

**ALTERNATIVES ANALYSIS FOR TREATING WASTEWATER FROM  
NACO, SONORA, MEXICO IN THE UNITED STATES AT  
NACO, AZ WASTEWATER PONDS OR CITY OF BISBEE, AZ SAN  
JOSE WWTP**

**December 9, 2020**

**Prepared for:**

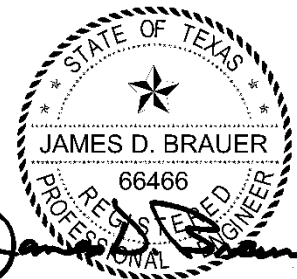
**U.S. ENVIRONMENTAL PROTECTION AGENCY  
REGION 9  
75 Hawthorn St. Street  
San Francisco, CA 94105-3901**



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**By:**

**Floyd Johnson, PE (AZ#49271)  
James D. Brauer, PE (TX#66466)  
Huitt-Zollars, Inc.  
5822 Cromo Drive, Suite 210  
El Paso, Texas 79912**



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## EXECUTIVE SUMMARY

### Background

Fugitive transboundary sanitary sewer overflows (SSOs) from the Naco, Sonora, Mexico wastewater system have affected both sides of the border for decades. The Naco, Sonora collection system and East Lagoon treatment ponds are undersized for current flows and surcharge during wet weather. The SSOs drain to the north and west toward Naco, AZ. This report evaluates the technical feasibility of three alternatives for mitigating these SSOs that focus on delivery of untreated wastewater from Naco, Sonora, Mexico to either of two locations in Arizona, USA. The two US sites are the Naco Sanitary District Wastewater Management Facility (NSD WMF) in Naco, AZ and the City of Bisbee, AZ San Jose Regional Wastewater Treatment Plant (SJWWTP) located southeast of Bisbee, AZ. The amount of flow proposed to be diverted to the US varies based on the alternative. The three alternatives evaluated are:

1. Provide an emergency connection from the existing Naco, Sonora Aduana Lift Station, located just east of the Naco, Sonora Port of Entry, to an existing 8-inch gravity sanitary sewer located in Second St. between S. Tanner Ave. and S. Giesler Ave in Naco, AZ. This option addresses a recommendation contained in Minute No. 273 of the Water Treaty of 1944.
2. Divert the total wastewater flow from Naco, Sonora East Lagoons to NSD for treatment and disposal. Based on direction from the North American Development Bank (NADBank), a 2020 average daily dry weather flow of 456,500 gpd ( $\approx 20$  l/s) will be used as the basis for design. The improvements will consist of the construction of a new gravity sanitary sewer from the Naco, Sonora East Lagoons, north along the Naco Highway to Greenbush Draw, then west, discharging to a new lift station at S. Wilson Rd. and W. Zepeda St. that discharges to a new wastewater treatment facility to be built on property owned by the NSD adjacent to its existing WMF. Treated effluent from the new NSD treatment facility will discharge to Greenbush Draw. Treated effluent will satisfy current Arizona Department of Environmental Quality (ADEQ) requirements for secondary treatment. Conventional stabilization ponds are not recognized by ADEQ as providing a secondary level of treatment. **The existing NSD WMF is permitted for 0.80 MGD. A new wastewater treatment facility will be required to treat the increased flow and satisfy ADEQ treatment requirements. The existing NSD WMF will be abandoned and closed.** The new treatment facility will include the current 0.80 MGD permitted capacity for Naco, AZ in its design. For the purposes of this evaluation, it is anticipated that the new treatment facility will mimic the existing SJWWTP. It is our understanding that effluent from the SJWWTP is considered to be Class “B+” reclaimed water as defined by 18 A.A.C. 11 (R18-11-305).
3. Divert the total wastewater flow from Naco, Sonora East Lagoons to a new wastewater treatment facility, to be constructed on the site of the existing SJWWTP, for treatment and disposal. A 2020 average daily dry weather flow of 456,500 gpd ( $\approx 20$  l/s) will be used as the basis for design. The existing SJWWTP has an average daily dry weather design capacity of 0.81 MGD and is permitted for 1.22 MGD. It is our understanding that effluent from the existing facility is considered to be Class “B+” reclaimed water as defined by 18 A.A.C. 11 (R18-11-305). None of the existing SJWWTP capacity will be used by Naco, Sonora. The improvements will consist of the construction of a gravity sanitary sewer, lift station, and force main from the Naco, Sonora East Lagoons connecting to the new wastewater treatment facility. The route for these improvements will generally be north along the Naco Highway to W. Purdy Lane, then east to the WWTP access road, S. Bob Kasun Way, then north to the WWTP. Discharge from the new facility will be to Greenbush Draw via a new gravity outfall line. For the purposes of this evaluation, it is anticipated that the new treatment facility will mimic the existing SJWWTP.

### Cost Summary

The costs associated with alternative are presented **Table ES-1**, below.

**Table ES-1**  
**Alternatives Cost Summary**

	Line Item Construction Costs	Non-Construction Costs	Total Project Cost	Annual O&M Costs
Alternative 1	\$531,750	\$212,700	\$744,450	\$12,000
Alternative 2	\$11,782,500	\$4,713,000	\$16,495,500	\$839,953
Alternative 3	\$10,616,100	\$4,246,440	\$14,862,540	\$731,193

## 1.0 PROJECT SCOPE

Fugitive transboundary sanitary sewer overflows (SSOs) from the Naco, Sonora, Mexico wastewater system have affected both sides of the border for decades. The Naco, Sonora collection system and East Lagoon treatment ponds are undersized for current flows and surcharge during wet weather. The SSOs drain to the north and west toward Naco, AZ. This report evaluates the technical feasibility of three alternatives for mitigating these SSOs that focus on delivery of untreated wastewater from Naco, Sonora, Mexico to either of two locations in Arizona, USA. The two US sites are the Naco Sanitary District Wastewater Management Facility (NSD WMF) in Naco, AZ and the City of Bisbee, AZ San Jose Regional Wastewater Treatment Plant (SJWWTP) located southeast of Bisbee, AZ. The amount of flow proposed to be diverted to the US varies based on the alternative. The three alternatives evaluated are:

4. Provide an emergency connection from the existing Naco, Sonora Aduana Lift Station, located just east of the Naco, Sonora Port of Entry, to an existing 8-inch gravity sanitary sewer located in Second St. between S. Tanner Ave. and S. Giesler Ave in Naco, AZ. This option addresses a recommendation contained in Minute No. 273 of the Water Treaty of 1944.
5. Divert the total wastewater flow from Naco, Sonora East Lagoons to NSD for treatment and disposal. Based on direction from the North American Development Bank (NADBank), a 2020 average daily dry weather flow of 456,500 gpd ( $\approx 20$  l/s) will be used as the basis for design. The improvements will consist of the construction of a new gravity sanitary sewer from the Naco, Sonora East Lagoons, north along the Naco Highway to Greenbush Draw, then west, discharging to a new lift station at S. Wilson Rd. and W. Zepeda St. that discharges to a new wastewater treatment facility to be built on property owned by the NSD adjacent to its existing WMF. Treated effluent from the new NSD treatment facility will discharge to Greenbush Draw. Treated effluent will satisfy current Arizona Department of Environmental Quality (ADEQ) requirements for secondary treatment. Conventional stabilization ponds are not recognized by ADEQ as providing a secondary level of treatment. The existing NSD WMF is permitted for 0.80 MGD. A new wastewater treatment facility will be required to treat the increased flow and satisfy ADEQ treatment requirements. The existing NSD WMF will be abandoned and closed. The new treatment facility will include the current 0.80 MGD permitted capacity for Naco, AZ in its design. For the purposes of this evaluation, it is anticipated that the new treatment facility will mimic the existing SJWWTP. It is our understanding that effluent from the SJWWTP is considered to be Class “B+” reclaimed water as defined by 18 A.A.C. 11 (R18-11-305).
6. Divert the total wastewater flow from Naco, Sonora East Lagoons to a new wastewater treatment facility, to be constructed on the site of the existing SJWWTP, for treatment and disposal. A 2020 average daily dry weather flow of 456,500 gpd ( $\approx 20$  l/s) will be used as the basis for design. The existing SJWWTP has an average daily dry weather design capacity of 0.81 MGD and is permitted for 1.22 MGD. It is our understanding that effluent from the existing facility is considered to be Class “B+” reclaimed water as defined by 18 A.A.C. 11 (R18-11-305). None of the existing SJWWTP capacity will be used by Naco, Sonora. The improvements will consist of the construction of a gravity sanitary sewer, lift station, and force main from the Naco, Sonora East Lagoons connecting to the new wastewater treatment facility. The route for these improvements will generally be north along the Naco Highway to W. Purdy Lane, then east to the WWTP access road, S. Bob Kasun Way, then north to the WWTP. Discharge from the new facility will be to Greenbush Draw via a new gravity outfall line. For the purposes of this evaluation, it is anticipated that the new treatment facility will mimic the existing SJWWTP.

**Figure 1** (see **Appendix A**) shows the project area with pertinent existing infrastructure and flood prone areas shown. The following project background provides a cursory history of the fugitive transboundary SSOs.

## 2.0 PROJECT BACKGROUND

### 2.1 International Boundary and Water Commission (IBWC)

Minute No. 273 of the Water Treaty of 1944 titled “Recommendations for the Solution of the Border Sanitation Problem at Naco, Arizona-Naco, Sonora” and dated March 19, 1987 states in part:

“The Commissioners observed that the border sanitation problem in the Naco, Arizona-Naco, Sonora area results from overflows of wastewater from the Naco, Sonora wastewater collection, treatment and disposal system into the natural drainage courses that flow northward across the international boundary. The Commissioners further observed that because of the topography, the natural drainage traverses a wellfield which provides the municipal water supply to the City of Bisbee, Arizona.”

Minute No. 273 (included as **Appendix B**) describes the history of the Naco, Sonora wastewater system that was originally constructed in the 1960s. The original system delivered collected wastewater to a lagoon system on the west side of town via two wastewater pumping stations. The West Lagoons were abandoned in the 1970s and wastewater was then delivered to a new lagoon system on the east side of town. Minute No. 273 describes a new project that would rehabilitate and reopen the West Lagoons using its effluent for irrigation. The intent of the project was to provide sufficient capacity to accommodate projected 1995 flows of 375,000 gpd (16.43 l/s) and contain all of the treated flows for use in Mexico. Effluent from the West Lagoons would be used to irrigate 62 acres of nearby lands that would be developed into croplands. Minute No. 273 states:

“...The Commissioners agreed that the rehabilitated lagoons would utilize the total wastewater load of the City of Naco, Sonora, since additional lagoon capacity will be provided to store the effluent during the rainy season when it is not needed for irrigation, the 62 acres (25 hectares) will be properly prepared for crops and properly irrigated, and the eastside system will be continually operated and maintained to provide irrigation to a proposed 44 acres (18 hectares) in that area”.

A wastewater pumping station (Aduana Lift Station) was included in the project, shown in **Figure 1**, that is located immediately east of the Port of Entry on the Sonoran side of the border. The lift station conveyed a portion of the City’s wastewater to the West Lagoons with the remainder going to the East Lagoons. Improvements to the East Lagoons would include expanding the existing 27 acres (11 hectares) of irrigated land by 17 acres (7 hectares) for a total of 44 acres (18 hectares). Flow to the East Lagoons would be limited to that amount of wastewater necessary for the irrigation of its 44 acre irrigation area. Minute No. 273 noted:

“...the important provision that as an emergency measure, the reserve lagoons would be available to provide additional capacity to store the effluent during the rainy season when it is not needed for irrigation...They noted that because the drainage from the 62 acres (25 hectares) is northward into a natural course which flows across the international boundary in the vicinity of the municipal wellfield that supplies the City of Bisbee, Arizona, it is suitable that proper land preparation and irrigation practices be followed and proper precautions be taken to prevent uncontrolled effluent from flowing into the natural drainage courses.”

Minute No. 273 continued:

“The Commissioners then concluded that the above described portion of the plans of the Government of the State of Sonora for improvement of the Naco, Sonora wastewater collection, treatment and disposal system provide a solution to the border sanitation problem for the design of 0.375 million gallons per day (16.48 litres per second) since the

design, construction, and operation and maintenance plans contemplate use of all of the wastewaters in Mexican territory, including those utilized in irrigation.”

Item No. 8 of the resolution presented in Minute No. 273 included a reference to Naco, AZ which states:

8. That the Commission study the need for an emergency connection between the Naco, Sonora wastewater collection system and the Naco, Arizona wastewater, collection and disposal system.”

**Alternative 1** evaluated herein addresses Item No. 8.

### **3.0 ALTERNATIVES ANALYSIS**

#### **3.1.0 Alternative 1 - Emergency Connection With Naco, AZ**

**Figure 2** shows the NSD wastewater collection system and pond locations taken from the original design plans from August 1979. The NSD collection system discharges to the pond system as shown in **Figure 3**. Stabilization Ponds 1 and 2 can be operated in parallel or in series. The polishing pond (Pond 3) can receive wastewater from Ponds 1 and 2 independently in parallel operation or from Pond 2 when operated in series. Incoming flow enters the headworks structure shown in **Figure 4**. The headworks structure consists of a manual bar screen, a 60° V-notch weir measuring device, and a discharge box with a splitter plate intended to allow flow to be split evenly between Ponds 1 and 2. The ponds are currently operated in series mode with all incoming flow being directed to Pond 1 where it flows through Pond 2 and Pond 3 sequentially. Huitt-Zollars’ analysis does not include an evaluation of the ponds ability to accommodate flows in excess of its 0.80 MGD permitted capacity. This analysis only evaluates the additional capacity that can be supported by the collection system and the headworks structure without causing an unacceptable level of surcharge in the collection system or creating a condition in the headworks structure that would prevent accurate measurement of the flow entering the structure.

Referring to **Figure 4**, the 60° V-notch weir limits the hydraulic capacity of the headworks structure. The weir is cut into a steel weir plate. This analysis assumes that the maximum allowable flow through the inlet structure cannot inundate the weir. To that end, Huitt-Zollars assumes that flow through the weir should be allowed to discharge with a gap of 3/4" between the highest water level and the top of the weir cutout. Water levels through the weir are shown for 0.035 MGD, 0.0754 MGD, and the maximum estimated flow of 0.454 MGD. The maximum flow occurs at a water depth of 9 inches above the lowest part of the weir. The maximum height of the weir is 9.75 inches. For the purposes of this evaluation, a maximum allowable flow rate of 0.454 MGD (454,357 gpd, 19.91 l/s) will be used to evaluate the capacity of the collection system.

**Figure 5** shows the proposed emergency interconnect between Naco, Sonora and the NSD, as well as, the NSD collection system in Naco, AZ. The proposed emergency connection will include modifications to the existing lift station in Naco, Sonora, a PVC force main to Naco, AZ, and a connection to the NSD collection system in Second St., between S. Tanner Ave. and S. Giesler Ave. A review of the as-built plans for the collection system shows that the minimum slope in the collection system occurs between MH B12 and MH B11. The slope is 0.21%. The next downstream pipe segment has a slope of 0.23%. The collection system consists of 8-inch SDR-35 PVC in this area. The full pipe capacity for an 8-inch SDR-35 PVC pipe at 0.21% using a Manning’s “n” value of 0.013 is 348,418 gpd (242 gpm, 15.27 l/s).

In order to determine the capacity available to Naco, Sonora, it is necessary to identify the potential flow that could be generated by Naco, AZ at this location. Influent flows to the ponds were reviewed for the period January 2015 through March 2020. This review indicated that the average daily flow entering he



facility is approximately 35,000 gpd (1.53 l/s). The largest daily flow on record is 75,000 gpd (3.29 l/s) that occurred on February 8 and February 17 of 2020. For the purposes of this evaluation, the average daily dry weather flow of 35,000 gpd will be used in conjunction with a wet weather peaking factor to estimate the peak wet weather flow expected for the system. Records for the City of Bisbee San Jose Wastewater Treatment Plant show that a wet weather peaking factor of 3.02 was used in its design. For the purposes of this evaluation, a peak wet weather factor of 3.00 will be used. When applied to the 35,000 gpd average daily dry weather flow, the peak wet weather instantaneous flow through the system could be 105,000 gpd (4.60 l/s). The estimated available capacity available for Naco, Sonora was determined by subtracting 105,000 gpd from the 454,357 gpd maximum allowed flow through the 60° V-notch weir in the WMF headworks structure. The flow allocated for Naco, Sonora is 349,357 gpd (243 gpm, 15.31 l/s).

**Figure 5** shows a simplified approach to flow distribution in Naco, AZ used for developing a computer model for the system. This distribution of flows was input to SewerCAD to show estimated hydraulic grade lines in the collection system. Total daily flows were prorated and inserted into the collection system at the locations shown with the flow from Naco, Sonora being inserted at the identified location. The estimated potential flow at MH B12 is 428,107 gpd (18.76 l/s). A review of the modeling results show that a minimum surcharge will occur at this location with a water depth of 0.95 feet. No other surcharging occurs within the system. Thus, for the purposes of this evaluation, the Aduana Lift Station in Naco, Sonora should be designed for a maximum flow of 349,357 gpd (243 gpm, 15.31 l/s).

