	1210 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	DIETHYLENE GLYCOL MONOBUTYL ETHER POLY(OXY-1,2-ETHANEDIYL),ALPHA-(NONYLPHENYL)-OMEGA-HYDROXY-, SODIUM CUMENESULFONATE	10 % 10 % 5 %		112-34-5 9016-45-9 28348-53-0
	Traffic Acid No. 315 CAS No Map: 14	**Pounds** State: Solid Type: Pure Storage Container: Plastic/Non-metalic Drum	**325**	**325**	295 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Urea	100 %		57-13-6
	Ultra LFA No 176 CAS No 7697-37-2 Map: 14	**Gallons** State: Liquid Type: Pure Storage Container: Aboveground Tank, Tote Bin Days on Site: 365	**10275**	**10000**	10000 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Nitric Acid	50 %	✓	7697-37-2

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 14**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities Max. Daily	Largest Cont.	Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only) Component Name	% Wt	EHS	CAS No.
	Ultrasolve No. 580 CAS No Map: 14	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**110**	**55**	100 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable - Health Specific Target Organ Toxicity	Dipropylene Glycol Monomethyl Ether	99 %		34590-94-8
	Vibrant No 173 CAS No Map: 14	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**55**	**55**	50 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Citric Acid Hydroxyacetic Acid Sulfamic Acid Dimethyldodecylamine Oxide Secondary Alcohol Ethoxylate	20 % 10 % 10 % 5 % 5 %		77-92-9 79-14-1 5329-14-6 1643-20-5 84133-50-6

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 15**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Diesel CAS No 68476-34-6 Map: 15	**Gallons** State: Liquid Type: Pure	**1250** Storage Container: Aboveground Tank Days on Site: 365	**1250**	1125 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable - Health Carcinogenicity - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Specific Target Organ Toxicity - Health Aspiration Hazard	Diesel no. 2	100 %		68476-34-6

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location	CERS ID **10410073**
Facility Name	**Leprino Foods Company**	**Map Location 17**	Facility ID **FA0002923**
	351 North Belle Haven Drive, Lemoore 93245		Status **Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Enrich No 299 CAS No	**Gallons** State: Liquid Storage Container: Tote Bin Type: Mixture Days on Site: 365	**330**	**330**	300 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Sodium Hydroxide Sodium Hypochlorite Proprietary	10 % 5 % 10 %		1310-73-2 7681-52-9 Proprietary
DOT: 9 - Misc. Hazardous Materials	**Enzyterge No. 400** CAS No Mixture	**Gallons** State: Liquid Storage Container: Plastic/Non-metalic Drum Type: Mixture Days on Site: 365	**55**	**55**	50 Pressue: Ambient Temperature: Ambient	0 Waste Code	- Health Respiratory Skin Sensitization - Health Serious Eye Damage Eye Irritation	Secondary Alcohol Ethoxylate Triethanolamine Dodecylbenzene Sulfonate Sodium Formate Protease Enzyme Protein	10 % 10 % 5 % 3 %		84133-50-6 27323-41-7 141-53-7 9014-0-1
	Hydricleanse No 325 CAS No	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**110**	**55**	100 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Proprietary Proprietary	65 % 45 %		Proprietary Proprietary
	Hydrisoak No 180 CAS No	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**110**	**55**	100 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Citric Acid Lactic Acid C(10-16)-Alkylbenzenesulfonic Acid Sulfuric Acid	15 % 15 % 10 % 0 %		77-92-9 50-21-5 68584-22-5 7664-93-9
	Sterilex Disinfectant CAS No Map: 17	**Gallons** State: Liquid Storage Container: Tote Bin Type: Mixture Days on Site: 365	**550**	**55**	495 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	hydrogen peroxide Alkyl dimethyl ethyl benzyl ammonium chloride Alkyl (C12,C14,C16) Dimethyl Benzyl Ammonium Chloride	7 % 4 % 4 %		7722-84-1 85409-23-0 68391-01-5

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 17**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Sterilex Ultra Activator CAS No	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**550**	**275**	495 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Sodium carbonate Potassium carbonate Tetrasodium ethylenediaminetetraacetate	6 % 6 % 5 %		497-19-8 584-08-7 64-02-8
	Traffic Acid No. 315 CAS No Map: 17	**Pounds** State: Solid Storage Container: Plastic/Non-metalic Drum Type: Pure Days on Site: 365	**1300**	**325**	1170 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Urea	100 %		57-13-6

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 18**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Gluconic Acid CAS No 526-95-4	**Gallons** State: Liquid Storage Container: Tote Bin Type: Pure Days on Site: 365	**3575**	**275**	3220 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Respiratory Skin Sensitization - Health Serious Eye Damage Eye Irritation	D(-)-Pentahydroxycaproic Acid	50 %		526-95-4

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 2**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	BL4350 CAS No Map: 2	**Gallons** State: Liquid Storage Container: Tote Bin Type: Pure Days on Site: 365	**250**	**250**	225 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Acute Toxicity	1-Hydroxyethylidene-1, 1-diphosphonic acid, tetrapotassium salt	5 %		14860-53-8
	ChemTreat BL 1258 CAS No Map: 2	**Gallons** State: Liquid Storage Container: Tote Bin Type: Days on Site: 365	**550**	**275**	495 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Carcinogenicity - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Respiratory Skin Sensitization - Health Specific Target Organ Toxicity	Potassium Hydroxide Ethylene diamine tetraacetic acid Sodium Bisulfate	7 % 1 % 40 %		1310-58-3 64-02-8 7631-90-5
	CL 427 CAS No 7722-84-1 Map: 2	**Gallons** State: Liquid Storage Container: Plastic/Non-metalic Drum Type: Pure Days on Site: 365	**55**	**55**	50 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Oxidizer - Health Acute Toxicity - Health Serious Eye Damage Eye Irritation	Hydrogen peroxide	20 %		7722-84-1
	CL 49 CAS No Map: 2	**Gallons** State: Liquid Storage Container: Tote Bin Type: Mixture Days on Site: 365	**250**	**250**	225 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Sodium chlorosulfamate Sodium bromosulfamate Sodium hydroxide	10 % 13 % 10 %		17172-27-9 134509-56-1 1310-73-2
	CL 49 CAS No Map: 2	**Gallons** State: Liquid Storage Container: Tote Bin Type: Mixture Days on Site: 365	**550**	**275**	495 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Sodium chlorosulfamate Sodium bromosulfamate Sodium hydroxide	10 % 13 % 10 %		17172-27-9 134509-56-1 1310-73-2

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 2**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	CL 561 CAS No Map: 2	**Gallons** State: Liquid Storage Container: Tote Bin Type: Pure Days on Site: 365	**275**	**275**	250 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Carcinogenicity - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Sulfuric acid	28 %		7664-93-9
	CL 6819 CAS No Map: 2	**Gallons** State: Liquid Storage Container: Steel Drum Type: Pure Days on Site: 365	**275**	**275**	250 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Hazard Not Otherwise Classified	Sodium Hydroxide	30 %		1310-73-2

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	Leprino Foods Company	Chemical Location		CERS ID	10410073
Facility Name	Leprino Foods Company	Map Location 3		Facility ID	FA0002923
	351 North Belle Haven Drive, Lemoore 93245			Status	Draft

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Largest Cont.	Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Propane	**Gallons**	**1000**	**1000**	1000		- Physical Flammable	Propane	80 %		74-98-6
	CAS No	State: Liquid	Storage Container: Aboveground Tank		Pressue: > Ambient	Waste Code	- Physical Gas Under Pressure	Propene	20 %		115-07-1
	Map: 3	Type: Mixture	Days on Site: 365		Temperature: Ambient		- Health Simple Asphyxiant	Ethane	6 %		74-84-0
								Butane	5 %		106-97-8
								Isobutane	3 %		75-28-5

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	Leprino Foods Company	Chemical Location		CERS ID	10410073
Facility Name	Leprino Foods Company	Map Location 5		Facility ID	FA0002923
	351 North Belle Haven Drive, Lemoore 93245			Status	Draft

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Diesel CAS No 68476-34-6 Map: 5	**Gallons** State: Liquid Storage Container: Aboveground Tank Type: Pure Days on Site: 365	**1250**	**1250**	1125 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable - Health Carcinogenicity - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Specific Target Organ Toxicity - Health Aspiration Hazard	Diesel no. 2	100 %		68476-34-6
	Hydrochloric Acid CAS No 7647-01-0 Map: 5	**Gallons** State: Liquid Storage Container: Aboveground Tank Type: Pure Days on Site: 365	**10250**	**10250**	9225 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Hydrochloric Acid	35 %	✓	7647-01-0
	Phosphoric Acid CAS No 7664-38-2 Map: 5	**Gallons** State: Liquid Storage Container: Aboveground Tank Type: Pure Days on Site: 365	**6000**	**6000**	5400 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Phosphoric acid	75 %		7664-38-2
	Potassium Hydroxide CAS No 1310-58-3 Map: 5	**Gallons** State: Liquid Storage Container: Aboveground Tank Type: Pure Days on Site: 365	**6000**	**6000**	5400 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Potassium Hydroxide	10 %		1310-58-3

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 5**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Sodium Hydroxide CAS No Map: 5	**Gallons** State: Liquid Storage Container: Aboveground Tank Type: Mixture Days on Site: 365	**10250**	**10250**	9225 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Sodium Hydroxide Water Sodium Chloride	48 % 48 % 5 %		1310-73-2 7732-18-5 7647-14-5
	Sodium Hypochlorite CAS No Map: 5	**Gallons** State: Liquid Storage Container: Tank Inside Building Type: Mixture Days on Site: 365	**6540**	**6000**	5890 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Sodium hypochlorite Sodium hydroxide Water	13 % 3 % 81 %		7681-52-9 1310-73-2 7732-18-5
	Surge 407 CAS No 1310-73-2 Map: 5	**Gallons** State: Liquid Storage Container: Aboveground Tank Type: Pure Days on Site: 365	**22250**	**12000**	20025 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Sodium Hydroxide	55 %		1310-73-2
	Ultra LFA No 176 CAS No 7697-37-2 Map: 5	**Gallons** State: Liquid Storage Container: Aboveground Tank Type: Pure Days on Site: 365	**12000**	**12000**	10800 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Nitric Acid	50 %	✓	7697-37-2

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 6**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Alpet D2 (UN 1987) CAS No Map: 6	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**110**	**55**	100 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable - Health Serious Eye Damage Eye Irritation	Ethanol Isopropyl alochol	70 % 8 %		64-17-5 67-63-0
	Alpet E2 CAS No	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**110**	**55**	100 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Isopropyl Alcohol 4-chloro-3, 5 xylenol Glycerin Triclosan	7 % 2 % 1 % 1 %		67-63-0 88-04-0 56-81-5 3380-34-5
	Alpet E3 CAS No Map: 6	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**110**	**55**	100 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable	Ethyl alcohol Isopropyl alcohol	71 % 7 %		64-17-5 67-63-0
	Apollo No 327 CAS No	**Gallons** State: Liquid Storage Container: Plastic/Non-metalic Drum Type: Mixture Days on Site: 365	**110**	**55**	100 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Ethoxylated Alcohol Blend	80 %		
	Cling No 153 CAS No Map: 6	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**110**	**55**	100 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Phosphoric Acid C(10-16)-Alkylbenzenesulfonic Acid Polyethylene Glycol Phenyl Ether Phosphate Secondary Alcohol Ethoxylate	35 % 10 % 5 % 5 %		7664-38-2 68584-22-5 39464-70-5 84133-50-6
	Defoamer CAS No Map: 6	**Gallons** State: Liquid Storage Container: Tote Bin Type: Mixture Days on Site: 365	**660**	**330**	595 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Respiratory Skin Sensitization - Health Serious Eye Damage Eye Irritation	Alochols, C6-10, ethoxylated propoxylated Sodium Cumenesulfonate	35 % 10 %		68987-81-5 28348-53-0

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 6**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Detbuild No 394 CAS No Map: 6	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**165**	**55**	150 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Skin Corrosion Irritation - Health Respiratory Skin Sensitization - Health Serious Eye Damage Eye Irritation	Potassium 4-Dodecylbenzene Sulfonate Triethanolamine Dodecylbenzene Sulfonate Triethanolamine	20 % 10 % 5 %		14564-74-0 27323-41-7 102-71-6
	Dictate No 465 CAS No Map: 6	**Gallons** State: Liquid Storage Container: Tote Bin Type: Mixture Days on Site: 365	**275**	**275**	250 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Carcinogenicity - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Propionic Acid Sulfuric Acid Phosphoric Acid Decanoic Acid Pelargonic Acid	10 % 10 % 9 % 3 % 3 %		79-09-4 7664-93-9 7664-38-2 334-48-5 112-05-0
	Enhance 567 CAS No Map: 6	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**55**	**55**	50 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Tetrasodium EDTA Proprietary	40 % 5 %		64-02-8 Proprietary
	Enrich No 299 CAS No Map: 6	**Gallons** State: Liquid Storage Container: Tote Bin Type: Mixture Days on Site: 365	**660**	**330**	595 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Sodium Hydroxide Sodium Hypochlorite Proprietary	10 % 5 % 10 %		1310-73-2 7681-52-9 Proprietary

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**		**Map Location 6**	Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities Max. Daily	Largest Cont.	Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only) Component Name	% Wt	EHS	CAS No.
DOT: 9 - Misc. Hazardous Materials	**Enzyterge No. 400** CAS No Map: 6	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**110**	**55**	100 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Respiratory Skin Sensitization - Health Serious Eye Damage Eye Irritation	Secondary Alcohol Ethoxylate	10 %		84133-50-6
								Triethanolamine Dodecylbenzene Sulfonate	10 %		27323-41-7
								Sodium Formate	5 %		141-53-7
								Protease Enzyme Protein	3 %		9014-01-1
	Grease No. 367 CAS No Mixture	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**110**	**55**	100 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Diethylene Glycol Monobutyl Ether	15 %		112-34-5
								Sodium Xylene Sulfonate	10 %		1300-72-7
								Potassium Hydroxide	5 %		1310-58-3
								Secondary Alcohol Ethoxylate	5 %		84133-50-6
								Potassium Silicate	3 %		1312-76-1
	Hydriflux No. 366 CAS No	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**220**	**55**	200 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Sodium Hydroxide	25 %		1310-73-2
								tetrasodium EDTA	6 %		
	Hydrisoak No 180 CAS No Map: 6	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**55**	**55**	50 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Citric Acid	15 %		77-92-9
								Lactic Acid	15 %		50-21-5
								C(10-16)-Alkylbenzenesulfonic Acid	10 %		68584-22-5
								Sulfuric Acid	0 %		7664-93-9

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	Leprino Foods Company	Chemical Location		CERS ID	10410073
Facility Name	Leprino Foods Company	Map Location 6		Facility ID	FA0002923
	351 North Belle Haven Drive, Lemoore 93245			Status	Draft

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Hydrogen Peroxide 0.34% CAS No 7722-84-1 Map: 6	**Gallons** State: Liquid Storage Container: Steel Drum Type: Pure Days on Site: 365	**110**	**5**	100 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Oxidizer - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Hydrogen Peroxide	34 %		7722-84-1
	Passage 323 CAS No	**Gallons** State: Liquid Storage Container: Tote Bin Type: Mixture Days on Site: 365	**990**	**495**	895 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Oxidizer - Health Acute Toxicity - Health Serious Eye Damage Eye Irritation	Sodium Percarbonate	95 %		15630-89-4
	Perasan A CAS No Map: 6	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**165**	**55**	150 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Oxidizer - Physical Organic Peroxide - Physical Corrosive To Metal - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Hydrogen Peroxide Acetic Acid Peroxyacetic Acid	26 % 4 % 6 %		7722-84-1 64-19-7 79-21-0
	Phosphoric Acid 11 % CAS No Map: 6	**Gallons** State: Liquid Storage Container: Tank Inside Building Type: Pure Days on Site: 365	**55**	**55**	50 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Phosphoric acid	11 %		

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 6**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Reflux No 193 CAS No Map: 6	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**55**	**55**	50 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Nitric Acid Phosphoric Acid	35 % 30 %	✓	7697-37-2 7664-38-2
	Relief CAS No Map: 6	**Gallons** State: Liquid Storage Container: Tote Bin Type: Mixture Days on Site: 365	**275**	**275**	250 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Serious Eye Damage Eye Irritation	D-Glucopyranose, oligomeric, decy octyl glycosides Polylethylene glycol, propoxylated	20 % 5 %		68515-73-1 9003-11-6
	Sodium Hypochlorite CAS No Map: 6	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**300**	**300**	270 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Sodium hypochlorite Sodium hydroxide Water	13 % 3 % 81 %		7681-52-9 1310-73-2 7732-18-5

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	Leprino Foods Company	Chemical Location		CERS ID	10410073
Facility Name	Leprino Foods Company	Map Location 7		Facility ID	FA0002923
	351 North Belle Haven Drive, Lemoore 93245			Status	Draft

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Acetylene Dissolved CAS No	**Cu. Feet** State: Gas Storage Container: Cylinder Type: Days on Site: 365	**250**	**125**	225 Pressue: Temperature:	Waste Code:					
	Alpet E3 CAS No	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**110**	**55**	100 Pressue: Ambient Temperature: Ambient	Waste Code:	- Physical Flammable	Ethyl alcohol Isopropyl alcohol	71 % 7 %		64-17-5 67-63-0
	Argon CAS No 7440-37-1 Map: 7	**Cu. Feet** State: Gas Storage Container: Cylinder Type: Pure Days on Site: 365	**1992**	**249**	1795 Pressue: > Ambient Temperature: Ambient	Waste Code:	- Physical Gas Under Pressure - Health Simple Asphyxiant	Argon	100 %		7440-37-1
	Compressed Gas NOS CAS No Map: 7	**Cu. Feet** State: Gas Storage Container: Cylinder Type: Mixture Days on Site: 365	**1980**	**330**	1785 Pressue: > Ambient Temperature: Ambient	Waste Code:	- Physical Gas Under Pressure - Health Simple Asphyxiant	Carbon Dioxide Helium Argon	50 % 49 % 49 %		124-38-9 7440-59-7 7440-37-1
	Drum PGO FGL 150 CAS No Map: 7	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**275**	**55**	250 Pressue: Ambient Temperature: Ambient	Waste Code:	- Physical Flammable - Health Respiratory Skin Sensitization	Glycols, polyethylenepropylene, monobutyl ether 1H-Benzotriazole-1-methanamine, N, N-bis (2-ethylhexyl)-ar-methyl	45 % 0 %		9038-95-3 94270-86-7
	Drum PGO FGL 220 CAS No Map: 7	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**2090**	**55**	1885 Pressue: Ambient Temperature: Ambient	Waste Code:	- Physical Flammable - Health Respiratory Skin Sensitization	Glycols, polyethylenepropylene, monobutyl ether 1H-Benzotriazole-1-methanamine, N, N-bis (2-ethylhexyl)-ar-methyl	45 % 0 %		9038-95-3 94270-86-7
Flammable Liquid, Class I-A	**Drum SFGO Ultra 100** CAS No	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**5885**	**55**	5300 Pressue: Ambient Temperature: Ambient	Waste Code:	- Physical Flammable - Health Carcinogenicity				
Flammable Liquid, Class I-A	**Drum SFGO Ultra 150** CAS No	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**85**	**55**	80 Pressue: Ambient Temperature: Ambient	Waste Code:	- Physical Flammable - Health Carcinogenicity				

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 7**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
Flammable Liquid, Class I-A	**Drum SFGO Ultra 220** CAS No	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**1045**	**55**	945 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable - Health Carcinogenicity				
Flammable Liquid, Class I-A	**Drum SFGO Ultra 320** CAS No	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**1100**	**55**	990 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable - Health Carcinogenicity				
Flammable Liquid, Class I-A	**Drum SFGO Ultra 46** CAS No	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**7040**	**55**	6340 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable - Health Carcinogenicity				
Flammable Liquid, Class I-A	**Drum SFGO Ultra 460** CAS No	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**1155**	**55**	1040 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable - Health Carcinogenicity				
Flammable Liquid, Class I-A	**Drum SGFO Ultra 68** CAS No	**Gallons** State: Liquid Storage Container: Steel Drum Type: Mixture Days on Site: 365	**6050**	**55**	5445 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable - Health Carcinogenicity				
	FMO-1100-AW CAS No 8042-47-5 Map: 7	**Gallons** State: Liquid Storage Container: Steel Drum Type: Pure Days on Site: 365	**55**	**55**	50 Pressue: Ambient Temperature: Ambient	Waste Code		White mineral oil (petroleum)	90 %		8042-47-5
	FMO-150-AW-ISO CAS No 8042-47-5 Map: 7	**Gallons** State: Liquid Storage Container: Steel Drum Type: Pure Days on Site: 365	**4125**	**55**	3715 Pressue: Ambient Temperature: Ambient	Waste Code		White mineral oil (petroleum)	90 %		8042-47-5
	FMO-1700-AW CAS No 8042-47-5 Map: 7	**Gallons** State: Liquid Storage Container: Steel Drum Type: Pure Days on Site: 365	**935**	**55**	845 Pressue: Ambient Temperature: Ambient	Waste Code		White mineral oil (petroleum)	90 %		8042-47-5

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	Leprino Foods Company	Chemical Location		CERS ID	10410073
Facility Name	Leprino Foods Company	Map Location 7		Facility ID	FA0002923
	351 North Belle Haven Drive, Lemoore 93245			Status	Draft

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities Max. Daily	Quantities Largest Cont.	Quantities Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only) Component Name	% Wt	EHS	CAS No.
	FMO-350-AW CAS No 8042-47-5 Map: 7	**Gallons** State: Liquid Storage Container: Steel Drum Type: Pure Days on Site: 365	**440**	**55**	400 Pressue: Ambient Temperature: Ambient	Waste Code		White mineral oil (petroleum)	90 %		8042-47-5
	FMO-500-AW CAS No 8042-47-5 Map: 7	**Gallons** State: Liquid Storage Container: Steel Drum Type: Pure Days on Site: 365	**1100**	**55**	990 Pressue: Ambient Temperature: Ambient	Waste Code		White mineral oil (petroleum)	90 %		8042-47-5
	Helium CAS No 7440-59-7 Map: 7	**Cu. Feet** State: Gas Storage Container: Cylinder Type: Pure Days on Site: 365	**990**	**330**	895 Pressue: > Ambient Temperature: Ambient	Waste Code	- Physical Gas Under Pressure - Health Simple Asphyxiant	Helium	100 %		7440-59-7
	Mobil Vacuoline 537 CAS No Map: 7	**Gallons** State: Liquid Storage Container: Steel Drum Type: Days on Site: 365	**75**	**5**	70 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Flammable	2-PENTANOL, 4-METHYL-, HYDROGEN PHOSPHORODITHIOATE, ZINC SALT NAPHTHALENESULFONIC ACID, DINONYL-, CALCIUM SALT	1 % 1 %		2215-35-2 57855-77-3
	Nitrogen CAS No 7727-37-9 Map: 7	**Cu. Feet** State: Gas Storage Container: Cylinder Type: Pure Days on Site: 365	**990**	**330**	895 Pressue: > Ambient Temperature: Ambient	Waste Code	- Physical Gas Under Pressure - Health Simple Asphyxiant	Nitrogen	100 %		7727-37-9
	Oxygen CAS No 7782-44-7 Map: 7	**Cu. Feet** State: Gas Storage Container: Cylinder Type: Pure Days on Site: 365	**990**	**330**	895 Pressue: > Ambient Temperature: Ambient	Waste Code	- Physical Flammable - Physical Gas Under Pressure - Physical Oxidizer	Oxygen	100 %		7782-44-7

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 8**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	CD 23 CAS No 7681-52-9 Map: 8	**Gallons** State: Liquid Type: Pure	**220** Storage Container: Plastic/Non-metalic Drum Days on Site: 365	**55**	200 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Sodium hypochlorite	15 %		7681-52-9
	CD 24 CAS No 7664-93-9 Map: 8	**Gallons** State: Liquid Type: Pure	**400** Storage Container: Tote Bin Days on Site: 365	**400**	360 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Carcinogenicity - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Sulfuric Acid	21 %		7664-93-9
	CL 25 CAS No Map: 8	**Gallons** State: Liquid Type: Mixture	**700** Storage Container: Tote Bin Days on Site: 365	**400**	630 Pressue: Ambient Temperature: Ambient	Waste Code	- Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation - Health Specific Target Organ Toxicity	Sodium chlorite Sodium chloride	35 % 5 %		7758-19-2 7647-14-5
	Liquid CO2 CAS No Map: 8	**Gallons** State: Liquid Type: Pure	**60000** Storage Container: Aboveground Tank Days on Site: 365	**60000**	54000 Pressue: Ambient Temperature: < Ambient	Waste Code	- Physical Hazard Not Otherwise Classified - Health Simple Asphyxiant				
	Liquid N2 CAS No 7727-37-9 Map: 8	**Gallons** State: Liquid Type: Pure	**13000** Storage Container: Aboveground Tank Days on Site: 365	**13000**	11700 Pressue: > Ambient Temperature: Cryogenic	Waste Code	- Physical Gas Under Pressure - Health Skin Corrosion Irritation - Health Simple Asphyxiant	Nitrogen, Refrigerated Liquid	100 %		7727-37-9

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 8**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

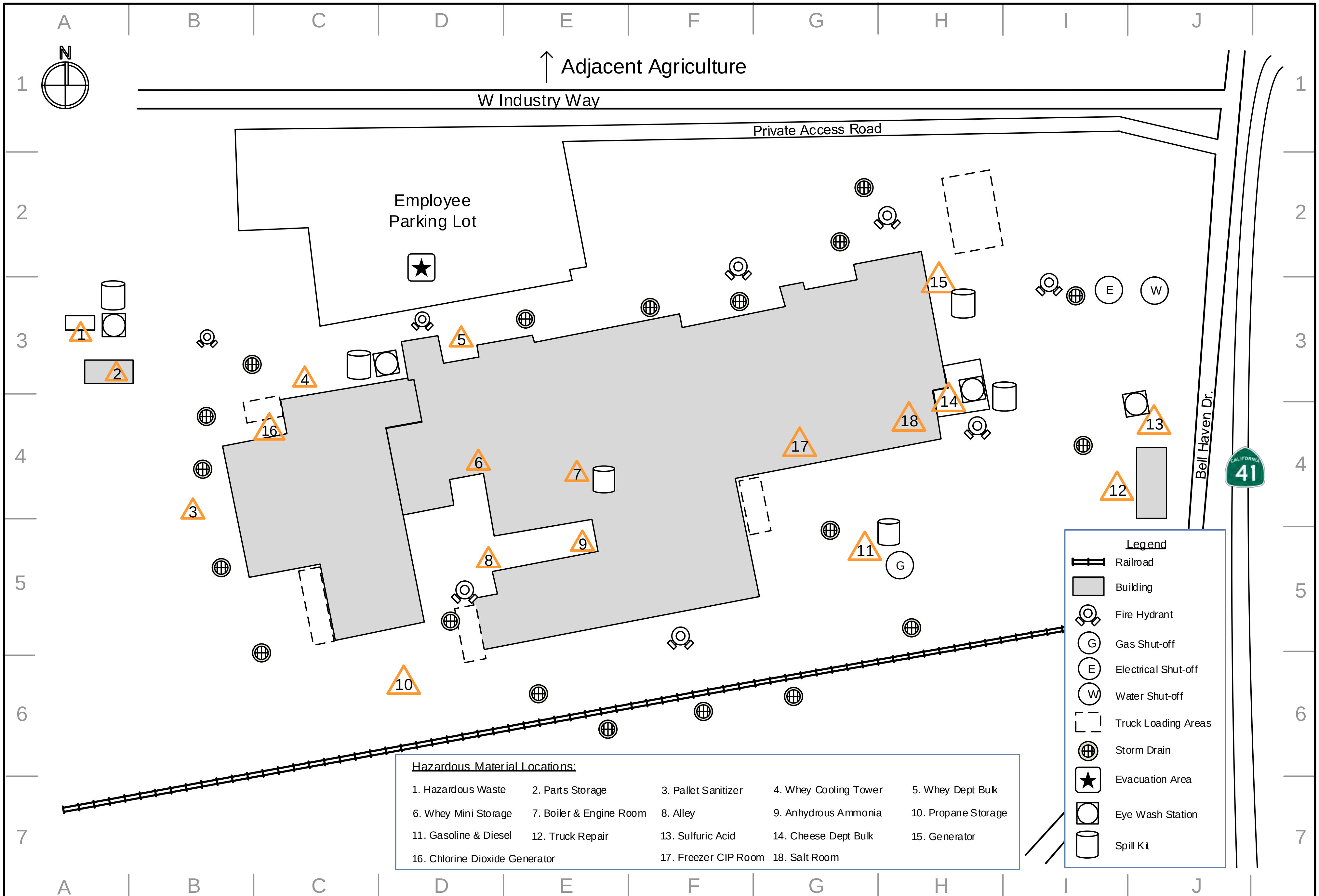
DOT Code/Fire Haz. Class	Common Name	Unit	Quantities Max. Daily	Largest Cont.	Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only) Component Name	% Wt	EHS	CAS No.
	Phosphoric Acid 75% CAS No 7664-38-2 Map: 8	**Gallons** State: Liquid Type: Pure	**300** Storage Container: Tote Bin Days on Site: 365	**300**	270 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Phosphoric acid	75 %		7664-38-2
	Sodium Hypochlorite CAS No Map: 6	**Gallons** State: Liquid Type: Mixture	**660** Storage Container: Steel Drum, Tote Bin Days on Site: 365	**300**	595 Pressue: Ambient Temperature: Ambient	Waste Code	- Physical Corrosive To Metal - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Sodium hypochlorite Sodium hydroxide Water	13 % 3 % 81 %		7681-52-9 1310-73-2 7732-18-5

Hazardous Materials And Wastes Inventory Matrix Report

CERS Business/Org.	**Leprino Foods Company**	Chemical Location		CERS ID	**10410073**
Facility Name	**Leprino Foods Company**	**Map Location 9**		Facility ID	**FA0002923**
	351 North Belle Haven Drive, Lemoore 93245			Status	**Draft**

DOT Code/Fire Haz. Class	Common Name	Unit	Quantities: Max. Daily	Quantities: Largest Cont.	Quantities: Avg. Daily	Annual Waste Amount	Federal Hazard Categories	Hazardous Components (For mixture only): Component Name	% Wt	EHS	CAS No.
	Anhydrous Ammonia CAS No ✓EHS 7664-41-7 Map: 9	**Pounds** State Gas Type Pure	**238000** Storage Container Aboveground Tank Days on Site: 365	**238000**	214200 Pressue > Ambient Temperature Ambient	Waste Code	- Physical Flammable - Physical Gas Under Pressure - Health Acute Toxicity - Health Skin Corrosion Irritation - Health Serious Eye Damage Eye Irritation	Anhydrous Ammonia	100 %	✓	7664-41-7

3. FACILITY SITE MAP



Prepared By: Trinity Consultants

Prepared For: Leprino Foods

Leprino Foods
351 N. Belle Haven Dr.
Lemoore, CA 93245

Description: Facility Site Map

Scale: 1"=~115'

Rev Date	Revision Notes
2/25/19	Trinity developed site map for 2019 HMBP
2/26/21	Trinity updated site map for 2021 HMBP
2/10/22	Trinity updated site map for 2022 HMBP

4. EMERGENCY RESPONSE / CONTINGENCY PLAN

Emergency Preparedness
And
Response Plan (EPRP) 2017

Leprino Foods Company
Lemoore, CA Facility

Prepared for:

Leprino Foods Company
351 N. Belle Haven Drive
Lemoore, CA 93245

Document Prepared by:

Chad Billingsley, Safety Supervisor

Created: 11/1/08

Revision: #11

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1.0. INTRODUCTION

1.1 Purpose and Scope

This Emergency Preparedness and Response Plan (EPRP) for the Leprino Foods Lemoore, CA Facility is intended to satisfy the emergency response requirements under the following federal and state laws:

US OSHA Process Safety Management [29 CFR §1910.119(n)],

US EPA Accidental Release Prevention (40 CFR §§68.90-68.95),

US OSHA Emergency Action Plan (29 CFR §1910.38), and

US OSHA HAZWOPER [29 CFR §1910.120(a)].

In addition to federal regulatory requirements, the Plan is consistent with Leprino Foods' HUM4900, a business policy for the creation of an Employee Emergency Plan.

The plan is intended to provide guidance for the quick and safe handling or response when addressing a hazardous materials release or other emergencies that may threaten workers, the community, and the environment. In support of the EPRP, this document provides several shut down plans for key areas in the facility; basic guidelines for emergency response training and a basic plan for continued improvement in the process for the future.

In addition to meeting regulatory requirements, the EPRP was organized to be utilized as one of many training resources for Leprino employees, upon whom rests the responsibility for making immediate and informed actions to minimize and mitigate an incident. Leprino has designated and trained personnel to assist in the safe and orderly emergency evacuation of employees. It is Leprino's policy to review the EPRP with all employees on the following schedule:

- When the employee is first hired
- Whenever the employee's responsibilities or designated actions under the plan change
- Annually; and
- Whenever the plan is changed.

Documentation of each employee's review will be made and kept in their training file. Refer to Section 6.1 Training for further information and related forms on documentation.

1.2 Statement of Policy

It is the policy of the Leprino Foods facility management to implement the requirements of this EPRP by managing and operating the facility in accordance with applicable regulations and general good engineering practices. The objective is to minimize the risk of a fire, an accidental hazardous material release, including anhydrous Ammonia, or other facility emergencies.

Leprino Foods personnel are expected to cooperate with fellow employees and other support personnel as directed by the on-scene or other designated Incident Commander to assure successful resolution of any emergency.

While the information contained in this document is provided for the use of Leprino Foods' personnel during a chemical release or other emergency, it is not the intent of Leprino Foods to limit decisions made by qualified persons at the time of the incident or release. A shut-down of an area may not be necessary to mitigate a chemical release.

1.3 EPRP Revisions Log

Responsibility for updating the plan and who may be contacted for further information or explanation of duties under the plan lies with the facilities Safety Supervisor who is the Program Administrator. The Emergency Preparedness and Response Plan (EPRP) Program Administrator will initiate all changes and will ensure that copies of the changed pages are distributed to all individuals and agencies in possession of the EPRP, listed in Section 1.4, documentation utilizing the *Controlled Document Distribution & Acknowledgement Receipt Log* (Appendix A). As noted below, the Program Administrator will maintain the electronic archives and control copy of the plan. The Program Administrator initiating a revision will record the pages changed on the *Controlled Document Log* (Appendix B) on the inside cover of the control EPRP. The sections will be updated by the Program Administrator and a new cover sheet will be inserted to reflect the changes.

1.4 Distribution List

A current copy of the EPRP will be maintained at the following locations. The uncontrolled copies will be updated by the Program Administrator.

#1 - Safety Supervisor / *Program Administrator* (CONTROL COPY)
#2 - Plant Managers
#3 - HazMat Trailer
#4 - Lemoore Fire Department (Updated yearly)
#5 - Kings County LEPC (Updated yearly)
#6 - Kings County Fire Department (Updated yearly)
#7 - CERS

1.5 Availability of the EPRP to Employees

This Emergency Preparedness and Response Plan is available for review by full and part-time employees of Leprino Foods as well as contractors and visitors performing work on or around the Ammonia refrigeration system. This is accomplished by contacting the immediate supervisor (full and part-time employees) or designated facility contacts (contractors and visitors). A sign is posted on the employee bulletin board advising all employees where to obtain access to the Leprino Foods, Lemoore EPRP (Appendix C).

1.6 Description of the Lemoore Operation

The Leprino Foods facility is primarily engaged in the manufacture of cheese and whey products. LFC meets USDA/FDA requirements for processing and staging of Grade A dairy products. LFC utilizes Ammonia refrigeration to achieve process cooling and HVAC cooling of the plant.

1.7 Facility Description and Identification

Facility Name:

Leprino Foods Company
351 N. Belle Haven
Lemoore, CA 93245
(559) 925-7300

Owner:

Leprino Foods Company
1830 West 38th Avenue
PO Box 173400
Denver, CO 80217-3400
(303)480-2600

Coordinates:

Latitude: 36° 20’ 58.2” N.
Longitude: -119° 49’ 27.0” W

Correspondence Contact:

Safety Supervisor / Program Administrator

EPA ID:

#CAL00279534

SIC Code:

2022, Natural, Processed, and Imitation Cheese
2023, Whey processing & packaging

NAICS Code:

311513, Cheese Manufacturing
311514, Whey processing & packaging

Hours of Operation:

24 hours per day, 7 days per week

Startup Date:

July 7, 2002

Dun & Bradstreet

102142804

1.8 Release Reporting Requirements

A separate (but related) issue from an incident's potential threat to the safety and health of workers, the community, and the environment is whether the release exceeds federal and state reporting requirements. Immediate reporting to Kings County, National Response Center and Cal OES is required where a significant release or threat of a significant release results or could result (not to supersede California regulation which states you must report any release or a potential release and local UPA requirements). Failure to make timely (immediate) notifications under these statutes is a felony and punishable with jail time and/or significant fines. At the Leprino Foods Lemoore West Facility, it is the Incident Commander's responsibility to make the necessary immediate reporting and notification.

Anhydrous Ammonia is designated by the EPA as an Extremely Hazardous Substance. Due to the classification and quantity of Ammonia kept on site, specific response requirements must be met. Various other bulk chemicals & cleansing agents are stored and used throughout the facility, as noted on Table 1-1. Information regarding health hazards, first aid or spill / leak procedures, CERCLA reportable discharges & SARA Title III hazard classifications, should be referred to the SDS report for each specific chemical. Appendix D gives direction on *how to access Safety Data Sheets (SDS) through our 3E system*, which contains information concerning the characteristics of hazardous chemicals that are present onsite.

The chemicals listed in Table 1-1 reference RQ's (Reporting Quantities) for chemicals typically found in the Leprino Foods – Lemoore facility. Additional RQ's are found in the EPA List of Lists; see Appendix O:

TABLE 1-1: REPORTABLE RELEASE QUANTITIES

Chemical Name	Reportable Release Quantity (RQ)
Anhydrous Ammonia	**100 #**
Surge No. 407 (Conquest)	1,000#
AC-1351	1,000#
Hydraulic Oil	Any Amount in water
Diesel Fuel	Any Amount in water
Lubricating Oil	Any Amount in water
KOH	See Potassium Hydroxide
Ultra LFA No.176 (AC-55-5)	See Nitric Acid (30-60%)
Nitric Acid	1,000#
Phosphoric Acid	5,000#
Potassium Hydroxide	1,000#
Propionic Acid	5,000#
Sodium Hydroxide	1,000#
Sodium Hypochlorite	100#
Sulfuric Acid	1000#

Bulk Chemicals

Caustics	Tank Size	#of Tanks	Departments
Sodium Hypochlorite - 12.5	3,100 gal	2	Cheese, Waste Treatment
Sodium Hypochlorite - 12.5	6,500 gal	1	Whey
Calcium Chloride - 37%	9,100 gal	1	Cheese
KOH (Potassium Hydroxide - 10%)	6,500 gal	1	Whey
Surge No. 407 (sodium hydroxide 30%)	12,500 gal	1	Whey
Surge No. 407 (sodium hydroxide 30%)	12,100 gal	1	Cheese
Chelated Caustic (sodium hydroxide 55%)	6,500 gal	1	Whey
Sodium Hydroxide 50%	10,200 gal	1	Whey (MWPC)

Acids	Tank Size	#of Tanks	Departments
Phosphoric Acid - 35%	12,100 gal	1	Cheese
Phosphoric Acid - 75 %	6,500 gal	1	Whey
Ultra LFA No. 176 (nitric acid 38%)	12,500 gal	1	Whey
Ultra LFA No. 176 (nitric acid 38%)	9,200 gal	1	Cheese
Hydrochloric Acid 35%	10,200 gal	1	Whey (MWPC)
Sulfuric Acid 93%	5,000 gal	1	Waste Treatment

Gases	Tank Size	#of Tanks	Location
Propane	30,000 gal	2	Outside - South Location
Gasoline	300 gal	1	Outside - South Location
Diesel	500 gal	1	Outside - South Location

Anhydrous Ammonia	Tank Size	#of Tanks	System
Anhydrous Ammonia (Total System -189,000)	30,000 gal.	1	Main Receiver Tank

1.9 Description of Surrounding Area

The Leprino facility is located in a rural area incorporated by the City of Lemoore as an industrial park. The area surrounding the LFC plant is zoned commercial, light industrial and residential. For more information about specific businesses, schools, hospitals, residences, and other establishments close to the plant, see Section 2.3. For maps of the surrounding community, and a plot plan of the facility.

Refer to Table 1-2 for more information about specific schools, hospitals, convalescent homes, churches, medical facilities and day care centers within the 5.6-mile distance from the plant (distance determined by RMP "worst case" Consequence Analysis). This area has been defined based upon our worst-case scenario, which would be a complete release of our high-pressure receiver. The alternate scenario, deemed to be more likely, would be a result of a valve failure while conducting oil pot draining or severe damage to the oil pot itself.

The distance to end point on the alternate scenario is 0.3 miles (distance determined by RMP "alternate case" Consequence Analysis), which does affect any public receptors, as you can see listed in Table 1-2. All locations in Table 1-2 have a mailing address of Lemoore CA 93245.. For a specific map of the surrounding community, and a plot plan of the facility, please refer to Appendix E.

TABLE 1-2: SENSITIVE PUBLIC RECEPTORS NEAR THE LEMOORE FACILITY

Receptor Categories	**WCS**	**ACS**
Residences	X	X
Schools (in order of proximately):	X	
Lemoore Union High School District Middle School / 555 College Dr / (559) 925-3552 / 0.7 miles Bridges Academy / 1200 W Cinnamon Dr / (559) 924-6800 / 0.7 miles Lemoore University Elementary Charter / 450 Marsh dr. / (559) 924-6890 / 0.9 miles P. W. Engvall Elementary / 19TH And Cedar / (559) 924-6850 / 1.1 miles Liberty Middle / 1000 Liberty Dr / (559) 924-6860 / 1.4 miles Lemoore Elementary School District / 100 Vine St / (559) 924-6800 / 1.5 miles Lemoore Elementary School / 573 W Bush St / (559) 924-6820 / 1.5 miles Kings Community Action Organization / 573 W Bush St / (559) 925-1792 / 1.5 miles TLC Learning Center / 119 Heinlen St / (559) 924-0852 / 1.7 miles The Lemoore Preschool / 118 Heinlen St / (559) 924-7336 / 1.8 miles Lemoore Union High School Dist. / 101 E Bush St / (559) 924-6633 / 2 miles Donald Jamison High School / 101 E Bush St / (559) 924-6620 / 2 miles Mary Immaculate Queen School / 884 N Lemoore Ave / (559) 924-3424 / 2.1 miles Gertrude F Gundacker Ctr / 351 E Bush St / (559) 924-6610 / 2.2 miles Kcao Generation Center / 1075 Blake St / (559) 925-1502 / 2.3 miles Cinnamon Elementary / 500 E Cinnamon Dr / (559) 924-6870 / 2.3 miles Meadow Lane Elementary / MEADOW Lane And Quandt / (559) 924-6840 / 2.4 miles Kings Christian School / 900 E D St / (559) 924-8301 / 2.7 miles Pioneer Union Elementary / 1888 Mustang Dr (Lemoore NAS) (559) 585-2400 / 4.0 Miles		

Frontier Elementary/ 1854 Mustang Dr (Lemoore NAS) / (559) 585-2430 / 4.0 Miles Island Union Elementary / 7799 21st Ave / (559) 924-6424 / 4.3 miles Central Union School District / 15783 18th Ave / (559) 924-7797 / 4.4 miles Neutra Elementary School / COMMUNITY Center Drive (NAS Lemoore) (559) 998-6823 4.7 miles Tachi-Yokuts Early Education Center / 16125 Alkali Dr / (559) 924-8656 / 5.3 miles		
Colleges (including campus housing, sports fields) (in order of proximately):	X	
Lemoore Middle College High / 555 College Dr / (559) 925-3552 / 0.7 miles Embry-Riddle Aeronautical University / 834 Hancock Circle # 103 / (559) 998-6026 / 1.9 miles Columbia College 826 Hancock Cir (NAS Lemoore) / (559) 998-8570 / 5.3 miles Brandman University Hancock Cir Ste 101 Bldg 824 (NAS Lemoore) / (559) 998-6891 / 5.5 miles		
Child/Day Care Centers (in order of proximately):	X	
Lil' Wonders Family Child Care / 1432 Atlantic Ave. / 559-925-1446 / 0.8 miles Precious Moments Daycare / 1228 Acacia Ct. / 925-924-3050 / 0.9 miles Learning Steps Childcare / 1302 Stinson / (559) 380-8621 / 1.3 miles Carrie's Childcare Connection / 255 Vine St./ 559-924-6202 / 1.5 miles Kings Community Action Organization / 573 W. Bush St. / 559-925-1792 / 1.5 miles Kids First Cce / 312 W. D St. / 559-925-1437 / 1.7 miles TLC Leaning Center / 119 Heinlen St. / 559-924-0852 / 1.7 miles The Lemoore Preschool (3) / 118 Heinlen St. / 559-924-7336 / 1.8 miles Big Brothers Big Sisters / 124 C St. / 559-268-2447 / 1.9 miles Kings Community Action Org Inc / 101 E Bush st. / 559-924-6633 / 2.0 miles Creating Curiosity Child Care / 170 Club dr. apt B / 559-709-3312 / 2.2 miles Kcao Generation Center / 1075 Blake St. / 559-925-1502 2.2 miles Total Child Care / 501 E Bush st. / 559-924-8025 / 2.4 miles Tachi-Yokuts Early Education Center / 16125 Alkali Dr. / 559-924-8656 / 5.3 miles Sitter on the Move / 2501A Talon / 559-997-0498 / 5.4 miles		

Churches	X	
Long-term Healthcare / Rehabilitation Facilities / Assisted Living Centers	X	
Always Best Care Fresno / 329 Heinlen St. / 559-924-9998 Lemoore Adult Day Center / 1075 Blake St. / 559-924-4419		
Senior Centers / Recreational Areas (in order of proximately):	X	
Recreation Department / 435 C St. / 559-925-6767 Lemoore Senior Center / 789 S Lemoore Ave. / 559-924-9737 The Community Center / 54 W Bush St. / 559-924-2500 Santa Rosa Rancheria / 16445 17th Ave. / 559-924-2500		
Commercial and Retail Establishments	X	
Professional Offices and Buildings	X	
Industrial Areas	X	
Airport	X	
US Naval Air Station / 700 Avenger Ave. / 559-998-0100 Vineyard Oaks Farm Arport-Cn15 / 7380 18th Ave. / 559-779-4600		
Prison / Correctional Facilities		
Neighborhood Parks		

2.0 EMERGENCY RESPONSE ORGANIZATION

2.1 Personnel Roles

The facility personnel are assigned specific responsibilities to prevent and/or respond to an accidental release of hazardous materials based on their level of training and available emergency response equipment. This will include as a minimum:

- Plant Technical Director – Responsible to participate as a trained Incident Commander, leading the Emergency Response Team of HAZMAT Technicians and local Emergency Responders in the event of a response, or as trained to participate. Most often this person will fill the roll of technical expert.
- Maintenance Manager – Responsible to participate as a backup to the most senior trained Incident Commander in the event of a response, or as trained.
- Emergency Response Team – Responsible to participate as a trained HAZMAT Technician to respond and contain any on-site minor or major hazardous material release.
- Safety Supervisor / Program Administrator - Responsible for updating and reviewing this document to reflect changes at the facility and/or in the emergency response procedures to ensure that employees are informed of the current procedures. Also trained to participate as Incident Commander in the event of a response and responsible for training and development of the Emergency Response Team.
- Assigned Department Supervisors – Responsible for evacuation of departments and accountability of department employees.

2.2 Lines of Authority

There is more than one trained Incident Commander (IC) at this facility site. The first IC on site will immediately assume control of the situation and remain in control until the situation has been made safe or if relieved by a more senior IC. Any time an IC relinquishes control to a more senior IC, the first IC will remain on site through the incident for assistance in pass down information or to assist in another support roles.

2.3 Incident Command System

The overall program will utilize a comprehensive approach to incident management by the implementation of an Incident Command System (ICS). The ICS techniques will be used in emergency response fields regardless of the incident type or size. The ICS is an organization framework for an incident chain of command. Leprino Foods will have its own pre-established flexible chain of command with an Incident Commander defined to execute overall responsibilities.

Field responders, as appropriate, can include police officers, fire fighters, Leprino Foods employees, contractors, etc.

All responders will report to the Incident Commander, with additional reporting to the Safety. Responsibilities are delegated by the IC who is the overall authority for the incident. ICS will involve five functions: command, operation, planning, logistics, and finance.
Functions will include:

- Planning
- Gathering and analyzing information
- Evaluating and revising the response plan
- Logistics (provides support needs including food, shelter, first aid, communications, and recovery)

All functions are not required for each incident, but will be dependent on the extent of real or potential damage. The Incident Command System, however, will be activated in every case. The IC can designate specific roles and/or functions for individuals or retain some for his/her self. *Pre-Entry Checklists* for the specific roles of the ICS are available in Appendix F. The roles include:

- **Incident Commander**
- **Medical**
- **Decon**
- **Responders**
- **Operations**
- **Safety**
- **Scribe**
- **Staging**
- **Security**
- **Liaison**
- **Plans**
- **Public Information Officer**
- **Finance**
- **Logistics**

In each incident, the IC continually evaluates the action plan and makes adjustments as new information becomes available or as the situation changes.

Under no circumstances should the designated IC undertake response activities to a spill or release of a hazardous substance unless they have received Incident Commander training.

A current list of the personnel trained as Incident Commander is maintained by the Safety Supervisor. TABLE 2-1 contains the Plant Management Emergency Contacts and lists trained Incident Commanders. TABLE 2-1 is updated in this program once per quarter by the Program Administrator. In addition we keep a HAZMAT specific phone list to be used for making emergency contacts. (see TABLE 2-2

TABLE 2-1: TRAINED HAZMAT TEAM AND JOB FUNCTION

	Hazmat Team	24hr Initial Training Date	Medical Clearance	Shift
1st Shift				
1	Brian Cornelius	9/8/2011	Level A	1st
2	Bruce Jones	6/30/2005	Level A	1st
3	Carlos Guiterrez	10/20/2015	Level B	1st
4	Cesar Arboleda	9/17/2009	Level D	1st
5	Chris Aguilar	8/21/2002	Level A	1st
6	Jacob German	8/29/2014	Level A	1st
7	Joey Boyer	10/22/2008	Level A	1st
8	Joe Ochoa	6/16/2016	Level A	1st/3rd
9	Ryan Yocum	4/28/2016	Level A	1st
10	Rolando Salvo	4/13/2005	Level A	1st
11	Rudy Ramirez	12/10/2009	Level A	1st
12	Salvador Sandoval	9/3/2009	Level A	1st
13	Stephen Chism	10/19/2015	Level A	1st
14	Thomas Chism	4/28/2016	Level A	1st
15	Yolanda Sanchez	8/29/2014	Level A	1st
16	Rick Parks	9/17/2009	Level A	1st
17	Joe Brown	12/29/2010	Level A	1st
18	Nathan Currie	12/29/2010	Level A	1st
19	Wes Nelson	8/5/2003	Level A	1st
20	Benjamin Fisher-Sosa			1st
2nd Shift				
1	Aaron Chavez	4/28/2016	Level A	2nd
2	Alejandro Osuna	8/29/2014	Level A	2nd
3	Brandon Owens	10/19/2015	Level D	2nd
4	Doug Harrison	4/28/2016	Level A	2nd
5	Caleb Patrick	9/03/2009	Level A	2nd
6	Chad Ornelles	10/20/2015	Level D	2nd
7	Jose Lomeli	4/28/2016	Level A	2nd
8	Kenneth Willhite	10/19/2015	Level A	2nd
9	Randy Alexander	9/08/2011	Level A	2nd
10	Steve Pursch	9/08/2011	Level A	2nd
11	Rolando Rivas	4/28/2016	Level A	2nd
12	Uriel Solis	9/03/2009	Level A	2nd
3rd Shift				
1	Adolfo Medina	8/29/2014	Level A	3rd
2	Bernadino Torres	4/28/2016	Level A	3rd
3	Brian Lopez	10/19/2015	Level A	3rd
4	Ryan Bass	8/29/14	Level C	3rd
5	Chris Dominguez	10/19/2015	Level A	3rd
6	Gavorg Gharibian	10/20/2015	Level A	3rd
7	Gregg Fogg	4/28/2016	Level A	3rd
8	Jose Campos	4/28/2016	Level A	3rd
9	Luis Sanchez	4/28/2016	Level A	1st/3rd
10	Tim Batista	11/17/	Level A	3rd
Incident Commanders				
1	Anthony Perez	8/21/2002	Level A	IC
2	Chad Billingsley	7/9/2009	Level A	IC
3	Colin Wright	10/19/2015	Level A	IC
4	Dan Williamson	10/19/2015	Level B	IC

5	Dave Heinks	9/12/2006	Level D	IC
6	Gregg McCoy	9/17/2009	Level A	IC
7	Mike Farrar	9/12/2006	Level A	IC
8	Peter Davidson	9/17/2013	Level B	IC
9	Tom Robinson	12/10/2009	Level A	IC

TABLE 2-2: HAZMAT RESPONDER PHONE LIST

AGENCY	PHONE #	
(WITHIN 15 MINUTES)		
NATIONAL RESPONSE CENTER (NRC)	800-424-8802	
GOVERNORS OFFICE OF EMERGENCY SERVICES	800-852-7550	
KINGS COUNTY LOCAL EMERGENCY PLANNING COMMITTEE (LEPC)	559-584-1411	
CORPORATE CONTACT	**PHONE #**	
	303-547-6974	
DIRECTOR OF MAINTENANCE - NIKOLAUS DESPAIN	303-617-0604	
SAFETY MANAGER - JOHN FORRESTER	303-908-5801	
DIRECTOR OF SAFETY - STEVE SCHMIDT	303-483-3864	
ASSISTANT COUNSEL - ON CALL	303-530-4823	
CORPORATE PUBLIC RELATIONS	720-550-3751	
LEPRINO WEST CONTACT	**PHONE #**	**LOCATION**
TECHNICAL DIRECTOR - DAN WILLIAMSON	559-997-9082	VISALIA
ENGINEERING MANAGER - PETER DAVIDSON	559-772-9241	ARMONA
PLANT ENGINEER - MANNY EGBUNA	224-629-3810	LEMOORE
SR. SAFETY SUPERVIOSR - DAVID HEINKS	559-904-5202	VISALIA
SAFETY SUPERVIOSR - CHAD BILLINGSLEY	559-381-2193	LEMOORE
UTILITIES PLANNER - THOMAS ROBINSON	559-423-3072	LEMOORE
PSM COORDINATOR - YOLANDA SANCHEZ	559-697-9394	HANFORD
POWER TECH - CHRIS AGUILAR	559-410-6560	HANFORD
POWER TECH - WESLEY NELSON	559-381-3214	HANFORD
POWER TECH - BRIAN CORNELIUS	757-572-4721	LEMOORE
POWER TECH - RYAN YOCUM	559-772-7826	LEMOORE
POWER TECH - RUDY RAMIREZ	559-930-6041	KINGSBURG
POWER TECH - RANDY ALEXANDER	559-309-2349	HANFORD
POWER TECH - STEVE PURSCH	559-972-5480	TULARE
POWER TECH - AARON CHAVEZ	559-410-8081	LEMOORE
POWER TECH - ROLANDO RIVAS	559-381-4085	TIPTON
POWER TECH - ADOLFO MEDINA	559-679-5118	VISALIA
POWER TECH - CHRIS DOMINGUEZ	559-741-5069	TULARE
POWER TECH - BRIAN LOPEZ	559-904-5202	LEMOORE
POWER TECH - JOSE CAMPOS	559-288-1807	FRESNO
CENTRAL SERVICES - COLIN WRIGHT	559-998-9838	LEMOORE
MAINT SUPERVISOR - ROLANDO SALVO	559-816-5528	LEMOORE
WHEY MAINT MANAGER - ANTHONY PEREZ	559-997-9027	LEMOORE
CHEESE MAINT MANAGER - GREGG MCCOY	559-309-7470	VISALIA
MAINT SUPERVISOR - NATHAN CURRIE	801-809-4406	LEMOORE
MAINT SUPERVISOR - JACOB GERMAN	559-355-0511	FRESNO
PROC MAINT MANAGER - MIKE FARRAR	559-362-7649	LEMOORE

3.0. EMERGENCY RESPONSE PROCEDURES

The first steps taken in an emergency are often the most important in safely mitigating an emergency. It cannot be assumed that everyone in a plant can or will remember every step to be taken in each and every emergency. Therefore, it is important that this plan be used as a tool when working to control an emergency situation. The following plan outlines specific protocols that must be followed to effectively mitigate such emergencies as hazardous chemical release of anhydrous Ammonia, Section 3.2 or other Hazardous Substances, Section 3.5.

3.1 Response Management System

Incident Commander

Under no circumstances should the designated IC undertake response activities to a spill or release of a hazardous substance unless they have received Incident Commander training. In such cases when training has not been completed, action is limited to notification and area evacuation.

All emergencies require prompt and deliberate action. In the event of any major emergency, it will be necessary to follow an established set of procedures. Such established procedures should be followed as closely as possible. However, in specific emergency situations, the IC may deviate from the procedures to provide a more effective plan for bringing the situation under control.

The IC or designated Scribe must initiate and maintain a "log" of events during an emergency. Refer to the forms with the *Incident Commander's Checklist / Hazardous Materials Release Information Sheet* (Appendix G). The IC or Scribe completes these forms in order to record the sequence of events for each incident in which the EPRP is implemented and for each drill involving the ERT. The following information should be included:

Refer to Section 5.0 for formal reporting and notification requirements of any release exceeding CERCLA threshold quantities, in a twenty-four (24) hour period (required by the Environmental Protection Agency – EPA). NOTE: This notification must be made as soon as possible (e.g., within fifteen (15) minutes) after the initial detection of the release. A *possible script* to use for the notification is available in Appendix G.

The Incident Log is one of several forms available in the section of the Incident Commander's Checklist that can be found in Appendix G. These forms are used as a reminder for the Incident Commander and includes the following:

- General size up of situation and actions to be taken
- Post operations & Clean up
- Log of emergency responders & Detector readings

After assessing the initial information regarding the extent of the emergency, the IC will make a determination as to the need to mobilize the ERT.

Emergency Response (ER) Team

Under no circumstances should the designated Responder undertake response activities to a spill or release of a hazardous substance unless they have received HAZMAT Technician training. In such cases when training has not been completed, action is limited to notification and area evacuation.

Upon notification of an emergency, the ER Team members will report immediately to the IC. The ER Team will follow the direction of the IC in responding to the emergency.

After a briefing and discussion with the IC, members of the ER Team will be dispatched to the scene of the incident. ER Team members are trained & authorized to enter an area contaminated with Ammonia liquid or vapors or other identified hazardous materials. The ER Team and outside responders will provide support to those who are to respond to the incident in the appropriate personal protective equipment. The responding ER Team members will maintain open communications with Operations Chief at all times. The main objective of the initial response of the ER Team will be to determine the extent of the incident, particularly regarding any possible personnel injuries. The responding ER Team members will report to the IC regarding the extent and current status of the incident. The IC will then provide additional direction and guidance to the ER Team. The following provides an approximate order of priority for responding to emergencies:

- Life
- Environmnent
- Property

Emergency Operations Center (EOC)

The EOC is activated at the discretion of the IC. The EOC should be activated for all emergencies meeting the following criteria:

- Extended, on-going release of a hazardous material;
- Release of a hazardous material resulting in injuries to facility personnel;
- Release of a hazardous material causing, or potentially causing, an off-site impact;
- Incidents resulting in the need to coordinate the activities of local, state or federal response agencies or an outside contractor; and
- Incidents where the response activities are expected to continue beyond a 2-3 hour time period.

The IC will activate the EOC after making an initial assessment of the incident. If the EOC is activated, the ER Team members are instructed to gather at that location. The HAZMAT trailer will serve as the EOC. The trailer is portable and can be relocated if necessary. All response equipment will be housed in the HAZMAT trailer. The IC will direct all emergency response activities from the EOC.

The IC, will remain in the EOC throughout the duration of the incident. This will help ensure proper and effective implementation of the emergency response procedures by making the IC readily available and reachable to make the necessary decisions.

The EOC will be equipped with appropriate communications equipment and information necessary for proper implementation of the plan.

The primary identified EOC location is the North side of Parts Room West (Bone Yard). The EOC may be relocated due to location, wind direction, size and/or material released. Refer to Appendix E and the EOC for exact locations.

3.2 Anhydrous Ammonia Leaks

Chemical Characteristics

- Appearance - colorless gas and liquid
- Odor - extremely pungent odor
- Exposure Limits:

IDLH	Immediately Dangerous to Life or Health: NIOSH standard representing maximum concentration above which only a reliable breathing apparatus properly protects the worker.	300 ppm
STEL	Short-Term Exposure Limit: A NIOSH 15-minute time-weighted average exposure that should not be exceeded at any time during a workday.	35 ppm
TWA	Time Weighted Average: OSHA air contaminant limits for average concentrations for up to a 10-hour workday during a 40-hour workweek.	25 ppm
RQ	Reportable Quantity: CERCLA-assigned value above which the release must be reported to the National Response Center.	100 #

Emergency Recognition and Prevention
When an employee or contractor detects, or suspects that Ammonia might be present, they are to contact their immediate Supervisor or Working Foreperson.

