SANTO DOMINGO
PUEBLO

LIFT STATIONS, FORCEMAINS, AND GRAVITY SEWER

PRELIMINARY ENGINEERING REPORT

Revised
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ABBREVIATIONS AND ACRONYMS

BBER	Bureau of Business and Economic Research
BIA	Bureau of Indian Affairs
BISON	Biota Information System of New Mexico
BOD_5	Biochemical Oxygen Demand
CE	Categorical Exclusion
CEC	Certificate of Environmental Clearance
CFR	Code of Federal Regulations
CIP	complete in place
COD	Chemical Oxygen Demand
CWA	Clean Water Act
DAR	Design Analysis Report
DESCRM	Division of Environmental, Safety and Cultural Resources Management
DIP	ductile iron pipe
DO	dissolved oxygen
EO	Executive Order
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FOG	fats, oils, and grease
fps	feet per second
GLS	Galileo Lift Station

ABBREVIATIONS AND ACRONYMS (continued)

gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
HDD	horizontal directional drilling
HDPE	high density polyethylene
HP	horsepower
Hz	hertz
I-25	Interstate 25
IHS	Indian Health Service
IPaC	Information for Planning and Construction
ISR 88	Indian Service Route 88
kW	kilowatt
LOC	Letter of Concurrence
LS	lift station
MBR	membrane bioreactor
MC	Molzen Corbin
MG	million gallons
mg/L	milligrams per liter
MGPD	million gallons per day
MP	Master Plan
MRGCD	Middle Rio Grande Conservancy District
MSL	Mean Sea Level
MVLS	Main Village Lift Station
ND	not detected
NFHL	National Flood Hazard Layer
NM 22	State Road 22
NMDGF	New Mexico Department of Game and Fish
NMDOT	New Mexico Department of Transportation
NMRPTC	New Mexico Rare Plant Technical Council

ABBREVIATIONS AND ACRONYMS (continued)

NPV	net present value
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
O&M	Operation and Maintenance
OMB	Office of Management and Budget
PER	Preliminary Engineering Report
PF	peaking factor
PNM	Public Service Company of New Mexico
PPW	previous present worth
psi	pounds per square inch
PVC	polyvinyl chloride
RD	Rural Development
RFP	Request for Proposals
RMRTD	Rio Metro Regional Transit District
ROW	right-of-way
rpm	revolutions per minute
RUS	Rural Utilities Service
sf	square feet
SPPW	single payment present worth
SUE	Subsurface Utility Engineering
SWR DOT	Southwest Region Division of Transportation
SWPPP	Stormwater Pollution Prevention Plan
TDH	total dynamic head
THPO	Tribal Historic Preservation Office
TIF	Tribal Infrastructure Fund
TKN	Total Kjeldahl Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
TUA	Tribal Utility Authority

ABBREVIATIONS AND ACRONYMS (continued)

UNM	University of New Mexico
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USPW	uniform series present worth
VFD	variable frequency drive
VSS	Volatile Suspended Solids
WRCC	Western Regional Climate Center
WWTP	Wastewater Treatment Plant

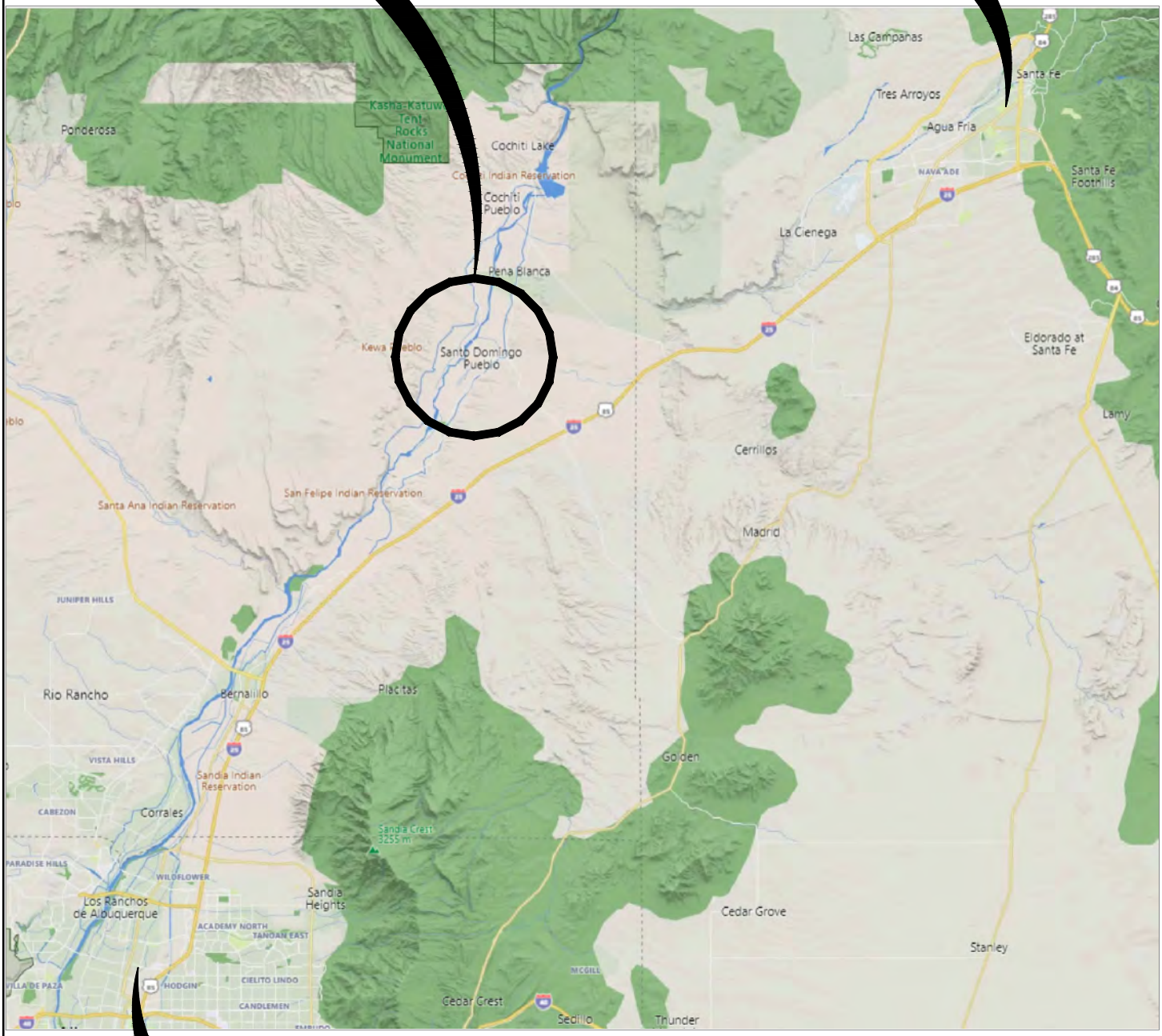
1.0 INTRODUCTION

1.1 Background and Location

Santo Domingo Pueblo (Santo Domingo) is located between Albuquerque, New Mexico and Santa Fe, New Mexico near Interstate 25 (I-25) and along State Road 22 (NM 22), the road to Cochiti Lake, also known as "Highway 22", as illustrated in Figure 1-1. Santo Domingo is seeking to implement a long-term solution to replace the existing wastewater collection, treatment, and disposal facilities. Three planning documents have been commissioned by Santo Domingo to facilitate the implementation of these critical facilities: (1) a Design Analysis Report (DAR) for a new Wastewater Treatment Plant (WWTP), the *Santo Domingo Pueblo Wastewater Treatment Plant Final Design Analysis Report – Revised Scope, May 2022* (Molzen Corbin [MC]), (2) this Preliminary Engineering Report (PER) the *Santo Domingo Pueblo Lift Stations, Forcemains, and Gravity Sewer PER*, *June 2022* (MC) and (3) the upcoming *Santo Domingo Pueblo Main Village Sewer Rehabilitation and Extension PER*, (MC). The proposed site for the new WWTP will be located approximately 1/2 mile south of the New Mexico Rail Runner Express Kewa Station adjacent to Indian Service Route 88 (ISR 88), as shown in Figure 1-2. Santo Domingo intends to orchestrate the implementation of the new and upgraded wastewater collection, treatment, and disposal facilities such that the new WWTP is constructed and available to accept wastewater from the community just prior to the time when the new lift station and forcemain facilities are constructed and become operational. Owing to the long-lead nature of the WWTP design and construction, the WWTP DAR was implemented early and has been completed.

The purpose of this PER is to evaluate population and growth trends to determine the required capacity of the lift stations and forcemains, establish lift station and forcemain component sizing, consider forcemain and gravity sewer alternatives, and make recommendations on the preferred options to effectively convey wastewater from the various community areas to the new WWTP site.

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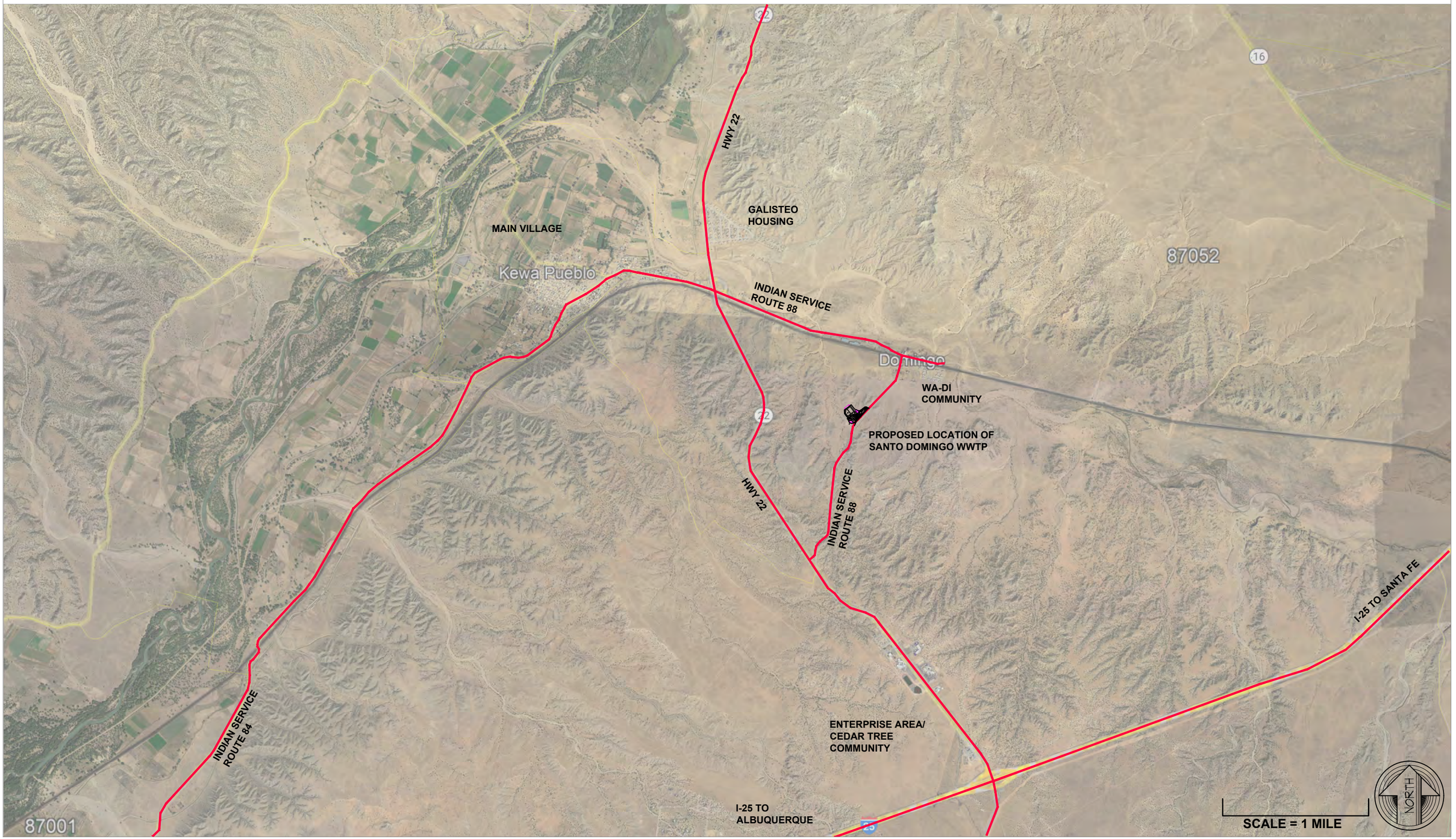


LIFT STATION FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

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AREA MAP & SITE LOCATION
FIGURE 1-1

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LIFT STATION FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

PROPOSED WWTP LOCATION MAP

FIGURE 1-2

1.2 Report Organization

This PER is generally structured based on the United States Department of Agriculture (USDA) Rural Development (RD) *Rural Utilities Service (RUS) Bulletin 1780-2* PER format. The format is required by many of the funding agencies that may review the PER as part of a funding request. The layout of the PER is outlined below:

- Section 1.0 – Explains the need for the PER and presents the environmental resources, population trends, and community engagement efforts.

- Sections 2.0 – Presents the system background, existing facilities, and financial and operational parameters.

- Section 3.0 – Describes the need for the project.

- Section 4.0 – Defines alternatives to address the needs, taking into consideration design criteria, land acquisition and permitting requirements, potential construction problems, environmental impacts, and costs.

- Section 5.0 – Provides a selection of alternatives based on life-cycle cost and non-monetary factors.

- Section 6.0 – Presents the recommended project components and provides detailed cost estimates and anticipated construction schedules.

- Section 7.0 – Provides conclusions for the PER and recommendations for phasing if necessary to facilitate infrastructure implementation.

- Section 8.0 – Provides reference citations for resources utilized in preparation of the PER.

1.3 Environmental Resources Present

1.3.1 Geology and Soils

Santo Domingo Pueblo is adjacent to the Rio Grande and the project limits are located within a portion of the Santo Domingo Basin situated between the Española Basin and the Northern Albuquerque Basin as related to the Rio Grande Rift. The Rio Grande Rift is a major continental rift system that separates the Colorado Plateau microplate on the west from the stable North American craton underlying the Great Plains to the east. The Santo Domingo Basin is part of an interconnected series of north-south aligned grabens and structural basins which have subsided between mountain and highland uplifts comprising the Rio Grande Rift. The complex structural basin was formed during the Tertiary Period, more than 7 million years ago, when the Sandia-Manzano fault block was uplifted and tilted. The basin is approximately 25 to 30 miles long and varies from about 15 to 20 miles wide. See the *Preliminary Geotechnical Report New Wastewater Treatment Plant Indian Service Route (ISR) 88 and 841 Santo Domingo (KEWA) Pueblo, New Mexico, February 23, 2022* (Terracon Consultants, Inc.) provided in Appendix C of the *Santo Domingo Pueblo Wastewater Treatment Plant Final Design Analysis Report – Revised Scope, May 2022* (MC).

The USDA Natural Resources Conservation Service (NRCS) Web Soil Survey was queried to identify the soils within the vicinity of the project area. Soil data reports for the project area are provided in Attachment A of Appendix A. As summarized in Attachment A of Appendix A, the project area includes various types of loam soils with slopes generally in the 0 to 3 percent range, riverwash, Witt-Harvey association with 1 to 7 percent slopes, and Harvey-Cascajo association with 5 to 15 percent slopes.