### 3.1.1 Recommended Improvements for Naco, Sonora Emergency Connection

**Figure 5** shows the location of the existing Aduana Lift Station and a proposed alignment for delivering wastewater to the NSD collection system via a 4-inch AWWA C-900 DR-18 PVC force main. **Figure 6** shows the results of a water model developed to size the proposed pumps at the lift station. Based on ground elevations taken from Google Earth and known depths for the existing NSD sanitary sewer, the initial model indicated that the design point for the system is approximately 243 gpm at 18.70 feet total dynamic head (TDH). The Xylem pump selection software for Flygt submersible pumps was used to identify a candidate pump for the lift station. From the software, a Flygt model NP 3085 MT 3 ~ Adaptive 462 pump with a variable frequency drive will provide adequate capacity for the lift station. The design point for this pump is 267 gpm at 22.68 ft TDH.

Retrofitting these pumps into the existing lift station can be accomplished using a Flygt above ground style valve vault. Use of an above ground valve vault will simplify installation and reduce excavation requirements. **Figure 7** through **Figure 9** show the proposed approach for retrofitting the Aduana Lift Station. Improvements will include a recirculation line that will allow maintenance staff to exercise the pumps on a routine basis without sending wastewater to the NSD system, as well as an upstream sedimentation basin that will reduce the amount of sediment and debris delivered to the NSD system.

### 3.1.2 Estimated Cost of Naco, Sonora Emergency Connection

Referring to **Appendix C, Table 2** summarizes the preliminary capital costs associated with US Alternative 1. The subtotal cost for construction line items is \$531,750. Miscellaneous costs associated with engineering related services are \$212,700. Total estimated construction cost for US Alternative 1 is \$744,450. Due to the unknown operating schedule for US Alternative 1 it is not possible to develop an annual O&M cost; however, assuming that weekly maintenance will be performed on the lift station to ensure its ability to function in an emergency, an annual O&M cost of \$12,000 will be assumed for cost comparison purposes.



### 3.2.0 Alternative 2 - Diversion of Flow From Naco, Sonora East Lagoons to New NSD Treatment Facility

**Figure 10** shows the improvements evaluated for this alternative. All flow currently entering the Naco, Sonora East Lagoons will be diverted at the location shown, immediately upstream of the East Lagoons. A new manhole will be inserted into the Naco, Sonora East Interceptor. From this manhole a new sanitary sewer interceptor will be constructed across the United States/Mexico Border. The new interceptor will continue north along the east right-of-way of the Naco Highway to a point south of Greenbush Draw. The new interceptor will cross the Naco Highway to the west and assume an assignment generally along the south bank of Greenbush Draw. The interceptor will end at a proposed lift station tentatively located west of S. Wilson Rd. near W. Zepeda St. The existing 8-inch NSD sanitary sewer will be rerouted to connect to the proposed lift station. The proposed lift station will discharge to a new force main that will run parallel to the existing NSD sanitary sewer to the northwest bank of Greenbush Draw adjacent to the southeast edge of the existing NSD WMF. The force main will terminate at the proposed NSD WWTP. For the purposes of this report, it is assumed that the unused portion of the existing WMF Storage Pond (Pond 4) is large enough to contain the proposed facility using the existing SJWWTP footprint as a guide.

#### 3.2.1 Basis of Design

NADBank has directed Huitt-Zollars to use 20 l/s ( $\approx 456,500$  gpd) as the 2020 average dry weather flow for the baseline for the design of the improvements. Projected 2040 wastewater flows will be used to size the proposed infrastructure. Historical population counts have been used to develop a 2040 projected wastewater design flow. The population of Naco, Sonora was estimated to be 5,733 persons in 1996. The 2018 population for Naco, Sonora was estimated to be 6,401 persons. This represents an annual growth rate of approximately 0.502% between 1996 and 2018. Using this growth rate, the estimated 2020 population for Naco, Sonora is 6,465 persons. Using 456,500 gpd as the average daily dry weather baseline flow for 2020, the per capita wastewater generation is estimated be 70.61 gpd. The estimated population for 2040 is 7,146, using a 0.502% annual growth factor. The estimated 2040 dry weather design flow is, therefore, 504,586 gpd (22.11 l/s).

Wastewater infrastructure design uses several multiplying factors to size the various elements of a collection and treatment system. Gravity collection systems, lift stations, and force mains are typically sized based on peak wet weather flow. The peak wet weather flow is estimated by first establishing an estimated peak dry weather flow. 18 A.A.C. 9 (R18-9-E301.4.01D.1.i.) provides a method for determining the peak dry weather flow based on population. For populations ranging between 1,001 and 10,000 persons, the dry weather peaking factor is calculated as:

$$\text{Dry Weather Peaking Factor (PF)} = (6.330 \times p^{-0.231}) + 1.094 \quad (1)$$

where,

p = population

For the 2020 population of 6,465 persons, PF is 1.93. For the 2040 population of 7,146 persons, PF is 1.91. Due to the arid climate of the region, and assuming that improvements to the Naco, Sonora wastewater collection system will reduce I/I in the system, it will be assumed that the peak wet weather flow will be approximately 135% greater than the peak dry weather flow; thus, the peak wet weather factor used for this analysis is 2.60. Treatment facilities are generally designed based on the average daily dry weather flow for biological treatment purposes and the maximum monthly flow for hydraulic capacity purposes. A

maximum month flow factor of 1.50 will be used for this analysis. This maximum monthly flow factor was used for the design of the SJWWTP.

Design flow development is summarized in the following table.

**Table 1**  
**Naco, Sonora Wastewater Projections To 2040**

Year	Population	Q <sub>Avg Dry</sub> gpd	(Q <sub>Peak Dry</sub> ) gpd	(Q <sub>Peak Wet</sub> ) gpd	(Q <sub>Max Month</sub> ) gpd
2020	6,465	456,500	881,045	1,186,900	684,750
2040	7,146	504,586	963,759	1,311,924	757,284

### 3.2.2 Gravity Collection System

**Figure 10** shows that there is a 47-foot loss in ground elevation over the approximate 9,155-ft length of the proposed gravity interceptor that results in a ground slope of -0.51%. A topographic survey is not available for the alignment at this time; thus, for the purposes of this evaluation it is assumed that the shallowest interceptor slope required along the alignment will be 50% of the ground slope, or approximately 0.25%. 18 A.A. C. 9 (R18-9-E301.4.01.D.2.e.) requires that sewer lines have a minimum slope capable of providing a velocity of 2.0 fps when flowing full using a Manning’s “n” value of 0.013 and not exceed 0.75 d/D at peak dry weather flow. A 12-inch SDR-35 PVC gravity interceptor with a minimum slope of -0.25% has a carrying capacity of 1.095 MGD at 2.24 fps when flowing full and 0.999 MGD at 2.54 fps at 0.75 d/D but cannot provide capacity for the projected peak wet weather flow since the maximum flow that a 12-inch pipe can carry at -0.25% slope is 1.179 MGD at 0.94 d/D. A 15-inch SDR-35 PVC gravity interceptor with a minimum slope of -0.25% has a carrying capacity of 1.881 MGD at 2.56 fps when flowing full and 1.715 MGD at 2.91 fps at 0.75 d/D. For the 2020 average daily dry weather flow of 456,500 gpd, the velocity is 2.11 fps at 0.34 d/D while the 2040 peak wet weather flow of 1,311,924 gpd has a velocity of 2.77 fps at 0.61 d/D. A 15-inch SDR-35 PVC interceptor is recommended for this alternative.

### 3.2.3 Lift Station and Force Main

The existing stabilization pond system does not have capacity to serve the projected flows from Naco, Sonora; thus, a new treatment plant is required. Greenbush Draw must be crossed to access the proposed plant site. For the purposes of this evaluation, it is assumed that a new lift station will be required to cross Greenbush Draw and discharge to the headworks of the new facility. The location of the proposed lift station was selected to optimize access and place it higher than the designated flood prone areas that abut the existing siphon location shown in **Figure 10**. The proposed force main is shown running parallel to the existing 8-inch NSD sanitary sewer with the expectation that it will be constructed on the same properties as the existing sanitary sewer.

The proposed lift station will be sized to accommodate the projected 2040 peak wet weather flow of 1.312 MGD (911 gpm, 57.48 l/s) from Naco, Sonora and a 105,000 gpd peak wet weather flow from Naco, AZ with a total capacity of 1.417 MGD (984 gpm, 62.08 l/s). **Figure 11** shows water model results based on estimated elevations, line sizes, and line lengths. The Xylem selection software for Flygt submersible pumps was used to select a 10 hp NP 3127 LT 3 ~ Adaptive 425 submersible pump with a design point of 1,096 gpm at 24.10 ft TDH. Variable frequency drives are recommended to pace the loading on the treatment plant to match incoming flow requirements. **Figure 12** shows a schematic of the proposed configuration of the lift station with an above ground valve vault, similar to that proposed for the Naco,

Sonora lift station improvements. A magnetic flow meter will be provided in a separate manhole to provide feedback to the pump controls. Additional items proposed for this lift station include:

- 460V/3 $\phi$ /60Hz power
- Emergency generator
- SCADA capability
- Monopole antenna
- Access road
- Security fence
- Site lighting

### 3.2.4 NSD Wastewater Treatment Facility to Serve Naco, Sonora

For the purposes of this analysis, it is assumed that an extended aeration treatment system similar to that used at the City of Bisbee San Jose WWTP will be used at Naco, AZ. For planning purposes, the footprint of the SJWWTP is used to show the maximum possible footprint of the proposed facility. **Figure 13** shows the proposed location of the new NSD WWTP in the southwest end of the existing WMF Storage Pond. The existing NSD WMF sees an average daily flow of approximately 35,000 gpd which is 44% of its permitted capacity. It is our understanding that the Storage Pond does not receive enough effluent to fill and, based on a review of historic satellite imagery from Google Earth, it does not appear that more than the first 50% of the pond has seen an appreciable amount of water. Further consideration of this concept is required, but the primary purpose for showing this location for the proposed WWTP is to show the land requirement, not necessarily its final location. Adequate land is available in the existing irrigation field if this approach proves to be unacceptable. The existing and proposed NSD treatment facilities are shown to be in flood prone areas; however, the Storage Pond has a berm surrounding it that protects it from inundation and the irrigation field is largely outside the designated flood areas.

The SJWWTP is sized for an average dry weather flow of 0.81 MGD and a maximum monthly flow of 1.22 MGD. The proposed NSD WWTP will have an average daily dry weather design flow of 580,000 gpd and a maximum monthly flow of 870,000 gpd, which includes the 80,000 gpd permitted capacity for Naco, AZ. The proposed NSD WWTP would have approximately 72% of the capacity of the SJWWTP.

The SJWWTP is a sequencing batch reactor (SBR) type facility that achieves the required secondary level of treatment and can produce, at a minimum, Class “B+” reclaimed water, as defined by ADEQ. Discharge of treated effluent will be to Greenbush Draw at a location acceptable to ADEQ and down gradient from the City of Bisbee well field.

### 3.2.5 Estimated Cost for Diversion of Naco, Sonora Wastewater Flows to NSD

Referring to **Appendix C, Table 3** summarizes the preliminary capital costs associated with US Alternative 2. The subtotal cost for construction line items is \$11,782,500. Miscellaneous costs associated with engineering related services are \$4,713,000. Total estimated construction cost for US Alternative 2 is \$16,495,500. **Table 4** summarizes anticipated costs associated with the operation and maintenance of the proposed improvements. The O&M costs are based on the 2020-2021 budget for the City of Bisbee for its wastewater operations. The City of Bisbee budget items have been adjusted to approximate the percentage of cost that may be incurred by NSD. These estimates will be revised prior to the final submittal. Annual personnel expenses are estimated to be \$98,984 while non-personnel expenses are estimated to be \$740,969. It is assumed that a contractor will be hired to operate the new collection system, lift station, and

treatment plant similar to how the City of Bisbee has contracted with Jacobs to operate its San Jose WWTP. The total estimated annual O&M costs for US Alternative 2 is \$839,953.

### **3.3.0 Alternative 3 - Diversion of Flow From Naco, Sonora East Lagoons to New City of Bisbee Treatment Facility**

**Figure 14** shows the improvements evaluated for this alternative. All flow currently entering the Naco, Sonora East Lagoons will be diverted at the location shown immediately upstream of the East Lagoons. A new manhole will be inserted into the Naco, Sonora East Interceptor. From this manhole a new sanitary sewer interceptor will be constructed across the US/Mexico Border. The interceptor will discharge to a new lift station immediately north of the US/Mexico border. The lift station will discharge to a new force main that will extend north along the east right-of-way of the Naco Highway to W. Purdy Ln., turning east along the south right-of-way of W. Purdy Ln. to S. Bob Kasun Way, terminating at a new wastewater treatment facility that will serve the 2040 Naco, Sonora flows.

#### **3.3.1 Gravity Collection System**

Based on sizing criteria developed in Section 3.2.2, the proposed gravity interceptor will consist of 15-inch SDR-35 PVC pipe constructed at a slope of -0.25%. The 15-inch interceptor will discharge to a new lift station immediately north of the US/Mexico border.

#### **3.3.2 City of Bisbee Lift Station From Naco, Sonora to SJWWTP**

A new lift station sized to accommodate the 2040 wet weather peak flow from Naco, Sonora will be constructed in the location shown in **Figure 14**. The 2040 wet weather peak flow is estimated to be 1,312,000 gpd (911 gpm, 57.48 l/s). **Figure 15** shows water model results based on estimated elevations, line sizes, and line lengths. The Xylem selection software for Flygt submersible pumps was used to select a 70 hp NP 3202 HT 3 ~ 465 submersible pump. Variable frequency drives are recommended to pace the loading on the treatment plant to match incoming flow requirements. **Figure 16** shows a schematic of the proposed configuration of the lift station with an above ground valve vault, similar to that proposed for the Naco, Sonora lift station improvements. A magnetic flow meter will be provided in a separate manhole to provide feedback to the pump controls. Additional items proposed for this lift station include:

- 460V/3 $\phi$ /60Hz power
- Emergency generator
- SCADA capability
- Monopole antenna
- Access road
- Security fence
- Site lighting

#### **3.3.3 New City of Bisbee Wastewater Treatment Plant to Serve Naco, Sonora**

**Figure 17** shows an enlarged view of the proposed lift station site along with a tentative location for the new treatment plant to serve Naco, Sonora. The proposed facility is intended to mirror the existing plant. The footprint shown is the same as the existing facility and is shown for comparative purposes recognizing that the new facility will be sized for 500,000 gpd (21.90 l/s) and not 810,000 gpd. The SJWWTP is a sequencing batch reactor (SBR) type facility that achieves the required secondary level of treatment and can produce, at a minimum, Class “B+” reclaimed water, as defined by ADEQ. Discharge of treated effluent will be to Greenbush Draw at a location acceptable to ADEQ. A new outfall line will be required

to discharge to Greenbush Draw. It is anticipated that the outfall line will be a 15-inch gravity line paralleling the existing outfall. Huitt-Zollars is awaiting confirmation of the location of the existing outfall line at this time.