Shift On Duty
The Supervisor or Working Foreperson will notify a Power Department Technician (Table 2-2), who will pick-up the electronic Ammonia detector and investigate the odor. Based on the findings, the Technician, as necessary, will confer with the Technical Director and/or Power Manager to determine whether to evacuate or not and whether to activate the HAZMAT team.

Response Procedures
In the event that an Ammonia leak is discovered, the person nearest to the leak will alert any personnel in the immediate area who are unaware of the potential danger. It is the policy of Leprino Foods Company that **all employees** will follow these procedures when dealing with Ammonia.

All Employees

If Ammonia is sensed **WITHOUT** irritation, the department supervisor is to be immediately contacted.

- Extinguish all open flames, do not turn on any electrical equipment or lights, doing so could trigger a possible explosion.
- Employees are to remain in their work areas, unless ordered to evacuate or if the odor increases, causing irritation to eye and nasal passages, at which time they are to evacuate the area. Portable Ammonia detection equipment must be brought in immediately to determine the concentration level and the area of influence.
- Once a concentration has been determined, notify an Incident Commander and a Department Manager in (Table 3-1) if evacuation is necessary.
- Begin to evaluate which evacuation route you would take, if deemed necessary.

If Ammonia is sensed at a level WHERE EMPLOYEES EXPERIENCE EYE AND / OR NASAL PASSAGE IRRITATION, they are to evacuate the area and contact their supervisor immediately, who will in turn contact an ER Team member to take immediate detector readings. Follow the specific evacuation procedures defined in Section 4.0.

Supervisors/Department Managers

- Notify Power Department
- Assist in evacuation of your department, as necessary
- Ensure that all critical equipment has been secured, refer to *Critical Plant Operations / Emergency SOP's* in Appendix H
- Account for all employees in your department after evacuation, by use of the employee schedule and / or Kronos report
- Assist in directing emergency vehicles
- Ensure that only trained ER Team personnel respond to a leak or a spill.

Power Department

- After receiving the call, verify the extent of the spill.
- Is the Ammonia odor tolerable?
- Have the people evacuated the area?
- Has anyone been injured?
- Is a white fog cloud visible?
- Has the Supervisor / Foreperson been notified? If not, contact a HAZMAT Team member listed on Table 2-1, or a department Manager / Supervisor listed on Table 3-1 located at the end of Section 3. **Do Not Leave Voicemail and contact a live person**
- Contact the Technical Director, Plant Manager and/or Power Department Manager
- Upon instruction from the Incident Commander, announce the emergency evacuation, location of the situation, etc. over the telephone intercom. ***Evacuation Script*:** **"ATTENTION, ATTENTION. THIS IS NOT A DRILL. EVACUATION IN PROGRESS FOR (SPECIFY DEPT OR ALL PLANT). REPORT IMMEDIATELY TO (PRIMARY / SECONDARY) DESIGNATED EVACUATION ASSEMBLY AREA."** Repeat two times. There may also be a call for "Shelter in Place," depending on the situation.
- Contact outside emergency responders by calling the guard shack at ext. 7000
- Guard Shack will direct emergency vehicles to the appropriate area

Power Department Groupleader

- Shut down all critical equipment, *Critical Plant Operations / Emergency SOP's* in Appendix H **except** the Ammonia system, unless specified by the IC
- Report to your department supervisor / manager

Incident Commander

- Ensure your safety and the safety of others prior to responding to the incident
- Delegate to a member of Management the responsibility of notifying corporate safety and the Government Agencies and to begin calling plant management
- Advise Security that you have received the call and that you are proceeding to the area of the incident
- Direct Security to request the presence of Lemoore Fire Department
- Delegate a person to meet the emergency vehicles
- Go to the area of the incident
- Advise the EOC of your arrival in the area and give a brief synopsis of the situation
- Always assume the incident involves hazardous materials
- Upon arrival, assess the situation in collaboration with the ER Team; begin size-up.
- Order an evacuation of the area at risk, if appropriate. Refer to Section 4.0 for specific evacuation procedures
- Request that the Lemoore Fire Department set up a unified command of the incident.
- Report to the Fire Department Incident Commander.
- Refer the outside responders to onsite EMS.
- Designate duties to members of the response team who are present [Safety , Liaison , Public Information , Responders (minimum of 2 teams, with each team consisting of 2 responders), Decon (minimum of 1), Security, Scribe, Staging , Operations , Medical , Finance , Plans, Logistics]

Emergency Response Team

Leprino maintains a staff of trained emergency response team members. However, Leprino Foods may rely on outside agencies to provide support in responding to an emergency. Outside support may be needed for response to fire, Ammonia or other hazardous material releases, and will provide emergency medical services, as needed.

Personnel designated to be responders or decontamination personnel must have passed the baseline physical as outlined in 29 CFR 1910.134, Appendix A (CPL 2-2.59A fit test protocol) and Appendix -C of the respirator standard. The baseline resting pulse rate and resting temperature must be pre-determined. Maximum allowable pulse rates must be calculated using the formula (220-(age) X.7)=MAPR (maximum allowable pulse rate). All response personnel's pulse, temperature blood pressure (no greater than 160/100) and MAPR should be listed on a sheet prior to the response.

Responsibilities

- ER Team is to evaluate the situation following the established *Pre-Planning Scenarios* listed in Appendix I
- Identify and initiate plant alarms;
- Mobilize and follow instructions of the IC;
- Identify the level of hazards or potential hazards, which have caused or may have caused an emergency situation, through meter readings, visual assessments, etc.
- Conduct an evacuation at the command of the IC, as outlined in Section 4.0
- Notify Plant Management personnel as designated in Table 2.1;
- Monitor air quality with portable monitoring equipment to verify zone locations.
- Suit-up in proper personal protective equipment, if necessary and as directed by IC;
- Conduct a Search and Rescue Operation, if required as directed by IC;
- Mobilize the ER equipment in order to prepare the site for off-site responders to conduct joint entry response;
- Provide technical support regarding design and operation of the Ammonia refrigeration equipment
- If immediate evacuation is not needed, the ER Team member must continue to monitor the area to determine if evacuation becomes a need, until the situation has been resolved and returned to the ***"all-clear"*** status by the IC.
- Once at the spill area, the ER Team, donned with appropriate Level of PPE. Must continually monitor the level of Ammonia from initial entrance of the area until they have reached the Hot Zone location. Contain any spill using non-absorbent diking and damming materials, or absorbent material to clean it up; or as directed by IC.
- The team's actions shall be consistent with the following, based on the airborne concentration of Ammonia present:

Concentration	Action
0 ppm – 24 ppm	Periodically monitor and document. Do not exceed a TWA of over 25 ppm for 8 hours.
25 ppm – 249 ppm	Immediately evacuate the area, start ventilation and continuous monitoring. Short term entry allowed only in these conditions. This area can be entered with a proper APR and protection Level C gear. Implement emergency response procedures. Mobilize HAZMAT team, consisting of certified members only.
>250ppm	SCBA's & Level A gear is Mandatory
>300 ppm	IDLH Level

The primary responsibilities of the ER Team members are to make all necessary notifications, assist in assuring that all personnel are evacuated, and provide technical support regarding the design and operation of the Ammonia refrigeration system to outside response agencies. Only trained, medically qualified, and fit tested Leprino Foods ER Team members can actively respond into an area contaminated with significant quantities of Ammonia or chlorine. Outside agencies will provide additional back-up response for search and rescue and mitigation in contaminated areas.

3.3 Decontamination

Decontamination is the procedure for cleaning off responders and all the affected equipment from the released material. **The decontamination area must be delineated and set up prior to entry of the response team**. Decontamination takes place in the warm zone. A travel way is designated for the responders to enter the decontamination area and one is established for leaving the area and returning to the cold zone for un-suiting. Consideration for "Air Decontamination" should be made for non-liquid clean up procedures.

Decontamination areas will be pre-determined prior to the hazardous material release using the site map of the facility (Appendix E).

Additional decon services can also be provided by the Lemoore Fire Department.

3.4 Emergency Medical Treatment And First Aid

Emergency medical services are to be provided by the Lemoore Fire Department or EMS during all evacuations and emergency response procedures

First Aid (Refer to Ammonia SDS Located in Appendix D):

Skin Contact: Water is the best initial first aid treatment. When a person has been exposed to enough Ammonia that it has caused burning and irritation, flush the area(s) with cool water for at least 15 minutes or longer. If the exposure was to the extent that frost formed, flush with water to remove all traces of Ammonia. **DO NOT ATTEMPT TO REMOVE CLOTHING FROM A VICTIM WITH AMMONIA FROST. DO NOT ALLOW ANY PETROLEUM BASED OINTMENTS OR EYE DROPS TO BE USED IN RESPONSE TO AMMONIA EXPOSURE, ADDITIONAL DAMAGE CAN OCCUR.**

Inhalation: Fresh air is the best first aid treatment unless a trained person can administer oxygen. Prolonged inhalation of high concentrations of Ammonia may cause bronchitis and/or pneumonia symptoms. If dizziness or drowsiness occurs after exposure, rush to emergency medical treatment, inflammation of airway and lungs due to exposure can restrict the flow and exchange of oxygen in the lungs.

Eyes: Water is the best first aid treatment. Force eyelids open and flush eyes with water for at least 15 minutes. In any case, get medical assistance AS SOON AS POSSIBLE. **DO NOT ALLOW ANY PETROLEUM BASED OINTMENTS OR EYE DROPS TO BE USED IN RESPONSE TO AMMONIA EXPOSURE, ADDITIONAL DAMAGE CAN OCCUR.** In the event of transportation to a medical facility, an SDS **MUST** accompany the patient.

3.5 All Other Hazardous Substances

Refer to the SDS for the specific substance, located in Appendix D, and Table 1-1 for proper reporting requirements, with follow up from Section 5.0. **There may be a call for "Shelter in Place," depending on the situation.**

3.6 Critique Of Responses And Follow-Up

Critiquing of a response is a required component of the HAZWOPER standard. All parties responding to a particular incident must critique the incident to evaluate the effectiveness of the response. Refer to *Emergency Preparedness & Response Plan, Investigation / Critique Form* in Appendix J. Mutual aide agreements (Appendix K) should be reviewed with outside parties to verify that their support was consistent with the mutual aid agreement.

A critique of the response from Leprino Foods personnel should review the emergency action plan and the **Emergency Prepardness Response Plan** utilizing the Critique Form (Appendix J) verifying that all emergency actions and responses followed the proper procedures. As soon as possible after the incident (if at all possible the day of the incident, but no more than 7 days), all responders (including any outside agencies) will assemble and collectively answer questions about whether the emergency response followed Leprino's procedures, and was done in a safe and responsible manner. If the assembled group does not adequately critique the incident in one session, additional sessions should be scheduled. The written assessment will address the following areas:

- The adequacy of the EPRP;
- The implementation of the EPRP;
- The performance of the site personnel and the site ER Team;
- The adequacy of treatment of exposed personnel at the site and at off-site facilities;
- The adequacy of on and off-site emergency response communication systems; and
- The adequacy of emergency power, lighting systems, and other emergency response equipment.

The written assessment must be completed for each unannounced evacuation and true emergency with copies sent to the Plant and Corporate HR safety departments. A separate file for all assessment forms should be located in the Safety Office and kept on file for a period of at least five years.

Based on the material gathered in the Critique Form and other notes taken during the meetings, a written report will be prepared by the Incident Commander. The report will address what went well and what did not. Plans to correct any deficiencies will be documented. Follow-up to ensure that the deficiencies are corrected will be the responsibility of the Safety Supervisor / Program Administrator, and the EPRP will be updated accordingly.

TABLE 3-1: PLANT MANAGEMENT PERSONNEL

Last	First	Phone	Last	First	Phone
ALLEN	MIKE	559-212-5196	LEMUS	ISRAEL	559-827-6742
ALLEN	ROGER	559-309-4551	LEYVA	VICTOR	559-360-6461
ALMARES	LOUIE	559-302-7734	LOERA	ALFREDO	559-3809016
ALEXANDER	DARIN	559-998-9701	LOMAS	TERESA	209-601-6552
AMEZCUA	SAL	831-210-3478	LUIS	JEREMY	619-850-2024
ANDERSEN	KES	559-476-7408	MACHADO	VICTOR	559-904-5317
ANDRADE	DAVE	559-250-5306	MARTIN	MARCOS	559-759-3250
AQUINO	THOMAS	559-901-2807	MATA	MONICA	559-632-3691
AVILA	JACOB	559-817-9067	MCCOY	GREGG	559-309-7470
BACKMAN	BRANDON	321-316-8020	MCGEE	VICTOR	559-309-0949
BARBER	ERIC	616-204-8773	MCMAHAN	BRIAN	559-410-1364
BARRON	DANIEL	559-381-3501	MENDIVIL	MANUEL	559-901-4191
BAUMHARDT	MATHIAS	559-471-8683	MENDONCA	DANIEL	559-786-5229
BETTENCOURT	CASEY	559-816-3867	MILLER	DONNIE	916-361-7088
BEYERSDORF	BRIAN	303-895-6928	MILLER	LEE	559-750-1769
BILLINGSLEY	CHAD	559-381-2193	MILLER	KIM	559-998-9503
BLANKENSHIP	DANIEL	559-916-4693	MILLER	KLINT	559-589-3566
BOLDEN	DON	209-683-9759	MILLER	TERESA	701-450-2104
BROWN	JOE	559-362-9845	MIRANDA	JENNIFER	559-537-6118
CANSECO	HECTOR	559-707-5242	MONTES	CLEMENTE	559-852-1151
CARDENAS	CHRISTOPHER	916-214-0062	MONTOYA	RIANN	559-380-5925
CARRIER	BRANDON	559-572-8805	MOXON	CRYSTAL	559-381-0654
CHANG	SAMANTHA	415-609-3775	NEWBURY	LINDA	559-585-8545
CHISM	STEPHEN	559-816-8615	NICHOLS	DAN	559-469-1988
CHISM	THOMAS	559-904-8617	OCHOA	JOE	559-303-7291
COE	STAN	559-423-3071	OROZCO	ESTEVAN	559-999-3414
COMTOIS	MARIO	559-429-4775	OWENS	KENNY	559-469-7298
COLLIER	ALBERT	843-540-4647	PEREZ	ANTHONY	559-997-9027
CONDIE	MARK	559-362-8756	PONOZZO	JOLEEN	952-292-3437
COOK	PHILLIP	559-362-6899	PORRAS	ROY	559-997-5708
CSILLAG	RICHARD	317-750-5394	PURNER	EILEEN	760-809-6232
CURRIE	NATHAN	559-423-5776	RICHMOND	BRIAN	317-339-1999
DAS	AMAN	530-383-6037	ROCHA	JASON	559-707-7725
DAVIDSON	PETER	559-772-9241	ROCHA	RYAN	559-997-5739
DENNIS	BRAD	559-801-3354	ROBINSON	THOMAS	559-423-3072
DOGAN	MERTCAN	518-752-6414	RODRIGUEZ	LOUIE	559-212-7269
DOMINGUEZ	JOHN	559-3034141	ROGERS	DANIEL	559-991-5324
DUTRA	KRISTIN	559-380-5355	ROMERO	GILBERT	559-816-2219
DUTRA	MATT	559-423-3070	SAGARIBALLA	ROGER	559-803-3955
DUESTERHAUS	STACY	559-999-8146	SALAZAR	NATHAN	559-345-3080
EGBUNA	MANNY	224-629-3810	SALVO	ROLANDO	559-816-5528
ELLIGEN	ED	805-235-6507	SANCHEZ	LUIS	559-799-0432
EMERY	SHAWNA	559-997-5961	SANDOVAL	JESUS	559-630-4315
EMERSON	FRANZ	559-381-2039	SERWACKI	HEATHER	219-718-3517
ENGLAND	CHRISTOPHER	559-707-5411	SILVEIRA	BRAIN	949-357-8225
ESQUER	ROBERT	559-345-3894	SMITH	SPENCER	308-641-0939
FARRAR	MIKE	559-997-3145	STULL	SHANE	559-747-7937
FERREIRA	DANNY	559-362-7425	SYMONDS	CURTIS	559-904-9354
FOX	BILL	559-410-2120	TOMB	ERIC	757-288-3538
GERMAN	JACOB	559-355-0511	TUTTRUP	ROB	559-417-4524
GREGORY	LIZZY	989-430-9297	URRUTIA	ANTONIO	559-415-5041

GOMEZ	**STEVEN**	559-387-0307	**VALADEZ**	**RICK**	559-303-4000
GONZALES	**DAVID**	559-302-0772	**VALDEZ**	**MARCELINO**	559-817-2876
HALL	**ZACH**	559-836-1263	**VANEGAS**	**EDWIN**	559-213-1254
HEINKS	**DAVID**	559-904-7684	**VASQUEZ**	**ANTHONY**	559-836-1688
HENDRICKSON	**MARIAN**	559-974-5678	**VELASQUEZ**	**JAMES**	559-816-2481
HOPPER	**JASON**	559-410-7829	**VIEIRA**	**STEPHANIE**	559-736-1126
HUBER	**KEITH**	559-997-9163	**VEENENDAAL**	**JOSH**	559-362-1692
HUDGENS	**MELINDA**	559-998-9318	**WADDLE**	**ELIJAH**	619-888-8827
HUGHES	**SANDRA**	304-206-1502	**WILLIAMSON**	**DAN**	559-997-9082
HUNSAKER	**TAYLOR**	801-628-1455	**WILLIAMSON**	**JOHN**	208-949-6463
INIGUEZ	**SERGIO**	559-718-6153	**WILSON**	**JOEY**	559-904-5367
JACKS	**AARON**	559-303-4700	**WRIGHT**	**COLIN**	559-998-9838
JOBE	**CHARLES**	559-997-3749	**ZEPEDA**	**JOSE**	559-346-8248
KAISER	**ASHLEY**	805-441-0564			
LABUGA	**TIFFANY**	559-985-2181			

4.0. EVACUATION PROCEDURES

The following evacuation procedures explain the circumstances triggering an evacuation, how an evacuation plan is undertaken, and includes roles for operators remaining to shut down plant equipment (Appendix H) and medical responder roles (Section 3.4).

4.1 Determining When Evacuation is Necessary

The IC will consult with plant personnel to assess the actual or potential hazard. The IC will determine if a full (department) evacuation is necessary or temporarily relocating personnel.

In general, evacuations are announced when:

- There is danger from smoke, flames, hazardous chemicals, and debris
- Immediate action is necessary to keep personnel from being injured by smoke, flames, hazardous chemicals, or debris.

4.2 How an Evacuation is Announced

The Leprino facility is equipped with a Paging System, which provides us with the method for announcing an emergency, and there is an evacuation alarm (Fire Alarm) that will direct employees to evacuate the plant. Our Third method would be to notify all Supervisors and Groupleadeaders with radios and to physically notify the employees in their department when there is a call for an evacuation.

4.3 Who Directs the Evacuation

Once the IC has ordered an evacuation, the Evacuation Coordinator (an on duty supervisor) is responsible for directing the orderly evacuation of employees.

4.4 Evacuation Coordinators

Evacuation Coordinators, typically department supervisors, are assigned to assist in all evacuations. Upon notification of an evacuation, the Evacuation Coordinators will assist in ensuring that all personnel in their area of responsibility are quickly and safely evacuated to the Designated Assembly Areas. The Evacuation Coordinators will then conduct a sweep of the plant to ensure all employees have evacuated. Upon arriving at the Designated Assembly Areas, the Evacuation Coordinators are responsible for conducting a "head count" to ensure that all personnel are accounted for. The results of the head count are to be reported to Operations. Any indication of a missing person should be immediately reported to the Incident Commander. Under no circumstances should anyone return to the evacuated area without specific authorization from the Incident Commander.

Each supervisor, on all shifts, is responsible for the evacuation and accountability of the individuals they directly supervise, ***as well as additional assistance as needed for physically disabled persons in the facility.***

Responsibilities

- Assist in implementing area evacuations;
- Conduct a head count at the assembly area to account for all personnel; and
- Report the results of the head count to the Incident Commander in person, if accessible, or by 2-way radio, or cell phone.

Each Evacuation Coordinator will serve as the primary point of contact between the IC and personnel at the assembly area.

4.5 Ammonia

The Leprino Foods Lemoore facility has Ammonia in six (6) areas of the building, all of which are near occupied work areas. If an Ammonia release or other emergency occurred, an evacuation decision would need to be made. Refer to Section 3.2 for specific instructions on Ammonia response.

Upon acknowledgement of an Ammonia alarm, a HAZMAT Technician or Dept Supervisor will check a windsock and report findings to the IC, who will then determine which designated Assembly Area the personnel need to evacuated to. The IC or designated representative will then make an announcement on the plant paging system as to which Designated Assembly Area the evacuation is being directed to. **There may also be a call for "Shelter in Place," depending on the situation.**

4.6 Bomb Threats

Bomb threats would generally be received by the plant receptionist (or Guard Shack personnel during off hours and weekends) and are short, hurried and often unclear. Persons receiving the call should, as soon as possible, record in writing all information relating to the call by using the *Telephone Bomb Threat Checklist* located in Appendix G. The Lemoore Facility does not have any type of call tracking system in place that could provide clues to the identity of the call.

Procedures

- If the public address system, emergency alarm (fire alarm) or PA announces an evacuation, all employees should proceed to the designated evacuation area. The last person to leave any area should ensure that no one is left behind and the area is secured.
- Supervisors are to account for all employees.
- Volunteers should be available to assist and/or search their designated work areas.
- If a suspicious device is found, do not disturb. Have police and/or fire department handle.
- All public areas must be searched on a priority basis.
- Ensure that all fire extinguishers and hoses are ready for use.
- See Food Safety Standard Operating Procedure QUA3122.200 for Suspicious Packages.

Responsibility

- Person receiving the bomb threat must immediately report it to the Department Manager or Department Supervisor.
- Department Manager will analyze information, make a decision regarding action to be taken and direct response.
- Police and Fire Departments must be advised.
- Evacuation decision must be made. Resolve any real doubt in favor of evacuation.

4.7 Earthquake

If an earthquake occurs, all equipment in operation or motion will be stopped at once. Refer to Appendix H for critical plant operations shutdown procedures. Find immediate shelter in doorways, away from glass and falling objects or overhead power lines until the shaking stops. Follow instructions given by your supervisor or by the IC.

The IC will decide whether evacuation is necessary from any of the buildings at the facility. The IC will also be in contact with the Managers throughout the facility by phone. The Managers and other personnel will inform the IC of the situation and damage in their areas.

If the evacuation is necessary

- All employees will proceed to the Designated Assembly Area for a head count. Employees are to remain in the Designated Assembly Area so that no one will have to unnecessarily re-enter the building and risk his or her personal safety to look for an unaccounted person.
- Each Evacuation Coordinator will take a head count and report the results to the Incident Commander of any missing persons.

After the earthquake, the Incident Commander will analyze the building to determine if it is safe to continue the shift. However, should the Fire Department be present, they will be in charge and will make the decision.

If the earthquake has visually damaged the building, if people are missing after the head count, or there are injured persons:

- Injured persons will be taken and kept at the Designated Assembly Area if professional medical assistance is unavailable.
- A first aid kit (Refer to Appendix E for locations within the facility) will be taken to the Designated Assembly Area.
- If safe, a search party of volunteers will be led by the Incident Commander or a designated employee to look for additional persons, either trapped or injured.

4.8 Employee or Individual with a Weapon

In the event an employee or any individual on the premises brings a weapon on site, Leprino Management should be notified immediately by the person(s) who witness the act, followed by 7000 or 8-911 notification. Police should be summoned to take over for the Leprino Management or security personnel.

4.9 Fire

In the event a fire is discovered, the employee(s) nearest to the fire will immediately (as appropriate to their level of training):

- Alert any personnel that may be unaware of the danger.
- Alert supervisor for the area who will ensure that the Lemoore Fire Department is called.
- If the fire is small, such as a trash can fire or a fire in an open area, and can be extinguished in a safe manner, then the use of a fire extinguisher or water hose (for non-electrical fires) to put out the fire if voluntarily performed. Report the fire to your supervisor immediately and maintain a fire watch after the fire is extinguished in accordance with hot work permit instructions (Refer to Corporate Hot Work Policy **SAF2701**)
- If the fire is in a vehicle or a structure (wall or ceiling) immediately call the fire department (9-911) to report the incident. Sound the evacuation alarms and evacuate the building or area. If you can safely keep the fire under control, do so, if not, evacuate the area with the other personnel. Report the incident to your supervisor immediately. Do ***NOT*** take any chances; always error to ***SAFETY***.

The supervisor on duty in that area or the contractor's supervisor will immediately inform other employees and the IC of the situation.

Employees assigned the role of contacting the Guard Shack/Fire Department will do so. All employees are trained and instructed to **not** attempt mitigation of emergency situations; the sole response that will be taken is evacuation. We do train our maintenance employees in the proper fire watch procedures, the classifications of fire extinguishers and how to use fire extinguishers to fight a fire.

The IC in conjunction with designated personnel will decide if an evacuation is necessary and if the practiced routes to the assembly area are safe. This information will be relayed via the Telephone Paging system, evacuation alarm, and 2-way radios or cell phones. The managers and supervisors (including contractor lead persons) will then direct the employees out of the building. Employees will exit the location as per the evacuation protocol called out in Section 4.2. The evacuation maps for the facility are shown in the main hallway of the facility and in other various locations throughout the plant. A reference copy is located in Appendix L.

All managers along with employees, contractors, and other occupants of the building will report to the Designated Assembly Area as identified by IC, for roll call.

Fire Response

In the event of a fire, employees are to remain in their department unless otherwise instructed by a Supervisor or Groupleader. Should there be an obvious problem in their immediate area, then follow evacuation procedures according to the hazard as outlined in this chapter

- Maintenance Supervisor or Foreperson and ALL Production Supervisors on duty will report to the maintenance shop.
- Have at least 2 individuals search for and identify the cause of the fire and report back to the IC.
- After identifying the fires source and severity (within 5 to 10 minutes), make notification over paging system with directions as to **"ALL CLEAR"** or to **"EVACUATE."** Evacuation script can be found in Section 3.2 under **'Response Procedures; Reception'**
- In the event of the need to evacuate, follow specific evacuation procedures called out in this chapter.

4.10 Power Failure to the Plant

In the event of a power failure to the plant, all employees will remain at their stations until the power is restored. At that time, the Supervisor, under the direction of the IC, will direct the employees to either restart / resume production or to shutdown the equipment and proceed to the outside, Designated Assembly Area.

Illumination

The Leprino site contains adequate lighting in the event of an emergency. If there is a power outage, the Back-up generator will auto start and provide emergency lights. These emergency lights should be sufficient to allow safe evacuation by all employees.

4.11 Terrorist Attack

In the event of a terrorist attack on the facility or any food product associated with Leprino Foods, the person discovering the problem should immediately report it to management, who will then contact emergency services at 8-911 or 7000. If the substance is an airborne contaminate all rooms should be sealed by closing all personnel and overhead doors and if necessary sealing the opening with tape and all air handling units and ventilation devices will be turned off. Personnel will shelter in place until the all clear is given by the appropriate agency. Management should immediately notify corporate and if instructed, notify the local HAZMAT agency and the CUPA in the area. Refer to Table 5-2 for a list of *External Emergency Contacts* and phone numbers.

Active Shooter Situation

Run: Leave all personal items behind and watch for danger along the evacuation route (the shooter may be familiar with the routes and may be waiting for employees at the exit point). Leave your cell phone in your pocket. Keep your hands visible at all times so law enforcement can see that you are not hiding anything.

Hide: Turn off your cell phone, including vibration mode, and stay quiet. If you attempt to text family or friends to tell them to alert authorities, have a code word previously set up to let them know it is a legitimate emergency and not a hoax. This will also let them know that they should not call you back.

Fight: Barricade yourself into a secure room if possible. Remember that everything and anything can become a weapon in this type of situation. Do not worry about the possible harm to the shooter. There is safety in numbers; attack en masse whenever possible.

4.12 Tornado

In the event of a tornado or a tornado warning, all equipment in operation or motion will be stopped at once. Refer to Appendix H for critical plant operations shutdown procedures. Employees will proceed to the designated Tornado Shelter Assembly Area listed below.

Procedures

- Take shelter in any confined area away from windows such as hallways, restrooms, closets, basements, conference rooms, etc. *The primary storm shelter area is the Utilidorn Hallway.*
- All locations shall be secured prior to seeking shelter.

Responsibility

Receptionist / Lab Personnel

- Monitor the local radio station when conditions dictate a potentially dangerous situation.

- Contact a Dept Supervisor to sound the shelter alarm via the paging system.
- Areas not covered under the paging system must be contacted person-to-person by a supervisor.

Other Employees

- Make sure all employees in your area are informed of the potential danger, and seek shelter immediately.

4.13 Where to Go

Safe distances are based on the current North American Emergency Response Guidebook.

The Evacuation Coordinator is responsible for confirming the meeting place with the IC and directing the people out of the building, including additional assistance as needed for handicapped evacuation. Designated Assembly Areas are mapped out in Appendix L and listed as follows:

Primary Location – Parking lot on North side of facility.

Secondary Location – Milk Receiving on the Northeast side of facility.

The default meeting place location will always be the primary meeting location as listed above, unless the reason for evacuation dictates otherwise. When releases of highly hazardous chemicals may occur outdoors, orange wind direction indicators (wind socks) have been placed at the highest points of the plant roofline that can be seen from various areas outside the plant. These indicators allow employees to move crosswind to upwind to gain safe access to the Designated Assembly Areas.

If it is unsafe to remain near the facility, you will be directed to a local community shelter.

A copy of a facility map with evacuation routes is located in Appendix L. Community shelters are designated on the City of Lemoore Plot Plan Map located in Appendix E.

4.14 Evacuation Protocol

Employees will shutdown and secure equipment before evacuating if time & safety permits. *Critical Plant Operations / Shutdown SOP's* are referenced in Appendix H. If the actual or potential hazard poses an immediate threat to employee safety, employees will forego equipment shutdown and evacuate immediately from their nearest available exit.

Employees with disabilities that are unable to directly exit the building should proceed to the pre-assigned areas of rescue assistance where the Evacuation Coordinator will assist them in evacuating the building. These areas of rescue assistance are designated on the Appendix L evacuation maps.

The Receptionist will take the visitor & contractor logs when evacuating, so a check can be made to account for all visitors once the building is evacuated.

Each Evacuation Coordinator will be sure all people are accounted for at the Designated Assembly Area by using work schedules, visitor log, and security logs. Immediately contact the Incident Commander if anyone is unaccounted for.

Instruct all people to remain at the Designated Assembly Area until instructed otherwise by the IC.

Each Evacuation Coordinator will remain at the Designated Assembly Area after the evacuation is completed and will give a report to the IC.

If the fire department is involved,the IC will report to the fire department's "unified command post" after, the evacuation is complete.

4.15 Procedures for Employees who Operate Critical Plant Operations

Procedures have been developed for supervisors, production forepersons and maintenance technicians who will remain to operate and/or shut down production equipment. *Critical Plant Operations / Emergency SOPs* are found in Appendix I.

The Incident Commander will consult with the highest-ranking HAZMAT-trained maintenance person on-site to determine if any critical equipment or systems needs to be shutdown. Critical equipment or systems will ***only*** be shutdown if necessary and if it can be done ***safely*** without the risk of injury to personnel.

The highest ranking trained HAZMAT Technician will use the buddy system with the next available trained HAZMAT Technician or Emergency Responder as designated by the IC.

- If the emergency dictates a need to shut off the Ammonia king valves, then refer to the *Pre-Planning Scenarios* located in Appendix I.
- If the emergency dictates a need to shut off the natural gas at the gas main, then refer to the *Critical Plant Operations* located in Appendix H.
- If the emergency dictates a need to open the main electrical disconnects for the plant electrical service, then refer to the *Critical Plant Operations* located in Appendix H.

Note: ***The Ammonia, natural gas, and electricity should only be shut off in the event of a serious emergency where they are directly involved in the actual or potential hazard. This should be a joint decision of the Incident Commander and highest-ranking maintenance / engineering persons.***

- Analyze the problem area and secure if possible. If remaining in the area is not safe, evacuate immediately and report to the meeting place.
- If the emergency is minor and it is safe to remain in the plant proceed as follows:
  - Inspect the plant.
  - If there is a small fire, you may try to extinguish it with a portable fire extinguisher. Do not attempt to extinguish a fire if it will put you at risk of an injury.
  - Check equipment that is still operating in the plant.
  - Report to the meeting place and inform the Incident Commander of the condition inside of the plant.

4.16 Site Security and Control

Leprino Foods personnel, in conjunction with Lemoore Police department personnel, will be responsible for site security and control of an emergency response situation. This will ensure that only trained hazardous material technicians, Incident Commanders and other designated personnel are allowed at the response site to respond to a chemical release.

Leprino Foods personnel will utilize yellow hazard tape to delineate the warm and cold zones and designate which areas are to be secured. Only trained and authorized personnel will be allowed in the controlled areas.

4.17 Rescue and Medical Duties

Leprino Foods does train certain personnel in emergency medical treatment, first-aid and CPR. The Plant relies on these people to be first responder to care for the injured employee until the EMS can make it to the plant.

The nearest available medical services are available through:

- Lemoore Ambulance service
- JobCare Medical Clinic (Monday thru Thursday, 9am to 5pm)
- Hanford Community Hospital

First aid procedures for hazardous chemicals are contained in the SDS'. *Access procedures for SDS'* are available in Appendix D.

4.18 Account For Personnel Procedures

During an evacuation, all personnel will be accounted for as follows:

Truck drivers in Shipping & Receiving shall be notified and escorted to the Designated Assembly Area by a Shipping and Receiving Manager or by a Leprino employee working in that area.

Milk truck drivers shall be notified and escorted to the Designated Assembly Area by the milk receiver or Department Supervisor.

Visitors and contractors shall be notified and escorted to the Designated Assembly Area by a designated Leprino Foods contact entity. The designated Leprino Foods contact entity shall ensure hand-off of responsibility for the visitor / contractor to their replacement upon change of shift.

At the Designated Assembly Area, each Evacuation Coordinator will take a head count of all employees, visitors, truck drivers and / or contractors from his / her location and report the results of the head count to the Incident Commander.

The Incident Commander will inform the Fire Department contact of the approximate area where any unaccounted for employee, visitor, or contractor might have been working.

Rescue will be performed by the Hazmat response team or the Lemoore Fire Department.

No employees will remain behind to operate critical plant operations during an evacuation.

4.19 Surrounding Community Evacuation

One of the duties of the Emergency Response Team is to monitor the impact of a release at the property line. Any potential for exposure beyond the property line will be reported to the IC and any chemical readings shall be document on the *Log of Detector Readings*, located in Appendix G. Based on this information, the ER Team Leader will notify the Lemoore police and fire department of the possible need for an evacuation of the downwind off-site neighbors. The decision to order a community evacuation can only be made by the Lemoore Police or the Kings County LEPC. The ER Team Leader and On-site IC will serve in an advisory capacity in the decision-making. Conducting a community evacuation is the responsibility of the Lemoore Fire Department and other community responders.

4.20 Returning to All Clear Status

The IC will notify Evacuation Coordinators, Supervisors and other employees at the assembly areas when the "All-Clear Status" has been determined.

5.0 INTERNAL AND EXTERNAL NOTIFICATION

It is imperative that all Leprino Foods employees are constantly aware of their surroundings. All senses should be utilized at all times. The sense of smell should not be overlooked. Peculiar odors should be reported to their supervisor. It should be possible, for example, to smell an Ammonia leak.

Most of the product streams and chemicals have distinguishable characteristics that make identification possible. It is important that you know the location of stored chemicals and their odor characteristics. Refer to Appendix E site map for bulk chemical locations at the Lemoore Facility.

5.1 Internal Notifications

In the event of a release or spill, Leprino follows a "chain-of-command." The following Table 5-1 distinguishes for all Leprino Foods employees, who should be notified.

TABLE 5-1: INTERNAL NOTIFICATIONS

Employee Classification	To Whom They Should Report
Department Manager	Production Manager, General Manager, Technical Director
Supervisor	Immediate Department Manager
All other Employees	Immediate Supervisor or Working Foreperson

Table 3-1 lists Management and Supervisory personnel who may be contacted by employees in the event of an incident. Table 2-1 identifies the trained HAZMAT Team Members and their job functions. The most senior management person at the time of the emergency assumes the role of the Incident Commander. Remember, response activities undertaken by Leprino HAZMAT Technicians must do so only under the direction of a trained Incident Commander.

Plant and Corporate Senior Management **must** be contacted as soon as reasonably possible in the event of any major emergency or incident. These contacts must include the **Plant Manager**, **Plant Engineer**, **Production Manager**, **Maintenance Manager** and **Plant People Development Manager** as well as **Central Region VP**, **Corporate Director of Environmental Operations**, **Corporate Director of Maintenance Operations**, **Corporate Legal** and **Corporate Safety Manager**. Refer to Table 3-1 for contact information on Plant Management and Table 5-2 for contact information on Corporate Senior Management.

For response and / or clean up operations that would require company funds for additional equipment, contact the Central Region Vice President (Refer to Table 5-2 for contact information).

5.2 Pre-Emergency Planning And Coordination With Outside Parties

Preplanning has been completed with Lemoore Police Department and the Lemoore Fire Department.

During an emergency response the Lemoore Police will provide site security at the street entrances. Refer to *Site Map* located in Appendix E for property access. The Lemoore Fire Department will provide emergency support to the HAZMAT team and rescue service when needed. The fire department will typically assist in decontamination, and be a part of an entry team if needed. Please refer to Appendix K for Mutual Aid Assistance Agreements established with outside parties.

5.3 Whom to Notify

The following Table 5-2 lists organizations that are commonly notified in an emergency. Some of the contacts listed must be notified under federal or state law, while others may be contacted as a resource for information and assistance in addressing the emergency.

Procedure steps to report a release:

(Employee calls Maint. To report odor)

1. Call Power to ask if they are working on Ammonia equipment in the area
2. If 'Yes" find out scope of work from Power and if there is any uncontrolled release of ammonia
   If Power says it's a normal part of work being performed then just report back to dept. - no issues
3. If "No" (Power is not working in the area) then immediately, both yourself and
   Power Tech, grab the ammonia sensor and APR to investigate odor.

Any area registering 25 ppm musts be immediately evacuated.

Put "on"your APR whenever:

4. Power Tech confirms an uncontrolled release * We now have "Knowledge of Uncontrolled Release" and
5. Activate the IC and call Dan W, Tom R, or Chad B.

makes the event reportable to NRC (15 minute clock starts now) - **read #5- #8 first before calling NRC**).

6. Let Dan / Tom call NRC, OES & LEPC

7. If Dan,Tom, Chad etc… not available then you will have to call
8. The amount released is always "unknown at this time"
9. Continue with Emergency Response Plan

*

Additional Information you may need:

- Leprino Foods 351 N. Belle Haven Drive Lemoore CA 93245
- Your Name & Phone # (plant phone 559 925-7300)
- The Chemical name

Advice regarding medical attention necessary for exposed individuals

Ammonia CAS number 7664-41-7

Estimate of the quantity released (unknown at time of call)

The medium or media into which the release occurred

It is Plant Management's responsibility to determine which organizations should be contacted.

TABLE 5-2: EXTERNAL EMERGENCY CONTACTS

Agency/Organization	Business Phone #	Home or Cell #
Fire-Police-Ambulance		
Lemoore Fire, Police Department, Sheriff or Ambulance Service	8-911	
Adventist Medical Center	8-559-582-9000	
3E Company (SDS resource, refer to Appendix D)	8-1-800-451-8346	
Federal, State and Local Emergency Response Contacts		
National Response Center	8-1-800-424-8802	Must call within 15 minutes
California OES	8-1-800-852-7550	
Kings County LEPC	8-559-584-1411 8-559-582-3211	
Lemoore Naval Air Station	8-559-707-0001	
Chemtrec-Emergency Response Information Services	8-1-800-424-9300	
24 hr. Poison Control Center	8-1-800-342-9293	
CalOSHA Fresno Office	8-559-445-5302	
EPA EPCRA Hotline	8-1-800-535-0202	
Kings County Dispatch	8-559-584-9276	
Lemoore and Hanford Fire Dispatch	8-559-585-2535	
Kings County UPA	8-559-584-1411	
Corporate Emergency Response Contacts		
Joe Herrud , P.E., Director Tech Svcs Environmental Op's	**8-1-303-480-2894**	
Nikolas Despain, Director of Maint Op's	**8-1-303-480-2932**	**8-1-303-588-7610**
Steve Schmidt, Director of PD and Safety	**8-1-303-480-2905**	**8-1-303-483-3864**
John Forrester – Corporate Safety Manager	**8-1-303-480-2616**	**8-1-303-908-5801**
Jon Alby, Corporate Legal	**8-1-303-480-2676**	**8-1-303-590-4823**
Mike Reidy, Senior VP of Logistics & Business Development	**8-1-303-480-2961**	**8-1-303-482-6603**
Corporate Public Relations	**8-1-720-550-3751**	

5.4 Information Reported to Agencies

Refer to Appendix G for the *Incident Commander's Checklist / Hazardous Material Release Information Sheet* and possible script to assist in making Agency notifications. Notifications should not interfere with the initial responsibility of the IC to mitigate the response. The Liaison should take on this responsibility immediately. Information given at the time of the Agency Notification should include the following:

- The name, title, affiliation, address, and facility telephone number of the person reporting the incident.
- Information regarding the extent of the release including:
  - A release has occurred which will probably not have an off-site impact; or
  - A release has occurred which will probably have an off-site impact.
- The time, or estimated time, of the release, the projected duration, and a brief description of the measures taken to terminate the release.
- The exact location of the discharge including the name of the site, the street address, the municipality, and the county.
- The chemical name and an estimate of the quantity of the hazardous substance(s) discharged.
- Weather conditions, including wind direction and speed, temperature, precipitation and any expected off-site effects.
- The date and time at which the discharge began or was discovered, and ended.
- The actions taken to contain, clean up, and remove the hazardous substance(s) discharged.

Appendix G also includes a help list for *Size Up / Action / Post Op / Clean Up,* and a *Log of Emergency Responders & Detector Readings* to assist in data collection for the formal report to be submitted as defined in Section 5.8, Incident Documentation / Reporting Requirements. Make sure to obtain and record the National Response Center's case number for the incident supplied by the agency, and the name of the individual the incident was reported to and document on the *Agency Notification Log* (Appendix M).

Any incident involving a hazardous material release should be investigated using the forms and guidelines established in Section 3.6 Critique of Responses and Follow Up.

5.5 Agency Notification

- Emergency notification must be made to the agencies as indicated above. The initial notification of a release or potential release should include as much of the information contained on the *National Response Center Incident Report Form* (Appendix N) as possible.
- Chapter 6.95 of division 20 of the Caifornia Health and Safety Code requires that written emergency release follow-up notices prepared pursuant to 42 U.S.C.& 11004, be submitted using this reporting form. Non-permitted releases of reportable quantities of Extremely Hazardous Substances (listed in 40 CFR 355, appendix a) or of chemicals that require release reporting under section 103 (a) of the Comprehensive Environmental Action, Compensation, and Lability Act of 1980, must reported on the form, as soon as practicable, but no later than 30 days, following a release. The written follow-up report is required in addition to the verbal notification.
- The follow-up report must contain the following information:
  - Actual response actions taken.
  - Any known / anticipated data or chronic health risks associated with release.
  - Advice regarding medical attention necessary for exposed individuals.
- The "Emergency Release Follow- Up Notice Reporting Form" will be submitted to the following agencies (Refer to Section 5.8 for specific reporting instructions):

State Emergency Action Commission (SERC)
Attn: Section 304 Reports
Hazardous Materials Unit
3650 Schriever Ave
Mather, CA 95655

5.6 Public / External Notifications

If there is a spill that may affect the surrounding community, Leprino Foods and local emergency responders should be aware of the residences and businesses, which may be affected by a release. Refer to Table 1-1 for definition of reportable quantities.

Table 1-2 is provided for the purpose of identifying sensitive receptors within a 5.6 mile radius (distance to end point) of the plant. This calculation is based on the end result of our Worst-Case Scenario, a complete release (within 10 minutes) of the High Pressure Receiver. The Alternate Scenario results in a distance to end point of 0.3 miles.

5.7 Information

If you are contacted by the media for comment on any incident, politely decline comment and assist the caller in reaching the office of the Plant Manager or Corporate Public Relations. The following is an example of a recommended response:

> ***"Our company is organized to handle media inquiries accurately and quickly. I will report your call immediately to the Plant Manager or Corporate Public Relations."***

5.8 Incident Documentation/Reporting Requirements

A written confirmation report may be required by the US Environmental Protection Agency (CALEPA), as soon as practicable, after the reporting of a discharge. **The Plant Manager and Corporate offices should review and approve this report for accuracy prior to submission to the EPA.** This written confirmation report shall include:

- The name, address, and telephone number of the individual that reported the release;
- The name, address, and telephone number of the individual submitting the confirmation report (if different from the individual reporting the release);
- The source of the release;
- The location of the release, as follows:
  - For discharge from sites located on land; the name of the site, the street address, the municipality, the county, and any state or EPA ID numbers of facilities involved; or
  - For discharge on, under, or into water; the name of the water body, the latitude and longitude of the place the discharge originated, and a map identifying the areas affected by the discharge;
- A list of the chemical name and Chemical Abstract Service (CAS) number and CHRIS Code of each of the hazardous substances discharged; *(Ammonia: CAS #7664-41-7, CHRIS Code "AMA")*
- A list of the quantities of each hazardous substance discharged, including best estimates if the quantities are unknown;
- The dates and times for the following:
  - discharge began
  - discharge was discovered
  - discharge ended
  - agencies were notified
- A detailed description of the measures taken to contain, clean up, and remove the discharge;
- The corrective actions or countermeasures taken, including a description of equipment repairs or replacements; and
- Additional preventive measures taken or proposed to minimize the possibility of recurrence.

Please make sure to contact our Corporate Environmental Operations Director for assistance in preparing this report and where to send it.

6.0 TRAINING & EQUIPMENT

6.1 Training

Emergency Response training is divided into three levels as follows:

- Awareness training, for all employees at the time of hire, and refreshed annually (Evacuation drills **and** written understanding). Additional training for RMP, PSM, PPE, SDS, HazCom, Ammonia Awareness are also covered in the same timeline intervals.
- Additionally, all operators who's jobs categorize them to be working under a "Covered Process" (as defined by 29 CFR 1910.119, our facility's "Covered Process" is Ammonia), will receive PSM/RMP overview training prior to beginning their job, with refresher training every 3 years as defined by corporate guidelines.
- Additionally, all employees who are members of the Hazmat Team (as a Hazmat Technician or Incident Commander) will receive **initial** 24 or 40 hour training, respectively, with annual refreshers at a minimum of 8 hours.

Refer to Table 2-1 to identify the level of training received by each qualified HAZMAT Team member.

In addition to meeting regulatory requirements, the EPRP was organized to be utilized as one of many training resources for Leprino employees, upon who rests the responsibility for making immediate and informed actions to minimize and mitigate an incident. It is Leprino's policy to review the EPRP at least annually and training will occur for all employees when:

- The employee is first hired, with periodic refreshers as defined by guidelines.
- Whenever the employee's responsibilities or designated actions under the plan change, and
- Whenever the plan is changed.

6.2 Respiratory and Hazmat Medical Surveillance And Consultation

Confidential Respiratory Medical Evaluations and Hazmat Medial Surveillances are conducted for all employees required to wear a respirator for daily work tasks and / or for Emergency Response Team members that are expected to wear SCBAs, respirators and/or protective clothing. Respiratory / Hazmat Medical Surveillance would consist of:

- Respiratory Medical Evaluation Questionnaire; for all employees required to wear a respirator for daily work tasks (such as oil draining of Ammonia compressors, etc), in a non-emergency capacity, with a follow up physical only as deemed necessary by the physician. The Questionnaire will be completed on an annual basis.
- Hazmat Physical; for all employees who will participate on the Emergency Response Team. The Hazmat physical would also meet the respirator physical requirement. The extent of the annual checkups will be determined in conjunction with appropriate medical personnel, following the guidelines as defined in the *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (85-115-a), Chapter 5-1 Medical Program,* published by NIOSH (1985).

6.3 PPE And Emergency Equipment

Refer to Appendix E for a site map to locate First Aid Kits, Fire Extinguishers, Eyewash Stations / Safety Showers; Alarm Pull Boxes, Wind Socks and Emergency Operations Center Location(s). Each emergency apparatus center location will contain a specific list of items available for use in response to an emergency. The Plant custodians verify the content of each first aid kit and refill them as necessary. We also maintain supplies and equipment in a HAZMAT trailer, for the complete and updated list of trailer contents see Table 6-1.

Table 6-1: HAZMAT EQUIPMENT INVENTORY

ITEM	QTY	ITEM	QTY
Generator 5500 Watts	1	Tool Kit (Black Case)	1
SCBA Units	7	Extension Cords	3
Spare Tanks	7	Electronic Megaphone	1
Responder Level A Vapor Protective Suits	7	Type II Safety Gas Can 5 gal	2
Level B Hooded Coveralls (L, XL, XXL) 4ea size	12	Portable Flood Lighting w/ stand	2
Brushes	2	Paper Towels	2
Steel Toe PVC Boots (sizes 8, 9, 10, 11, 12, & 13)	24	Lysol Disinfectant	1
Cavcom Communication units	8	Air Horn	8
Thermometer – ear	1	Flashlight (Maglight)	4
Ammonia Monitors	2	Tarp (12ft x 15ft)	3
Back-up tubes and Pump	2	NH_3 Ammonia Leak Detectors	1
Stopwatches	7	Ramfan Portable Blower 25'	1
Chemical Resistant Latex boot covers (L & XL)	36	Universal Earpieces	10
Nitrile Gloves (size 9, 10, & 11)	38	Freestanding Halogen Light Sets	2
Disposable Nitrile Gloves (100 ea)	2	Fiberglass 24' Extension Ladder	1
First Aid Kit	1	Portable Shade Canopy	1
Drum Repair Kit	1	Ventilation Fan	1
Floor Squeegee	2	Stretcher on Wheels	1
Plastic Shovel	1	Trauma Kit	1
Broom	1	Portable pH monitor	1
Non-Sparking Bung Wrench	2	Hazmat Fluid Pump	1
95 Gal Poly Overpack Salvage Drum	1	Four gas portable air monitor – eagle (O_2, LEL, $CH_{1,}$ Co2)	1
Absorbent (40 lb bag)	3	Metal Storage Clips	11
Absorbent (Large Rolls)	2	Cool Draft Misting Fan	1
Drum Upender	1	Spill Kit – oil	1
Decon Pool	2	Storm Drain Seal 36 x 36	1
Caution Barricade Tape	2	Portable Bench 6ft	1
Emergency Response Guidebook	1	Folding Tables 5 ft	2
Fire Extinguisher	2	Sunblock	1
Duct Tape	4	SCBA Suit Tool Baskets	4
Portable Water Spray Unit (Garden Sprayer)	2	Chlorine APR Cartridges	8
5 Gal Bucket for Soap & Decon of Tools	5	Universal APR Cartridges	8
Water Cooler w/ cups	2	Circular Storm Drain Cover 24" ea	2
Ear Muffs	10	Flexible Spill Containment Diking 10' ea	4
Air Purifying Respirators w/ spare cartridges	4	pH Strips, disposable	1
Clipboards	3		
Blood Pressure & Pulse Monitor	1		
Wrist Blood Pressure & Pulse Monitor	1		
Pens	10		
Planning Board, Dry Erase	1		
Dry Erase Marker Kit	1		
Cool Vests	4		
Cryogenic Gloves (over Responder suit)	2		
Positive Pressure Fans	1		

Canopy Tent	1		

6.4 Inspection, Testing, and Maintenance

Leprino makes periodic inspections of the ER equipment, and has a computerized maintenance management system (Maximo) to ensure that maintenance team is reminded to carry out these activities on time. PM's include cleaning and inspection. Inspections are recorded and kept with the equipment log, which is located in the Hazmat Truck. For specifics on ER equipment PM's, inspections, calibration requirements / frequencies or any other information related to specific equipment, refer to the equipment files located in Maximo. PM's are to be reviewed and updated by the Power Team and subsequent results or updates are to be forwarded to the Power Planner / Scheduler for documentation in Maximo.

Appendix A

Controlled Document Distribution Includes:

#1 - Safety Supervisor / *Program Administrator* (CONTROL COPY)

#2 - Plant Managers

#3 - HazMat Trailer

#4 - Lemoore Fire Department (Updated yearly)

#5 - Kings County LEPC (Updated yearly)

#6 – Kings County Fire Department (Updated yearly)

#7 – CERS

Appendix B

EAP to be Updated Annually or when Major Emergency Contacts Change

Controlled Document Log

This log must be kept in the front of the control copy

Revision Number	Revision Date	Sections or Pages Revised	Person Initiating Revision	Initials of Document Owner
	11/1/08	New Electronic version developed	Dave Heinks	DH
1	5/22/09	Updated plant release maps, updated plant ERT checklists, plant hazmat team list, Corporate Contacts	Dave Heinks	DH
2	5/10/10	Updated current plant hazmat team, management team, Corporate Contacts, Hazmat equipment	Dave Heinks	DH
3	5/20/11	Updated current plant hazmat team, plant management team, Corporate Contacts, Hazmat Equipment, ERT checklists	Dave Heinks	DH
4	3/14/12	Updated current plant hazmat team, Hazmat equipment list, sensitive areas Lemoore, plant management team, Corporate Contacts, Bulk chemicals	Dave Heinks	DH
5	6/21/13	Plant Management Team, Corporate Contacts, Bulk Chemicals, Updated HAZMAT team, Updated Plant Release Maps, Plant Evacuation Map, Emergency Vehicle map.	Dave Heinks	DH
6	10/09/14	Updated - Plant Management Team, Corporate Contacts, Bulk Chemicals, Sensitive public receptors in surrounding area, HAZMAT team	Dave Heinks	DH
7	6/25/15	Updated - Plant Management Team, HAZMAT team	Chad Billingsley	CB

8	1/19/16	Updated Alt Case, Worst Case Scenario, public receptors, added reporting form to Appendix "N". Manager and HazMat Team Update.	Chad Billingsley and PSIG	CB
9	4/13/16	EAP to be Updated Annually or Major Changes to Emergency Contacts. Updated Evacuation- 4.6 with SOP for suspicious packages.	Chad Billingsley	CB
10	12/7/16	Updated Appendix "F" , changed color schemes and added phone numbers to #2and #3 on pg12. Removed comment on pg.25 and added vitals. Rotated P&ID, changed pre- qual verbage on page 15 and 18.	Yolanda Sanchez	YS
11	1/4/17	Updated - Plant Management Team and Phone List. HAZMAT Team. Refrigeration System and locations. Changed pre-qual verbage on pg15&18. Updated Bulk Chemicals and Sensitive Public Receptors. Worse case scenario maps.	LEW PSM Team	CB

Appendix C

EMPLOYEE ACCESS TO THE EMERGENCY RESPONSE PLAN

The Emergency Response Plan for the Lemoore Facility is available for all employees to view. The Control Document is kept in the Safety Supervisor's Office. Copies are also available in the following locations:

Safety Office
Power Department Office
Department Managers Office
HAZMAT Truck

If you have any questions regarding the

Emergency Response Plan, please contact your Department Manager or the Safety Supervisor.