1.3.2 Floodplains

The project area falls within areas designated as Zone D by the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) No. 35043C1475D. Zone D represents areas with potentially moderate to high risk of flooding, but the probability has not been

determined. Data obtained from FEMA for the project area are included in a series of FIRMette maps included in Attachment B of Appendix A.

1.3.3 Wetlands

Wetlands are lowland areas inundated or saturated with water for a sufficient time to allow a prevalence of hydrophytic vegetation to develop. Jurisdictional wetlands, those protected from unauthorized dredge-and fill activities under Section 404 of the United States Environmental Protection Agency (USEPA) Clean Water Act (CWA) and *Executive Order (EO) 11990 – Protection of Wetlands*, have the following three essential characteristics: dominance by hydrophytic vegetation, hydric soils, and wetland hydrology. Hydrophytic vegetation requires inundated or saturated soil for its existence. Hydric soils are ponded or flooded for a sufficient time during the growing season to develop anaerobic conditions. Wetland hydrology is the availability of surface water or ground water to create the wetland environment. See the *Santo Domingo Pueblo Wastewater Treatment Plant Environmental Scoping Report, February 2022* (Epsilon Systems Solutions, Inc.) provided in Appendix E of the *Santo Domingo Pueblo Wastewater Treatment Plant Final Design Analysis Report – Revised Scope, May 2022* (MC).

The results of a query of the United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) website are included in Attachment C of Appendix A. As shown in Attachment C of Appendix A, Galisteo Creek is the only water body (Riverine) identified within the project area. Interestingly, as shown in Attachment C of Appendix A, the existing wastewater treatment lagoons for the Main Village at Santo Domingo are identified in the NWI map as freshwater ponds. It appears that there are no mapped wetlands which will impact the collection system improvements described within this PER.

1.3.4 Biological Resources

1.3.4.1 Threatened and Endangered Species

The USFWS is the federal agency with direct responsibility for implementing the Federal Endangered Species Act, listing species as threatened or endangered, and protecting the listed species. A list of threatened and endangered species from the USFWS Information for Planning and Construction (IPaC) website that might be found in the project area is included in Attachment D of Appendix A. This listing indicates that three birds and one fish have the potential to occur within the project area. The species and their status are: the Mexican spotted owl (*Strix occidentalis lucida*) – threatened, the southwestern willow flycatcher (*Empidonax traillii extimus*) – endangered, the yellow-billed cuckoo (*Coccyzus americanus*) – threatened, and the Rio Grande silvery minnow (*Hybognathus amarus)* – endangered.

Other agencies, such as the New Mexico Department of Game and Fish (NMDGF) keep their own list of species they deem as being sensitive, threatened, or endangered. The NMDGF Biota Information System of New Mexico (BISON) website provides detailed information about endangered, threatened, candidate, and other species for Sandoval County. This list is included in Attachment E of Appendix A.

1.3.4.2 Critical Habitat

A review of the USFWS IPaC resource list included in Attachment D of Appendix A indicates that no mapped critical habitat is present within the project area.

1.3.4.3 Rare Plants

A review of the New Mexico Rare Plant Technical Council (NMRPTC) list of rare plants for Sandoval County is included in Attachment F of Appendix A. The NMRPTC list identifies 11 species classified as Rare by the NMRPTC as well as two species classified as Endangered by the State of New Mexico but dropped by the NMRPTC.

1.3.5 Climate

The climate of Santo Domingo is considered to be cold semi-arid. There are no data specifically for Santo Domingo, so nearby reporting stations were queried. The Western Regional Climate Center (WRCC) has some data for Peña Blanca, but the data is quite old and limited to 1958 - 1968. The WRCC has data for the Santa Fe Municipal Airport (now known as the "Santa Fe Regional Airport"), located approximately 16 miles northeast from Santo Domingo, for the period of 1941 - 2016, which is summarized in Table 1-1. As shown in Table 1-1, the temperatures range from an average minimum of 18.4°F to an average maximum of 86.5°F. Table 1-1 also shows the average rainfall and snowfall throughout the year (in inches).

TABLE 1-1
AVERAGE MONTHLY CLIMATE DATA NEAR SANTO DOMINGO PUEBLO [1]

AVERAGES	MONTH												ANNUAL
	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	
Max Temp[2]	42.7	48.0	53.9	64.5	72.6	83.6	86.5	84.4	78.7	67.7	52.5	43.3	64.9
Min Temp[2]	18.7	22.3	26.5	34.5	43.2	51.9	57.9	56.4	49.2	38.9	24.9	18.4	36.9
Precipitation[3]	0.40	0.35	0.52	0.54	0.66	0.60	1.78	2.04	1.00	0.89	1.8	0.46	9.54
Snowfall[3]	5.2	3.7	2.3	1.6	0.1	0.0	0.0	0.0	0.0	0.0	2.4	3.1	17.7

[1] Source: WRCC, https://wrcc.dri.edu/
[2] In degrees Fahrenheit
[3] In inches

1.4 Population Trends

1.4.1 Community Demographics

Demographic information for Santo Domingo Pueblo, Sandoval County, and the state of New Mexico are provided in Table 1-2. The information was obtained from queries of United States Census Bureau databases, which are included in Attachment G of Appendix A.

1.4.2 Current Population

Santo Domingo estimates there were 4,032 persons within the Pueblo as of 2021. Based on aerial photography from Google Earth to estimate the number of houses and buildings in each population center, counting the number of sewer connections from sewer video logs in the Main Village, and using 4.9 persons per dwelling based on the 2020 Census (see Table 1-2 and Attachment G of Appendix A), the estimated current population distribution is presented in Table 1-3.

TABLE 1-2
DEMOGRAPHIC CHARACTERISTICS

CHARACTERISTIC	NEW MEXICO [1]	SANDOVAL COUNTY [1]	SANTO DOMINGO PUEBLO [2]
Racial and Age Characteristics [1]			
White	81.9%	78.2%	0.7%
Black	2.6%	2.7%	0.1%
American Indian/Alaska Native	11.0%	14.1%	77.5%
Asian	1.8%	1.7%	--
Native Hawaiian/Other Pacific Islander	0.2%	0.2%	--
Hispanic or Latino Origin	49.3%	39.9%	21.5%
Other/Two or More Races	2.6%	3.1%	0.2%
White Persons not Hispanic	36.8%	39.9%	--
Persons under 5 Years	5.8%	5.4%	6.9%
Persons under 18 Years	22.7%	22.8%	28.5%
Persons 65 Years and Over	5.8%	5.4%	8.3%
Female Persons	50.5%	50.9%	49.9%
Income Statistics [2]			
Per Capita Income (2020)	$27,945	$30,273	$14,417
Persons Per Household	2.59	2.74	4.9
Median Household Income	$51,243	$65,071	$36,540
Persons Below Poverty Level	16.8%	10.4%	22.5%

[1] Based upon 2020 data.
[2] Based on 2016-2020 data.

TABLE 1-3
ESTIMATED CURRENT POPULATION

POPULATION CENTER	ESTIMATED STRUCTURES	ESTIMATED POPULATION [1]
Main Village	648[2]	3,175
Galisteo Housing	107	524
Wa-Di Community	47	230
Cedar Tree Community in the Enterprise Area	21	103
TOTAL:	**823**	**4,032**

[1] Estimated population based on 4.9 persons per dwelling from 2020 Census.
[2] Based on 623 service connections counted during review of sewer video logs plus an estimated 25 additional homes assumed not to be accounted for in the video log review.

1.4.3 Projected Population

Projecting populations for a community can be accomplished by reviewing census data, historical building activity, utility accounts, and published sources that specialize in socioeconomic data and forecasting. The University of New Mexico (UNM) Bureau of Business and Economic Research (BBER) is recognized as an expert in providing socioeconomic data and forecasting in New Mexico, with more than 70 years of experience. Although the BBER does not have population projections specifically for Santo Domingo, there are projections for Sandoval County. The projected population growth rates for Sandoval County are available in 5-year increments within the 20-year planning period of this PER and are summarized in Table 1-4.

TABLE 1-4
PROJECTED GROWTH RATES FOR SANDOVAL COUNTY

RANGE OF YEARS IN PLANNING PERIOD	PROJECTED ANNUAL GROWTH RATE [1]
2020 to 2025	0.967%
2026 to 2030	0.868%
2031 to 2035	0.751%
2036 to 2040	0.658%

[1] Based on projections from the UNM BBER.

For the purposes of this PER, the annual growth rates from Table 1-4 have been used to estimate the population from current to 2042 (20-year planning period) in Table 1-5. Also presented in Table 1-5 is an approximated ultimate population of 10,200 which corresponds closely to the

ultimate population indicated in the Request for Proposals (RFP) for this project, as issued by the Santo Domingo Tribal Utility Authority (TUA).

TABLE 1-5
POPULATION PROJECTIONS FOR SANTO DOMINGO PUEBLO

YEAR	PROJECTED POPULATION [1]
2021	4,032
2022	4,071
2023	4,110
2024	4,150
2025	4,190
2026	4,227
2027	4,263
2028	4,300
2029	4,338
2030	4,375
2031	4,408
2032	4,441
2033	4,475
2034	4,508
2035	4,542
2036	4,572
2037	4,602
2038	4,632
2039	4,663
2040	4,693
2041	4,724
2042	4,755
Ultimate [2]	10,200

[1] Based on projections from the UNM BBER for Sandoval County and 2021 population provided by Santo Domingo Pueblo

[2] The RFP for Professional Engineering Services issued by Santo Domingo Pueblo TUA indicates an anticipated population of as much as 10,000.

1.5 Community Engagement

As indicated in Section 1.1, this PER is part of an overall planning effort by Santo Domingo related to the community's wastewater collection, treatment, and disposal facilities. Santo Domingo plans to engage the community once the various planning efforts have been developed to a level of completion that supports the desired community outreach efforts.

2.0 EXISTING FACILITIES

2.1 Location Map and System Description

The project location maps were introduced in Figures 1-1 and Figure 1-2 of Section 1.0. The existing wastewater collection, treatment, and disposal system for Santo Domingo consists of a combination of community-based gravity sewers, onsite systems with septic tanks and leach fields, lagoons for treatment and evaporative disposal, and two small package treatment plants in the Enterprise Area.

2.2 History

Santo Domingo (also known as the Kewa Pueblo) has a long history of producing, trading, and selling crafts, particularly pottery and jewelry. Unlike many Native American tribes, the Kewa people were never physically displaced, so the area has been their tribal homeland for thousands of years. Community wastewater collection and treatment facilities for the Main Village date back to the 1960s with the construction of the original clay lined treatment lagoons. Wastewater collection and treatment facilities for the areas of Galisteo, Wa-Di, and the Enterprise Area have been implemented over the years as these areas have developed.

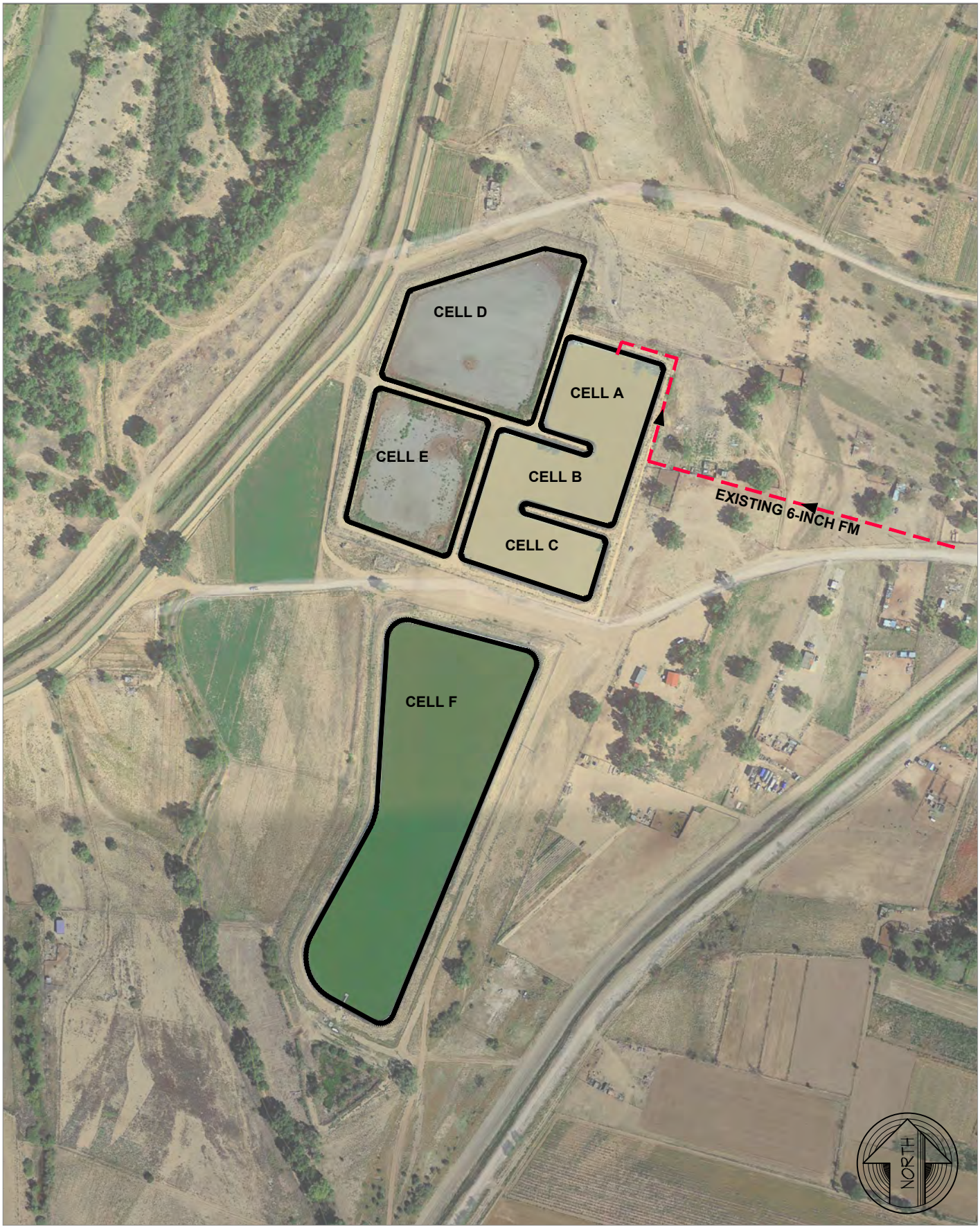
2.3 Condition of Existing Facilities

Existing wastewater treatment facilities and their condition for the Main Village, Galisteo Housing area, Wa-Di Housing area, and the Enterprise Area are described in the following paragraphs.

2.3.1 Main Village Lagoons and Lift Station

The Main Village lagoons consist of six cells with a total volume of approximately 33 million gallons (MG). The Main Village lagoons are illustrated in Figure 2-1.

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LIFT STATION FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

EXISTING LAGOONS AT MAIN VILLAGE

FIGURE 2-1

MOLZENCORBIN

The lagoons were originally constructed in 1960, consisting of five lagoons, designated as Cells A through E, with clay liners. Cell F was constructed in 1998. Three of the older cells (Cells A, B, and C) were modified in 2015-2016 to combine them and create a serpentine flow arrangement as shown in Figure 2-1. Santo Domingo reports that the lagoons are inadequately sized for current flows, and that wastewater periodically must be pumped and hauled to an offsite disposal facility.