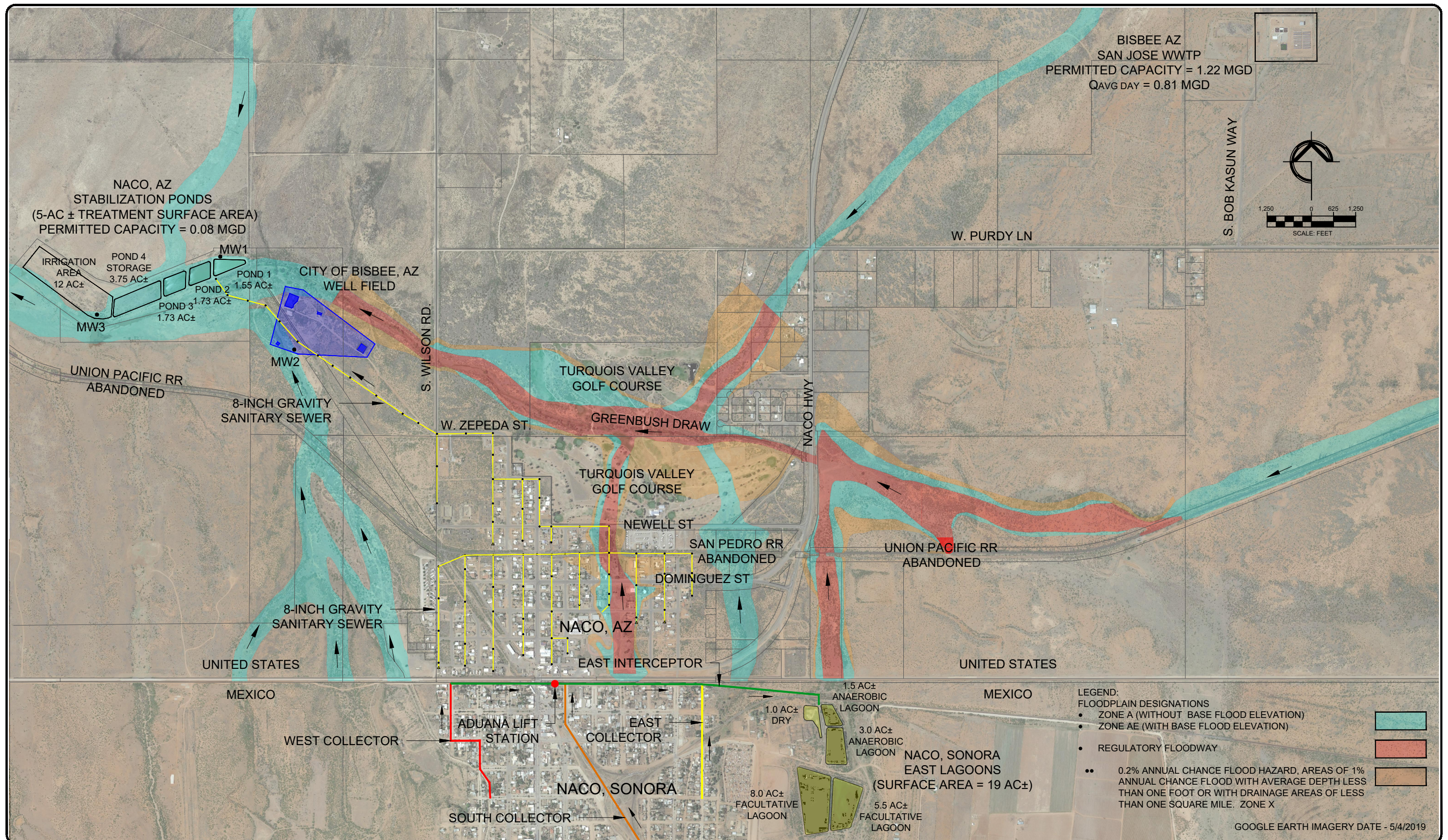
#### **3.3.4 Estimated Cost for Diversion of Naco, Sonora Wastewater Flows to the City of Bisbee SJWWTP**

Referring to **Appendix C, Table 5** summarizes the preliminary capital costs associated with US Alternative 3. The subtotal cost for construction line items is \$10,616,100. Miscellaneous costs associated with engineering related services are \$4,246,440. Total estimated construction cost for US Alternative 3 is \$14,862,540. **Table 6** summarizes anticipated costs associated with the operation and maintenance of the proposed improvements. The O&M costs are based on the 2020-20201 budget for the City of Bisbee for its wastewater operations. The City of Bisbee budget items have been adjusted to approximate the percentage of cost that may be incurred by NSD. These estimates will be revised prior to the final submittal. Annual personnel expenses are estimated to be \$98,984 while non-personnel expenses are estimated to be \$632,209. It is assumed that the City of Bisbee will expand its contract with Jacobs to operate its San Jose WWTP. The total estimated annual O&M costs for US Alternative 3 is \$731,193.

# **Appendix A**

## **Figures**





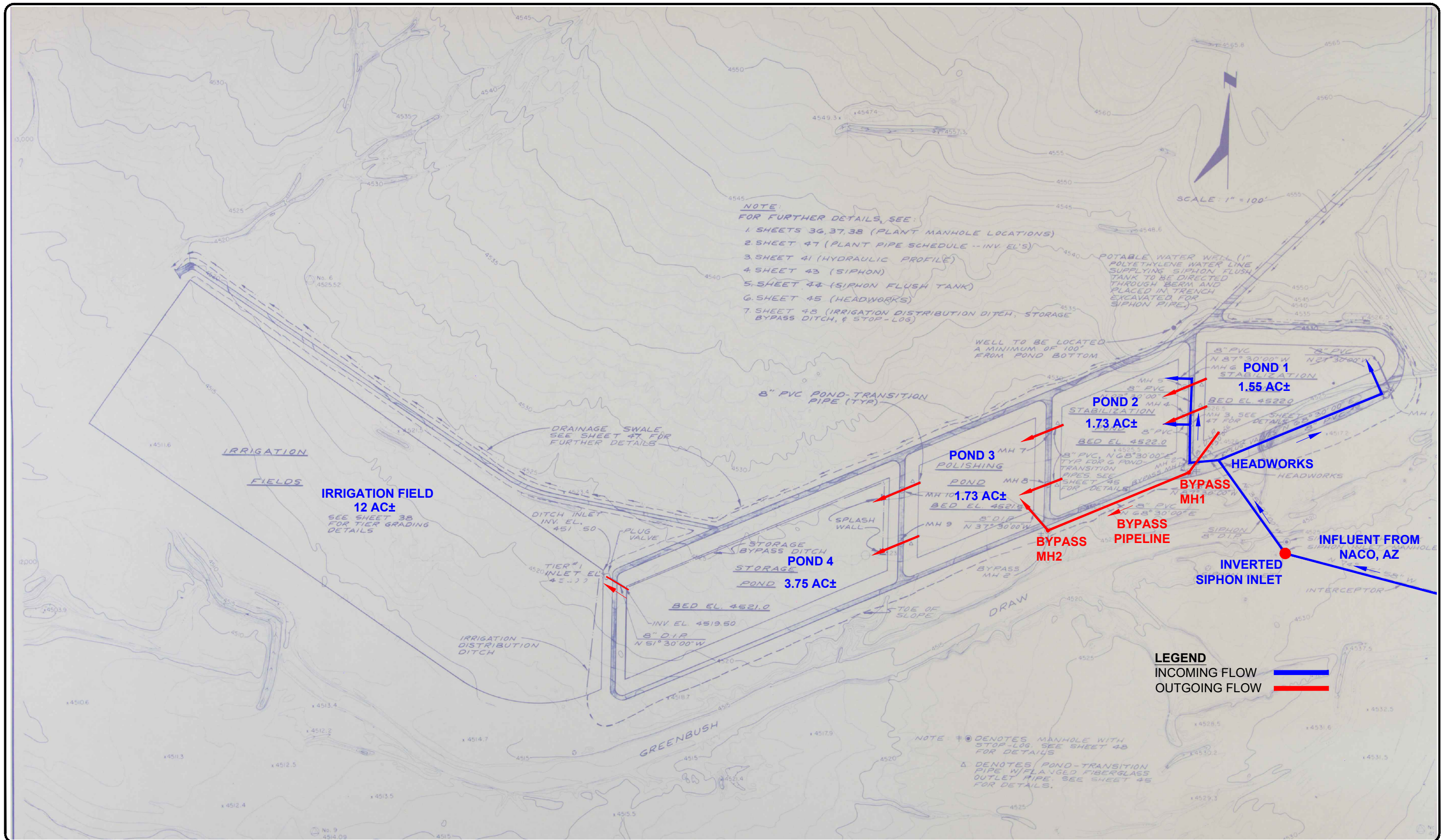




TRANSBOUNDARY FLOW ANALYSIS, INFRASTRUCTURE DIAGNOSTIC, AND ALTERNATIVES ANALYSIS

FIGURE 2  
 NACO SANITARY DISTRICT WASTEWATER SYSTEM LAYOUT

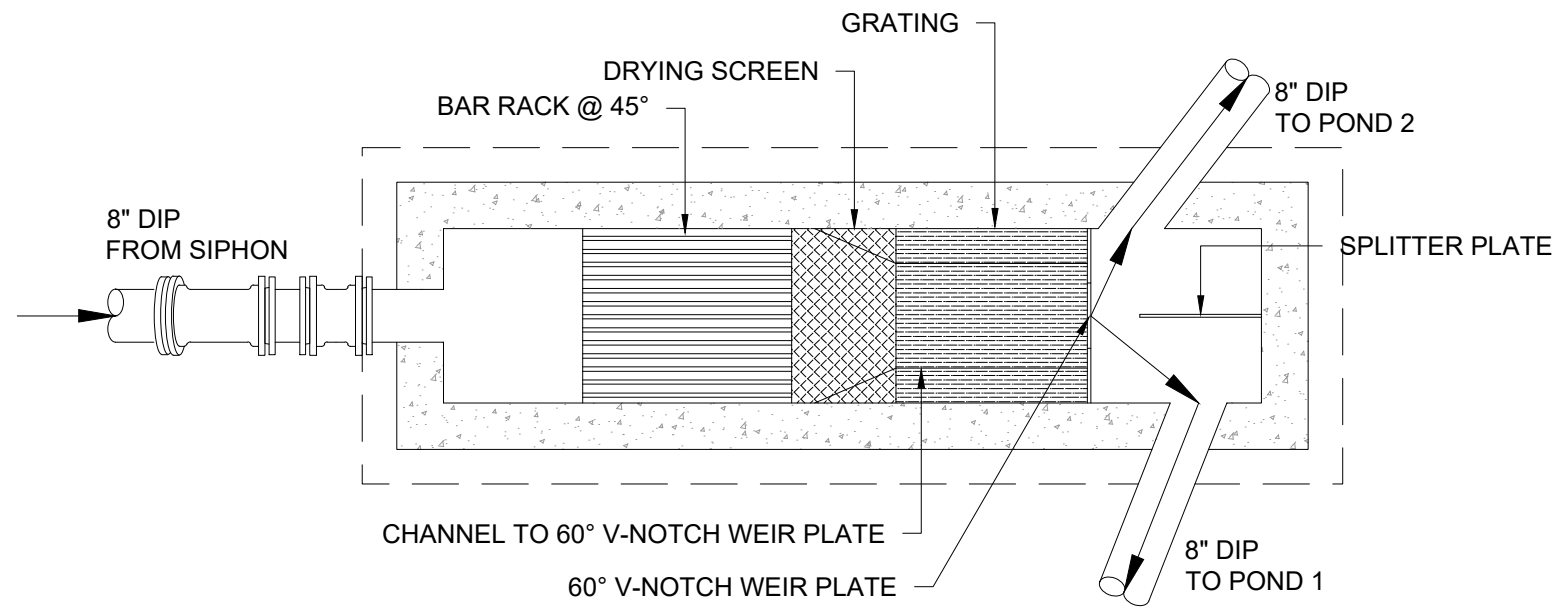




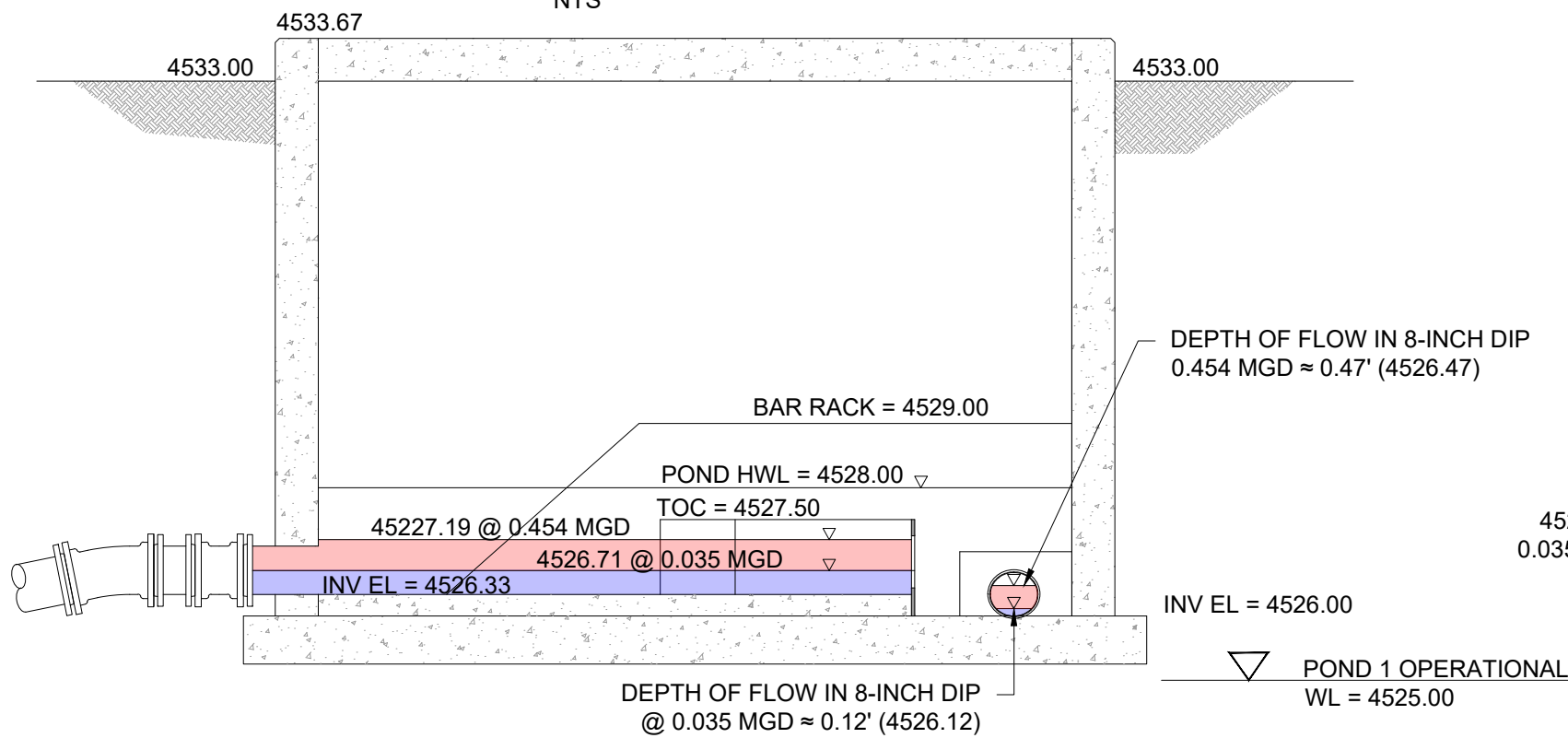
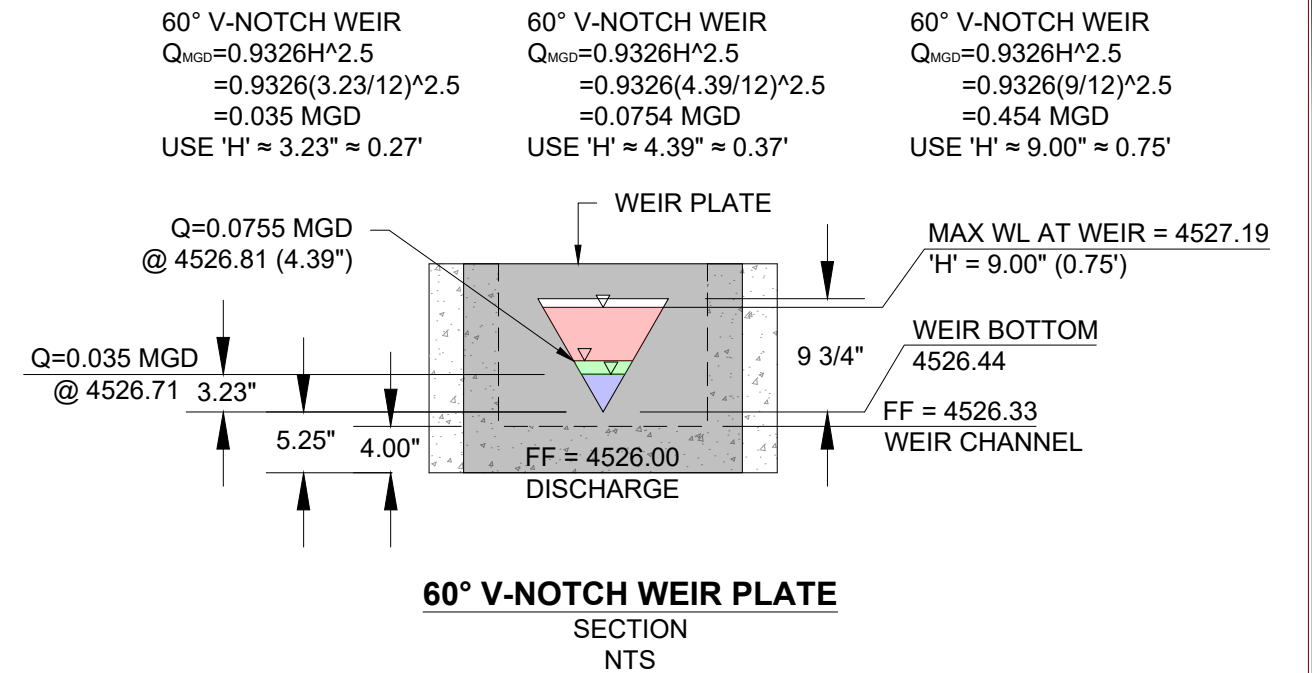
TRANSBOUNDARY FLOW ANALYSIS, INFRASTRUCTURE DIAGNOSTIC, AND ALTERNATIVES ANALYSIS