Appendix D

SDS

Safety Data Sheets for Onsite Hazardous Materials

CHEMICAL:

Spill – Exposure – Poisoning

Contact: 3E Company

1-800-451-8346

Information you need

when calling 3E with a request:

⇒ **Product Name**

⇒ **Manufacturer Name**

⇒ **Product Number**

3E Company

4920 Carroll Canyon Road, San Diego, CA 92121

Telephone: (619)677-0150

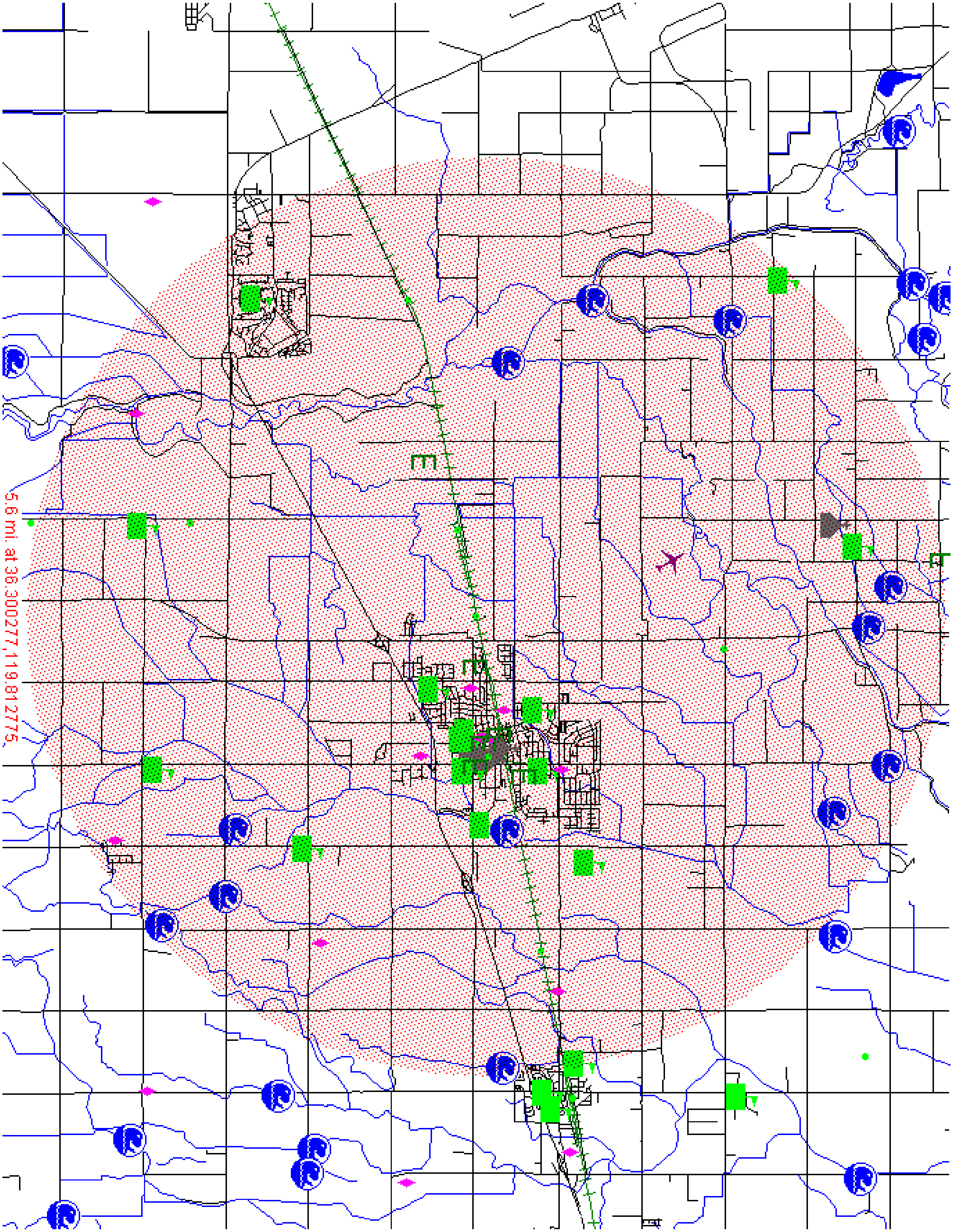
Fax: (619)677-0270

Website: https://www.3eonline.com

Appendix E

Facility Plot Plan and Site Map of Surrounding Community

- ♦ **Lemoore Facility Plot Plan**
- ♦ **Lemoore Facility Site Map**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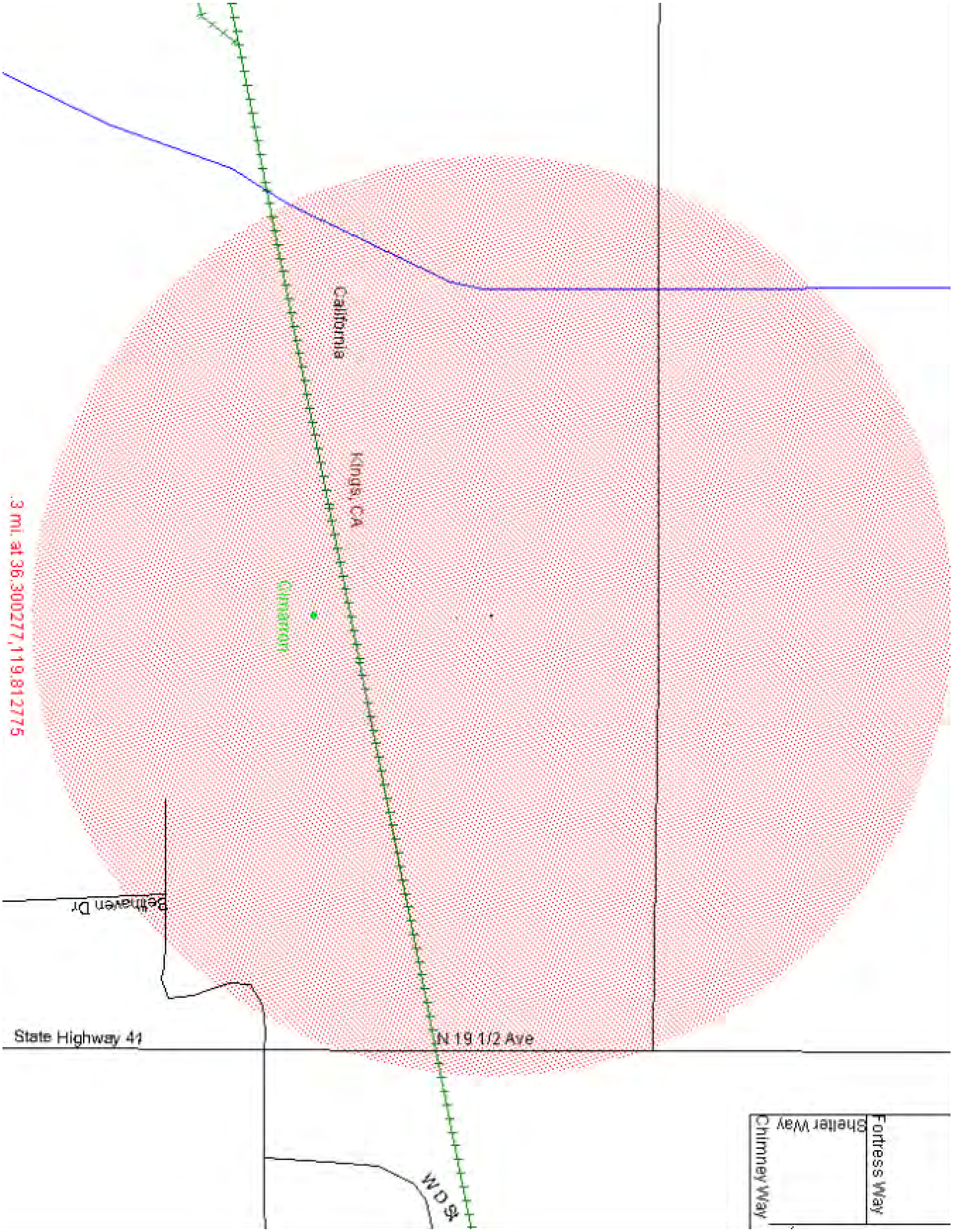
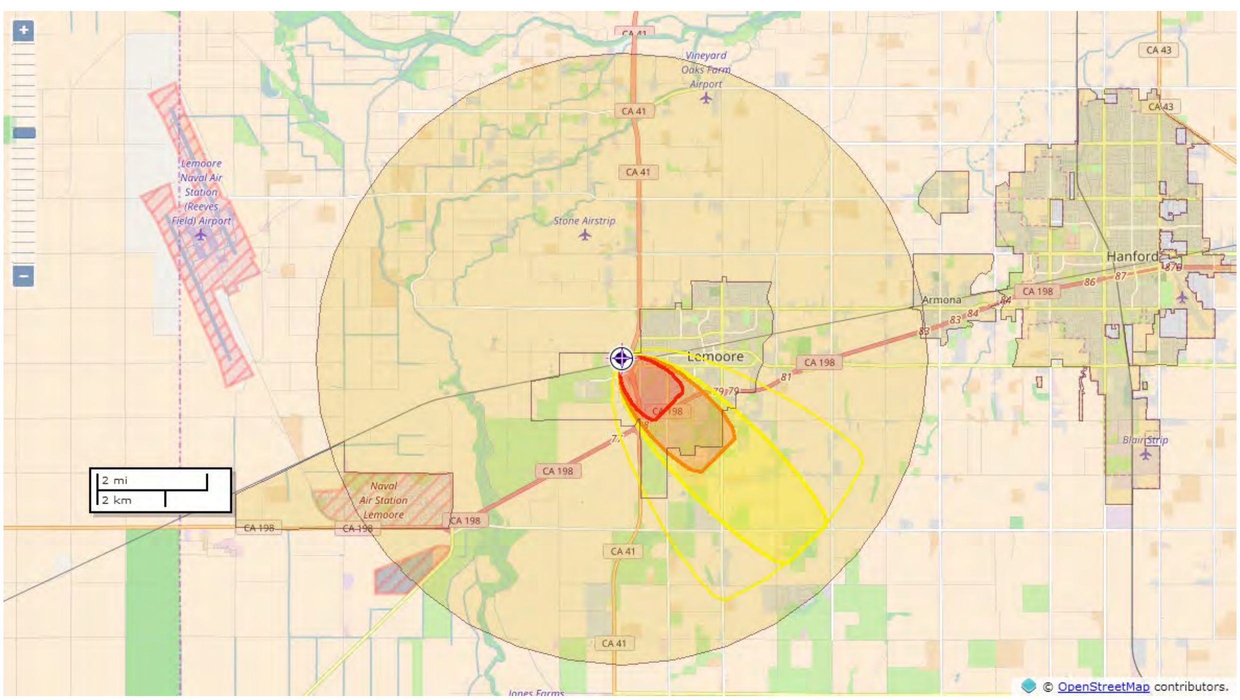
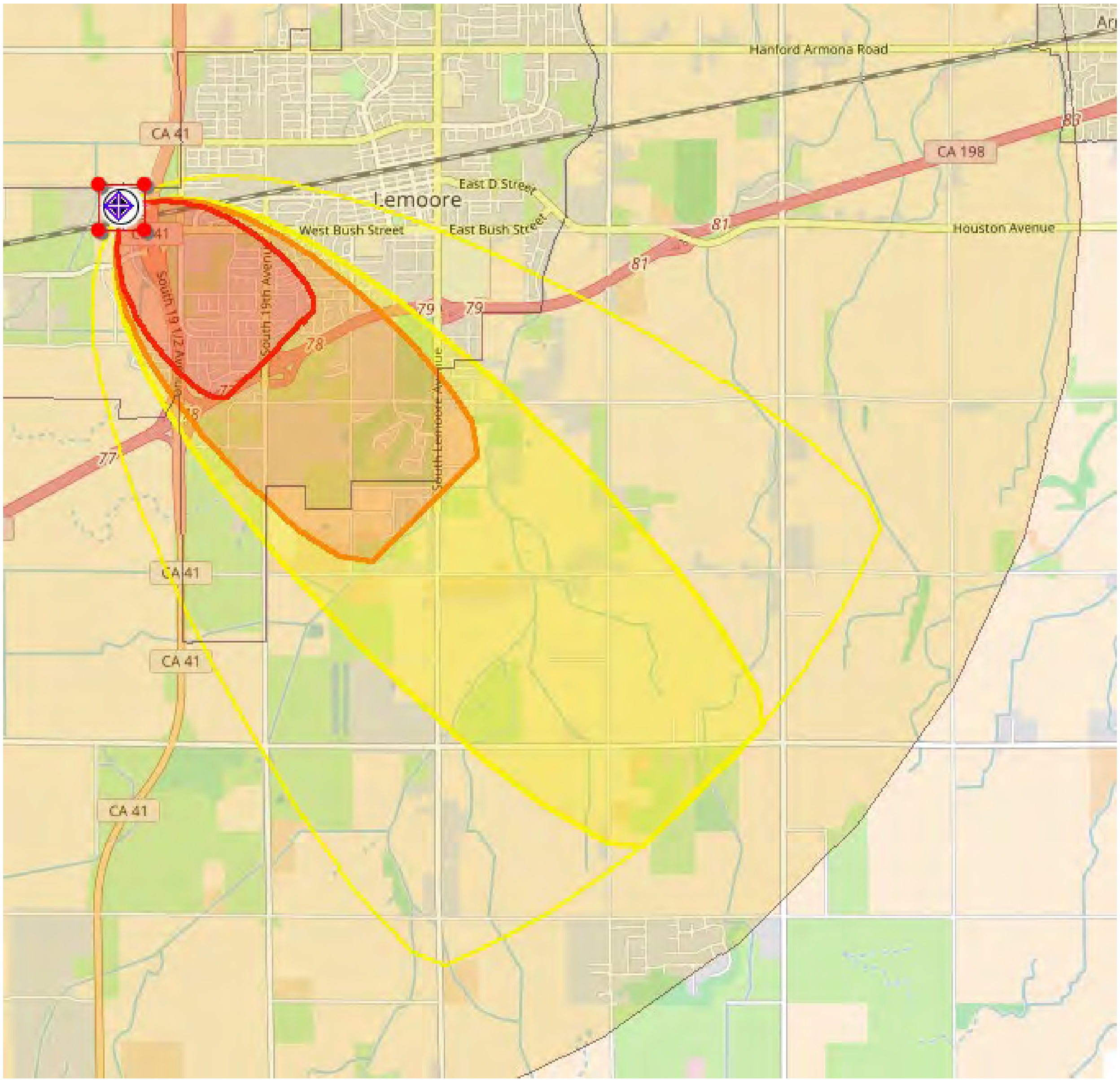
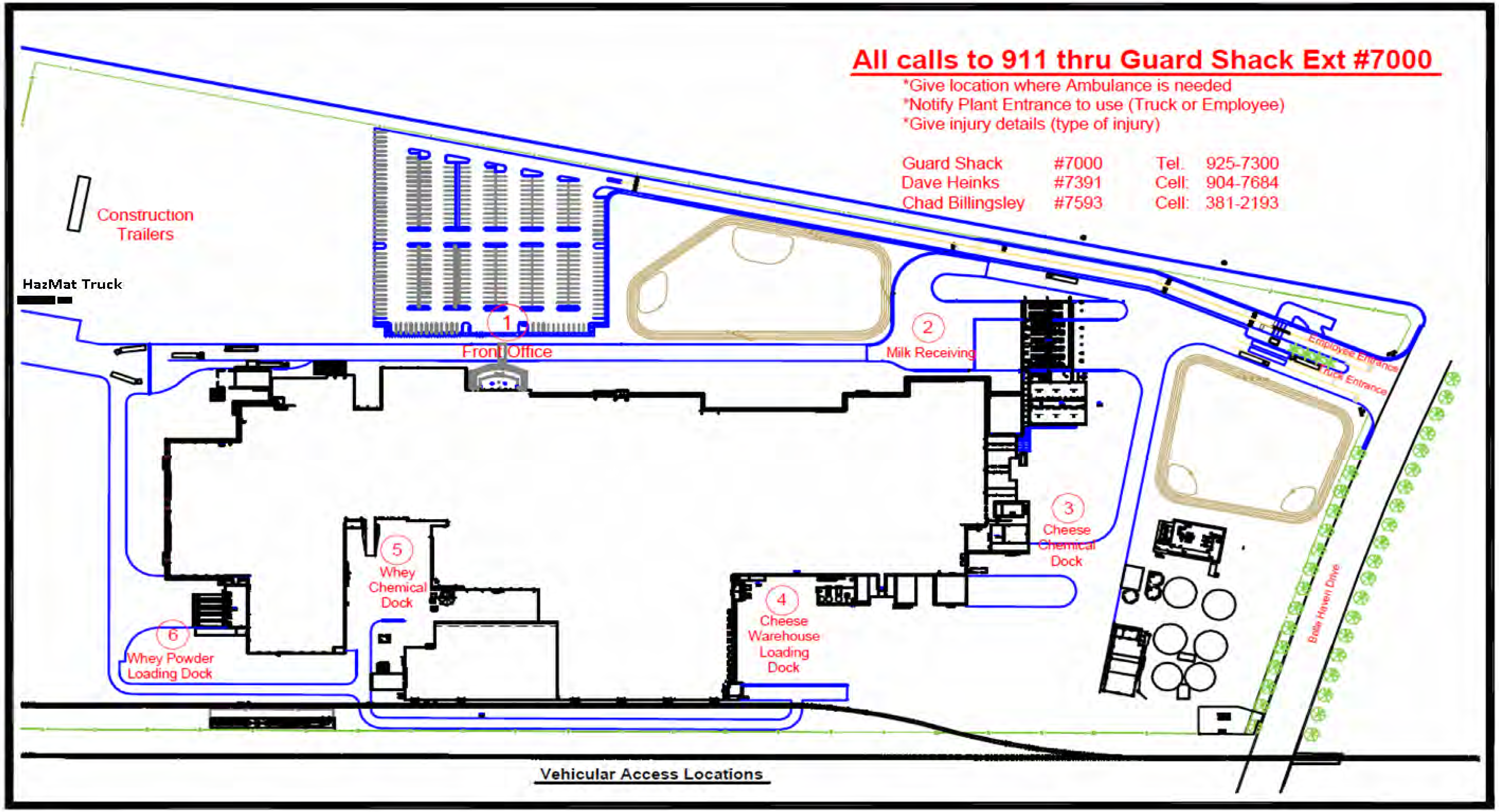

California
Kings, CA
.3 mi. at 36.300277,119.812775
Cimarron
Bethaven Dr
State Highway 41
N 19 1/2 Ave
W D St
Chimney Way
Shelter Way
Fortress Way


CA 41
CA 43
N
W
E
S
Vineyard Oaks Farm Airport
Lemoore Naval Air Station (Reeves Field) Airport
Stone Airstrip
Hanford
CA 198
Lemoore
Blair Strip
CA 41
CA 198
Jones Farms Airport
5 mi
5 km
Stratford Grain and Seed Airport
Newton Field
© OpenStreetMap contributors.


Vineyard Oaks Farm Airport
CA 41
CA 43
Lemoore Naval Air Station (Reeves Field) Airport
Stone Airstrip
Hanford
Armona
CA 198
Lemoore
2 mi
2 km
Naval Air Station Lemoore
Blair Strip
© OpenStreetMap contributors.


Hanford Armona Road
CA 41
Lemoore
East D Street
West Bush Street
East Bush Street
Houston Avenue
CA 198
South 19 1/2 Av
South 19th Avenue
South Lemoore Avenue
CA 41
CA 41
CA 41


All calls to 911 thru Guard Shack Ext #7000
*Give location where Ambulance is needed
*Notify Plant Entrance to use (Truck or Employee)
*Give injury details (type of injury)
Guard Shack #7000 Tel. 925-7300
Dave Heinks #7391 Cell: 904-7684
Chad Billingsley #7593 Cell: 381-2193
Construction Trailers
HazMat Truck
1 Front Office
2 Milk Receiving
3 Cheese Chemical Dock
4 Cheese Warehouse Loading Dock
5 Whey Chemical Dock
6 Whey Powder Loading Dock
Employee Entrance
Truck Entrance
Belle Haven Drive
Vehicular Access Locations

Appendix F

Pre-Entry Checklists

- Incident Commander
- Medical
- Decon
- Responders
- Operations
- Safety
- Scribe
- Staging
- Security
- Liaison
- Plans
- Public Information Officer
- Finance
- Logistics

Incident Commander

Pre-Qualification:	**24 Hour Hazmat and Incident Commander trained**
Page 1 of 3	
Your radio designation is:	"IC"
Report to Location:	Incident Command Post
Mission:	Organize and manage the emergency

☐ Don position identification vest

Obtain briefing from a person with knowledge of the incident

☐ Are all employees and contractors accounted for? ____________________

☐ For injuries: how many? How severe? ____________________

☐ For releases: what chemicals are involved? Exact source? ____________________

____

☐ Estimated amount? Potential impact? ____________________

☐ Are there off-site impacts? ____________________

☐ Is there environmental damage? ____________________

☐ What notifications have been made? ____________________

Assessing potential hazards

☐ Estimate the likely harm if there is no intervention

☐ Effects of toxic, irritating or asphyxiating gases that may be generated

☐ Effects of hazardous surface water runoff

☐ Potential for additional impacts (i.e. due to location of other chemicals, due to wind conditions, etc.)

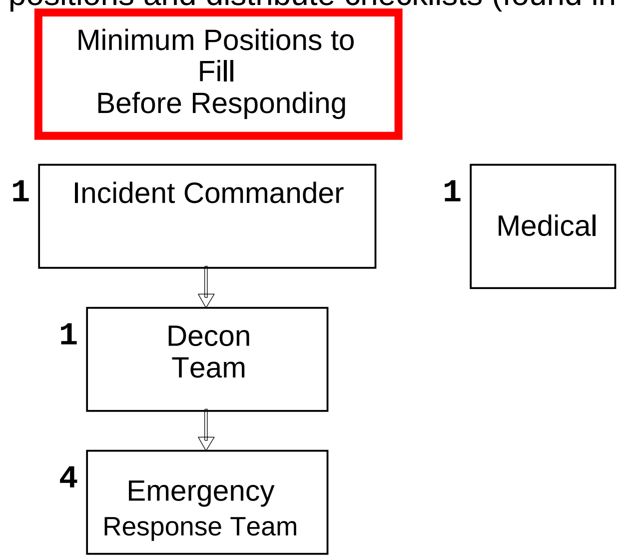
(Over for page 2)

Determine level of emergency

☐ Be sure to make any necessary recommendations to shelter in place, close highways, etc.

☐ Evaluate need for Evacuation of affected areas or entire facility.

☐ Fill necessary ICS positions and distribute checklists (found in HazmatTruck)



☐ Confirm that Information has been notified and is on the way if the event may get media attention.

☐ Notify the National Response Center via the **Liaison**

☐ Develop overall strategy with the **Operations**, **Plans**, and **Safety**.

Offensive - Operating in the Hot Zone to attempt to control the hazard at its source (Examples: patching container leaks, applying a C-kit).

Defensive - Hot Zone is kept clear and personal exposure is minimized. (Example: monitoring a leaky cylinder until it is empty) Most HAZMAT operations at least begin from a defensive point of view ("What happens if we do nothing?").

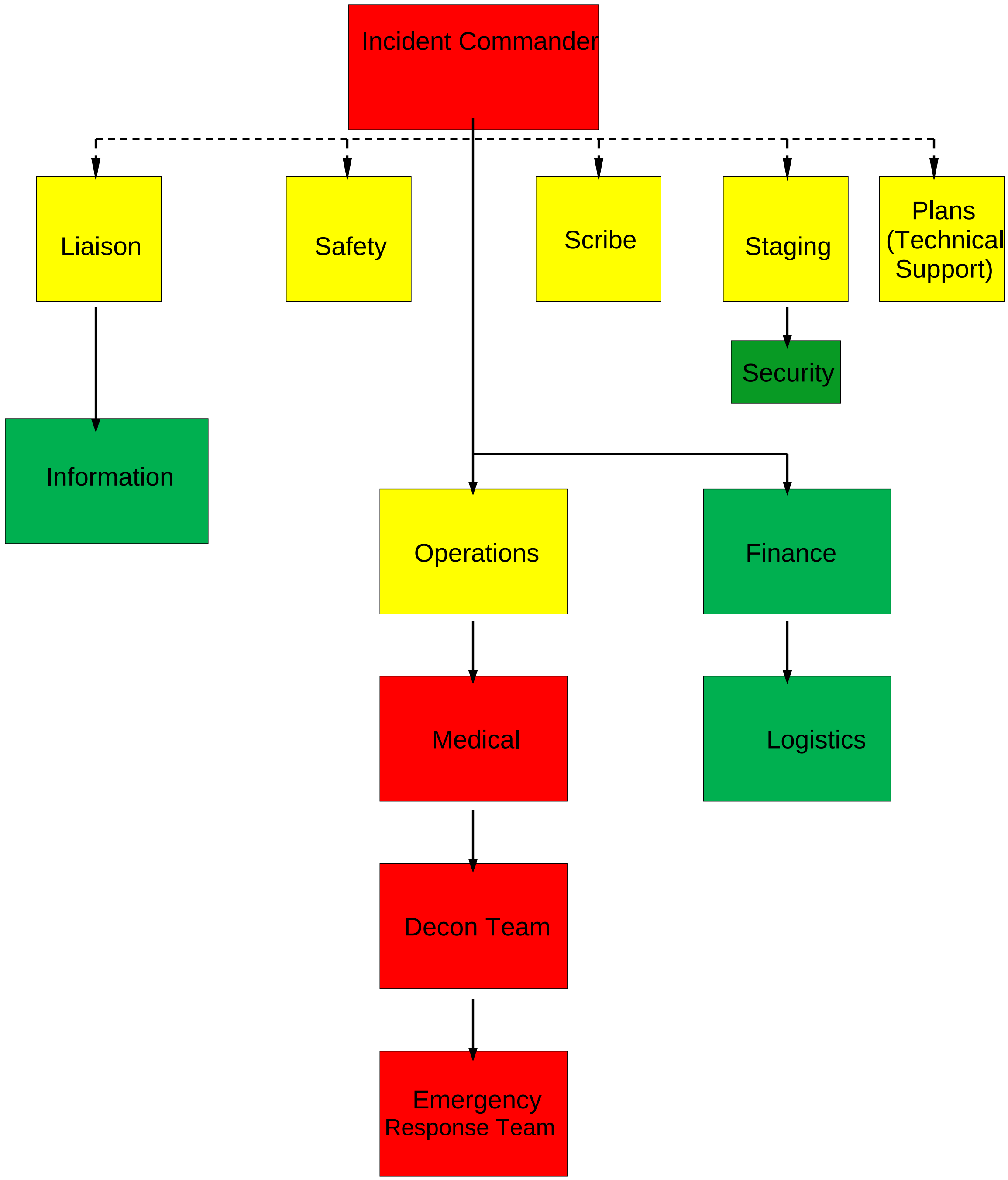
☐ Assign the Radio Channel(s)you want your team on.

☐ Establish the Incident Command Post and relocate there.

☐ Establish unified command with public safety agencies if present.

☐ Implement response plan.

- ☐ Limit personnel to those required at the scene.
- ☐ Coordinate resources.
- ☐ Ensure **<u>Liaison</u>** has made the necessary notifications.
- ☐ Ensure that **<u>Operations</u>** has adequate number of teams available.
- ☐ Provide backup units.
- ☐ Provide for decontamination.
- ☐ What else could go wrong? Think ahead.
- ☐ **Utilize the Incident Organization and field tactical worksheet provided in the IC Binder /Hazmat Truck.**


Incident Commander
Liaison
Safety
Scribe
Staging
Plans (Technical Support)
Security
Information
Operations
Finance
Medical
Logistics
Decon Team
Emergency Response Team

Medical

Pre-Qualification:	**Must be 1st Aid / CPR Trained**
Page 1 of 1	
Your radio designation is:	Medical
Reports to:	Operations
Reports to Location:	Incident Command Post
Mission:	Attend to the injured

- ☐ Assess medical needs and render first aid.
- ☐ Report medical care personnel and equipment needs to the IC.
- ☐ Establish ambulance-loading area.
- ☐ Ensure casualties exposed to hazardous materials have been decontaminated (by the Plant's Decon) before transportation.
- ☐ Provide appropriate SDSs or summary sheet to the outside emergency medical services staff.
- ☐ Call 3E at 1.800.451.8346 for medical and toxicological information.
- ☐ Medically monitor the ERT's pulse, blood pressure, etc.

See Next Page

PRE/POST
Medical Monitoring/Vital Signs:

MAPR = Maximum allowable pulse rates must be calculated using the formula (220-(age) X.7)=MAPR (maximum allowable pulse rate). All response personnel's pulse, temperature blood pressure (no greater than 160/100) and MAPR should be listed on this sheet prior to the response.

RESPONDER 1 NAME:

	DATE	TIME	BP	TEMP	PULSE	RESP	WEIGHT
PRE							
POST							

RESPONDER 2 NAME:

	DATE	TIME	BP	TEMP	PULSE	RESP	WEIGHT
PRE							
POST							

BACK UP 1 NAME:

	DATE	TIME	BP	TEMP	PULSE	RESP	WEIGHT
PRE							
POST							

BACK UP 2 NAME:

	DATE	TIME	BP	TEMP	PULSE	RESP	WEIGHT
PRE							
POST							

Decontamination

Pre-Qualification:	**Must be Level B Certified, Passed Fit Test, Received 24 Hour Training and Current on 8 Hour Refresher.**
Page 1 of 1	
Your radio designation is:	"Decon"
Reports to:	Operations
Reports to Location:	Incident Command Post
Mission:	Decontaminate personnel and equipment prior to return to the Cold Zone.

- ☐ Set up the decon area between the hot zone and the warm zone treatment/triage area.
- ☐ Establish decon area for the Fire Department or other outside agencies.
- ☐ Mark decon area.
- ☐ Put on proper PPE.
- ☐ Use the proper decon procedure:
  - Drop tools.
  - Primary decon.
  - Rinse.
  - Remove PPE except for SCBA face-piece.
  - Wash and rinse inner gloves.
  - Remove inner gloves and SCBA face-piece.
  - Shower.
  - Re-dress.
  - Medical evaluation.
- ☐ Contain water from the decon process.
- ☐ Assure all contaminated persons are decontaminated, including fatalities.
- ☐ Assure contaminated clothing and equipment are bagged and left at the scene.
- ☐ Identify emergency care needs of casualties in the decon area.

Responders

Pre-Qualification:	**Must have passed physical & fit test, received 24 Hour Hazmat Training and Current on 8 Hour Refresher Training.**
Page 1 of 2	
Your radio designation is:	"Response Team 1" or "Response Team 2"
Reports to:	Operations
Reports to Location:	Incident Command Post
Mission:	Rescue and mitigation

- ☐ Secure the hot zone area to prevent unintentional entry.
- ☐ Don PPE as selected by Safety and check radio's for functionality.
- ☐ Identify the nature of the emergency and materials involved, if any.

Under direction of the Operations, enter the Hot Zone to:

- ☐ Remove trapped and confined casualties.
- ☐ Transport casualties to the treatment area.
- ☐ Decontaminate casualties and rescuers.

Control or contain the emergency.

- ☐ Neutralize hazards to casualties and rescuers.
- ☐ Suppress and control releases following the Operations plan.

Over for Page 2

While in the Hot Zone, obey responder safety rules:

- ☐ Avoid contact with hazardous substances and contaminated surfaces.
- ☐ Avoid walking through releases.
- ☐ Always have an escape route.
- ☐ Know what you're going to do before entering the Hot Zone.
- ☐ Maintain contact with the backup rescue crew.
- ☐ Decontaminate before leaving the Warm Zone and before eating or drinking.

Operations

Pre-Qualification:	Must be First Responder Operations Trained
Page 1 of 2	
Your radio designation is:	Operations
Reports to:	Incident Commander
Reports to Location:	Incident Command Post
Mission:	Manage incident tactical activities

Establish a command post at the scene of the emergency and take over control of the ERT from the Lead Operator.

- ☐ Don position identification vest.
- ☐ Obtain briefing from Incident Commander.
- ☐ Get trained responders and distribute checklists.(Located in Hazmat truck)
- ☐ Emergency Response Team. Need 4-6 Responders.
- ☐ First Aid Team. Need 1 Employee, or Outside Medical Service (ambulance)
- ☐ Decontamination Team. Need 1-2 Employees.
- ☐ Establish the command post.

Confirm that the area is secured.

- ☐ Isolate people from the problem.
- ☐ Isolate the Hot Zone.
- ☐ If the situation warrants, recommend the protective action for the community to the Incident Commander.
- ☐ Confirm materials involved; Estimate potential external impact and impact on plant operations.
- ☐ Coordinate with plant operations to continually monitor production unit and or shut-down operations if necessary.

Over for Page 2

Rescue the injured

- ☐ Devise a plan before entry.
- ☐ Discuss rescue plan with the Incident Commander.
- ☐ Rescue the injured.
- ☐ Have ERT don proper PPE.
- ☐ Have a backup rescue crew.
- ☐ Use the buddy system.
- ☐ Have an escape route.
- ☐ Avoid contact with hazardous substances. Avoid walking through releases.
- ☐ Obtain medical assistance.
- ☐ Request outside aid as necessary.

Mitigate the release

- ☐ Devise a plan before entering the Hot Zone.
- ☐ Contain = divert, dike, suppress.
- ☐ Stop = shut off, plug, patch, transfer.
- ☐ Discuss mitigation plan with the Incident Commander.
- ☐ Coordinate activities with outside responders, if any.
- ☐ Inform the Incident Commander of resource needs.
- ☐ Identify the need for relief personnel.
- ☐ Clean up the site to restore safety to the people and the environment.
- ☐ Establish unified command with public safety agencies, if they are present.

Safety

Pre-Qualification: Page 1 of 3	**24 Hour Hazmat and CPR & First Aid**
Your radio designation is:	"Safety"
Reports to:	Incident Commander
Reports to Location:	Incident Command Post
Mission:	Assess hazards and at risk conditions

Work first hand with the operations on PRE-entry decisions

- ☐ Don position identification vest.
- ☐ Get briefing from the incident commander (IC)
- ☐ Evaluate situation and determine if evacuation is needed or get input from the lead shift supervisor if the evacuation has already been initiated.
- ☐ Use air monitoring equipment to identify the green and yellow zone for decon placement.

Hot Zone
Hot Zone is the area where potential for contamination is expected. Requirements include complete and appropriate protective clothing. Entry requires approval by the Incident Commander. Complete backup rescue teams must be in place at the perimeter before operations begin. ERT personnel only.

Warm Zone
Warm Zone represents an area where decontamination activities are conducted.

Cold Zone
The Cold Zone is the area outside of the warm zone that is free of contamination and is used to support activities. This zone includes the incident command post, the staging area, agency representatives and usually the media.

Over for page 2

☐ Perform functional check on response radio's (ensure radio's are on proper channel)

☐ Prescribe personal protective equipment for the responders according to the following levels.

Level A (highest protection for skin, eyes and respiratory system).

☐ Positive pressure SCBA.
☐ TECP [Totally Encapsulated Chemical (Gas Tight) Protective Suit].
☐ Two-way radio.

Level B (liquid and vapor exposure, above IDLH). Level B protection is the minimum recommended on initial site entry until the hazards have been further identified and defined by monitoring. Lesser skin and eye protection than Level A.

☐ Chemical resistant gloves/boots
☐ Positive pressure SCBA.
☐ Hooded chemical suit or encapsulating chemical suit.
☐ Two-way radio.

Level C (less than IDLH exposures, no oxygen deficient atmospheres). Skin and eye exposure is unlikely.

☐ Chemical resistant gloves/boots
☐ Full face-piece air purifying respirator.
☐ Hooded chemical suit.

Level D (no airborne hazard).

☐ Chemical resistant gloves/boots as necessary.
☐ No respirator necessary.

☐ **Prescribe PPE required for decon team. (Generally one level below Response Team)**

During Equipment Donning:

☐ Inform the response and decon personnel of the effects of exposure to hazardous materials involved using the chemical cheat sheets.

☐ Advise the ERT of site entry points.

☐ Minimize the number of people operating in the contaminated area.

Responder # Name	Air level in SCBA	Time on Air	Time off Air	Air level in SCBA after entry
1				
2				
3				
4				
5				
6				

☐ **Monitor and track the use of air in SCBA units.**

☐ **Check and track the radiant heat index.**

Time	Air Temp	Humidity	Rel. Heat Index	Wind Speed

☐ Monitor personnel for signs or symptoms of exposure to hazardous materials or heat stress. Consider potential time limitation of personnel and fatigue.

☐ Supervise decontamination from outside the affected area.

☐ Debrief entrants after they have been decontaminated and log hot zone activities.

☐ Stop any activities you consider at risk.

☐ Suspend entry operations when necessary.

Scribe

Pre-Qualification:	**Eye for detail, excellent at taking notes, spelling.**
Page 1 of 2	
Your radio designation is:	Scribe
Reports to:	Incident Commander
Reports to Location:	Incident Command Center
Mission:	Record all directions from the IC and direct reports
Responsibilities:	Document the functions that the IC dictates (e.g., conversations of the meetings and attendees). See Page 2

- ☐ Don position identification vest
- ☐ Get briefing from IC
- ☐ Update information board as needed.
- ☐ Update organizational chart as needed.

Over for Page 2

Hazardous Material Release Initial Information			
Date	Incident Number		
What happened?	Wind Direction		
	Outside air temperature		
	Temp. in the area of the spill		
When did it happen?			
Where did it happen?			
Who reported it?			
For any of the following questions answered “No”, list the planned action items below.			
Has the area been evacuated?	Yes	No	Time
If evacuated, have all employees been accounted for?	Yes	No	Time
Has facility management been notified?	Yes	No	Time
Has Corporate Offices been notified?	Yes	No	Time
Has the Fire Department been notified?	Yes	No	Time
Have the State Police been notified?	Yes	No	Time
Has LEPC been notified?	Yes	No	Time
Has EPA been notified?	Yes	No	Time
Were there any injuries?	Yes	No	
Are there medical personnel at the site?	Yes	No	
What type of chemical has been spilled?			
What types of chemicals are in the area?			
Any physical hazards in the area?			
What has been done so far?			

Staging

Pre-Qualification:	
Page 1 of 1	
Your radio designation is:	Staging
Reports to:	Incident Commander
Reports to Location:	Incident Command Post
Mission:	Control of outside resources prior to their operational assignment

- ☐ Don position identification vest.
- ☐ Determine where to establish the staging area, normally on LFC property.
- ☐ Select Security
- ☐ Inform Security to direct all arriving units to the staging area.
- ☐ Identify plant ingress and egress routes if necessary.
- ☐ Direct outside agency personnel to the Operations.
- ☐ Dispatch outside resources to the emergency scene when requested by the Operations.

Security

Pre-Qualification:	
Page 1 of 1	
Your radio designation is:	Security
Reports to:	Staging
Reports to Location:	Incident Command Post
Mission:	Control entrance to facility

- ☐ Don position identification vest.
- ☐ Unless the evacuation alarm has sounded, secure to grounds.

Check with Liaison where to direct agency personnel and emergency equipment.

- ☐ Agency personnel should be instructed to go to IC Post.
- ☐ Keep an open path for emergency vehicles.

Notify the Information if reporters appear.

- ☐ Inform any reporter that a Company Official will be available.
- ☐ For their safety, reporters and media personnel shall not be allowed access to the site. These people should be asked to congregate at an off site designated location.

Note: Only Information or their designee is authorized to make statements to the press. Security should not answer any questions from the public or the media, or respond to inquiries from Police, Fire or other Public Officials. When inquiries come from any source about emergency situations, the Security should respond courteously by obtaining the name and number of the caller and saying someone will call them promptly with a response. They should then convey the message to Information.

- ☐ Make appropriate entrees on the Emergency Incident Check-in List.

Liaison

Pre-Qualification:	
Page 1 of 2	
Your radio designation is:	"Liaison"
Reports to:	Incident Commander
Reports to Location:	Command Post
Mission:	Communicate incident information internally and to outside agencies.

☐ Don position identification vest.

☐ Make all appropriate internal and external (agency) reports and notifications.

External reports

Should the emergency threaten public health or the environment or should community evacuation become advisable, the Incident Commander will direct you to take the actions listed in the LFC Emergency Response Plan.
Hazardous material emergencies will likely trigger regulatory reporting obligations.

1. Contact NRC: 1-800-424-8802 "The loss quantity is unknown, release is ongoing and LFC will call to revise the report once the loss is stopped and estimated or periodically every hour for non-controllable releases."

2. Contact OES: 1-800-852-7550 (when applicable) "The loss quantity is unknown, release is ongoing and LFC will call to revise to report once the loss is stopped and estimated or periodically every hour for non-controllable releases."

3.. Contact Kings County LEPC: (559)584-1411 (when applicable) "The loss quantity is unknown, release is ongoing and LFC will call to revise to report once the loss is stopped and estimated or periodically every hour for non-controllable releases."

4. Call OSHA if hospitalization of three or more employees or if a death occurs 1-800-321-6742.

Over for Page 2

Internal reports

- ☐ See LFC SAF3501
- ☐ Establish a sign-in list for the people entering or leaving the Command Post.
- ☐ Note in the operating record the time, date and details of any hazardous waste incident that requires implementation of the Emergency Response Plan. Within 72 Hours after such incident, a written report will be submitted to the LFC Director of Maintenance Operations.

  Nikolaus Despain
  Fax (303) 209-6045
  Work (303) 480-2932
  Cell (303) 547-6974

- ☐ Record incidents in the operating log (for use for LFC loss investigation):

  - Location and date.
  - Nature of emergency or source, quantity and cause of release.
  - Weather information.
  - Injury log.
  - Corrective Action.
  - Chronological recording of significant events.

Plans (Specialist)

Pre-Qualification:	**Must possess technical expertise**
Page 1 of 1	
Your radio designation is:	Plans
Reports to:	Incident Commander
Reports to Location:	Incident Command Post
Mission:	Assist incident commander by providing technical advice and strategy development.

- ☐ Don position identification vest.
- ☐ Provide technical support to the incident commander.
- ☐ Provide drawings and technical documents as needed.
- ☐ Man a radio and assist incident commander as necessary.
- ☐ Report atmosphere conditions, wind direction, speed, and temperature.

Information

Pre-Qualification:	
Page 1 of 3	1.3
Your radio designation is:	"Information"
Reports to:	Liaison
Reports to Location:	Incident Command Post
Mission:	Manage communications with media and families.

- ☐ Don position identification vest.
- ☐ Contact LFC Sr. Vice President of Logistics and Business Development Mike Reidy if appropriate.
- ☐ Notify injured employee's families.
- ☐ Call in Hazmat Team members. (Local Team Members)
- ☐ Setup media congregation area in the administration building. Provide media with general company information and known facts cleared for release.
- ☐ Provide media with pre-approved statement. (See Back - Page 3)
- ☐ Obtain briefing from Liaison. Maintain contact to receive updates form Liaison throughout the emergency. Be sure to obtain the following critical information as quickly as possible:

  - Time of incident.
  - Time of ambulance arrival (if appropriate).
  - Time when Community Warning System was sounded.
  - Agencies arrival on site.
  - Time when all required agency notifications were completed.
  - Shelter-in-place, evacuations or road closure details.
  - Known injuries.
- ☐ Coordinate with Liaison and counterparts representing the various emergency response agencies.
- ☐ Use media to send information about the situation.
  - Injuries or not
  - Media does not get the name of the injured person.
  - If injuries have occurred, Leprino Foods will contact family/significant others.

Over for Page 2

Tips for Communicating with the Public/Media

Below are some tips for communicating with the public or media in the event they should arrive at the scene and begin asking questions.

- Do not assume facts or make preliminary conclusions or guesses. If you do not know, say so. (e.g., “We will look into that.” Or “The safety of our employees is our first priority. We are still looking into this matter and gathering the facts so that we may fully assess the situation.”)
- Do not take on liability or responsibility. (e.g., Do Not Say: “We made a mistake. We should have done… “ or “We believe additional training is necessary”)
- Avoid discussion of any previous incidents. (e.g., “At this time, we decline to comment on incidents in the past, as it is critical that we stay focused on the situation at hand.”)
- Do not mention any employee names.
- Do not make promises.

PRESS RELEASE SAMPLE: AMMONIA

[Do not release until authorization of the Sr. Vice President of Logistics and Business Development has been obtained]

Leprino Foods is a cheese manufacturing company. We employee 1000 employees working 3 shifts 7 days a week. After the cheese has been manufactured, it is important to properly cool. Ammonia refrigeration is used for that purpose.

The Ammonia refrigerant is circulated in a closed system to produce this refrigeration. Ammonia is one of the oldest and universally available refrigerants in use throughout the world today. Ammonia is a compound of nitrogen and hydrogen. It is found in its natural state in the atmosphere. It will cause no harm to the ozone layer if accidentally released.

One advantage of Ammonia is its self-alarming qualities. It has a pungent odor and will alert anyone to its presence. This factor will be an indication for the person to leave the area.

As with any compressed gas, there is always a chance of leak or spill. Valves could break, pipes could rupture and the buildings may have to be evacuated to protect the workers. A gas cloud may form that might threaten nearby personnel and force evacuation. If this occurs, ample notice will be given for a safe evacuation. Generally, the gas cloud is not a problem, since Ammonia is lighter than air and if released outdoors, it will rise into the atmosphere.

In the unlikely event that this occurs, we have highly trained hazmat personnel on-site that can quickly act to control or contain the leak or spill. These people are specially trained individuals that are trained according to OSHA guidelines. They have the equipment and training to quickly bring a halt to any leaks or spills.

To further explain the effects of Ammonia, farmers use Ammonia as a crop fertilization use this same Ammonia. In fact, farmers use 90% of all the Ammonia produced in the world today.

If you were in the close proximity of an Ammonia spill, you would notice tearing of the eyes and irritation to the nose and throat. Normally this condition will clear immediately when you are clear of the area.

Finance

Pre-Qualification:	**Must have spending authority for the facility**
Page 1 of 1	
Your radio designation is:	Finance
Reports to:	Incident Commander
Reports to Location:	Incident Command Post
Mission:	Manage financial concerns of the incident

- ☐ Designate Logistics
- ☐ Keep track of personnel hours.
- ☐ Direct Logistics in procurement of equipment and support materials.
- ☐ Keep records of all transactions.

Logistics

Pre-Qualification:	
Page 1 of 1	
Your radio designation is:	“Logistics“
Reports to:	Finance
Reports to Location:	Incident Command Post
Mission:	Obtain and control support needs

- ☐ Don position identification vest.
- ☐ Obtain briefing from the Finance.
- ☐ Assess immediate incident supply/procurement requirements.
- ☐ Order supplies and services as needed to support incident activities.
- ☐ Coordinate activities with the Finance
- ☐ Order and release contract resources as directed by the Financial
- ☐ If necessary, order meals, general supplies, portable restrooms, etc.

Appendix G

Leprino Foods, Lemoore West
Incident Commander's Checklist / Hazardous Material Release Information Sheet

Date of release: ______________________________
Agency reported to: ______________________________
Person Reported to: ______________________________
Case or Incident Number: ______________________________
(If more than one agency is contacted, use Appendix C, Page 5)

Name (person reporting incident):		Title:
Affiliation:		Phone #: Extension #:
Site Address: Immediate Offsite Impact Effect: YES NO		
City:	County:	State:
Time of Release: (circle one) ESTIMATED or ACTUAL	Duration: (circle one) PROJECTED or ACTUAL	End Time:
Weather Condition, wind direction / speed:	Outside air temperature:	Temperature in spill area:
Describe what happened and exact location in plant:		
Brief description of measures taken to terminate release:		
Actions taken to contain, clean up and remove any hazardous substances discharged:		
Chemical Name(include CAS #):		Estimated quantity of discharge:
Who made first finding or report?	Date:	Time:

LIST THE PLANNED ACTION ITEMS ON A SEPARATE SHEET FOR ANY OF THE FOLLOWING QUESTIONS ANSWERED "NO,"			
1. Has the area been evacuated?	YES	NO	TIME:
2. If evacuated, have all employees been accounted for?	YES	NO	TIME:
3. Has facility management been notified?	YES	NO	TIME:
4. Has the Fire Dept been notified?	YES	NO	TIME:
5. Has LEPC been notified?	YES	NO	TIME:
6. Has EPA been notified?	YES	NO	TIME:
7. Were there any injuries?	YES	NO	TIME:
8. Are there medical personnel at the site?	YES	NO	TIME:
9. What type of chemical has been spilled?	Estimate Quantity:		
10. What type of chemicals are in the area?			
11. Any physical hazards in the area?			
12. What has been done so far?			

Completed By:______________________ Safety Supervisor: ______________________
Plant/Prod Mgr:______________________ Plant Engineer: ______________________

THE FOLLOWING IS A POSSIBLE SCRIPT TO USE WHEN MAKING AGENCY NOTIFICATIONS (Use the I/C Checklist / HazMaterials Release Info Sheet to provide the information for the script):

- This is Leprino Foods at 351 N. Belle Haven, Lemoore CA 93245
- My name is ***(state your name)***.
- I am the ***(insert your position at facility)***, and my telephone number is (559) 925-7300
- I am calling to report a release of ***(insert name of material)***.
- This leak occurred at ***(insert time and date)*** and has/has not been contained as of this moment. **OR** This leak occurred at ***(insert time and date)*** and is ongoing and is not expected to be contained/stopped until ***(estimate time leak will be stopped).***
- This is a ***(choose one)***:
  - **Site Emergency**:Release has occurred and will probably not have an off-site impact.
  - **General Emergency**: Release has occurred which will probably have an off-site impact.
- The estimated quantity of ***(insert name of material)*** released is ***(insert quantity or unknown)***.
- The current weather conditions, as measured at the plant, are a wind speed of ***(insert speed)*** in a direction that is ***(insert from - to direction)***.
- We have ***(insert number)*** of injured personnel who ***will or will not*** require medical assistance.
- We ***need or do not need*** your assistance at this time to ***(describe what you need).***
- Please tell me my case number: ____________________________ ***(Write number here)***
- Please spell your name so that I may record it properly ____________________________
- Do you have any questions for me about the incident?

SIZE UP

On a drawing of the area indicate the following:

1. Probable spill location.
2. Safest point of entry.
3. Routes of exit once inside.
4. Delineate the hot zone.
5. Identify the cold zone and the command post.
6. Identify decontamination areas.

ACTION

1. Move equipment to the cold zone. This includes all self-contained breathing apparatus, encapsulated suits, ropes, flashlights, drinking liquids, materials for decontamination, fans, first aid supplies, ladders, tools, etc.

2. Setup decontamination area. Establish 2 equipped decon personnel prior to responder entry.

3. Equip two responders with self-contained breathing apparatus and sampling equipment

4. Equip a 3rd & 4th responder and have them stay at the edge of the hot zone and ready to respond should the first two responders have issues.

5. Send the first two responders to the incident and have them take a sample just inside the doorway to the spill area.

6. Based on the reading, the type of protective clothing that is required can be determined. (Since Ammonia is harmful to the skin, chemical suit protection is required.)

7. Confirm ventilation fan has automatically started.

8. After the spill site has been secured, the responders will exit and go to the decontamination area. They will have to be washed down, all personal clothing, boots, etc., using a surfactant detergent.

POST OPERATIONS

Time leak was secured:

Estimated duration of release:

Time building was safe to re-enter:

Decontamination:

1. Time complete:
2. Method of disposal of contaminated water:
3. Equipment cleaned and stored:

Self-Contained Breathing Apparatus:

1. Bottles refilled: YES ☐ NO ☐
2. Cleaned and disinfected: YES ☐ NO ☐
3. Stored properly: YES ☐ NO ☐

Calculate the amount of chemical lost, and if above reportable quantities, make the suitable reports.
Complete? YES ☐ NO ☐

Have each member of the response team write a short report of his actions during the emergency.
Complete? YES ☐ NO ☐

Conduct a critique of the operation.
Complete? YES ☐ NO ☐

CLEAN-UP

Determine the chemical concentration remaining. This is done by sampling.

Use one or all of the three methods for elimination of the contamination.

- Ventilation
- Absorption
- Neutralization

LOG OF EMERGENCY RESPONDERS

Name: ______________________ Time Entry: _______ Time Exit: ________

Name: ______________________ Time Entry: _______ Time Exit: ________

Name: ______________________ Time Entry: _______ Time Exit: ________

Name: ______________________ Time Entry: _______ Time Exit: ________

Name: ______________________ Time Entry: _______ Time Exit: ________

Name: ______________________ Time Entry: _______ Time Exit: ________

Name: ______________________ Time Entry: _______ Time Exit: ________

Name: ______________________ Time Entry: _______ Time Exit: ________

Name: ______________________ Time Entry: _______ Time Exit: ________

Name: ______________________ Time Entry: _______ Time Exit: ________

LOG OF DETECTOR READINGS:

TIME	LOCATION	READING

TELEPHONE BOMB THREAT CHECKLIST

KEEP CALM: Do not get excited or excite others.

TIME: **Call Received:**______________am/pm **Terminated**:_______________am/pm

EXACT WORDS OF CALLER:____

____

DELAY, Ask Caller to Repeat…

Questions you should ask:

a. What time is bomb set to explode?____

b. Where is it located? Floor___________________Area_____________________________

c. What kind of bomb is it?____

d. Describe it to me:____

e. Why do you want to kill or injure innocent people?________________________________

____

Voice Description:

☐ Male ☐ Female

☐ Calm ☐ Nervous

☐ Young ☐ Old ☐ Middle Aged

☐ Rough ☐ Refined

Accent ☐ Yes ☐ No Describe:____________________________________

Speech Impediment ☐ Yes ☐ No Describe:__________________________

Unusual Phrases?____

Recognize voice? If so, who do you think it was?____

Background Noise:

☐ Music ☐ Running Motor (type)____

☐ Traffic ☐ Whistles ☐ Bells

☐ Horns ☐ Aircraft ☐ Tape recorder

☐ Machinery ☐ Other ____

Additional Information:

a. Did caller indicate knowledge of the facility? If so, how? In what way? _______________

b. What line did the call come in on? ____

c. Is the number listed? ☐ Yes ☐ No

d. Private number? __________________________________Whose? __________________

Signature of Person Who Received Call:___________________________________ Date:______________

Appendix H

Critical Plant Operation
Emergency Shut Down Procedures

MAINTENANCE – UTILITIES

Natural Gas Main Shut Off

Sub Station & Secondary Electrical Shut down

Backup Generator

PRODUCTION

Cheese Department

Packaging Department

Whey Department

Critical Plant Operation
Emergency Shut Down Procedures

MAINTENANCE – UTILITIES

Natural Gas Main Shut Off

1. The main gas line feed valve is located just at the south end of the property line, southeast of the boiler room. To shut off all feed to the plant close the valve closest to the ground on the east end of valve train. You will need to take an adjustable wrench that will open up to 2 ¼”. There are no padlocks that are used to secure the valve actuator. Use the wrench close the valve according to the arrows stamped on the valve stem.

2. Communicate with all affected departments and personnel.

3. Lock Out / Tag Out as needed.

4. Evacuate to the Designated Assembly Area

Critical Plant Operation
Emergency Shut Down Procedures

MAINTENANCE – UTILITIES

Sub Station & Secondary Electrical Shut down

1. The main plant power feed is in the remote MCC room that is on the east end of the plant, just by the front entryway of the guard shack. Only the Power techs have keys to access this MCC room. It can be accessed coming from the guard shack to the left towards the treatment plant tanks. To access this MCC room from inside the plant, you will need to go towards the wastewater treatment plant equalizing tanks and then proceed towards the main transformer. Once inside the MCC room you will see the breakers MS-1, MS-2, MS-3, MS-4, MS-5, MS-6, MS-8, MS-9, MS-10, MS-11 and MS-12. These breakers feed specific areas of the plant and are marked as such on the panels. These ten panels all have a black and red button on them, the red button needs to be pressed to open the contacts and isolate the power from specific areas of the plant, do this on all ten panels.
2. Communicate with all affected departments and personnel.
3. Lock Out / Tag Out as needed.
4. Evacuate to the Designated Assembly Area

Critical Plant Operation
Emergency Shut Down Procedures

MAINTENANCE – UTILITIES

Backup Generator

The backup generator in our facility has an automated starting and switching mechanism to it.

Critical Plant Operation Emergency Shut Down Procedures

Cheese Department

1. **RECEIVING BAY**
   a. Stop Product from pumping
   b. Shut off valves and CIP if in progress
   c. Evacuate to the Designated Assembly Area
2. **HTST**
   a. Secure equipment as necessary, and Evacuate to the Designated Assembly Area

   If time and equipment permit:

   b. Shut milk down, rinse press with water
   c. Shut off any CIP process
   d. Evacuate to the Designated Assembly Area
3. **VATS**
   a. Secure equipment as necessary, and Evacuate to the Designated Assembly Area

   If time and equipment permit

   b. Stop vats from draining, but do not shut agitators off. Stop drain, put agitator in manual on, put the rest of vats put in hold. NOTE: Vat filling will hold at rennet step
   c. Evacuate to the Designated Assembly Area
4. **MIXERS**
   a. Secure equipment as necessary, and Evacuate to the Designated Assembly Area

   If time and equipment permit

   b. Shut off chill tank curd pump
   c. Shut off preheat tank curd pump
   d. Shut powder SEM off
   e. Empty wet mixer and dry mixer(s) if time permits. If not, shut steam off
   f. Shut Hex and salt off
   g. Evacuate to the Designated Assembly Area

5. **CUTTER OPERATOR**

   a. Secure equipment as necessary, shut steam off at the extruders and Evacuate to the Designated Assembly Area

If time and equipment permit

   b. Empty the extruder hoppers if time permits.

   c. Shut down the brine flow

   d. Shut down the cutter and belts

6. STARTER ROOM

   a. Secure equipment as necessary, and Evacuate to the Designated Assembly Area

If time and equipment permit

   b. Shut off all steam

   c. Shut off any CIP

   d. Secure equipment necessary, i.e., liquefier

   e. Evacuate to the Designated Assembly Area

Critical Plant Operation
Emergency Shut Down Procedures

Packaging Department

1. **SCALE OPERATOR**
    a. Evacuate to the Designated Assembly Area
2. **PALLETIZER OPERATOR**
    a. The operator should hit the E-Stop on the palletizer control panel and the E-Stop on the Stretch wrapper control panel
    b. Evacuate to the Designated Assembly Area
3. **BOXMAKER**
    a. Go to the touch screen and shut down all conveyors by switching the switch from Auto to Off. You **DO NOT** have to shut down the box makers or bag inserters.
    b. Evacuate to the Designated Assembly Area
4. **GRD / REWORK PERSONS**
    a. The operator should hit the E-Stop on the GRD unit or on the Addback conveyor
    b. Evacuate to the Designated Assembly Area
5. **FREEZER OPERATOR**
    a. The operator should hit the E-Stop for the freezer
    b. Evacuate to the Designated Assembly Area

Critical Plant Operation

Emergency Shut Down Procedures

Whey Department

This section will discuss the shutdown of the following equipment. This is written as a continuous procedure because it must be done in order to be effective.

HTST/UF-

1. Disable feed supply fromseparator room.
2. Enable product to water on the HTST.
3. Stop transfer from the pasteurized whey silo to UF.
4. Stop UF/NF systems
    - i. UF1A
    - ii. UF1B
    - iii. UF2A
    - iv. UF2B
    - v. UF3
    - vi. NF1

EVAPORATER

1. Stop the feed to the evaporators.
2. Reduce MVR fans to 1900 rpm.
3. Change concentrate routing to sewer.
4. Start flush on the concentrate line from the Perm. Evap filters screen.

LACTOSE DRYER

1. Stop the transfer from the crystallizer
2. Place refiners in hold
3. Manually turn off all steam valves on the dryer.

MSD

1. Stop the transfer from the retentate silo.
2. Flush feed line to MSD
3. Shut off the MSD HPP
4. Shut off exhaust fan.

PACKAGING

1. Stop the transfer from the silo.
2. Place machine in hold.

Appendix I

PRE-PLANNING SCENARIOS

SYSTEM #1 – Refrigeration Room PD01

SYSTEM #2 – Cold Storage Warehouse MM02

SYSTEM #3 – Cold Storage MM03

SYSTEM #4 – Cold Storage Freezer MM04

SYSTEM #5 – Cold Storage Rail & Truck Dock MM05/MM07

SYSTEM #6 - Palletizing Room CP12

SYSTEM #7 – LVS Freezer Attic Space

SYSTEM #8 – LVS Freezer

SYSTEM #9 – Brine Chiller Room CM57

SYSTEM #1 – REFRIGERATION ROOM PD01/AR01

PD01 is the main area of the ammonia system. The Ammonia Compressors, Recirculator Packages, Suction Accumulators and other ammonia equipment are located in this room.

There are three emergency pull stations. One is located outside each door, that will shut down all equipment in the Refrigeration Room PD01 and close the King Valves. The emergency pull station should only be pulled if there is a massive uncontrollable release of ammonia in the room.

PD01 has four exhaust fans (EF53, EF54, EF55 and EF57). Exhaust Fans 53 thru 55 help to maintain a negative pressure in the room when air handlers 20 and 22 are running. Exhaust fan EF57 is an explosion proof fan.

The ammonia detectors are there to notify the refrigeration technicians if there is a possible ammonia release in that area and sound a warning. The following are actions and conditions that will occur at different PPMs.

@25 ppm- Energize audio/visual for refrigeration room. The PLC will also provide and output to the ventilation system to shutdown the air-handlers and start all exhaust fans in the refrigeration room.

@250 ppm- The king solenoid valves are de-energized at the High Pressure Receiver (AR01). Send a signal to the fire alarm panel.

@5,000ppm- Shut down all electrical motors, de-energize all electrical equipment and electrical outputs in the refrigeration room. The PLC will also provide an output to the ventilation system to shutdown all exhaust fans except the emergency exhaust fan which is explosion proof.

If an ammonia release is detected in the Refrigeration Room PD01:

Make sure to wear Proper PPE and have a hand held ammonia sensor.

1. Determine the concentration of ammonia in room. Note which ammonia sensor is reading highest, this will help in locating the area the leak is in and this will determine the proper level of PPE to be worn. Make sure Exhaust Fans are running to help control the concentration of ammonia in the room.

2. Determine if the ammonia leak is controlled or an uncontrolled release. If uncontrolled, and you are reading above 25 ppm, the Emergency Response Plan needs to be implemented.

3. Determine if the ammonia leak is liquid or vapor, is there a isolation valve upstream of the ammonia leak that can be isolated, **Note:** what system the leak is on, any labels on equipment or piping to help identify the system or location of release.

AR01(High Pressure Receiver):

If there is an uncontrolled massive ammonia release at AR01, shut down the ammonia compressors, start all the Condenser Fans and Water Pumps to drive the high pressure (discharge pressure) down. Isolate the valves at the condensers for liquid returning to AR01. Isolate the liquid ammonia lines going to Thermosyphons and if possible isolate the EQ Line. If needed, pull the Emergency Pull Station Handle to shut down the equipment in PD01.

ITEMS REQUIRED:

1. P&ID Diagrams to showing valve locations, Located in PD04 and Hazmat Truck.
2. PROPER PPE for Ammonia Concentration in the area.
3. Tools to assist in isolating valves (Crescent Wrench, Pipe Wrench, Service Wrench).
4. Ammonia Approved Hoses and Fittings.
5. Hand held Ammonia Sensor.

SYSTEM #2 – COLD/FREEZER STORAGE AREA

The Cooler Areas CP12, MM02, MM05 and MM07 run on HPL ammonia and the suction is returned to IC01. If MM03 and MM04 are used as Coolers, along with CM192 will get pumped liquid ammonia from AS04 and the suction will also return to AS04.

The Freezer Storage area is CM190 and CM191. They are fed liquid ammonia from AS03 with the suction returning to AS03.

All the isolation valves for the Evaporators for the Cooler/Storage areas are located on the roof.

The ammonia detectors are there to notify the refrigeration technicians and Warehouse personnel if there is a possible ammonia release in that area by sounding a visual/audio alarm. Following are actions and conditions that will occur at certain PPMs.

@25ppm- Energize audio/visual alarm on the Truck Dock to notify warehouse personnel of possible ammonia release. The PLC will also provide an output to the ventilation system to shutdown the air-handlers as required.

@250 ppm- The king solenoid valves are de-energized at the High Pressure Receiver (AR01). Send a signal to the fire alarm panel.

Perform the following if an ammonia leak is detected in one of the Cooler/Freezer Storage rooms:

Make sure to wear Proper PPE, have a hand held ammonia sensor.

1. Determine the concentration level of ammonia in the room; this will determine the proper level of PPE to be worn this can be done by verifying ammonia sensor reading for that room on the HMI.. If it's a uncontrolled release with a Ammonia Level above 25 ppm the Emergency Response Plan needs to be implemented and employees need to evacuated from area.

2. Try to determine if the leak is on the liquid ammonia side of the Evaporator or Suction side of the Evaporator. Put the MTS or Freezer Suction into a 3" of vacuum and Isolate the Liquid Feed Valves, Hot Gas Valves. Next manually open the Suction Valves on the Evaporators for that Storage Room. This will lower the pressure in the Evaporators.

ITEMS REQUIRED:

1. P&ID Diagrams to show valve locations. (Located in PD04 and Hazmat Truck)
2. PROPER PPE for Ammonia Concentration in the area.
3. Tools to assist in isolating valves (Crescent Wrench, Pipe Wrench, Service Wrench).
4. Ammonia Approved Hoses and Fittings.
5. Hand held Ammonia Sensor.

SYSTEM #3 – LVS FREEZERS and ATTIC AREA

In Cheese Processing area room CP32 are the two LVS Freezers for flash freezing diced cheese. Each Freezer has three coils with a vessel that is vertical suppling liquid ammonia to the coils. In the Attic area above the LVS Freezers is were the isolation valves for the LVS Freezers are located.

All the isolation valves for the LVS Freezers are located in the Attic above the LVS Freezers.

The ammonia detectors one in CP32 and one in the Attic are there to notify the Refrigeration technicians and Cheese Processing employees if there is a possible ammonia release in that area by sounding a visual/audio alarm. Following are actions and conditions that will occur at certain PPMs.

@25ppm- Energize audio/visual alarm on the Truck Dock to notify warehouse personnel of possible ammonia release. The PLC will also provide an output to the ventilation system to shutdown the air-handlers as required.

@250 ppm- The king solenoid valves are de-energized at the High Pressure Receiver (AR01). Send a signal to the fire alarm panel.

Perform the following if an ammonia leak is detected in one of the Cooler/Freezer Storage rooms:

Make sure to wear Proper PPE, have a hand held ammonia sensor.

1. Determine the concentration level of ammonia in the room ; this will determine the proper level of PPE to be worn this can be done by verifying ammonia sensor reading for that room on the HMI.. If it's a uncontrolled release with a Ammonia Level above 25 ppm the Emergency Response Plan needs to be implemented and employees need to evacuated from area. Make sure the exhaust fan in the LVS Freezer Attic is running, may have to put fan in hand at HMI or Bucket.