Wastewater from the Main Village is pumped to the Main Village lagoons via the Main Village Lift Station. The Main Village Lift Station was designed by the Indian Health Service (IHS) and was commissioned in August 2011. Key features and current conditions of the Main Village Lift Station are summarized below:

- Two submersible pumps in wet well
- FLYGT™ Pump No. 3127.090-0810241:
  - Motor: 60 hertz (Hz); 7.5 kilowatt (kW)-10 horsepower (HP); 1735 revolutions per minute (rpm)
  - 460/Y/230V; 13/25A
  - Pump Curve: 3127.090-2772
- EG Controls, Inc.:
  - Factory No. 262244
  - 230V
  - 3-Phase
  - 60 Hz
  - 4X UL Enclosure
- Pump No. 1 Running Time: 27,203 hours
- Pump No. 2 Running Time: 23,885 hours
- Flow Meter Readout: 260 gallons per minute (gpm) with one pump running
- Wet Well Size:
  - 8 feet inside diameter by 16 feet-8 inches deep
  - Concrete cover, 16 inches above grade
  - FLYGT™ aluminum metal bi-fold cover with grate fall protection – good condition

- Interior concrete walls coated with Zebron™ protective coating – good condition
- Stainless steel vent pipe through concrete cover

- Jib Crane:
  - Manual chain
  - Spanco Part No. 100-1208-1208-1210 (or 1211?)
  - Serial Number: 080080-01-A
  - Trolley without hoist
  - Jib crane rusted – fair condition
  - Lifting Capacity: Unknown
- Standby Generator: None
- Valve Vault:
  - Approximate Size: 11 feet length by 6 feet width by 7 feet depth
  - Concrete cover, 16 inches above grade
  - Concrete walls – good condition
  - Concrete walls not coated
  - FLYGT™ aluminum metal bi-fold cover without fall protection – good condition
  - Metal ladder – good condition
  - 6-inch discharge piping from each pump:
    - Pressure gauge upstream of ball check valve
    - Ball check valve
    - Plug valve with handwheel operator
    - Pressure gauge installed downstream of plug valve
    - Piping not coated – in good condition, rust minor
  - Individual discharge pipes connected to single 6-inch forcemain upstream of mag flow meter in valve vault.
  - Valve vault includes sump pit.
  - Stainless steel vent pipe through concrete cover.
- Site:
  - Galvanized chain link fence and gate – good condition
  - Graveled ground surface within chain link fence

2.3.2 Galisteo Housing

The Galisteo Housing lagoons consist of a three-cell lagoon system with a total volume of approximately 23 MG. The Galisteo Housing lagoons were constructed in 1998 and are illustrated in Figure 2-2. Santo Domingo suspects there are a significant number of leaking water fixtures in the Galisteo Housing area, increasing flows to the lagoons that have exceeded the capacity of the lagoons, causing overflow events and the need to pump wastewater to the Main Village lagoons.

2.3.3 Wa-Di Housing

The wastewater collection system serving Wa-Di consists of 8-inch gravity sewer lines that discharge to a community septic system. The community of Domingo lies just north of Wa-Di across the railroad tracks and consists of several residential units, the Railrunner Light Rail Train Station, and a commercial Trading Post. The method of wastewater treatment for these structures are individual commercial or residential septic tanks. A WWTP for the Wa-Di Housing area was considered in a PER prepared for the Santo Domingo Tribal Housing Authority, the *Preliminary Engineering Report Domingo Housing – Wastewater Kew Pueblo, New Mexico, November 22, 2016, (*Forsgren Associates, Inc). However, lack of funding to implement the treatment plant resulted in onsite wastewater treatment being the only solution at the time of construction. The large onsite wastewater disposal system for the Wa-Di Housing area consists of a 20,000-gallon septic tank and approximately 7,000-feet of leach line for infiltration of septic tank effluent. Field observations show a substantial amount of fats, oils, and grease (FOG) in this septic tank and it is believed that the leach field has failed because of the FOG. As a result, Santo Domingo routinely pumps out the septic tank to maintain wastewater service to the Wa-Di area.

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LIFT STATION FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

EXISTING LAGOONS FOR GALISTEO HOUSING

MOLZENCORBIN

FIGURE 2-2

2.3.4 Enterprise Area

The six areas that currently comprise the Enterprise Area include the Cedar Tree Community, Santo Domingo High School, the Gas Station / Travel Center, and the Tribal Housing Authority, the Kewa Safety Complex, the Santo Domingo Health Center, and the Santo Domingo Early Childhood Learning Center. The existing wastewater facilities for each of these areas are described in the following paragraphs.

2.3.4.1 Cedar Tree Community

Wastewater from the Cedar Tree Community is collected in gravity sewers constructed in the streets and is conveyed to a community septic tank located southwest of the community. Treatment and disposal of the wastewater is through the septic tank and leach field located adjacent to the community septic tank.

2.3.4.2 Santo Domingo High School

Wastewater from the High School is conveyed by gravity to a lift station located just north of the northeast corner of the athletic field. Pumped flows from the lift station are directed to a septic tank and leach field located between the athletic / ball fields and NM 22.

2.3.4.3 Gas Station / Travel Center and the Tribal Housing Authority

Wastewater from the Gas Station / Travel Center and the Santo Domingo Tribal Housing Authority is conveyed by gravity north across NM 22 and is disposed of via a lagoon located north of NM 22.

2.3.4.4 Kewa Safety Complex

The Kewa Safety Complex is served by a dedicated septic tank and leach field located north of the Safety Complex.

2.3.4.5 Santo Domingo Health Center

Wastewater from the Health Center is directed to two septic tanks and leach fields located north of the complex. In addition, a membrane bioreactor (MBR) package plant provides treatment for disposal of a portion of the wastewater flows generated by the Health Center via leach field.

2.3.4.6 Santo Domingo Early Childhood Learning Center

The Santo Domingo Early Childhood Learning Center is served by a package MBR plant that treats the wastewater generated in the Center for disposal via leach field.

2.3.5 Existing Sewage Collection and Treatment System

The existing sewage collection and treatment systems for the four service areas, including the Main Village, Galisteo, Wa-Di, and the Enterprise Area are shown schematically in Figure 2-3.

2.4 Financial Status of Existing Facilities

2.4.1 Revenue and Expenditures

Santo Domingo operates a combined water and sewer enterprise fund. A summary of Santo Domingo's water and sewer enterprise fund for the past 4 years is provided below in Table 2-1. The expenditures have historically significantly exceeded the revenue generated from user rates, resulting in substantial subsidies from other funding sources at Santo Domingo.

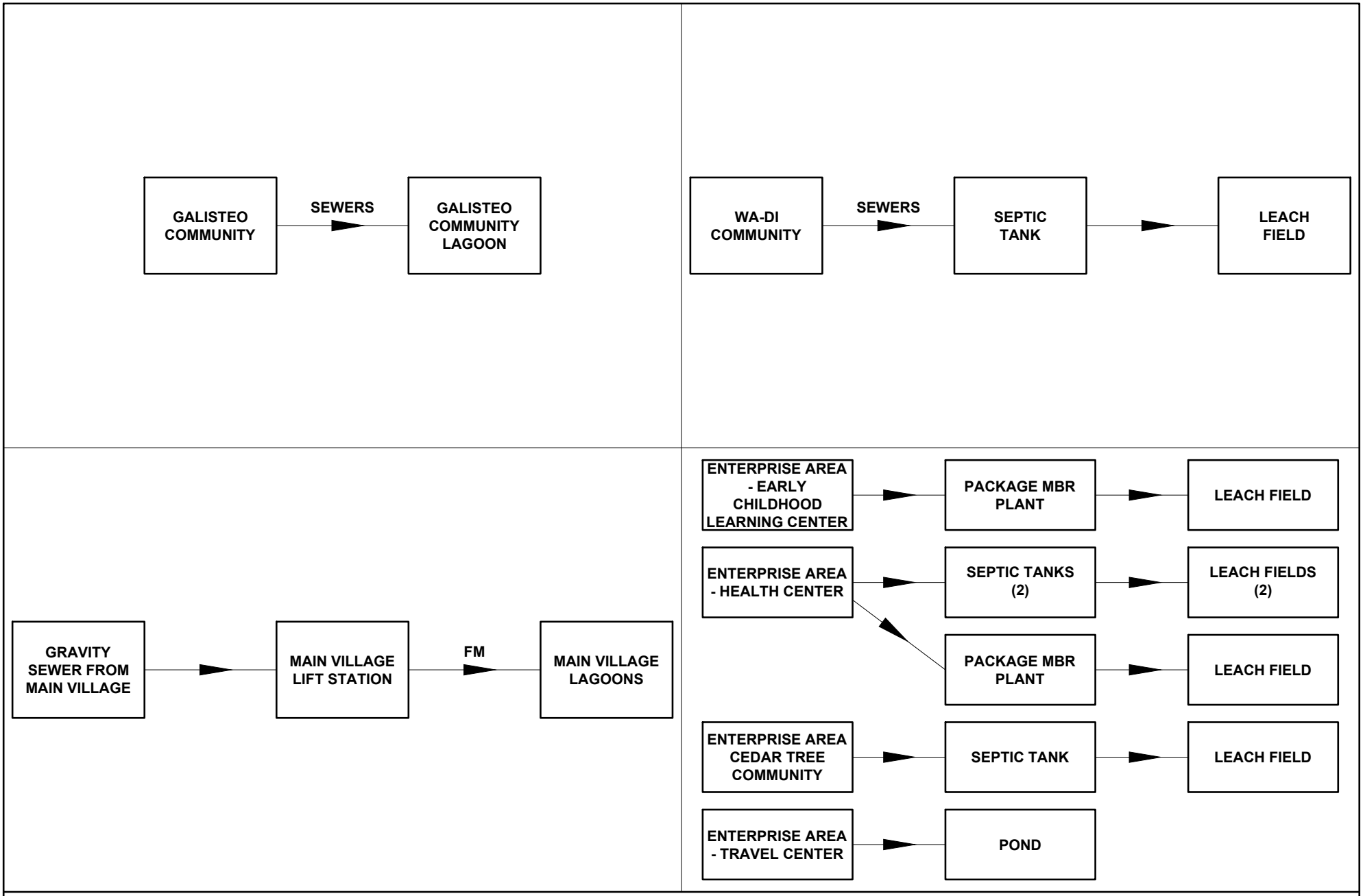
TABLE 2-1
SANTO DOMINGO WATER AND SEWER ENTERPRISE FUND REVENUE AND EXPENDITURES 2018-2021

YEAR	REVENUE	EXPENDITURE	BALANCE
2018	$ 69,391.00	$ 699,147.00	($ 629,756.00)
2019	$ 101,311.00	$ 967,245.00	($ 865,934.00)
2020	$ 100,149.00	$ 747,923.00	($ 647,774.00)
2021	$ 179,245.00	$ 975,095.00	($ 795,850.00)

2.4.2 Existing Debt

Santo Domingo currently has no debt assigned to its water and sewer enterprise fund.

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LIFT STATION FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

MOLZENCORBIN

EXISTING SEWAGE COLLECTION & TREATMENT SYSTEM
FIGURE 2-3

2.4.3 User Rates

On March 21, 2022, Santo Domingo adopted Resolution No. 03-2022-06 which increased charges for commercial water and sewer services. Residential rates for water and sewer remained at the flat rate of $40 per month. A summary of the current and impact increases for the various commercial accounts is provided in Table 2-2.

TABLE 2-2
SANTO DOMINGO CHARGES FOR
COMMERCIAL WATER AND SEWER SERVICES

COMMERCIAL ACCOUNTS	CURRENT	IMPACT INCREASE
Santo Domingo Senior Center	$ 200.00	$ 500.00
United States Postal Service	$ 200.00	$ 200.00
Santo Domingo Headstart	$ 200.00	$ 1,000.00
Santo Domingo Health Clinic	$ 200.00	$ 1,200.00
Kewa House	$ 200.00	$ 500.00
Santo Domingo Housing Authority	$ 200.00	$ 500.00
Kewa Gas Ltd.	$ 200.00	$ 1,200.00
Education Department	$ 200.00	$ 400.00
Santo Domingo Fitness Center	$ 200.00	$ 500.00
Child Care and Development	$ 200.00	$ 500.00
Kewa Keres Language Program	-	$ 50.00
Emergency Response Services	-	$ 100.00
Santo Domingo Census Office	-	$ 50.00
Tribal Historical Preservation	-	$ 50.00
Information Technology	-	$ 50.00
Sorna	-	$ 50.00
IDC	-	$ 50.00
Tribal Courts	-	$ 100.00
Santo Domingo Library	-	$ 100.00
Governors Office	$ 200.00	$ 200.00
Community Health Representatives	-	$ 100.00
Emergency Medical Services	-	$ 1,200.00
Natural Resources Department	-	$ 200.00
Tribal Utility Authority	-	$ 200.00
Transportation Department	-	$ 200.00
Kewa Family Wellness Center	-	$ 500.00

2.4.4 Current Operating Budget

A summary of the Santo Domingo 2022 operating and maintenance budget for the water and sewer enterprise fund is provided in Table 2-3.

2.5 Water / Energy / Waste Audits

No official audits for water, energy, or waste have been conducted to date.

TABLE 2-3
SANTO DOMINGO WATER AND SEWER ENTERPRISE FUND
2022 OPERATING AND MAINTENANCE BUDGET

ITEM	AMOUNT
Salaries and benefits	$ 895,973.00
Travel and training	$ 19,000.00
Landfill fees	$ 55,000.00
Insurance	$ 20,000.00
Materials and supplies	$ 85,000.00
Utility and office expenses	$ 53,500.00
Repairs and maintenance	$ 20,000.00
Vehicle gas	$ 20,000.00
Professional fees	$ 20,000.00
Administrative fees	$ 292,400.00
TOTAL:	**$ 1,480,873.00**

3.0 NEED FOR PROJECT

3.1 Health, Sanitation, and Security

The Main Village Lagoons and the Galisteo Lagoons are susceptible to overflows of partially treated sewage, potentially raising health and sanitation concerns for the residents and visitors to the area. In addition, the Rio Grande and Galisteo Creek are in close proximity to these treatment lagoons, leaving these water bodies susceptible to contamination should an overflow situation occur.

For Wa-Di, the existing wastewater treatment system consists of an array of commercial septic tanks that contain splitter boxes that distribute the effluent to approximately 1.5 acres of leach field. The leach field has completely plugged-up due to a combination of poor soil conditions, as well as an accumulation of fats, oils and grease (FOG) that has reduced the ability of the soil to bioremediate the sewage and drain the effluent into the ground. The Santo Domingo TUA is required to pump out the retained sewage every other week. This practice is not only expensive, but it also runs the risk of sewage surcharges to the surface if the pumping is delayed for any reason.

The open lagoon for the Travel Center near the intersection of Interstate 25 and Highway 22 is also susceptible to an overflow situation.