FIGURE 3

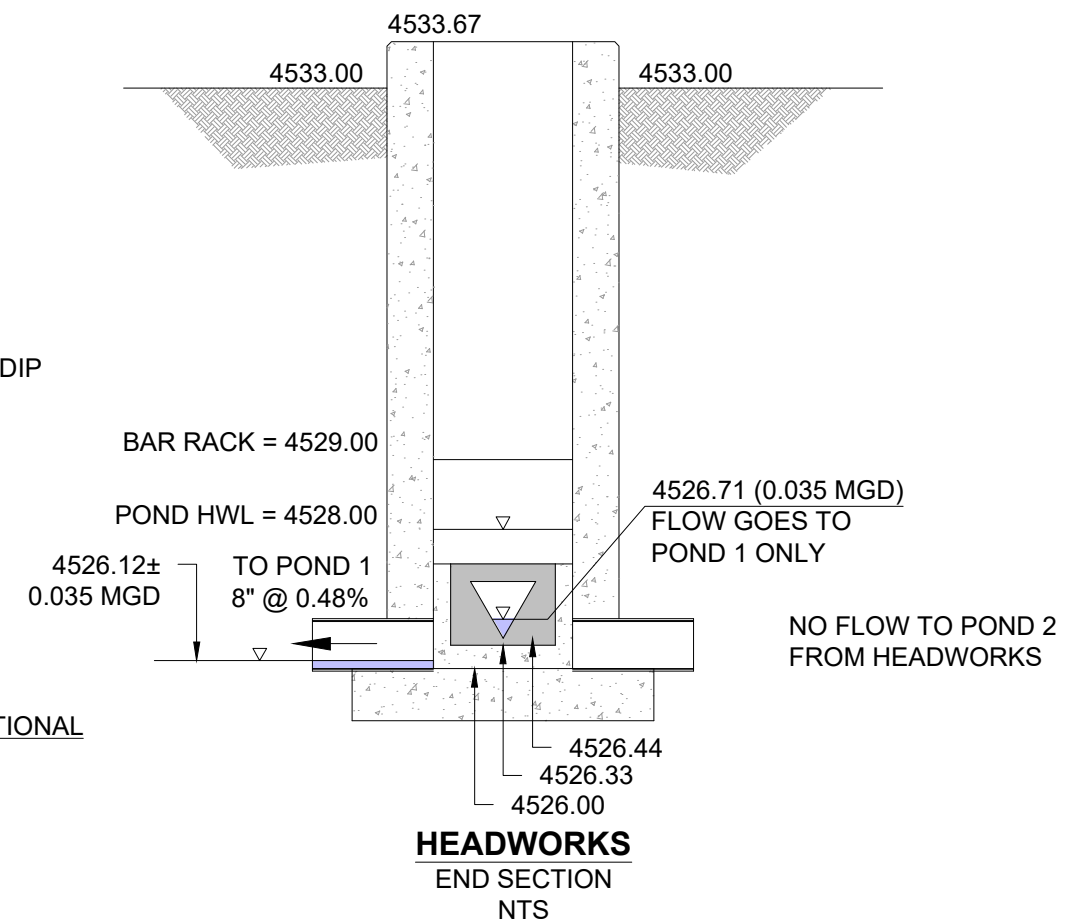
OVERVIEW OF NACO SANITARY DISTRICT WASTEWATER MANAGEMENT FACILITY



**HEADWORKS**  
PLAN  
NTS



**HEADWORKS**  
ELEVATION  
NTS





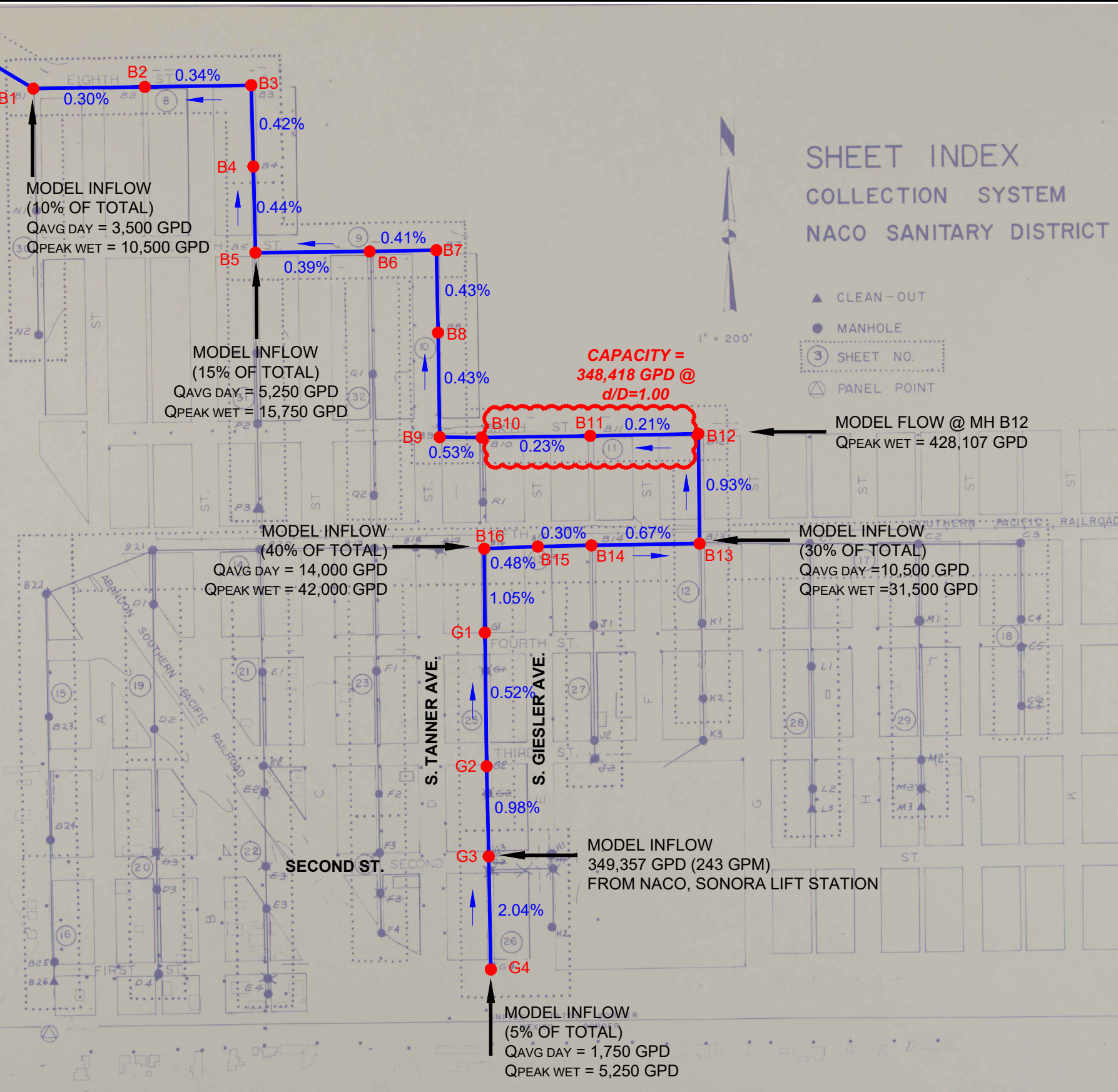
**COMMENTS:**

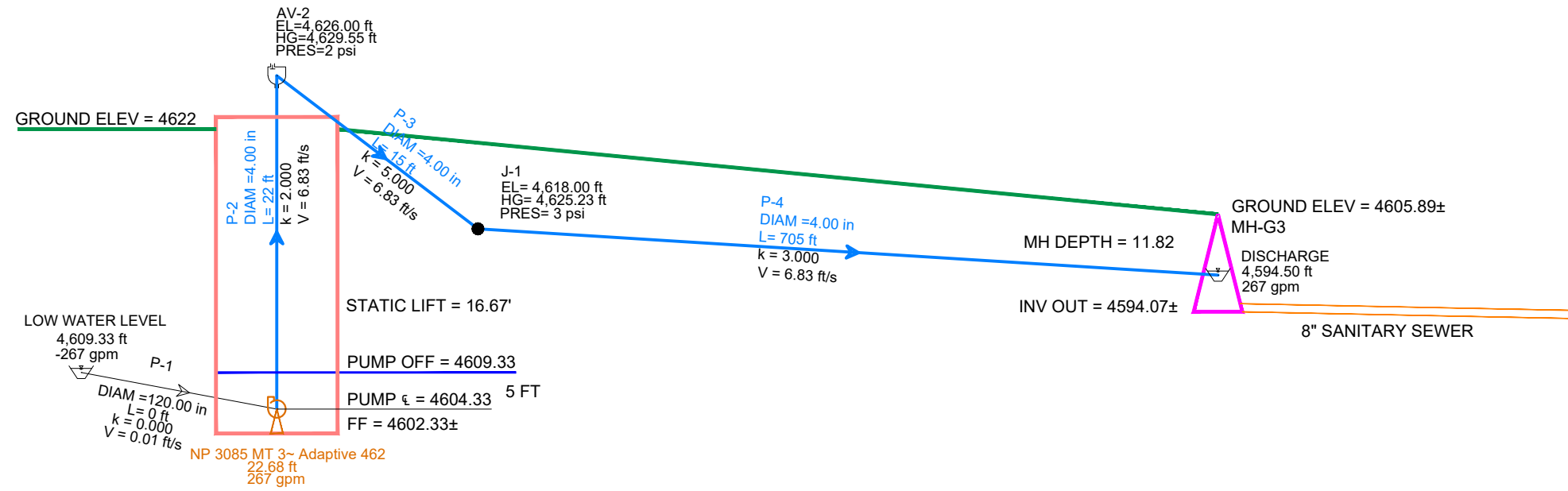
1. CURRENT POPULATION ≈ 833 PERSONS
2. Q<sub>AVG DAY</sub> = 35,000 GPD.
3. ASSUME WET WEATHER PEAK FACTOR = 3.00 (SIMILAR TO CITY OF BISBEE SAN JOSE WASTEWATER TREATMENT PLANT DESIGN CRITERIA).
4. Q<sub>PEAK WET</sub> = 105,000 GPD (73 GPM).
5. LIMITING FEATURE OF SYSTEM IS INFLUENT HEADWORKS V-NOTCH WEIR.
6. MAXIMUM RECOMMENDED FLOW THROUGH WEIR = 454,357 GPD.
7. AVAILABLE CAPACITY FOR NACO, SONORA = 349,357 GPD (243 GPM, 15.31 L/S).
8. LIMITING SECTION OF SANITARY SEWER IS BETWEEN MH B12 AND MH B11 WITH SLOPE OF 0.21%.
9. FULL PIPE CAPACITY OF 8-INCH PVC @ 0.21% = 348,418 GPD (242 GPM).
10. MODELING RESULTS FROM SEWERCAD SHOW NOMINAL SURCHARGING WITH A WATER DEPTH OF 0.95 FT AT MH B12 BASED ON LOADING IN MODEL.
11. USE **243 GPM** AS DESIGN FLOW FOR THE RENOVATED ADUANA LIFT STATION AT NACO, SONORA PORT OF ENTRY.
12. INFLOW TO NSD PONDS = 454,357 GPD (315.53 GPM, 19.91 L/S).
13. CURRENT Q<sub>AVG DAY</sub> FOR NACO, SONORA = 926,000 GPD (643 GPM).
14. NET FLOW TO NACO, SONORA EAST LAGOONS = 926,000 GPD - 349,357 GPD = 576,643 GPD ≈ 25.26 L/S.
15. APPROX. 38% REDUCTION IN FLOWS.



Q<sub>PEAK WET</sub> = 454,357 GPD  
(NSD + NACO, SONORA)

0.80%  
TO LAGOONS





REFER TO FIGURE 5 FOR LOCATION OF THE ADUANA LIFT STATION AND PROPOSED FORCE MAIN ALIGNMENT

**NP 3085 MT 3~ Adaptive 462**  
Technical specification

Motor number	Phases	Rated speed	Rated power
NP3085-000-15-10-4AL-W	3 $\phi$	1710 rpm	3 hp
ATIS approved no.	Number of poles	Rated current	Motor variant
4	4	3.1 A	60
Frequency	Rated voltage	Insulation class	Type of Duty
60 Hz	230 V	H	S1
Version code	000		

**NP 3085 MT 3~ Adaptive 462**  
Duty Analysis

Curves according to: Water, pure (100%); 4 °C; 999.9 kg/m<sup>3</sup>; 1.5692 mm<sup>2</sup>/s

Flow	Head	Shaft power	Flow	Head	Shaft power	Eff. a.H.	Specific Energy	NP Size
319 US g.p.m.	20.9 ft	2.7 hp	319 US g.p.m.	20.9 ft	2.7 hp	62.5%	0.033 kWh/m <sup>3</sup>	3.2 ft

2" Guide bars

DN 80

VIEW Z-Z

Weight (kg)
Pump
Disch
69
35
104



TRANSBOUNDARY FLOW ANALYSIS, INFRASTRUCTURE DIAGNOSTIC, AND ALTERNATIVES ANALYSIS

FIGURE 6  
NACO, SONORA ADUANA LIFT STATION AND FORCE MAIN - WATER MODEL

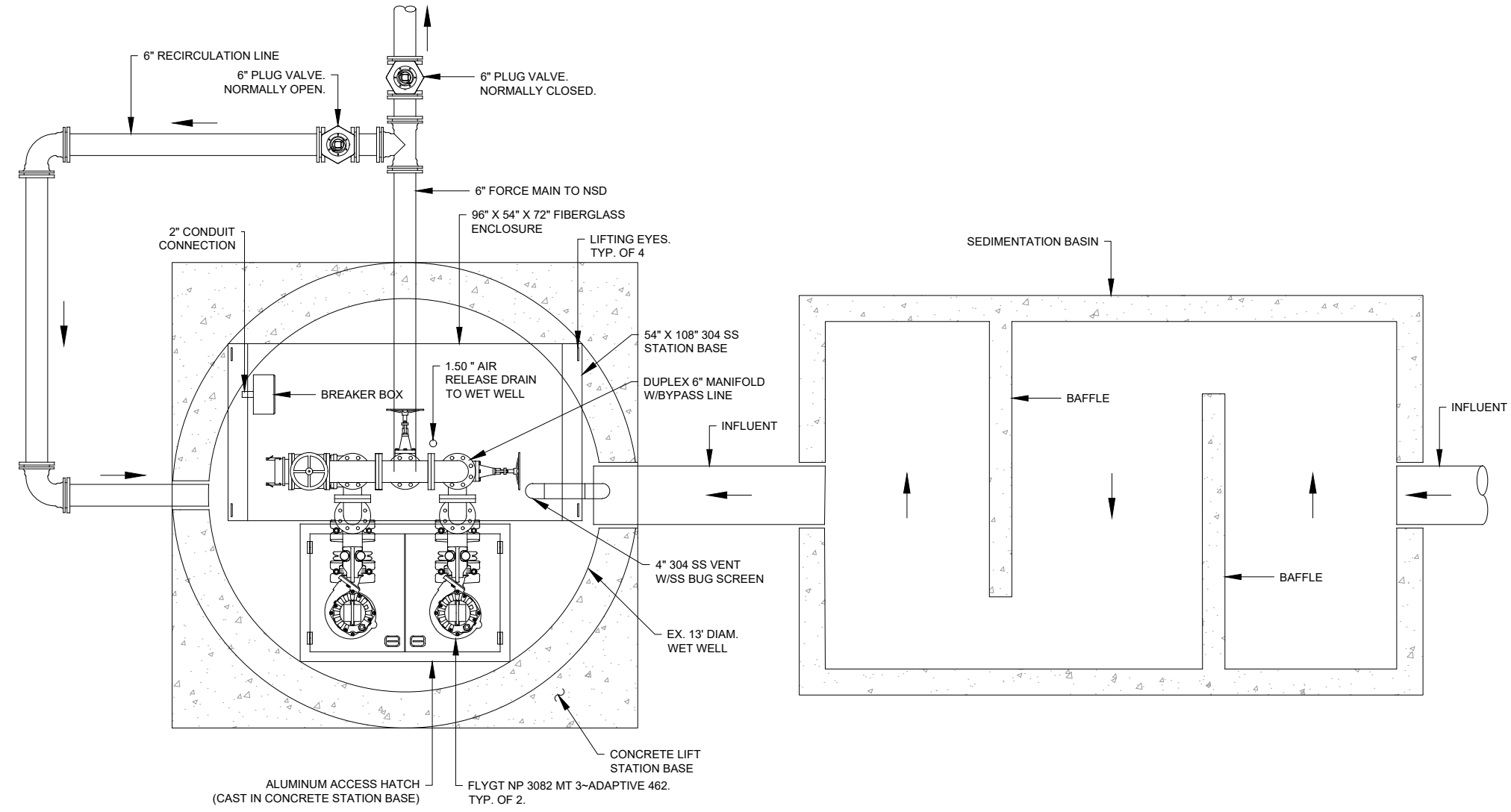
Prepared By:  
**HUITT-ZOLLARS**  
El Paso

Huitt-Zollars, Inc.  
5822 Cromo Drive, Suite 210  
El Paso, TX 79912-5502  
Phone 915-587-4339 Fax 915-587-5247  
Tx Firm No. F-761