2. Try and determine if the leak is on the liquid ammonia side of the Evaporator or Suction side of the Evaporator. Put the LVS Freezer Suction into a 10" of vacuum then Isolate the Liquid Feed Valves, Hot Gas Valves and have PLC open the Suction Valves on the LVS Freezers, this will lower the pressure in the LVS Freezer Coils. If the isolation valves in the Attic Area cannot be accessed then go to the roof and isolate the Liquid Feed Valve and Hot Gas Valve.

ITEMS REQUIRED:

1. P&ID Diagrams to showing valve locations, Located in PD04 and Hazmat Truck.
2. PROPER PPE for Ammonia Concentration in the area.
3. Tools to assist in isolating valves (Crescent Wrench, Pipe Wrench, Service (Wrench).
4. Ammonia Approved Hoses and Fittings.
5. Hand held Ammonia Sensor.

SYSTEM #4 – BRINE CHILLER AREA and GLYCOL #1

In Cheese Make area there is 7 Brine Chillers and Glycol #1for cooling brine water. Brine Chillers 1 thru 4 and 7 are located in Room CM57 upstairs above Line 1 & 2 Brine Belts, along with Glycol #1. Brine Chillers 5 & 6 is located in room CM202 upstairs above Line 3 Brine Belts.

All the isolation valves for the Brine Chillers and Glycol #1 are located in room CM57 and CM202. There is Liquid Feed Isolation Valve outside of CM57 on the Roof.

The ammonia detectors one in CM57 and one in CM202 are there to notify the Refrigeration technicians if there is possible ammonia release in that area by showing a visual alarm on the Refrigeration Page on the HMI. Following are actions and conditions that will occur at certain PPMs.

@25ppm- Energize visual alarm on the Refrigeration Page on the HMI to notify Refrigeration Technicians of possible ammonia release. The PLC will also provide an output to the ventilation system to start the exhaust fan and shutdown the air-handlers as required.

@250 ppm- A Solenoid Valve located on the Roof controls the Liquid Ammonia Line that feeds the Ammonia Equipment in CM57, CM50 and CM202 is de-energized. Also sends a signal to the fire alarm panel.

Perform the following if an ammonia leak is detected in one of the Cooler/Freezer Storage rooms:

Make sure to wear Proper PPE, have a hand held ammonia sensor.

1. Determine the concentration level of ammonia in the room; this will determine the proper level of PPE to be worn this can be done by verifying ammonia sensor reading for that room on the HMI. If it's a uncontrolled release with a Ammonia Level above 25 ppm the Emergency Response Plan needs to be implemented and employees need to evacuated from area. Make sure the exhaust fan in CM57 or CM202 is running, may have to put fan in hand at HMI or Bucket.

2. Try and determine if the leak is on the liquid ammonia side of the Brine Chiller or Glycol #1 or Suction side of the Brine Chiller or Glycol #1. If possible isolate the Liquid Ammonia Feed Valve to the Brine Chiller or Glycol #1and have PLC open the Suction Valve to 50% on that Brine Chiller or Glycol #1. If the Liquid Feed Isolation Valves

cannot be accessed then go to the roof and isolate the Liquid Feed Valve AS02GV23 (located outside of CM57 on Roof) which will isolate all Liquid Ammonia to CM57 and CM202, then lower the suction set point into a vacuum the BTS (for BC01 thru 06) or MTS (for BC07 and Glycol #1).

Note: Depending on location of the Liquid Ammonia Leak will determine if brine water pumps need to stay on to circulate brine water which will help to boil the liquid ammonia out of the equipment.

3. If the ammonia leak is on the suction side Brine Chillers or Glycol #1 (Vapor), lower the suction set point into a vacuum on the BTS (for BC01 thru 06) or MTS (for BC07 and Glycol #1). If possible isolate the Suction Isolation Valves and pump down the suction Valve, return suction set points to normal.

4. If the ammonia leak is on a Suction Line BTS or MTS, then have PLC close the Suction Valves for the Brine Chillers or Glycol #1 and lower suction Set Point into a vacuum. If possible manual close the Suction Valves on each Brine Chiller or Glycol #1 that is effected by that suction.

ITEMS REQUIRED:

1. P&ID Diagrams to showing valve locations, Located in PD04 and Hazmat Truck.
2. PROPER PPE for Ammonia Concentration in the area.
3. Tools to assist in isolating valves (Crescent Wrench, Pipe Wrench, Service (Wrench).
4. Ammonia Approved Hoses and Fittings.
5. Hand held Ammonia Sensor.

SYSTEM #5 – GLYCOL #2

In Cheese Make area Glycol #2 is located in CM50 that use water to cool Silos and different processes.

All the isolation valves for the Glycol #2 are located on the Roof.

The ammonia detectors one in CM50 is there to notify the Refrigeration technicians if there is possible ammonia release in that area by showing a visual alarm on the Refrigeration Page on the HMI. Following are actions and conditions that will occur at certain PPMs.

@25ppm- Energize visual alarm on the Refrigeration Page on the HMI to notify Refrigeration Technicians of possible ammonia release. The PLC will also provide an output to the ventilation system to start the exhaust fan and shutdown the air-handlers as required.

@250 ppm- A Solenoid Valve located on the Roof controls the Liquid Ammonia Line that feeds the Ammonia Equipment in CM57, CM50 and CM202 is de-energized. Also sends a signal to the fire alarm panel.

Perform the following if an ammonia leak is detected in one of the Cooler/Freezer Storage rooms:

Make sure to wear Proper PPE, have a hand held ammonia sensor.

1. Determine the concentration level of ammonia in the room; this will determine the proper level of PPE to be worn this can be done by verifying ammonia sensor reading for that room on the HMI. If it's a uncontrolled release with a Ammonia Level above 25 ppm the Emergency Response Plan needs to be implemented and employees need to evacuated from area. Make sure the exhaust fan in CM50 is running, may have to put fan in hand at HMI or Bucket.

2. Try and determine if the leak is on the liquid ammonia side of the Glycol #2 or Suction side of the Glycol #2. Isolate the Liquid Ammonia Valve to Glycol #2 and have PLC open the Suction Valve to 30%. Change the MTS Suction Set Point into a Vacuum and keep the Glycol/Water pumps running to help boil liquid ammonia out of glycol system.

ITEMS REQUIRED:

1. P&ID Diagrams to showing valve locations, Located in PD04 and Hazmat Truck.
2. PROPER PPE for Ammonia Concentration in the area.
3. Tools to assist in isolating valves (Crescent Wrench, Pipe Wrench, Service (Wrench).
4. Ammonia Approved Hoses and Fittings.
5. Hand held Ammonia Sensor.

SYSTEM #6 – AMMONIA EQUIPMENT ON ROOF

On the Roof there is Ammonia Equipment such as Ammonia Valves, Penthouses for Coolers/Freezers and Condensers.

All the ammonia valves on the Roof are for isolating or controlling the different equipment on the Roof or in the Plant.

Of course there is no Ammonia Sensors on the Roof because of the wide open space.

Perform the following if an ammonia leak is detected in one of the Cooler/Freezer Storage rooms:

Make sure to wear Proper PPE, have a hand held ammonia sensor.

1. Evaporators - If there is uncontrolled ammonia release on roof, verify wind direction and approach the ammonia leak from upwind and isolate the upstream Liquid Feed Ammonia Valve.

2. Condensers Coil – Isolate the Discharge Isolation valve, Manual open the Purger Solenoid Valve, set the FTS Set Point in a vacuum and the Isolate the CD Isolation Valve and allow the coil to pump down.

3. Any Misc Solenoid valve on roof, Isolate the Upstream Isolation valve for the Solenoid valve and then the downstream Isolation Valve and allow the ammonia to bleed out of the valve.

ITEMS REQUIRED:

1. P&ID Diagrams to showing valve locations, Located in PD04 and Hazmat Truck.
2. PROPER PPE for Ammonia Concentration in the area.
3. Tools to assist in isolating valves (Crescent Wrench, Pipe Wrench, Service (Wrench).
4. Ammonia Approved Hoses and Fittings.
5. Hand held Ammonia Sensor.

Appendix J

Emergency Preparedness and Response Plan Investigation / Critique Form

This form is to be completed after each implementation of the Emergency Preparedness and Response Plan and submitted to Corporate Safety within 7 days. Attach a written overview of the incident, along with written statements by all participants in the response.

Date Emergency Preparedness and Response Plan Implemented:	
Time Emergency Preparedness and Response Plan Implemented:	

Plan was implemented for a *(please check one)*:

Drill ☐ Fire ☐ Release ☐ Other (Specify): ☐

Were there any problems in implementing the plan?

Yes ☐ No ☐ Comments:

Was the performance of the site personnel satisfactory?

Yes ☐ No ☐ Comments:

Was the performance of the emergency response team satisfactory?

Yes ☐ No ☐ Comments:

Was the first aid preparation of exposed personnel on-site adequate?

Yes ☐ No ☐ N/A ☐ Comments:

Was the first aid treatment of exposed personnel off-site adequate?

Yes ☐ No ☐ N/A ☐ Comments:

LEPRINO FOODS
EMERGENCY PREPAREDNESS AND RESPONSE PLAN
INVESTIGATION / CRITIQUE FORM (continued)

Was the on-site communications system adequate?

Yes ☐ No ☐ N/A ☐ Comments:

Was the off-site communications system adequate?

Yes ☐ No ☐ N/A ☐ Comments:

Was the emergency power and lighting systems adequate?

Yes ☐ No ☐ N/A ☐ Comments:

Recommendations for any changes in equipment, procedures, or additional comments, etc.:

ACTION PLAN:		
WHAT	WHO	BY WHEN

Signature of Incident Commander *Date*

Appendix K

Mutual Aid Assistant Agreement Between:

Company ____

Agency ____

Date ____________________________

Company Name ____________________________________
Company Address ____________________________________
Company City, State ____________________ ________
Company Contact ________________________________
Contact Phone # ________________________________
Secondary Contact ____________________________________
Secondary Phone # ____________________________________

SCBA's	Y or N (Qty ___________)
Spare Air Tanks	Y or N (Qty ___________)
Positive Pressure Fans	Y or N (Qty ___________)
Decontamination Suits	Y or N (Qty ___________)
Gloves	Y or N (Qty ___________)
Air Purifying Masks	Y or N (Qty ___________)
Boots	Y or N (Qty ___________)
Decontamination Station	Y or N (Qty ___________)
Decontamination Pools	Y or N (Qty ___________)
Hoses	Y or N (Qty ___________)
Brushes	Y or N (Qty ___________)
Security Tape	Y or N (Qty ___________)
Security Personnel	Y or N (Qty ___________)
Ropes	Y or N (Qty ___________)
Flash lights	Y or N (Qty ___________)
Sampling Devices	Y or N (Qty ___________)
Electronic	Y or N (Qty ___________)
Manual	Y or N (Qty ___________)
Tubes	Y or N (Qty ___________)
Radio's	Y or N (Qty ___________)
Ear Mikes/Push to talks	Y or N (Qty ___________)
Wrenches (tools)	Y or N (Qty ___________)
First Aid	Y or N (Qty ___________)
Other _______________	Y or N (Qty ___________)

Page 1 of 2

Mutual Aid Assistant Agreement (Continued)

Agency Name ______________________________
Agency Address ______________________________
Agency City, State ______________ ______
Agency Contact ______________________________
Agency Phone # ______________________________
Secondary Contact ______________________________
Secondary Phone # ______________________________

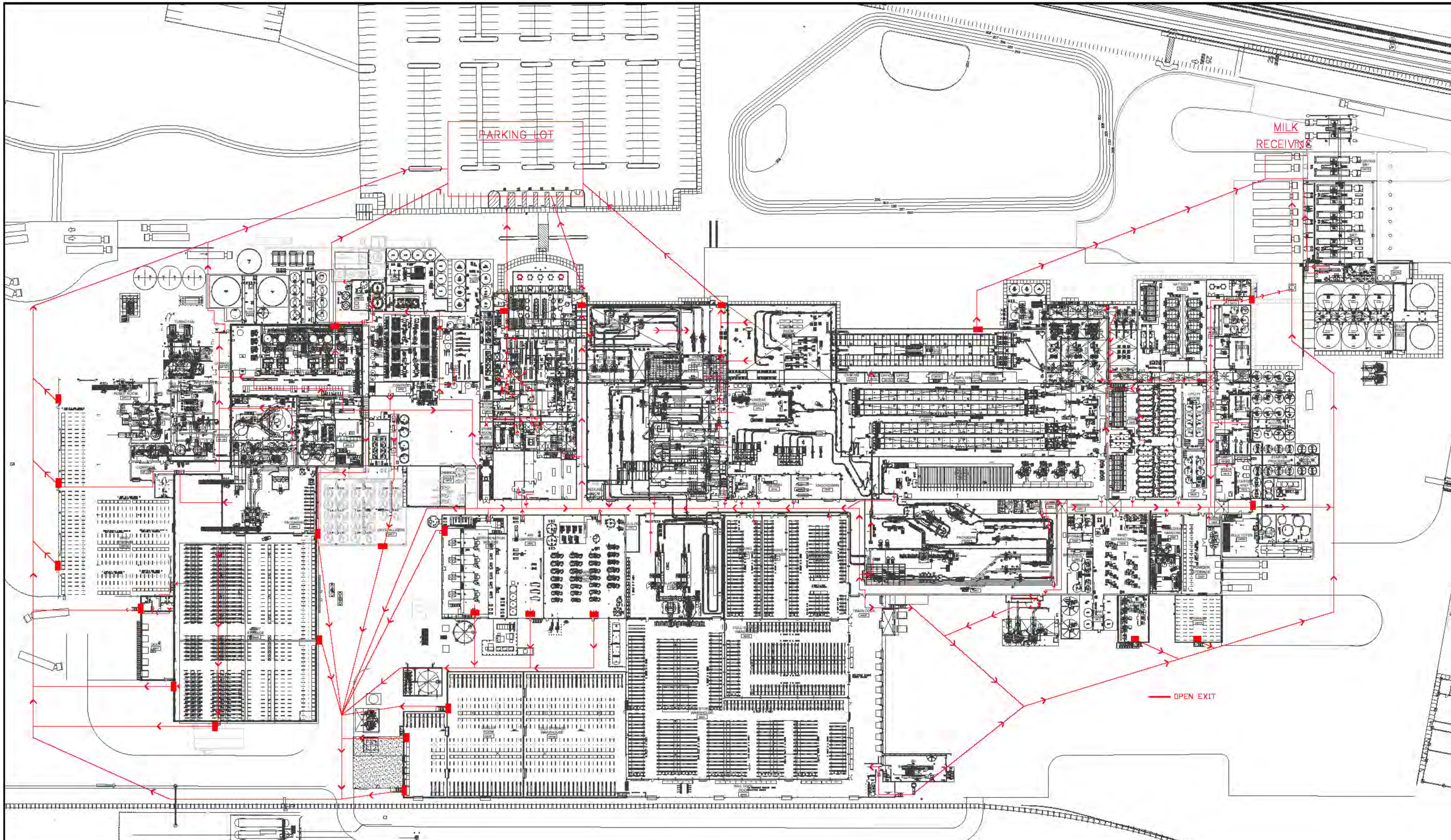
SCBA's	Y or N (Qty ____________)
Spare Air Tanks	Y or N (Qty ____________)
Positive Pressure Fans	Y or N (Qty ____________)
Decontamination Suits	Y or N (Qty ____________)
Gloves	Y or N (Qty ____________)
Air Purifying Masks	Y or N (Qty ____________)
Boots	Y or N (Qty ____________)
Decontamination Station	Y or N (Qty ____________)
Decontamination Pools	Y or N (Qty ____________)
Hoses	Y or N (Qty ____________)
Brushes	Y or N (Qty ____________)
Security Tape	Y or N (Qty ____________)
Security Personnel	Y or N (Qty ____________)
Ropes	Y or N (Qty ____________)
Flash lights	Y or N (Qty ____________)
Sampling Devices	Y or N (Qty ____________)
Electronic	Y or N (Qty ____________)
Manual	Y or N (Qty ____________)
Tubes	Y or N (Qty ____________)
Radio's	Y or N (Qty ____________)
Ear Mikes/Push to talks	Y or N (Qty ____________)
Wrenches (tools)	Y or N (Qty ____________)
First Aid	Y or N (Qty ____________)
Other ______________________________	Y or N (Qty ____________)

Security ______________________________
Evacuation/Routes ______________________________
Jurisdiction ______________________________
RoadBlocks set up ______________________________
Shelters ______________________________
Railroads ______________________________
DNR ______________________________
LEPC ______________________________
SEPC ______________________________
Corp. of Engineers ______________________________
Airport Authority ______________________________
Neighboring businesses ______________________________
Schools ______________________________
Retirement Homes, etc. ______________________________
Other ______________________________

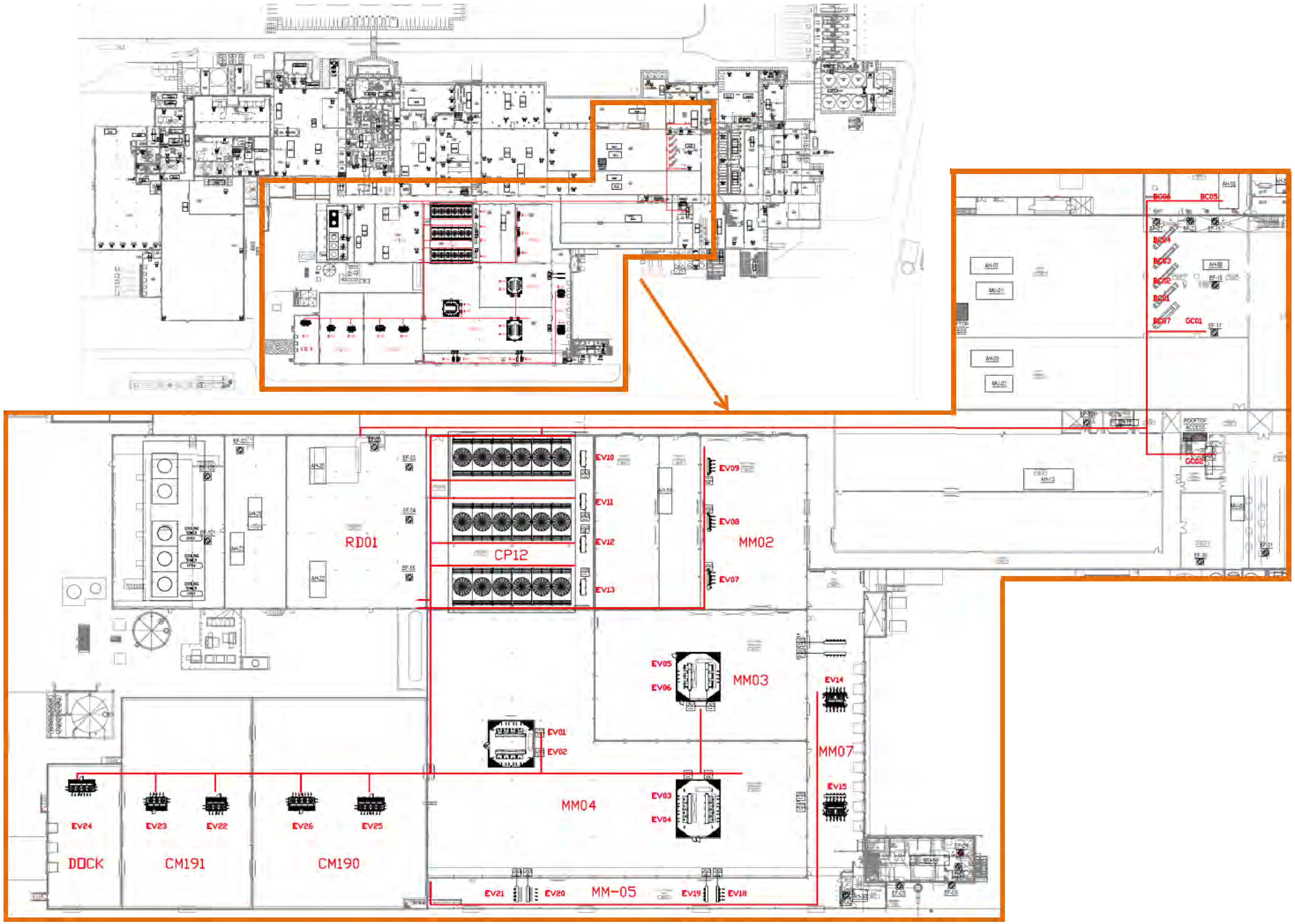
Agency Signature ______________________ Date __________
Company Signature ______________________ Date __________

Appendix L

Evacuation Routes
Designated Assembly Areas Map
&
Ammonia Systems Overview Map


PARKING LOT
MILK
RECEIVING
OPEN EXIT

AMMONIA SYSTEM OVERVIEW MAP; LEPRINO FOODS LEMOORE WEST



Appendix M

AGENCY NOTIFICATION LOG

Added information for management report:

Name of person making notification: ______________________________

Names of persons notified: ______________________________

National Response Center: Date: ______________ Time: __________

Individual: ____________________ Case #: ________________

State OES: Date:__________ Time:__________

Individual:______________________________

Kings County LEPC: Date: ______________ Time: __________

Individual: ______________________________

Other: Date: ______________ Time: __________

Individual: ______________________________

Date: ______________ Time: __________

Other (______________): Date: ______________ Time: __________

Individual: ______________________________

Appendix N

National Response Center Incident Report Form

Page 1 of 3

Report Spills to the NRC at: 1-800-424-8802

REPORTING PARTY	SUSPECTED RESPONSIBLE PARTY
Last Name:	**Last Name:**
First Name:	**First Name:**
Phone:	**Phone:**
Company: Leprino Foods	**Company:**
Position:	**Position:**
Address: 351 N. Belle Haven Drive	**Address:**
City: ***Lemoore***	**City:**
State/ZIP: ***California 93245***	**State/ZIP:**
Were materials released? Yes No	**Request Caller Confidentiality?** Yes No
Meeting Federal Requirements by Calling for Responsible Party? Yes No	

EMERGENCY RELEASE FOLLOW - UP NOTICE REPORTING FORM

A
BUSINESS NAME
FACILITY EMERGENCY CONTACT & PHONE NUMBER
( ) -

B
INCIDENT DATE MO DAY YR
TIME OES NOTIFIED (use 24 hr time)
OES CONTROL NO.

C
INCIDENT ADDRESS LOCATION
CITY / COMMUNITY
COUNTY ZIP

D
CHEMICAL OR TRADE NAME (print or type)
CAS Number

CHECK IF CHEMICAL IS LISTED IN 40 CFR 355, APPENDIX A ☐
CHECK IF RELEASE REQUIRES NOTIFI - CATION UNDER 42 U.S.C. Section 9603 (a) ☐

PHYSICAL STATE CONTAINED ☐ SOLID ☐ LIQUID ☐ GAS
PHYSICAL STATE RELEASED ☐ SOLID ☐ LIQUID ☐ GAS
QUANTITY RELEASED

ENVIRONMENTAL CONTAMINATION ☐ AIR ☐ WATER ☐ GROUND ☐ OTHER
TIME OF RELEASE
DURATION OF RELEASE ___DAYS ___HOURS___MINUTES

E
ACTIONS TAKEN

F
KNOWN OR ANTICIPATED HEALTH EFFECTS (Use the comments section for addition information)
☐ ACUTE OR IMMEDIATE (explain) ____________________
☐ CHRONIC OR DELAYED (explain) ____________________
☐ NOTKNOWN (explain)

G
ADVICE REGARDING MEDICAL ATTENTION NECESSARY FOR EXPOSED INDIVIDUALS

H
COMMENTS (INDICATE SECTION (A - G) AND ITEM WITH COMMENTS OR ADDITIONAL INFORMATION)

I
CERTIFICATION: I certify under penalty of law that I have personally examined and I am familiar with the information submitted and believe the submitted information is true, accurate, and complete.
REPORTING FACILITY REPRESENTATIVE (print or type) ____________________
SIGNATURE OF REPORTING FACILITY REPRESENTATIVE ____________________ DATE: ____________

National Response Center

Incident Report Form

Page 2 of 3

INCIDENT SOURCE AND CAUSE	
Source/Cause:	
Date: _______Time: _______	**Occurred Discovered**
Type: Air Fixed Facility Highway Marine Offshore Offshore Unknown Pipeline Grade Crossing Railroad Unknown	
Cause: Dumping Equipment Failure Natural Phenomenon Operator Error Transport Accident Unknown	
Railroad Hotline ?: Yes No	**Vessel/Vehicle Number:**
Continuous Release Type:	**Continuous Release #:**
INCIDENT LOCATION	
Incident Address/Location:	**Nearest City:**
State:	**County/ZIP:**
Distance from City:	**Direction from City:**
Section:	**Township:______Range:____**
Container Type:____Capacity:____	**Facility Capacity:**
Latitude: 36° 20’ 58.2” N.	**Longitude:** -119° 49’ 27.0” W
Offshore Area ID:____Block:____	**Milepost:**

National Response Center

Incident Report Form

Page 3 of 3

MATERIAL INVOLVED	
Chris Code__*AMA*__Amt____Unit_____ **Material Name: *Anhydrous Ammonia*____Amt in Water____Unit____**	
Chris Code________Amt____Unit_____ **Material Name_________________________________Amt in Water____Unit____**	
Chris Code________Amt____Unit_____ **Material Name_________________________________Amt in Water____Unit____**	
Chris Code________Amt____Unit_____ **Material Name_________________________________Amt in Water____Unit____**	
Chris Code________Amt____Unit_____ **Material Name_________________________________Amt in Water____Unit____**	
Chris Code________Amt____Unit_____ **Material Name_________________________________Amt in Water____Unit____**	
REMEDIAL ACTION	
Actions Taken:	
Air Corridor Closed ?: Yes No	**Roads Closed ?: Yes No**
Number of Injuries:	**Number of Fatalities:**
Evacuations ?: Yes No	**Number Evacuated:**
Damage ?: Yes No	**Damage in Dollars:**
Medium Affected:	
CALLER NOTIFICATIONS	
NRC REPORT NUMBER #:	
This number is assigned by an NRC Duty Officer upon receipt of the report.	

Appendix O

The EPA List of Lists can be accessed online at
http://www.epa.gov/swercepp/pubs/title3.pdf

5. ABOVEGROUND PETROLEUM STORAGE ACT

California Environmental Reporting System (CERS) | Aboveground Petroleum Storage Act - Facility Information Report

Facility/Site

Leprino Foods Company
351 North Belle Haven Drive
Lemoore, CA 93245

CERS ID
10410073

CAL000279534

Submittal Status

Submitted on 2/26/2021 by *Richard Csillag* of Leprino Foods Company (Denver, CO)
Submittal was ***Accepted***; Processed on 5/24/2021 by *Yatee Patel* for Kings County Environmental Health
Comments by regulator: Please save and update SPCC every 5 years. Keep onsite.

APSA Facility Information

Conditionally Exempt APSA Tank Facility
N

Date Of SPCC Plan Certification or Date of 5-Year Review
9/18/2019

Total Aboveground Storage Capacity of Petroleum	Number of Tanks in Underground Area(s)
18125	0

Appendix C

Technical Memorandum: Lemoore WWTP Sensitivity Analysis
(Probst 2022)

The Probst Group
Technology-Driven Wastewater Solutions.
Your Partner. Today and Tomorrow.

262.264.5665
Main Line
www.probstgroup.com
info@probstgroup.com
17035 W. Wisconsin Ave., Suite 120
Brookfield, WI 53005

Friday, April 15, 2022

Mr. Joe Herrud, P.E.
Leprino Foods Company
1830 W 38th Ave
Denver, CO 80211

Re: Lemoore Sensitivity Analysis

Dear Mr. Herrud,

The Probst Group, LLC has completed the Lemoore Sensitivity Analysis requested by Leprino Foods Company (Leprino) to evaluate the capacity of the existing treatment plant to meet targeted agronomic rates of BOD 4,529 mg/L and Total Nitrogen of 23 mg/L at a future flow of 5 MGD. We understand these Agronomic rates were computed by Kennedy Jenkins as summarized in the Section 1 of the attached memo.

Based on our evaluation of the treatment plant capacity using modelling at increased flow of 5.0 MGD, we have identified

- Leprino will be operating at maximum hydraulic capacity of the treatment plant.
- Aeration capacity is sufficient with no increase in load.
- With higher flows the retention time in the existing HRAS is lowered resulting in lower SCOD performance. The increased flows will increase DAF hydraulic loading which could reduce DAF solids capture efficiency causing solids washout.
- The existing three SBRs and downstream surge tank can handle the increased flow processing.
- Effluent nitrogen is dependent on the level of nitrification and the amount of TSS discharged in the effluent from the SBRs.
- Leprino wastewater treatment plant effluent quality at increased flow is modelled to be:
  COD: < 1,300 mg/L
  BOD: < 270 mg/L
  TN: < 23 mg/L
  Assuming effluent TSS less than 70 mg/L

To improve the process performance at higher flows, we recommend following for Leprino's consideration

- Minimize HRAS wasting and reseeding the HRAS if required to improve HRAS DAF system performance
- Although not required per modelling, Leprino can increase the SBR cycles from current 2 cycles per day to 3 cycles per day to process additional flow comfortably.
- Continue to maintain D.O of 2.0 mg/L and increase sludge age if required to improve nitrification
- Utilize existing filtration unit for effluent solids control.
- Additional pumps for SBR feed and surge tank effluent pumping to provide redundancy.

Overall, as predicted by the model, Leprino can meet the required agronomic rates for BOD and TN consistently following the above recommendations and successful treatment plant operation. The details of this capacity analysis are summarized in the attached memo for your review. Please don't hesitate to contact us if further questions.

Best regards,

Srinath Devaraj, P.E. | Process Engineer
Direct: (262) 402-6082
Email: sdevaraj@probstgroup.com

The Probst Group
Technology-Driven Wastewater Solutions.
Your Partner. Today and Tomorrow.

262.264.5665
Main Line
www.probstgroup.com
info@probstgroup.com
17035 W. Wisconsin Ave., Suite 120
Brookfield, WI 53005

MEMO

To: Joseph Herrud, P.E., Richard Csillag

From: Srinath Devaraj, P.E., Mark Pronley, P.E., Henry Probst

cc:

Date: Friday, April 15, 2022

Re: Lemoore WWTP Sensitivity Analysis Rev 2

1 BACKGROUND

Leprino Foods Company (Leprino) owns and operates a food processing facility in Lemoore, CA. All wastewater generated by the east and west facility is treated by an onsite wastewater treatment plant (WWTP) at the west facility. Leprino would like to understand if the potential effluent quality can meet the targeted agronomic rates Leprino is trying to achieve in permit if flowrate increases from current 2.92 MGD average/3.6 MGD peak to 5.0 MGD. Analysis done by Kennedy Jenkins shows how high the effluent BOD and Nitrogen in Leprino's effluent can be without exceeding loading limits. Summary of Leprino's effluent target is presented below for BOD and Nitrogen at 5 MGD.

Table 1
Kennedy Jenkins Limits for Land Application

	ACRES	LIMITS (MG/L)
BOD	1,900	4,529
Total Nitrogen	2,100	23.1

Currently Leprino effluent meets the following limits at 3 MGD flow:

Table 2
Leprino Current Effluent Quality

PARAMETER	VALUES
BOD (mg/L)	6.1
Total Nitrogen (mg/L)	5.5
TKN (mg/L)	2.5
Ammonia (mg/L)	0.5
Nitrate (mg/L)	2.5

This memo summarizes our analysis of treatment plant's capacity to meet the limits in Table 1. <u>For this analysis, Leprino confirmed the loading rate will remain the same as current with flow increase to 5 MGD diluting the concentration.</u>

2 BASIS OF ANALYSIS

From the data provided to Probst, the current and future influent to the treatment plant from Tank T-310 is summarized below. These values were used for capacity analysis and modelling to estimate the effluent discharge quality. Since BOD and Nitrogen are the primary concerns, these parameters are listed.

Table 3
T-310 Influent Average Basis

PARAMETER	AT CURRENT	AT FUTURE FLOW
Flow	2.92	5
COD (mg/L)	4,627	2,702
COD (lbs/day)	112,680	
SCOD (mg/L)	2,235	1305
SCOD (lbs/day)	54,430	
BOD (mg/L)	2,776	1,621
BOD (lbs/day)	67,600	
SBOD (mg/L)	1,341	783
SBOD (lbs/day)	32,657	
TKN (mg/L)	89	52
TKN (lbs/day)	2167	
Nitrate (mg/L)	83	48

We understand not all this flow is fed to the High Rate Activated Sludge (HRAS) system; about 234,000 gpd is bypassed around HRAS which combines with HRAS effluent and lagoon decant prior feeding SBRs. A BOD to COD ratio of 0.6 was used to estimate influent BOD concentration.

3 CAPACITY ANALYSIS

Probst evaluated major unit operations for capacity summarized below. Calculations performed under capacity analysis is provided as Attachment A to this memo.

3.1 *EQUALIZATION (EQ)*

The objective of the EQ tank is to equalize flow and load. The total volume of equalization is about 3,550,000 gallons which provides about 29 hours hydraulic retention time (HRT) at current flowrate of 2.92 MGD, and is in the typical range of 24 to 48 hours recommended for HRT in dairy industrial wastewater. At future flow rate of 5 MGD, the HRT of the EQ tank will reduce to about 17 hours. While 24 to 48 hours is a general guideline, an EQ tank can be operated at a minimum of 14 to 16 hours retention time while still providing sufficient equalization depending on downstream treatment processes.

3.2 *HIGH RATE ACTIVATED SLUDGE (HRAS) SYSTEM*

The HRAS system at the Leprino WWTP is used to remove 70% of influent soluble COD/BOD. HRAS systems are generally designed to operate at a high F/M of 1 to 2 lbs of BOD/ lbs of MLVSS, and hydraulic residence time (HRT) between 8 to 12 hours (forward flow without DAF recycle flows). With a total capacity of 917,000 gallons, the operating HRT at current flows is 7.54 hours at F/M of 1.64

lbs of BOD/lbs of MLVSS. At future 5 MGD flow, the HRT of system reduces significantly to 4.4 hours. BioWin modelling was performed to model the impact of the reduced HRT in the HRAS. Performance of the model is detailed in the modelling section of this memo.

The HRAS system currently has three blowers for a total capacity of 13,500 scfm with two of them running to maintain a D.O of 0.1 mg/L to remove 70% of influent SCOD/SBOD. Using a 26-foot operating depth, 0.4 alpha, and standard oxygen transfer efficiency of 1.8%/ft, we estimate about 48,000 lbs/day of COD can be treated while operating all three blowers at 0.5 mg/L of D.O concentration. Each HRAS tank has fine bubble diffusers that can handle design airflow capacity of 13,900 scfm to handle 13,500 scfm airflows delivered from all three blowers. With no change in the influent load to HRAS, no blower or diffuser modification is required.

3.3 HRAS DISSOLVED AIR FLOTATION UNITS (DAFs)

Two DAF units are used for solid liquid separation followed by HRAS system to separate biomass. About 50,000 gpd at 5% of this biomass is wasted to maintain solids concentration of about 7,000 mg/L in the HRAS system. Currently, the DAF system provides about 90% of the solids removal. The effective area for the DAF units combined is calculated to about 1,250 ft². This calculation was based on Leprino provided flow capacity of 2,500 gpm with general DAF hydraulic loading design criteria of 2 gpm/ft².

At current flows, the hydraulic loading of DAF system is about 2.11 gpm/ft². At future flow of 5 MGD, this loading increases to 3.61 gpm/ft² which is higher than the recommended design criteria of 2 gpm/ft². The hydraulic loading was computed including 30% DAF recycle flow (RAS).

Another design criteria used for sizing DAF is solids loading rate lbs of solids/ft²/hr. At current flows and MLSS concentration, this value is about 7.4 lbs of solids/ft²/hr. Depending on the type of solids, the general solids loading rate guideline is between 1 to 8 lbs of solids/ft²/hr. For a DAF system separating biomass lower solids loading rate of 2 to 4 lbs of solids/ft²/hr is recommended. While the solids loading rate is on the high end at the current flows, the DAF performance is stellar providing 90% solids removal.

To retain HRAS SCOD performance at future flows, it is recommended that the design F/M ratio of HRAS be maintained. At maximum F/M of 2 lbs of BOD/lbs of MLVSS, the MLSS concentration required in the HRAS is 5,700 mg/L. Using this concentration and future flow of 5 MGD, the calculated solids loading rate is 10.3 lbs of solids/ft²/hr.

With higher hydraulic and solids loading rate at future flows, a sensitivity analysis was performed using BioWin model to estimate the effluent quality from the HRAS and DAF combined at different DAF solids percent removal. The modelling section of this memo summarizes the analysis.

3.4 SBR SYSTEM

The SBR system comprises of feed tank, feed pumps, three SBRs with decanters, jet mixing system, and six blowers (two per SBR). Current operation of SBR involves two 12-hour cycles per day.

Currently, SBRs are operating at below conditions:

F/M:	0.23 BOD/MLVSS
BOD Loading Rate:	29 lbs of BOD/1000 ft³
MLSS:	4,800 mg/L
SRT:	19 days

These conditions align with general SBR design criteria. Settleability of SBRs is key for obtaining low suspended solids that contribute to effluent nitrogen and BOD. Leprino's data shows good settling producing average effluent TSS of 25 mg/L.

Each SBR currently has two dedicated blowers each of capacity 3,000 scfm for a total air flow capacity of 18,000 scfm. Using a 26-foot operating level, 0.85 alpha (different than HRAS because of jet mixing system), and standard oxygen transfer efficiency of 1.5%/ft for jet system, aeration time of 540 minutes/cycle, and 2 cycles per SBR we estimate about 21,000 lbs of BOD/SBR/day can be treated while maintaining 1.0 mg/L of D.O concentration. WWTP actual treatment performance data shows Leprino is able to maintain a minimum of 2.0 mg/L dissolved oxygen in the SBRs while operating both the blowers. With similar load in the future, no blower or jet mix system modification is required.

4 SBR HYDRAULIC MODELLING

With higher flow in the future, the potential bottleneck could be the surge tank that equalizes the SBR flow. Probst created a model to simulate the level in the surge tank based on the current 12-hour cycles. The hydraulic capacity of SBR system as a whole, including SBR feed pumps, SBR decanter rates, surge tank volume, surge tank effluent pumps, was used to identify the required surge tank volume at current and future flow rates.

Capacity of each system is listed:

SBR Feed Pumps:	2,500 gpm per pump, total three (3) pumps
SBR Decanter:	7,300 gpm per SBR, total three (3) decanters
Surge Tank:	607,000 gallons design capacity
Surge Tank Effluent Pumps:	1,800 gpm, total two (2) pumps

Detailed calculations are provided in Attachment B. Below is the summary of model findings:

- <u>At current flow, operating three (3) SBRs 2 cycles per SBR</u>
  SBR In Flow/Surge tank Out Flow Required = 2,100 gpm
  Decant Rate Required = 4,167 gpm
  Decant Volume % = 22 % of tank volume
  Surge Tank EQ Volume Required = 250,000 gallons

- <u>At future flow of 5 MGD, operating three (3) SBRs 2 cycles per SBR</u>
  SBR In Flow Required/Surge tank Out Flow = 3,472 gpm
  Decant Rate Required = 6,944 gpm
  Decant Volume % = 37 % of tank volume
  Surge Tank EQ Volume Required = 417,000 gallons

- <u>At future flow of 5 MGD, operating three (3) SBRs 3 cycles per SBR</u>
  SBR In Flow Required/Surge tank Out Flow = 3,472 gpm
  Decant Rate Required = 6,173 gpm
  Decant Volume % = 25 % of tank volume
  Surge Tank EQ Volume Required = 278,000 gallons

Under all these scenarios, the capacity of existing pumping system was not exceeded. Two surge tank effluent pumps will be required to handle the extra flow. An extra surge effluent pump should be added as redundancy. The decant volume equates to 37% of the total tank volume under future flow operated at 2 cycles per SBR; this value is close to 40% value that each tank can be decanted. In order to decant to this level, the settling in the tank will need to be lower than 600 ml in settlometer. To increase the hydraulic throughput, Leprino could consider incorporating 3 cycles per SBR.

5 PERFORMANCE MODELLING

5.1 HRAS SYSTEM

The performance of HRAS and DAF combined system was modelled using BioWin software; the model was calibrated using dairy wastewater kinetics and current plant data at current flows and loads to match HRAS effluent quality. Future flows at different DAF solids capture were tested. Figure 1 shows the BioWin set up, followed by Table 4 & 5 showing the effluent results in concentration and mass.

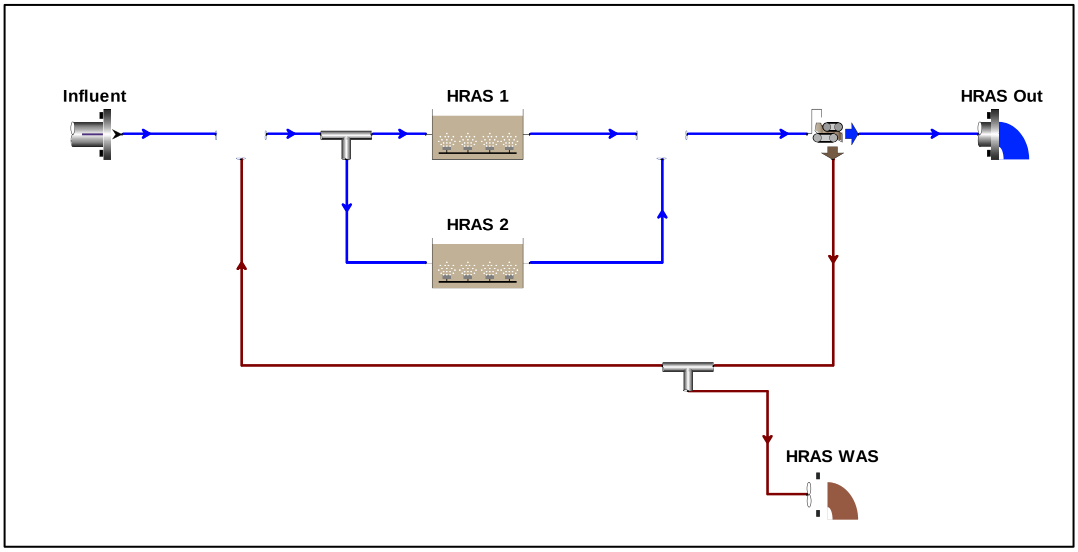


Figure 1: HRAS DAF BioWin Set Up

Table 4
HRAS Performance in Concentration

	HRAS EFFLUENT CURRENT FLOW	HRAS EFFLUENT FUTURE FLOW 5 MGD		
DAF Removal %	**90%**	**90%**	**85%**	**80%**
PARAMETERS	VALUES			
TCOD (mg/L)	1,693	1380	1668	1869
SCOD (mg/L)	695	565	738	905
TBOD (mg/L)	896	742	925	1,066
SBOD (mg/L)	482	399	527	650
Total Nitrogen (mg/L)	59	47.32	53	53
TSS (mg/L)	900	729	826	845
MLSS (mg/L)	**6,886**	**5,600**	**4,232**	**3,250**
WAS gpd	70,000	40,000	20,000	10,000
WAS (mg/L)	2.60%	2.20%	1.60%	1.10%

Table 5
HRAS Performance in Mass

	HRAS EFFLUENT CURRENT FLOW	HRAS EFFLUENT FUTURE FLOW 5 MGD		
DAF Removal	**90%**	**90%**	**85%**	**80%**
PARAMETERS	VALUES			
TCOD (lbs/day)	39,817	57,086	69,277	77,781
SCOD (lbs/day)	**16,346**	**23,372**	**30,652**	**37,663**
TBOD (lbs/day)	21,073	30,694	38,418	44,408
SBOD (lbs/day)	11,336	16,505	21,888	27,078
Total Nitrogen (lbs/day)	1,388	1,957	2,201	2,208
TSS (lbs/day)	21,167	30,156	34,306	35,201
MLSS (lbs/day)	52,605	42,781	32,330	24,828
F:M (BOD/MLVSS)	**1.76**	**2.17**	2.87	3.74
WAS gpd	70,000	40,000	20,000	10,000
WAS (lbs/day)	15,179	7,339	2,669	667

Under future scenario, with declining DAF performance simulation, wasting flow was adjusted to maintain MLSS concentration to provide sufficient biomass inventory for treatment. As the performance of the DAF system decreases, it can be noted the TCOD increases in the HRAS effluent. With solids loss contributing to F/M significantly higher than the design of 2.0 and reduced hydraulic residence time in the HRAS, the SCOD removal performance declines from 70% at current SCOD load listed under Table 3 to 33% removal at the future flow as shown under Table 5.

5.2 SBR

The output from the HRAS model combined with side stream was plugged into a SBR model to estimate the effluent quality based on the current 12-hour cycle times information provided by

Leprino. This model utilizes kinetic reaction rates for BOD, nitrification, and denitrification specific to Leprino wastewater characteristics. Current feed react, settle, and decant times were entered in the model to simulate the effluent quality summarized in Table 6. Attachment C provides model inputs and graphical output.

Table 6
Three SBRs 2 Cycles Per Day Performance

	ESTIMATED SBR EFFLUENT AT FUTURE FLOW 5 MGD EFFLUENT TO LAND APPLICATION		
PARAMETERS	SBR OUT @ HRAS EFFLUENT AT DAF REMOVAL 90%	SBR OUT @ HRAS EFFLUENT AT DAF REMOVAL 85%	SBR OUT @ HRAS EFFLUENT AT DAF REMOVAL 80%
TBOD (mg/L)	153	218	262
SBOD (mg/L)	133	192	234
Ammonia (mg/L)	13	15	15.6
Nitrate (mg/L)	0.0	0	0
Organic Particulate (mg/L)	6	7.8	8.4
Organic Soluble (mg/L)	0	0	0
Total Nitrogen (mg/L)	19	23	24
TSS (mg/L)	50	65	70
MLSS (mg/L)	5,000	5,000	5,000

As the performance of the HRAS and DAF declines at future higher flows, additional loading is carried to the SBRs which then overloads the SBRs, reducing SBR performance and increasing the effluent BOD from the SBRs. The amount of BOD in the effluent is lower than the land application limit of 4,529 mg/L. Since BOD must be removed before nitrification can proceed, the nitrogen removed in SBR is primarily of cell synthesis with higher ammonia in the effluent. Computer modelling cannot predict the effect of filamentous bacteria, bulking, and its impact on settling. As effluent TSS contributes to particulate BOD and nitrogen in the effluent, to achieve the land application limit of 23 mg/L total nitrogen, Leprino's SBR settling combined with existing filtration unit must produce effluent TSS less than 60 mg/L.

6 CONCLUSIONS AND RECOMMENDATIONS

- At future flow of 5 MGD, Leprino will be operating at max hydraulic capacity of the treatment plant. With no change in the COD/BOD load, modifications to aeration capacity are not required.

- BioWin modelling shows at higher flows, the SCOD removal by the HRAS reduces. Higher hydraulic flow can impact DAF solids liquids separation which could drop the DAFs performance causing solids carry over to downstream SBR system. To improve treatment efficiency and maintain design F/M ratio at the HRAS system, Leprino may have to stop wasting at the HRAS and potentially may have to reseed the HRAS using biomass from the SBR system.

- With solids carry over and reduced performance, the downstream SBR could be potentially overloaded which can drop D.O and potentially reduce treatment performance at the SBRs, contributing to higher effluent soluble BOD and ammonia in the effluent.

- The existing 3 SBRs with 2 cycles/SBR surge tank along with pumping system can hydraulically handle future flows. However, the SBRs will need to be decanted close to 40% of the tank every cycle which could be the maximum decant that can be achieved based on the decanter mobility in the SBRs tank. While 3 SBR 3 cycles/SBR can reduce the hydraulic overload, allowing Leprino to decant only 25% of tank volume each cycle, operating 3 cycles per SBR will reduce the valuable overall aeration time impacting BOD and ammonia removal.

- While models can predict effluent TSS quality, they may not be accurate without considering filamentous bacteria effect on settling. Effluent TSS impacts the amount of particulate nitrogen and particulate BOD discharged in the effluent.

- Overall, the modeling shows with increased flow Leprino can potentially meet the BOD land application limit. While the model predicts partial nitrification based on reaction rates and cycle times it should be noted that nitrification is a function of SRT, maintaining higher MLSS levels (increasing sludge age) and providing D.O >= 2.0 mg/L could lower effluent ammonia levels. We understand Leprino can maintain >= 2.0 mg/L in the SBRs currently.

- To maintain the effluent nitrogen consistently under the land application limit, the amount of TSS discharged in the effluent under different scenarios modeled will need to be lower than 60 mg/L. Leprino can accomplish this by using existing filtration unit in place or by operational management including filament control to improve settling and lower SBR effluent TSS.

- An additional pump is recommended to provide redundancy for the SBR feed and surge tank effluent pump for future flows.

- Leprino could consider converting the existing batch system SBR into a 24-hour operation continuous flow system followed by a new clarifier or new membrane system to meet these limits comfortably. Continuous system provides longer aeration time to complete BOD and nitrification.

ATTACHMENT A
Unit Sizing

LFC Lemoore West
WWTP Process Unit Sizing
The Probst Group
2/25/2022

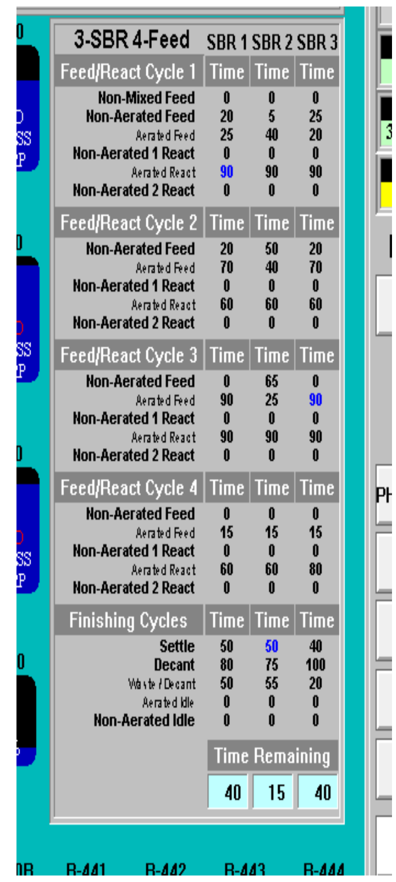
EQ IN			
		Aerobic	Aerobic
		Current Operations	Future
EQ In Flow	gal/day	2,917,000	5,000,000
	gpm	2,026	3,472
AEROBIC EQUALIZATION TANK			
Total Useable Volume	3,550,000		
		Current Operations	Future
HRT	hours	29	17
HRAS IN			
Total Useable Volume			
916,836	gallons	Current Operations	Future
HRAS In Flow	gal/day	2,917,000	5,000,000
	gpm	2,026	3,472
BOD	mg/L	2,776	1,620
	lbs/day	67,539	67,539
SBOD	mg/L	1,341	782
	lbs/day	32,624	32,624
TKN	mg/L	89	52
	lbs/day	2,165	2,165
HRT	hrs	7.54	4.40
MLSS	mg/L	7,051	5,700 Minimum MLSS required
F:M	lbs of BOD/lbs of MLVSS	1.64	2.03
Blower Total			
13,500	cfm		
48,802	lbs/day COD @ 0.1 mg/L		
29,281	lbs/day BOD @ 0.1 mg/L		
HRAS DAFs			
Quantity	2.0		
Surface Area	NA	Current Operations	Future
Flow Capacity / unit (gpm)	1,250		
Total Flow Capacity (gpm)	2,500		
Total Effective Area (sq.ft)	1,250		
DAF Influent Solids	lb/day	223,007	308,997
Hydraulic Loading Rate	gpd/ft2		
	gpm/ft2	2.11	3.61
Solids Loading	lbs/ft2/day	178.41	247.20
Solids Loading	lbs/ft2/hr	7.43	10.30
LAGOON DECANT			
Flow	gal/day	353,000	353,000
	gpm	245	245
BOD	mg/L	500	500
	lbs/day	1,472	1,472
Ammonia	mg/L	400	400
	lbs/day	1,178	1,178
SBR IN			
Flow	gal/day	3,271,000	See Modelling section in the report based on DAF performance
	gpm	2,272	
BOD	mg/L	943	
	lbs/day	61,968	
Ammonia	mg/L	108	
	lbs/day	2,946	
SBR			
Quantity	3		
Diameter	121		
SWD	26		
Total Useable Volume	6,708,985		
		Current Operations	
HRT	days	2.1	See Modelling section in the report based on DAF performance
MLSS	mg/L	4,800	
BOD VLR	lbs/1000ft3-d	69	
BOD F:M	d-1	0.23	
COD F:M	d-1	0.38	
Observed Yield Rate	lbs/lbs COD	0.14	
SRT	days	19	

ATTACHMENT B
SBR HYDRAULIC MODELLING

CURRENT FLOW 3 SBR 2 Cycles /SBR

Influent Flow Average	3.0	MGD	
SBR Quantity	3		
Cycles per SBR	2	/day/SBR	
SBR Decant Time	2.0	hrs/cycle	
Total SBR Decant Time	**12**	**hrs/day**	
Decant flowrate	4167	gpm	7300 GPM CURRENT PUMP MAX
Decant volume	500,000	gallons	
SBR Tank Volume	2,246,556	gallons	
SBR Tank Height	26	ft	
SBR Volume per height	86,406	gal/ft	
Decant Height	5.8	ft	
Decant Volume %	22%		
SBR Feed Time per tank	4.00	hrs/cycle	
TOTAL SBR Feed Time per tank	8.00	hrs/day	
TOTAL SBR Feed Time	24.00	hrs/day (should equal 24 hrs/day)	
Feed flowrate	**2083**	**gpm**	2500 GPM CURRENT PUMP MAX EACH
SBR Settle time	1	hr/cycle	
SBR React time per cycle	5.00	hr/cycle	
SBR React+Feed time per cycle	9.00	hr/cycle	
SBR React+Feed time per day	**18.00**	**hr/day**	
Equalization Volume Req'd (from table below)	250,000	gallons	600,000 GAL TANK

CURRENT CYCLES



	SBR 1 gpm	SBR 2 gpm	SBR 3 gpm	Surge Out gpm	Surge Volume gallons
0:00	4167			2083	100,000
0:15	4167			2083	131,250
0:30	4167			2083	162,500
0:45	4167			2083	193,750
1:00	4167			2083	225,000
1:15	4167			2083	256,250
1:30	4167			2083	287,500
1:45	4167			2083	318,750
2:00				2083	287,500
2:15				2083	256,250
2:30				2083	225,000
2:45				2083	193,750
3:00				2083	162,500
3:15				2083	131,250
3:30				2083	100,000
3:45				2083	68,750
4:00		4167		2083	100,000
4:15		4167		2083	131,250
4:30		4167		2083	162,500
4:45		4167		2083	193,750
5:00		4167		2083	225,000
5:15		4167		2083	256,250
5:30		4167		2083	287,500
5:45		4167		2083	318,750
6:00				2083	287,500
6:15				2083	256,250
6:30				2083	225,000
6:45				2083	193,750
7:00				2083	162,500
7:15				2083	131,250
7:30				2083	100,000
7:45				2083	68,750
8:00			4167	2083	100,000
8:15			4167	2083	131,250
8:30			4167	2083	162,500
8:45			4167	2083	193,750
9:00			4167	2083	225,000
9:15			4167	2083	256,250
9:30			4167	2083	287,500
9:45			4167	2083	318,750
10:00				2083	287,500
10:15				2083	256,250
10:30				2083	225,000
10:45				2083	193,750
11:00				2083	162,500
11:15				2083	131,250
11:30				2083	100,000
11:45				2083	68,750
12:00	4167			2083	100,000
12:15	4167			2083	131,250
12:30	4167			2083	162,500
12:45	4167			2083	193,750
13:00	4167			2083	225,000
13:15	4167			2083	256,250
13:30	4167			2083	287,500
13:45	4167			2083	318,750
14:00				2083	287,500
14:15				2083	256,250
14:30				2083	225,000
14:45				2083	193,750
15:00				2083	162,500
15:15				2083	131,250
15:30				2083	100,000
15:45				2083	68,750
16:00		4167		2083	100,000
16:15		4167		2083	131,250
16:30		4167		2083	162,500
16:45		4167		2083	193,750
17:00		4167		2083	225,000
17:15		4167		2083	256,250
17:30		4167		2083	287,500
17:45		4167		2083	318,750
18:00				2083	287,500
18:15				2083	256,250
18:30				2083	225,000
18:45				2083	193,750
19:00				2083	162,500
19:15				2083	131,250
19:30				2083	100,000
19:45				2083	68,750

20:00			4167	2083	100,000
20:15			4167	2083	131,250
20:30			4167	2083	162,500
20:45			4167	2083	193,750
21:00			4167	2083	225,000
21:15			4167	2083	256,250
21:30			4167	2083	287,500
21:45			4167	2083	318,750
22:00				2083	287,500
22:15				2083	256,250
22:30				2083	225,000
22:45				2083	193,750
23:00				2083	162,500
23:15				2083	131,250
23:30				2083	100,000
23:45				2083	68,750
	66667	66667	66667	200000	
			200000	200000	

FUTURE FLOW 3 SBR 2 Cycles /SBR

Influent Flow Average	5.0	MGD
SBR Quantity	3	
Cycles per SBR	2	/day/SBR
SBR Decant Time	2.0	hrs/cycle
Total SBR Decant Time	**12**	**hrs/day**
Decant flowrate	6944	gpm
Decant volume	833,333	gallons
SBR Tank Volume	2,246,556	gallons
SBR Tank Height	26	ft
SBR Volume per height	86,406	gal/ft
Decant Height	9.6	ft
Decant Volume %	37%	
SBR Feed Time per tank	4.00	hrs/cycle
TOTAL SBR Feed Time per tank	8.00	hrs/day
TOTAL SBR Feed Time	24.00	hrs/day (should equal 24 hrs/day)
Feed flowrate	**3472**	**gpm**
SBR Settle time	1	hr/cycle
SBR React time per cycle	5.00	hr/cycle
SBR React+Feed time per cycle	9.00	hr/cycle
SBR React+Feed time per day	**18.00**	**hr/day**
Equalization Volume Req'd (from table below)	416,667	gallons

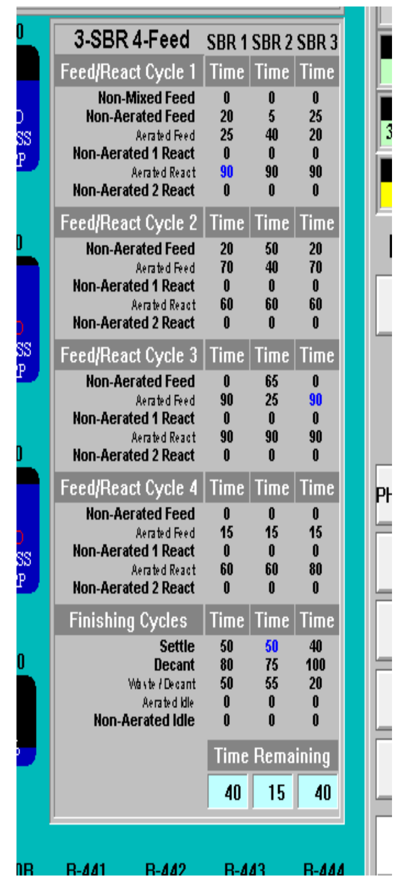
7300 GPM CURRENT PUMP MAX

2500 GPM CURRENT PUMP MAX EACH

600,000 GAL TANK

	SBR 1 gpm	SBR 2 gpm	SBR 3 gpm	Surge Out gpm	Surge Volume gallons
0:00	6944			3472	100,000
0:15	6944			3472	152,083
0:30	6944			3472	204,167
0:45	6944			3472	256,250
1:00	6944			3472	308,333
1:15	6944			3472	360,417
1:30	6944			3472	412,500
1:45	6944			3472	464,583
2:00				3472	412,500
2:15				3472	360,417
2:30				3472	308,333
2:45				3472	256,250
3:00				3472	204,167
3:15				3472	152,083
3:30				3472	100,000
3:45				3472	47,917
4:00		6944		3472	100,000
4:15		6944		3472	152,083
4:30		6944		3472	204,167
4:45		6944		3472	256,250
5:00		6944		3472	308,333
5:15		6944		3472	360,417
5:30		6944		3472	412,500
5:45		6944		3472	464,583
6:00				3472	412,500
6:15				3472	360,417
6:30				3472	308,333
6:45				3472	256,250
7:00				3472	204,167
7:15				3472	152,083
7:30				3472	100,000
7:45				3472	47,917
8:00			6944	3472	100,000
8:15			6944	3472	152,083
8:30			6944	3472	204,167
8:45			6944	3472	256,250
9:00			6944	3472	308,333
9:15			6944	3472	360,417
9:30			6944	3472	412,500
9:45			6944	3472	464,583
10:00				3472	412,500
10:15				3472	360,417
10:30				3472	308,333
10:45				3472	256,250
11:00				3472	204,167
11:15				3472	152,083
11:30				3472	100,000
11:45				3472	47,917
12:00	6944			3472	100,000
12:15	6944			3472	152,083
12:30	6944			3472	204,167
12:45	6944			3472	256,250
13:00	6944			3472	308,333
13:15	6944			3472	360,417
13:30	6944			3472	412,500
13:45	6944			3472	464,583
14:00				3472	412,500
14:15				3472	360,417
14:30				3472	308,333
14:45				3472	256,250
15:00				3472	204,167
15:15				3472	152,083
15:30				3472	100,000
15:45				3472	47,917
16:00		6944		3472	100,000
16:15		6944		3472	152,083
16:30		6944		3472	204,167
16:45		6944		3472	256,250
17:00		6944		3472	308,333
17:15		6944		3472	360,417
17:30		6944		3472	412,500
17:45		6944		3472	464,583
18:00				3472	412,500
18:15				3472	360,417
18:30				3472	308,333
18:45				3472	256,250
19:00				3472	204,167
19:15				3472	152,083
19:30				3472	100,000