Untreated wastewater can spread disease and potentially contaminate drinking water sources if left unattended. Feces and urine from humans carry many disease-causing organisms. Disease-causing organisms (pathogens) from humans can result in residents acting as carriers of these diseases. Carriers may not have symptoms or even know they have a disease and can spread to other humans or animals. Pathogens in wastewater may be transmitted by direct contact with sewage, should a resident encounter pooled sewage above the leach field (as an example - a stray ball is hit or kicked into the leach field, and someone retrieves that ball).

3.2 Aging Infrastructure

By far, the oldest portion of the Santo Domingo wastewater system is the collection system and treatment lagoons in the Main Village. These facilities date back to the 1960s. While not the focus of this PER, the Main Village sewer collection facilities and treatment lagoons have reached the end of their service life and are in need of major repair or replacement. The Galisteo lagoons were constructed in 1998, so those facilities are approaching 25 years of age. The Wa-Di community sewerage facilities are newer, having been constructed in 2017. However, the leach field at Wa-Di has failed, resulting in the need for system replacement. The sewerage facilities at the Enterprise Area are of various ages, relying on septic tanks or treatment facilities with leach fields or evaporation / percolation ponds.

Santo Domingo has determined that a new WWTP is needed for their community and the location selected, although centrally located, is at a higher elevation than most of the existing facilities. As such, the focus of this PER is on the new facilities needed to convey wastewater from the four service areas in Santo Domingo to the new WWTP site.

3.3 Reasonable Growth Flow Projections

3.3.1 Estimated Residential Wastewater Flows

Wastewater flows can be estimated for a community based on water production data, particularly for a community with limited landscape irrigation. Water production data from Santo Domingo was obtained for the calendar year of 2019 to approximate the current water production under normal conditions (i.e., the last full year prior to the onset of the COVID-19 pandemic). This water production data is presented graphically in Figure 3-1. As shown in Figure 3-1, the average water production for 2019 was 215,242 gpd and the peak day was 408,722 gpd. This data yields a peak day to average day peaking factor (PF) of 1.90. The modest increase (about 25%) of summertime water use compared to the rest of the year suggests there is limited outdoor watering from the potable system. For a community with very limited landscape irrigation, the wastewater flows can be estimated by assuming that 90% of the water pumped in the wells is

discharged into the sewers as wastewater flow. As such, for the current population of 4,032 from Table 1-2 and Attachment G of Appendix A, this equates to a per-capita wastewater flow rate of:

Per-Capita Wastewater Flow = (215,242 gpd) x 90% ÷ 4,032 people

Per-Capita Wastewater Flow = 48 gallons per capita per day (gpcd)

Per-Capita Wastewater Flow (rounded) = 50 gpcd

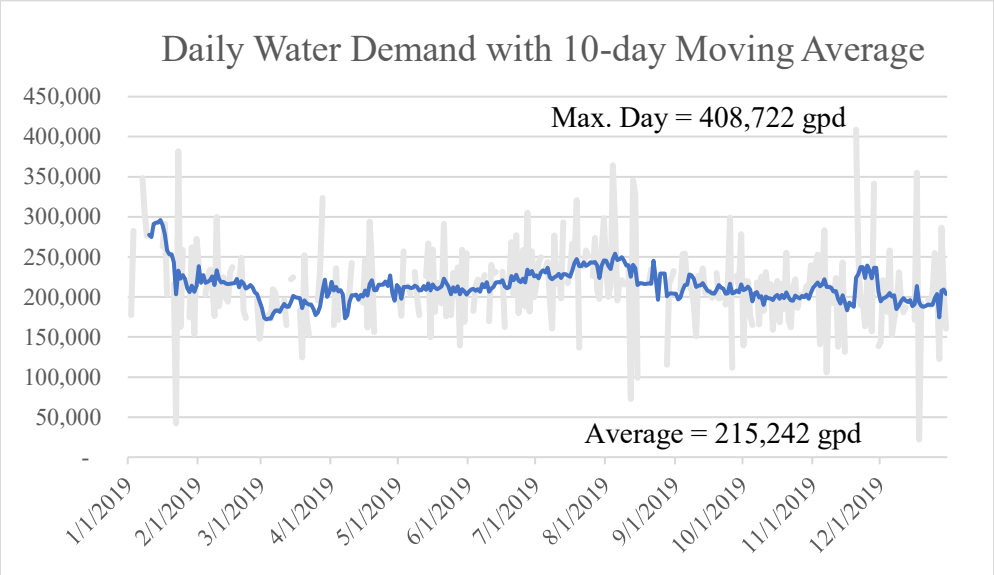


FIGURE 3-1

SANTO DOMINGO WATER DEMAND FROM WELL PRODUCTION DATA

Peaking factors to estimate peak month, peak day, and peak hour wastewater flows can be established from several resource documents, including *Wastewater Engineering Treatment and Reuse, 5th Edition, Metcalf & Eddy, Inc., Recommended Standards for Wastewater Facilities, 2014 Edition*, published by the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, and known as the "Ten State Standards", the Maryland Department of the Environment Engineering and Capital Projects Program, and others. The *Maryland Department of the Environment Engineering and Capital Projects*

Program, Design Guidelines for Wastewater Facilities, 2016 provides a useful approach to estimate all the peaking factors indicated above, and is summarized below:

Daily PF = 75% of Hourly Peak Flow

Monthly PF = 50% of Hourly Peak Flow (but not below 1.2)

3.3.2 Estimated Wastewater Flows from the Commercial Portion of the Enterprise Area

The Enterprise Area of Santo Domingo includes several commercial establishments, along with a residential area known as the Cedar Tree community. The growth of the commercial portion of the Enterprise Area is anticipated to occur at a greater rate than the residential areas. As such, the estimated wastewater flows from the commercial portion of the Enterprise Area is considered separately from the other areas of Santo Domingo and is summarized in Table 3-1. As shown in Table 3-1, for planning purposes, the current wastewater flows from the commercial portion of the Enterprise Area is estimated at 80,000 gpd.

TABLE 3-1
ESTIMATED WASTEWATER FLOWS FROM ENTERPRISE AREA [1]

DESCRIPTION	UNIT	UNIT FLOW RATE	ESTIMATED WASTEWATER FLOW (gpd)
Health Center	60,000 square feet (sf) [2]	0.62 gpd/sf [3]	37,572
Elementary School	261 students	25 gpd/student [4]	6,525
Middle School	87 students	25 gpd/student [4]	2,175
Early Childhood Learning Center	215 children	25 gpd/student [4]	5,375
Safety Complex	20 staff	25 gpd/staff [5]	500
Gas Station / Travel Center	two complexes	5,000 gpd each [6]	10,000
		Subtotal:	62,147
TOTAL (ROUNDED UP FOR CONSERVATISM):			**80,000**

1 The Enterprise Area also includes a residential component, which is not included here.
2 Dimensions approximated from Google Earth image.
3 From the Maryland Department of the Environment Engineering and Capital Projects Program.
4 Per the *USEPA Onsite Wastewater Treatment Systems Manual, February 2002*.
5 As recommended in the 15A North Carolina Administrative Code Section 02T.0114 – Wastewater Design Flow Rates.
6 Assumed amount.

3.3.3 Estimated Current Wastewater Flows

Based on the estimated current populations from Table 1-2 and Attachment G of Appendix A for each of the population centers in Santo Domingo and the average day wastewater flow rate of 50 gpcd, along with the peaking factors established above, the current wastewater flows can be established. In addition, based on the estimated wastewater flows from the commercial portion of the Enterprise Area and applying the same peaking factors, the estimated average day, peak month, peak day, and peak hour wastewater flows can be established, as summarized in Table 3-2.

TABLE 3-2
ESTIMATED CURRENT WASTEWATER FLOWS

POPULATION CENTER	ESTIMATED POPULATION	AVERAGE DAY (gpd)	PEAK MONTH (gpd) [1][2]	PEAK DAY (gpd) [1][3]	PEAK HOUR (gpd) [1][4]
Main Village	3,175	158,750	201,000	302,000	402,000
Galisteo Housing	524	26,200	34,000	50,000	67,000
Wa-Di Community	230	11,500	15,000	22,000	30,000
Cedar Tree Community in the Enterprise Area	103	5,150	7,000	10,000	13,000
Subtotal:	4,032	201,600	257,000	384,000	512,000
Enterprise Area	---	80,000	101,000	152,000	203,000
TOTAL:	**4,032**	**282,000 [1]**	**358,000**	**536,000**	**715,000**

[1] Rounded to nearest 1,000 gpd.

[2] Peak hour multiplied by 0.5 (per the *Maryland Department of the Environment Engineering and Capital Projects Program, Design Guidelines for Wastewater Facilities, 2016*, see Section 3.3.1).

[3] Average day multiplied by 1.9 based on well production records for 2019.

[4] Peak day divided by 0.75 (per the *Maryland Department of the Environment Engineering and Capital Projects Program, Design Guidelines for Wastewater Facilities, 2016*, see Section 3.3.1).

3.3.4 Flow Projections

Based on the population projections from Table 1-4 of Section 1.4.3 and the same methodology used to establish the wastewater flow projections presented in Table 3-2, the projected wastewater flows throughout the planning period, including ultimate build-out, are presented in Table 3-3.

TABLE 3-3
WASTEWATER FLOW PROJECTIONS

YEAR	POPULATION (UNM BBER)	RESIDENTIAL FLOW (gpd)	ENTERPRISE AREA (gpd)	FLOW (gpd)			
				AVG. DAY	MAX. MONTH	MAX. DAY	PEAK HOUR
2021	4,032	201,600	80,000	282,000	358,000	536,000	715,000
2022	4,071	203,549	84,297	288,000	365,000	548,000	730,000
2023	4,110	205,518	88,824	295,000	374,000	561,000	748,000
2024	4,150	207,505	93,594	302,000	383,000	574,000	766,000
2025	4,190	209,512	98,621	309,000	392,000	588,000	783,000
2026	4,227	211,330	103,918	316,000	401,000	601,000	801,000
2027	4,263	213,165	109,499	323,000	410,000	614,000	819,000
2028	4,300	215,015	115,380	331,000	420,000	629,000	839,000
2029	4,338	216,881	121,577	339,000	430,000	645,000	859,000
2030	4,375	218,764	128,106	347,000	440,000	660,000	880,000
2031	4,408	220,407	134,987	356,000	451,000	677,000	902,000
2032	4,441	222,062	142,236	365,000	463,000	694,000	925,000
2033	4,475	223,730	149,876	374,000	474,000	711,000	948,000
2034	4,508	225,410	157,925	384,000	487,000	730,000	973,000
2035	4,542	227,103	166,407	394,000	500,000	749,000	999,000
2036	4,572	228,597	175,344	404,000	512,000	768,000	1,024,000
2037	4,602	230,101	184,761	415,000	526,000	789,000	1,052,000
2038	4,632	231,615	194,684	427,000	541,000	812,000	1,082,000
2039	4,663	233,139	205,140	439,000	557,000	835,000	1,113,000
2040	4,693	234,673	216,158	451,000	572,000	857,000	1,143,000
2041	4,724	236,217	227,767	464,000	588,000	882,000	1,176,000
2042	4,755	237,772	240,000	478,000	606,000	909,000	1,211,000
Ultimate	10,200	510,000	240,000	750,000	950,000	1,425,000	1,900,000

As shown in Table 3-3, the projected residential wastewater flows are estimated by year based on the projected population and a per-capita wastewater flow of 50 gpcd. The Enterprise Area is assumed to triple in size at a linear rate over the 20-year planning period. Adding the residential flow to the projected Enterprise Area flows yields an average day wastewater flow by year for the planning period, including the ultimate build-out scenario. Estimated flows for maximum month, maximum day, and peak hour are also presented in Table 3-3 for each year in the planning period. Key flow projections from Table 3-3 are summarized below:

- Current Average Day Flow = 282,000 gpd
- 20-Year Average Day Flow = 478,000 gpd
- Ultimate Average Day Flow = 750,000 gpd
- Ultimate Peak Hour Flow = 1.9 million gallons per day (MGPD)

The flow projections in Table 3-3 are consistent with the projected wastewater flows developed in the *Santo Domingo Pueblo Wastewater Treatment Plant Final Design Analysis Report – Revised Scope, May 2022* (MC). However, the nature of these flow projections essentially is based on the accumulation of gravity flows to estimate daily flow rates. The influence of pumped flow and minimum velocity criteria in forcemains must be factored in to determine required facility sizing. For the purposes of this PER and to determine the impact of pumped flow conditions, it is necessary to disaggregate the projected flows to determine the flow contributions from the four service areas described in Section 2.3 (Main Village, Galisteo Housing area, Wa-Di Housing area, and the Enterprise Area).

For wastewater collection, pumping, and conveyance (forcemain) facilities, it is important to understand the range of flows to be accommodated within the planning period, as well as the ultimate flows that can be expected to appropriately size these facilities. The average day flows from Table 3-3 have been disaggregated by service area based on the population distribution for the four services areas presented in Table 3-2 and are shown in Table 3-4. For the purposes of sizing pumping facilities, the average daily flow rates are also shown in gpm in Table 3-4. Key flow rates for the wastewater pumping analysis are highlighted in green in Table 3-4.