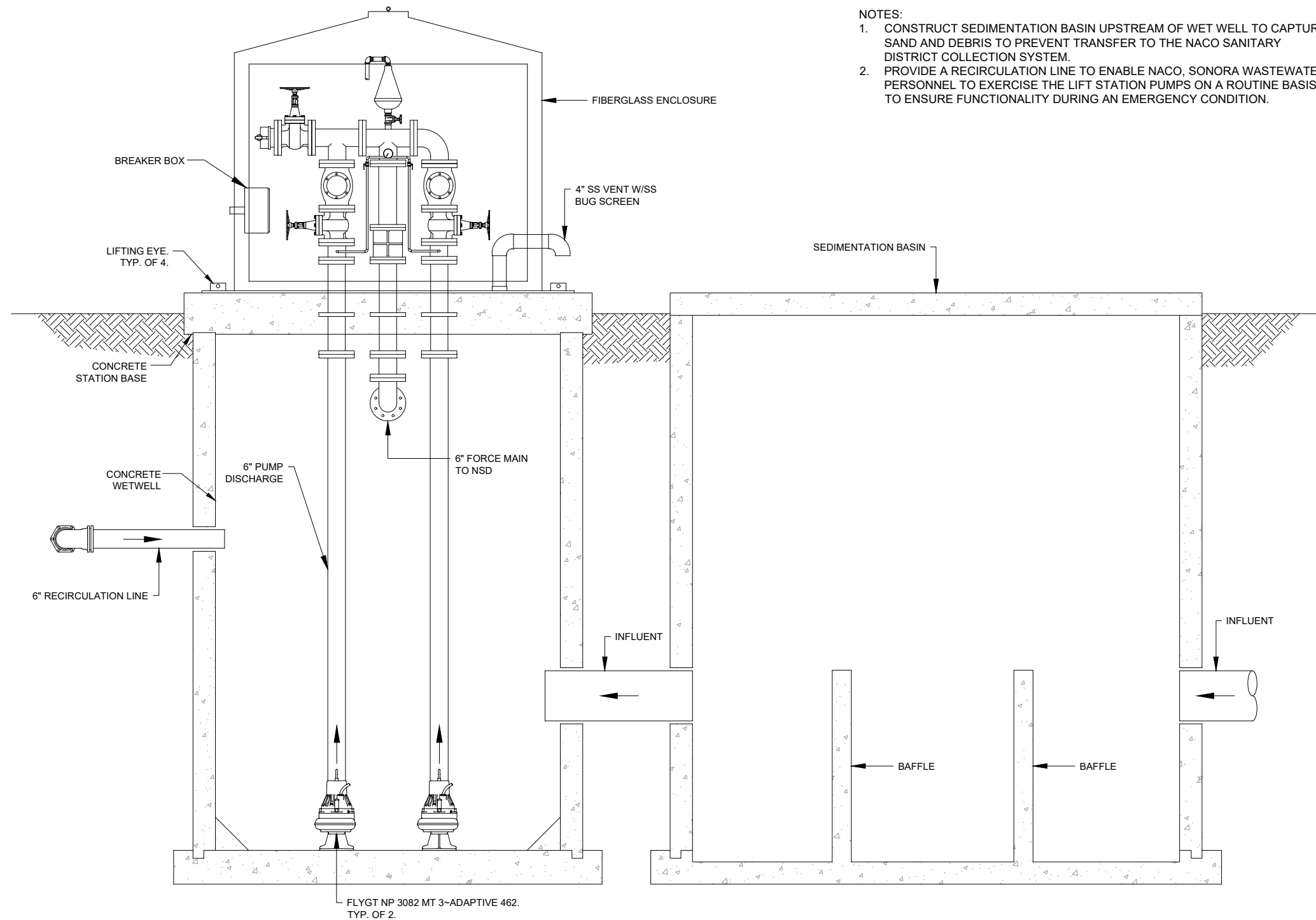
OCTOBER 23, 2020



- NOTES:
1. CONSTRUCT SEDIMENTATION BASIN UPSTREAM OF WET WELL TO CAPTURE SAND AND DEBRIS TO PREVENT TRANSFER TO THE NACO SANITARY DISTRICT COLLECTION SYSTEM.
  2. PROVIDE A RECIRCULATION LINE TO ENABLE NACO, SONORA WASTEWATER PERSONNEL TO EXERCISE THE LIFT STATION PUMPS ON A ROUTINE BASIS TO ENSURE FUNCTIONALITY DURING AN EMERGENCY CONDITION.



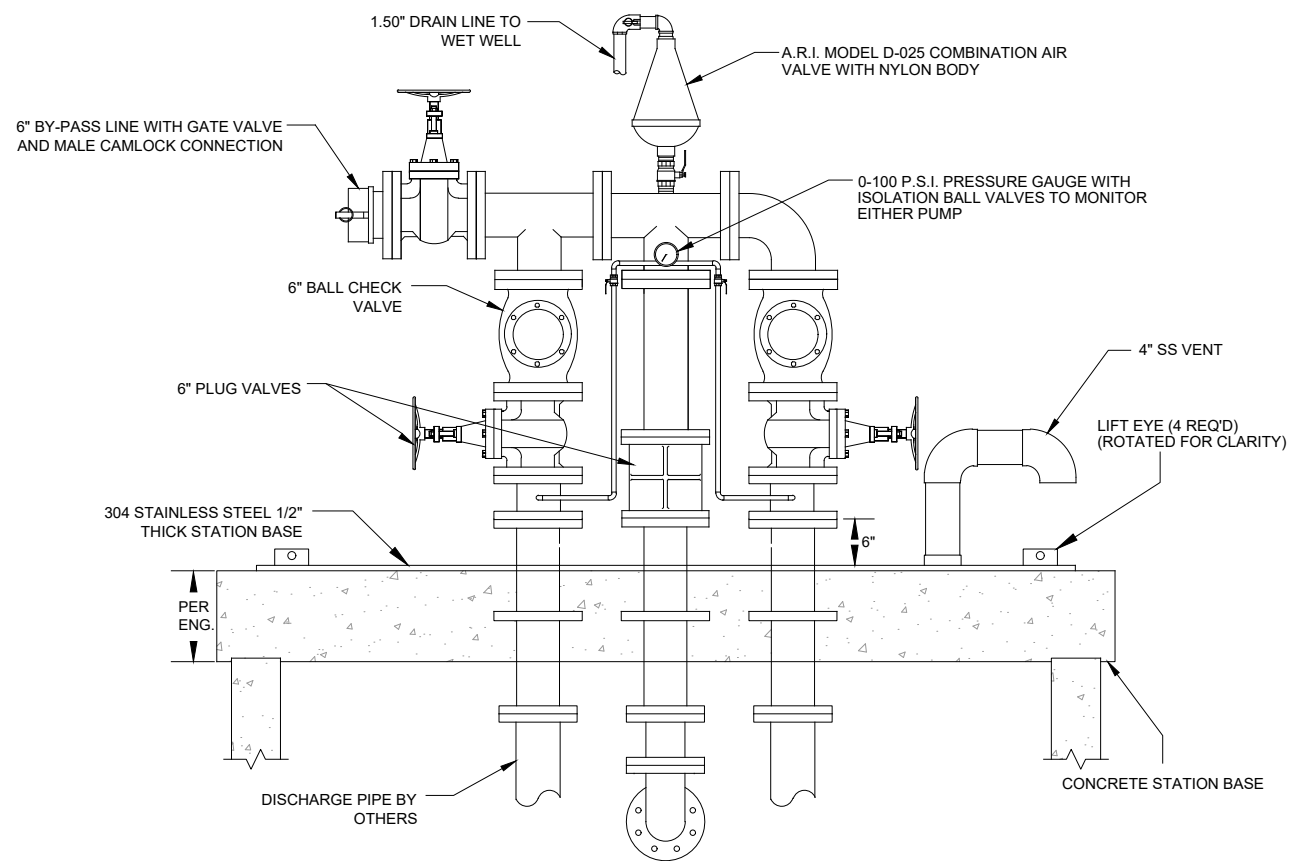
WET WELL AND SEDIMENTATION BASIN - PLAN  
SCALE: NTS



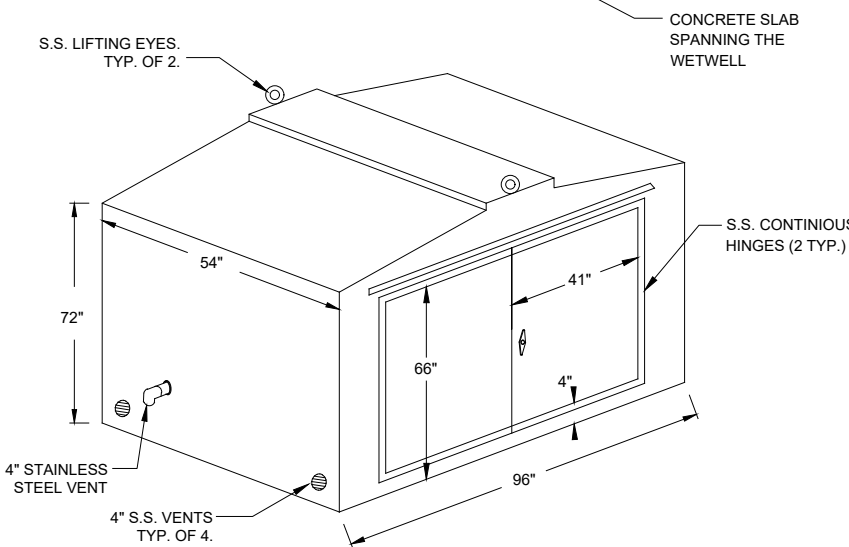
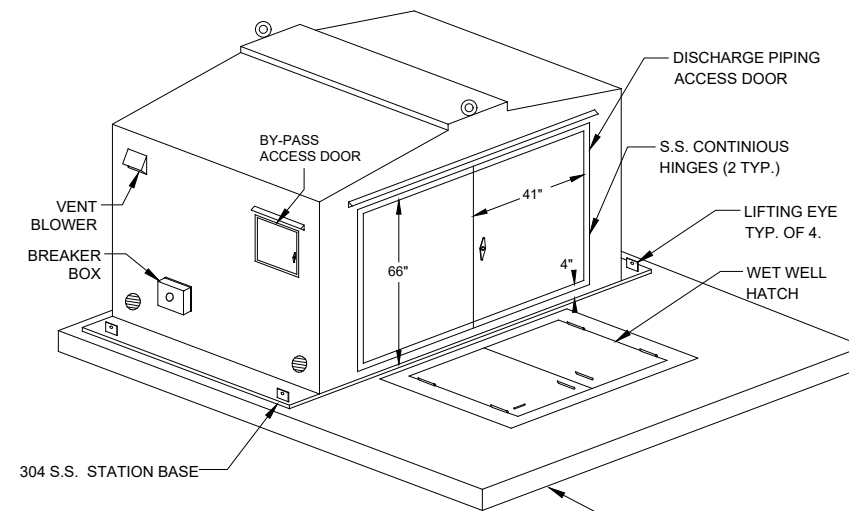
- NOTES:
1. CONSTRUCT SEDIMENTATION BASIN UPSTREAM OF WET WELL TO CAPTURE SAND AND DEBRIS TO PREVENT TRANSFER TO THE NACO SANITARY DISTRICT COLLECTION SYSTEM.
  2. PROVIDE A RECIRCULATION LINE TO ENABLE NACO, SONORA WASTEWATER PERSONNEL TO EXERCISE THE LIFT STATION PUMPS ON A ROUTINE BASIS TO ENSURE FUNCTIONALITY DURING AN EMERGENCY CONDITION.

WET WELL AND SEDIMENTATION BASIN - ELEVATION  
SCALE: NTS





ABOVE GROUND PIPING - ELEVATION  
SCALE: NTS



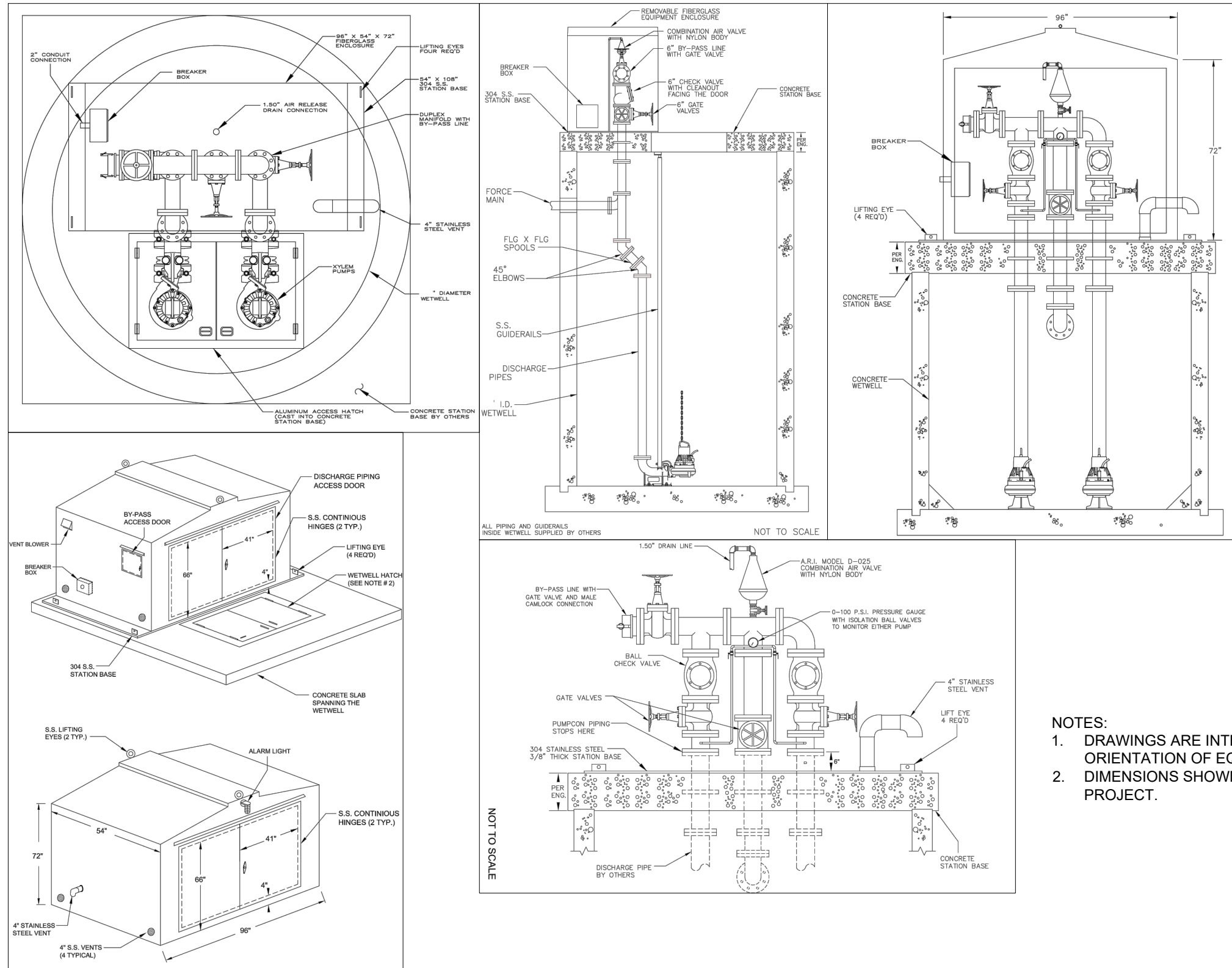
FIBERGLASS ENCLOSURE - ELEVATION  
SCALE: NTS