CURRENT CYCLES



3-SBR 4-Feed	SBR 1	SBR 2	SBR 3
Feed/React Cycle 1	Time	Time	Time
Non-Mixed Feed	0	0	0
Non-Aerated Feed	20	5	25
Aerated Feed	25	40	20
Non-Aerated 1 React	0	0	0
Aerated React	90	90	90
Non-Aerated 2 React	0	0	0
Feed/React Cycle 2	Time	Time	Time
Non-Aerated Feed	20	50	20
Aerated Feed	70	40	70
Non-Aerated 1 React	0	0	0
Aerated React	60	60	60
Non-Aerated 2 React	0	0	0
Feed/React Cycle 3	Time	Time	Time
Non-Aerated Feed	0	65	0
Aerated Feed	90	25	90
Non-Aerated 1 React	0	0	0
Aerated React	90	90	90
Non-Aerated 2 React	0	0	0
Feed/React Cycle 4	Time	Time	Time
Non-Aerated Feed	0	0	0
Aerated Feed	15	15	15
Non-Aerated 1 React	0	0	0
Aerated React	60	60	80
Non-Aerated 2 React	0	0	0
Finishing Cycles	Time	Time	Time
Settle	50	50	40
Decant	80	75	100
Waste / Decant	50	55	20
Aerated Idle	0	0	0
Non-Aerated Idle	0	0	0
Time Remaining	40	15	40

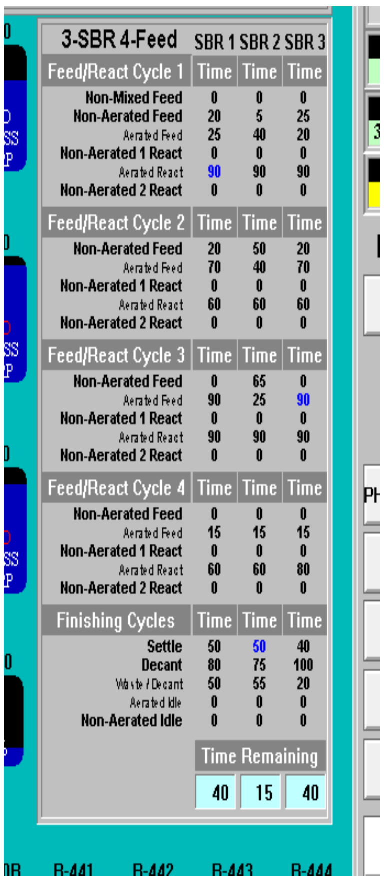
B-441 B-442 B-443 B-444

19:45				3472	47,917
20:00			6944	3472	100,000
20:15			6944	3472	152,083
20:30			6944	3472	204,167
20:45			6944	3472	256,250
21:00			6944	3472	308,333
21:15			6944	3472	360,417
21:30			6944	3472	412,500
21:45			6944	3472	464,583
22:00				3472	412,500
22:15				3472	360,417
22:30				3472	308,333
22:45				3472	256,250
23:00				3472	204,167
23:15				3472	152,083
23:30				3472	100,000
23:45				3472	47,917
	111111	111111	111111	333333	
			333333	333333	

FUTURE FLOW 3 SBR 3 Cycles /SBR

Influent Flow Average	5.0	MGD	
SBR Quantity	3		
Cycles per SBR	3	/day/SBR	
SBR Decant Time	1.5	hrs/cycle	
Total SBR Decant Time	**13.5**	**hrs/day**	
Decant flowrate	6173	gpm	7300 GPM CURRENT PUMP MAX
Decant volume	555,556	gallons	
SBR Tank Volume	2,246,556	gallons	
SBR Tank Height	26	ft	
SBR Volume per height	86,406	gal/ft	
Decant Height	6.4	ft	
Decant Volume %	25%		
SBR Feed Time per tank	2.67	hrs/cycle	
TOTAL SBR Feed Time per tank	8.00	hrs/day	
TOTAL SBR Feed Time	24.00	hrs/day (should equal 24 hrs/day)	
Feed flowrate	**3472**	**gpm**	2500 GPM CURRENT PUMP MAX EACH
SBR Settle time	1	hr/cycle	
SBR React time per cycle	2.83	hr/cycle	
SBR React+Feed time per cycle	5.50	hr/cycle	
SBR React+Feed time per day	**16.50**	**hr/day**	
Equalization Volume Req'd (from table below)	277,778	gallons	600,000 GAL TANK

CURRENT CYCLES



3-SBR 4-Feed	SBR 1	SBR 2	SBR 3
Feed/React Cycle 1	Time	Time	Time
Non-Mixed Feed	0	0	0
Non-Aerated Feed	20	5	25
Aerated Feed	25	40	20
Non-Aerated 1 React	0	0	0
Aerated React	90	90	90
Non-Aerated 2 React	0	0	0
Feed/React Cycle 2	Time	Time	Time
Non-Aerated Feed	20	50	20
Aerated Feed	70	40	70
Non-Aerated 1 React	0	0	0
Aerated React	60	60	60
Non-Aerated 2 React	0	0	0
Feed/React Cycle 3	Time	Time	Time
Non-Aerated Feed	0	65	0
Aerated Feed	90	25	90
Non-Aerated 1 React	0	0	0
Aerated React	90	90	90
Non-Aerated 2 React	0	0	0
Feed/React Cycle 4	Time	Time	Time
Non-Aerated Feed	0	0	0
Aerated Feed	15	15	15
Non-Aerated 1 React	0	0	0
Aerated React	60	60	80
Non-Aerated 2 React	0	0	0
Finishing Cycles	Time	Time	Time
Settle	50	50	40
Decant	80	75	100
Waste / Decant	50	55	20
Aerated Idle	0	0	0
Non-Aerated Idle	0	0	0
Time Remaining	40	15	40

	SBR 1 gpm	SBR 2 gpm	SBR 3 gpm	Surge Out gpm	Surge Volume gallons
0:00	6173			3472	100,000
0:15	6173			3472	140,509
0:30	6173			3472	181,019
0:45	6173			3472	221,528
1:00	6173			3472	262,037
1:15	6173			3472	302,546
1:30				3472	250,463
1:45				3472	198,380
2:00				3472	146,296
2:15				3472	94,213
2:30				3472	42,130
2:45		6173		3472	82,639
3:00		6173		3472	123,148
3:15		6173		3472	163,657
3:30		6173		3472	204,167
3:45		6173		3472	244,676
4:00		6173		3472	285,185
4:15				3472	233,102
4:30				3472	181,019
4:45				3472	128,935
5:00				3472	76,852
5:15				3472	24,769
5:30			6173	3472	65,278
5:45			6173	3472	105,787
6:00			6173	3472	146,296
6:15			6173	3472	186,806
6:30			6173	3472	227,315
6:45			6173	3472	267,824
7:00				3472	215,741
7:15				3472	163,657
7:30				3472	111,574
7:45				3472	59,491
8:00	6173			3472	100,000
8:15	6173			3472	140,509
8:30	6173			3472	181,019
8:45	6173			3472	221,528
9:00	6173			3472	262,037
9:15	6173			3472	302,546
9:30				3472	250,463
9:45				3472	198,380
10:00				3472	146,296
10:15				3472	94,213
10:30				3472	42,130
10:45		6173		3472	82,639
11:00		6173		3472	123,148
11:15		6173		3472	163,657
11:30		6173		3472	204,167
11:45		6173		3472	244,676
12:00		6173		3472	285,185
12:15				3472	233,102
12:30				3472	181,019
12:45				3472	128,935
13:00				3472	76,852
13:15				3472	24,769
13:30			6173	3472	65,278
13:45			6173	3472	105,787
14:00			6173	3472	146,296
14:15			6173	3472	186,806
14:30			6173	3472	227,315
14:45			6173	3472	267,824
15:00				3472	215,741
15:15				3472	163,657
15:30				3472	111,574
15:45				3472	59,491
16:00	6173			3472	100,000
16:15	6173			3472	140,509
16:30	6173			3472	181,019
16:45	6173			3472	221,528
17:00	6173			3472	262,037
17:15	6173			3472	302,546
17:30				3472	250,463
17:45				3472	198,380
18:00				3472	146,296
18:15				3472	94,213
18:30				3472	42,130
18:45		6173		3472	82,639
19:00		6173		3472	123,148
19:15		6173		3472	163,657
19:30		6173		3472	204,167

19:45		6173		3472	244,676
20:00		6173		3472	285,185
20:15				3472	233,102
20:30				3472	181,019
20:45				3472	128,935
21:00				3472	76,852
21:15				3472	24,769
21:30			6173	3472	65,278
21:45			6173	3472	105,787
22:00			6173	3472	146,296
22:15			6173	3472	186,806
22:30			6173	3472	227,315
22:45			6173	3472	267,824
23:00				3472	215,741
23:15				3472	163,657
23:30				3472	111,574
23:45				3472	59,491
	111111	111111	111111	333333	
			333333	333333	

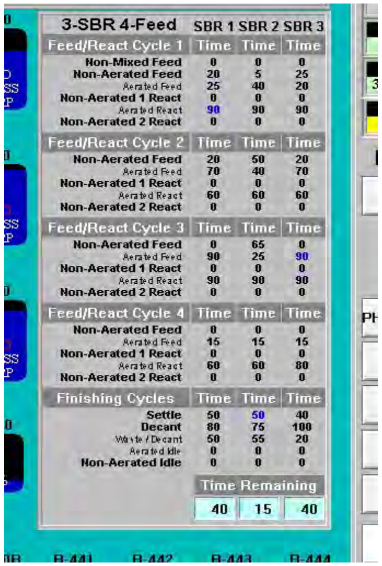
ATTACHMENT C
SBR PERFORMACE MODELLING

SBR INFLUENT PARAMETERS FR0M T-390		
Flow	5	mgd
COD Concentration	1341	mg/L
BOD Concentration	765	mg/L
Organic. Nitrogen	46	mg/L
Ammonia Nitrogen NH_3-N	1	mg/L
Nitrate Nitrogen NO_3-N	1	mg/L

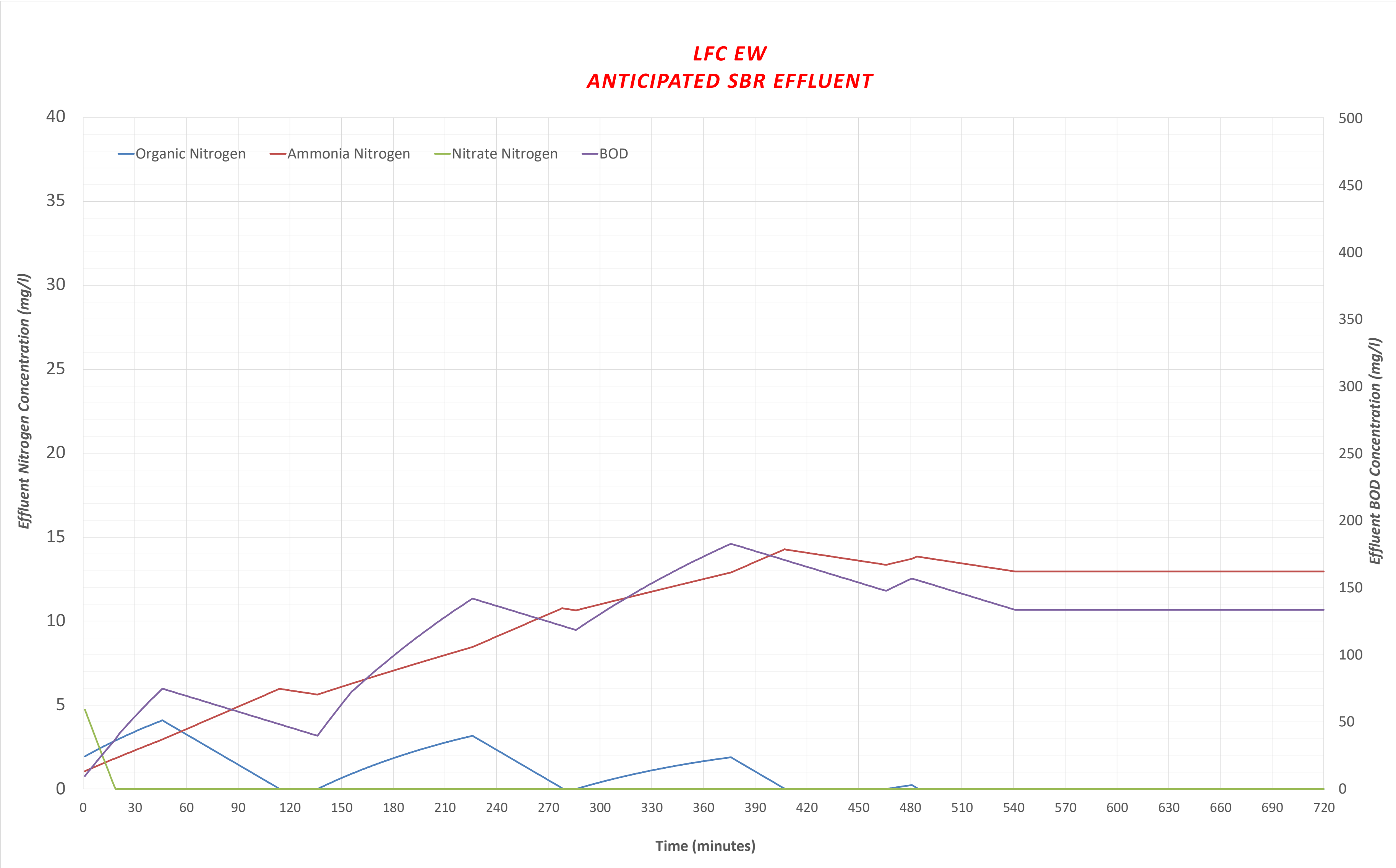
	FLOW mgd	COD mg/L
HRAS Out	4.96	1380
HRAS Bypass		
Lagoon	0.353	800
Combined	5.313	1341

LFC PROVIDED SBR INFORMATION			
SBR Feed Rate	3,500	gpm	Max 7500 gpm per LFC
SBR Decanter Rate	4,500	gpm	Max 7500 gpm per LFC
Number of SBR Tanks	3	Unit	
Diameter	121	ft	
Height	28	ft	
Freeboard	3	ft	
Volume per Tank	2,408,352	gallons	
Working Volume perTank	2,150,314	gallons	
Gallons of Water per Foot of Tank	86,013		
Total Volume of all three Tanks	7,225,055	gallons	
Total Working Volume of all three Tanks	6,450,942	gallons	
Initial Tank Volume	1,316,981	gallons	
Volume During Filling Cycle	833,333	gallons	
Total Filling Time	240	minutes	
Final SBR Volume	2,150,314	gallons	
Total No of Cycles	6		
Number of Cycles per SBR	2		
SBR Cycle Time	12	hour	
Offset Time SBR 2	240	minutes	
Offset Time SBR 3	480	minutes	
Volume of WW to Decant	833,333	gallons	
Calculated Decant Time	190	minutes	
MLSS Concentration in SBR	5000	mg/L	
Volatile Fraction	75%	%	
VSS	3,750	mg/L	

Current LFC SBR Cycle Time Provided by LFC		
Feed/React Cycle 1		**Units**
Non-Aerated Feed Time	20	minutes
Aerated Feed Time	25	minutes
Aerated React Time	90	minutes
Non-Aerated React Time	0	minutes
Feed/React Cycle 2		
Non-Aerated Feed Time	20	minutes
Aerated Feed Time	70	minutes
Aerated React Time	60	minutes
Non-Aerated React Time	0	minutes
Feed/React Cycle 3		
Non-Aerated Feed Time	0	minutes
Aerated Feed Time	90	minutes
Aerated React Time	90	minutes
Non-Aerated React Time		minutes
Feed/React Cycle 4		
Non-Aerated Feed Time	0	minutes
Aerated Feed Time	15	minutes
Aerated React Time	60	minutes
Non-Aerated React Time	0	minutes
Finishing Cycles		
Settle Time	50	minutes
Decant Time	80	minutes
Waste Time	50	minutes
Idle Time	0	minutes



3-SBR 4-Feed	SBR 1	SBR 2	SBR 3
Feed/React Cycle 1	**Time**	**Time**	**Time**
Non-Mixed Feed	0	0	0
Non-Aerated Feed	20	5	25
Aerated Feed	25	40	20
Non-Aerated 1 React	0	0	0
Aerated React	90	90	90
Non-Aerated 2 React	0	0	0
Feed/React Cycle 2	**Time**	**Time**	**Time**
Non-Aerated Feed	20	50	20
Aerated Feed	70	40	70
Non-Aerated 1 React	0	0	0
Aerated React	60	60	60
Non-Aerated 2 React	0	0	0
Feed/React Cycle 3	**Time**	**Time**	**Time**
Non-Aerated Feed	0	65	0
Aerated Feed	90	25	90
Non-Aerated 1 React	0	0	0
Aerated React	90	90	90
Non-Aerated 2 React	0	0	0
Feed/React Cycle 4	**Time**	**Time**	**Time**
Non-Aerated Feed	0	0	0
Aerated Feed	15	15	15
Non-Aerated 1 React	0	0	0
Aerated React	60	60	80
Non-Aerated 2 React	0	0	0
Finishing Cycles	**Time**	**Time**	**Time**
Settle	50	50	40
Decant	80	75	100
Waste / Decant	50	55	20
Aerated Idle	0	0	0
Non-Aerated Idle	0	0	0
Time Remaining	40	15	40



LFC EW
ANTICIPATED SBR EFFLUENT
Organic Nitrogen
Ammonia Nitrogen
Nitrate Nitrogen
BOD
Effluent Nitrogen Concentration (mg/l)
Effluent BOD Concentration (mg/l)
Time (minutes)
0
5
10
15
20
25
30
35
40
0
50
100
150
200
250
300
350
400
450
500
0
30
60
90
120
150
180
210
240
270
300
330
360
390
420
450
480
510
540
570
600
630
660
690
720

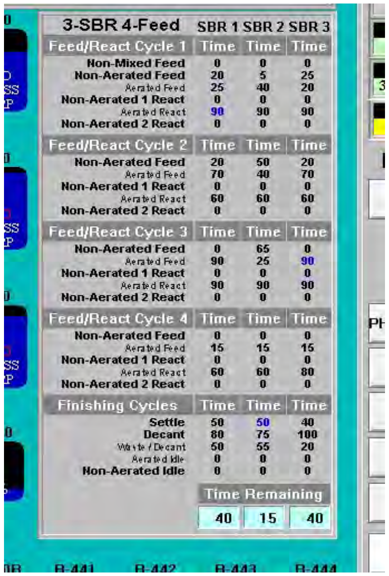
Leprino Foods Company
Lemoore West Wastewater
Pretreatment System Upgrade
Lemoore, California

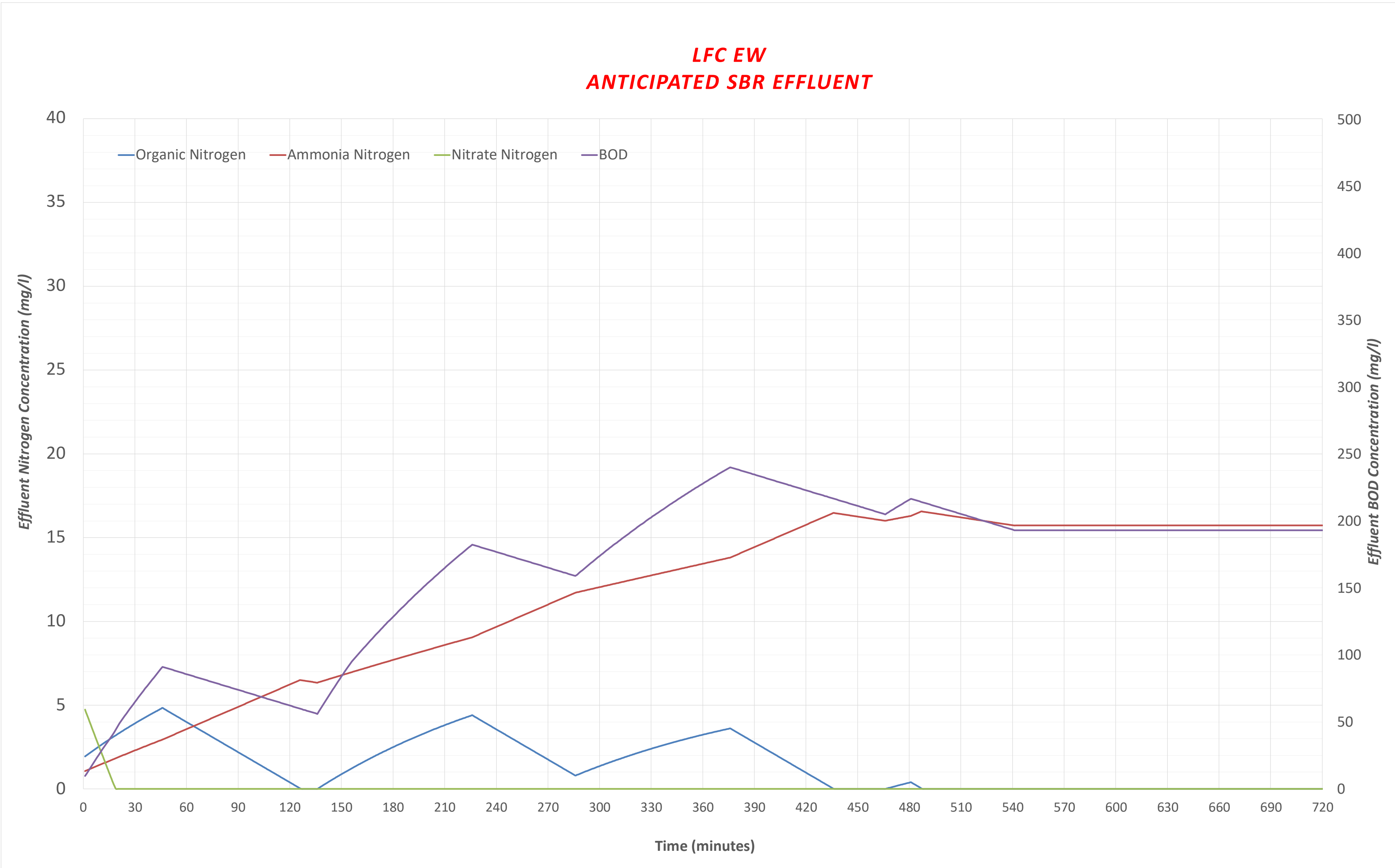
SBR INFLUENT PARAMETERS FR0M T-390		
Flow	5	mgd
COD Concentration	1611	mg/L
BOD Concentration	918	mg/L
Organic. Nitrogen	53	mg/L
Ammonia Nitrogen NH_3-N	1	mg/L
Nitrate Nitrogen NO_3-N	1	mg/L

	FLOW mgd	COD mg/L
HRAS Out	4.98	1668
HRAS Bypass		
Lagoon	0.353	800
Combined	5.333	1611

LFC PROVIDED SBR INFORMATION			
SBR Feed Rate	3,500	gpm	Max 7500 gpm per LFC
SBR Decanter Rate	4,500	gpm	Max 7500 gpm per LFC
Number of SBR Tanks	3	Unit	
Diameter	121	ft	
Height	28	ft	
Freeboard	3	ft	
Volume per Tank	2,408,352	gallons	
Working Volume perTank	2,150,314	gallons	
Gallons of Water per Foot of Tank	86,013		
Total Volume of all three Tanks	7,225,055	gallons	
Total Working Volume of all three Tanks	6,450,942	gallons	
Initial Tank Volume	1,316,981	gallons	
Volume During Filling Cycle	833,333	gallons	
Total Filling Time	240	minutes	
Final SBR Volume	2,150,314	gallons	
Total No of Cycles	6		
Number of Cycles per SBR	2		
SBR Cycle Time	12	hour	
Offset Time SBR 2	240	minutes	
Offset Time SBR 3	480	minutes	
Volume of WW to Decant	833,333	gallons	
Calculated Decant Time	190	minutes	
MLSS Concentration in SBR	5000	mg/L	
Volatile Fraction	75%	%	
VSS	3,750	mg/L	

Current LFC SBR Cycle Time Provided by LFC		
Feed/React Cycle 1		Units
Non-Aerated Feed Time	20	minutes
Aerated Feed Time	25	minutes
Aerated React Time	90	minutes
Non-Aerated React Time	0	minutes
Feed/React Cycle 2		
Non-Aerated Feed Time	20	minutes
Aerated Feed Time	70	minutes
Aerated React Time	60	minutes
Non-Aerated React Time	0	minutes
Feed/React Cycle 3		
Non-Aerated Feed Time	0	minutes
Aerated Feed Time	90	minutes
Aerated React Time	90	minutes
Non-Aerated React Time		minutes
Feed/React Cycle 4		
Non-Aerated Feed Time	0	minutes
Aerated Feed Time	15	minutes
Aerated React Time	60	minutes
Non-Aerated React Time	0	minutes
Finishing Cycles		
Settle Time	50	minutes
Decant Time	80	minutes
Waste Time	50	minutes
Idle Time	0	minutes





LFC EW
ANTICIPATED SBR EFFLUENT
Organic Nitrogen
Ammonia Nitrogen
Nitrate Nitrogen
BOD
Effluent Nitrogen Concentration (mg/l)
Effluent BOD Concentration (mg/l)
Time (minutes)
0
5
10
15
20
25
30
35
40
0
50
100
150
200
250
300
350
400
450
500
0 30 60 90 120 150 180 210 240 270 300 330 360 390 420 450 480 510 540 570 600 630 660 690 720

Leprino Foods Company
Lemoore West Wastewater
Pretreatment System Upgrade
Lemoore, California

SBR INFLUENT PARAMETERS FR0M T-390		
Flow	5	mgd
COD Concentration	1798	mg/L
BOD Concentration	1025	mg/L
Organic. Nitrogen	53	mg/L
Ammonia Nitrogen NH_3-N	1	mg/L
Nitrate Nitrogen NO_3-N	1	mg/L

	FLOW mgd	COD mg/L
HRAS Out HRAS Bypass	4.99	1869
Lagoon	0.353	800
Combined	5.343	1798

LFC PROVIDED SBR INFORMATION			
SBR Feed Rate	3,500	gpm	Max 7500 gpm per LFC
SBR Decanter Rate	4,500	gpm	Max 7500 gpm per LFC
Number of SBR Tanks	3	Unit	
Diameter	121	ft	
Height	28	ft	
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Offset Time SBR 3	480	minutes	
Volume of WW to Decant	833,333	gallons	
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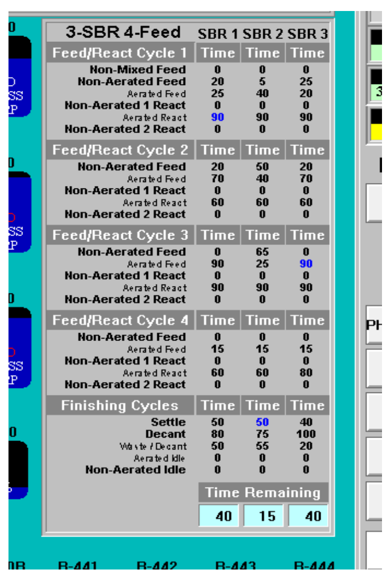
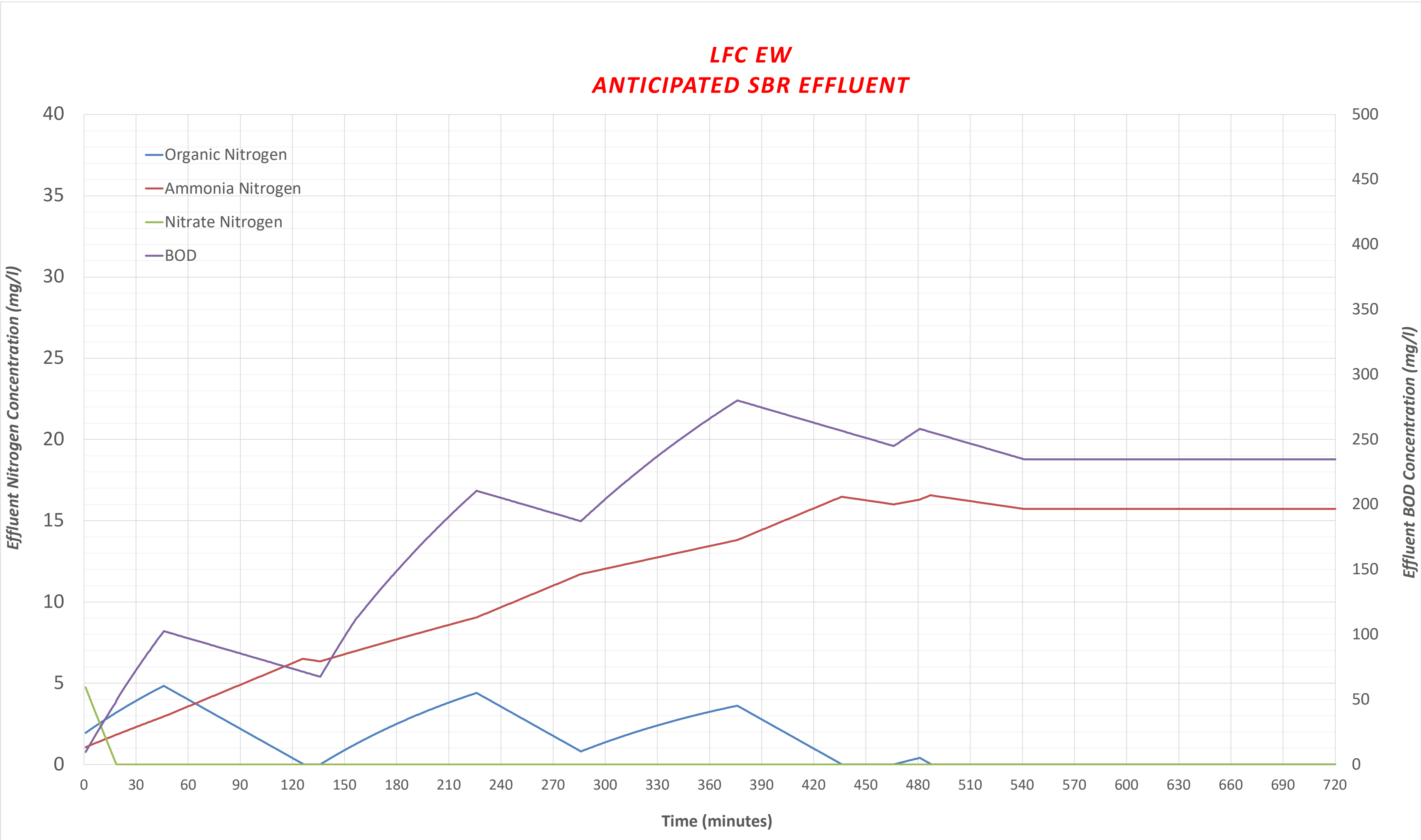
Volatile Fraction	75%	%	
VSS	3,750	mg/L	

Current LFC SBR Cycle Time Provided by LFC		
Feed/React Cycle 1		Units
Non-Aerated Feed Time	20	minutes
Aerated Feed Time	25	minutes
Aerated React Time	90	minutes
Non-Aerated React Time	0	minutes
Feed/React Cycle 2		
Non-Aerated Feed Time	20	minutes
Aerated Feed Time	70	minutes
Aerated React Time	60	minutes
Non-Aerated React Time	0	minutes
Feed/React Cycle 3		
Non-Aerated Feed Time	0	minutes
Aerated Feed Time	90	minutes
Aerated React Time	90	minutes
Non-Aerated React Time		minutes
Feed/React Cycle 4		
Non-Aerated Feed Time	0	minutes
Aerated Feed Time	15	minutes
Aerated React Time	60	minutes
Non-Aerated React Time	0	minutes
Finishing Cycles		
Settle Time	50	minutes
Decant Time	80	minutes
Waste Time	50	minutes
Idle Time	0	minutes



3-SBR 4-Feed	SBR 1	SBR 2	SBR 3
Feed/React Cycle 1	Time	Time	Time
Non-Mixed Feed	0	0	0
Non-Aerated Feed	20	5	25
Aerated Feed	25	40	20
Non-Aerated 1 React	0	0	0
Aerated React	90	90	90
Non-Aerated 2 React	0	0	0
Feed/React Cycle 2	Time	Time	Time
Non-Aerated Feed	20	50	20
Aerated Feed	70	40	70
Non-Aerated 1 React	0	0	0
Aerated React	60	60	60
Non-Aerated 2 React	0	0	0
Feed/React Cycle 3	Time	Time	Time
Non-Aerated Feed	0	65	0
Aerated Feed	90	25	90
Non-Aerated 1 React	0	0	0
Aerated React	90	90	90
Non-Aerated 2 React	0	0	0
Feed/React Cycle 4	Time	Time	Time
Non-Aerated Feed	0	0	0
Aerated Feed	15	15	15
Non-Aerated 1 React	0	0	0
Aerated React	60	60	80
Non-Aerated 2 React	0	0	0
Finishing Cycles	Time	Time	Time
Settle	50	50	40
Decant	80	75	100
Waste / Decant	50	55	20
Aerated Idle	0	0	0
Non-Aerated Idle	0	0	0
Time Remaining	40	15	40



LFC EW
ANTICIPATED SBR EFFLUENT
Organic Nitrogen
Ammonia Nitrogen
Nitrate Nitrogen
BOD
Effluent Nitrogen Concentration (mg/l)
Effluent BOD Concentration (mg/l)
Time (minutes)
0
5
10
15
20
25
30
35
40
0
50
100
150
200
250
300
350
400
450
500
0 30 60 90 120 150 180 210 240 270 300 330 360 390 420 450 480 510 540 570 600 630 660 690 720

Appendix D

Treated Combined Effluent Characteristics

Appendix D-1: Treated Combined Effluent Characteristics(a)

Sample Date	Total Monthly Flow (gallons)	BOD-5 (mg/L)[c]	TSS (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Nitrate as N (mg/L)	Nitrite as N (mg/L)	Ammonia as N (mg/L)	Total Nitrogen (mg/L)	TDS (mg/L)	FDS (mg/L)	Arsenic (Diss.) (µg/L)[e]	Sele-nium (Diss.) (µg/L)	Boron (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Iron (mg/L)	Magne-sium (mg/L)	Manga-nese (mg/L)	Potas-sium (mg/L)	Sodium (mg/L)	Sulfate as SO_4 (mg/L)	Alkalinity as $CaCO_3$ (mg/L)	Bicarb. as CaCO3 (mg/L)	Carbonate as $CaCO_3$ (mg/L)	Hydroxide as $CaCO_3$ (mg/L)	Hardness as $CaCO_3$ (mg/L)	SAR (mg/L)
Monitoring Frequency	**C[b]**	**M[d]**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**Q[f]**	**Q**	**Q**	**Q**	**Q**	**Q**	**Q**	**Q**	**Q**	**Q**	**Q**	**Q**	**Q**	**Q**	**Q**	**Q**	**Q**
October-19	32,650,760	16.2	0	15.5	-	-	-	-	-	710	-	-	-	26.7	208	0.31	5.1	8.3	9.1	247	21.6	450	450	1	-	87.6	10.9
November-19	148,890,760	18.4	940	18	1	0	13	19	940	660	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
December-19	150,328,666	14	1280	15	4	1	13	19	1240	760	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
January-20	152,849,204	9	10	22	1	1	18	23	1070	740	2.7	0.54	0.52	37.2	225	0.24	7.4	0.02	94.8	260	15.9	940	904	1	-	123	10.2
February-20	128,976,520	10	10	21	1	1	15	22	1220	720	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
March-20	142,502,855	27.4	39	21	2	1	12	23	1190	710	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
April-20	146,121,535	7	10	22	1	1	2	20	1250	820	3.1	0.98	0.47	37.9	274	0.49	8	0.02	161	322	13.6	621	621	1	-	128	12.4
May-20	144,948,600	5	12	21	1	1	15	25	1220	930	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
June-20	123,804,000	5	10	21	2	<0.4	12	51	1320	890	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
July-20	139,920,000	7	24	16	3	0	7	19	1320	990	3.4	1.8	0.47	32.9	320	0.67	9.6	0.02	127	359	15.8	588	621	1	-	122	14.2
August-20	134,259,000	9	24	15	1	0	6	16	1250	970	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
September-20	136,043,000	5	19	15	2	0	8	16	1240	920	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October-20	143,154,000	7	24	16	1	1	10	17	1290	1010	3.2	3.1	0.57	36.4	321	0.38	8.7	0.02	79.1	380	16.3	551	551	1	-	127	14.7
November-20	137,350,000	9	15	19	2	1	11	20	1320	970	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
December-20	144,472,000	5	25	19	1	1	12	20	1340	900	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
January-21	149,766,026	5	25	19	3	1	11	28	1260	1000	5.8	1.1	0.47	49.5	75.4	0.34	10.1	0.02	99.2	355	2.1	626	626	1	-	165	12
February-21	136,197,820	3.2	39	25	3	1	16	28	1140	810	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
March-21	144,247,348	1.8	32	24	4	1	15	20	1240	730	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
April-21	138,770,000	2.3	13	16	7	ND	14	24	1410	1140	2.3	0.24	0.49	31.5	324	0.46	8.7	ND	140	333	19.9	664	664	ND	-	126	14
May-21	146,520,000	5.8	21	15	7	ND	10	23	21	1120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
June-21	132,439,000	0.1	ND	18	7	1	12	25	ND	1160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
July-21	132,751,869	7.7	32	20	6	ND	12	26	1410	1100	3.7	1.7	0.82	38	338	0.27	9.6	0.02	144	370	16.9	638	638	ND	-	47.6	13.9
August-21	125,422,219	ND	27	16	5	0	9	21	1400	1120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
September-21	134,734,961	28.0	38	20	2	ND	9	23	1330	1000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

(a) Based on data collected between October 2019 through September 2021 in accordance with MRP Order No. R5-2019-0008.
(b) C = Monitored Continuously in accordance with MRP Order No. R5-2019-0008.
(c) mg/L = milligrams per liter.
(d) M = Monitored Monthly in accordance with MRP Order No. R5-2019-0008.
(e) µg/L = micrograms per liter.
(f) Q = Monitored Quarterly in accordance with MRP Order No. R5-2019-0008.
(g) W = Monitored Weekly in accordance with MRP Order No. R5-2019-0008.
(h) µS/cm = micro Siemens per centimeter
(i) MPN/100 mL = most probably number per 100 milliliters.
(j) D = Monitored Daily in accordance with MRP Order No. R5-2019-0008.

Definitions

Bicarb.	Bicarbonate
BOD-5	5-Day Biochemical Oxygen Demand
CaCO3	Calcium Carbonate
Diss.	Dissolved
EC	Electrical Conductivity
FDS	Fixed Dissolved Solids
N	Nitrogen
ND	Not Detected above Laboratory Reporting Limit
SAR	Sodium Absorption Ratio
TDS	Total Dissolved Solids
TSS	Total Suspended Solids

Kennedy Jenks

Appendix D-2: Treated Combined Effluent Characteristics[a]

	pH	EC
Sample Date	std. units	(µmho/cm)[h]
Mon. Freq.	W[g]	W
11/11/2019	7.40	1,971
11/24/2019	7.80	2,720
12/1/2019	7.30	2,370
12/8/2019	7.30	2,210
12/15/2019	7.70	2,360
12/22/2019	7.30	2,010
12/29/2019	7.80	2,400
1/1/2020	7.40	2,020
1/7/2020	7.30	2,050
1/14/2020	7.50	1,997
1/21/2020	7.30	1,874
1/28/2020	7.30	1,960
2/3/2020	7.40	1,932
2/10/2020	7.70	2,220
2/17/2020	7.60	2,100
2/24/2020	7.55	1,858
3/2/2020	7.70	2,180
3/9/2020	7.39	2,160
3/16/2020	7.64	2,220
3/23/2020	7.40	2,020
3/30/2020	7.26	2,150
4/6/2020	7.89	2,170
4/13/2020	7.24	2,140
4/20/2020	7.77	2,290
4/27/2020	7.17	1,951
5/4/2020	7.50	2,060
5/11/2020	7.98	2,590
5/18/2020	7.91	2,350
5/25/2020	7.78	2,370
6/1/2020	7.61	2,520
6/8/2020	7.50	2,270
6/15/2020	7.43	2,410
6/22/2020	7.53	2,490
6/29/2020	7.29	2,270
7/6/2020	7.36	2,270
7/13/2020	7.16	2,360
7/20/2020	7.30	2,370
7/27/2020	7.33	2,170
8/3/2020	7.31	2,130
8/10/2020	7.19	1,729
8/17/2020	7.22	2,350
8/24/2020	7.39	2,100

Appendix D-2: Treated Combined Effluent Characteristics[a]

	pH	EC
Sample Date	std. units	(µmho/cm)[h]
Mon. Freq.	W[g]	W
8/31/2020	7.41	2,240
9/7/2020	7.50	2,260
9/14/2020	7.38	2,410
9/21/2020	7.50	2,310
9/28/2020	7.29	1,986
10/5/2020	7.27	2,270
10/12/2020	7.54	2,260
10/19/2020	7.45	2,290
10/26/2020	7.46	2,260
11/2/2020	7.92	2,380
11/9/2020	7.69	2,170
11/16/2020	7.46	2,290
11/23/2020	7.49	2,030
11/30/2020	7.66	2,100
12/7/2020	7.11	2,120
12/14/2020	7.16	2,100
12/21/2020	7.25	1,950
12/28/2020	7.35	1,919
1/4/2021	7.51	2,020
1/11/2021	7.22	1,794
1/18/2021	7.56	2,150
1/25/2021	6.94	2,130
2/1/2021	6.97	1,968
2/8/2021	7.63	2,010
2/15/2021	7.53	2,250
2/22/2021	7.11	2,190
3/1/2021	7.56	2,550
3/8/2021	7.33	2,290
3/15/2021	8.10	2,550
3/22/2021	7.67	2,340
3/29/2021	7.98	2,330
4/5/2021	7.66	2,330
4/12/2021	7.48	2,300
4/19/2021	7.32	2,370
4/26/2021	7.52	2,430
5/3/2021	7.20	2,350
5/10/2021	7.31	2,340
5/17/2021	7.51	2,650
5/24/2021	7.53	2,460
5/31/2021	7.61	2,630
6/7/2021	7.69	2,530
6/14/2021	7.36	2,410

Appendix D-2: Treated Combined Effluent Characteristics[a]

	pH	EC
Sample Date	std. units	(μmho/cm)[h]
Mon. Freq.	W[g]	W
6/21/2021	7.46	2,920
6/28/2021	7.32	2,530
7/5/2021	7.49	2,370
7/12/2021	7.67	2,350
7/19/2021	8.72	2,780
7/26/2021	7.90	2,710
8/2/2021	7.76	2,330
8/9/2021	7.50	2,340
8/16/2021	7.86	2,450
8/23/2021	7.42	2,620
8/30/2021	7.83	2,200
9/6/2021	7.47	2,210
9/13/2021	7.36	2,150
9/20/2021	7.68	2,450
9/27/2021	8.50	3,320

Notes:

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(c) mg/L = milligrams per liter.
(d) M = Monitored Monthly in accordance with MRP Order No. R5-2019-0008.
(e) μg/L = micrograms per liter.
(f) Q = Monitored Quarterly in accordance with MRP Order No. R5-2019-0008.
(g) W = Monitored Weekly in accordance with MRP Order No. R5-2019-0008.
(h) μS/cm = micro Siemens per centimeter
(i) MPN/100 mL = most probably number per 100 milliliters.
(j) D = Monitored Daily in accordance with MRP Order No. R5-2019-0008.

Definitions

Bicarb.	Bicarbonate
BOD-5	5-Day Biochemical Oxygen Demand
CaCO3	Calcium Carbonate
Diss.	Dissolved
EC	Electrical Conductivity
FDS	Fixed Dissolved Solids
N	Nitrogen
ND	Not Detected above Laboratory Reporting Limit
SAR	Sodium Absorption Ratio
TDS	Total Dissolved Solids
TSS	Total Suspended Solids

Appendix D-3: Treated Combined Effluent Characteristics[a]

Sample Date	Total Coliform (MPN/100 mL)[i]
Mon. Freq.	D[j]
10/25/2019	2.20
10/26/2019	12.00
10/27/2019	23.00
10/28/2019	1.10
10/29/2019	1.10
10/30/2019	23.00
10/31/2019	23.00
11/1/2019	1.10
11/2/2019	1.10
11/3/2019	23.00
11/4/2019	1.10
11/5/2019	1.10
11/6/2019	1.00
11/7/2019	1.10
11/8/2019	1.10
11/9/2019	1.10
11/10/2019	1.10
11/11/2019	1.10
11/12/2019	1.10
11/13/2019	1.10
11/14/2019	1.10
11/15/2019	1.10
11/16/2019	1.10
11/17/2019	1.10
11/18/2019	1.10
11/19/2019	1.10
11/20/2019	1.10
11/21/2019	1.10
11/22/2019	1.10
11/23/2019	12.00
11/24/2019	2.20
11/25/2019	2.20
11/26/2019	2.00
11/27/2019	1.80
11/28/2019	1.80
11/29/2019	1.80
11/30/2019	7.80
12/1/2019	4.50
12/2/2019	1.80
12/3/2019	2.00
12/4/2019	2.00
12/5/2019	1.80
12/6/2019	2.00
12/7/2019	7.80
12/8/2019	17.00
12/9/2019	2.00
12/10/2019	4.50
12/11/2019	0.00
12/12/2019	1.80
12/13/2019	2.00
12/14/2019	1.80
12/15/2019	1.80
12/16/2019	1.80

Appendix D-3: Treated Combined Effluent Characteristics[a]

Sample Date	Total Coliform (MPN/100 mL)[i]
Mon. Freq.	D[j]
12/17/2019	4.50
12/18/2019	1.80
12/19/2019	1.80
12/20/2019	1.80
12/21/2019	1.80
12/22/2019	1.80
12/23/2019	1.80
12/24/2019	1.80
12/25/2019	1.80
12/26/2019	1.80
12/27/2019	1.80
12/28/2019	1.80
12/29/2019	1.80
12/30/2019	1.80
12/31/2019	1.80
1/1/2020	4.50
1/2/2020	1.80
1/3/2020	1.80
1/4/2020	23.00
1/5/2020	1.80
1/6/2020	1.80
1/7/2020	1.80
1/8/2020	1.80
1/9/2020	1.80
1/10/2020	1.80
1/11/2020	2.00
1/12/2020	1.80
1/13/2020	1.80
1/14/2020	4.50
1/15/2020	2.00
1/16/2020	1.80
1/17/2020	1600.00
1/18/2020	1.80
1/19/2020	1.80
1/20/2020	1.80
1/21/2020	1.80
1/22/2020	1.80
1/23/2020	1.80
1/24/2020	1.80
1/25/2020	1.80
1/26/2020	1.80
1/27/2020	1.80
1/28/2020	2.00
1/29/2020	1.80
1/30/2020	1.80
1/31/2020	1.80
2/1/2020	1.80
2/2/2020	1.80
2/3/2020	1.80
2/4/2020	1.80
2/5/2020	1.80
2/6/2020	1.80
2/7/2020	1.80

Appendix D-3: Treated Combined Effluent Characteristics[a]

Sample Date	Total Coliform (MPN/100 mL)[i]
Mon. Freq.	D[j]
2/8/2020	1.80
2/9/2020	1.80
2/10/2020	1.80
2/11/2020	2.00
2/12/2020	1.80
2/13/2020	1.80
2/14/2020	1.80
2/15/2020	13.00
2/16/2020	1.80
2/17/2020	1.80
2/18/2020	13.00
2/19/2020	1.80
2/20/2020	1.80
2/21/2020	1.80
2/22/2020	1.80
2/23/2020	1.80
2/24/2020	1.80
2/25/2020	1.80
2/26/2020	240
2/27/2020	1.80
2/28/2020	1.80
2/29/2020	13.00
3/1/2020	1.80
3/2/2020	1.80
3/3/2020	1.80
3/4/2020	1.80
3/5/2020	1.80
3/6/2020	1.80
3/7/2020	1.80
3/8/2020	2.00
3/9/2020	1.80
3/10/2020	1.80
3/11/2020	1.80
3/12/2020	1.80
3/13/2020	1.80
3/14/2020	1.80
3/15/2020	1.80
3/16/2020	1.80
3/17/2020	1.80
3/18/2020	1.80
3/19/2020	1.80
3/20/2020	2.00
3/21/2020	2.00
3/22/2020	1.80
3/23/2020	1.80
3/24/2020	1.80
3/25/2020	1.80
3/26/2020	1.80
3/27/2020	1.80
3/28/2020	4.00
3/29/2020	13.00
3/30/2020	1.80
3/31/2020	1.80

Appendix D-3: Treated Combined Effluent Characteristics[(a)]

Sample Date	Total Coliform (MPN/100 mL)[(i)]
Mon. Freq.	D[(j)]
4/1/2020	1.80
4/2/2020	1.80
4/3/2020	1.80
4/4/2020	1.80
4/5/2020	4.50
4/6/2020	1.80
4/7/2020	1.80
4/8/2020	1.80
4/9/2020	1.80
4/10/2020	1.80
4/11/2020	2.00
4/12/2020	4.50
4/13/2020	1.80
4/14/2020	1.80
4/15/2020	0.80
4/16/2020	1.80
4/17/2020	1.80
4/18/2020	1.80
4/19/2020	4.50
4/20/2020	9.30
4/21/2020	2.00
4/22/2020	79.00
4/23/2020	1.80
4/24/2020	1.80
4/25/2020	13.00
4/26/2020	6.80
4/27/2020	2.00
4/28/2020	2.00
4/29/2020	1.80
4/30/2020	1.80
5/1/2020	1.80
5/2/2020	1.80
5/3/2020	13.00
5/4/2020	2.00
5/5/2020	1.80
5/6/2020	1.80
5/7/2020	1.80
5/8/2020	1.80
5/9/2020	1.80
5/10/2020	1.80
5/11/2020	1.80
5/12/2020	1.80
5/13/2020	2.00
5/14/2020	7.80
5/15/2020	1.80
5/16/2020	1.80
5/17/2020	7.80
5/18/2020	1.80
5/19/2020	1.80
5/20/2020	1.80
5/21/2020	1.80
5/22/2020	1.80
5/23/2020	22.00

Appendix D-3: Treated Combined Effluent Characteristics[a]

Sample Date	Total Coliform (MPN/100 mL)[i]
Mon. Freq.	D[j]
5/24/2020	1.80
5/25/2020	1.80
5/26/2020	4.50
5/27/2020	33.00
5/28/2020	1.80
5/29/2020	1.80
5/30/2020	2.00
5/31/2020	1.80
6/1/2020	1.80
6/2/2020	1.80
6/3/2020	1.80
6/4/2020	1.80
6/5/2020	4.50
6/6/2020	1.80
6/7/2020	1.80
6/8/2020	130.00
6/9/2020	1.80
6/10/2020	1.80
6/11/2020	1.80
6/12/2020	1.80
6/13/2020	1.80
6/14/2020	1.80
6/15/2020	1.80
6/16/2020	1.80
6/17/2020	350.00
6/18/2020	23.00
6/19/2020	33.00
6/20/2020	4.50
6/21/2020	1.80
6/22/2020	1.80
6/23/2020	1.80
6/24/2020	1.80
6/25/2020	1.80
6/26/2020	1.80
6/27/2020	1.80
6/28/2020	1.80
6/29/2020	1.80
6/30/2020	1.80
7/1/2020	1.80
7/2/2020	1.80
7/3/2020	1.80
7/4/2020	7.80
7/5/2020	1.80
7/6/2020	1.80
7/7/2020	1.80
7/8/2020	1.80
7/9/2020	NR
7/10/2020	1.80
7/11/2020	2.00
7/12/2020	1.80
7/13/2020	1.80
7/14/2020	1.80
7/15/2020	1.80

Appendix D-3: Treated Combined Effluent Characteristics[a]

Sample Date	Total Coliform (MPN/100 mL)[i]
Mon. Freq.	D[j]
7/16/2020	2.00
7/17/2020	2.00
7/18/2020	1.80
7/19/2020	1.80
7/20/2020	1.80
7/21/2020	1.80
7/22/2020	1.80
7/23/2020	1.80
7/24/2020	1.80
7/25/2020	1.80
7/26/2020	1.80
7/27/2020	1.80
7/28/2020	1.80
7/29/2020	1.80
7/30/2020	1.80
7/31/2020	1.80
8/1/2020	1.80
8/2/2020	1.80
8/3/2020	1.80
8/4/2020	1.80
8/5/2020	1.80
8/6/2020	1.80
8/7/2020	1.80
8/8/2020	1.80
8/9/2020	1.80
8/10/2020	1.80
8/11/2020	1.80
8/12/2020	1.80
8/13/2020	1.80
8/14/2020	1.80
8/15/2020	1.80
8/16/2020	1.80
8/17/2020	1.80
8/18/2020	1.80
8/19/2020	1.80
8/20/2020	1.80
8/21/2020	1.80
8/22/2020	1.80
8/23/2020	13.00
8/24/2020	1.80
8/25/2020	1.80
8/26/2020	4.50
8/27/2020	1.80
8/28/2020	1.80
8/29/2020	1.80
8/30/2020	1.80
8/31/2020	1.80
9/1/2020	1.80
9/2/2020	1.80
9/3/2020	1.80
9/4/2020	1.80
9/5/2020	1.80
9/6/2020	4.50

Appendix D-3: Treated Combined Effluent Characteristics[a]

Sample Date	Total Coliform (MPN/100 mL)[i]
Mon. Freq.	D[j]
9/7/2020	1.80
9/8/2020	1.80
9/9/2020	1.80
9/10/2020	1.80
9/11/2020	1.80
9/12/2020	1.80
9/13/2020	1.80
9/14/2020	1.80
9/15/2020	1.80
9/16/2020	1.80
9/17/2020	1.80
9/18/2020	1.80
9/19/2020	1.80
9/20/2020	1.80
9/21/2020	1.80
9/22/2020	1.80
9/23/2020	1.80
9/24/2020	1.80
9/25/2020	1.80
9/26/2020	1.80
9/27/2020	2.00
9/28/2020	1.80
9/29/2020	1.80
9/30/2020	1.80
10/1/2020	1.80
10/2/2020	1.80
10/3/2020	1.80
10/4/2020	1.80
10/5/2020	1.80
10/6/2020	1.80
10/7/2020	1.80
10/8/2020	2.00
10/9/2020	1.80
10/10/2020	2.00
10/11/2020	1.80
10/12/2020	1.80
10/13/2020	1.80
10/14/2020	1.80
10/15/2020	1.80
10/16/2020	1.80
10/17/2020	1.80
10/18/2020	1.80
10/19/2020	1.80
10/20/2020	1.80
10/21/2020	1.80
10/22/2020	1.80
10/23/2020	1.80
10/24/2020	1.80
10/25/2020	1.80
10/26/2020	1.80
10/27/2020	4.50
10/28/2020	1.80
10/29/2020	2.00

Appendix D-3: Treated Combined Effluent Characteristics[a]

	Total Coliform
Sample Date	(MPN/100 mL)[i]
Mon. Freq.	D[j]
10/30/2020	1600.00
10/31/2020	2.00
11/1/2020	1600.00
11/2/2020	17.00
11/3/2020	1600.00
11/4/2020	1600.00
11/5/2020	1.80
11/6/2020	1.80
11/7/2020	4.00
11/8/2020	1.80
11/9/2020	1.80
11/10/2020	1.80
11/11/2020	1.80
11/12/2020	1.80
11/13/2020	1.80
11/14/2020	1.80
11/15/2020	6.00
11/16/2020	1.80
11/17/2020	1.80
11/18/2020	2.00
11/19/2020	1.80
11/20/2020	1.80
11/21/2020	2.00
11/22/2020	1.80
11/23/2020	1.80
11/24/2020	1.80
11/25/2020	1.80
11/26/2020	1.80
11/27/2020	1.80
11/28/2020	1.80
11/29/2020	1.80
11/30/2020	2.00
12/1/2020	1.80
12/2/2020	1.80
12/3/2020	1.80
12/4/2020	1.80
12/5/2020	2.00
12/6/2020	1.80
12/7/2020	1.80
12/8/2020	1.80
12/9/2020	1.80
12/10/2020	1.80
12/11/2020	1.80
12/12/2020	9.30
12/13/2020	1.80
12/14/2020	7.80
12/15/2020	1.80
12/16/2020	1.80
12/17/2020	1.70
12/18/2020	1.80
12/19/2020	1.80
12/20/2020	2.00
12/21/2020	2.00

Appendix D-3: Treated Combined Effluent Characteristics[a]

Sample Date	Total Coliform (MPN/100 mL)[i]
Mon. Freq.	D[j]
12/22/2020	2.00
12/23/2020	2.00
12/24/2020	2.00
12/25/2020	1.80
12/26/2020	1.80
12/27/2020	1.80
12/28/2020	1.80
12/29/2020	1.80
12/30/2020	1.80
12/31/2020	1.80
1/1/2021	1.80
1/2/2021	1.80
1/3/2021	2.00
1/4/2021	1.80
1/5/2021	1.80
1/6/2021	1.80
1/7/2021	1.80
1/8/2021	1.80
1/9/2021	1.80
1/10/2021	1.80
1/11/2021	1.80
1/12/2021	13.00
1/13/2021	1.80
1/14/2021	1.80
1/15/2021	1.80
1/16/2021	1.80
1/17/2021	1.80
1/18/2021	2.00
1/19/2021	1.80
1/20/2021	1.80
1/21/2021	1.80
1/22/2021	1.80
1/23/2021	1.80
1/24/2021	1.80
1/25/2021	4.50
1/26/2021	1.80
1/27/2021	1.80
1/28/2021	1.80
1/29/2021	2.00
1/30/2021	2.00
1/31/2021	2.00
2/1/2021	1.80
2/2/2021	1.80
2/3/2021	1.80
2/4/2021	1.80
2/5/2021	2.00
2/6/2021	1.80
2/7/2021	1.80
2/8/2021	1.80
2/9/2021	1.80
2/10/2021	1.80
2/11/2021	1.80
2/12/2021	1.80

Appendix D-3: Treated Combined Effluent Characteristics[(a)]

Sample Date	Total Coliform (MPN/100 mL)[(i)]
Mon. Freq.	D[(j)]
2/13/2021	1.80
2/14/2021	1.80
2/15/2021	2.00
2/16/2021	1.80
2/17/2021	1.80
2/18/2021	1.80
2/19/2021	1.80
2/20/2021	4.50
2/21/2021	7.80
2/22/2021	2.00
2/23/2021	1.80
2/24/2021	1.80
2/25/2021	1.80
2/26/2021	1.80
2/27/2021	1.80
2/28/2021	1.80
3/1/2021	2.00
3/2/2021	1.80
3/3/2021	1.80
3/4/2021	1.80
3/5/2021	1.80
3/6/2021	1.80
3/7/2021	1.80
3/8/2021	2.00
3/9/2021	180.00
3/10/2021	1.80
3/11/2021	23.00
3/12/2021	1.80
3/13/2021	1.80
3/14/2021	1.80
3/15/2021	1.80
3/16/2021	1.80
3/17/2021	2.00
3/18/2021	1.80
3/19/2021	1.80
3/20/2021	1.80
3/21/2021	1.80
3/22/2021	4.50
3/23/2021	1.80
3/24/2021	2.00
3/25/2021	1.80
3/26/2021	1.80
3/27/2021	1.80
3/28/2021	1.80
3/29/2021	1.80
3/30/2021	1.80
3/31/2021	NR
4/1/2021	1.80
4/2/2021	2.00
4/3/2021	1.80
4/4/2021	4.50
4/5/2021	2.00
4/6/2021	4.60

Appendix D-3: Treated Combined Effluent Characteristics[a]

Sample Date	Total Coliform (MPN/100 mL)[i]
Mon. Freq.	D[j]
4/7/2021	1.80
4/8/2021	1.80
4/9/2021	1.80
4/10/2021	1.80
4/11/2021	1.80
4/12/2021	2.00
4/13/2021	4.50
4/14/2021	1.80
4/15/2021	1.80
4/16/2021	1.80
4/17/2021	1.80
4/18/2021	1.80
4/19/2021	1.80
4/20/2021	1.80
4/21/2021	1.80
4/22/2021	1.80
4/23/2021	1.80
4/24/2021	1.80
4/25/2021	1.80
4/26/2021	1.80
4/27/2021	1.80
4/28/2021	1.80
4/29/2021	1.80
4/30/2021	NA
5/1/2021	1.80
5/2/2021	1.80
5/3/2021	1.80
5/4/2021	1.80
5/5/2021	1.80
5/6/2021	1.80
5/7/2021	1.80
5/8/2021	1.80
5/9/2021	1.80
5/10/2021	1.80
5/11/2021	1.80
5/12/2021	1.80
5/13/2021	1.80
5/14/2021	1.80
5/15/2021	1.80
5/16/2021	1.80
5/17/2021	1.80
5/18/2021	1.80
5/19/2021	1.80
5/20/2021	1.80
5/21/2021	1.80
5/22/2021	1.80
5/23/2021	1.80
5/24/2021	1.80
5/25/2021	2.00
5/26/2021	1.80
5/27/2021	1.80
5/28/2021	1.80
5/29/2021	1.80

Appendix D-3: Treated Combined Effluent Characteristics[a]

Sample Date	Total Coliform (MPN/100 mL)[i]
Mon. Freq.	D[j]
5/30/2021	1.80
5/31/2021	1.80
6/1/2021	1.80
6/2/2021	1.80
6/3/2021	1.80
6/4/2021	1.80
6/5/2021	1.80
6/6/2021	1.80
6/7/2021	1.80
6/8/2021	1.80
6/9/2021	1.80
6/10/2021	1.80
6/11/2021	1.80
6/12/2021	7.80
6/13/2021	1.80
6/14/2021	1.80
6/15/2021	1.80
6/16/2021	2.00
6/17/2021	4.80
6/18/2021	4.00
6/19/2021	na
6/20/2021	7.80
6/21/2021	1.80
6/22/2021	1.80
6/23/2021	79.00
6/24/2021	1.80
6/25/2021	1.80
6/26/2021	2.00
6/27/2021	2.00
6/28/2021	7.80
6/29/2021	1.80
6/30/2021	1.80
7/1/2021	1.80
7/2/2021	1.80
7/3/2021	1.80
7/4/2021	1.80
7/5/2021	1.80
7/6/2021	1.80
7/7/2021	1.80
7/8/2021	1.80
7/9/2021	1.80
7/10/2021	27.00
7/11/2021	1.80
7/12/2021	1.80
7/13/2021	1.80
7/14/2021	1.80
7/15/2021	1.80
7/16/2021	1.80
7/17/2021	1.80
7/18/2021	2.00
7/19/2021	1.80
7/20/2021	2.00
7/21/2021	1.80

Appendix D-3: Treated Combined Effluent Characteristics[a]

Sample Date	Total Coliform (MPN/100 mL)[i]
Mon. Freq.	D[j]
7/22/2021	1.80
7/23/2021	1.80
7/24/2021	4.50
7/25/2021	49.00
7/26/2021	7.80
7/27/2021	1.80
7/28/2021	1.80
7/29/2021	79.00
7/30/2021	1.80
7/31/2021	1.80
8/1/2021	1.80
8/2/2021	1.80
8/3/2021	13.00
8/4/2021	1.80
8/5/2021	1.80
8/6/2021	1.80
8/7/2021	2.00
8/8/2021	17.00
8/9/2021	7.80
8/10/2021	1.80
8/11/2021	2.00
8/12/2021	1.80
8/13/2021	1.80
8/14/2021	1.80
8/15/2021	1.80
8/16/2021	1.80
8/17/2021	2.00
8/18/2021	1.80
8/19/2021	1.80
8/20/2021	1.80
8/21/2021	1.80
8/22/2021	1.80
8/23/2021	7.80
8/24/2021	1.80
8/25/2021	1.80
8/26/2021	1.80
8/27/2021	1.80
8/28/2021	1.80
8/29/2021	1.80
8/30/2021	1.80
8/31/2021	13.00
9/1/2021	1.80
9/2/2021	1.80
9/3/2021	1.80
9/4/2021	1.80
9/5/2021	1.80
9/6/2021	1.80
9/7/2021	1.80
9/8/2021	1.80
9/9/2021	1.80
9/10/2021	1.80
9/11/2021	1.80
9/12/2021	1.80

Appendix D-3: Treated Combined Effluent Characteristics[a]

Sample Date	Total Coliform (MPN/100 mL)[i]
Mon. Freq.	D[j]
9/13/2021	1.80
9/14/2021	1.80
9/15/2021	1.80
9/16/2021	1.80
9/17/2021	1.80
9/18/2021	1.80
9/19/2021	1.80
9/20/2021	1.80
9/21/2021	1.80
9/22/2021	1.80
9/23/2021	1.80
9/24/2021	1.80
9/25/2021	1.80
9/26/2021	1.80
9/27/2021	2.00
9/28/2021	1.80
9/29/2021	1.80
9/30/2021	1.80

Notes:

(a) Based on data collected between October 2019 through September 2021 in accordance with MRP Order No. R5-2019-0008.