TABLE 3-4
SANITARY SEWER COLLECTION SYSTEM – AVERAGE DAY FLOW PROJECTIONS

YEAR	GRAVITY FLOW TO MAIN VILLAGE LIFT STATION		GALISTEO LIFT STATION				GRAVITY FLOW TO WA-DI LIFT STATION		ENTERPRISE AREA						TOTAL FLOW TO WWTP
			GRAVITY FLOW		MAIN VILLAGE LIFT STATION	TOTAL			ENTERPRISE AREA LIFT STATION		CEDAR TREE GRAVITY FLOW		ENTERPRISE AREA GRAVITY FLOW		TOTAL	
	(gpd)	(gpm)	(gpd)	(gpm)	(gpd)	(gpd)	(gpd)	(gpm)	(gpd)	(gpm)	(gpd)	(gpm)	(gpd)	(gpm)	(gpd)	(gpd)
2021	158,750	110	26,200	18	158,750	184,950	11,500	8	40,000	28	5,150	3.6	40,000	28	85,150	282,000
2022	160,285	111	26,453	18	160,285	186,738	11,611	8	42,148	29	5,200	3.6	42,148	29	89,496	288,000
2023	161,835	112	26,709	19	161,835	188,544	11,723	8	44,412	31	5,250	3.6	44,412	31	94,074	295,000
2024	163,400	113	26,967	19	163,400	190,367	11,837	8	46,797	32	5,301	3.7	46,797	32	98,895	302,000
2025	164,980	115	27,228	19	164,980	192,208	11,951	8	49,311	34	5,352	3.7	49,311	34	103,973	309,000
2026	166,412	116	27,465	19	166,412	193,877	12,055	8	51,959	36	5,399	3.7	51,959	36	109,316	316,000
2027	167,857	117	27,703	19	167,857	195,560	12,160	8	54,750	38	5,445	3.8	54,750	38	114,944	323,000
2028	169,314	118	27,943	19	169,314	197,257	12,265	9	57,690	40	5,493	3.8	57,690	40	120,873	331,000
2029	170,783	119	28,186	20	170,783	198,969	12,372	9	60,788	42	5,540	3.8	60,788	42	127,117	339,000
2030	172,266	120	28,431	20	172,266	200,696	12,479	9	64,053	44	5,588	3.9	64,053	44	133,695	347,000
2031	173,559	121	28,644	20	173,559	202,203	12,573	9	67,493	47	5,630	3.9	67,493	47	140,617	356,000
2032	174,863	121	28,859	20	174,863	203,722	12,667	9	71,118	49	5,673	3.9	71,118	49	147,909	365,000
2033	176,176	122	29,076	20	176,176	205,252	12,762	9	74,938	52	5,715	4.0	74,938	52	155,591	374,000
2034	177,499	123	29,294	20	177,499	206,793	12,858	9	78,962	55	5,758	4.0	78,962	55	163,683	384,000
2035	178,832	124	29,514	20	178,832	208,346	12,955	9	83,203	58	5,801	4.0	83,203	58	172,208	394,000
2036	180,009	125	29,709	21	180,009	209,717	13,040	9	87,672	61	5,840	4.1	87,672	61	181,184	404,000
2037	181,193	126	29,904	21	181,193	211,097	13,126	9	92,381	64	5,878	4.1	92,381	64	190,639	415,000
2038	182,386	127	30,101	21	182,386	212,486	13,212	9	97,342	68	5,917	4.1	97,342	68	200,601	427,000
2039	183,586	127	30,299	21	183,586	213,884	13,299	9	102,570	71	5,956	4.1	102,570	71	211,096	439,000
2040	184,794	128	30,498	21	184,794	215,292	13,387	9	108,079	75	5,995	4.2	108,079	75	222,153	451,000
2041	186,010	129	30,699	21	186,010	216,708	13,475	9	113,884	79	6,034	4.2	113,884	79	233,802	464,000
2042	187,233	130	30,901	21	187,233	218,134	13,563	9	120,000	83	6,074	4.2	120,000	83	246,074	478,000
Ultimate	401,600	279	66,280	46	401,600	467,879	29,092	20	120,000	83	13,028	9.0	120,000	83	253,028	750,000

Peak hour flow rates must also be accommodated in the wastewater collection, pumping, and conveyance facilities. The peak hour flow rates from Table 3-3 are disaggregated into the four service areas and are summarized in Table 3-5. Key flow rates for the wastewater pumping analysis are also highlighted in green in Table 3-5. In summary, key flow rates for the hydraulic analyses are listed below:

Current Average Day Conditions (from Table 3-4):

- Gravity Flow to Main Village Lift Station = 110 gpm
- Gravity Flow to New Galisteo Lift Station = 18 gpm
- Gravity Flow to New Wa-Di Lift Station = 8 gpm
- Gravity Flow to New Enterprise Area Lift Station = 28 gpm
- Gravity Flow from Cedar Tree into New Sewer to WWTP = 3.6 gpm
- Gravity Flow from Enterprise Area into New Sewer to WWTP = 28 gpm

20-Year Projected Peak-Hour Flows (from Table 3-5):

- Gravity Flow to Main Village Lift Station = 330 gpm
- Gravity Flow to New Galisteo Lift Station = 55 gpm
- Gravity Flow to New Wa-Di Lift Station = 24 gpm
- Gravity Flow to New Enterprise Area Lift Station = 212 gpm
- Gravity Flow from Cedar Tree / Enterprise Area into New Sewer to WWTP = 222 gpm

Ultimate Projected Peak-Hour Flows (from Table 3-5):

- Gravity Flow to Main Village Lift Station = 707 gpm
- Gravity Flow to New Galisteo Lift Station = 117 gpm
- Gravity Flow to New Wa-Di Lift Station = 51 gpm
- Gravity Flow to New Enterprise Area Lift Station = 212 gpm
- Gravity Flow from Cedar Tree / Enterprise Area into New Sewer to WWTP = 235 gpm

TABLE 3-5
SANITARY SEWER COLLECTION SYSTEM – PEAK HOUR FLOW PROJECTIONS

YEAR	GRAVITY FLOW TO MAIN VILLAGE LIFT STATION.		GALISTEO LIFT STATION					GRAVITY FLOW TO WA-DI LIFT STATION.		ENTERPRISE AREA				WWTP PRIMARY LIFT STATION		
			GRAVITY FLOW		MAIN VILLAGE LIFT STATION.	TOTAL				ENTERPRISE AREA LIFT STATION		ENTERPRISE AREA / CEDAR TREE GRAVITY FLOW		INFLUENT	WWTP DRAINS	TOTAL
	gpd	gpm	gpd	gpm	gpd	gpd	gpm	gpd	gpm	gpd	gpm	gpd	gpm	gpm	gpm	gpm
2021	403,000	280	67,000	47	403,000	470,000	326	30,000	21	102,000	71	115,000	80	498	75	573
2022	407,000	283	68,000	47	407,000	475,000	330	30,000	21	107,000	74	121,000	84	509	75	584
2023	411,000	285	68,000	47	411,000	479,000	333	30,000	21	113,000	78	126,000	88	519	75	594
2024	415,000	288	69,000	48	415,000	484,000	336	31,000	22	119,000	83	133,000	92	533	75	608
2025	419,000	291	70,000	49	419,000	489,000	340	31,000	22	125,000	87	139,000	97	544	75	619
2026	422,000	293	70,000	49	422,000	492,000	342	31,000	22	132,000	92	146,000	101	556	75	631
2027	426,000	296	71,000	49	426,000	497,000	345	31,000	22	139,000	97	153,000	106	569	75	644
2028	430,000	299	71,000	49	430,000	501,000	348	32,000	22	147,000	102	161,000	112	584	75	659
2029	433,000	301	72,000	50	433,000	505,000	351	32,000	22	155,000	108	169,000	117	598	75	673
2030	437,000	303	73,000	51	437,000	510,000	354	32,000	22	163,000	113	177,000	123	613	75	688
2031	440,000	306	73,000	51	440,000	513,000	356	32,000	22	172,000	119	186,000	129	627	75	702
2032	444,000	308	74,000	51	444,000	518,000	360	33,000	23	181,000	126	195,000	135	644	75	719
2033	447,000	310	74,000	51	447,000	521,000	362	33,000	23	190,000	132	205,000	142	659	75	734
2034	450,000	313	75,000	52	450,000	525,000	365	33,000	23	201,000	140	215,000	149	676	75	751
2035	454,000	315	75,000	52	454,000	529,000	367	33,000	23	211,000	147	226,000	157	694	75	769
2036	457,000	317	76,000	53	457,000	533,000	370	34,000	24	223,000	155	238,000	165	714	75	789
2037	460,000	319	76,000	53	460,000	536,000	372	34,000	24	235,000	163	250,000	174	733	75	808
2038	463,000	322	77,000	53	463,000	540,000	375	34,000	24	247,000	172	262,000	182	752	75	827
2039	466,000	324	77,000	53	466,000	543,000	377	34,000	24	260,000	181	276,000	192	773	75	848
2040	469,000	326	78,000	54	469,000	547,000	380	34,000	24	274,000	190	290,000	201	795	75	870
2041	472,000	328	78,000	54	472,000	550,000	382	35,000	24	289,000	201	304,000	211	818	75	893
2042	475,000	330	79,000	55	475,000	554,000	385	35,000	24	305,000	212	320,000	222	843	75	918
Ultimate	1,018,000	707	168,000	117	1,018,000	1,186,000	824	74,000	51	305,000	212	338,000	235	1322	75	1397

3.4 Influent Quality

Limited wastewater sampling and analyses were conducted at the Main Village Lift Station to characterize the wastewater from the Main Village. Four separate 24-hour composite sampling events were implemented, with analyses completed for various parameters. The results of the analyses are presented in Table 3-6. As shown in Table 3-6, the wastewater is generally a medium strength waste, with slightly lower than expected Biochemical Oxygen Demand (BOD_5) and Total Suspended Solids (TSS) concentrations.

TABLE 3-6
SANTO DOMINGO MAIN VILLAGE LIFT STATION SAMPLING RESULTS

PARAMETER	24-HOUR COMPOSITE SAMPLING			
	2203808 (1)	2203A85 (1)	2203C51 (1)	2203D50 (1)
	Monday March 14, 2022 at 12:00 p.m. to Tuesday, March 15, 2022 at 11:00 a.m.	Thursday, March 17, 2022 at 11:00 a.m. to Friday, March 18, 2022 at 10:00 a.m.	Tuesday, March 22, 2022 at 11:00 a.m. to Wednesday, March 23, 2022 at 10:00 a.m.	Wednesday, March 23, 2022 at 12:00 p.m. to Thursday, March 24, 2022 at 11:00 a.m.
BOD5 (mg/L)	203	DO Depletion <2.0	>188.55	163
COD (mg/L)	472	498	415	494
pH	7.38	7.34	7.50	7.25
TSS (mg/L)	82	160	146	193
Volatile Suspended Solids (VSS) (% of TSS)	88.4%	93.4%	93.8%	92.0%
Total Kjeldahl Nitrogen (TKN) (mg/L)	43	45	39	45
Ammonia (mg/L)	26	29	24	31
Nitrate (mg/L)	ND (2)	ND (2)	ND (2)	ND (2)
Chlorides (mg/L)	56	63	96	62
Alkalinity (Bicarbonate as CaCO3) (mg/L)	303.4	282.8	243.3	303.4
Hardness as CaCO3 (mg/L)	190	190	180	190
Fats, Oils and Grease (FOG) (EPA Method 1664B) (mg/L)	35.6	27.8	37.2	32.6
Total Phosphorus (TP) (mg/L)	5.2	5.1	4.9	5.5
Calcium (mg/L)	48	50	48	49
Magnesium (mg/L)	17	15	14	16

(1) Work Order number assigned by Hall Environmental Analysis Laboratory.
(2) ND = Not Detected at the Reporting Limit.

When the DAR for the WWTP was being prepared, the results of the sample analyses for influent wastewater characteristics described above had not been received. For the purposes of the DAR for the WWTP, the assumed influent wastewater characteristics are summarized in

Table 3-7. Prior to the implementation of the design phase of this project, the recommended influent wastewater characteristics shown in Table 3-7 will be reconciled with the data obtained from the Main Village Lift Station sampling to determine the parameters to use during design.

TABLE 3-7
RECOMMENDED INFLUENT WASTEWATER CHARACTERISTICS

DESCRIPTION	VALUES
BOD_5 (1)	300 milligrams per liter (mg/L)
TSS (1)	250 mg/L
TKN (1)	50 mg/L
TP (1)	8 mg/L
Temperature Range, Influent (2)	10 to 20°C
Min. Wastewater Temperature in WWTP (2)	12°C
Temperature Range, Air (2)	-10 to 38°C

[1] Values derived by typical ranges published in the *Wastewater Engineering Treatment and Reuse, 5th Edition, Metcalf & Eddy, Inc., Recommended Standards for Wastewater Facilities, 2014 Edition*, published by the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, known as the "Ten State Standards".

[2] Temperatures obtained from basis of design for the nearby Santa Ana WWTP.

4.0 ALTERNATIVES CONSIDERED

The location selected by Santo Domingo for the new WWTP, as described in the *Santo Domingo Pueblo Wastewater Treatment Plant Final Design Analysis Report – Revised Scope, May 2022* (MC), is centrally-located within the four service areas and at a higher elevation than the Main Village, Galisteo, and Wa-Di areas. As a result, wastewater flows from each of these areas must be pumped to the new WWTP. The Enterprise Area is located at a higher elevation than the WWTP and can be served with a new gravity sewer. However, a portion of the service area in the Enterprise Area is located east of a high point, thus requiring a lift station to provide service to the area. The wastewater collection, pumping, and conveyance (forcemain) facilities required to provide service to these areas are described, evaluated and, where alternatives are available, compared in this section.

4.1 Main Village Lift Station and Discharge Forcemain Sizing

4.1.1 Description

The existing lift station that receives wastewater flow from the Main Village and conveys it to the Main Village Lagoons is described in Section 2.3.1. In general, the Main Village Lift Station is in good condition and can be utilized for future wastewater pumping service. Conceptually, there are two options for pumping wastewater from the Main Village Lift Station: (1) pump directly to the WWTP, or (2) pump to the new Galisteo Lift Station and pump the combined flows from the Main Village and the Galisteo Housing Area to the WWTP. The elevation of the new WWTP is approximately 5,330 feet above Mean Sea Level (MSL). The existing Main Village Lift Station is at approximately 5,168 feet MSL. Allowing 15 feet for the depth to water level in the Main Village Lift Station equates to a static lift for pumping directly to the WWTP of about 177 feet. Alternatively, the new Galisteo Lift Station will be located at an elevation of approximately 5,220 feet MSL, but there is a high point along the route to the Galisteo Lift Station of 5,227 feet. As such, the static lift for pumping from the Main Village Lift Station to the Galisteo Lift Station would be about 74 feet. These two alternatives are evaluated in the following paragraphs.

The size of the forcemain from the Main Village Lift Station is also evaluated in the following paragraphs. Two sizes of forcemain, 6-inch and 8-inch, are considered. In general, a smaller forcemain will allow for more operational flexibility to accommodate the initial flows by incorporating variable frequency drives (VFDs) to control the speed of the pumps to match the influent flow rates. In addition, a smaller forcemain will be less costly to construct. A larger forcemain will allow for installed capacity for future growth, likely at a modest increase in material cost for the pipe, fittings, and valves (trenching and backfilling costs are similar between 6-inch and 8-inch pipelines). In determining the size of the forcemain, the velocity of the flow will be an important consideration to maintain scouring velocities that will resuspend any settled solids in the forcemain between pumping cycles.

4.1.2 Design Criteria

The key criteria for a lift station and forcemain are listed below:

- Limit submersible pump starts to 10 per hour (results in a minimum cycle time of 6 minutes).
- Provide a minimum storage volume in the lift station wet well to store 3 minutes of influent flow at a rate equal to one-half the capacity of the pump.
- Pump through the forcemain at a velocity that creates a minimum scouring velocity of 2 feet per second (fps) to resuspend solids in the forcemain: 176 gpm for a 6-inch forcemain and 314 gpm for an 8-inch forcemain (Ten State Standards).
- Maximum velocity in forcemains of 8 fps to avoid high headloss and to protect valves (Ten State Standards).
- Minimum size for forcemains of 4-inch diameter (Ten State Standards).
- Friction Coefficient: Hazen-Williams "C" factor of a maximum of 120 for polyvinyl chloride (PVC) and lined ductile iron pipe (DIP) (Ten State Standards).

For the forcemain alignments presented in the following Sections 4.2 and 4.3, hydraulic analyses have been prepared and are summarized in Appendix B. As discussed above, two pumping scenarios are considered: (1) pump from the Main Village Lift Station to the new WWTP site, with

flows from the Galisteo Housing Area pumped into the forcemain near Galisteo, and (2) pump from the Main Village Lift Station to the new Galisteo Lift Station, then pump the combined flows from the Main Village and the Galisteo Housing Area together.

4.1.2.1 Pumping from Main Village Lift Station to Wastewater Treatment Plant (WWTP) through 6-inch Forcemain

For the first option of pumping from the Main Village Lift Station to the WWTP, an analysis of a 6-inch forcemain resulted in pumping conditions that are not accommodated by any submersible pumps. That is, the total dynamic head (TDH), which accounts for the static lift from the water level in the lift station wet well to the discharge point plus the frictional headloss associated with liquid flowing through the pipes, for the 6-inch forcemain would be approximately 430 feet TDH at the projected 20-year peak hour flow rate of 330 gpm (see Table 3-5). Based on these results, a 6-inch forcemain from the Main Village Lift Station to the WWTP is not a viable option.