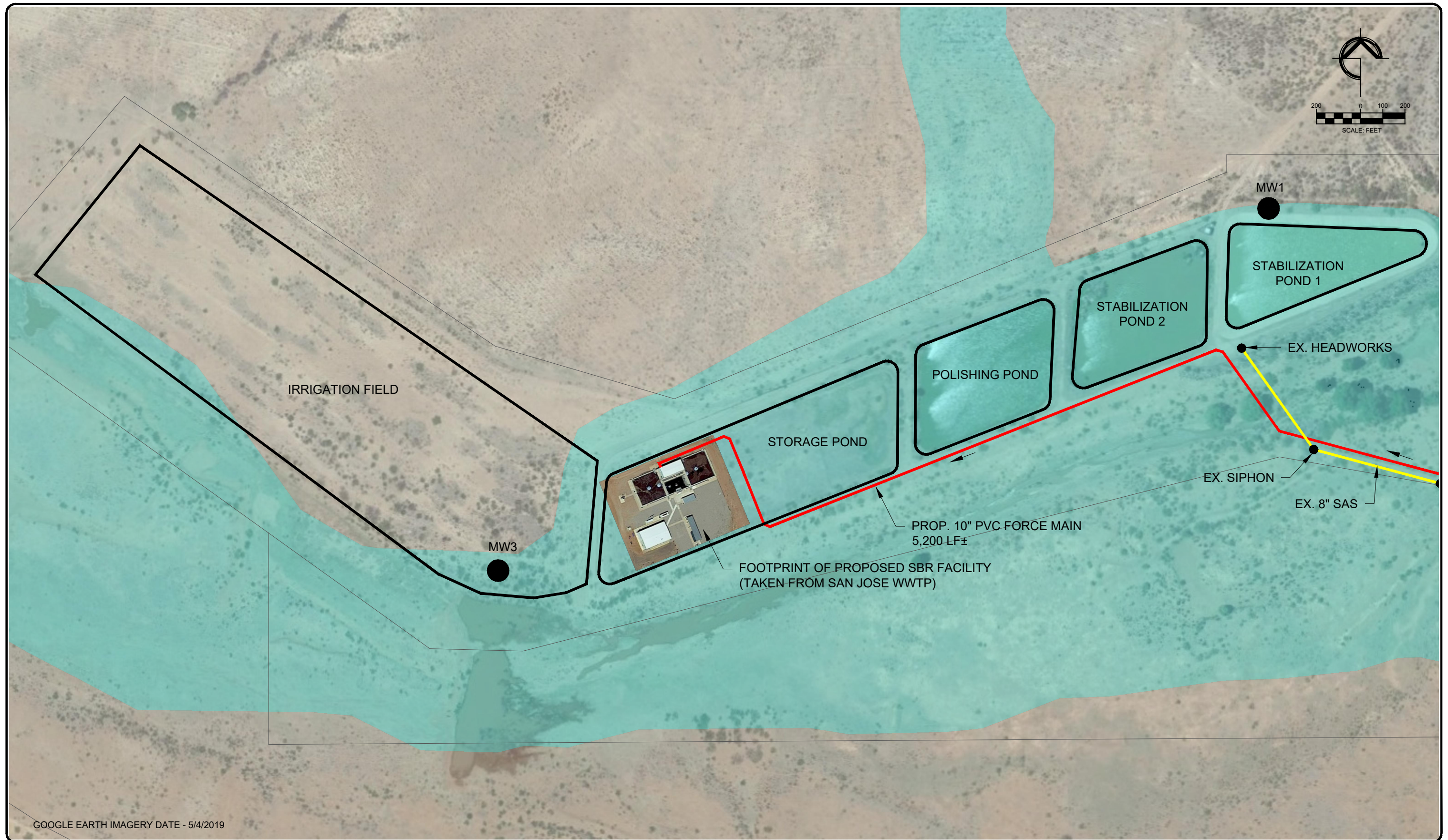




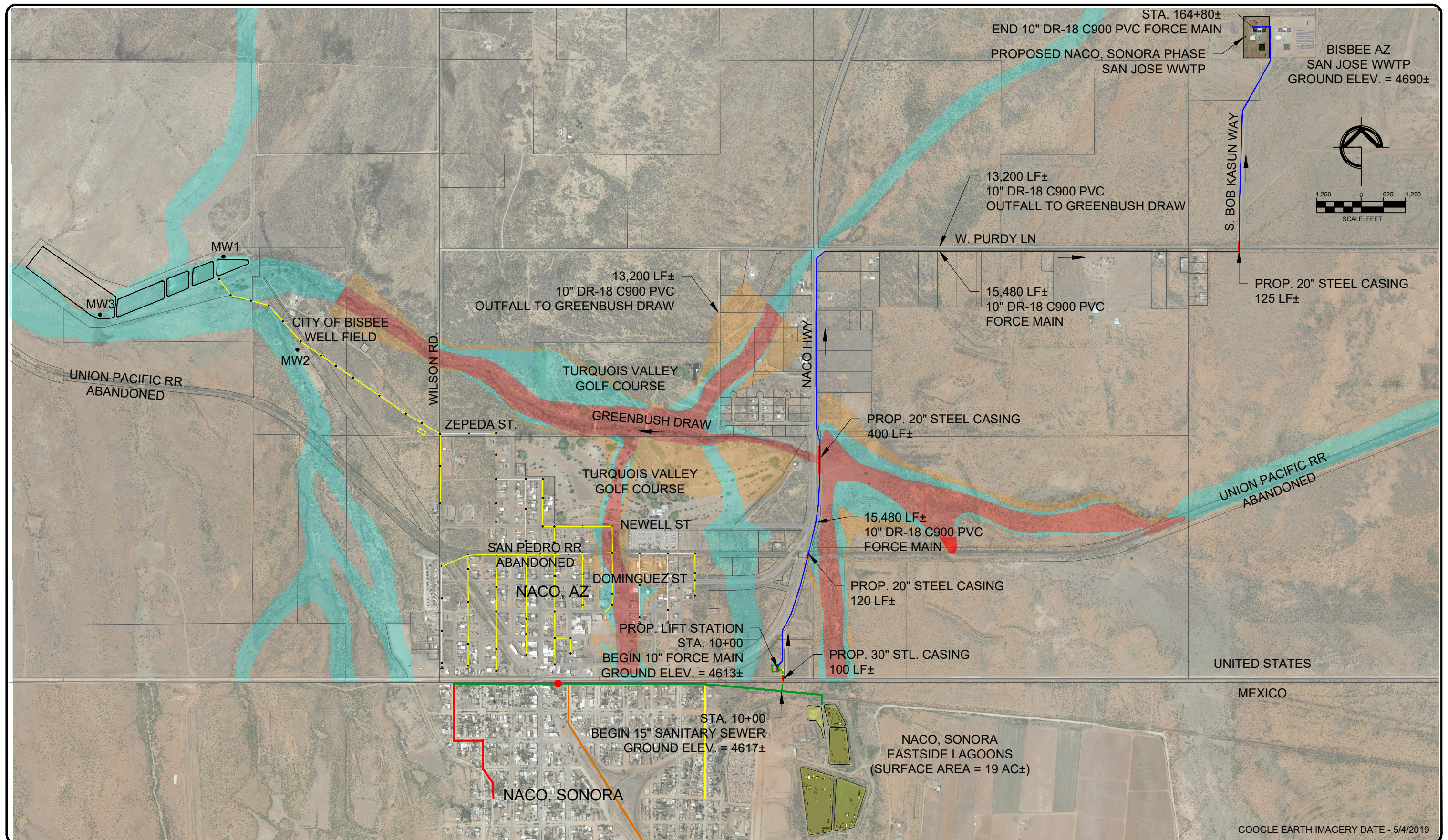


- NOTES:
1. DRAWINGS ARE INTENDED TO SHOW ORIENTATION OF EQUIPMENT.
  2. DIMENSIONS SHOWN ARE FOR SPECIFIC PROJECT.

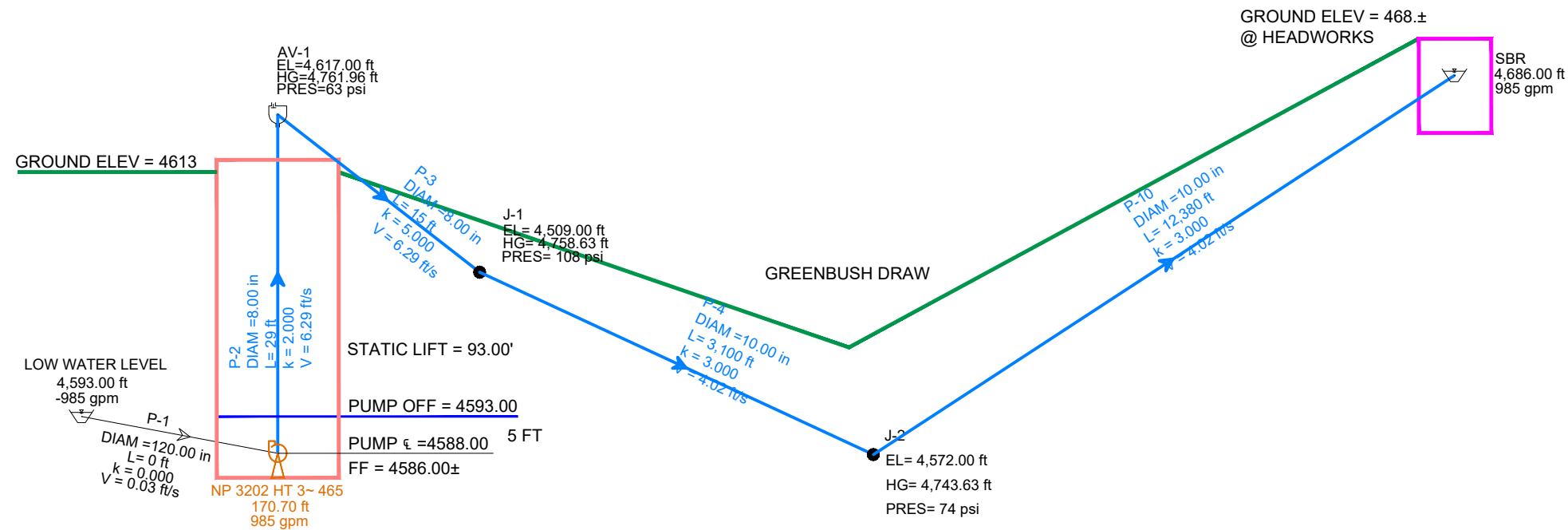












REFER TO FIGURE 12 FOR LOCATION OF LIFT STATION AND PROPOSED FORCE MAIN ALIGNMENT

**NP 3202 HT 3~465**

Patented self-cleaning semi-open channel impeller. Ideal for pumping in waste water applications. Possible to be upgraded with "Guide-pipe" for even better dragging resistance. Modular based design with high adaptation grade.

**FLYGT**  
a xylem brand

**Technical specification**

Curves according to: Water, pure [100%], 4°C, 999.9 kg/m<sup>3</sup>, 1.5692 mm<sup>2</sup>/s

**Configuration**

Motor number	NS202.180 30-29-AAA-W	Installation type	P - Semi permanent, Wet
Impeller diameter	370 mm	Discharge diameter	100 mm

**Pump information**

Impeller diameter	370 mm	Impeller	Grey cast iron
Discharge diameter	100 mm		
Inlet diameter	250 mm		
Maximum operating speed	1775 rpm		
Number of blades	2		
Max. fluid temperature	40 °C		

Project: Block  
Created by: [Name]  
Created on: 9/16/2020  
Last update: [Name]

**NP 3202 HT 3~465**

**Technical specification**

**Motor - General**

Motor number	NS202.180 30-29-AAA-W	Phases	3~	Rated speed	1775 rpm	Rated power	70 hp
ATX approved	7099	Number of poles	4	Rated current	79 A	Stator current	1
Frequency	60 Hz	Rated voltage	460 V	Insulation class	F	Type of Duty	S1
Version code	180						

**Motor - Technical**

Power factor - 1/2 Load	0.90	Motor efficiency - 1/2 Load	92.5 %	Total moment of inertia	0.497 kg m <sup>2</sup>	Starts per hour max.	30
Power factor - 3/4 Load	0.87	Motor efficiency - 3/4 Load	93.0 %	Starting current, direct starting	550 A		
Power factor - 1/2 Load	0.80	Motor efficiency - 1/2 Load	93.0 %	Starting current, star-delta	183 A		

Project: Block  
Created by: [Name]  
Created on: 9/16/2020  
Last update: [Name]

**NP 3202 HT 3~465**

**Duty Analysis**

Curves according to: Water, pure [100%], 4°C, 999.9 kg/m<sup>3</sup>, 1.5692 mm<sup>2</sup>/s

**Operating characteristics**

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd.eff.	Specific Energy	NP3000
1	992 US g.p.m.	172 ft	61.3 hp	992 US g.p.m.	172 ft	61.3 hp	70.9 %	0.218 kWh/m <sup>3</sup>	18.7 ft

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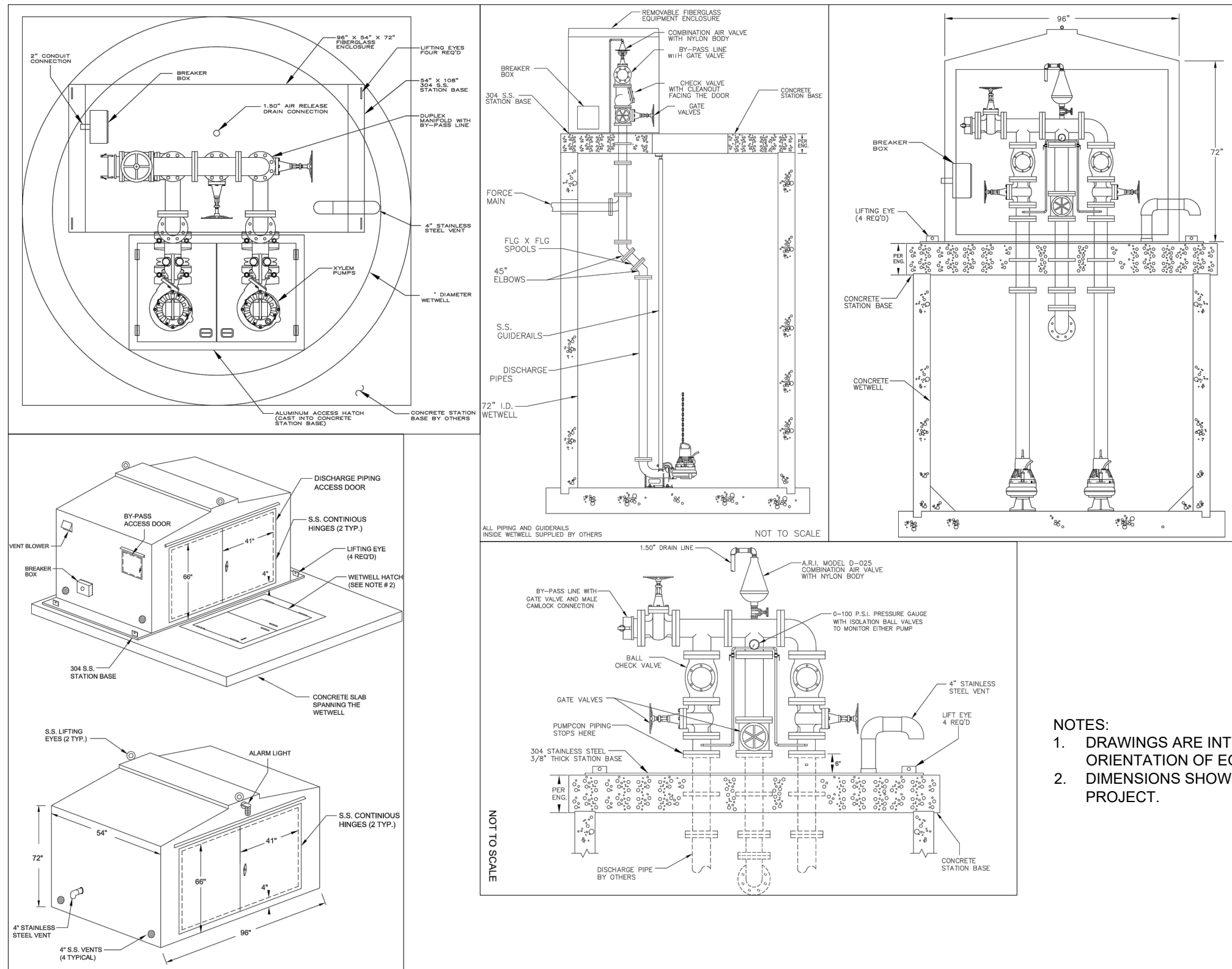
3" GUIDE BARS  
DN100  
REF. LINE  
BOLT Ø20 (4X)

Weight (kg)	Pump	Discharge
with cooling jacket	560	45
without cooling jacket	510	45

Dimensional drwg  
Scale: 1:40  
7011100

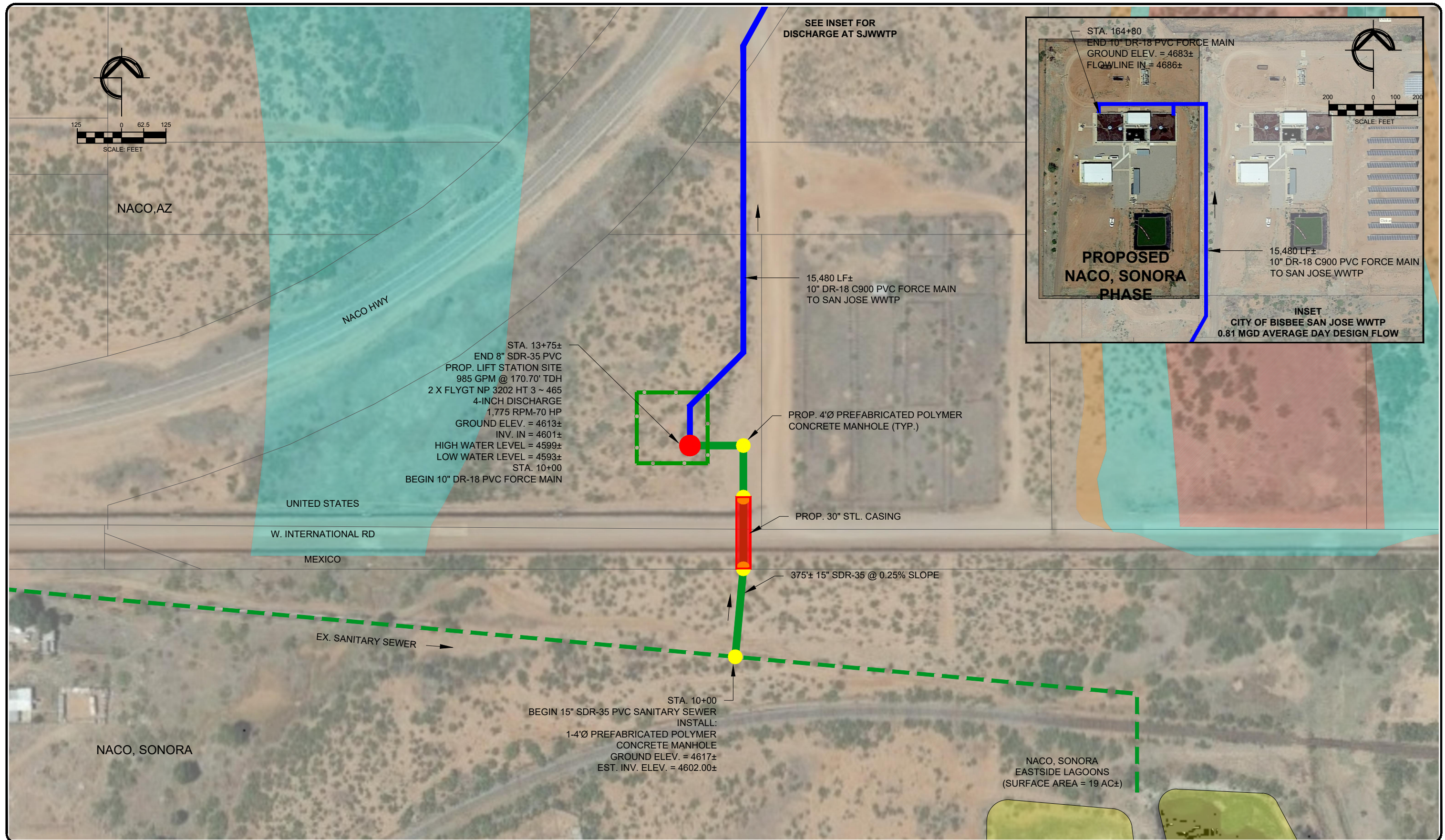
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Created on: 9/16/2020  
Last update: [Name]





- NOTES:
1. DRAWINGS ARE INTENDED TO SHOW ORIENTATION OF EQUIPMENT.
  2. DIMENSIONS SHOWN ARE FOR SPECIFIC PROJECT.