(b) C = Monitored Continuously in accordance with MRP Order No. R5-2019-0008.

(c) mg/L = milligrams per liter.

(d) M = Monitored Monthly in accordance with MRP Order No. R5-2019-0008.

(e) µg/L = micrograms per liter.

(f) Q = Monitored Quarterly in accordance with MRP Order No. R5-2019-0008.

(g) W = Monitored Weekly in accordance with MRP Order No. R5-2019-0008.

(h) µS/cm = micro Siemens per centimeter

(i) MPN/100 mL = most probably number per 100 milliliters.

(j) D = Monitored Daily in accordance with MRP Order No. R5-2019-0008.

Definitions

Bicarb.	Bicarbonate
BOD-5	5-Day Biochemical Oxygen Demand
CaCO3	Calcium Carbonate
Diss.	Dissolved
EC	Electrical Conductivity
FDS	Fixed Dissolved Solids
N	Nitrogen
ND	Not Detected above Laboratory Reporting Limit
SAR	Sodium Absorption Ratio
TDS	Total Dissolved Solids
TSS	Total Suspended Solids

Appendix E

Technical Memorandum: *Pathogen Reduction for Tomatoes Irrigated with Disinfected Secondary Treated Wastewater* (Kennedy Jenks 2021a)

2 September 2021

Technical Memorandum

To: Mr. Scott Hatton (CRWQCB)

From: Stuart Childs, Ph.D. and Margaret Wild, P.E. (Kennedy/Jenks Consultants, Inc.)

Subject: Pathogen Reduction for Tomatoes Irrigated with Disinfected, Secondary Treated Wastewater
KJ 2065027*02

The combined effluent of the City of Lemoore (City) treated wastewater (recycled water) and Leprino Foods Company process wastewater is used as an irrigation water supply at the Stone Ranch which is regulated by Waste Discharge Requirements Order No. R5-2019-0008. The contract farmer who manages the Stone Ranch irrigation program, Stone Land Company, has requested to grow tomato crops that will be irrigated with combined effluent and processed by Los Gatos Tomato Products in Huron, California.

Kennedy Jenks reviewed the proposed new project for the Stone Ranch and Nederend Property with you and Regional Water Quality Control Board staff on 22 June 2021 and provided an overview of the proposed increase in land application area acreage and combined effluent flow. As part of this discussion, you mentioned that you would like to see our evaluation of the proposed project and whether the City's disinfected secondary 23 (MPN total coliform/100 ml) treated effluent application on tomatoes could meet the Title 22 requirement that "*Food crops undergoing commercial pathogen-destroying processing before consumption by humans*".

The following paragraphs provide our analysis of this topic. We identified knowledgeable people at California State agencies, evaluated the nature of pathogen reduction practices in tomato processing facilities, and reviewed irrigation management practices at Stone Ranch.

1. Kennedy Jenks contacted Mr. Michael D. Needham of the California Department of Public Health, Food and Drug Branch (see attached email chain labelled "*Title 22 and tomato canning*"). Mr. Needham did verify that typical tomato food processing would qualify as a "pathogen-destroying process" and is aseptic (free from contamination caused by harmful bacteria, viruses, or other microorganisms). He also recommended that Kennedy Jenks contact Ms. Natalie Krout-Greenberg of the California Department of Food and Agriculture, Inspection Services Division, if additional information was necessary. Kennedy Jenks has not contacted Ms. Krout-Greenberg at this time. Finally, Mr. Needham said that his agency does not have the authority to enforce Title 22 requirements. The State Water Resources Control Board Division of Drinking Water is responsible for enforcement of the Title 22 recycled water program.

2. A letter dated 17 January 2020 from Los Gatos Tomato Products (LGTP, attached) describes the pathogen destroying processes in place at LGTP to reduce pathogen levels in their tomato products. The quality control program employed by food processors is a Hazard Analysis Critical Control Program (HACCP). The program incorporates frequent product monitoring including pathogen testing and an annual review by a third-party certification group. In LGTP's cannery, pathogen testing occurs hourly during production.

   LGTP also makes a distinction between common pathogen reduction treatments (referred to as "*public health thermal process criteria"*) which are conducted at temperatures less than 100 degrees Celsius (°C) for periods of 5 to 10 minutes (Petruzzi et al. 2017), and LGTP's treatments for "*commercial sterility*" which requires temperatures greater than 100° C. LGTP regards their HACCP and commercial sterility pathogen reduction practices to be sufficient to meet Title 22 standards.

3. The potential impact of irrigation of food crops at the Stone Ranch with the City's disinfected secondary 23 recycled water is minimized in several ways. Initially, the City's recycled water is blended with Leprino's process wastewater flow. For the proposed project with 7 million gallons per day (MGD) combined effluent discharge, the percentage of the City's 2 MGD discharge in the combined effluent will be 29 percent.

   When the combined effluent is discharged at the Stone Ranch, the City's discharge will be further diluted by adding groundwater from onsite wells to meet crop irrigation needs. At 7 MGD combined effluent discharge to 2,414 acres (including the Nederend Property), the combined effluent will account for 65 percent of the irrigation required and 35 percent will be from groundwater. The percentage of the City's discharge in the total irrigation amount will decrease to 19 percent.

   A final factor that mitigates the City's recycled water loading on food crops is related to the method of irrigation. Stone Land Company proposes to irrigate tomato crops using drip irrigation methods. As a result, the combined effluent will be applied directly to the ground surface. Combined effluent will not come into contact with the above ground, edible portion of the crop including both leaves and tomatoes. This will further minimize the potential for pathogens in the City's recycled water to affect products made from the tomatoes for human consumption.

Enclosures (4)

cc: Joe Herrud, Leprino Foods Co.

Stuart W Childs

Stuart W. Childs, Ph.D.

Margaret R Wild

Margaret R. Wild, P.E.

Attachment 1

Email re: Title 22 and Tomato Canning

From: Stuart Childs
Sent: Friday, August 27, 2021 9:34 AM
To: Stuart Childs
Subject: FW: Title 22 and tomato canning

From: Danielle Charleston <DanielleCharleston@kennedyjenks.com>
Sent: Tuesday, September 3, 2019 10:41 AM
To: Margaret Wild <MargaretWild@KennedyJenks.com>; Stuart Childs <StuartChilds@KennedyJenks.com>
Subject: FW: Title 22

Morning,

This morning, I spoke with Michael Needham at the CDPH and have forwarded you the follow up email exchange we had after speaking. He did mention canning as being "as aseptic as you can get" and hence my written confirmation from him. He did put me in contact with someone at CDFA, who I'm now waiting to hear back from.

It looks like something like this could be covered in Title 21, specifically 117.80 Processes and controls, or under the Food Safety Modernization Act (FSMA), who I also reached out to the technical team and am waiting to hear back from. Let me know if you want me to dive deeper into this.

Danielle

100 KJ YEARS
Kennedy Jenks

Danielle Charleston, EIT | Staff Engineer
303 Second Street, Suite 300 South
San Francisco, CA 94107
P: 415.243.2150 | Direct: 415.243.2409 | C: 818.621.4357
Service is Our Legacy | EST 1919 | KENNEDYJENKS.COM

From: Needham, Michael@CDPH <Michael.Needham@cdph.ca.gov>
Sent: Tuesday, September 3, 2019 9:49 AM
To: Danielle Charleston <DanielleCharleston@kennedyjenks.com>
Subject: RE: Title 22

Hello Danielle,

Yes – typical canning (heat and pressure applied to specific types of packaging – standard metal cans, pouches, etc.) would be a "pathogen-destroying process".

Mike Needham
CDPH, Food and Drug Branch

From: Danielle Charleston <DanielleCharleston@kennedyjenks.com>
Sent: Tuesday, September 03, 2019 9:28 AM
To: Needham, Michael@CDPH <Michael.Needham@cdph.ca.gov>
Subject: RE: Title 22

Hi Michael,

Thanks again, I really appreciate all your help! Just to confirm, when it comes to regulating food processing establishments in California do you think canning would qualify as an appropriate "pathogen-destroying process"?

Danielle

Kennedy Jenks 100 YEARS

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Service is Our Legacy | EST 1919 | KENNEDYJENKS.COM

From: Needham, Michael@CDPH <Michael.Needham@cdph.ca.gov>
Sent: Tuesday, September 3, 2019 9:18 AM
To: Danielle Charleston <DanielleCharleston@kennedyjenks.com>
Cc: Krout, Natalie@CDFA <natalie.krout@cdfa.ca.gov>
Subject: RE: Title 22

Hello Danielle,

It was nice talking with you this morning. As discussed on the phone, the California Department of Public Health, Food and Drug Branch primarily regulates food processing establishments in California. We cannot enforce sections of CCR Title 22 pertaining to the use of recycled water used to irrigate crops. I have cc'd Natalie Krout-Greenberg with the California Department of Food and Agriculture who may have a contact that may be able to assist.

Natalie – Danielle is a consultant looking at the requirements to use recycled water to irrigate tomatoes. I know this is done frequently in the Central Valley with other crops (purple pipe – link below) but I don't have any significant knowledge in regards to tomatoes. The specific section we were discussing Title 22, section 60304 (d)(6) as follows:

(d) Recycled wastewater used for the surface irrigation of the following shall be at least undisinfected secondary recycled water:

(1) Orchards where the recycled water does not come into contact with the edible portion of the crop,

(2) Vineyards where the recycled water does not come into contact with the edible portion of the crop,

(3) Non food-bearing trees (Christmas tree farms are included in this category provided no irrigation with recycled water occurs fc harvesting or allowing access by the general public),

(4) Fodder and fiber crops and pasture for animals not producing milk for human consumption,

(5) Seed crops not eaten by humans,

(6) Food crops that must undergo commercial pathogen-destroying processing before being consumed by humans, and

(7) Ornamental nursery stock and sod farms provided no irrigation with recycled water occurs for a period of 14 days prior to harv access by the general public.

https://journals.ashs.org/hortsci/view/journals/hortsci/45/11/article-p1626.xml

Michael D. Needham MPH
Chief, Emergency Response Unit
California Department of Public Health
Food and Drug Branch

916-650-6705
916-440-5451 - fax
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From: Danielle Charleston <DanielleCharleston@kennedyjenks.com>
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Subject: Title 22

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Attachment 2

Los Gatos Tomato Products Letter, 17 January 2020

January 17, 2020

Re: Hazzard Analysis Critical Control Points (HAACP) Program and Pathogen Testing

Los Gatos Tomato Products (LGTP) has a HACCP Plan in place and is monitored once a year by a third part certification body. The last reviewed was completed on September 25, 2019. The plan takes into consideration all biological, physical, chemical and radiological hazards for each step in the process flow. Pathogen testing is one of our monitoring process for the biological hazards. Pathogen tests are performed on every lot of tomato paste production which is equivalent to a 60 min period. Pathogen testing is performed to reduce, and ultimately eliminate foodborne illnesses. It is also a process implemented in every step of food production to ensure sanitation and food safety compliances. LGTP tests for the most common foodborne illnesses that pathogen testing is concerned with which are salmonella, listeria, and E. coli.

Our sterilization system has been reviewed by a qualified processing authority and has provided LGTP with a thermal process recommendation to achieve food safety (in terms of vegetative pathogens) in our tomato paste products. While tomato paste does not support the growth of organisms of public health significance, these organisms may potentially survive in the products but the thermal processes targeting these spoilage organisms in the products destroy these organisms. Public health thermal process criteria are separate (and far less severe) from those ensuring commercial sterility. This process recommendation ensures commercial sterility of all products produced at LGTP.

If there are any additional questions please contact LGTP at (559) 945-2700.

Regards,

Brandon Clement
CEO

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Attachment 3

Thermal Treatments for Fruit and Vegetable Juices and Beverages

Comprehensive REVIEWS in Food Science and Food Safety

Thermal Treatments for Fruit and Vegetable Juices and Beverages: A Literature Overview

Leonardo Petruzzi, Daniela Campaniello, Barbara Speranza, Maria Rosaria Corbo, Milena Sinigaglia, and Antonio Bevilacqua

Abstract: Fruit and vegetable juices and beverages are generally preserved by thermal processing, currently being the most cost-effective means ensuring microbial safety and enzyme deactivation. However, thermal treatments may induce several chemical and physical changes that impair the organoleptic properties and may reduce the content or bioavailability of some nutrients; in most cases, these effects are strongly dependent on the food matrix. Moreover, the efficacy of treatments can also be affected by the complexity of the product and microorganisms. This review covers researches on this topic, with a particular emphasis on products derived from different botanical sources. Technologies presented include conventional and alternative thermal treatments. Advances toward hurdle-based technology approaches have been also reviewed.

Keywords: beverages, fruit, juices, thermal processing, vegetable

Introduction

The intake of fruits and vegetables decreases the occurrence of diseases related to oxidative stress (inflammation, cardiovascular diseases, cancer, and aging-related disorders) (Escudero-López and others 2016). Beneficial effects are attributed to dietary intake of some bioactive compounds (tocopherols, carotenoids, polyphenols, phenolics, and anthocyanins) (Kongkachuichai and others 2015), vitamins, minerals, and fibers (Liu 2013).

The 2010 Dietary Guidelines for Americans recommend in a 2000-kcal diet 9 servings of fruits and vegetables per day, 4 servings of fruits and 5 servings of vegetables (Liu 2013). The European Union supports the WHO recommendation for at least 400 g/d (Tennant and others 2014). Dietary guidelines around the world recommend increased intakes of fruits and nonstarchy vegetables for the prevention of chronic diseases and possibly obesity (Charlton and others 2014).

Despite these guidelines, the consumption of vegetables and fruit remains below recommended levels in many countries and a substantial burden of disease globally is attributable to low consumption (Mytton and others 2014). Therefore, the promotion of the consumption of fruit and vegetable is a key objective of food and nutrition policy (Rekhy and McConchie 2014). Juices, blends, smoothies, and fermented and fortified beverages are a popular way to consume fruits and fresh-like vegetables and contribute to a healthy diet and a healthy life style (Wootton-Beard and Ryan 2011; Corbo and others 2014; Marsh and others 2014; Ramachandran and Nagarajan 2014; Hurtado and others 2015).

Many approaches alternative to thermal treatments have been tested and successfully proposed for juices (Jiménez-Sánchez and others 2017), but thermal processing still remains the most cost-effective tool to ensure microbial safety and enzyme deactivation (Rawson and others 2011). Some drawbacks of thermal processes are the slow conduction and convection heat transfer (Baysal and Icier 2010), and the negative effect of overprocessing on the sensory, nutritional, and functional properties (Gonzalez and Barrett 2010). In most cases, these effects are strongly dependent on the food matrix (Rodríguez-Roque and others 2015, 2016). Moreover, the efficacy of thermal treatments can also be affected by the complexity of the product and microorganisms (Chen and others 2013b).

The preservation of the organoleptic scores of food is a key goal of the food industry. As a result, the optimization of heat treatments is a key tool to maintain an equilibrium between safety and nutritional quality of the raw material (Traffano-Schiffo and others 2014). Apart from the conventional thermal processing, there are some other nonconventional thermal approaches (ohmic and microwave heating (MHW)), characterized by some benefits, such as a better energy efficiency, a lower capital cost, and shorter treatment time (Salazar-González and others 2014; Lee and others 2015).

To the best of our knowledge, there are not comprehensive reviews on the thermal treatments applied to fruit and vegetable juices, juice blends, smoothies, and enriched and fermented beverages. This review is an update of the most important advances on this topic; Figure 1 offers an overview of the manuscript. A summary of the current state of knowledge about the factors enhanced or reduced by thermal processing is given in Table 1.

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Table 1–Factors enhanced or reduced by thermal processing: summary of issues.

Compound(s)/quality attribute(s)	Product	Thermal treatment	Reference(s)
		Enhanced by thermal processing	
Anthocyanins	Juice	MTLT	Mena and others (2013b)
	Juice	HTLT	Elez Garofulić and others (2015)
Aromatic compounds	Nectar	HTLT	Šimunek and others (2013)
	Juice blend	OH	Dima and others (2015)
Carotenoids	Smoothie	MWH	Arjmandi and others (2016)
Enzymatic inactivation	Juice	MWH	Rayman and Baysal (2011) Demirdöven and Baysal (2015)
	Smoothie	HTLT	Hurtado and others (2015) Rodríguez-Verástegui and others (2016)
	Juice-blend mixed with soymilk	HTLT	Morales-de la Peña and others (2010)
	Mixed beverage	HTLT	Swami Hulle and Rao (2016)
	Juice	HTLT	Saeeduddin and others (2015) Chaikham and Baipong (2016)
	Smoothie	MTLT	Keenan and others (2012)
	Juice	HTST	Aguilar-Rosas and others (2013) Katiyo and others (2014)
	Nectar	HTST	Huang and others (2013)
	Nectar	MWH	Salazar-González and others (2014)
	Juice	MWH	Rayman and Baysal (2011)
Flavonoid content	Juice	MWH	Saikia and others (2015)
Microbial inactivation	Juice enriched with hydrolyzed collagen	HTLT	Bilek and Bayram (2015)
	Juice	HTLT	Farhadi Chitgar and others (2016) Bhat and others (2016) Suna and others (2013) Santhirasegaram and others (2015)
	Beverage	HTLT	de Oliveira and others (2011)
	Juice	HTST	Zhao and others (2013) Zou and others (2016)
	Juice	MTLT	Mert and others (2013) Saeeduddin and others (2015) Aganovic and others (2016)
	Juice blend	MTLT	Kaya and others (2015)
	Smoothie	MTST	Palgan and others (2012)
	Juice	MTST	Aganovic and others (2014)
	Juice	MWH	Piasek and others (2011) Dhumal and others (2015) Stratakos and others (2016)
	Juice	OH	Somavat and others (2013)
Overall quality	Juice	MTST	Sun and others (2016)
	Concentrated juice	OH	Tumpanuvatr and Jittanit (2012)
Phenolic content	Juice	HTLT	He and others (2016) Dereli and others (2015)
	Juice	MWH	Saikia and others (2015)
	Juice	HTST	He and others (2016)
	Juice	MTLT	Saikia and others (2015)
	Juice	MTST	Queirós and others (2015)
Viscosity	Juice	HTST	Chen and others (2012)
		Reduced by thermal processing	
Anthocyanins	Juice	HTLT	Shaheer and others (2014) Pala and Toklucu (2011)
	Juice	HTST	Woodward and others (2011)
Antioxidant capacity	Juice	HTLT	Bansal and others (2015) Chen and others (2015b)
Aromatic compounds	Smoothie added with skim milk	HTLT	Andrés and others (2016c)
	Juice	HTLT	Zhang and others (2010)
	Juice	MTLT	Aganovic and others (2016)
	Juice blend	MTST	Caminiti and others (2012)
Ascorbic acid	Juice	HTLT	Bansal and others (2015) Chen and others (2015b)
	Juice-blend mixed with soymilk	HTLT	Rodríguez-Roque and others (2015)
	Blended beverage	HTLT	Radziejewska-Kubzdela and Biegańska-Marecik (2015)
	Blended beverage	HTST	Barba and others (2010)
	Juice blend	HTST	Mena and others (2013a)
	Drink	MTLT	Abioye and others (2013)
	Juice blend	MTLT	Profir and Vizireanu (2013)
	Juice blend	MTST	Mena and others (2013a)
Carotenoids	Juice	HTLT	Oliveira and others (2012)
	Juice	HTST	Uçan and others (2016)
Color	Juice blend	MTST	Caminiti and others (2012)
	Smoothie	HTLT	Andrés and others (2016b)
	Juice	HTLT	Guo and others (2011)
	Herbal-plant beverage added with rice	HTLT	Worametrachanon and others (2014)
Flavonoid content	Juice	MTLT	Saikia and others (2015)
Overall quality	Blended beverage	HTLT	Jayachandran and others (2015) Kathiravan and others (2014a)
	Juice	HTLT	Santhirasegaram and others (2015)
Phenolic content	Juice-blend mixed with soymilk	HTLT	Rodríguez-Roque and others (2015)
	Juice	HTST	Jiménez-Aguilar and others (2015)

(*Continued*)

Table 1–Continued.

Compound(s)/quality attribute(s)	Product	Thermal treatment	Reference(s)
Protein content	Juice	HTLT	Deboni and others (2014)
Soluble solids	Juice	HTLT	Khandpur and Gogate (2015)
Viscosity	Juice	HTLT	Nayak and others (2016) Liu and others (2012) Deboni and others (2014)
	Juice	HTST	Aguiló-Aguayo and others (2010)

Thermal Treatments

High temperature-long time (HTLT)

Thermal processes can be classified according to the intensity of the heat treatment (Miller and Silva 2012). HTLT (temperature ≥80 °C and holding times >30 s) is the most commonly used method in the processing of juices and beverages; it can be classified as pasteurization (temperature <100 °C), canning (temperature ca. 100 °C), or sterilization (temperature >100 °C) (Miller and Silva 2012). Juice pasteurization is based on a 5 log reduction of the most resistant microorganisms. This method relies on heat generated outside and then transferred into the food through conduction and convection mechanisms (Chen and others 2013b). Exposure to high temperatures (strong stresses) can induce a continuous increase in membrane permeability caused by time-dependent changes such as lipid phase transitions and protein conformation changes, eventually causing cell death. Membrane fluidity changes may differ significantly, according to the type of thermal stress (Gonzalez and Barrett 2010). Juices with pH > 4.5 require stronger treatments to achieve the desirable shelf life. Table 2 provides a comprehensive summary of the most important outputs on HTLT thermal treatments.

Some examples of the effect of this technology on microbial quality of products include the total inactivation of native microflora in coconut-nannari blended beverage (Kathiravan and others 2014a), litchi (Guo and others 2011), mango (Santhirasegaram and others 2015), pear (Saeeduddin and others 2015) and tomato juices (Stratakos and others 2016), longan juice added with xanthan gum (Chaikham and Apichartsrangkoon 2012), and apple, grape, or orange juices enriched with hydrolyzed collagen (Bilek and Bayram 2015). Moreover, HTLT could control bacterial growth in açaí beverage (de Oliveira and others 2011), amla (Bansal and others 2015), asparagus (Chen and others 2015b), black raspberry (Suna and others 2013) and reduced-calorie carrot juices (Sinchaipanit and others 2013), papaya nectar (Parker and others 2010), as well as yeast growth in grape wine (Cui and others 2012). During the storage, thermal pasteurization assures the control of microbial growth in cupuaçu nectar (Vieira and Silva 2014), basil-bottle gourd juice blend (Majumdar and others 2011), grapefruit (Uckoo and others 2013), pennywort (Chaikham and others 2013), spinach and sweet lime juices (Khandpur and Gogate 2015), an herbal-plant beverage added with rice (Worametrachanon and others 2014), as well as in a juice-blend mixed with whole or skim milk (Salvia-Trujillo and others 2011), or mixed with soymilk (Morales-de la Peña and others 2010).

HTLT treatments could reduce or inactivate some enzymes, whose activities result in undesirable changes in sensory quality attributes and nutritive value of the products (Miller and Silva 2012), such as polyphenoloxidase (PPO), peroxidase (POD), pectin esterase (PE), and polygalacturonase (PG) (Marszałek and others 2016). PPO is responsible for the browning and degradation of natural pigments and other polyphenols, leading to discoloration and the loss of antioxidant activity. POD participates in several metabolic plant processes (catabolism of auxins, lignification of the cell wall, browning reactions which catalyze

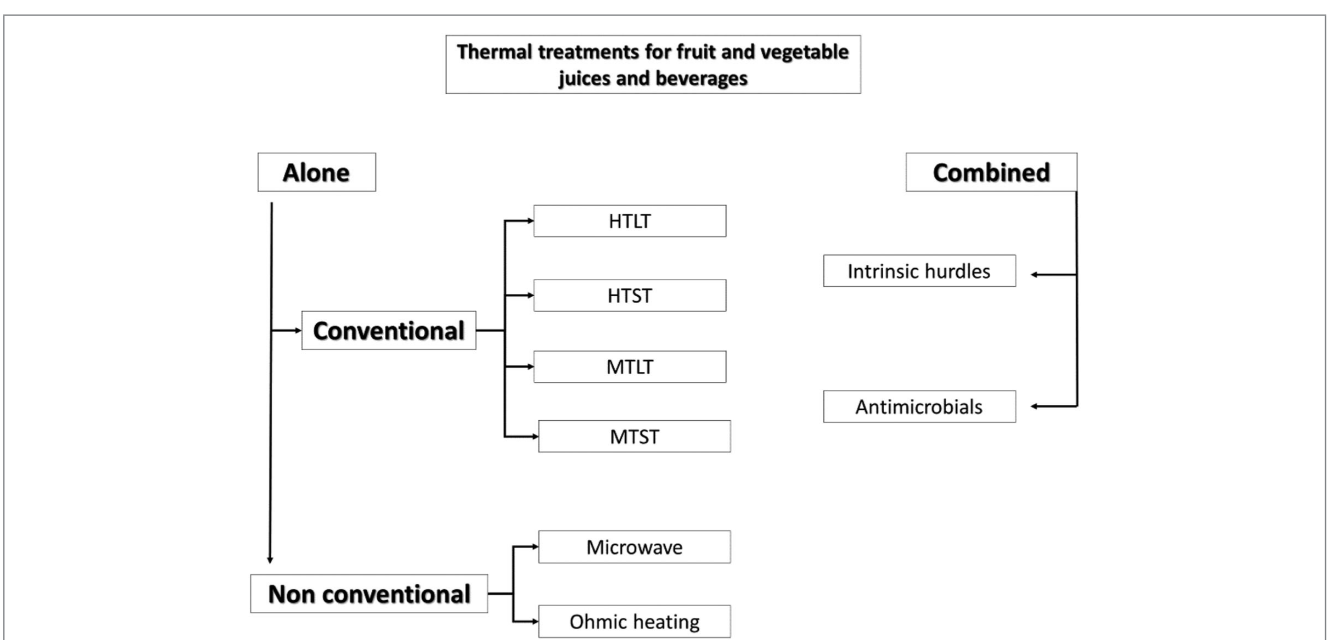

Figure 1–Roadmap of the manuscript.

Table 2–Conventional thermal processing: high temperature-long time (HTLT)

Fruit/vegetable source(s)	Product	Processing conditions	Key finding(s)	Reference
Açaí	Beverage	80 °C/2 min	Reduction of naturally occurring microbiota	de Oliveira and others (2011)
Acerola, cashew apple, mango	Nectar blend	90 °C/1 min	Lower counts of lactic acid bacteria, yeasts and molds, coliforms, and *Salmonella* sp. below the detection limit	da Silva and others (2011)
Amla	Juice	90 °C/1 min	*Zygosaccharomyces bailii* (MTCC 257) reduced by 4.9 log CFU/mL; significant degradation of ascorbic acid and antioxidant capacity	Bansal and others (2015)
Aonla, bottle gourd, ginger, lemon	Juice blend	80 to 95/5 to 30 min	Minimum and maximum loss of ascorbic acid of juice blend were 22.97% at 80 °C for 5 min and 47.70% at 95 °C for 30 min, respectively	Gajera and Joshi (2014)
Aonla, carrot	Blended nectar	80 to 90 °C/30 s to 5 min	The treatment at 90 °C for 30 s retained significantly higher ascorbic acid content as compared to other treatments	Yadav (2015)
Apple	Juice enriched with oligosaccharides	80 and 90 °C/5 to 15 min	The carbohydrate fraction with a degree of polymerization ≥3 was stable in juice heated at temperatures up to 90 °C for 15 min	López-Sanz and others (2015)
Apple	Nectar	80 °C/2 min	More aromatic compounds in comparison with the untreated samples	Šimunek and others (2013)
Apple	Juice	80 °C/30 min	Increase of 39.8% and 69.1% in total phenolic content and radical scavenging activity value, respectively. No significant difference in the bioaccessibility of phenols	He and others (2016)
Apple	Juice supplemented with onion	96 °C/60 min	Improved overall quality	Lee and others (2016)
Apple, banana, blackberry, gooseberry, grape, lime, orange, strawberry	Smoothie	85 °C/7 min	Microbial quality in the smoothies kept at 4 °C for 28 d	Hurtado and others (2017)
Apple, banana, orange, strawberry	Smoothie	85 °C/7 min	Benefits regarding enzyme inactivation (POD, PPO, PME); limits connected to the development of cooked-fruit flavors	Hurtado and others (2015)
Apple, bilberry, blackberry, raspberry, red currant, grape, orange, strawberry	Smoothie	80 °C/1 min	Reduction of total aerobic mesophilic (3.4 log CFU/mL), lactic acid bacteria (3.3 log CFU/mL) and yeasts and molds (3.8 log CFU/mL)	Zacconi and others (2015)
Apple, carrot	Juice blend	98 °C/3 min	No effect on the antioxidant capacity	Gao and Rupasinghe (2012)
Apple, grape	Juice enriched with hydrolyzed collagen	95 °C/20 to 23 min	Inactivation of the naturally occurring microbiota	Bilek and Bayram (2015)
Apple, red cabbage	Blended beverage	90 °C/5 min	Significant reduction of ascorbic acid and glucosinolates. However, samples were found to be sensorially acceptable	Radziejewska-Kubzdela and Biegańska-Marecik (2015)
Aronia, cistus, green tea, nettle	Juice-herbal drink	85 °C/6 min	Slight increase of polyphenols content. Decrease of the total content of anthocyanin	Skąpska and others (2016)
Asparagus	Juice	121 °C/3 min	Reduction of the total mesophilic bacteria below the detection limit. Negative effects on aldehydes, alcohols and ketones concentrations, ascorbic acid, rutin, total phenolic contents, and total antioxidant activity	Chen and others (2015b)
Baobab	Drink	80 and 90 °C/0 to 180 min	95.99 and 98.90% ascorbic acid degradation after 180 min at 80 and 90 °C, respectively.	Abioye and others (2013)
Barberry	Juice	Approximately 90 °C/1 min	Complete inactivation naturally occurring microbiota. Significant reduction in total phenol content and antioxidant activity	Farhadi Chitgar and others (2016)
Basil, bottle gourd	Juice blend	95 °C/15 min	The blended juice was acceptable for 6 mo at room temperature and was microbiologically safe	Majumdar and others (2011)
Beetroot	Juice	96 °C/9 to 15 min	Thermal pasteurization for a total heating time of 12 min was able to produce microbiologically stable beetroot juice with the retention of quality attributes	Kathiravan and others (2014b)
Blackberry	Juice	80 and 90 °C/0 to 300 min	The antioxidant activity of juice was reduced as a result of temperature increase. However, the amount of cyanidin derivative slightly increased	Zhang and others (2012)
Black mulberry	Juice	107 °C/3 min	The total phenolic content, total flavonoid content monomeric anthocyanin content, and total antioxidant capacities were all significantly higher in the final pasteurized juice sample as compared to the starting raw fruit material. However, during *in vitro* simulated gastrointestinal digestion, monomeric anthocyanins in the fruit matrix had a significantly higher bioavailability than in the juice matrix	Tomas and others (2015)
Black raspberry	Juice	100 °C/25 min	Microbial safety	Suna and others (2013)

(*Continued*)

Table 2–Continued.

Fruit/vegetable source(s)	Product	Processing conditions	Key finding(s)	Reference
Bottle gourd	Juice	121 °C/5 to 7 min	A reduction of 49.14% and 51.97% was observed in ascorbic acid content for 6 and 7 min, respectively. Bacteria, yeasts, and molds were reduced below the detection limit	Bhat and others (2016)
Blueberry	Nectar	80 °C/2 min	Decrease of the consistency coefficient for pasteurized samples	Šimunek and others (2014)
Blue-berried honeysuckle	Juice	100 °C/60 to 300 min	Reduction of anthocyanins, degradation of bioactive phytochemicals, and decrease of antioxidant activity	Piasek and others (2011)
Broccoli	Juice	90 °C/1 min	Reduction of bioactive compounds and thus diminution of antioxidant capacity	Sánchez-Vega and others (2015)
Broccoli, carrot, red pepper, tomato	Smoothie	80 °C/3 min	Thermal treatment totally inactivated PPO, POD, and PME which activities were minimal during storage up to 40 and 58 d at 20 and 5 °C, respectively	Rodríguez-Verástegui and others (2016)
Cactus	Juice	100 °C/20 min	Pasteurization process affected viscosity and protein content	Deboni and others (2014)
Carrot	Juice	90 °C/10 min	Increase of the total phenolic and hydroxycinnamic acids contents	Dereli and others (2015)
Carrot	Reduced-calorie juice	80 °C/1 min	*Salmonella* sp. or *Staphyloccoccus aureus* below the detection limit. Reduction of yeasts, molds, and total coliforms	Sinchaipanit and others (2013)
Carrot, grape	Blended nectar	80 to 90 °C/30 s to 5 min	The total sugars content was significantly higher at 80°C for 5 min	Yadav (2015)
Carrot, melon, orange, papaya	Smoothie	80 °C/3 min	Color degradation	Andrés and others (2016b)
Carrot, melon, orange, papaya	Smoothie added with soymilk	80 °C/3 min	Heat treatment did not produce any major variations in bioactive compounds. The bioactive compounds of treated smoothies were relatively stable after 45 d of refrigerated storage compared to the fresh product, although the loss of ascorbic acid resulted in decreased antioxidant capacity	Andrés and others (2016a)
Carrot, melon, orange, papaya	Smoothie added with skim milk	80 °C/3 min	Total reduction in microorganisms. Aroma and acceptability scores significantly decreased	Andrés and others (2016c)
Carrot, pomegranate	Blended nectar	80 to 90 °C/30 s to 5 min	Decrease of vitamin A because of the increase of processing temperature and heating time.	Yadav (2015)
Chokeberry	Juice	90 °C/10 min	Loss of cyanidin 3-arabinoside and cyanidin 3xyloside (69%), cyanidin 3-galactoside (58%), and cyanidin 3-glucoside (50%)	Wilkes and others (2014)
Coconut	Water	90 °C/1 min	Increase in aldehydes, ketones, and 2-acetyl-1-pyrroline, an aroma compound active at low odor thresholds and characterized by "popcorn" and "toasted" odor descriptors	De Marchi and others (2015)
Coconut, lemon, litchi	Blended beverage	95 °C/10 min	Loss in ascorbic acid. Low retention of nutritional quality attributes	Jayachandran and others (2015)
Coconut, nannari	Blended beverage	96 °C/6 min	Total inactivation of native microflora. Decrease of radical scavenging activity and overall acceptability	Kathiravan and others (2014a)
Cranberry	Nectar	80 °C/2 min	Significant decrease in the consistency coefficient	Šimunek and others (2014)
Cupuaçu	Nectar	90 °C/3 min	Reduction of mesophilic bacteria, yeasts and molds; stability for 45 d	Vieira and Silva (2014)
Elephant apple	Juice	80 °C/1 min	Decrease in viscosity during the storage	Nayak and others (2016)
Ginger	Ready-to-drink beverage	95 °C/10 min	The beverage remain microbiologically safe for 6 mo, with a good retention of active components	Dadasaheb and others (2015)
Grape	Juice	80 °C/30 min	Increase of 67.4% and 216.9% in total phenolic content and radical scavenging activity. The bioaccessibility of the total phenolics increased by 33.9%	He and others (2016)
Grape	Wine	80 °C/15 min	Lethality of 89.40% for *S. cerevisiae* (QA23)	Cui and others (2012)
Grape, orange	Juice blend enriched with hydrolyzed collagen	95 °C/18 min	Inactivation of the naturally occurring microbiota	Bilek and Bayram (2015)
Grapefruit	Juice	85 °C/45 s	No microbial growth during 21 d of refrigerated storage. Negative effect on the levels of ascorbic acid and color characteristics	Uckoo and others 2013
Guava	Juice	85 °C/1 min	Ascorbic acid decreased by 20% to 26%	Sinchaipanit and others (2015)
Guava, mango, papaya, roselle	Juice blend	82.5 °C/20 min	Ascorbic acid, total monomeric anthocyanins, total phenols, and antioxidant activity decreased significantly during storage	Mgaya-Kilima and others (2014)
Indian borage	Ready-to-drink beverage	95 °C/10 min	The beverage remained microbiologically safe for 6 mo, with a good retention of active components	Dadasaheb and others (2015)
Jamun	Juice	80 °C/5 min	High anthocyanin degradation	Shaheer and others (2014)
Jaboticaba	Juice	80 to 90 °C/15 to 90 min	Low stability of the monomeric anthocyanins (degradation of 1% to 2% after 60 min)	Mercali and others (2015)

(*Continued*)

Table 2–Continued.

Fruit/vegetable source(s)	Product	Processing conditions	Key finding(s)	Reference
Kiwifruit, mango, orange, pineapple	Juice-blend mixed with soymilk	90 °C/1 min	Decreased bioaccessibility of ascorbic acid and phenolic compounds	Rodríguez-Roque and others (2015)
Kiwifruit, mango, orange, pineapple	Juice-blend mixed with whole or skim milk	90 °C/1 min	Thermal processing ensured the microbial stability of the beverages during 56 d at 4 °C without significant changes on pH, acidity, and soluble solid content values. Thermal treatment did not inactivate PG enzymatic activity	Salvia-Trujillo and others (2011)
Kiwifruit, orange, pineapple	Juice-blend mixed with soymilk	90 °C/1 min	POD and LOX of heat treated beverages were inactivated by 100% and 51%, respectively. Thermal treatment ensured the microbial stability of the beverage for 56 d	Morales-de la Peña and others (2010)
Litchi	Mixed beverage	95 °C/5 min	Inactivation of PME, PPO and POD (83%, 79%, and 78%, respectively); loss of ascorbic acid of 31%. Shelf life 80 d	Swami Hulle and Rao (2016)
Litchi	Juice	90 °C/1 min	Total inactivation of naturally occurring microbiota. Negative effects on color. Decrease of the total free amino acids	Guo and others (2011)
Litchi	Probiotic juice	95 °C/1 min	Probiotic *Lactobacillus casei* at 8.0 CFU/mL log after 4 wk at 4 °C	Zheng and others (2014)
Longan	Juice	100 °C/1 min	Significant loss in physicochemical properties and flavor compounds	Zhang and others (2010)
Longan	Xanthan-added juice	90 °C/2 min	Complete inactivation of naturally occurring microorganisms and PPO significant decrease of total phenols and antioxidant activity	Chaikham and Apichart-srangkoon (2012)
Longan, pennywort	Herbal-plant beverage added with rice (*Oryza sativa* L.)	90 °C/2 min	No microbial growth for 3 wk at 4 °C. Negative impact on color and bioactive compounds	Worametrachanon and others (2014)
Mandarin	Juice	85 °C/5 to 15 min	The highest nonenzymatic browning during 6-mo-refrigerated storage was observed in juice processed at 85 °C for 15 min	Pareek and others (2011)
Mango	Juice	90 °C/1 min	Complete inactivation of occurring microbiota. Detrimental effects on the overall quality	Santhirasegaram and others (2015)
Mango	Nectar	100 °C/10 min	Negative impact on color	Tribst and others (2011)
Maoberry	Juice	90 °C/1 min	Complete inactivation of mesophilic bacteria, and PPO. Negative effects on color attributes	Chaikham (2015)
Maqui berry	Juice	85 °C/2 min	Reduction of anthocyanin	Brauch and others (2016)
Orange	Juice	90 °C/1 min	High retention of ascorbic acid. Low preservation of total polyphenol content and antioxidant capacity	Velázquez-Estrada and others (2013)
Orange	Juice enriched with hydrolyzed collagen	95 °C/21 min	Inactivation of occurring microbiota	Bilek and Bayram (2015)
Papaya	Nectar	80 °C/5 min	Reduction pectinesterase activity, *E. coli* K12, *L. innocua*, *Salmonella* Typhimurium, *Clostridium sporogenes*	Parker and others (2010)
Passion fruit	Juice	90 °C/1 min	The levels of ascorbic acid, anthocyanins, and carotenoids were slightly affected	Fernandes and others (2011)
Peach	Juice	90 °C/5 min	Significant reductions in total carotenoids, protocatechuic acid, zexanthin and β-cryptoxanthin	Oliveira and others (2012)
Pear	Juice	95 °C/2 min	Complete inactivation of PPO, POD, PME, and natural occurring microbiota. Reduction of ascorbic acid, total phenols, flavonoids, and antioxidant capacity	Saeeduddin and others (2015)
Pennywort	Juice	90 °C/3 min	Naturally occurring microbiota below the detection limit for 4 mo at 4 °C. Negative effects on ascorbic acid, total phenolic compounds, and antioxidant capacity	Chaikham and others (2013)
Physalis	Juice	90 °C/2 min	Preservation of the valuable attributes of the juice	Rabie and others (2015)
Pindo palm	Juice	85 °C/20 min	The physicochemical properties of juice, excluding color, and their proportion of ascorbic acid and β-carotene, was not affected	Jachna and others (2016)
Pineapple	Juice	90 °C/1.5 min	Adverse effect on ascorbic acid, total phenolic, and radical scavenging activity	Zheng and Lu (2011)
Pitahaya	Juice	80 and 85 °C/10 to 30 min	High reduction of betacyanin content at 85 °C for 30 min.	Wong and Siow (2015)
Pomegranate	Juice	90 °C/2 min	15.4% to 28.3% loss of anthocyanin	Pala and Toklucu (2011)
Pomegranate	Nectar	95 °C/45 s	Loss of 76% and 42% to 77% for flavonoid and antioxidant activity	Surek and Nilufer-Erdil (2014)
Rabbiteye blueberry	Juice	80 °C/0 to 3000 min	Half-life time of 5.1 h for anthocyanin.	Kechinski and others (2010)
Red-fleshed apple	Juice	80 °C/10 min and 90 °C/5 min	0.02 and 0.12 for PPO and POD residual enzyme activity at 80 °C, and 0.00 and 0.10 at 90 °C, respectively.	Katiyo and others (2014)

(*Continued*)

Table 2–Continued.

Fruit/vegetable source(s)	Product	Processing conditions	Key finding(s)	Reference
Red raspberry	Juice	80 °C/15 min	The content of the ascorbic acid was reduced by 47% and 31% in fresh and processed juice after 20 d of refrigerated storage	Yang and others (2015)
Sea buckthorn	Juice	90 to 120 °C/0 to 300 min	Significant effect on ascorbic acid content.	Xu and others (2015a)
Sour cherry	Juice	80 °C/2 min	Increase in anthocyanins and phenolic acids	Elez Garofulić and others (2015)
Sour orange	Juice	70 to 80 °C/5 to 25 min	12.10% PME residual activity at 80 °C for 5 min	Koshani and others (2014)
Soursoup	Juice	60 °C/60 min	Significant decrease of naturally occurring microbiota during storage (30 to 31 °C; 2 wk). Decrease in titratable acidity from 23.25 to 21.92	Nwachukwu and Ezeigbo (2013)
Spinach	Juice	80 °C/10 min	No microbial growth during the storage at 4 °C for 10 wk. Degradation of color pigments. Significant loss of soluble solids	Khandpur and Gogate (2015)
Strawberry	Juice	90 °C/1 min	No effect on the antioxidant activity	Odriozola-Serrano and others (2016)
Strawberry	Nectar	85 °C/15 min	Moderate loss of anthocyanins during the refrigerated storage	Marszałek and others (2011)
Sweet lime	Juice	80 °C/10 min	No microbial growth during the storage at 4 °C for 10 wk. Degradation of color pigments. Significant loss of soluble solids	Khandpur and Gogate (2015)
Tamarillo	Nectar	80 to 95 °C/10 min	Increasing temperatures led to significant loss in some carotenoids, such as zeaxanthin and β-carotene.	Mertz and others (2010)
Tomato	Juice	85 °C/5 min	Inactivation of natural microorganisms. Moderate effect on physicochemical and color characteristics	Stratakos and others (2016)
Tomato	Fermented juice	100 °C/5 to 120 min	The lycopene content of tomato juice after heating at 100 °C for 5 min was significantly increased from 88 to 113 μg/g.	Koh and others (2010)
Twistspine pricklypear	Juice	95 °C/3 min	Low preservation of antioxidant activity	Moussa-Ayoub and others (2011)
Yellow mombin	Juice	90 °C/1 min	25% and 2.5% residual activity for PME and POD	De Carvalho and others (2015)
Watermelon	Juice	95 °C/1 min	Decrease of cloud stability	Liu and others (2012)
White mulberry	Juice	95 °C/1 min	14% reduction of α-glucosidase inhibitory activity	Yu and others (2014)
Wild cherry	Juice	90 °C/1 min	PPO was completely inactivated	Chaikham and Baipong (2016)

PME, pectin methyl esterase; PG, polygalacturonase; LOX, lipoxygenase; PPO, polyphenol oxidase; POD, peroxidase

the oxidation processes). PE and PG are involved in the breakdown of pectin and other cell wall materials, resulting in a product with reduced viscosity and undesirable organoleptic properties (Marszałek and others 2016). Therefore, several studies were performed to evaluate the effect of HTLT treatments on these activities. Examples include: (1) the reduction of PME enzymatic activity by 75% to 83%, respectively, in yellow mombin juice (de Carvalho and others 2015) and litchi-based beverage (Swami Hulle and Rao 2016), or its complete inactivation in pear juice (Saeeduddin and others 2015), and broccoli/carrot/red pepper/tomato smoothie (Rodríguez-Verástegui and others 2016); (2) the reduction of PPO enzymatic activity by 79% in litchi-based beverage (Swami Hulle and Rao 2016), or its total inactivation in smoothie (Rodríguez-Verástegui and others 2016), pear juice (Saeeduddin and others 2015), and longan juice added with xanthan (Chaikham and Apichartsrangkoon 2012); (3) the reduction of POD enzymatic activity by 78% and 97.5% in litchi-based beverage (Swami Hulle and Rao 2016) and yellow mombin juice (de Carvalho and others 2015), respectively, as well as its complete inactivation in pear juice (Saeeduddin and others 2015), in a juice-blend mixed with soymilk (Morales-de la Peña and others 2010), and a vegetable-based smoothie (Rodríguez-Verástegui and others 2016); and (4) the reduction of LOX enzymatic activity by 51% in kiwifruit/orange/pineapple juice blend mixed with soymilk (Morales-de la Peña and others 2010).

HTLT might affect many antioxidant compounds, thus reducing their beneficial health effects. The reduction of the antioxidant capacity was generally due to a loss in total anthocyanins and vitamin C (Miller and Silva 2012). Some of these studies reported: (1) the degradation of ascorbic acid in amla juice (Bansal and others 2015), apple/red cabbage (Radziejewska-Kubzdela and Biegańska-Marecik 2015) and coconut/lemon/litchi blended beverages (Jayachandran and others 2015), grapefruit juice (Uckoo and others 2013); (2) the degradation of anthocyanins in jamun (Shaheer and others 2014), maqui berry (Brauch and others 2016), and pomegranate (Pala and Toklucu 2011) juices; (3) the degradation of carotenoids in peach (Oliveira and others 2012) and pindo palm (Jachna and others 2016) juices; and (4) the reduction of antioxidant capacity in amla (Bansal and others 2015), asparagus (Chen and others 2015b), orange (Velázquez-Estrada and others 2013), pear (Saeeduddin and others 2015), and twist spine prickly pear juices (Moussa-Ayoub and others 2011).

Similarly, other drawbacks related to quality attributes include (1) the detrimental effect on color in carrot/melon/orange/papaya smoothie (Andrés and others 2016b), coconut/nannari blended beverage (Kathiravan and others 2014a), grapefruit (Uckoo and others 2013), litchi (Guo and others 2011), spinach and sweet lime (Khandpur and Gogate 2015) juices, mango nectar (Tribst and others 2011), as well as in a longan/pennywort-based beverage added with rice (Worametrachanon and others 2014); (2) the losses in physicochemical properties in cactus (Deboni and others 2014), litchi (Guo and others 2011), longan (Zhang and others 2010), mango (Santhirasegaram and others 2015), and watermelon (Liu and others 2012) juices, as well as in blueberry nectar (Šimunek

Table 3–Conventional thermal processing: high temperature-short time (HTST)

Fruit/vegetable source(s)	Product	Processing conditions	Key finding(s)	Reference
Amla, bael	Juice blend	80 to 90 °C/25 s	Juice treated at 90 °C showed best results for the nutritional quality of product	Rathod and others (2014)
Apple	Juice	90 °C/30 s	Complete inactivation of *L. brevis* and *S. cerevisiae*. 95.3% and 90.9% inactivation of PME and PPO	Aguilar-Rosas and others (2013)
Apple	Concentrated juice	100 °C/30 s	Reduction of *A. acidoterrestris* spores; the complete inactivation was not achieved	Djas and others (2011)
Apple	Smoothie added with carboxymethyl cellulose	85 °C/15 s	Negative effects were not reported	Sun-Waterhouse and others (2014)
Apricot	Nectar	110 °C/8.6 s	Complete inactivation of PPO, POD, and PME	Huang and others (2013)
Blackberry	Juice	92 °C/10 s	High levels of total phenolics, (−)-epicatechin, ferulic acid, and *p*-coumaric acid. Retention of biological properties related to inhibition of peroxidation and its capacity to scavenge intracellular radicals	Azofeifa and others (2015)
Blackcurrant	Juice	103 °C/30 s	Significant loss in anthocyanin content (approximately 22%)	Woodward and others (2011)
Black mulberry	Juice	90 °C/30 s	Reduction of the antioxidant activity	Jiang and others (2015)
Blueberry	Juice	90 °C/15 s	No changes for reducing sugars, total acid, phenol contents, and soluble solids. Low stability of ascorbic acid	Chen and others (2014)
Carrot	Juice	98 °C/21 s	Higher viscosity and low stability of particles dispersion during the refrigerated storage	Chen and others (2012)
Carrot	Reduced-calorie juice	90 °C/15 s	Low β-carotene content	Sinchaipanit and others (2013)
Carrot, celery, green pepper, lemon, olive, onion, tomato	Blended beverage	90 and 98 °C/15 and 21 s	Decrease of ascorbic acid	Barba and others (2010)
Chinese bayberry	Juice	120 °C/3 s	Moderate flavor changes	Xu and others (2014)
Cucumber	Juice	85 °C/15 s	Yeasts and molds were completely inactivated, and their levels were below the detection limit for 50 d	Zhao and others (2013)
Grape	Juice	90 °C/30 s	Increase of 65% and 116.6% in total phenolic content and radical scavenging activity value, respectively	He and others (2016)
Grapefruit	Juice	80 °C/11 s	Significant decrease in citric and ascorbic acids	Igual and others (2010)
Guava	Nectar	90 °C/3.1 and 12.5 s	Treatments for 3.1 and 12.5 s retained, respectively, 92% and 90% of the initial ascorbic acid content after 12 d of refrigerated storage	Salazar-González and others (2014)
Lemon	Juice	90 °C/15 s	Increase of total phenolic content. Decrease of total carotenoid content	Uçan and others (2016)
Lemon, maqui berry	Isotonic drink	80 and 85 °C/6 s	Heat treatments did not affect anthocyanins. However, 80 °C/heat treatment with storage at 7°C controlled microbial growth	Gironés-Vilaplana and others (2016)
Lemon, pomegranate	Juice blend	90 °C/5 s	Complete inactivation of naturally occurring microorganisms. High increase in the color hue. Marked effect on ascorbic acid degradation	Mena and others (2013a)
Mandarin	Juice	82 and 92 °C/12 s	POD activity ranging from 0.11 to 0.23 (units/g of juice) at 82 and 92 °C, respectively	Hirsch and others (2011)
Mango	Nectar	110 °C/8.6 s	Significant inactivation of naturally occurring microorganisms. The activity of acid invertase was reduced by 91.4%. Significant increase of viscosity	Liu and others (2014)
Mulberry	Juice	110 °C/8.6 s	Total aerobic bacteria, yeasts, and molds were not detected for 28 d at 4 °C and 25 °C	Zou and others (2016)
Orange	Juice	90 °C/20 s	PME activity increased during storage (4 °C, 180 d)	Agcam and others (2014)
Orange	Juice mixed with milk	90 °C/15 s	5-log reduction of *L. plantarum* (CECT 220). Significant increase of HMF content	Zulueta and others (2013)
Orange	Fermented juice	85 °C/30 s	Partial amino acid degradation; however, the total amino acid content was higher	Cerrillo and others (2015)
Orange, sweet pepper	Juice blend	110 °C/8.6 s	About 4 log reduction of total aerobic bacteria, yeasts, and molds	Xu and others (2015b)
Papaya	Beverage	110 °C/8.6 s	Total aerobic bacteria, yeasts, and molds were below the limit of detection	Chen and others (2015a)
Papaya	Nectar	80 to 135 °C/1 to 3 s	β-Carotene was significantly reduced at 80 and 110 °C (22.5%) and increased at 135 °C, with an overall 6.26% increase	Swada and others (2016)
Persimmon	Juice	95 °C/30 s	Formation of phenylalanine-hexoside and tryptophan-hexoside	Jiménez-Sánchez and others (2015)
Pomegranate	Juice	110 °C/8.6 s	pH, total soluble solids, and titratable acidity did not show significant changes	Chen and others (2013a)
Prickly pear	Juice	131 °C/2 s	High loss in phenols	Jiménez-Aguilar and others (2015)
Pummelo	Juice	110 °C/8.6 s	PME and POD were inactivated. Decrease of total phenols (7.7%) and ascorbic acid (27.9%)	Gao and others (2015)

(*Continued*)

Table 3–Continued.

Fruit/vegetable source(s)	Product	Processing conditions	Key finding(s)	Reference
Purple sweet potato	Nectar	110 °C/8.6 s	Inactivation of yeasts and molds to a level below the detection limit, and the count of yeasts and molds in juice was kept lower than the detection limit during 12 wk of storage at 4 and 25 °C	Wang and others (2012)
Red-fleshed apple	Juice	115 °C/5 s	0.06 and 0.20 for PPO and POD residual enzyme activity, respectively	Katiyo and others (2014)
Strawberry	Nectar	80 to 135 °C/1 to 3 s	Antioxidant capacity was constant at 80 °C, significantly increased at 110 °C, and remained relatively constant thereafter, with an overall 9.82% increase.	Swada and others (2016)
Tomato	Juice	92 °C/5 s	Complete inactivation of total plate count. Slight increase of acidity	Giner and others (2013)
Watermelon	Juice	90 °C/30 s	Low viscosity values over the subsequent refrigerated storage	Aguiló-Aguayo and others (2010)

PME, pectin methyl esterase; PPO, polyphenol oxidase; POD, peroxidase.

and others 2014); and (3) the negative effects on flavor compounds in longan juice (Zhang and others 2010).

However, HTLT could affect in a positive way some bioactive compounds. Remarkable examples include the enhancement of: (1) total phenolic, total flavonoid, and monomeric anthocyanin contents, as well as total antioxidant capacity in black mulberry juice (Tomas and others 2015); (2) total phenolic and hydroxycinnamic acids amount in carrot juice (Dereli and others 2015); (3) anthocyanins and phenolic acids content in sour cherry juice (Elez Garofulić and others 2015); and (4) aromatic compounds in apple juice (Šimunek and others 2013).

High temperature-short time (HTST)

In order to avoid the drawbacks of the traditional thermal technologies, ensure product safety, and maintain the desired bioactive compounds, HTST thermal pasteurization (temperature ≥80 °C and holding times ≤30 s) has been proposed and tested (Table 3), because temperature dependency is more significant for microorganism destruction than for nutrient degradation (Achir and others 2016).

A broad range of studies mainly focused on microbiological quality of products. HTST treatments can: (1) control the growth of *Lactobacillus plantarum* CECT 220 in orange juice added with milk (Zulueta and others 2013), or the native microorganisms in orange/sweet pepper juice blend (Xu and others 2015b) and mango nectar (Liu and others 2014); (2) inactivate *Lactobacillus brevis* and *Saccharomyces cerevisiae* in apple juice (Aguilar-Rosas and others 2013), as well as the native microorganisms in purple sweet potato nectar (Wang and others 2012), tomato (Giner and others 2013) and cucumber juices (Zhao and others 2013), and lemon/pomegranate juice blend (Mena and others 2013a); and (3) ensure microbial stability during the storage of mulberry juice (Zou and others 2016) and purple sweet potato nectar (Wang and others 2012).

The effects of HTST treatment on different enzymes were also studied; it could: (1) reduce PME (95.3%) and PPO (90.9%) in apple juice (Aguilar-Rosas and others 2013); and (2) ensure the complete inactivation of PPO, POD, and PME in apricot nectar (Huang and others 2013), and PME and POD in pummelo juice (Gao and others 2015), respectively.

Interestingly, the application of HTST heat treatment is reported to increase: (1) total phenolics, (−)-epicatechin, ferulic acid, and *p*-coumaric acid content in apricot nectar (Huang and others 2013); (2) color hue in lemon/pomegranate juice blend (Mena and others 2013a); (3) nutritional value in fermented orange juice (Cerrillo and others 2015); and (4) viscosity in carrot juice (Chen and others 2012) and mango nectar (Liu and others 2014). Nevertheless, the exposure to high temperatures, even for short periods, can result in sensorial changes of appearance, texture, color, and flavor (Miller and Silva 2012). For example, HTST heat treatment can decrease: (1) the content of citric and ascorbic acids in grapefruit juice (Igual and others 2010); (2) the amount of ascorbic acid in lemon/pomegranate juice blend (Mena and others 2013a); and (3) total phenolic content in prickly pear juice (Jiménez-Aguilar and others 2015).