4.1.2.2 Pumping from Main Village Lift Station to Wastewater Treatment Plant (WWTP) through 8-inch Forcemain

The hydraulic analysis and tentative pump selection for the alternative of pumping from the Main Village Lift Station to the WWTP through an 8-inch forcemain is presented in Attachment A of Appendix B. As shown in Attachment A of Appendix B, a FLYGT™ Model NP 3315 HT 3 (160 HP) pump would provide 358 gpm under conditions where the Galisteo Lift Station is operating to 415 gpm if the Galisteo Lift Station is off. With the operating condition when the Galisteo Lift Station is operating being so close to the 20-year peak hour flow estimate of 330 gpm and to the minimum flow rate of 314 gpm for 2 fps scouring velocity, the only situation where the Main Village Lift Station pump could operate under a more efficient condition with a VFD would be when the Galisteo Lift Station is not operating. As such, there probably would not be much benefit from considering a VFD for the Main Village Lift Station in this scenario. This would result in the submersible pumps operating at full speed every time they are called for to run. Initial average day flows of 110 gpm (see Table 3-4) would result in short cycles at high HP followed by periods of nonoperation until the pump is called for to run again. In addition, these 160 HP pumps

would not fit through the existing hatch on the Main Village Lift Station and the discharge piping would need to be replaced to accommodate the significantly larger pumps. Based on these observations, it is evident that the alternative of pumping from the Main Village Lift Station to the WWTP is not a viable option.

4.1.2.3 Pumping from Main Village Lift Station to Galisteo Lift Station through 6-inch Forcemain

The hydraulic analysis and tentative pump selection for the alternative of pumping from the Main Village Lift Station to the Galisteo Lift Station through a 6-inch forcemain is presented in Attachment B of Appendix B. As shown in Attachment B of Appendix B, a FLYGT™ Model NP 3202 SH 3 (72 HP) pump would provide about 360 gpm with one pump operating at full speed (60 Hz) and the estimated 20-year flow peak hour flow rate of 330 gpm at 56 Hz. In addition, this pump could be operated at 40 Hz with a VFD, resulting in a pumping rate of 191 gpm. This flow rate exceeds the minimum flow rate of 176 gpm to achieve 2 fps for scouring velocity in the forcemain. As shown in Attachment B of Appendix B, the shaft HP can be reduced from 56.3 HP at 362 gpm and 60 Hz down to 16.1 HP at 191 gpm and 40 Hz. This variation in flow capacity allows for matching more closely the influent flow rate and minimizing the power costs associated with the lift station. The ability to vary the flow rate will be advantageous at the WWTP to avoid substantial variations in flow in the influent flows to the WWTP. Operating two pumps in this arrangement adds less than 30 gpm to the combined pumping rate because of the steep system curve, as illustrated in the system head curve in Attachment B of Appendix B. The existing hatch on the Main Village Lift Station has a 33-inch by 48-inch clear opening, but the new pumps require a 39-inch by 47.5-inch clear opening. As a result, the existing hatch will require replacement by removing and replacing the concrete top of the wet well. In addition, the new pumps require 3-inch guide rails, whereas the existing guide rails are 2-inch. The guide rails and the discharge elbows will need to be replaced to accommodate the larger pumps, but the discharge piping matches the existing pump discharge connection. The capacity of the existing jib crane and hoist will need to be evaluated during the design to determine if the existing equipment has the capacity to remove and install the new larger pumps. If it is determined that the hoist is undersized and can be replaced with a new device on the existing jib crane, this would be a relatively inexpensive solution. However, if the jib crane is undersized for the new pumps, a new lifting mechanism will be

required at greater cost. Based on this analysis, a 6-inch forcemain from the Main Village Lift Station to the Galisteo Lift Station is a viable alternative.

4.1.2.4 Pumping from Main Village Lift Station to Galisteo Lift Station through 8-inch Forcemain

Attachment C of Appendix B includes the hydraulic analysis and tentative pump selection for the alternative of pumping from the Main Village Lift Station to the Galisteo Lift Station through an 8-inch forcemain. As indicated in Attachment C of Appendix B, a FLYGT™ Model NP 3202 HT 3 (45 HP) pump would provide approximately 355 gpm with one pump operating at full speed (60 Hz). With this operating condition being so close to the 20-year peak hour flow estimate of 330 gpm and to the minimum flow rate of 314 gpm for 2 fps scouring velocity, there probably would not be much benefit from considering a VFD for the Main Village Lift Station with an 8-inch forcemain to the Galisteo Lift Station. This would result in the submersible pumps operating at full speed every time they are called for to run. Initial average day flows of 110 gpm (see Table 3-4) would result in short cycles at high HP followed by periods of nonoperation until the pump is called for to run again.

In addition to evaluating the 20-year projected flows, projected ultimate flows were evaluated for the 8-inch forcemain alternative. The results of this analysis are presented in Attachment D of Appendix B. As shown in Attachment D of Appendix B, a FLYGT™ Model NP 3315 HT 3 (160 HP) pump would provide about 660 gpm of pumping capacity. Although this capacity is slightly less than the projected 707 gpm from Table 3-5 for the ultimate peak hour flows, it would provide substantial future pumping capacity if the Main Village Lift Station were retrofitted at a future date to accommodate these larger pumps.

4.1.3 Map

The existing Main Village Lift Station location is illustrated in Figure 4-1. Also shown in Figure 4-1 is the alignment of the existing 6-inch forcemain from the Main Village Lift Station to the Main Village Lagoons.

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MAIN VILLAGE LIFT STATION SITE PLAN

WET WELL

VALVE VAULT

ELECTRICAL PANELS
SHELTER

EXISTING 6 INCH
FM

MAIN VILLAGE
TREATMENT
LAGOONS

EXISTING
MAIN VILLAGE
LIFT STATION

Indian Service Rte 86

Indian Ser

Third St

Cochiti Street 2

Pojoaque St

Jemez

Za St

San Felipe St

Isleta St

Is

SCALE = 600 FEET

NORTH

84

LIFT STATION & FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

EXISTING MAIN VILLAGE LIFT STATION AND FORCEMAIN

FIGURE 4-1

MOLZENCORBIN

4.1.4 Screening of Lift Station Alternatives

As indicated above, the alternatives associated with pumping directly from the Main Village Lift Station to the new WWTP were screened out based on the unavailability of submersible sewage pumps with the capacity to pump through a 6-inch forcemain and the size of the pumps needed to pump through an 8-inch forcemain. The alternative of pumping from the Main Village Lift Station to the Galisteo Lift Station is viable and the pump sizes required to pump through 6-inch and 8-inch forcemains are reasonable.

Pumping from the Main Village Lift Station to the new Galisteo Lift Station through a 6-inch forcemain provides the operational advantage of incorporating VFDs and matching the pumping rate closely to the influent flow rate. In contrast, pumping through an 8-inch forcemain allows for very little operational flexibility due to the need to pump at a velocity that will resuspend settled solids in the forcemain and that pumping rate being nearly equal to the projected 20-year peak hour flow rates. The flow rates associated with an 8-inch forcemain would result in flow rates to the WWTP that will intermittently cycle between peak hour flows and very low flows. To mitigate for these large variations in flow rates to the WWTP, an Equalization (EQ) Basin may be required at the WWTP.

The 6-inch forcemain would not be capable of accommodating the ultimate projected flow rates. An 8-inch forcemain could accommodate peak hour flow rates associated with the projected ultimate population and flow projections, but at a substantial sized pump of 160 HP. Based on detailed discussions with Santo Domingo, the 8-inch forcemain was believed to be oversized and with its higher construction cost due to the larger pipe and material sizes, a 6-inch forcemain is preferred.

For the purposes of this analysis for the sizing of the Main Village Lift Station, and the subsequent considerations in this section of the PER, it is assumed that a 6-inch forcemain will be selected to convey wastewater from the Main Village Lift Station to the new Galisteo Lift Station.

4.1.5 Environmental Impacts

Environmental impacts associated with upgrading the existing Main Village Lift Station are expected to be minimal, since the existing lift station is in good condition and can be used for continued service. The addition of an emergency generator to the Main Village Lift Station site will be designed around a diesel generator with an integral double-wall fuel storage tank. The emergency generator will only operate when there is a power outage and briefly for weekly functional testing. As such, the environmental impacts of the new emergency generator will be minimal, and any such impacts would be more than offset by the potential environmental impacts of sewage overflows that could occur during a power outage if the emergency generator is not included in the scope of the project.

4.1.6 Land Requirements

The existing Main Village Lift Station site is quite constrained, as shown in Figure 4-1. Additional land may need to be allocated to the site by Santo Domingo to accommodate the addition of a new emergency generator on the site.

4.1.7 Potential Construction Problems

New pumps, controls, and an emergency generator are required to accommodate the flows from the Main Village at the Main Village Lift Station. Since this lift station is currently in operation to pump raw wastewater to the existing Main Village Lagoons, carefully orchestrated phasing of the pump and controls replacement will need to be implemented during construction, or the influent flows will need to be intercepted at an upstream manhole with temporary piping and connection to the existing 6-inch forcemain conveying wastewater to the Main Village Lagoons.

4.1.8 Sustainability Considerations

4.1.8.1 Water and Energy Efficiency

Selection of a 6-inch forcemain to convey wastewater from the Main Village Lift Station to the Galisteo Lift Station allows for the implementation of VFDs which will facilitate matching the pumped flow rates more closely to the influent flow rates than compared to the 8-inch forcemain option. Selecting an 8-inch forcemain results in pumped flows that exceed the projected 20-year peak hour flow every time the pumps turn on.

4.1.8.2 Green Infrastructure

No green infrastructure is contemplated for the Main Village Lift Station.

4.1.9 Cost Estimates

The estimated construction costs for the Main Village Lift Station modifications and site improvements, based on the pump selections for a 6-inch forcemain from the Main Village Lift Station to the new Galisteo Lift Station, as discussed above, are summarized in Table C-1 of Appendix C. The total estimated construction cost (not including Professional Services, New Mexico Gross Receipts Tax [NMGRT], or an inflation factor) is $947,000. The estimated annual Operation and Maintenance (O&M) costs for the Main Village Lift Station, as presented in Table D-1 of Appendix D, is $70,200.

4.2 Main Village to Galisteo Lift Station Forcemain Alignment

4.2.1 Description

Two forcemain alignment alternatives have been identified to convey wastewater from the Main Village Lift Station to the new Galisteo Lift Station. Alternative 1 avoids the historic and culturally sensitive Main Village completely and Alternative 2 skirts along the western portion of the Main

Village before heading north then east to the Galisteo Lift Station site. Other alignment alternatives were considered but immediately eliminated from further consideration due to those alignments being directed through the Main Village. Alternatives 1 and 2 are considered in the following paragraphs.

4.2.1.1 Alternative 1 – Alignment Outside Main Village Along Middle Rio Grande Conservancy District (MRGCD) Canal

Forcemain alignment Alternative 1 is essentially a continuation of the existing forcemain from the Main Village Lift Station to the Main Village Lagoons. The concept would be to tie into the existing forcemain on the north side of the existing Main Village Lagoons, extend the new forcemain to the west, then follow the MRGCD canal alignment around the northern border of the Main Village area to a point where the new forcemain would be constructed east to the site of the new Galisteo Lift Station near the southeast corner of the existing Galisteo Lagoons.

4.2.1.2 Alternative 2 – Alignment through Main Village to Middle Rio Grande Conservancy District (MRGCD) Canal

As shown in Figure 4-2 forcemain alignment Alternative 2 starts at the existing Main Village Lift Station at Point C, heads east towards the Main Village, then follows Third Street north across ISR 88 and continues north to Point B. From Point B to Point D at the new Galisteo Lift Station, Alternative 2 is the same alignment as Alternative 1 described above.

END OF FORCEMAIN ALIGNMENT ALTERNATIVE 1

DIRECTIONAL DRILL UNDER MRGCD CANAL

POINT B

MRGCD CANAL

GALISTEO CREEK

FORCEMAIN TO NEW GALISTEO LIFT STATION

NEW GALISTEO LIFT STATION

POINT D

MH

MH

MH

ENCASED CROSSING AT GALISTEO CREEK

SANTO DOMINGO PUEBLO

FORCEMAIN ALIGNMENT ALTERNATIVE 1

FORCEMAIN ALIGNMENT ALTERNATIVE 2

NEW FORCEMAIN TO WA-DI LIFT STATION OR WWTP. SEE FIGURE 4-3 FOR CONTINUATION.

POINT A

FORCEMAIN ALIGNMENT ALTERNATIVE 2

EXISTING 6" FORCEMAIN

Kewa Pueblo

Indian Service Rte 88

EXISTING MAIN LIFT STATION

POINT C

EXISTING TREATMENT LAGOONS

SCALE=1000 FEET

NORTH

LIFT STATION & FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

MAIN LIFT STATION & FORCEMAIN ALIGNMENT ALTERNATIVES

FIGURE 4-2

MOLZENCORBIN

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4.2.2 Design Criteria

The key criteria for a forcemain are listed below:

- Pump through the forcemain at a velocity that creates a minimum scouring velocity of 2 fps to resuspend solids in the forcemain: 176 gpm for a 6-inch forcemain and 314 gpm for an 8-inch forcemain (Ten State Standards).
- Maximum velocity in forcemains of 8 fps to avoid high headloss and to protect valves (Ten State Standards).
- Minimum size for forcemains of 4-inch diameter (Ten State Standards).
- Friction Coefficient: Hazen-Williams "C" factor of a maximum of 120 for PVC and lined DIP (Ten State Standards).

4.2.3 Map

Forcemain alignment Alternative 1 from the existing Main Village Lift Station to the new Galisteo Lift Station is illustrated as the red line in Figure 4-2. As shown in Figure 4-2, the new forcemain would be connected to the existing 6-inch forcemain that currently feeds wastewater into the Main Village Lagoons at Point A. The new forcemain would then be constructed towards the west to the MRGCD canal alignment and around the north of the Main Village to a location near Point B where the new forcemain would cross the MRGCD canal. The distance from Point A to Point B is approximately 8,570 feet. The new forcemain would then be constructed from Point B to Point D (Point D being at the proposed location of the new Galisteo Lift Station). Note that Figure 4-2 also shows the alignment of Alternative 2 and that the alignment between Points B and D are common to both alternatives. The distance from Point B to Point D is approximately 4,830 feet.

The alignment of forcemain Alternative 2 is shown as the blue line in Figure 4-2 from Point C at the existing Main Village Lift Station to Point B. The distance from Point C to Point B is approximately 6,340 feet. As described above, the alignment of Alternative 2 from Point B to

Point D at the new Galisteo Lift Station is identical to the alignment described for this segment in Alternative 1 and is approximately 4,830 feet in length.

4.2.4 Screening of Forcemain Alignment Alternatives

Although Alignment Alternative 2 is slightly shorter than Alternative 1, and would likely have a lower construction cost, the proximity of the initial portion of Alternative 2 to the Main Village was determined by Santo Domingo to be too risky related to potential cultural impacts and due to the potential impact on future expansion of the Main Village. As a result, Alternative 1 is the preferred alignment for the forcemain from the Main Village Lift Station to the new Galisteo Lift Station.