## **Appendix B**

### **Minute No. 273 of the Water Treaty of 1944**

INTERNATIONAL BOUNDARY AND WATER COMMISSION  
UNITED STATES AND MEXICO

Minute No. 273

El Paso, Texas  
March 19, 1987RECOMMENDATIONS FOR THE SOLUTION OF THE BORDER SANITATION  
PROBLEM AT NACO, ARIZONA-NACO, SONORA

The Commission met in the offices of the United States Section in El Paso, Texas at 10:00 a.m., on March 19, 1987 to consider the border sanitation problem at Naco, Arizona-Naco, Sonora, to review the plans prepared by the Secretariat for Infrastructure and Urban Development of the Government of the State of Sonora, Mexico for improvement of the Naco, Sonora wastewater collection, treatment and disposal system, and to formulate recommendations to the two Governments for the solution of the border sanitation problem.

The Commission referred to the last paragraph in Article No. 3 of the treaty, relating to the "Utilization of the Waters of the Colorado and Tijuana Rivers and of the Rio Grande", signed February 3, 1944, which stipulates that the two Governments "agree to give preferential attention to the solution of all border sanitation problems". The Commission also referred to Recommendation No. 4 of Minute No. 261, dated September 24, 1979, approved by the two Governments which stipulates, "That for each of the border sanitation problems, the Commission prepare a Minute for the approval of the two Governments, in which there would be included, identification of the problem, definition of conditions which require solution, specific quality standards that should be applied, the course of action that should be followed for its solution, and the specific time schedule for its implementation".

The Commission also referred to the agreement signed by Presidents Ronald W. Reagan and Miguel de la Madrid Hurtado on August 14, 1983, on Cooperation for the Protection and Improvement of the Environment in the Border Area, Article No. 2 of which stipulates that, "The parties undertake, to the fullest extent practical, to adopt appropriate measures to prevent, reduce, and eliminate sources of pollution in their respective territory which affect the border area of the other".

The Commissioners observed that the border sanitation problem in the Naco, Arizona-Naco, Sonora area results from overflows of wastewaters from the Naco, Sonora wastewater collection, treatment and disposal system into the natural drainage courses that flow northward across the international boundary. The Commissioners further observed that because of the topography, the natural drainage traverses a wellfield area which provides the municipal water supply for the City of Bisbee, Arizona.

The Commissioners then made note that according to the information provided by the Government of the State of Sonora, the existing Naco, Sonora wastewater disposal system, constructed in the mid 1970s and expanded in the early 1980s, does not have the capacity to retain in its

oxidation lagoons all of the wastewater generated by the estimated population of 5,000 inhabitants. They further noted that the City of Naco, Sonora has in the last two years sought to resolve the problem by utilizing a part of that effluent for irrigation of trees on 27 acres (11 hectares) but these irrigation facilities have been insufficient to maintain the lagoons at the proper level to prevent overflows from the lagoons or overflows from collection lines.

The Commissioners also noted the information provided by the Government of the State of Sonora that a wastewater collection and treatment system had been constructed in the early 1960s to discharge into oxidation lagoons located west of the city by means of two pumping stations and a 3,300 foot (1,000 meters) force main, but, due to conditions at that time, the westside lagoons were abandoned in the mid 1970s in favor of discharging the collected wastewaters by gravity into the eastside lagoon system.

The Commissioners examined the plans prepared by the Secretariat for Infrastructure and Urban Development of the Government of the State of Sonora to improve the wastewater collection, treatment and disposal system to serve a projected population of Naco, Sonora of 7,120 inhabitants in the year 1995, when the volume of wastewaters is expected to increase from the current 0.26 million gallons per day (11.57 liters per second) to 0.375 million gallons per day (16.48 liters per second). They observed that the Government of the State of Sonora proposes to rehabilitate and operate the old westside lagoons with the lagoon effluent used for irrigation of crops on nearby lands in addition to the operation of the existing eastside lagoons so that all of the wastewater generated by the City of Naco, Sonora would be contained in Mexico. The features of the Government of the State of Sonora's plans are described on the drawings attached as Exhibit 1 and Exhibit 2.

The Commissioners reviewed the portion of the Government of the State of Sonora's plans for rehabilitating the westside lagoons noting the rehabilitation consists of deepening the old lagoons, reinforcing the levees, and replacing interconnecting pipes with 16 inch (40 centimeters) concrete pipes. They noted that the westside lagoon system consists of one anaerobic and two facultative lagoons with a total area of 6.52 acres (26.362 square meters) which, when rehabilitated, will have a total capacity of 32 acre feet (39.540 cubic meters). They further noted the plans consider utilizing that effluent for the irrigation of 62 acres (25 hectares) of nearby lands that would be developed into croplands. The Commissioners agreed that the rehabilitated lagoons would utilize the total wastewater load of the City of Naco, Sonora, since additional lagoon capacity will be provided to store the effluent during the rainy season when it is not needed for irrigation, the 62 acres (25 hectares) will be properly prepared for crops and properly irrigated, and the eastside system will be continually operated and maintained to provide irrigation to a proposed 44 acres (18 hectares) in that area.

The Commissioners then reviewed the portion of the Government of the State of Sonora's plans for conveying the Naco, Sonora wastewater into the westside lagoons. They noted that the plans provide for the construction of a 12 inch (30 centimeters) gravity collector to convey the

wastewaters from the lowermost end of the collection system 1,640 feet (500 meters) to a new pumping plant. They further observed that the wastewaters would be pumped to the westside lagoons by a 15 horse power motor pump with a peak capacity of 0.87 million gallons per day (38 liters per second) utilizing an 8 inch (20 centimeters), PVC 2,870 foot (870 meters) portion of the force main to the intersection of a 12 inch (30 centimeters) portion of the previously constructed force main. They noted that the 12 inch (30 centimeters) force main would be rehabilitated with the replacement of a 140 foot (42 meters) section with class A-5 asbestos pipe. The Commissioners noted that since reliable operation of the pumping plant is critical to a satisfactory solution to the Naco, Sonora sanitation problem, a standby pump will be required.

The Commissioners then noted that the plans include construction of control works at the confluence of the existing collector and the proposed 12 inch (30 centimeters) gravity collector to divide the flows between the existing eastside lagoon system and the proposed westside lagoon system.

The Commissioners reviewed the portion of the Government of the State of Sonora's plans concerning the disposal of effluent from both the eastside and westside lagoons by irrigating nearby lands. They further noted that for the eastside system 17 acres (7 hectares) have been added to the 27 acres (11 hectares) of lands already under irrigation and that the plans call for conveyance into the eastside lagoon system of only those waters necessary to irrigate the total 44 acres (18 hectares). They noted the important provision that as an emergency measure, the reserve lagoons would be available to provide additional capacity to store the effluent during the rainy season when it is not needed for irrigation. They noted that the 62 acres (25 hectares) for effluent disposal on the westside would be planted in perennial crops. They noted that because the drainage from the 62 acres (25 hectares) is northward into a natural course which flows across the international boundary in the vicinity of the municipal wellfield that supplies the City of Bisbee, Arizona, it is suitable that proper land preparation and irrigation practices be followed and proper precautions be taken to prevent uncontrolled effluent from flowing into the natural drainage courses.

The Commissioners then concluded that the above described portion of the plans of the Government of the State of Sonora for improvement of the Naco, Sonora wastewater collection, treatment and disposal system provide a solution to the border sanitation problem for the design flow of 0.375 million gallons per day (16.48 liters per second) since the design, construction, and operation and maintenance plans contemplate use of all of the wastewaters in Mexican territory, including those utilized in irrigation. Further, the Commissioners recognized that an orderly plan for sludge removal and berm reinforcement on the existing eastside lagoons undertaken once westside lagoons are placed into operation, is an important feature for the solution of the problem.

The Commission made additional note that there may be merit in a study of an emergency connection sewer line between the Naco, Sonora sewage collection system and the Naco, Arizona sewage collection, treatment



and disposal system, in U.S. and Mexican territories to provide an added measure of security.

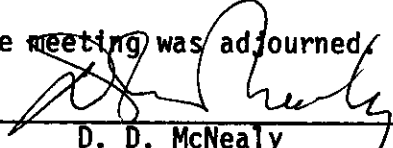
The Commissioners then examined the construction schedule provided by the Government of the State of Sonora, noting that construction has begun with the rehabilitation of the westside lagoons system, which is to be completed in 1987 and placed in operation immediately, and that the irrigation of croplands adjacent to the westside lagoons will begin as soon as practical but no later than the time the lagoons initially fill.


Accordingly, the Commission agreed to submit for the approval of the two Governments, the following resolution:

1. That Mexico complete the construction and operate and maintain the Naco, Sonora wastewater collection, treatment and disposal system, as described above. The features of the project are shown in Exhibits No. 1 and No. 2, which are attached and form a part of this Minute.
2. That Mexico rehabilitate the westside lagoons and operate and maintain them as a system combined with the existing eastside lagoons in a manner to prevent discharge of wastewaters across the international boundary in the Naco, Arizona-Naco, Sonora area including measures described hereinabove for storing effluent during those times when it cannot be used in irrigation.
3. That Mexico utilize all of the effluent in Mexico as described hereinabove, and take timely remedial measures as needed to prevent wastewater flows across the international boundary.
4. That Mexico provide standby equipment at the pumping plant in the event of pump breakdowns.
5. That Mexico take the necessary measures to assure that sufficient funds are available to operate and maintain the combined system, including a preventative maintenance program.
6. That in the event of a breakdown or interruption in the operation of either of the two systems, Mexico take special measures to make immediate repairs. If Mexico requests through the Commission, the United States Section will seek to make arrangements so that assistance may be provided to Mexico through and under the supervision of the Commission.
7. That in accordance with Article No. 2 of the Treaty relating to "Utilization of the Waters of the Colorado and Tijuana Rivers and of the Rio Grande", signed February 3, 1944, the construction, operation, and maintenance of the Naco, Sonora wastewater collection, treatment and disposal system, be jointly observed by representatives of the Commission and that each Section of the Commission inform the proper agencies of its Government of the results of the observations.

8. That the Commission study the need for an emergency connection between the Naco, Sonora wastewater collection system and the Naco, Arizona wastewater collection, treatment and disposal system.
9. That this Minute requires the specific approval of the two Governments.

The meeting was adjourned.

  
D. D. McNealy  
Acting U.S. Commissioner

  
Carlos Santibanez Mata  
Mexican Commissioner

  
Mandel R. Ybarra  
U.S. Secretary

  
Mario Bucio Cruz  
Mexican Secretary

# **Appendix C**

## **Tables**



**Table 2**  
**Engineer's Opinion of Estimated Probable Cost**  
**US Alternative No. 1 - Emergency Connection Between Naco, Sonora and Naco, AZ**

Final (Draft)

Date: 10/23/2020

Item No.	Description	Unit	Quantity	Unit Price	Extended Price
1	Renovation of existing lift station including, but not limited to: removal of existing pumps and controls; purchase and installation of two 3 hp Flygt NP 3085 MT 3 ~ Adaptive 462 pumps with associated valves, fittings, and appurtenances; installation of above ground valve vault w/enclosure; installation of new controls and panels; and, modifications to existing wet well concrete lid to accomodate new hatches and pipe penetrations, complete-in-place	LS	1	\$350,000	\$350,000
2	4-inch AWWA C-900 PVC force main with fittings and appurtenance, including joint restraints, all depths, complete-in-place	LF	705	\$50	\$35,250
3	Concrete sedimentation basin, complete-in-place	LS	1	\$100,000	\$100,000
4	Bore & jack w/265 LF of 12-inch SCH40 steel casing, excluding carrier pipe, all depths, complete-in-place	LF	265	\$100	\$26,500
5	4-ft diameter prefabricated concrete valve manhole w/4-inch full port plug valve, up to 16 ft depth, complete-in-place	EA	1	\$15,000	\$15,000
6	Connect to existing manhole, up to 16-ft depth, complete-in-place	EA	1	\$5,000	\$5,000
<b>7</b>	<b>Subtotal</b>				<b>\$531,750</b>
8	Contingency, as Percent of Subtotal			20%	\$106,350
9	Design & Surveying, as Percent of Subtotal			10%	\$53,175
10	Project Management, as Percent of Subtotal			3%	\$15,952.50
11	Construction Phase Services, as Percent of Subtotal			7%	\$37,222.50
12	Easements/Land Acquisition			-	TBD
<b>13</b>	<b>Subtotal</b>				<b>\$212,700</b>
<b>14</b>	<b>Total (Excluding Easements/Land Acquisition)</b>				<b>\$744,450</b>

**Table 3**  
**Engineer's Opinion of Estimated Probable Cost**  
**US Alternative No. 2 - Total Diversion of Naco, Sonora Wastewater Flow to Naco, AZ**

Final (Draft)

Date: 10/23/2020

Item No.	Description	Unit	Quantity	Unit Price	Extended Price
1	15-inch SDR-35 (PS 46) PVC gravity sanitary sewer, all depths, complete-in-place	LF	9,155	\$100	\$915,500
2	4-ft diameter prefabricated polymer concrete manholes, all depths, complete in place	EA	37	\$15,000	\$555,000
3	Bore & jack w/480 LF of 30-inch SCH40 steel casing, excluding carrier pipe, all depths, complete-in-place	LF	480	\$600	\$288,000
4	10-inch AWWA C-900 DR-18 PVC force main including fittings and joint restraint, all depths, complete-in-place	LF	5,200	\$70	\$364,000
5	Lift station including but not limited to: 2-Flygt NP 3127 LT 3 ~ Adaptive 425 submersible pumps rated at 1,096' @ 24.10' TDH w/3-inch discharge, 10 hp motor w/associated valves, fittings, and appurtenance, or approved equal; pump controls; SCADA; monopole antenna; flow metering manhole w/magnetic flow meter; emergency generator; access road; security lighting; and, security fencing, complete-in-place	LS	1	\$750,000	\$750,000
6	Sequencing Batch Reactor wastewater treatment plant rated for an average daily dry weather flow of 580,000 gpd and a maximum monthly daily flow of 870,000 gpd capable of producing Class "B+" reclaimed water, including but not limited to: control building w/laboratory; SCADA; monopole antenna; disinfection; discharge flow meter; sludge processing; emergency generator; access road; security lighting; and, security fencing; complete-in-place	GAL	580,000	\$15	\$8,700,000
7	Concrete sedimentation basin, complete-in-place	LS	1	\$100,000	\$100,000

**Table 3**  
**Engineer's Opinion of Estimated Probable Cost**  
**US Alternative No. 2 - Total Diversion of Naco, Sonora Wastewater Flow to Naco, AZ**

Final (Draft)

Date: 10/23/2020

Item No.	Description	Unit	Quantity	Unit Price	Extended Price
8	4-ft diameter prefabricated polymer concrete manhole up to 16 ft depth for discharge outfall, complete-in-place	EA	4	\$15,000	\$60,000
9	15-inch SDR-35 PVC (PS 46) discharge outfall line, all depths, complete-in-place	LF	500	\$100	\$50,000
<b>10</b>	<b>Subtotal</b>				<b>\$11,782,500</b>
11	Contingency, as Percent of Subtotal			20%	\$2,356,500
12	Design & Surveying, as Percent of Subtotal			10%	\$1,178,250
13	Project Management, as Percent of Subtotal			3%	\$353,475.00
14	Construction Phase Services, as Percent of Subtotal			7%	\$824,775.00
15	Easements/Land Acquisition			-	TBD
<b>16</b>	<b>Subtotal</b>				<b>\$4,713,000</b>
<b>17</b>	<b>Total (Excluding Easements/Land Acquisition)</b>				<b>\$16,495,500</b>