Mild temperature-long time (MTLT)

Over the last years, some researchers studied MTLT heat treatments (temperature <80 °C and holding times >30 s) to improve the shelf life of minimally processed products (Table 4). MTLT can provide: (1) the increase of total phenolic content in black jamun juice (Saikia and others 2015); (2) a good preservation of color in cucumber juice (Wang and others 2013); (3) high retention of ascorbic acid and other phenolic compounds in pineapple juice (Saeeduddin and others 2015); (4) an increase of color stability and viscosity in prickly pear juice (Cruz-Cansino and others 2015); (5) high retention of β-carotene content in reduced-calorie carrot juice (Sinchaipanit and others 2013); and (6) a good retention of ascorbic acid and anthocyanin (58.3% and 85.1%, respectively) in Chinese bayberry juice (Wang and others 2015).

Moreover, MTLT can ensure: (1) ca. 4.39 log reduction of aerobic plate count in pomegranate juice (Mena and others 2013b); (2) the complete inactivation of total plate count in maoberry juice (Chaikham 2015); and (3) the microbial stability of up to 2 y storage in grape juice (Mert and others 2013). However, Gouma and others (2015) reported only 2.9-log reduction of potential pathogen *Escherichia coli* (STCC 4201) population in apple juice (Gouma and others 2015). On the other hand, Kaya and others (2015) reported >6 log reduction of *E. coli* K12 (ATCC 25253) in lemon/melon juice blend (Kaya and others 2015), which is likely the result of using different *E. coli* strains, as well as a different acidic food-matrix. Pathogens can survive in juice because of acid adaptation and develop adaptive mechanisms by undergoing genetic and physiologic changes that allow cells to stay viable. Acid adaption of pathogens shows cross-protection against thermal processing (Song and others 2015). When microorganisms develop resistance to commonly used preservation methods, juice quality and safety may be affected, and therefore understanding of stress adaptive mechanisms plays a key role in designing safe food processing conditions (Guevara and others 2015).

Regarding the enzymatic activities, MTLT heat treatments were efficient to: (1) reduce significantly PPO, POD, and PME in pear juice (Saeeduddin and others 2015); and (2) completely inactivate PPO in maoberry juice (Chaikham 2015) and

Table 4–Conventional thermal processing: mild temperature-long time (MTLT)

Fruit/vegetable source(s)	Product	Processing conditions	Key finding(s)	Reference
Amla	Juice	70 °C/10 min	Initial reduction and increase of the naturally occurring microbiota within the storage. The critical threshold was never attained	Sangeeta and others (2013)
Apple	Juice	55 °C/3.58 min	2.9-log reduction of *E. coli* (STCC 4201)	Gouma and others (2015)
Apple, banana, orange, strawberry	Smoothie	70 °C/10 min	Reduction of the total antioxidant capacity, total phenols, anthocyanins and color. Total inactivation of PPO	Keenan and others (2012)
Apple, orange	Juice blend	70 °C/60 and 90 s	A thermal treatment for 60 s did not have effect on the growth of *S. cerevisiae* SPA. Indeed, only a 0.49 log CFU/mL reduction was observed in samples, subjected to a thermal treatment for 90 s, after 8 d at room temperature	Tyagi and others (2014b)
Banana	Juice	45 to 60 °C/30 min	At a temperature below 50 °C, PPO activity only decreased by 9.1% at 55 °C and 20.5% at 60 °C	Yu and others (2013b)
Baobab	Drink	60 and 70 °C/0 to 180 min	83.37% and 91.71% ascorbic acid degradation after 180 min at 60 and 70 °C, respectively	Abioye and others (2013)
Blackberry	Juice	70 °C/0 to 300 min	The antioxidant capacity is highly related with anthocyanin degradation over time	Zhang and others (2012)
Black jamun	Juice	Approximately 75 °C/3 min	Increase in total phenolic content and ferric reducing antioxidant property	Saikia and others (2015)
Bottle gourd	Juice	63 °C/30 min and 75 °C/10 min	Higher decrease in ascorbic acid (35.27%) was observed at 63 °C. Increase in pasteurization temperature lead to significant increase in total phenolics	Bhat and others (2016)
Carrot	Reduced-calorie juice	65 °C/30 min	High retention of β-carotene content. Production of an unacceptable cooked flavor	Sinchaipanit and others (2013)
Carrot	Juice	20 to 70 °C/1 to 60 min	Juices processed at low temperatures of 20 °C showed an enhancement on both falcarinol and falcarindiol-3-acetate contents with increasing the processing times up to 10 min compared to untreated juices. In contrast, longer processing times of 30 and 60 min did not affect the polyacetylene levels of the samples	Aguiló-Aguayo and others (2014)
Carrot, celery, beetroot	Juice blend	70 °C/3 min	High losses of ascorbic acid, as well as low increase of acidity throughout the subsequent storage for 2 wk at 4 °C	Profir and Vizireanu (2013)
Carrot, orange, pumpkin-carrot, grapefruit, pumpkin celery, orange, pumpkin	Juice blend	70 °C/10 min	Negative influence on flavor and flavonoids during the refrigerated storage for 14 d	Dima and others (2015)
Carambola	Juice	Approximately 75 °C/3 min	Increase in ferric reducing antioxidant property	Saikia and others (2015)
Chinese bayberry	Juice	55 °C/8 min	58.3% and 85.1% of ascorbic acid and anthocyanin retention	Wang and others (2015)
Coconut, lemon, litchi	Beverage blend	40 to 70 °C/0 to 20 min	A minimum thermal inactivation of PPO up to 7.5 % was achieved at 40 °C/5 min, and a maximum level of inactivation to the tune of 50 % was attained at 70 °C/20 min	Jayachandran and others (2016)
Cucumber	Juice	60 °C/2 min	Good preservation of color	Wang and others (2013)
Grape	Juice	65 °C/30 min	No microbial growth up to 2 y storage. Detection of HMF	Mert and others (2013)
Guava	Whey drink-based beverage	60 to 70 °C/15 to 25 min	The beverage pasteurized at 65 °C/25 min was more acceptable compared to the other combinations for shelf life, microbiological safety, color, taste, aroma, and overall acceptability	Singh and others (2014)
Jaboticaba	Juice	15 to 90 min/60 and 70	A high stability of the monomeric anthocyanins was observed at 60 °C (degradation of 1% to 2% after 60 min)	Mercali and others (2015)
Litchi	Juice	Approximately 75 °C/3 min	Decrease in total phenolic content and ferric reducing antioxidant property	Saikia and others (2015)
Lemon, melon	Juice blend	72 °C/1.11 min	Reduction of *E. coli* K12 (ATCC 25253) population by >6 log	Kaya and others (2015)
Mandarin	Juice	65 °C/15 to 35 min and 75 °C/10 to 30 min	Juice processed at 65 °C for 15 min maintained better qualitative characteristics like total soluble solids, acidity, ascorbic acid, sugars, and nonenzymatic browning during 6 mo refrigerated storage	Pareek and others (2011)
Pear	Juice	65 °C/10 min	High retention of ascorbic acid and other phenols. Significant reduction in PPO, POD, and PME, and complete microbial inactivation	Saeeduddin and others (2015)
Pineapple	Juice	Approximately 75 °C/3 min	Decrease in total flavonoid content	Saikia and others (2015)
Pitahaya	Juice	65 to 75 °C/10 to 30 min	High preservation of betacyanin content at 65 °C. No effect of different heating times	Wong and Siow (2015)
Pomegranate	Juice	65 °C/1 min	4.39 log reduction of aerobic plate count. The anthocyanin content was enhanced	Mena and others (2013b)

(*Continued*)

Table 4–Continued.

Fruit/vegetable source(s)	Product	Processing conditions	Key finding(s)	Reference
Prickly pear	Juice	70 °C/30 min	Partial inactivation of mesophilic bacteria and enterobacteria. Higher total phenolic values	Cruz-Cansino and others (2015)
Rabbiteye blueberry	Juice	40 to 70 °C/0 to 3000 min	Half-life time values of 180.5, 42.3, 25.3, and 8.6 h for the degradation of anthocyanin at 40, 50, 60, and 70 °C, respectively	Kechinski and others (2010)
Sour orange	Juice	40 to 70 °C/5 to 25 min	Thermal treatments at low temperatures ($T < 60$ °C) did not reduce PME activity considerably. After 5 min of thermal treatment at 60 °C, the residual activity was 77.55%	Koshani and others (2014)
Watermelon	Juice	74 °C/45 s	*E. coli*, *L. innocua*, *L. plantarum*, and *S. cerevisiae* were inactivated below the detection limit. Alteration of the flavor profile	Aganovic and others (2016)

PME, pectin methyl esterase; PPO, polyphenol oxidase; POD, peroxidase.

apple/banana/orange/strawberry smoothie (Keenan and others 2012).

Some drawbacks related to MTLT include: (1) the reduction of total antioxidant capacity, total phenols, anthocyanin content, and instrumental color variables in smoothie (Keenan and others 2012); (2) high losses of ascorbic acid in carrot/celery/beetroot juice blend (Profir and Vizireanu 2013); (3) a decrease of total phenolic content and ferric reducing antioxidant property in litchi juice (Saikia and others 2015); (4) the reduction of total flavonoid content in pineapple juice (Saikia and others 2015); and (5) negative effects on color attributes of maoberry juice (Chaikham 2015).

Mild temperature-short time (MTST)

MTST heat processing uses temperatures <80 °C and holding times ≤30 s (Table 5). These treatments have a limited effect on product characteristics. Examples include: (1) the preservation of the sensory quality (appearance, sweetness, and acidity) in apple/cranberry juice blend (Caminiti and others 2011), as well as the biological properties related to inhibition of peroxidation and its capacity to scavenge intracellular radicals in blackberry juice (Azofeifa and others 2015); and (2) the enhancement of anthocyanin content in pomegranate juice (Mena and others 2013b), and total phenolic content in sweet cherry juice (Queirós and others 2015).

MTST heat treatments were reported to achieve: (1) a 6 to 7 log reduction of *Listeria innocua* (NCTC 11288) population in apple/mango/orange/pineapple smoothie (Palgan and others 2012); (2) a 3.5 to 3.7 log reduction of the native microorganisms in apple/banana/coconut/orange/pineapple smoothie (Walkling-Ribeiro and others 2010); (3) ca. 4.09 log reduction in pomegranate juice (Mena and others 2013b); (4) the total inactivation of microbiological load in sweet cherry juice (Queirós and others 2015); and (5) the control of the residual microorganisms (*L. innocua*, *E. coli*, *L. plantarum*, *S. cerevisiae*, and *Aspergillus niger*) in tomato juice for at least 21 d (Aganovic and others 2014), and the total plate count in apple juice for 48 d (Torkamani 2011).

However, MTST treatments can affect the physicochemical, sensory, and functional properties of beverages, namely: (1) color in apple juice (Torkamani 2011), as well as color and flavor in a carrot/orange juice blend (Caminiti and others 2012); (2) ascorbic acid content in lemon/pomegranate juice blend (Mena and others 2013a); and (3) unsaturated fatty acids in tomato juice (Aganovic and others 2014).

MWH

New thermal technologies have been studied as alternative methods to heat treatment (Mercali and others 2015). MWH is a promising way for some benefits, like the reduced processing time, high energy efficiency, a good process control, and space savings (Salazar-González and others 2014). An overview of the effects of MWH on fruit and vegetable beverages is shown in Table 6.

Generally, the effectiveness of MWH toward the conventional processing is confirmed by: (1) the increase of total phenolic content in carambola, watermelon, and pineapple juices (Saikia and others 2015); (2) the great retention of flavonoid compounds throughout 2 mo of frozen storage in grapefruit juice (Igual and others 2011); (3) the preservation of physicochemical properties in tomato juice (Stratakos and others 2016) and many juice-blends (Math and others 2014); (4) the increase of total flavonoid content in black jamun and litchi juices (Saikia and others 2015); (5) the significant retention of ascorbic acid and the preservation of color and rheological properties in guava nectar (Salazar-González and others 2014); and (6) the 2- to 3-fold increase of total soluble solids, acidity, sugars, polyphenols, anthocyanins, and antioxidant activity content in pomegranate juice (Dhumal and others 2013).

Overall, MWH systems have been considered to deliver reduced thermal exposure to inactivate microorganisms (Arjmandi and others 2016). However, some studies reported: (1) the inactivation of natural microorganisms in tomato juice (Stratakos and others 2016) and in pomegranate juice (Dhumal and others 2015); (2) a 3 log reduction of bacteria and fungi population in many juice blends (Math and others 2014); and (3) the microbial stability during storage of guava nectar (Salazar-González and others 2014) and orange juice (Demirdöven and Baysal 2015). Recently, MWH successfully eliminated vegetative bacteria in smoothies without compromising food quality. Interestingly, *L. monocytogenes* was not detected throughout the shelf life of product (Arjmandi and others 2016). Since increasing MWH power has an important effect on the reduction of heating time, a combination of high power and short time might be a solution for reducing the loss of quality, as well as destroy harmful pathogenic microorganisms (Arjmandi and others 2016).

Generally, MWH could not inactivate browning-related enzymes (Miller and Silva 2012), but there is not a general consensus on this topic. In fact, some studies stated that MWH ensures significant PME inactivation in guava nectar (Salazar-González and others 2014), and kava juice (Abdullah and others 2013), as well as its complete inactivation in carrot juice (Rayman and Baysal 2011). Some drawbacks related to MWH include: (1) the formation of colored decomposition products (that is, browning) in beetroot juice (Gonçalves and others 2013); and (2) the decrease of pH and color values in pomegranate juice (Dhumal and others 2015).

Table 5–Conventional thermal processing: mild temperature-short time (MTST)

Fruit/vegetable source(s)	Product	Processing conditions	Key finding(s)	Reference
Amla	Juice blend	75 °C/25 s	Shelf life at 45 d (refrigeration)	Rathod and others (2014)
Apple	Juice	74.3 °C/25 s	Mesophilic bacteria below the detection limit for 48 d. Change in color	Torkamani (2011)
Apple	Cider	60 to 76 °C/1.3 s	A significant decrease in *E. coli* K12 (ATCC 23716) was found at 76 °C	Azhuvalappil and others (2010)
Apple, banana, coconut, orange, pineapple	Smoothie	72 °C/15 s	3.5 to 3.7 log reduction of naturally occurring microbiota. High structural degradation	Walkling-Ribeiro and others (2010)
Apple, orange	Juice blend	70 °C/30 s	The treatment did not have effect on the growth of *S. cerevisiae* SPA	Tyagi and others (2014b)
Apple, cranberry	Juice blend	72 °C/26 s	No significant loss in sensory quality	Caminiti and others (2011)
Apple, mango, orange, pineapple	Smoothie	72 °C/26 s	Microbial reduction of *L. innocua* (NCTC 11288) of about 6 to 7 log CFU/mL	Palgan and others (2012)
Blackberry	Juice	75 °C/15 s	Retention of the biological properties related to inhibition of peroxidation and to scavenge intracellular radicals	Azofeifa and others (2015)
Carrot, orange	Juice blend	72 °C/26 s	8% PME residual activity. Negative effects on color and flavor	Caminiti and others (2012)
Guava	Nectar	60 and 73 °C/0 to 20 s	Significant reduction in the heat resistance of cocktails of *E. coli* (NRRL 3704, ATCC 8739, ATCC 92522) and *S. enterica* serovars Typhimurium (NRRL B-4420), Typhi (NRRL B-573), and Enteritidis (Biotech 1963) when heating was increased from 60 to 73 °C	Gabriel and others (2015)
Lemon	Juice	42 to 72 °C/12 s	Any effect of temperature on final POD activity	Hirsch and others (2011)
Lemon, pomegranate	Juice blend	65 °C/30 s	Reduction of naturally occurring microbiota. Good preservation of color properties. Marked effect on ascorbic acid degradation	Mena and others (2013a)
Mandarin	Juice	42 to 72 °C/12 s	PME activity ranged from 0.07 to 0.88 (units/g of juice) at 72 and 42 °C, respectively	Hirsch and others (2011)
Orange	Juice	70 °C/7.2 s	No changes in pH, soluble solids, titratable acidity, and ascorbic acid content. 86.4% PME inactivation	Yuk and others (2014)
Pomegranate	Juice	65 °C/30 s	4.09 log reduction of natural microbiota. The anthocyanin content was enhanced	Mena and others (2013b)
Soursop	Nectar	60 and 73 °C/0 to 20 s	Significant reduction in the heat resistance of cocktails of *E. coli* (NRRL 3704, ATCC 8739, ATCC 92522) and *S. enterica* serovars Typhimurium (NRRL B-4420), Typhi (NRRL B-573), and Enteritidis (Biotech 1963) when heating was increased from 60 to 73 °C	Gabriel and others (2015)
Sweet cherry	Juice	70 °C/30 s	Reduction of natural microbiota below the detection limit. Increase of total phenolic content. No effect on anthocyanins	Queirós and others (2015)
Tomato	Juice	74 °C/30 s	Residual microorganisms (*L. innocua*, *E. coli*, *L. plantarum*, *S. cerevisiae*, and *A. niger*) were below the detection limit for at least 21 d. Enhancement oxidative breakdown of unsaturated fatty acids	Aganovic and others (2014)
Winter melon	Juice	71 °C/15 s	High acceptability in the sensory panel	Sun and others (2016)

PME, pectin methyl esterase.

Ohmic heating (OH)

OH is based on the passage of electrical current through a food product that provides electrical resistance (Baysal and Icier 2010). Since the electrical conductivity of most foods increases with temperature, OH is very effective in fruit juices, which contain water and ionic salts in abundance (Miller and Silva 2012). OH provides uniform and rapid heating of foods, with a beneficial effect on the nutritional and organoleptic properties of processed products (Mercali and others 2015). Additionally, OH offers better energy efficiency, lower capital cost, shorter treatment time, and is an environmentally friendly process (Lee and others 2015) since 90% of electrical energy is converted into heat (Srivastav and Roy 2014).

With regard to the applications of OH in the juice industry, a broad range of studies focused on its suitability for replacing traditional heating processes, studying in turn its effects on the nutrients in processed juices (Traffano-Schiffo and others 2014) (Table 7). Bhat and others (2016) confirmed this statement, suggesting that OH is a promising alternative to conventional thermal technologies with a maximum retention of functional components and the complete destruction of microorganisms in bottle gourd juice. Similarly, other studies reported: (1) the lack of the effect on the flavor of many juice blends during the refrigerated storage for 2 wk (Dima and others 2015); (2) the retention of the carotenoids in orange and grapefruit juices (Achir and others 2016); (3) a moderate loss of ascorbic acid in carrot/celery/beetroot juice blend (Profir and Vizireanu 2013); and (4) any effect on the overall quality of orange and pineapple juices (Tumpanuvatr and Jittanit 2012).

Electric field strength, which is applied in OH, is too weak to inactivate foodborne pathogens by electroporation alone. However, the lethal effect of cell electroporation is an important factor for inactivating foodborne pathogens when combined with heating (Park and Kang 2013). In apple juice, OH for 30 s at 58 °C accomplished 4.00-, 4.63-, and 1.11-log reductions in levels of *E. coli* O157:H7, *S. Typhimurium*, and *L. monocytogenes* organisms, respectively. Conventional heating under the same conditions resulted in 1.58-, 1.42-, and 0.41-log reductions, respectively, which were less than those obtained by OH for all 3 pathogens (Park and Kang 2013).

Table 6–Alternative thermal processing: microwave heating (MWH)

Fruit/vegetable source(s)	Product(s)	Processing conditions	Key finding(s)	Reference
Apple	Juice	1200 W/90 and 120 s	Microwave (MW) could effectively remove the moisture in apple juice without affecting the overall quality	Xinfeng (2014)
Apple	Concentrated juice	40 to 800 W/18 to 270 s/<97 °C	*A. acidoterrestris* spores could be inactivated by combining heat-treatment and MW	Djas and others (2011)
Beetroot	Juice	25 to 200 W/0.3 to 40 min/approximately 100 °C	Browning	Gonçalves and others (2013)
Banana, grape, papaya; Bittergourd, bottlegourd, cucumber; Bittergourd, black jamun; Carrot, pomegranate; Figs, watermelon; Grape, melon: Grape, papaya; Grape, mango	Juice blend	1800 W/0 to 400 s/<121 °C	3 log reduction bacteria and fungi. Enterobacteria below the detection limit	Math and others (2014)
Black jamun	Juice	600 and 900 W/30 s/approximately 75 to 80 °C	Increase of flavonoid content	Saikia and others (2015)
Black mulberry	Juice	300 W/<150 min	Good preservation of anthocyanins	Hojjatpanah and others (2011)
Blueberry	Juice	200 and 250 W	Good preservation of phenolic content	Elik and others (2016)
Blue-berried honeysuckle	Juice	90 to 135 °C/7 s	Only the portion of juice treated with the lowest temperature (80 °C) contained some contaminating bacteria	Piasek and others (2011)
Carambola	Juice	600 and 900 W/30 s/approximately 75 to 80 °C	Increase of total phenolic content, ferric reducing antioxidant property	Saikia and others (2015)
Carrot	Juice	540 to 900 W/4 min/<99 °C	Total inactivation of PME	Rayman and Baysal (2011)
Carrot, lemon, pumpkin, tomato	Smoothie	210 and 260 W or 1600 and 3600 W/approximately 90 °C/646 and 608 s or 206 and 93 s	Increase of the contents of total phenolic compounds and carotenoids. The highest power and the shortest time MWH treatments (3600 W for 93 s), resulted into better preservation of antioxidant capacity and vitamin C. No *L. monocytogenes* growth	Arjmandi and others (2016)
Chokeberry	Juice	90 to 135 °C/7 s	Total inactivation of contaminating bacteria from 90 to 135 °C	Piasek and others (2011)
Grapefruit	Juice	900 W/30 s/80 °C	Retention of flavonoids throughout 2 mo of frozen storage	Igual and others (2011)
Guava	Nectar	500 and 950 W/9 and 11 s/90 °C	Significant PME inactivation and ascorbic acid retention. Preservation of color and rheological properties. Microbial counts remained below detectable levels throughout storage	Salazar-González and others (2014)
Kava	Juice	1.8 kW	Significant PME inactivation (34% to 83%). Kavalactones were kept constant or increased	Abdullah and others (2013)
Litchi	Juice	600 and 900 W/30 s/approximately 75 to 80 °C	Increase of total flavonoid content	Saikia and others (2015)
Orange	Juice	540 to 900 W/1 min/<95 °C	95% PME inactivation. Preservation of the quality characteristics. Antimicrobial effect	Demirdöven and Baysal (2015)
Pineapple	Juice	600 and 900 W/30 s/approximately 75 to 80 °C	Increase in total phenolic content and radical scavenging activity	Saikia and others (2015)
Pomegranate	Juice	350 W/78 min	No microbial growth and absence of indicator organisms like *S. aureus*, *Pseudomonas* sp., *E. coli*, and *Salmonella* sp. Decrease in pH and effect on color, total soluble solids, acidity, sugars, polyphenols, anthocyanins, and antioxidant activity content	Dhumal and others (2015)
Tomato	Juice	18 kW/approximately 82 s/approximately 85 °C	Inactivation of naturally occurring microorganisms. Moderate effect on physicochemical and color characteristics	Stratakos and others (2016)
Watermelon	Juice	600 and 900 W/30 s/approximately 75 to 80 °C	Increase of total phenolic content	Saikia and others (2015)

PME, pectin methyl esterase.

Table 7–Alternative thermal processing: ohmic heating (OH)

Fruit/vegetable source(s)	Product	Processing conditions	Key finding(s)	Reference
Apple	Juice	60 V/cm/0 to 30 s/55 to 60 °C	Electric field-induced ohmic heating led to additional bacterial (*E. coli* O157:H7, *S. enterica* serovar Typhimurium, and *L. monocytogenes*) inactivation at sublethal temperatures	Park and Kang 2013
Black mulberry blueberry, coconut, guava, passion fruit, pummelo tamarind	Juice	50 Hz/10 and 33 V/cm/80 °C	Prediction of the temperature changes of the juice during OH was more accurate if the heat loss to the surroundings and evaporated moisture were included in the mathematical models	Tumpanuvatr and Jittanit (2012)
Bottle gourd	Juice	60 to 90 °C/0 to 105 s	No significant change in TS content at all temperature–time combinations but showed increase in TSS in temperature range of 60 to 90 °C. Maximum polyphenol content observed at 80 °C for 90 s; however, reverse trend was followed as temperature increased beyond 80 °C. Increase in temperature showed increase in carotenoids up to 80 °C, further increase in temperature led to degradation of these compounds	Bhat and others (2016)
Broccoli carrot	Juice	6 to 1500 min/58 to 78 °C	Destabilization of the labile isozyme fraction of POD	Jakób and others (2010)
Carrot, celery, beetroot	Juice blend	17.5 V/cm/3 to 4 min/70 °C	Low loss of ascorbic acid throughout the refrigerated storage for 2 wk	Profir and Vizireanu (2013)
Carrot, orange, pumpkin, carrot, grapefruit, pumpkin, celery, orange, pumpkin	Juice blend	17.5 V/cm/3 to 4 min/70 °C	No negative influence on flavor during the refrigerated storage for 2 wk	Dima and others (2015)
Cloudberry	Juice	6 to 1500 min/58 to 78 °C	A low destabilization of PME	Jakób and others (2010)
Grapefruit, orange	Juice	50 Hz/0.1 to 3 kV/m/50 and 150 min/95 °C	No negative effects on carotenoids	Achir and others (2016)
Jaboticaba	Juice	0 to 90 min/70 to 90 °C	Anthocyanins have similar degradation pathways during ohmic and conventional heating	Mercali and others (2015)
Lemon	Juice	20 to 74 °C/0 to 50 s	The electrical conductivity of lemon juice is strongly dependent on temperature	Darvishi and others (2011)
Orange, pineapple	Concentrated juice	50 Hz/10 and 33 V/cm/<500 s/80 °C	No additional effect on the juice quality	Tumpanuvatr and Jittanit (2012)
Pomegranate	Juice	20 to 85 °C/0 to 50 s	As the voltage gradient increased, time, system performance, and pH decreased	Darvishi and others (2013)
Potato	Juice	6 to 1500 min/58 to 78 °C	A significant destabilization of the labile isozyme fraction of POD	Jakób and others (2010)
Tomato	Juice	10 kHz and 60 Hz/<30 min/<110 °C	Accelerated inactivation of *B. coagulans* (ATCC 8038) spores	Somavat and others (2013)

PME, pectin methyl esterase; POD, peroxidase.

Bacillus coagulans is a nonpathogenic organism, but it can pose a safety hazard because of its ability to increase the pH of a high acid food, processed with a reduced treatment, to a level where surviving *Clostridium botulinum* spores can germinate (Somavat and others 2013). In this respect, OH at 60 Hz and 10 kHz resulted in accelerated inactivation of *B. coagulans* (ATCC 8038) spores in tomato juice compared to conventional treatment (Somavat and others 2013). According to the authors, these results could confirm the presence of the additional nonthermal effect of OH on bacterial spores.

Improving the Effectiveness of Thermal Processing Technologies

"Hurdle technology" is the term often applied when hurdles are deliberately combined to improve the microbial stability and quality of foods and their nutritional and economic properties (de Oliveira and others 2015). Different hurdles can have an additive or synergistic effect.

Examples of hurdle approaches used in thermal processing of fruit and vegetable juices and beverages include: (1) the evaluation of intrinsic hurdles such as pH and dissolved solids (°Brix), as well as (2) the combination with other preservation such as antimicrobials and bacteriocins. An overview of the different approaches currently used to improve the effectiveness of thermal processing is reported in Table 8 and 9.

When a thermal process is applied, the microbial heat resistance is influenced not only by temperature but also by several other factors, such as the physiological state of the microorganisms, pH, water activity, and the composition of raw material (Miller and Silva 2012). pH is generally considered the most important factor determining the heat resistance of bacterial spores (Peng and others 2012; Tola and Ramaswamy 2014).

The evaluation of solids content is also of concern, since it is extremely hard to kill pathogens in juice concentrate by thermal treatment (Song and others 2015). Song and others (2015) reported that 18 °Brix apple juice underwent a larger reduction of pathogens than 36 and 72 °Brix juice.

Several studies reported the synergistic effect of heat treatments and antimicrobial compounds or bacteriocins to extend the shelf-life of fruit and vegetable juices and beverages and/or inhibit pathogens. On the other hand, the pressure from consumers for minimally processed products free from traditional preservatives has induced manufacturers to consider new strategies for juice stabilization including natural antimicrobials (Belletti and others 2007). Overall, supplementation of these additives together with heating might result in more acceptable thermal process schedules, possessing the desired lethalities without

Table 8–Improving the effectiveness of thermal treatments. Approach 1: evaluation of intrinsic hurdles

Fruit/vegetable source(s)	Product	Processing conditions	Intrinsic hurdle	Key finding(s)	Reference
			HTLT		
Carrot	Juice	87 °C/0 to 24 min or 92 °C/0 to 16 min or 97 °C/0 to 8 min	pH 4.5 to 6.2	Enhancement of the lethality at acidic pH	Tola and Ramaswamy (2014)
Carrot, basil, celery, cucumber, lemon, olive, onion, pepper, tomato	Blended beverage	50 to 65 °C/0 to 75	pH (4.25 to 5.20)	A reduction of 5 log CFU/mL of *L. innocua* (CECT 910) at 65 °C could be achieved after 1 or 2 min, depending on the pH (4.25 to 4.75 or 5.20, respectively)	Vega and others (2016)
Tomato	Juice	100 °C/2 to 10 min	pH 3.8 to 4.3	Lethality toward *B. coagulans* (ATCC 8038) enhanced by pH	Peng and others (2012)
			MTLT		
Apple	Juice	25 to 55 °C/1 min	Soluble solids 18 to -72 °Brix	An increase of soluble solids caused an increase of the lethality of the treatment	Song and others (2015)
Pitahaya	Juice	65 °C/30 min	pH 3.0 to 7.0	High preservation of betacyanin content at pH 4	Wong and Siow (2015)
			OHMIC HEATING		
Grape	Juice	10 to 15 V/cm/25 to 80 °C	Soluble solids 10.5 to 14.5 °Brix	Electrical conductivity increased as concentration and temperature increased	Assawarachan (2010)
Carrot	Juice	4 kHz/87 °C/0 to 24 min or 92 °C/0 to 16 min or 97 °C/0 to 8 min	pH 4.5 to 6.2	Lethal effect of electricity on *Bacillus licheniformis* spores could be enhanced at higher pH and temperature	Tola and Ramaswamy (2014)
Orange	Juice	16 V/cm/20 kHz/0 to 60 s/50 to 60 °C	pH 2.5 to 4.5	The lethality of the thermal treatment towards *E. coli* O157:H7, *S.* Typhimurium and *L. monocytogenes* was enhanced by high temperatures and acidic pH	Lee and others (2015)

negatively affecting product qualities (Gabriel and Estilo 2015).

In apple juice, HTLT thermal treatment alone (80 °C/6 min) was not able to reduce *Alicyclobacillus acidoterrestris* (DSMZ 2498 and c8 cocktail) spore number, while citrus and lemon extract combined with thermal treatments reduced alicyclobacilli after 16 d by 1 or 1.50 log CFU/mL (Bevilacqua and others 2013). When combined with heat (51 °C/approximately 60 min), propolis reduced time and temperature required to achieve a 5 log reduction of *E. coli* O157:H7 (Sakai stx 1A− /stx 2A−) by 75% and 3 °C, respectively (Luis-Villaroya and others 2015). Using a MTLT treatment (54 °C/10 min), essential oils decreased the time to inactivate *E. coli* O157:H7 VTEC − (Phage type 34) cells by 3.5 to 5.7 times (Ait-Ouazzou and others 2012).

In coconut liquid endosperm, heat treatment (55 °C/120 min) combined with malic acid attained a 3-fold reduction of *E. coli* O157:H7 (Gabriel and Estilo 2015). In mango juice, the time to inactivate by 5 log cycles *E. coli* O157:H7 decreased by 75% when heat treatment (54 and 60 °C/10 min) was combined with carvacrol (Ait-Ouazzou and others 2013). In orange juice, a reduction of 2.34 log CFU/mL for *A. acidoterrestris* (CCT 49028) spores was observed in the first 24 h of incubation after heat treatment (99 °C/1 min) + saponin (Alberice and others 2012). The addition of 200 ppm of (+)-limonene or citrus essential oil to orange juice reduced the heating time to achieve a 5 log reduction of *E. coli* O157:H7 (VTEC − Phage type 34) by 3.8 or 2.5 times, respectively (Espina and others 2014). In pineapple juice, the use of 15 ppm of essential oil during pasteurization of pineapple juice at 60 °C reduced the time required for a 4-log reduction in *Listeria monocytogenes* (56 LY) by 74.9% (Ngang and others 2014).

Overall, these compounds control microbial growth by lowering the pH levels and disrupting cellular membrane functionality as well as by acting on enzymes and genetic material (Gabriel and Estilo 2015). Cell membrane alterations caused by these compounds are able to induce sublethal injury. As sublethal injury is supposed to be related to the higher sensitivity of survivors to stress conditions after treatment, the success of a combined treatment should be correlated with the degree of sublethal injury caused by the hurdles in the bacterial population. Moreover, under suitable conditions, sublethal injured cells might be repaired, which is a very important aspect to be taken into account regarding food safety (Guevara and others 2015).

The antimicrobial compounds can have a positive effect on the quality parameters. Combined with thermal treatment, stevia increased the stability of color and some polyphenols, such as quercetin, gallic acid, and rosmarinic acid, during the storage of roselle beverage. In addition, stevia decreased the loss of scavenging activity and α-amylase inhibitory capacity (Pérez-Ramírez and others 2015). Other compounds combined with thermal treatments include ascorbic acid (Wong and Siow 2015), SO_2 (Cui and others 2012), *Scapania nemorea* methanolic extract (Bukvicki and others 2014), and nanocomposite packaging containing nano-ZnO particles (Emamifar and others 2012).

Among antimicrobial compounds, bacteriocins have received special attention due to their natural origin but also because they are associated with a large number of fermentations (Martín-Belloso and Sobrino-López 2011). For example, nisin with thermal pasteurization had a synergistic effect on the inactivation of total aerobic bacteria (1.18 log reduction) in cucumber juice (Zhao and others 2013). In litchi juice, heat treatment combined with nisin reduced the aerobic bacteria by 4.19 log CFU/mL (Li and others 2012). In carrot juice, at the lowest nisin concentration tested (0.13 μM), growth rate was significantly reduced; at higher concentrations (0.39 μM), the growth of *L. monocytogenes* (CECT 4031) was completely inhibited for at least 15 d (Esteban and Palop 2011). Heat treatment (55 °C/120 min) combined with nisin caused a 3-fold reduction of the heat resistance of *E. coli* O157:H7 in coconut liquid endosperm (Gabriel and Estilo

Table 9–Improving the effectiveness of thermal treatments. Approach 2: combination with antimicrobials and bacteriocins

Fruit/vegetable source(s)	Product	Processing conditions	Additional hurdle(s)	Key finding(s)	Reference
			HTLT+ANTIMICROBIALS		
Apple	Juice	80 °C/6 min	**Citrus extract or lemon extract** (80 ppm)	The combination of citrus or lemon extract with the thermal treatment reduced *A. acidoterrestris* (DSMZ 2498 and c8 cocktail) spores by 1 or 1.50 log CFU/mL	Bevilacqua and others (2013)
Apple, orange	Juice blend	80 °C/60 and 90 s	**Lemon grass oil** (0.28 to 1.13 mg/mL)	The combination of thermal treatment for 90 s enhanced the log reduction of *S. cerevisiae* SPA by 1 log as compared to lemon grass alone	Tyagi and others (2014b)
Apple, orange	Juice blend	80 °C/60 and 90 s	**Mentha oil** (0.28 to 1.13 mg/mL)	The combination of thermal treatment for 90 s enhanced the log reduction of *S. cerevisiae* SPA by 1.03 log as compared to only mentha treated samples	Tyagi and others (2013)
Grape	Wine	80 °C/15 min	**SO_2** (40 mg/L)	99.91% lethality toward *S. cerevisiae* (QA23)	Cui and others (2012)
Guava	Juice	85 °C/1 min	**Sodium metabisulphite** (0.04 g/L), or **potassium sorbate** (0.8 g/L), or **sodium benzoate** (0.5 g/L), or **sodium metabisulfite** (0.02 g/L) + **sodium benzoate** (0.25 g/L), or **sodium metabisulphite** (0.02 g/L) + **potassium sorbate** (0.4 g/L)	The preservatives used were effective in inhibiting microorganisms during storage at room temperature. Formulations with the isolated metabisulphite and associated with potassium sorbate showed the highest sensory acceptance	da Silva and others (2016)
Mango	Juice	121 °C/15 min	**Zinc oxide nanoparticles** (5 and 8 mM) containing citric acid (0.3%)	Zinc oxide nanoparticles reduced the counts of *L. monocytogenes* (PTCC1163), *E. coli* (PTCC1394), *S. aureus* (PTCC1431), and *B. cereus* (PTCC1015) strains in juice	Firouzabadi and others (2014)
Orange	Juice	99 °C/1 min	**Saponin** (100 to 500 mg/L)	Reduction of 2.34 log CFU/mL for *A. acidoterrestris* (CCT 49028) spores in the first 24 h	Alberice and others (2012)
Papaya	Spiced beverage blend	80 to 90 °C/15 min	**Citric acid** (0.1%)	Microbiota below the detection limit (5 mo at approximately 28 °C)	Ramachandran and Nagarajan (2014)
Prickly pear	Juice	121 °C/15 min	**Sodium benzoate** (300 ppm) + **potassium sorbate** (100 ppm) + **fumaric** (0.17% w/v), citric (0.4% w/v) and **tartaric** (0.5% w/v) *acids*	After 4 d of storage, the use of acids caused a reduction of *E. coli* (ATCC 11229) (3- to 6-log CFU/mL) and *S. cerevisiae* (ATCC 26109) (2 log CFU/mL)	García-García and others (2015)
Roselle	Beverage	95 °C/15 min	**Sodium benzoate** (0.7 g/L), **stevia** (14 to 15 g/L), **citric acid** (0.2 and 0.3 g/L)	Stevia increased the stability of color and some polyphenols, such as quercetin, gallic acid, and rosmarinic acid, during storage. In addition, stevia decreased the loss of scavenging activity and α-amylase inhibitory capacity, whereas the incorporation of citric acid showed no effect	Pérez-Ramírez and others (2015)
			HTST+ANTIMICROBIALS		
Acerola, cashew apple, guava, papaya, passion fruit	Blended nectar added with caffeine	90 °C/30 s	**Sodium metabisulfite** (60 mg/L) + **sodium benzoate** (500 mg/L)	The product was microbiologically stable during 6 mo of storage at room temperature (approximately 25 °C). The ascorbic acid content decreased significantly throughout time.	de Sousa and others (2010)
Apple, orange	Juice blend	80 °C/30s	**Lemon grass essential oil** (0.28 to 1.13 mg/mL)	Inhibition of *S. cerevisiae* SPA after 2 d of storage at room temperature. No growth for 7 d	Tyagi and others (2014b)
Apple, orange	Juice blend	80 °C/30 s	**Mentha essential oil** (0.28 to 1.13 mg/mL)	Complete growth inhibition of *S. cerevisiae* SPA using 1.13 mg/mL of mentha oil. No effect on odor and color	Tyagi and others (2013)
Prickly pear	Juice	131 °C/2 s	**Sodium benzoate** (0.3 g/L), **sodium sorbate** (0.15 g/L), **fumaric acid** (1.4 g/L), **tartaric acid** (0.4 g/L) and **sodium citrate** (0.3 g/L)	Loss of ascorbic acid (46% to 76%), total phenolic (27% to 52%), flavonoids (0% to 52%), betalains (7% to 45%), and antioxidant activity (16% to 45%) when compared to untreated beverages	Jiménez-Aguilar and others (2015)
			MTLT+ANTIMICROBIALS		
Apple	Juice	54 °C/0 to 35 min	**Citrus lemon essential oil** (200 μL/L)	6.2-fold increase in the lethality on *E. coli* O157:H7. No effect on the sensory attributes	Espina and others (2012)

(*Continued*)

Table 9–Continued.

Fruit/vegetable source(s)	Product	Processing conditions	Additional hurdle(s)	Key finding(s)	Reference
Apple	Juice	54 °C/10 min	**(+)-limonene** (0.2 μL/mL)	The combination increased the lethality *Leuconostoc fallax* 74 by 1.5 log CFU/mL	Chueca and others (2016)
Apple	Juice	54 °C/8 min	**Citral** (18 and 200 ppm)	The addition of 18 and 200 ppm of citral to the juice acted synergistically with heat to inactivate 4.5 and 7.4 log *E. coli* O157:H7 cells, respectively	Espina and others (2010)
Apple	Juice	51 °C/approximately 60 min	**Propolis** (0.1 and 0.2 mg/mL)	The time to achieve a 5 log reduction of *E. coli* O157:H7 was reduced by 75% and the temperature by 3 °C	Luis-Villaroya and others (2015)
Apple	Juice	54 °C/10 min	**Essential oils** (0.2 μL/mL)	When combined with heat, *Mentha pulegium* or *Thymus algeriensis* accused, respectively, a 3.5- and a 5.7-fold decrease of the time to achieve a 5 log reduction of *E. coli* O157:H7 (VTEC - Phage type 34)	Ait-Ouazzou and others (2012)
Apple	Juice	54 and 60 °C/10 min	**Carvacrol** (1.3 mM)	The time to achieve a 5 log reduction of *E. coli* O157:H7 was reduced by 75%	Ait-Ouazzou and others (2013)
Apple	Juice	55 °C/0 to 3.58 min	**Dimethyl dicarbonate** (25 to 75 mg/L)	*E. coli* (STCC 4201) reduced by 4.4 log CFU/mL. The addition of dimethyl decarbonate (>25 mg/L) increased the lethality of heat	Gouma and others (2015)
Apple, orange	Juice blend	70 °C/60 and 90 s	**Eucalyptus essential oil** (0 to 4.5 mg/mL)	2.25 mg/mL of eucalyptus oil + 90 s thermal treatment reduced *S. cerevisiae* SPA below the detection limit	Tyagi and others (2014a)
Citron	Soft drink	55 °C/15 min	**Citral** (0 to 120 μL/L) or **linalool** (0 to 60 μL/L) or ***β*-pinene** (0 to 60 μL/L)	Additive/synergistic effect of the compounds	Belletti and others (2010)
Carrot	Juice	45 and 50 °C/5 to 15 min	**Caprylic acid** (5.0 mM) and/or **citric acid** (2.5 or 5.0 mM)	Combined treatment with caprylic acid + citric acid (2.5 mM) at 50 °C for >5 min or with caprylic acid + citric acid (both at 5.0 mM) at either 45 °C or 50 °C for >5 min completely inactivated the natural occurring bacteria. Combined treatment also increased the redness of the juice	Kim and Rhee (2015)
Carrot	Juice	55 °C/5 and 10 min or 63 °C/1 min	**Citral** (50 mg/L), or **carvacrol** (30 mg/L), or **(E)-2-hexenal** (65 mg/L)	Accelerated death kinetics of *L. monocytogenes* (56LY) in the presence of the aroma compounds	Sado Kamdem and others (2010)
Coconut	Liquid endosperm	55 °C/120 min	**Malic acid** (800 to 1500 ppm)	3-fold reduction of the heat resistance of the *E. coli* O157:H7	Gabriel and Estilo (2015)
Mango	Juice	54 and 60 °C/10 min	**Carvacrol** (1.3 mM)	The time to achieve a 5 log reduction of *E. coli* O157:H7 decreased by a 75%	Ait-Ouazzou and others (2013)
Orange	Juice	52 to 61 °C/0 to 12 min	**Vanillin** (900 to 1.100 ppm) and/or **citral** (25 to 75 ppm)	The addition of 900 ppm vanillin and 25 ppm citral enhanced the lethality of the thermal treatment towards *L. innocua* (ATCC 33090)	Char and others (2010)
Orange	Juice	54 to 60 °C/0 to 250 min	**(+)-limonen** (50, 100, and 200 ppm) or **citrus essential oil** (50 to 200 ppm)	The addition of 200 ppm of (+)-limonene or citrus essential oil reduced the time to achieve a 5-log inactivation of *E. coli* O157:H7	Espina and others (2014)
Orange	Juice	54 and 60 °C/10 min	**Carvacrol** (1.3 mM)	The time to achieve a 5 log reduction of *E. coli* O157:H7 decreased by 84%	Ait-Ouazzou and others (2013)
Orange	Concentrated juice	45 °C/28 d	**Sodium benzoate** (50 and 100 mg/L), **commercial benzoic acid** (50 and 100 mg /L), and **micronized benzoic acid** (25 and 50 mg/L)	A continuous bactericidal effect against 2 *Alicyclobacillus* strains for 28 d period using micronized benzoic acid (50 mg/L)	Kawase and others (2013)
Pineapple	Juice	55 to 65 °C/0 to 15 min	***Eryngium foetidum* essential oil** (0 to 60 ppm)	The use of 15 ppm of essential oil during pasteurization of pineapple juice at 60 °C reduced the time required for a 4-log reduction in *L. monocytogenes* (strain 56 LY) by 74.9%	Ngang and others (2014)
Pitahaya	Juice	65 °C/30 min	**Ascorbic acid** (0.25 to 1.50% w/w)	Juice added with 0.25% ascorbic acid gave the highest betacyanin content	Wong and Siow (2015)
Soursop	Juice	60 °C/60 min	**Sodium benzoate** (0.05%)	Significant decrease in microbial load throughout the period of storage (30 to 31 °C; 2 wk) compared to nonpasteurized juice. Decrease in titratable acidity from 23.62 to 18.10	Nwachukwu and Ezeigbo (2013)
Tomato	Juice	54 and 60 °C/10 min	**Carvacrol** (1.3 mM)	The time to achieve a 5 log reduction of *E. coli* O157:H7 decreased by 75%	Ait-Ouazzou and others (2013)

(*Continued*)

Table 9–Continued.

Fruit/vegetable source(s)	Product	Processing conditions	Additional hurdle(s)	Key finding(s)	Reference
			MTST+ANTIMICROBIALS		
Apple, orange	Juice blend	70 °C/30 s	**Eucalyptus essential oil** (0 to 4.5 mg/mL)	A dose 2.25 mg/mL of eucalyptus oil combined with thermal treatment reduced the naturally occurring microbiota by 4.5 log CFU/mL	Tyagi and others (2014a)
Apple, orange	Juice blend	70 °C/30 s	***Scapania nemorea* methanolic extract** (0.05 to 0.2 mg/mL)	Partial inactivation of *S. cerevisiae* 635. Changes in color and flavor of the beverages were considered acceptable also after 1 wk of storage at 25 °C	Bukvicki and others (2014)
Orange	Juice	65 and 55 °C/16 s	**Ag** and **ZnO nanoparticles** (10% m/m of low-density polyethylene nanocomposite packaging)	Application of nanocomposite packaging-containing Ag decreased the pasteurization temperature of juice by 10 °C, resulting in a lower degradation of ascorbic acid	Emamifar and others (2012)
			HTLT+ BACTERIOCINS		
Apple	Juice	90 °C/25 min	**Bificin C6165** (0 to 160 μg/mL)	The heat resistance of *A. acidoterrestris* (DSM3922 and CFD1) spores declined gradually as bificin C6165 concentration increased	Pei and others (2014)
			HTST+ BACTERIOCINS		
Cucumber	Juice	85 °C/15 s	**Nisin** (100 IU/mL)	Nisin with thermal pasteurization had a synergistic effect on the inactivation of total aerobic bacteria	Zhao and others (2013)
			MTLT+ BACTERIOCINS		
Carrot	Juice	55 °C/15 min	**Nisin** (0.13 to 0.39 μM)	The antimicrobial effect towards *L. monocytogenes* (CECT 4031) relied upon the concentration of nisin	Esteban and Palop (2011)
Coconut	Liquid endosperm	55 °C/120 min	**Nisin** (0 to 150 ppm)	The combined treatment caused a 3-fold reduction of the heat resistance of *E. coli* O157:H7	Gabriel and Estilo (2015)
Litchi	Juice	32 to 52 °C/5 to 30 min	**Nisin** (200 ppm)	Aerobic bacteria reduced by 4.19 log CFU/mL at 52 °C for 15 min	Li and others (2012)
Orange	Juice	72 °C/2 min	**Antilisterial Bacteriocin101 and 103** (40 ppm)	*L. monocytogenes* (MTCC 657) was controlled for 6 d at 4 °C	Backialakshmi and others (2015)
			HTST+BACTERIOCINS + ANTIMICROBIALS		
Orange	Nectar	90 °C/15 s	**Nisin** (46.8 IU/mL) + cinnamaldehyde (0.39 μL/mL)	The combination of nisin and cinnamaldehyde showed a synergistic effect against *A. acidoterrestris* (ATCC 49025) and extend the shelf life of nectar to 33 d at 45 °C	Khallaf-Allah and others (2015)
			MTLT+ BACTERIOCINS + ANTIMICROBIALS		
Carrot	Juice	55 °C/15 min	**Nisin** (0.13 μM) + **carvacrol** (0.11 and 0.22 mM)	The growth of *L. monocytogenes* (CECT 4031) was inhibited for at least 15 d even at the lowest concentration tested (0.13 μM nisin plus 0.11 μM carvacrol)	Esteban and Palop (2011)
Litchi	Juice	30 to 45 °C/0.5 to 6 h)	**Nisin** (200 IU/mL) + **dimethyl dicarbonate** (250 mg/L)	Molds and yeasts, and bacteria were not detected in the juice supplemented with 200 IU/mL nisin and exposed to 250 mg/L dimethyl dicarbonate at 45 °C for 3 h	Yu and others (2013a)

2015). However, several studies have been able to demonstrate that nisin was only able to reduce the population of Gram-negative cells that have been previously exposed to sublethal injury after exposure to 55 °C; and that the bacteriocin had little or no effect on uninjured cells (Gabriel and Estilo 2015). In apple juice, the heat resistance of *A. acidoterrestris* (DSM3922 and CFD1) spores declined gradually as bificin C6165 concentration increased (Pei and others 2014).

Some authors evaluated the combination between bacteriocins + antimicrobials and heat treatment. For example, yeasts and molds, and bacteria were not detected in litchi juice supplemented with 200 IU/mL nisin and 250 mg/L dimethyl dicarbonate at 45 °C for 3 h (Yu and others 2013a). In another study, the growth of *L. monocytogenes* (CECT 4031) in carrot juice was inhibited for at least 15 d by 0.13 μM nisin + 0.11 μM carvacrol (Esteban and Palop 2011).

In this perspective, predictive microbiology is a useful tool to determine shelf life and stability of juices and beverages treated with combined stabilizing techniques (Belletti and others 2007).

Future Perspectives and Current Efforts

Fruit and vegetable consumption is a marker of higher-quality diets. The consumption of fruit juices, along with whole fruit, is one way to meet total fruit consumption goals (Francou and others 2015).

Recent analyses showed that whole fruit contributed fully 2/3 to total fruit consumption, with only 1/3 coming from juices. However, whereas whole fruit consumption was highest among older adults and among groups with higher education and incomes, no social gradient was observed for juices (Francou and others 2015). Hence, these products were more likely to meet total fruit and vegetable goals that are promoted by food and nutrition policy.

The benefits and the drawbacks of heat treatments in juices were extensively reported in many papers and hereby shortly addressed. In most cases, these effects are strongly dependent on the food matrix. Moreover, the efficacy of treatments can also be affected by the complexity of the product and microorganisms.

The use of nonconventional heat approaches or the combination with some antimicrobial compounds are promising ways, but the optimization of the combination time/temperature still remains the only effective way to design energy-saving and efficient methods. Thus, a better understanding of the mechanism of action of thermal processing technologies and their effects on bioaccessibility and bioavailability of beneficial compounds, would also contribute to an effective application in juice.

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Attachment 4

Reclaimed Water as an Alternative
Water Source for Crop Irrigation

Reclaimed Water as an Alternative Water Source for Crop Irrigation

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***Abstract*. Reclaimed water has been safely and successfully used for more than 40 years in Florida and California. Reclaimed water in these states is regulated with restrictions more stringent than World Health Organization guidelines. In the United States, Florida is currently the largest producer and California is the second largest producer of reclaimed water. Reclaimed water is more highly tested than other sources of irrigation water, and the safety of this water has been demonstrated in these and other states. Very high application rates of reclaimed water to citrus on well-drained Florida sands increased tree growth and fruit production. Although reclaimed water contains some nutrient elements, there is usually insufficient macronutrient content to meet plant nutritional requirements. Most reclaimed waters do not have high salinity levels although they are slightly more salty than the potable waters from which they originated. With an adequate leaching fraction, salts in reclaimed water can be handled with appropriate irrigation management. Use of reclaimed water has steadily increased in Florida since 1992, but other entities besides agricultural irrigation are now competing for its use. Public acceptance of reclaimed water has also increased, and crops grown with reclaimed water in Florida and California have been marketed without a negative public reaction. Recent issues of food safety have caused some to question reclaimed water, but there is no evidence of food safety problems with its use. Although reclaimed water in Florida was initially promoted as a way to improve surface water quality, it has now become an important alternate source of water to help meet water shortages and urban demand. In California, reclaimed water has become a necessary part of statewide water management.**

The purpose of this article is to discuss several aspects of reclaimed water that are of importance today. Emphasis is placed on water reuse in Florida and California because they are two of the largest producers of reclaimed water in the United States. The term "reclaimed water" is commonly used in Florida. California changed from "reclaimed water" to "recycled water" in 2000 (State of California, 2000). For the purpose of this discussion, both terms are considered to mean the same thing. Reclaimed water in Florida is defined as "water that has received at least secondary treatment and basic disinfection and is reused after flowing out of a domestic wastewater treatment facility" [Florida Department of Environmental Protection (FDEP), 2010c].

Florida has less than half the population of California. Statewide, Florida receives an average of 1372 mm of rainfall annually (FDEP, 2010b), whereas much of southern California receives less than half that amount, yet Florida is the leading state in the nation in terms of reclaimed water production. Why is this?

Issues relating to water quality, population growth, environmental regulations, and saltwater intrusion are some of the primary reasons that Florida currently produces more reclaimed water than other states. Florida's population increased fivefold from 1950 to 2000, and it is now the fourth largest state in the nation with a 2009 estimated population of 18.5 million (U.S. Census Bureau, 2010).

Several major reclaimed water projects in Florida were started for water quality reasons. The city of St. Petersburg brought its reclaimed water system online in 1977 after passage of the Wilson-Grizzle Act (Asano et al., 2007). This act mandated that "wastewater treatment plants discharging to Tampa Bay and its tributaries treat their wastewater to that of drinking water standards…" (Tchobanoglous et al., 2003). St. Petersburg became the first major city in the United States to reach zero discharge of wastewater effluent into nearby surface waters. By using reclaimed water instead of groundwater, this project reduced demand for well water near the coast and thus helped slow saltwater intrusion. Another project, Water Conserv II, was started in 1986 to stop discharge of treated wastewater from Orlando and Orange County into Lake Tohopekaliga, an important recreational bass fishing lake (Parsons, 2009). Now, water shortages (or water quantity issues) in Florida are helping drive the increased production of reclaimed water.

Recent spring droughts from 2000 through 2009 in Florida increased demand for reclaimed water. Severe restrictions were placed on residential irrigation with potable water, but fewer restrictions were placed on reclaimed water irrigation. The Water Management Districts in Florida are actively promoting the use of reclaimed water as a way to reduce potable water use (Southwest Florida Water Management District, 2009a, 2009b).

With less rainfall and a larger population than Florida, California also has strong reasons for reclaiming water. Currently, California uses nearly half of its reclaimed water on agriculture and the rest on landscape irrigation and other uses. The two largest reclaimed water projects for food crop irrigation in California (and the United States) were developed in response to seawater intrusion. The Monterey County Water Recycling Projects (Asano et al., 2007) irrigates over 4800 ha with over 18.8 billion liters per year of reclaimed water. Crops grown include artichokes (*Cynara cardunculus*), lettuce (*Lactuca sativa*), strawberries (*Fragaria ×ananassa*), celery (*Apium graveolens*), cauliflower (*Brassica oleracea*), broccoli (*Brassica oleracea*), and spinach (*Spinacia oleracea*). The Watsonville Area Water Recycling Project irrigates over 800 ha of similar crops with over 4.9 billion liters per year of reclaimed water (Pajaro Valley Water

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Management Agency, 2010). The Irvine Ranch Water District has been providing reclaimed water for irrigation of over 400 ha of food crops for over 40 years (Irvine Ranch Water District, 2010). Their crops include lettuce and strawberries. The city of Santa Rosa has used reclaimed water for grapes (*Vitis vinifera*), row crops, and fodder for over 32 years. Currently, they use 6.8 billion liters per year to irrigate 2300 ha (Piazza, 2010). These and other California projects also produce organic certified crops with reclaimed water.

USES OF RECLAIMED WATER

As of 2008, Florida produced an estimated 921.3 billion liters per year of reclaimed water (FDEP, 2010a). California is gathering data for a survey of reclaimed water use, which they anticipate completing in 2010. The only accurate statewide survey was conducted for 2001 production and published in 2002. In 2001, California's production was 648 billion liters per year (California EPA, 2002; Water Facts, 2004).

In 1992, Florida produced 1.098 billion liters of reclaimed water per day and this more than doubled to 2.524 billion liters per day by 2008 (FDEP, 2010a). In 1992, agriculture was the largest user of reclaimed water in Florida and golf course irrigation was the second largest user. By 2008, Florida agriculture used only 12%, whereas golf courses used 19% of the total reclaimed water (Fig. 1). In contrast, agriculture was still the dominant user of reclaimed water in 2001 in California (Fig. 1) and accounted for 46% of the total reclaimed water use, whereas golf courses and landscaping accounted for 21%. Of the new reclaimed water projects since 2001, 84% convert wastewater into water that percolates into the drinking water groundwater system [e.g. Orange County's Groundwater Replenishment Project (96.7 billion liters per year)].

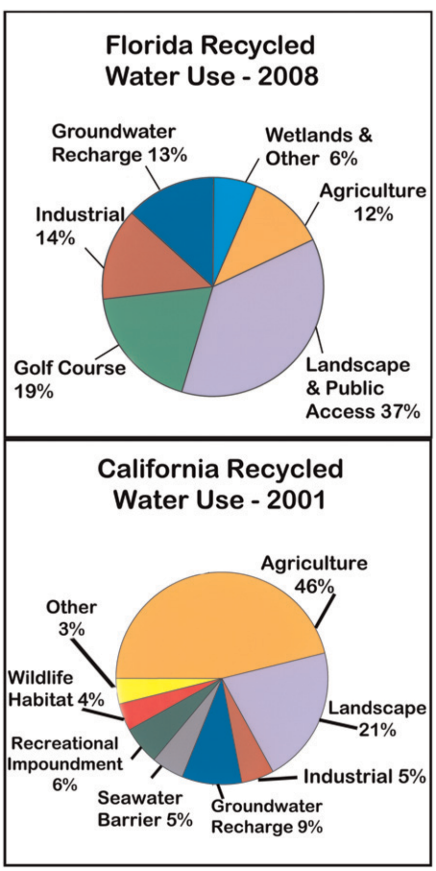

Fig. 1. Water reuse in Florida and California.

The U.S. Environmental Protection Agency (EPA) established guidelines for water reuse. Rather than establishing national water reuse standards, the EPA decided that comprehensive federal guidelines, along with state regulations, would increase implementation of water reuse projects. Hence, states have established their own water reuse regulations. In Florida, the FDEP established water quality standards and regulates reclaimed water. In California, the predecessor of the California Department of Public Health established the first criteria for crop irrigation with reclaimed water in 1918 (Crook, 2002). The modern era regulations were established in 1968 and have been revised three times since then.

SAFETY OF RECLAIMED WATER

Reclaimed water has an excellent safety record. Reclaimed water has been used in Florida for more than 40 years with no reported incidence of human illness (Southwest Florida Water Management District, 2009b). In Florida, reclaimed water is water that has received at least secondary treatment and basic disinfection. Because it is disinfected (usually by chlorination), reclaimed water can be better than some other irrigation sources from a health and safety point of view. In fact, reclaimed water undergoes more testing than most irrigation waters. Water quality standards for reclaimed water are stricter than standards for recreational water. Because of these strict water quality standards, there is essentially no risk to humans or animals from periodic contact with reclaimed water.

Reclaimed water can meet drinking water standards for many elements, but reclaimed water is not required to meet all the drinking water standards. Reclaimed water is not currently intended to be directly used for drinking. However, indirect potable reuse has become more common, particularly in California (Asano et al., 2007).

The National Research Council (1996) concluded, "Where reclaimed water has been used for food crop production, the state standards for wastewater treatment and reuse, along with site restrictions and generally good system reliability, have insured that food crops thus produced do not present a greater risk to the consumer than do crops irrigated from conventional sources."

IRRIGATION OF EDIBLE CROPS

For crops in Florida that are "peeled, cooked, or thermally processed," reclaimed water can be directly applied to the edible part of the crop. Hence, reclaimed water can be used with overhead irrigation for citrus and other crops that are peeled or cooked.