4.2.5 Environmental Impacts

The environmental impacts of the forcemain from the Main Village Lift Station to the new Galisteo Lift Station are expected to be minimal, as the construction consists of shallow PVC forcemain installation, which will mostly take place along roadways that have already been disturbed. The Santo Domingo Tribal Historic Preservation Office (THPO) has reviewed and approved the proposed alignment for Alternative 1. Arroyo or canal crossings would be installed using horizontal directional drilling (HDD) or jack-and-bore methods to avoid disturbing the stream bed or canal. A Stormwater Pollution Prevention Plan (SWPPP) would be filed and executed by the contractor to mitigate sediment runoff and other contaminants generated during construction.

4.2.6 Land Requirements and Permitting

The proposed alignment of the forcemain from the Main Village Lift Station to the new Galisteo Lift Station generally follows existing roads within Santo Domingo and along the MRGCD canal located west and north of the Main Village. Authorization from MRGCD will be sought for the pipeline alignments that encroach upon their facilities.

4.2.7 Potential Construction Problems

The new forcemain from the Main Village Lift Station to the new Galisteo Lift Station will connect to the existing 6-inch forcemain on the north side of the existing Main Village Lagoons. Since this existing forcemain will remain in operation until the new WWTP, lift stations, and forcemains are constructed, the timing of the transition to utilizing the new facilities will need to be carefully coordinated. All new facilities will need to be pressure tested and functional before the pumped flow is transferred to the new forcemain facilities. The new forcemain will be installed in a relatively shallow trench, with minimal conflicts anticipated with existing utilities. The forcemain will cross the MRGCD canal near Point B in Figure 4-2, requiring compliance with all MRGCD requirements.

4.2.8 Sustainability Considerations

4.2.8.1 Water and Energy Efficiency

The pipeline material and construction will be specified to minimize leakage in accordance with industry standards and prevent breakage, thus maximizing wastewater conveyance efficiency. The pipe diameter will be designed to minimize frictional losses to conserve energy while maintaining minimum velocities needed in a forcemain system to prevent deposition of solids and create a self-cleaning system.

4.2.8.2 Green Infrastructure

No green infrastructure is contemplated for the forcemain from the Main Village Lift Station to the new Galisteo Lift Station.

4.2.9 Cost Estimates

The estimated construction costs for the 6-inch forcemain from the Main Village Lift Station to the Galisteo Lift Station are summarized in Table C-2 of Appendix C. The total estimated

construction cost (not including Professional Services, NMGRT, or an inflation factor) is $2,861,800. The estimated annual O&M costs for the Main Village Lift Station, as presented in Table D-2 of Appendix D, is $11,000.

4.3 Galisteo Lift Station Discharge Forcemain Alignment

4.3.1 Description

Two alternatives were initially identified for the alignment of the Galisteo discharge forcemain: (1) Alternative 1 would be along NM 22 to the interchange of NM 22 and ISR 88, east along ISR 88 to a dry arroyo, then along the alignment of the dry arroyo to the new WWTP, and (2) Alternative 2 would be similar to Alternative 1 except the forcemain would be directed to the new Wa-Di Lift Station instead of the new WWTP. With forcemain alignment Alternative 2, all flows from the Main Village, the Galisteo Housing Area, and the Wa-Di Housing Area would be pumped to the new WWTP from the new Wa-Di Lift Station. Alternative 3 was added to the evaluation to provide an alternative alignment of the forcemain out of the Galisteo Lift Station to cross under Galisteo Creek and avoid construction within the New Mexico Department of Transportation (NMDOT) right-of-way (ROW) on NM 22 and on the NM 22 bridge over Galisteo Creek.

4.3.1.1 Alternative 1 – Alignment on NM 22 Bridge and NE of NM 22 / ISR 88 Interchange

The Galisteo Lift Station forcemain Alternative 1 is illustrated in Figure 4-3 as the green line from the new Galisteo Lift Station to the new WWTP.

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FORCEMAIN FROM MAIN LIFT STATION, TO NEW GALISTEO LIFT STATION

NEW GALISTEO LIFT STATION

DIRECTIONAL DRILL UNDER IRRIGATION CANAL

MH

MH

MH

JACK & BORE CROSSING OF HIGHWAY 22

SUPPORT FM FROM HIGHWAY 22 BRIDGE OVER GALISTEO CREEK

FORCEMAIN TO WWTP (ALTERNATIVE 1)

NEW LIFT STATION

4" SERVICE LATERAL SEWER

Indian Service Rte 88

JACK & BORE CROSSING OF ISR 88

GALISTEO CREEK

22

OFFSET FM TO SHOULDER OF ISR 88 AT PEDESTRIAN BRIDGE

JACK & BORE CROSSING OF RAILROAD TRACKS

ENCASED CROSSING AT ARROYO

START OF ALTERNATIVE 2 FORCEMAIN TO WA-DI LIFT STATION

GALISTEO FORCEMAIN ALIGNMENT ALTERNATIVE 2 TO WA-DI LIFT STATION

WA-DI LIFT STATION ALTERNATIVE 1, SEE FIGURE 4-6.

Domingo

WA-DI LIFT STATION ALTERNATIVE 2, SEE FIGURE 4-7.

GALISTEO FORCEMAIN ALIGNMENT ALTERNATIVE 1 TO WWTP

FORCEMAIN TO WWTP

PRIMARY LIFT STATION

WA-DI LIFT STATION ALTERNATIVE 3, SEE FIGURE 4-8.

WWTP

SCALE=1320 FEET

NORTH

LIFT STATION FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

MOLZENCORBIN GALISTEO LIFT STATION FORCEMAIN ALIGNMENT ALTERNATIVE 1&2 TO WA-DI LIFT STATION OR WWTP, FIGURE 4-3

As shown in Figure 4-3, the new forcemain would be constructed south from the Galisteo Lift Station to a point south of the limits of the Galisteo Housing Area, then east to NM 22. The forcemain would then follow NM 22 south, including hanging the forcemain from the NM 22 bridge over Galisteo Creek (if authorized by the NMDOT), to a point just north of the interchange at NM 22 and ISR 88, where the forcemain would follow around the north and east side of the interchange to a point on ISR 88. From there, the forcemain would be installed adjacent to ISR 88 to a dry arroyo. Crossing of the dry arroyo is recommended to be accomplished either by the jack-and-bore construction technique or by HDD. After crossing the dry arroyo, the forcemain would roughly follow the alignment of the dry arroyo with at least 75 feet of horizontal separation from the arroyo banks until reaching the influent sewer at the Entrance Works Facility at the WWTP.

4.3.1.2 Alternative 2 – Pump to Wa-Di Lift Station and Pump Combined Galisteo / Wa-Di Flows to Wastewater Treatment Plant (WWTP)

Galisteo forcemain Alternative 2 follows the same alignment as Alternative 1 from the new Galisteo Lift Station to the dry arroyo crossing. Instead of heading south, the forcemain would continue east in Alternative 2 to the location of the new Wa-Di Lift Station. The combined flows from the Galisteo Lift Station and the Wa-Di Housing Area would be pumped through a forcemain along ISR 88 to the new WWTP site.

4.3.1.3 Alternative 3 – Alignment Under Galisteo Creek and South of NM 22 / ISR 88 Interchange

Galisteo forcemain Alternative 3 is identical to Alternative 1 except instead of constructing the forcemain along NM 22, it would be constructed south from the new Galisteo Lift Station, under Galisteo Creek, then south to ISR 88, as shown in Figure 4-4.

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FORCEMAIN FROM MAIN LIFT STATION, TO NEW GALISTEO LIFT STATION

NEW GALISTEO LIFT STATION

DIRECTIONAL DRILL UNDER IRRIGATION CANAL

MH

MH

MH

ENCASED CROSSING AT GALISTEO CREEK

FORCEMAIN TO WWTP (ALTERNATIVE 3)

NEW LIFT STATION

Indian Service Rte 88

4" SERVICE LATERAL SEWER

GALISTEO CREEK

DIRECTIONAL DRILL CROSSING OF ARROYO AND ISR 88

22 OFFSET FM TO SHOULDER OF ISR 88 AT PEDESTRIAN BRIDGE

JACK & BORE CROSSING OF RAILROAD TRACKS

ENCASED CROSSING AT ARROYO

GALISTEO FORCEMAIN ALIGNMENT ALTERNATIVE 3 TO WWTP

8" SEWER

8" SEWER

EXISTING 10" SEWER

8" SEWER

FORCEMAIN TO WWTP

NEW WA-DI LIFT STATION

PRIMARY LIFT STATION

WWTP

LIFT STATION FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

GALISTEO LIFT STATION FORCEMAIN ALIGNMENT ALTERNATIVE 3 TO WA-DI LIFT STATION OR WWTP, FIGURE 4-4

MOLZENCORBIN

In the alignment illustrated in Figure 4-4, a horizontal offset is shown midway between the interchange at NM 22 / ISR 88 and the dry arroyo just west of Wa-Di. This horizontal offset is proposed to accommodate the deep arroyo crossing. One option is to attach the forcemain to the pedestrian bridge at this location and the other is to horizontally offset the forcemain to be constructed between the top of the box culvert at this location and the roadway. For safety and security purposes, and to eliminate any freezing potential associated with exposing the forcemain at the pedestrian bridge, the horizontal offset is preferred.

4.3.2 Design Criteria

The key criteria for a forcemain are listed below:

- Pump through the forcemain at a velocity that creates a minimum scouring velocity of 2 fps to resuspend solids in the forcemain: 176 gpm for a 6-inch forcemain and 314 gpm for an 8-inch forcemain (Ten State Standards).
- Maximum velocity in forcemains of 8 fps to avoid high headloss and to protect valves (Ten State Standards).
- Minimum size for forcemains of 4-inch diameter (Ten State Standards).
- Friction Coefficient: Hazen-Williams "C" factor of a maximum of 120 for PVC and lined DIP (Ten State Standards).

4.3.3 Map

The alignment alternatives for the forcemain from the new Galisteo Lift Station to the new WWTP are illustrated in Figure 4-3 and Figure 4-4.

4.3.4 Screening of Forcemain Alignment Alternatives

The three Galisteo forcemain alignment options were reviewed with Santo Domingo. Alternative 2, pumping all flows from the Main Village and Galisteo to the new Wa-Di Lift Station, was immediately eliminated due to the substantial increase in size of the lift station

required to accommodate all the flows, as opposed to the small flows projected for the Wa-Di Area. Alternative 3 was identified as the preferred alignment between Alternatives 1 and 3 to provide the straightest route while minimizing bends in the forcemain.

4.3.5 Environmental Impacts

The environmental impacts of the forcemain from the new Galisteo Lift Station to the new WWTP are expected to be minimal, as the construction consists of shallow PVC forcemain installation, which will mostly take place along roadways that have already been disturbed or across vacant land. The Santo Domingo THPO has reviewed and approved the proposed alignment Alternative 3. Arroyo or road crossings would be installed using HDD or jack-and-bore methods to avoid disturbing the stream bed or road. A SWPPP would be filed and executed by the Contractor to mitigate sediment runoff and other contaminants generated during construction.

4.3.6 Land Requirements and Permitting

The proposed alignment of the forcemain from the new Galisteo Lift Station to the new WWTP generally extends south from the lift station site across vacant land, across Galisteo Creek, and south to ISR 88. The alignment then follows ISR 88 east to a dry arroyo located west of Wa-Di. From the dry arroyo crossing, the alignment generally follows the dry arroyo south to the new WWTP site. Authorization from the IHS will be sought for the pipeline alignments that encroach upon ISR 88 and related facilities.

4.3.7 Potential Construction Problems

As with the new forcemain from the Main Village Lift Station to the new Galisteo Lift Station, the timing of the transition to utilizing the new facilities will need to be carefully coordinated with the construction of the new WWTP, the forcemains, and the lift stations. All new facilities will need to be pressure tested and functional before the pumped flow is transferred to the new forcemain facilities. The new forcemain will be installed in a relatively shallow trench, with

minimal conflicts anticipated with existing utilities. The forcemain will cross the ISR 88 near the NM 22 / ISR 88 interchange as shown in Figure 4-4 and is proposed to be located within the ISR 88 ROW, requiring compliance with all IHS requirements. During design, consideration will also need to be given to the inverted irrigation siphon across Galisteo Creek to confirm there is adequate separation with the proposed alignment of the new forcemain.

4.3.8 Sustainability Considerations

4.3.8.1 Water and Energy Efficiency

The pipeline material and construction will be specified to minimize leakage in accordance with industry standards and prevent breakage, thus maximizing wastewater conveyance efficiency. The pipe diameter will be designed to minimize frictional losses to conserve energy while maintaining minimum velocities needed in a forcemain system to prevent deposition of solids and create a self-cleaning system.

4.3.8.2 Green Infrastructure

No green infrastructure is contemplated for the forcemain from the new Galisteo Lift Station to the new WWTP.

4.3.9 Cost Estimates

The estimated construction costs for the forcemain from the Galisteo Lift Station to the WWTP via Alignment Alternative 3 are summarized in Table C-3 of Appendix C. Note that this cost estimate is based on a 6-inch forcemain, as described further in Section 4.4. The total estimated construction cost (not including Professional Services, NMGRT, or an inflation factor) is $3,165,800. The estimated annual O&M costs for the forcemain from the Main Village Lift Station to the Galisteo Lift Station, as presented in Table D-3 of Appendix D, is $10,800.

4.4 Galisteo Lift Station and Discharge Forcemain Sizing

4.4.1 Description

As described in Section 4.1, the option of pumping wastewater from the existing Main Village Lift Station directly to the WWTP is not viable. As such, the new Galisteo Lift Station must be sized to accommodate the pumped flows from the Main Village Lift Station along with gravity flows from the Galisteo Housing Area. Conceptually, there are two options for pumping wastewater from the new Galisteo Lift Station: (1) pump directly to the WWTP, or (2) pump to the new Wa-Di Lift Station, with pumping of combined flows from the Main Village, Galisteo Housing Area, and the Wa-Di Housing Area to the WWTP. The elevation of the new WWTP is approximately 5,330 feet above MSL. The new Galisteo Lift Station will be located at an elevation of approximately 5,220 feet MSL. Allowing 15 feet for the depth to water level in the Galisteo Lift Station equates to a static lift for pumping directly to the WWTP of about 125 feet. Alternatively, the new Wa-Di Lift Station is proposed to be constructed at a location with an elevation of about 5,275 feet. As such, the static lift for pumping from the Galisteo Lift Station to the new Wa-Di Lift Station would be about 70 feet. These two alternatives are evaluated in the Section 4.4.2.

The size of the forcemain from the new Galisteo Lift Station is also evaluated in Section 4.4.2. Two sizes of forcemain, 6-inch and 8-inch, are considered. As described in the previous Section for the Main Village Lift Station forcemain, a smaller forcemain will allow for more operational flexibility to accommodate the initial flows by incorporating VFDs to control the speed of the pumps to match the influent flow rates. In addition, a smaller forcemain will be less costly to construct. A larger forcemain will allow for installed capacity for future growth, likely at a modest increase in material cost for the pipe, fittings, and valves (trenching and backfilling costs are similar between 6-inch and 8-inch pipelines). In considering the size of the forcemain, the velocity of the flow will be an important consideration to maintain scouring velocities that will resuspend any settled solids in the forcemain between pumping cycles.