**Table 4**  
**Estimated Annual Operations and Maintenance Cost**  
**US Alternative No. 2 - Total Diversion of Naco, Sonora Wastewater Flow to Naco, AZ**

Item Number	Description	Proposed Bisbee 2020-2021	Adjustment Factor	NSD Estimated
1	SALARIES - GENERAL	\$159,502.00	0.400	\$63,800.80
2	OVERTIME - GENERAL	\$15,000.00	0.400	\$6,000.00
3	SALARIES - PART TIME	\$0.00	0.400	\$0.00
4	F.I.C.A.	\$10,819.00	0.400	\$4,327.60
5	MEDICARE	\$2,530.00	0.400	\$1,012.00
6	A.S.R.S.	\$21,324.00	0.400	\$8,529.60
7	A.S.R.S. PENSION EXPENSE	\$0.00	0.400	\$0.00
8	MEDICAL INSURANCE	\$21,679.00	0.400	\$8,671.60
9	STANDARD DISABILITY INSURANCE	\$1,127.00	0.400	\$450.80
10	MEDICAL INS DEPENDENT SUPPL.	\$3,028.00	0.400	\$1,211.20
11	DEFERRED COMP	\$3,773.00	0.400	\$1,509.20
12	DENTAL INSURANCE	\$2,689.00	0.400	\$1,075.60
13	LIFE INSURANCE	\$586.00	0.400	\$234.40
14	WORKERS COMPENSATION	\$5,403.00	0.400	\$2,161.20
15	STATE UNEMPLOYMENT	\$0.00	0.400	\$0.00
	<b>WASTEWATER PERSONNEL EXPENSE</b>	<b>\$247,460.00</b>		<b>\$98,984.00</b>
Item Number	Description	2020-21 Proposed	Adjustment Factor	NSD
16	UNIFORMS & CLOTHING	\$600.00	0.500	\$300.00
17	RECRUITMENT/EMPLOYEE TESTING	\$200.00	1.000	\$200.00
18	BUSINESS TRAVEL	\$1,000.00	1.000	\$1,000.00
19	EDUCATION & TRAINING	\$2,500.00	0.500	\$1,250.00
20	SUBSCRIPTIONS & DUES	\$800.00	1.000	\$800.00
21	<b>ELECTRIC</b>	<b>\$77,000.00</b>	<b>0.716</b>	<b>\$55,135.80</b>
22	WATER	\$4,000.00	0.500	\$2,000.00
23	PHONES	\$3,000.00	0.500	\$1,500.00
24	INTERNET ACCESS FEE	\$0.00	0.500	\$0.00
25	PROFESSIONAL FEES	\$5,000.00	0.500	\$2,500.00
26	<b>CONTRACT SERVICES (Jacobs)</b>	<b>\$755,000.00</b>	<b>0.716</b>	<b>\$540,617.28</b>
27	CONTRACT SERVICES-COLLECTIONS	\$10,000.00	0.000	\$0.00
28	DOC WORKERS	\$0.00	0.000	\$0.00
29	PROPERTY, CASUALTY, LIABILITY	\$63,450.00	0.500	\$31,725.00
30	INSURANCE CLAIMS & DEDUCTIBLES	\$5,000.00	0.500	\$2,500.00
31	OFFICE SUPPLIES	\$200.00	0.500	\$100.00
32	PRINTING & REPRODUCTION	\$200.00	0.500	\$100.00
33	BOOKS & REFERENCE MATERIALS	\$500.00	0.500	\$250.00
34	NON CAP ADMIN EQUIP/FURN	\$1,000.00	0.500	\$500.00
35	FEES- FUND MANAGEMENT	\$30.00	0.000	\$0.00
36	OTHER FEES	\$600.00	1.000	\$600.00
37	DEBT REFUNDING EXPENSE	\$0.00	0.000	\$0.00
38	INTEREST EXPENSE	\$26,930.00	0.500	\$13,465.00
39	POSTAGE	\$100.00	0.500	\$50.00
40	DISPOSABLE EQUIP & TOOLS	\$3,500.00	0.500	\$1,750.00
41	SAFETY EQUIP & SUPPLIES	\$3,000.00	0.500	\$1,500.00
42	CUSTODIAL SUPPLIES	\$800.00	0.500	\$400.00
43	OPERATIONAL EXPENSES	\$15,000.00	0.500	\$7,500.00
44	CHEMICALS	\$2,000.00	0.500	\$1,000.00
45	LAB SUPPLIES & TESTING	\$0.00	0.000	\$0.00
46	MANHOLE, PIPE & FITTINGS	\$20,000.00	0.500	\$10,000.00
47	SLUDGE REMOVAL	\$0.00	0.000	\$0.00

**Table 4**  
**Estimated Annual Operations and Maintenance Cost**  
**US Alternative No. 2 - Total Diversion of Naco, Sonora Wastewater Flow to Naco, AZ**

Item Number	Description	Proposed Bisbee 2020-2021	Adjustment Factor	NSD Estimated
48	PERMITS & LICENSES	\$18,000.00	1.000	\$18,000.00
49	BAD DEBT	\$30,000.00	0.000	\$0.00
50	BLDG REPAIR & MAINT	\$5,000.00	0.500	\$2,500.00
51	EQUIPMENT REPAIR & MAINT	\$130,000.00	0.100	\$13,000.00
52	EQUIP REPAIR&MAINT-COLLECTIONS	\$10,000.00	0.250	\$2,500.00
53	PUMP REPAIR & REPLACEMENT	\$20,000.00	0.100	\$2,000.00
54	EQUIPMENT RENTAL	\$5,000.00	1.000	\$5,000.00
55	REPAIR & MAINT - OTHER	\$5,000.00	1.000	\$5,000.00
56	NON CAP EQUIP PURCHASES	\$5,000.00	0.250	\$1,250.00
57	VEHICLE PARTS & LABOR	\$7,000.00	0.250	\$1,750.00
58	TIRES	\$1,500.00	1.000	\$1,500.00
59	GASOLINE	\$5,000.00	0.500	\$2,500.00
60	DIESEL	\$3,000.00	0.500	\$1,500.00
61	OTHER FLUIDS & LUBRICANTS	\$0.00	0.000	\$0.00
62	PRINCIPAL PMTS, LEASE PURCHASE	\$24,895.00	0.250	\$6,223.75
63	INTEREST PMTS, LEASE PURCHASE	\$6,010.00	0.250	\$1,502.50
	<b>NON-PERSONNEL WASTEWATER EXPENSE</b>	<b>\$1,276,815.00</b>		<b>\$740,969.34</b>
	<b>TOTAL WASTEWATER EXPENSE</b>	<b>\$1,524,275.00</b>		<b>\$839,953.34</b>

Notes: Loan repayment not included. TBD when loan amount is confirmed.  
Adjustment Factor for electricity and Contract Services based on following ratio: 580,000 gpd/810,000 = 0.716

**Table 5**  
**Engineer's Opinion of Estimated Probable Cost**  
**US Alternative No.3 - Total Diversion of Naco, Sonora Wastewater Flow to San Jose WWTP**

Final (Draft)

Date: 10/23/2020

Item No.	Description	Unit	Quantity	Unit Price	Extended Price
1	15-inch SDR-35 (PS 46) PVC gravity sanitary sewer, all depths, complete-in-place	LF	375	\$100	\$37,500
2	4-ft diameter prefabricated polymer concrete manholes, all depths, complete in place	EA	4	\$15,000	\$60,000
3	Bore & jack w/100 LF of 30-inch SCH40 steel casing, excluding carrier pipe, all depths, complete-in-place	LF	100	\$600	\$60,000
4	10-inch AWWA C-900 DR-18 PVC force main including fittings and joint restraint, all depths, complete-in-place	LF	15,480	\$70	\$1,083,600
5	Lift station including but not limited to: 2-Flygt NP 3202 HT 3 ~ 465 submersible pumps rated at 985 gpm @ 170.70' TDH w/4-inch discharge, 70 hp motor w/associated valves, fittings, and appurtenance, or approved equal; pump controls; SCADA; monopole antenna; flow metering manhole w/magnetic flow meter; emergency generator; access road; security lighting; and, security fencing, complete-in-place	LS	1	\$750,000	\$750,000
6	Sequencing Batch Reactor wastewater treatment plant rated for an average daily dry weather flow of 500,000 gpd and a maximum monthly daily flow of 750,000 gpd capable of producing Class "B+" reclaimed water, including but not limited to: SCADA; monopole antenna; disinfection; discharge flow meter; sludge processing; emergency generator; access road; security lighting; and, security fencing; complete-in-place	GAL	500,000	\$15	\$7,500,000
7	Concrete sedimentation basin, complete-in-place	LS	1	\$100,000	\$100,000
8	4-ft diameter prefabricated polymer concrete manhole up to 16 ft depth for discharge outfall, complete-in-place (placeholder)	EA	25	\$15,000	\$375,000
9	15-inch SDR-35 PVC (PS 46) discharge outfall line, all depths, complete-in-place (placeholder)	LF	6,500	\$100	\$650,000
<b>10</b>	<b>Subtotal</b>				<b>\$10,616,100</b>



**Table 5**  
**Engineer's Opinion of Estimated Probable Cost**  
**US Alternative No.3 - Total Diversion of Naco, Sonora Wastewater Flow to San Jose WWTP**

Final (Draft)

Date: 10/23/2020

Item No.	Description	Unit	Quantity	Unit Price	Extended Price
11	Contingency, as Percent of Subtotal			20%	\$2,123,220
12	Design & Surveying, as Percent of Subtotal			10%	\$1,061,610
13	Project Management, as Percent of Subtotal			3%	\$318,483.00
14	Construction Phase Services, as Percent of Subtotal			7%	\$743,127.00
15	Easements/Land Acquisition			-	TBD
<b>16</b>				<b>Subtotal</b>	<b>\$4,246,440</b>
<b>17</b>	<b>Total (Excluding Easements/Land Acquisition)</b>				<b>\$14,862,540</b>

**Table 6**  
**Estimated Annual Operations and Maintenance Cost**  
**US Alternative No. 3 - Total Diversion of Naco, Sonora Wastewater Flow to San Jose WWTP**

Item Number	Description	Proposed Bisbee 2020-2021	Adjustment Factor	NSD Estimated
1	SALARIES - GENERAL	\$159,502.00	0.400	\$63,800.80
2	OVERTIME - GENERAL	\$15,000.00	0.400	\$6,000.00
3	SALARIES - PART TIME	\$0.00	0.400	\$0.00
4	F.I.C.A.	\$10,819.00	0.400	\$4,327.60
5	MEDICARE	\$2,530.00	0.400	\$1,012.00
6	A.S.R.S.	\$21,324.00	0.400	\$8,529.60
7	A.S.R.S. PENSION EXPENSE	\$0.00	0.400	\$0.00
8	MEDICAL INSURANCE	\$21,679.00	0.400	\$8,671.60
9	STANDARD DISABILITY INSURANCE	\$1,127.00	0.400	\$450.80
10	MEDICAL INS DEPENDENT SUPPL.	\$3,028.00	0.400	\$1,211.20
11	DEFERRED COMP	\$3,773.00	0.400	\$1,509.20
12	DENTAL INSURANCE	\$2,689.00	0.400	\$1,075.60
13	LIFE INSURANCE	\$586.00	0.400	\$234.40
14	WORKERS COMPENSATION	\$5,403.00	0.400	\$2,161.20
15	STATE UNEMPLOYMENT	\$0.00	0.400	\$0.00
	<b>WASTEWATER PERSONNEL EXPENSE</b>	<b>\$247,460.00</b>		<b>\$98,984.00</b>
Item Number	Description	2020-21 Proposed	Adjustment Factor	NSD
16	UNIFORMS & CLOTHING	\$600.00	0.500	\$300.00
17	RECRUITMENT/EMPLOYEE TESTING	\$200.00	0.000	\$0.00
18	BUSINESS TRAVEL	\$1,000.00	0.000	\$0.00
19	EDUCATION & TRAINING	\$2,500.00	0.000	\$0.00
20	SUBSCRIPTIONS & DUES	\$800.00	0.000	\$0.00
21	<b>ELECTRIC</b>	<b>\$77,000.00</b>	<b>0.617</b>	<b>\$47,530.86</b>
22	WATER	\$4,000.00	0.500	\$2,000.00
23	PHONES	\$3,000.00	0.000	\$0.00
24	INTERNET ACCESS FEE	\$0.00	0.000	\$0.00
25	PROFESSIONAL FEES	\$5,000.00	0.000	\$0.00
26	<b>CONTRACT SERVICES (Jacobs)</b>	<b>\$755,000.00</b>	<b>0.617</b>	<b>\$466,049.38</b>
27	CONTRACT SERVICES-COLLECTIONS	\$10,000.00	0.000	\$0.00
28	DOC WORKERS	\$0.00	0.000	\$0.00
29	PROPERTY, CASUALTY, LIABILITY	\$63,450.00	0.250	\$15,862.50
30	INSURANCE CLAIMS & DEDUCTIBLES	\$5,000.00	0.250	\$1,250.00
31	OFFICE SUPPLIES	\$200.00	0.250	\$50.00
32	PRINTING & REPRODUCTION	\$200.00	0.250	\$50.00
33	BOOKS & REFERENCE MATERIALS	\$500.00	0.250	\$125.00
34	NON CAP ADMIN EQUIP/FURN	\$1,000.00	0.250	\$250.00
35	FEES- FUND MANAGEMENT	\$30.00	0.250	\$7.50
36	OTHER FEES	\$600.00	1.000	\$600.00
37	DEBT REFUNDING EXPENSE	\$0.00	0.000	\$0.00
38	INTEREST EXPENSE	\$26,930.00	0.250	\$6,732.50
39	POSTAGE	\$100.00	0.250	\$25.00
40	DISPOSABLE EQUIP & TOOLS	\$3,500.00	0.500	\$1,750.00
41	SAFETY EQUIP & SUPPLIES	\$3,000.00	0.500	\$1,500.00
42	CUSTODIAL SUPPLIES	\$800.00	0.500	\$400.00
43	OPERATIONAL EXPENSES	\$15,000.00	0.250	\$3,750.00
44	CHEMICALS	\$2,000.00	0.500	\$1,000.00
45	LAB SUPPLIES & TESTING	\$0.00	0.000	\$0.00
46	MANHOLE, PIPE & FITTINGS	\$20,000.00	0.000	\$0.00
47	SLUDGE REMOVAL	\$0.00	0.000	\$0.00

**Table 6**  
**Estimated Annual Operations and Maintenance Cost**  
**US Alternative No. 3 - Total Diversion of Naco, Sonora Wastewater Flow to San Jose WWTP**

<b>Item Number</b>	<b>Description</b>	<b>Proposed Bisbee 2021</b>	<b>Adjustment Factor</b>	<b>NSD Estimated</b>
48	PERMITS & LICENSES	\$18,000.00	1.000	\$18,000.00
49	BAD DEBT	\$30,000.00	0.000	\$0.00
50	BLDG REPAIR & MAINT	\$5,000.00	0.250	\$1,250.00
51	EQUIPMENT REPAIR & MAINT	\$130,000.00	0.250	\$32,500.00
52	EQUIP REPAIR&MAINT-COLLECTIONS	\$10,000.00	0.000	\$0.00
53	PUMP REPAIR & REPLACEMENT	\$20,000.00	0.250	\$5,000.00
54	EQUIPMENT RENTAL	\$5,000.00	1.000	\$5,000.00
55	REPAIR & MAINT - OTHER	\$5,000.00	1.000	\$5,000.00
56	NON CAP EQUIP PURCHASES	\$5,000.00	0.250	\$1,250.00
57	VEHICLE PARTS & LABOR	\$7,000.00	0.250	\$1,750.00
58	TIRES	\$1,500.00	1.000	\$1,500.00
59	GASOLINE	\$5,000.00	0.500	\$2,500.00
60	DIESEL	\$3,000.00	0.500	\$1,500.00
61	OTHER FLUIDS & LUBRICANTS	\$0.00	0.000	\$0.00
62	PRINCIPAL PMTS, LEASE PURCHASE	\$24,895.00	0.250	\$6,223.75
63	INTEREST PMTS, LEASE PURCHASE	\$6,010.00	0.250	\$1,502.50
	<b>NON-PERSONNEL WASTEWATER EXPENSE</b>	<b>\$1,276,815.00</b>		<b>\$632,209.00</b>
	<b>TOTAL WASTEWATER EXPENSE</b>	<b>\$1,524,275.00</b>		<b>\$731,193.00</b>

Notes: Loan repayment not included. TBD when loan amount is confirmed.  
Adjustment Factor for electricity and Contract Services based on following ratio: 500,000 gpd/810,000 = 0.617