For crops that are eaten raw (called the "salad crops"), FDEP regulations currently require that there be no direct contact of the reclaimed water with the edible part of the crop. This means that growers of salad crops who irrigate with reclaimed water should use drip, bubbler, or furrow irrigation, which does not spray water directly on the crop. This regulation also means that reclaimed water cannot be used in Florida for overhead frost protection sprays onto crops such as blueberries or strawberries (Parsons, 2009).

The regulation prohibiting direct contact of reclaimed water with salad crops was created in the 1980s to encourage acceptance of reclaimed water in Florida. At the time, there were not sufficient studies to determine whether such a precaution was necessary. Since then, studies conducted in California (Engineering Science, 1987; Sheikh et al., 1990) have shown that salad crops can be directly sprayed with reclaimed water with no health, safety, or marketing problems. This finding was expected because reclaimed water is disinfected, usually by chlorination. Reclaimed water has been successfully sprayed onto the edible portion of salad crops and strawberries for over 40 years in California. Nationally, there has never been a documented case of human illness caused by reclaimed water (Crook, 2002).

NUTRIENTS IN RECLAIMED WATER

Most wastewater treatment facilities do not monitor nutrients in detail. However, one facility that has regularly monitored nutrients and other elements is the Water Conserv II project near Orlando, FL. Maximum average concentration limits and typical concentrations of elements in this reclaimed water are shown in Parsons et al. (2001b). Nutrient concentration in reclaimed water, particularly advanced treated reclaimed water, is usually low. Important macronutrients include nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), and magnesium. For example, the typical concentration of total N in reclaimed water with biological nutrient removal is 2 to 12 $mg \cdot L^{-1}$ (Asano et al., 2007). For advanced wastewater treatment in Florida, total N cannot exceed 3 $mg \cdot L^{-1}$ (Florida Statutes, 2010). Reclaimed water can also contain low levels of other essential elements such as manganese, zinc, and boron (B). Boron is an element that is essential for plant growth in small quantities, but it can cause plant damage if too much is applied (Asano et al., 2007).

Along with other environmental factors, the amount of nutrient uptake from reclaimed water by plants depends on the concentration of nutrients, amount of reclaimed water applied, and residence time of the reclaimed water in the root zone. With regular irrigation, several turfgrasses can extract some N and P from reclaimed water. In those cases, reclaimed water can supply a reasonable amount of these nutrients. With other crops such as citrus, normal irrigation with reclaimed water provides less than 16% of the N requirement for mature trees. Although reclaimed water can provide some essential elements, the concentrations of N and K are usually too low to meet plant needs completely. Hence, additional applications of N, K, and other fertilizer elements are necessary to ensure good plant growth.

SALINITY AND SODICITY

Water quality of recycled waters may impact plants, soils, and irrigation systems. Most recycled waters do not inherently contain higher concentrations of salts although they typically contain ≈150 to 400 $mg \cdot L^{-1}$ more total dissolved solids than the potable waters from which they originated (Asano et al., 1984). In coastal areas, the incoming water source used to produce reclaimed water may already be salty. Also, the pipes carrying groundwater to the wastewater treatment facility may pass through areas of salty water. If salty water infiltrates into the incoming water pipes, the level of salt in the reclaimed water can further increase. If communities use sodium chloride (NaCl)-based water softeners, the reclaimed water may contain elevated Na and Cl ions compared with the potable water supply. Use of cleaning agents such as detergents may also elevate B concentrations in recycled waters. Many water reclamation facilities monitor salts (i.e., chlorides). If the salt concentration gets too high (more than 350 to 400 $mg \cdot L^{-1}$), they will typically divert the salty reclaimed water to another discharge point.

Plants have a wide range of tolerance to salinity, and many of them can be irrigated with recycled water without impact. Sensitive plants typically exhibit foliar leaf damage, slower growth, and, in more severe cases, defoliation and death. Excessive levels of Na may also cause an imbalance in mineral nutrition of plants such as Ca deficiency. The presence of dissolved mineral salts has an osmotic effect on plants, and some constituents like Na, Cl, and B cause specific ion toxicities to plants (Hanson et al., 1993).

Salts have a tendency to build up on the root zone of actively transpiring plants because more or less pure water is lost to the atmosphere through evaporation and transpiration, whereas dissolved mineral salts in the applied water are left behind in the soil solution. It is necessary to maintain a salt balance in the root zone to obtain satisfactory plant performance, especially under semiarid climatic conditions when natural rainfall may be insufficient to leach salts out of the root zone. In surface-irrigated soils (e.g., sprinklers) with no drainage impediments, the upper root zone is the zone of salt leaching, whereas the lower root zone is the zone of salt accumulation.

In inland Florida locations, salt in reclaimed water is not usually a problem. However, in coastal regions, whether the result of infiltration into the incoming water source or naturally high levels of Na and Cl, salts in reclaimed water can sometimes be a problem for salt-sensitive plants such as azaleas (*Rhododendron* sp.) or Chinese privet (*Ligustrum sinense*). If salinity is too high, the reclaimed water may be acceptable for some lawn irrigation but not for irrigation of salt-sensitive plants.

In California, the most common salt-sensitive crops are avocadoes (*Persea americana*), strawberries, and lettuce (Asano et al., 2007). All are grown with reclaimed water, but some actions may be necessary on the grower's part to be successful. Some municipalities have been successful in reducing brines and salts from entering the sewage system and thus reducing the salt in the reclaimed water. Other municipalities have encouraged the use of KCl rather than NaCl in residential and commercial water softeners to reduce Na while increasing K (a plant nutrient).

Soil permeability is affected by the combined effects of sodicity and salinity in the applied water. Sodicity is usually evaluated by the sodium adsorption ratio (SAR), a ratio of sodium to calcium plus magnesium, and salinity by electrical conductivity (EC). A moderate level of SAR and low EC may result in reduced soil permeability of some soil types. In contrast, the detrimental effects of moderate levels of SAR on soil permeability may be partially overcome by moderate levels of EC. In some treatment processes for recycled waters, additives are used that elevate SAR (e.g., using sodium hypochlorite for disinfection) and/or bicarbonate and carbonate concentrations (e.g., using lime to neutralize water pH). Nearly all recycled waters produced in California have a combination of salinity and sodicity that puts them in the safe range in terms of impacts on soil permeability.

A second sodicity parameter known as residual sodium carbonate, the difference between the sum of bicarbonate and carbonate ions minus sodium ion, is used to evaluate detrimental effects that cause dispersal of soil organic matter resulting, for instance, in dark unsightly matting on turf in golf courses and reduced water infiltration rates into turf soils.

Another constituent of concern in recycled waters is excessive N in the form of dissolved ammonia or ammonium ions and nitrates. The presence of these forms of N is highly dependent on the wastewater treatment processes used. Ammonia or ammonium ions in applied waters are eventually oxidized to nitrate ions in the soil. Nitrogen in recycled water used for irrigation can be an issue because nitrates not taken up by plant roots may run off or leach below the root zone. This can contribute to nitrate contamination of surface waters or underlying groundwater basins. Nitrate leaching losses may be minimized if N content in the recycled water is taken into account as contributing to the N requirement of plants.

Fortunately, most landscape plants have a denser rooting system in the surface depths where soil salinity tends to be lowest. Soil water is extracted from the more saline deeper root zone only when the available soil water becomes limiting in the less saline portions. The extent of accumulation of salts in the lower root zone is regulated by the leaching fraction (LF), the ratio of depth of drainage water to depth of applied water. The depth of drainage water may be obtained from the difference between applied water and water lost to the atmosphere from transpiration by plants and surface soil evaporation. In freely draining soils, a comparatively small depth of drainage may be sufficient to keep the root zone in salt balance. A LF of 0.15 to 0.2 is usually adequate to maintain salt balance for irrigation of most plant species and for typical recycled water salinities (Hanson et al., 1993).

PERCEPTION OF RECLAIMED WATER

When the idea of using reclaimed water for irrigation was first presented to Florida citrus growers for the Water Conserv II project in the 1980s, they initially rejected using such water as a result of concerns about tree damage by heavy metals, salinity, disease organisms, or excessive water (Parsons et al., 2001a). After much negotiation, water quality standards were established, and several growers decided to take a chance with the reclaimed water. At the request of growers, research was carried out on this water by scientists at the University of Florida (Parsons et al., 2001a). The research showed that very high quantities of this water could be applied to citrus on well-drained soils with no negative effects (Parsons et al., 2001b). Tree growth and fruit production were greater at rates of 2500 mm/year than at lower irrigation rates. Although the concentration of juice soluble solids in the fruit was lowered by the high irrigation rate, total soluble solids per hectare were significantly higher as a result of the greater fruit production caused by the greater tree canopy growth.

Water quality standards were maintained, and more growers agreed to accept reclaimed water. Now, citrus growers who initially opposed the use of reclaimed water are enthusiastic supporters of this water. In addition, over 800 parks and 477 golf courses are currently irrigated with reclaimed water (FDEP, 2010a). With fewer irrigation restrictions on reclaimed water during droughts, public acceptance has also increased noticeably.

However, perception issues still exist. For example, many Florida tomato growers do not want to use reclaimed water because of perceived, but scientifically unfounded, concerns over food safety. This attitude developed because Florida tomato growers were economically hurt by a *Salmonella* incident (Sutton, 2008). Because of a *Salmonella* outbreak in 2008, the U.S. Food and Drug Administration initially recommended that people not eat certain types of raw tomatoes. It was later found that tomatoes were not the source of *Salmonella*, but Florida growers lost an estimated $50 to $100 million because of the negative publicity. Although reclaimed water has no association with *Salmonella*, Florida tomato growers are reluctant to use it because of perceived issues related to food safety.

In California, the 2006 spinach *Escherichia coli* O157:H7 incident devastated fresh spinach sales for over a year (U.S. Department of Agriculture Economic Research Service, 2010). Although reclaimed water was not the source or involved in transport of the pathogen, there was an outcry against the use of reclaimed water for food crops. A result of that incident was the California Leafy Green Marketing Agreement (LGMA, 2009). This is a set of best practices developed by the growers and accepted by the state. The bacterial restrictions on irrigation water in that agreement are considerably less stringent than those imposed by Florida or California although more stringent than the World Health Organization's guidelines. All the major shippers and buyers have accepted the LGMA and demand that their growers follow the agreement. As a result, more growers have been asking their water providers for reclaimed water because it easily meets the LGMA irrigation water requirements.

CONCLUSIONS

Reclaimed water use has increased steadily since the 1980s, and Florida is now the largest producer of this water in the United States. This water has an excellent safety record and has been used successfully for more than 40 years. Although reclaimed water in Florida was initially promoted to improve surface water quality, it has now become an important alternate source of water to help meet water shortages and urban demand. In California, reclaimed water has become a necessary piece of the whole water picture and is increasingly becoming an indirect source for drinking water.

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Appendix F

Soil Water and Salt Balance Calculations for Five Proposed Project Scenarios

Appendix F-1: Soil Water and Salt Balance for Cropped Fields (Scenario 1)

Month	Effective Rainfall[a] (Inches)	Evapotran-spiration[b] (Inches)	Leprino/ Lemoore Combined Effluent[c] (MG/Month)	Combined Effluent EC[d] (µS/cm)[e]	Triticale Sileage/ Corn (591 Acres) Net Combined Effluent Irrigation[f] (Inches)	Net Supp'l Irrigation[g] (Inches)	Crop Coeff.	Soil Water[h] (Inches)	Percolate Amount[i] (Inches)	Percolate EC[j] (µS/cm)	Triticale Grain (151 Acres) Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	1.4	1.2	217	2,269	3.5		0.8	5.7	4.7	2,410	3.0		0.5	4.8	4.4	2,009
February	1.2	2.2	196	2,269	1.9		0.9	5.7	1.6	2,595	3.0		0.7	4.8	3.3	2,206
March	1.0	4.1	217	2,269	4.0		1.0	5.7	1.8	3,331	4.0		0.8	4.8	2.6	2,854
April	0.3	6.1	210	2,269	4.0		1.0	3.9	0.0	5,654	4.0		1.0	3.0	0.0	5,613
May	0.2	8.1	217	2,269		1.5	0.4	2.4	0.0	7,969	2.7	4.2	1.0	2.0	0.0	6,154
June	0.0	9.0	210	2,269	2.2	4.0	0.7	2.3	0.0	6,097	3.0	6.0	1.0	2.0	0.0	4,840
July	0.0	9.1	217	2,269	2.3	5.9	0.9	2.3	0.0	4,786	3.0	6.0	1.0	1.9	0.0	4,469
August	0.0	8.1	217	2,269	3.0	5.1	1.0	2.3	0.0	4,532			0.2	0.4	0.0	24,403
September	0.1	6.2	210	2,269	4.0	2.1	1.0	2.3	0.0	5,255			0.2	0.0	0.0	0
October	0.4	4.2	217	2,269		1.3	0.4	2.3	0.0	4,742			0.2	0.0	0.0	0
November	0.4	2.2	210	2,269	4.0		0.4	5.7	1.0	3,163	3.8		0.2	3.8	0.0	2,288
December	1.1	1.2	217	2,269	2.8		0.7	5.7	3.7	2,709	3.0		0.4	4.8	3.3	2,105
Total:	**6.2**	**61.7**	**2,555**		**31.7**	**19.9**			**12.7**	*2,707*	**29.5**	**16.2**			**13.6**	*2,241*
					1 January Soil Water (Inches):			5.7		2,709	1 January Soil Water (Inches):			4.8		2,105

Month	Cotton (832 Acres) Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)	Alfalfa (322 Acres) Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	1.9		0.9	5.7	2.2	4,532	1.9		0.7	5.7	2.9	2,780
February	2.0		0.5	5.7	2.1	3,831	3.0		0.8	5.7	3.1	2,703
March	3.2		0.6	5.7	1.7	3,834			0.9	3.0	0.0	5,083
April	1.1	0.1	0.8	2.4	0.0	9,926	2.5	2.6	1.0	2.4	0.0	5,782
May	4.0	3.1	0.9	2.3	0.0	11,654	4.0	3.9	1.0	2.3	0.0	5,426
June	2.9	6.1	1.0	2.4	0.0	11,749	1.9	7.1	1.0	2.3	0.0	4,279
July	2.9	6.2	1.0	2.3	0.0	11,960	1.8	7.4	1.0	2.4	0.0	3,728
August	2.9	5.2	1.0	2.3	0.0	12,263	1.8	6.3	1.0	2.4	0.0	3,683
September		2.4	0.4	2.3	0.0	11,877	5.9	0.2	1.0	2.3	0.0	5,677
October	4.0		0.4	5.0	0.0	6,897	4.0		0.9	2.9	0.0	5,682
November			0.4	4.5	0.0	7,621	3.0		0.8	4.5	0.0	4,478
December	2.0		0.7	5.7	1.1	5,605	3.0		0.7	5.7	2.8	3,292
Total:	**26.8**	**23.1**			**7.2**	*4,325*	**32.7**	**27.5**			**8.8**	*2,915*
	1 January Soil Water (Inches):			5.7		5,605	1 January Soil Water (Inches):			5.7		3,292

Month	Effective Rainfall[a] (Inches)	Evapotran-spiration[b] (Inches)	Leprino/ Lemoore Combined Effluent[c] (MG/Month)	Combined Effluent EC[d] (µS/cm)[e]	Tomatoes/ Summer Forage (0 Acres) Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	1.4	1.2	217	2,269						
February	1.2	2.2	196	2,269						
March	1.0	4.1	217	2,269						
April	0.3	6.1	210	2,269						
May	0.2	8.1	217	2,269						
June	0.0	9.0	210	2,269						
July	0.0	9.1	217	2,269						
August	0.0	8.1	217	2,269						
September	0.1	6.2	210	2,269						
October	0.4	4.2	217	2,269						
November	0.4	2.2	210	2,269						
December	1.1	1.2	217	2,269						
Total:	**6.2**	**61.7**	**2,555**							

Month	Alfalfa Nederend (286 Acres) Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)	Cotton Nederend (234 Acres) Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	3.0		0.7	6.6	4.2	2,682	1.9		0.9	6.6	2.2	4,411
February	3.0		0.8	6.6	3.1	2,647	2.0		0.5	6.6	2.1	3,813
March			0.9	3.9	0.0	4,445	3.2		0.6	6.6	1.7	3,823
April	2.6	1.9	1.0	2.7	0.0	6,083	1.0		0.8	3.1	0.0	8,763
May	2.0	6.0	1.0	2.7	0.0	4,763	4.0	2.8	0.9	2.7	0.0	11,327
June	2.2	6.8	1.0	2.7	0.0	4,153	2.9	6.0	1.0	2.7	0.0	11,831
July	3.1	6.0	1.0	2.7	0.0	4,202	2.9	6.3	1.0	2.7	0.0	11,670
August	3.1	5.0	1.0	2.7	0.0	4,352	2.9	5.2	1.0	2.7	0.0	12,010
September	4.0	2.1	1.0	2.7	0.0	5,111		2.4	0.4	2.7	0.0	11,697
October	4.0		0.9	3.2	0.0	5,377	3.1		0.4	4.5	0.0	8,162
November	4.0		0.8	5.9	0.0	3,989	2.0		0.4	6.0	0.0	6,687
December	3.0		0.7	6.6	3.2	3,170	2.0		0.7	6.6	1.7	5,301
Total:	**33.9**	**27.8**			**10.5**	*2,822*	**27.8**	**22.7**			**7.8**	*4,316*
	1 January Soil Water (Inches):			6.6		3,170	1 January Soil Water (Inches):			6.6		6,301

Water Balance Parameters

Lemoore/Leprino Flow (MGD)[k]:	7.0
Irrigation Efficiency[l]:	0.7 - 0.9
Soil Water Capacity (Inches)[m]:	4.8 - 5.7

Notes:

(a) Effective rainfall based on MacGillivray and Jones, DWR 1989.
(b) Evapotranspiration data from CIMIS Stratford Station (1983 - 2021).
(c) Proposed project combined effluent flow (7.0 MGD).
(d) Combined effluent EC level (2019 - 2021).
(e) µS/cm = micro Siemens per centimeter
(f) Net combined effluent irrigation, includes irrigation efficiency of 0.7 for flood irrigation or 0.9 for drip irrigation.
(g) Net supplemental groundwater irrigation, includes irrigation efficiency of 0.7 for flood irrigation or 0.9 for drip irrigation.
(h) Soil water calculation consists of inputs from the previous month's soil water storage, the net combined effluent and groundwater irrigation, less the actual evapotranspiration (evapotranspiration multiplied by the crop coefficient)
(i) Total amount of water percolating through the root zone (in excess of the soil water capacity)
(j) Electrical Conductivity of the percolate
(k) MGD = Million gallons per day
(l) Irrigation efficiency for flood irrigation is 0.7, it is 0.9 for drip irrigation on the tomatoes and cotton
(m) Source: Web Soil Survey (USDA, 2018). https://websoilsurvey.sc.egov.usda.gov/

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Appendix F-2: Soil Water and Salt Balance for Cropped Fields (Scenario 2)

Month	Effective Rainfall[a] (Inches)	Evapotranspiration[b] (Inches)	Leprino/ Lemoore Combined Effluent[c] (MG/Month)	Combined Effluent EC[d] (µS/cm)[e]	Triticale Sileage/ Corn (591 Acres): Net Combined Effluent Irrigation[f] (Inches)	Net Supp'l Irrigation[g] (Inches)	Crop Coeff.	Soil Water[h] (Inches)	Percolate Amount[i] (Inches)	Percolate EC[j] (µS/cm)
January	1.4	1.2	217	2,269	3.5	0.0	0.8	5.7	4.7	2,444
February	1.2	2.2	196	2,269	1.9	0.0	0.9	5.7	1.6	2,620
March	1.0	4.1	217	2,269	4.0	0.0	1.0	5.7	1.8	3,348
April	0.3	6.1	210	2,269	4.0	0.0	1.0	3.9	0.0	5,671
May	0.2	8.1	217	2,269	0.0	1.5	0.4	2.4	0.0	7,992
June	0.0	9.0	210	2,269	2.2	4.0	0.7	2.3	0.0	6,108
July	0.0	9.1	217	2,269	2.3	5.9	0.9	2.3	0.0	4,790
August	0.0	8.1	217	2,269	3.0	5.1	1.0	2.3	0.0	4,534
September	0.1	6.2	210	2,269	4.0	2.1	1.0	2.3	0.0	5,256
October	0.4	4.2	217	2,269	0.0	1.3	0.4	2.3	0.0	4,742
November	0.4	2.2	210	2,269	3.0	0.0	0.4	4.8	0.0	3,372
December	1.1	1.2	217	2,269	2.8	0.0	0.7	5.7	2.8	2,775
Total:	**6.2**	**61.7**	**2,555**		**30.7**	**19.9**			**10.8**	*2,704*
						1 January Soil Water (Inches):		5.7		2,775

Month	Triticale Grain (151 Acres): Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	3.0	0.0	0.5	4.8	4.4	2,011
February	3.0	0.0	0.7	4.8	3.3	2,207
March	4.0	0.0	0.8	4.8	2.6	2,855
April	4.0	0.0	1.0	3.0	0.0	5,613
May	2.7	4.2	1.0	2.0	0.0	6,154
June	3.0	6.0	1.0	2.0	0.0	4,840
July	3.0	6.0	1.0	1.9	0.0	4,469
August	0.0	0.0	0.2	0.4	0.0	24,403
September	0.0	0.0	0.2	0.0	0.0	0
October	0.0	0.0	0.2	0.0	0.0	0
November	4.0	0.0	0.2	4.0	0.0	2,287
December	3.0	0.0	0.4	4.8	3.5	2,108
Total:	**29.7**	**16.2**			**13.8**	*2,241*
	1 January Soil Water (Inches):			4.8		2,108

Month	Cotton (538 Acres): Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	1.9	0.0	0.9	5.7	2.2	4,363
February	2.0	0.0	0.5	5.7	2.1	3,712
March	3.2	0.0	0.6	5.7	1.7	3,746
April	1.1	0.1	0.8	2.4	0.0	9,726
May	4.0	3.1	0.9	2.3	0.0	11,502
June	2.9	6.1	1.0	2.4	0.0	11,644
July	2.9	6.2	1.0	2.3	0.0	11,887
August	2.9	5.2	1.0	2.3	0.0	12,209
September	0.0	2.4	0.4	2.3	0.0	11,829
October	4.5	0.0	0.4	5.5	0.0	6,450
November	0.0	0.0	0.4	5.0	0.0	7,060
December	2.0	0.0	0.7	5.7	1.6	5,365
Total:	**27.3**	**23.1**			**7.7**	*4,256*
	1 January Soil Water (Inches):			5.7		5,365

Month	Alfalfa (322 Acres): Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	1.9	0.0	0.7	5.7	2.9	2,769
February	3.0	0.0	0.8	5.7	3.1	2,696
March	0.0	0.0	0.9	3.0	0.0	5,071
April	2.5	2.6	1.0	2.4	0.0	5,774
May	4.0	3.9	1.0	2.3	0.0	5,423
June	1.9	7.1	1.0	2.3	0.0	4,278
July	1.8	7.4	1.0	2.4	0.0	3,728
August	1.8	6.3	1.0	2.4	0.0	3,683
September	5.9	0.2	1.0	2.3	0.0	5,677
October	4.5	0.0	0.9	3.4	0.0	5,223
November	3.0	0.0	0.8	5.0	0.0	4,328
December	3.0	0.0	0.7	5.7	3.3	3,275
Total:	**33.2**	**27.5**			**9.3**	*2,924*
	1 January Soil Water (Inches):			5.7		3,275

Month	Effective Rainfall[a] (Inches)	Evapotranspiration[b] (Inches)	Leprino/ Lemoore Combined Effluent[c] (MG/Month)	Combined Effluent EC[d] (µS/cm)[e]	Tomatoes/ Summer Forage (294 Acres): Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	1.4	1.2	217	2,269	1.9	0.0	0.4	5.7	2.8	4,830
February	1.2	2.2	196	2,269	2.0	0.0	0.4	5.7	2.4	3,935
March	1.0	4.1	217	2,269	3.2	0.0	0.4	5.7	2.5	3,537
April	0.3	6.1	210	2,269	1.1	0.1	0.5	4.2	0.0	5,331
May	0.2	8.1	217	2,269	4.0	3.1	0.7	5.7	0.1	5,344
June	0.0	9.0	210	2,269	2.9	6.1	0.9	5.7	0.9	5,618
July	0.0	9.1	217	2,269	2.9	6.2	1.0	5.7	0.0	6,636
August	0.0	8.1	217	2,269	2.9	5.2	1.0	5.7	0.0	7,505
September	0.1	6.2	210	2,269	0.0	2.4	0.8	3.2	0.0	12,933
October	0.4	4.2	217	2,269	2.0	0.0	0.5	3.5	0.0	12,594
November	0.4	2.2	210	2,269	2.0	0.0	0.4	5.0	0.0	9,332
December	1.1	1.2	217	2,269	2.0	0.0	0.4	5.7	1.9	6,549
Total:	**6.2**	**61.7**	**2,555**		**26.8**	**23.1**			**10.7**	*4,709*
						1 January Soil Water (Inches):		5.7		6,549

Month	Alfalfa Nederend (286 Acres): Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	3.0	0.0	0.7	6.6	4.2	2,682
February	3.0	0.0	0.8	6.6	3.1	2,647
March	0.0	0.0	0.9	3.9	0.0	4,445
April	2.6	1.9	1.0	2.7	0.0	6,083
May	2.0	6.0	1.0	2.7	0.0	4,763
June	2.2	6.8	1.0	2.7	0.0	4,153
July	3.1	6.0	1.0	2.7	0.0	4,202
August	3.1	5.0	1.0	2.7	0.0	4,352
September	4.0	2.1	1.0	2.7	0.0	5,111
October	4.0	0.0	0.9	3.2	0.0	5,377
November	4.0	0.0	0.8	5.9	0.0	3,989
December	3.0	0.0	0.7	6.6	3.2	3,170
Total:	**33.9**	**27.8**			**10.5**	*2,822*
	1 January Soil Water (Inches):			6.6		3,170

Month	Cotton Nederend (234 Acres): Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	1.9	0.0	0.9	6.6	2.2	4,095
February	2.0	0.0	0.5	6.6	2.1	3,579
March	3.2	0.0	0.6	6.6	1.7	3,645
April	1.0	0.0	0.8	3.1	0.0	8,393
May	4.0	2.8	0.9	2.7	0.0	11,000
June	2.9	6.0	1.0	2.7	0.0	11,588
July	2.9	6.3	1.0	2.7	0.0	11,499
August	2.9	5.2	1.0	2.7	0.0	11,881
September	0.0	2.4	0.4	2.7	0.0	11,579
October	3.6	0.0	0.4	5.0	0.0	7,496
November	2.6	0.0	0.4	6.6	0.5	5,968
December	2.0	0.0	0.7	6.6	2.3	4,868
Total:	**28.9**	**22.7**			**8.8**	*4,186*
	1 January Soil Water (Inches):			6.6		4,868

Water Balance Parameters	
Lemoore/Leprino Flow (MGD)[k]:	7.0
Irrigation Efficiency[l]:	0.7 - 0.9
Soil Water Capacity (Inches)[m]:	4.8 - 5.7

Notes:

(a) Effective rainfall based on MacGillivray and Jones, DWR 1989.

(b) Evapotranspiration data from CIMIS Stratford Station (1983 - 2021).

(c) Proposed project combined effluent flow (7.0 MGD).

(d) Combined effluent EC level (2019 - 2021).

(e) µS/cm = micro Siemens per centimeter

(f) Net combined effluent irrigation, includes irrigation efficiency of 0.7 for flood irrigation or 0.9 for drip irrigation.

(g) Net supplemental groundwater irrigation, includes irrigation efficiency of 0.7 for flood irrigation or 0.9 for drip irrigation.

(h) Soil water calculation consists of inputs from the previous month's soil water storage, the net combined effluent and groundwater irrigation, less the actual evapotranspiration (evapotranspiration multiplied by the crop coefficient)

(i) Total amount of water percolating through the root zone (in excess of the soil water capacity)

(j) Electrical Conductivity of the percolate

(k) MGD = Million gallons per day

(l) Irrigation efficiency for flood irrigation is 0.7, it is 0.9 for drip irrigation on the tomatoes and cotton

(m) Source: Web Soil Survey (USDA, 2018). https://websoilsurvey.sc.egov.usda.gov/

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Appendix F-3: Soil Water and Salt Balance for Cropped Fields (Scenario 3)

Month	Effective Rainfall[a] (Inches)	Evapotranspiration[b] (Inches)	Leprino/ Lemoore Combined Effluent[c] (MG/Month)	Combined Effluent EC[d] (µS/cm)[e]	Triticale Sileage/ Corn (591 Acres): Net Combined Effluent Irrigation[f] (Inches)	Net Supp'l Irrigation[g] (Inches)	Crop Coeff.	Soil Water[h] (Inches)	Percolate Amount[i] (Inches)	Percolate EC[j] (µS/cm)	Triticale Grain (151 Acres): Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	3.0	1.0	217	2,269	3.5		0.8	5.7	6.5	1,743	3.0		0.5	4.8	6.2	1,463
February	1.5	1.6	196	2,269	1.9		0.9	5.7	2.3	1,905	3.0		0.7	4.8	4.0	1,775
March	0.3	4.2	217	2,269	4.0		1.0	5.7	0.9	3,184	4.0		0.8	4.8	1.8	2,894
April	0.7	5.2	210	2,269	4.0		1.0	5.1	0.0	4,538	4.0		1.0	4.2	0.0	4,509
May	0.1	7.8	217	2,269		0.2	0.4	2.3	0.0	9,844	2.7	2.8	1.0	2.0	0.0	7,042
June	0.0	9.4	210	2,269	2.2	4.4	0.7	2.3	0.0	6,725	3.0	6.4	1.0	2.0	0.0	5,145
July	0.0	9.3	217	2,269	2.3	6.1	0.9	2.3	0.0	5,012	3.0	6.3	1.0	2.0	0.0	4,477
August	0.0	8.4	217	2,269	3.0	5.4	1.0	2.3	0.0	4,572			0.2	0.3	0.0	27,227
September	0.0	6.3	210	2,269	4.0	2.3	1.0	2.3	0.0	5,211			0.2	0.0	0.0	0
October	0.4	4.1	217	2,269		1.3	0.4	2.3	0.0	4,666			0.2	0.0	0.0	0
November	1.0	2.2	210	2,269	4.0		0.4	5.7	1.6	2,926	3.8		0.2	4.4	0.0	2,059
December	4.2	1.0	217	2,269	2.8		0.7	5.7	6.9	1,955	3.0		0.4	4.8	7.0	1,507
Total:	**11.1**	**60.6**	**2,555**		**31.7**	**19.7**			**18.2**	*2,021*	**29.5**	**15.5**			**18.9**	*1,679*
					1 January Soil Water (Inches):			5.7		1,955	1 January Soil Water (Inches):			4.8		1,507

Month	Cotton (832 Acres): Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)	Alfalfa (322 Acres): Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	1.9		0.9	5.7	4.0	2,505	1.9		0.7	5.7	4.7	1,838
February	2.0		0.5	5.7	2.7	2,249	3.0		0.8	5.7	3.8	1,984
March	3.2		0.6	5.7	0.9	2,984		0.1	0.9	2.3	0.0	4,899
April	1.1		0.8	3.3	0.0	5,795	2.5	2.1	1.0	2.3	0.0	5,017
May	4.0	2.0	0.9	2.4	0.0	10,190	4.0	3.7	1.0	2.3	0.0	5,101
June	2.9	6.5	1.0	2.3	0.0	10,921	1.9	7.6	1.0	2.3	0.0	4,087
July	2.9	6.4	1.0	2.3	0.0	11,462	1.8	7.5	1.0	2.3	0.0	3,730
August	2.9	5.5	1.0	2.3	0.0	11,839	1.8	6.7	1.0	2.4	0.0	3,585
September		2.6	0.4	2.4	0.0	11,055	5.9	0.4	1.0	2.4	0.0	5,555
October	4.0		0.4	5.1	0.0	6,555	4.0		0.9	3.0	0.0	5,495
November			0.4	5.2	0.0	6,419	3.0		0.8	5.2	0.0	4,039
December	2.0		0.7	5.7	5.0	3,520	3.0		0.7	5.7	6.7	2,374
Total:	**26.8**	**23.0**			**12.6**	*2,887*	**32.7**	**28.1**			**15.2**	*2,110*
	1 January Soil Water (Inches):			5.7		3,520	1 January Soil Water (Inches):			5.7		2,374

Month	Effective Rainfall[a] (Inches)	Evapotranspiration[b] (Inches)	Leprino/ Lemoore Combined Effluent[c] (MG/Month)	Combined Effluent EC[d] (µS/cm)[e]	Tomatoes/ Summer Forage (0 Acres): Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	3.0	1.0	217	2,269						
February	1.5	1.6	196	2,269						
March	0.3	4.2	217	2,269						
April	0.7	5.2	210	2,269						
May	0.1	7.8	217	2,269						
June	0.0	9.4	210	2,269						
July	0.0	9.3	217	2,269						
August	0.0	8.4	217	2,269						
September	0.0	6.3	210	2,269						
October	0.4	4.1	217	2,269						
November	1.0	2.2	210	2,269						
December	4.2	1.0	217	2,269						
Total:	**11.1**	**60.6**	**2,555**							

Month	Alfalfa Nederend (286 Acres): Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)	Cotton Nederend (234 Acres): Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	3.0		0.7	6.6	6.0	1,918	1.9		0.9	6.6	4.0	2,620
February	3.0		0.8	6.6	3.8	2,020	2.0		0.5	6.6	2.7	2,352
March			0.9	3.1	0.0	4,318	3.2		0.6	6.6	0.9	2,989
April	2.6	1.6	1.0	2.7	0.0	5,185	1.0		0.8	4.1	0.0	5,294
May	2.0	5.7	1.0	2.7	0.0	4,455	4.0	1.5	0.9	2.7	0.0	10,090
June	2.2	7.2	1.0	2.7	0.0	4,033	2.9	6.6	1.0	2.7	0.0	10,495
July	3.1	6.2	1.0	2.6	0.0	4,151	2.9	6.4	1.0	2.7	0.0	11,091
August	3.1	5.4	1.0	2.7	0.0	4,211	2.9	5.5	1.0	2.7	0.0	11,522
September	4.0	2.3	1.0	2.7	0.0	4,984		2.5	0.4	2.7	0.0	11,260
October	4.0		0.9	3.4	0.0	5,196	3.1		0.4	4.5	0.0	7,836
November	4.0		0.8	6.6	0.0	3,674	2.0		0.4	6.6	0.0	5,896
December	3.0		0.7	6.6	7.1	2,363	2.0		0.7	6.6	5.5	3,570
Total:	**33.9**	**28.4**			**16.9**	*2,129*	**27.8**	**22.5**			**13.1**	*2,988*
	1 January Soil Water (Inches):			6.6		2,363	1 January Soil Water (Inches):			6.6		3,570

Water Balance Parameters

Lemoore/Leprino Flow (MGD)[k]:	7.0
Irrigation Efficiency[l]:	0.7 - 0.9
Soil Water Capacity (Inches)[m]:	4.8 - 5.7

Notes:

(a) Effective rainfall based on MacGillivray and Jones, DWR 1989.

(b) Evapotranspiration data from CIMIS Stratford Station (1983 - 2021).

(c) Proposed project combined effluent flow (7.0 MGD).

(d) Combined effluent EC level (2019 - 2021).

(e) µS/cm = micro Siemens per centimeter

(f) Net combined effluent irrigation, includes irrigation efficiency of 0.7 for flood irrigation or 0.9 for drip irrigation.

(g) Net supplemental groundwater irrigation, includes irrigation efficiency of 0.7 for flood irrigation or 0.9 for drip irrigation.

(h) Soil water calculation consists of inputs from the previous month's soil water storage, the net combined effluent and groundwater irrigation, less the actual evapotranspiration (evapotranspiration multiplied by the crop coefficient)

(i) Total amount of water percolating through the root zone (in excess of the soil water capacity)

(j) Electrical Conductivity of the percolate

(k) MGD = Million gallons per day

(l) Irrigation efficiency for flood irrigation is 0.7, it is 0.9 for drip irrigation on the tomatoes and cotton

(m) Source: Web Soil Survey (USDA, 2018). https://websoilsurvey.sc.egov.usda.gov/

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Appendix F-4: Soil Water and Salt Balance for Cropped Fields (Scenario 4)

Month	Effective Rainfall[(a)] (Inches)	Evapotran-spiration[(b)] (Inches)	Leprino/ Lemoore Combined Effluent[(c)] (MG/Month)	Combined Effluent EC[(d)] (µS/cm)[(e)]
January	3.0	1.0	217	2,269
February	1.5	1.6	196	2,269
March	0.3	4.2	217	2,269
April	0.7	5.2	210	2,269
May	0.1	7.8	217	2,269
June	0.0	9.4	210	2,269
July	0.0	9.3	217	2,269
August	0.0	8.4	217	2,269
September	0.0	6.3	210	2,269
October	0.4	4.1	217	2,269
November	1.0	2.2	210	2,269
December	4.2	1.0	217	2,269
Total:	**11.1**	**60.6**	**2,555**	

Triticale Sileage/ Corn (591 Acres)

Month	Net Combined Effluent Irrigation[(f)] (Inches)	Net Supp'l Irrigation[(g)] (Inches)	Crop Coeff.	Soil Water[(h)] (Inches)	Percolate Amount[(i)] (Inches)	Percolate EC[(j)] (µS/cm)
January	3.5		0.8	5.7	6.5	1,760
February	1.9		0.9	5.7	2.3	1,917
March	4.0		1.0	5.7	0.9	3,193
April	4.0		1.0	5.1	0.0	4,545
May		1.0	0.4	3.1	0.0	6,918
June	2.2	3.6	0.7	2.3	0.0	6,772
July	2.3	6.1	0.9	2.3	0.0	5,030
August	3.0	5.4	1.0	2.3	0.0	4,579
September	4.0	2.3	1.0	2.3	0.0	5,214
October		1.3	0.4	2.3	0.0	4,669
November	3.0		0.4	5.4	0.0	3,066
December	2.8		0.7	5.7	6.6	1,995
Total:	**30.7**	**19.7**			**16.3**	*1,959*
1 January Soil Water (Inches):				5.7		1,995

Triticale Grain (151 Acres)

Month	Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	3.0		0.5	4.8	6.2	1,468
February	3.0		0.7	4.8	4.0	1,777
March	4.0		0.8	4.8	1.8	2,896
April	4.0		1.0	4.2	0.0	4,510
May	2.7	3.0	1.0	2.2	0.0	6,660
June	3.0	6.2	1.0	2.0	0.0	5,276
July	3.0	6.3	1.0	2.0	0.0	4,520
August			0.2	0.3	0.0	27,492
September			0.2	0.0	0.0	0
October			0.2	0.0	0.0	0
November	4.0		0.2	4.6	0.0	2,069
December	3.0		0.4	4.8	7.2	1,519
Total:	**29.7**	**15.5**			**19.1**	*1,684*
1 January Soil Water (Inches):				4.8		1,519

Cotton (538 Acres)

Month	Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	1.9		0.9	5.7	4.0	2,471
February	2.0		0.5	5.7	2.7	2,226
March	3.2		0.6	5.7	0.9	2,965
April	1.1		0.8	3.3	0.0	5,764
May	4.0	2.0	0.9	2.4	0.0	10,156
June	2.9	6.5	1.0	2.3	0.0	10,898
July	2.9	6.4	1.0	2.3	0.0	11,446
August	2.9	5.5	1.0	2.3	0.0	11,827
September		2.6	0.4	2.4	0.0	11,044
October	4.5		0.4	5.6	0.0	6,159
November			0.4	5.7	0.0	6,043
December	2.0		0.7	5.7	5.5	3,460
Total:	**27.3**	**23.0**			**13.1**	*2,869*
1 January Soil Water (Inches):				5.7		3,460

Alfalfa (322 Acres)

Month	Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	1.9		0.7	5.7	4.7	1,844
February	3.0		0.8	5.7	3.8	1,988
March		0.1	0.9	2.3	0.0	4,907
April	2.5	2.1	1.0	2.3	0.0	5,022
May	4.0	3.7	1.0	2.3	0.0	5,103
June	1.9	7.6	1.0	2.3	0.0	4,087
July	1.8	7.5	1.0	2.3	0.0	3,730
August	1.8	6.7	1.0	2.4	0.0	3,585
September	5.9	0.4	1.0	2.4	0.0	5,555
October	4.5		0.9	3.5	0.0	5,072
November	3.0		0.8	5.7	0.7	3,931
December	3.0		0.7	5.7	7.1	2,386
Total:	**33.2**	**28.1**			**16.3**	*2,201*
1 January Soil Water (Inches):				5.7		2,386

Month	Effective Rainfall[(a)] (Inches)	Evapotran-spiration[(b)] (Inches)	Leprino/ Lemoore Combined Effluent[(c)] (MG/Month)	Combined Effluent EC[(d)] (µS/cm)[(e)]
January	3.0	1.0	217	2,269
February	1.5	1.6	196	2,269
March	0.3	4.2	217	2,269
April	0.7	5.2	210	2,269
May	0.1	7.8	217	2,269
June	0.0	9.4	210	2,269
July	0.0	9.3	217	2,269
August	0.0	8.4	217	2,269
September	0.0	6.3	210	2,269
October	0.4	4.1	217	2,269
November	1.0	2.2	210	2,269
December	4.2	1.0	217	2,269
Total:	**11.1**	**60.6**	**2,555**	

Tomatoes/ Summer Forage (294 Acres)

Month	Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	1.9		0.4	5.7	4.5	2,349
February	2.0		0.4	5.7	2.8	2,106
March	3.2		0.4	5.7	1.8	2,558
April	1.1		0.5	4.9	0.0	3,481
May	4.0		0.7	3.5	0.0	6,866
June	2.9	4.5	0.9	2.4	0.0	10,873
July	2.9	6.4	1.0	2.4	0.0	11,416
August	2.9	5.5	1.0	2.4	0.0	11,798
September		5.0	0.8	2.3	0.0	11,212
October	2.0		0.5	2.6	0.0	10,898
November	2.0		0.4	4.7	0.0	6,784
December	2.0		0.4	5.7	4.8	3,458
Total:	**26.8**	**21.4**			**13.9**	*2,709*
1 January Soil Water (Inches):				5.7		3,458

Alfalfa Nederend (286 Acres)

Month	Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	3.0		0.7	6.6	6.0	1,918
February	3.0		0.8	6.6	3.8	2,020
March			0.9	3.1	0.0	4,318
April	2.6	1.6	1.0	2.7	0.0	5,185
May	2.0	5.7	1.0	2.7	0.0	4,455
June	2.2	7.2	1.0	2.7	0.0	4,033
July	3.1	6.2	1.0	2.6	0.0	4,151
August	3.1	5.4	1.0	2.7	0.0	4,211
September	4.0	2.3	1.0	2.7	0.0	4,984
October	4.0		0.9	3.4	0.0	5,196
November	4.0		0.8	6.6	0.0	3,674
December	3.0		0.7	6.6	7.1	2,363
Total:	**33.9**	**28.4**			**16.9**	*2,129*
1 January Soil Water (Inches):				6.6		2,363

Cotton Nederend (234 Acres)

Month	Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	1.9		0.9	6.6	4.0	2,555
February	2.0		0.5	6.6	2.7	2,307
March	3.2		0.6	6.6	0.9	2,951
April	1.0		0.8	4.1	0.0	5,235
May	4.0	2.8	0.9	4.0	0.0	7,181
June	2.9	6.0	1.0	3.4	0.0	9,238
July	2.9	6.3	1.0	3.3	0.0	10,259
August	2.9	5.2	1.0	3.0	0.0	11,674
September		2.4	0.4	2.9	0.0	11,804
October	3.6		0.4	5.2	0.0	7,684
November	2.6		0.4	6.6	1.2	5,693
December	2.0		0.7	6.6	5.5	3,464
Total:	**28.9**	**22.7**			**14.3**	*3,152*
1 January Soil Water (Inches):				6.6		3,464

Water Balance Parameters

Lemoore/Leprino Flow (MGD)[(k)]:	7.0
Irrigation Efficiency[(l)]:	0.7 - 0.9
Soil Water Capacity (Inches)[(m)]:	4.8 - 5.7

Notes:

(a) Effective rainfall based on MacGillivray and Jones, DWR 1989.

(b) Evapotranspiration data from CIMIS Stratford Station (1983 - 2021).

(c) Proposed project combined effluent flow (7.0 MGD).

(d) Combined effluent EC level (2019 - 2021).

(e) µS/cm = micro Siemens per centimeter

(f) Net combined effluent irrigation, includes irrigation efficiency of 0.7 for flood irrigation or 0.9 for drip irrigation.

(g) Net supplemental groundwater irrigation, includes irrigation efficiency of 0.7 for flood irrigation or 0.9 for drip irrigation.

(h) Soil water calculation consists of inputs from the previous month's soil water storage, the net combined effluent and groundwater irrigation, less the actual evapotranspiration (evapotranspiration multiplied by the crop coefficient)

(i) Total amount of water percolating through the root zone (in excess of the soil water capacity)

(j) Electrical Conductivity of the percolate

(k) MGD = Million gallons per day

(l) Irrigation efficiency for flood irrigation is 0.7, it is 0.9 for drip irrigation on the tomatoes and cotton

(m) Source: Web Soil Survey (USDA, 2018). https://websoilsurvey.sc.egov.usda.gov/

Appendix F-5: Soil Water and Salt Balance for Cropped Fields (Scenario 5)

Month	Effective Rainfall[a] (Inches)	Evapotran-spiration[b] (Inches)	Leprino/ Lemoore Combined Effluent[c] (MG/Month)	Combined Effluent EC[d] (µS/cm)[e]
January	4.8	1.2	217	2,269
February	4.2	2.2	196	2,269
March	3.5	4.1	217	2,269
April	1.1	6.1	210	2,269
May	0.6	8.1	217	2,269
June	0.1	9.0	210	2,269
July	0.1	9.1	217	2,269
August	0.1	8.1	217	2,269
September	0.2	6.2	210	2,269
October	1.3	4.2	217	2,269
November	1.3	2.2	210	2,269
December	3.9	1.2	217	2,269
Total:	**21.1**	**61.7**	**2,555**	

Triticale Sileage/ Corn (591 Acres)						
Month	Net Combined Effluent Irrigation[f] (Inches)	Net Supp'l Irrigation[g] (Inches)	Crop Coeff.	Soil Water[h] (Inches)	Percolate Amount[i] (Inches)	Percolate EC[j] (µS/cm)
January	3.5		0.8	5.7	8.0	1,601
February	1.9		0.9	5.7	4.5	1,436
March	4.0		1.0	5.7	4.2	1,963
April	4.0		1.0	4.7	0.0	3,745
May		0.3	0.4	2.4	0.0	7,247
June	2.2	4.0	0.7	2.4	0.0	5,699
July	2.3	5.9	0.9	2.4	0.0	4,601
August	3.0	5.0	1.0	2.4	0.0	4,497
September	4.0	2.0	1.0	2.4	0.0	5,216
October		0.4	0.4	2.4	0.0	4,999
November	3.0		0.4	5.7	0.8	3,048
December	2.8		0.7	5.7	6.5	2,076
Total:	**30.7**	**17.6**			**24.1**	*1,810*
	1 January Soil Water (Inches):			5.7		2,076

Triticale Grain (151 Acres)						
Month	Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	3.0		0.5	4.8	7.8	1,274
February	3.0		0.7	4.8	6.3	1,348
March	4.0		0.8	4.8	5.0	1,818
April	4.0		1.0	3.8	0.0	3,908
May	2.7	3.0	1.0	2.0	0.0	6,098
June	3.0	5.9	1.0	2.0	0.0	4,881
July	3.0	6.0	1.0	2.0	0.0	4,443
August			0.2	0.4	0.0	19,874
September			0.2	0.0	0.0	0
October			0.2	0.5	0.0	11
November	4.0		0.2	4.8	1.4	1,834
December	3.0		0.4	4.8	7.1	1,484
Total:	**29.7**	**14.9**			**27.6**	*1,473*
	1 January Soil Water (Inches):			4.8		1,484

Cotton (538 Acres)						
Month	Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	1.9		0.9	5.7	5.6	1,882
February	2.0		0.5	5.7	5.1	1,428
March	3.2		0.6	5.7	4.2	1,578
April	1.1		0.8	3.1	0.0	3,702
May	4.0	2.0	0.9	2.3	0.0	7,735
June	2.9	6.0	1.0	2.3	0.0	9,187
July	2.9	6.2	1.0	2.4	0.0	10,025
August	2.9	5.1	1.0	2.3	0.0	10,967
September		2.3	0.4	2.3	0.0	10,583
October	4.5		0.4	5.7	0.7	5,177
November			0.4	5.7	0.5	4,792
December	2.0		0.7	5.7	5.1	2,948
Total:	**27.3**	**21.6**			**21.1**	*2,147*
	1 January Soil Water (Inches):			5.7		2,948

Alfalfa (322 Acres)						
Month	Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	1.9		0.7	5.7	6.3	1,564
February	3.0		0.8	5.7	6.1	1,498
March			0.9	5.5	0.0	1,559
April	2.5		1.0	3.0	0.0	4,075
May	4.0	2.9	1.0	2.4	0.0	5,337
June	1.9	7.0	1.0	2.3	0.0	4,302
July	1.8	7.3	1.0	2.3	0.0	3,776
August	1.8	6.3	1.0	2.4	0.0	3,657
September	5.9		1.0	2.3	0.0	5,790
October	4.5		0.9	4.3	0.0	4,477
November	3.0		0.8	5.7	1.8	3,539
December	3.0		0.7	5.7	6.7	2,293
Total:	**33.2**	**23.5**			**20.9**	*1,950*
	1 January Soil Water (Inches):			5.7		2,293

Month	Effective Rainfall[a] (Inches)	Evapotran-spiration[b] (Inches)	Leprino/ Lemoore Combined Effluent[c] (MG/Month)	Combined Effluent EC[d] (µS/cm)[e]
January	4.8	1.2	217	2,269
February	4.2	2.2	196	2,269
March	3.5	4.1	217	2,269
April	1.1	6.1	210	2,269
May	0.6	8.1	217	2,269
June	0.1	9.0	210	2,269
July	0.1	9.1	217	2,269
August	0.1	8.1	217	2,269
September	0.2	6.2	210	2,269
October	1.3	4.2	217	2,269
November	1.3	2.2	210	2,269
December	3.9	1.2	217	2,269
Total:	**21.1**	**61.7**	**2,555**	

Tomatoes/ Summer Forage (294 Acres)						
Month	Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	1.9		0.4	5.7	6.2	1,855
February	2.0		0.4	5.7	5.3	1,387
March	3.2		0.4	5.7	5.0	1,439
April	1.1		0.5	4.9	0.0	2,192
May	4.0		0.7	3.8	0.0	4,931
June	2.9	3.7	0.9	2.4	0.0	9,376
July	2.9	6.2	1.0	2.4	0.0	10,143
August	2.9	5.1	1.0	2.4	0.0	11,038
September		4.8	0.8	2.4	0.0	10,276
October	2.0		0.5	3.6	0.0	7,782
November	2.0		0.4	5.7	0.4	5,264
December	2.0		0.4	5.7	5.4	3,093
Total:	**26.8**	**19.8**			**22.3**	*2,005*
	1 January Soil Water (Inches):			5.7		3,093

Alfalfa Nederend (286 Acres)						
Month	Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	3.0		0.7	6.6	7.6	1,678
February	3.0		0.8	6.6	6.1	1,559
March			0.9	6.4	0.0	1,614
April	2.6		1.0	4.0	0.0	3,651
May	2.0	4.2	1.0	2.7	0.0	4,830
June	2.2	6.8	1.0	2.7	0.0	4,144
July	3.1	5.9	1.0	2.7	0.0	4,242
August	3.1	5.0	1.0	2.7	0.0	4,320
September	4.0	2.0	1.0	2.7	0.0	5,081
October	4.0		0.9	4.2	0.0	4,516
November	4.0		0.8	6.6	2.1	3,361
December	3.0		0.7	6.6	6.7	2,289
Total:	**33.9**	**23.9**			**22.4**	*1,984*
	1 January Soil Water (Inches):			6.6		2,289

Cotton Nederend (234 Acres)						
Month	Net Combined Effluent Irrigation (Inches)	Net Supp'l Irrigation (Inches)	Crop Coeff.	Soil Water (Inches)	Percolate Amount (Inches)	Percolate EC (µS/cm)
January	1.9		0.9	6.6	5.6	1,925
February	2.0		0.5	6.6	5.1	1,486
March	3.2		0.6	6.6	4.2	1,599
April	1.0		0.8	3.9	0.0	3,295
May	4.0	1.6	0.9	2.7	0.0	7,227
June	2.9	6.0	1.0	2.7	0.0	8,657
July	2.9	6.1	1.0	2.7	0.0	9,821
August	2.9	5.2	1.0	2.7	0.0	10,425
September		2.3	0.4	2.7	0.0	10,141
October	3.6		0.4	5.9	0.0	5,786
November	2.6		0.4	6.6	2.4	4,420
December	2.0		0.7	6.6	5.1	2,882
Total:	**28.9**	**21.2**			**22.3**	*2,244*
	1 January Soil Water (Inches):			6.6		2,882

Water Balance Parameters	
Lemoore/Leprino Flow (MGD)[k]:	7.0
Irrigation Efficiency[l]:	0.7 - 0.9
Soil Water Capacity (Inches)[m]:	4.8 - 5.7

Notes:

(a) Effective rainfall based on MacGillivray and Jones, DWR 1989.
(b) Evapotranspiration data from CIMIS Stratford Station (1983 - 2021).
(c) Proposed project combined effluent flow (7.0 MGD).
(d) Combined effluent EC level (2019 - 2021).
(e) µS/cm = micro Siemens per centimeter
(f) Net combined effluent irrigation, includes irrigation efficiency of 0.7 for flood irrigation or 0.9 for drip irrigation.
(g) Net supplemental groundwater irrigation, includes irrigation efficiency of 0.7 for flood irrigation or 0.9 for drip irrigation.
(h) Soil water calculation consists of inputs from the previous month's soil water storage, the net combined effluent and groundwater irrigation, less the actual evapotranspiration (evapotranspiration multiplied by the crop coefficient)
(i) Total amount of water percolating through the root zone (in excess of the soil water capacity)
(j) Electrical Conductivity of the percolate
(k) MGD = Million gallons per day
(l) Irrigation efficiency for flood irrigation is 0.7, it is 0.9 for drip irrigation on the tomatoes and cotton
(m) Source: Web Soil Survey (USDA, 2018). https://websoilsurvey.sc.egov.usda.gov/

Appendix G

Evaporation Basin Water and Salt Balance Calculations for Three Climate Scenarios

Appendix G-1: Evaporation Basins Water and Salt Balance (Average Climate)

Month	Effective Rainfall[a] (AF)[b]	Adjusted Evaporation[c] (AF)	Flow From Collection Sumps[d] (AF)	Evaporation Basin Seepage[e] (AF)	Evaporation Basin Storage[f] (AF)	Evaporation Basin Surface Area[g] (Acres)	Collection Sump EC[h] (µS/cm)[i]	Evaporation Basin EC[j] (µS/cm)
January	23	17	58	15	139	175	9,991	18,999
February	20	30	58	14	173	176	9,991	17,076
March	17	57	58	15	176	177	9,991	18,624
April	5	85	58	15	140	177	11,144	26,035
May	3	112	58	15	73	176	11,144	53,121
June	0	123	58	15	0	175	11,144	300,000
July	0	123	58	0	0	173	9,330	300,000
August	0	110	58	0	0	173	9,330	300,000
September	1	84	58	0	0	173	9,330	300,000
October	6	58	58	0	7	173	11,472	300,000
November	6	29	58	0	42	173	11,472	65,219
December	19	16	58	15	90	174	11,472	27,600
Total:	**102**	**844**	**699**	**106**		**Weighted Average:**	*10,529* [k]	*28,241* [k]

Weighted Average Seepage EC[l], µS/cm: *32,539*

Notes:

(a) Effective rainfall based on MacGillivray and Jones, DWR 1989.

(b) AF = Acre Feet

(c) Evaporation adjusted based on salinity levels in pond.

(d) Flow from collection sumps at the Stone Ranch. Inputs include percolate from cropped fields collected in drain lines, shallow groundwater collected in the drain lines, and flow collected in the interceptor drains.

(e) Evaporation basin seepage estimated based on seepage rate of 1.0×10^{-6} cm/s (BSK, 1983).

(f) Evaporation basin storage based on inputs of previous month's storage, collection sump flow and rainfall; outputs of seepage and evaporation.

(g) Evaporation basin surface area calculated from storage using rating curve developed based on J.M. Lord 1983 evaporation basin design drawings.

(h) Electrical Conductivity (collection sump).

(i) µS/cm = microseimen per centimeter

(j) Electrical Conductivity (evaporation basins).

(k) Flow weighted average EC weighted based on volume in storage.

(l) Flow weighted average seepage EC weighted based on seepage volume.

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Appendix G-2: Evaporation Basins Water and Salt Balance (Wet Climate)

Month	Effective Rainfall[a] (AF)[b]	Adjusted Evaporation[c] (AF)	Flow From Collection Sumps[d] (AF)	Evaporation Basin Seepage[e] (AF)	Evaporation Basin Storage[f] (AF)	Evaporation Basin Surface Area[g] (Acres)	Collection Sump EC[h] (µS/cm)[i]	Evaporation Basin EC[j] (µS/cm)
January	50	14	59	15	229	176	9,991	14,555
February	24	22	59	14	276	178	9,991	13,482
March	5	59	59	15	265	179	9,991	15,485
April	11	73	59	15	246	179	11,144	18,361
May	1	109	59	15	182	178	11,144	26,890
June	0	131	59	15	95	177	11,144	54,274
July	0	128	59	15	11	175	9,330	300,000
August	0	114	59	0	0	173	9,330	300,000
September	0	86	59	0	0	173	9,330	300,000
October	6	56	59	0	9	173	11,472	300,000
November	16	30	59	0	54	173	11,472	63,108
December	69	14	59	15	150	174	11,472	20,400
Total:	**182**	**835**	**706**	**121**		**Weighted Average:**	*10,484* [k]	*25,124* [k]
						Weighted Average Seepage EC[l], µS/cm:		*28,548*

Notes:

(a) Effective rainfall based on MacGillivray and Jones, DWR 1989.

(b) AF = Acre Feet

(c) Evaporation adjusted based on salinity levels in pond.

(d) Flow from collection sumps at the Stone Ranch. Inputs include percolate from cropped fields collected in drain lines, shallow groundwater collected in the drain lines, and flow collected in the interceptor drains.

(e) Evaporation basin seepage estimated based on seepage rate of 1.0×10^{-6} cm/s (BSK, 1983).

(f) Evaporation basin storage based on inputs of previous month's storage, collection sump flow and rainfall; outputs of seepage and evaporation.

(g) Evaporation basin surface area calculated from storage using rating curve developed based on J.M. Lord 1983 evaporation basin design drawings.

(h) Electrical Conductivity (collection sump).

(i) µS/cm = microseimen per centimeter

(j) Electrical Conductivity (evaporation basins).

(k) Flow weighted average EC weighted based on volume in storage.

(l) Flow weighted average seepage EC weighted based on seepage volume.

Appendix G-3: Evaporation Basins Water and Salt Balance (100-Year Return Climate)

Month	Effective Rainfall[a] (AF)[b]	Adjusted Evaporation[c] (AF)	Flow From Collection Sumps[d] (AF)	Evaporation Basin Seepage[e] (AF)	Evaporation Basin Storage[f] (AF)	Evaporation Basin Surface Area[g] (Acres)	Collection Sump EC[h] (µS/cm)[i]	Evaporation Basin EC[j] (µS/cm)
January	78	17	59	15	315	178	9,991	19,618
February	69	31	59	14	398	180	9,991	16,310
March	57	58	59	15	440	182	9,991	15,520
April	19	87	59	15	415	183	11,144	17,467
May	10	116	59	15	352	182	11,144	21,699
June	1	127	59	15	269	181	11,144	29,553
July	1	127	59	15	187	179	9,330	43,165
August	2	113	59	15	119	177	9,330	66,656
September	3	85	59	15	81	176	9,330	92,706
October	22	58	59	15	88	175	11,472	76,815
November	22	30	59	15	124	175	11,472	50,613
December	64	16	59	15	210	176	11,472	28,700
Total:	**347**	**866**	**706**	**182**		**Weighted Average:**	*10,484*[k]	*28,312*[k]

Weighted Average Seepage EC[l], µS/cm: *40,011*

Notes:

(a) Effective rainfall based on MacGillivray and Jones, DWR 1989.

(b) AF = Acre Feet

(c) Evaporation adjusted based on salinity levels in pond.

(d) Flow from collection sumps at the Stone Ranch. Inputs include percolate from cropped fields collected in drain lines, shallow groundwater collected in the drain lines, and flow collected in the interceptor drains.

(e) Evaporation basin seepage estimated based on seepage rate of 1.0×10^{-6} cm/s (BSK, 1983).

(f) Evaporation basin storage based on inputs of previous month's storage, collection sump flow and rainfall; outputs of seepage and evaporation.

(g) Evaporation basin surface area calculated from storage using rating curve developed based on J.M. Lord 1983 evaporation basin design drawings.

(h) Electrical Conductivity (collection sump).

(i) µS/cm = microseimen per centimeter

(j) Electrical Conductivity (evaporation basins).

(k) Flow weighted average EC weighted based on volume in storage.

(l) Flow weighted average seepage EC weighted based on seepage volume.