4.4.2 Design Criteria

The lift station and forcemain design criteria described above in Section 4.1.2 for the Main Village Lift Station and forcemain also apply to the Galisteo Lift Station and forcemain.

Two pumping scenarios are considered: (1) pump from the new Galisteo Lift Station to the new WWTP site, with flows from the Wa-Di Housing Area pumped separately to the WWTP, and (2) pump from the new Galisteo Lift Station to the new Wa-Di Lift Station, then pump the combined flows from the Main Village, Galisteo Housing Area, and Wa-Di together to the WWTP.

4.4.2.1 Pumping from Galisteo Lift Station to Wastewater Treatment Plant (WWTP) through 6-Inch Forcemain

The hydraulic analysis and tentative pump selection for the alternative of pumping from the Galisteo Lift Station to the WWTP through a 6-inch forcemain is presented in Attachment E of Appendix B. As shown in Attachment E of Appendix B, a FLYGT™ Model NP 3202 SH 3 (72 HP) pump would provide about 364 gpm with one pump operating at full speed (60 Hz). This pumping rate is slightly less than the projected 20-year combined flow pumped from the Main Village Lift Station of 330 gpm plus the projected peak hour gravity flow from the Galisteo Housing Area of 55 gpm (see Table 3-5), for a total projected pumping capacity requirement of 385 gpm. Two of these pumps operating together would pump about 400 gpm, which slightly exceeds the projected 20-year flows. In addition, this pump could be operated at 44 Hz with a VFD, resulting in a pumping rate of 176 gpm as required to create a scouring velocity of 2 fps. As shown in Attachment E of Appendix B, the shaft HP can be reduced from 56.4 HP at 364 gpm and 60 Hz down to 15.4 HP at 176 gpm and 40 Hz. This variation in flow capacity allows for matching more closely the influent flow rate and minimizing the power costs associated with the lift station. The ability to vary the flow rate will be advantageous at the WWTP to avoid substantial variations in flow in the influent flows to the WWTP. Operating two pumps in this arrangement adds about 36 gpm to the combined pumping rate because of the steep system curve, as illustrated in the system head curve in Attachment E of Appendix B.

Based on this analysis, a 6-inch forcemain from the Main Village Lift Station to the Galisteo Lift Station is a viable alternative.

4.4.2.2 Pumping from Galisteo Lift Station to Wastewater Treatment Plant (WWTP) through 8-Inch Forcemain

Attachment F of Appendix B includes the hydraulic analysis and tentative pump selection for the alternative of pumping from the Galisteo Lift Station to the WWTP through an 8-inch forcemain. As indicated in Attachment F of Appendix B, a FLYGT™ Model NP 3202 SH 3 (50 HP) pump would provide approximately 417 gpm with one pump operating at full speed (60 Hz). As shown in Attachment F of Appendix B, the shaft HP can be reduced from 38.2 HP at 417 gpm and 60 Hz down to 28.4 HP at 328 gpm and 55 Hz, which is just slightly above the flow rate required for scouring velocity in an 8-inch forcemain. This variation in flow capacity allows for some flexibility in pumping rates, but varying the speed of a pump between 55 Hz and 60 Hz may not warrant the cost and operational requirements of a VFD.

In addition to evaluating the 20-year projected flows, projected ultimate flows were evaluated for the 8-inch forcemain alternative. The results of this analysis are presented in Attachment G of Appendix B. As shown in Attachment G of Appendix B, a FLYGT™ Model NP 3315 HT 3 (160 HP) pump would provide about 762 gpm of pumping capacity. Although this capacity is slightly less than the projected 824 gpm from Table 3-5 for the ultimate peak hour flows, it would provide substantial future pumping capacity if the Galisteo Lift Station were retrofitted at a future date to accommodate these larger pumps.

4.4.2.3 Pumping from Galisteo Lift Station to Wa-Di Lift Station

Conceptually, there is another pumping alternative for the Galisteo Lift Station in which the flows from the Main Village and the Galisteo Housing Area are pumped to the new Wa-Di Lift Station, and then the combined flows are pumped to the WWTP. This alternative would only be considered because it eliminates approximately 600 feet of 4-inch forcemain that would otherwise be required. As indicated in Tables 3-4 and 3-5, the flows projected from the Wa-Di

Housing Area range from an initial average day flow of 8 gpm to 24 gpm for the 20-year peak hour flow. The projected ultimate peak hour flow from Wa-Di is only projected to be 51 gpm. By inspection, it is clear that the cost of a small lift station to accommodate the Wa-Di flows and the additional 600 feet of 4-inch forcemain would be substantially less than the capital and operating costs of a larger lift station to pump the combined flows from these three service areas to the WWTP. As such, the alternative of pumping from the new Galisteo Lift Station to the new Wa-Di Lift Station can be eliminated from consideration.

4.4.3 Map

The proposed location of the new Galisteo Lift Station is illustrated in Figure 4-5. The lift station would be located to allow for diversion of the wastewater flowing to the existing Galisteo Lagoons to be intercepted and diverted to the new facility.

4.4.4 Screening of Lift Station Alternatives

As indicated above, the alternative of pumping the combined flows from the Main Village and Galisteo Area to the Wa-Di Lift Station is not practical and has been screened out. Pumping from the Galisteo Lift Station to the WWTP through 6-inch and 8-inch forcemains results in pump selections that are reasonable.

Pumping from the Galisteo Lift Station to the WWTP through a 6-inch forcemain provides the operational advantage of incorporating VFDs and matching the pumping rate closely to the influent flow rate. In contrast, pumping through an 8-inch forcemain allows for very little operational flexibility due to the need to pump at a velocity that will resuspend settled solids in the forcemain and that pumping rate being nearly equal to the projected 20-year peak hour flow rates. The flow rates associated with an 8-inch forcemain would result in flow rates to the WWTP that will intermittently cycle between peak hour flows and very low flows. To mitigate for these large variations in flow rates to the WWTP, an EQ Basin may be required at the WWTP.

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DWG. LOCATION: I:\Santo Domingo Pueblo\SDP211-12 Lift Stations-Forcemain-Sewer\DWGS\Figures\
DWG. NAME: FIGURE-4-5.dwg



LIFT STATION FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

MOLZENCORBIN

NEW GALISTEO LIFT STATION
FIGURE 4-5

The 6-inch forcemain would not be capable of accommodating the ultimate projected flow rates. An 8-inch forcemain could accommodate peak hour flow rates associated with the projected ultimate population and flow projections, but at a substantial sized pump of 160 HP. Based on detailed discussions with Santo Domingo, the 8-inch forcemain was believed to be oversized and with its higher construction cost due to the larger pipe and material sizes, a 6-inch forcemain is preferred.

For the purposes of this analysis for the sizing of the Galisteo Lift Station, and the subsequent considerations in this section of the PER, it is assumed that a 6-inch forcemain will be selected to convey wastewater from the Galisteo Lift Station to the WWTP.

4.4.5 Environmental Impacts

The proposed location of the new Galisteo Lift Station is adjacent to the existing Galisteo Lagoons. As such, this area was likely previously disturbed when the lagoons were constructed in 1998. The lift station will require a large, deep excavation. Santo Domingo will likely wish to monitor the excavation for any potential cultural items.

4.4.6 Land Requirements

The new Galisteo Lift Station will require a wet well for the submersible pumps, a valve pit, control panel, and jib crane. It is also recommended that an emergency generator be installed at the site to power the lift pumps during a power outage. These facilities will need to be accommodated in a fenced site dedicated by Santo Domingo for these purposes.

4.4.7 Potential Construction Problems

The existing Galisteo Lagoons will need to remain safe and operational during the construction of the new Galisteo Lift Station. Soil investigations to be commissioned during the design will provide guidance on how far the new lift station and its associated excavation needs to be from the

existing berms on the Galisteo Lagoons to allow for safe and successful construction of the new Galisteo Lift Station.

4.4.8 Sustainability Considerations

4.4.8.1 Water and Energy Efficiency

Selection of a 6-inch forcemain to convey wastewater from the new Galisteo Lift Station to the new WWTP allows for the implementation of VFDs which will facilitate matching the pumped flow rates more closely to the influent flow rates than compared to the 8-inch forcemain option. Selecting an 8-inch forcemain results in pumped flows that exceed the projected 20-year peak hour flow every time the pumps turn on.

4.4.8.2 Green Infrastructure

No green infrastructure is contemplated for the new Galisteo Lift Station.

4.4.9 Cost Estimates

The estimated construction costs for the Galisteo Lift Station and site improvements, based on the pump selections for a 6-inch forcemain from the Galisteo Lift Station to the WWTP, are summarized in Table C-4 of Appendix C. The total estimated construction cost (not including Professional Services, NMGRT, or an inflation factor) is $1,521,900. The estimated annual O&M costs for the Galisteo Lift Station, as presented in Table D-4 of Appendix D, is $72,500.

4.5 Wa-Di Collection System, Lift Station, and Discharge Forcemain

As a result of the failed leach field for the Wa-Di Community onsite wastewater disposal system, the wastewater flows from this area will need to be collected and directed to a new Wa-Di Lift Station that will convey the wastewater to the new WWTP. The existing wastewater collection system will be utilized to the maximum extent feasible. Alternative locations for the new Wa-Di

Lift Station are considered in this Section along with potential phased implementation of sewer collection line extensions to provide sewer service to areas that are currently on septic tanks.

4.5.1 Description

4.5.1.1 Wa-Di Lift Station Location and Sizing of Lift Station and Forcemain

Three alternative locations were considered for the new Wa-Di Lift Station, as introduced in Figure 4-3. Alternative 1 would be to locate the new Wa-Di Lift Station in the northwestern portion of the existing leach field, near the intersection of ISR 88 and ISR 841, as illustrated in Figure 4-6. Alternative 1 would allow for the continued use of the existing septic tank as a holding tank between pumping events as previously described. Alternative 2 would be to locate the new Wa-Di Lift Station adjacent to the existing septic tank as shown in Figure 4-7.

However, this would interfere with the continued use of the existing septic tank as a holding tank. Alternative 3 is illustrated in Figure 4-8 and would involve the construction of the new Wa-Di Lift Station further south on ISR 88 towards the new WWTP. Alternative 3 is preferred by Santo Domingo because the location of the new lift station is further from the housing areas, and it allows for growth in the Wa-Di Community.

SEWER
STUB OUTS

Indian Service Rte 841

Kewa

NEW 8" SEWER

WA-DI
LIFT STATION

NEW FM

100'

40'

EXISTING WA-DI
LEACH FIELD LIMITS

NEW 10" SEWER

NEW 10" SEWER

WA-DI HOUSING
COMMUNITY

EXISTING 10" SEWER

NEW FORCEMAIN
TO WWTP

SEWER
STUB OUTS

Service Rte 88

SCALE = 100'

NORTH

LIFT STATION FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

WA-DI LIFT STATION AND GRAVITY SEWERS - ALTERNATIVE 1

FIGURE 4-6

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NEW 8" SEWER

NEW 8" SEWER

EXISTING
LEACH FIELD

NEW WA-DI
LIFT STATION

EXISTING
SEPTIC TANK

FORCEMAIN

10"
SEWER

NEW SEWER

10"
SEWER

EXISTING 10" SEWER

FORCEMAIN TO WWTP

SEWER
STUB OUTS

SCALE = 100 FEET

NORTH

MOLZENCORBIN

WA-DI LIFT STATION

LIFT STATION FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

FIGURE 4-7

WA-DI LIFT STATION AND GRAVITY SEWERS - ALTERNATIVE 2

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DWG: NAME: FIGURE-4-8.dwg

LIFT STATION FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

WA-DI LIFT STATION AND GRAVITY SEWERS - ALTERNATIVE 3

FIGURE 4-8

MOLZENCORBIN

In addition to the alternatives described above regarding the location of the new Wa-Di Lift Station, two implementation phases have been identified to connect the existing sewers to the new lift station and to extend the service area to areas currently served by onsite septic tank systems. Phase A sewer collection lines would include those needed to connect the sewer lines that currently discharge to the community septic tank and convey this wastewater to the new Wa-Di Lift Station. Phase B sewer collection lines would extend the collection system to the Domingo Area and add additional customers north of the railroad tracks.

4.5.2 Design Criteria

The key criteria for a lift station, forcemain, and gravity sewer are listed below:

- Limit submersible pump starts to 10 per hour (results in a minimum cycle time of 6 minutes).
- Provide a minimum storage volume in the lift station wet well to store 3 minutes of influent flow at a rate equal to one-half the capacity of the pump.
- Pump through the forcemain at a velocity that creates a minimum scouring velocity of 2 fps to resuspend solids in the forcemain, which equates to about 79 gpm for a 4-inch forcemain (Ten State Standards).
- Maximum velocity in forcemains of 8 fps to avoid high headloss and to protect valves (Ten State Standards).
- Minimum size for forcemains of 4-inch diameter (Ten State Standards).
- Friction Coefficient: Hazen-Williams "C" factor of a maximum of 120 for PVC and lined DIP (Ten State Standards).
- Minimum size for a public gravity sewer conveying raw wastewater of 8-inch (Ten State Standards).
- Minimum slope for gravity sewer of 0.40 feet per 100 feet for 8-inch and 0.28 feet per 100 feet for 10-inch (Ten State Standards).

Although the projected 20-year peak hour flow in Table 3-5 from the Wa-Di Housing Area is only 24 gpm, with a projected ultimate peak hour flow rate of 51 gpm, the minimum flow rate to achieve 2 fps scouring velocity in the minimum size pipe of 4-inches is about 79 gpm. As such, the forcemain from the new Wa-Di Lift Station to the new WWTP will be a 4-inch pipe and the pumps will need to be sized to pump at least 79 gpm. The hydraulic analysis and tentative pump selection for pumping from the new Wa-Di Lift Station to the WWTP through a 4-inch forcemain is presented in Attachment H of Appendix B. As shown in Attachment H of Appendix B, a FLYGT™ Model NP 3102 SH 3 (7.2 HP) pump would provide 95 gpm with one pump in operation. With the operating condition being so close to the minimum flow rate of 79 gpm for 2 fps scouring velocity, the pump could only be turned down with a VFD to about 57 Hz. As such, there probably would not be much benefit from considering a VFD for the Wa-Di Lift Station.

4.5.3 Map

The location of the new Wa-Di Lift Station identified in Alternative 3, near ISR 88 and southwest from the Wa-Di Housing Community, is illustrated in Figure 4-8. Phase A of the sewer collection system connected to the new Wa-Di Housing Community is illustrated in Figure 4-9. The expansion of the sewer collection system to the north side of the railroad tracks is illustrated in Figure 4-10.

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TO MAIN VILLAGE

INDIAN SERVICE ROUTE 88

Domingo

EXISTING 10" SEWER

NEW 8" SEWER

NEW 8" SEWER

WA-DI HOUSING COMMUNITY

NEW WA-DI LIFT STATION

NEW 4" FORCEMAIN TO WWTP

NEW WASTEWATER TREATMENT PLANT

INDIAN SERVICE ROUTE 88

PRIMARY LIFT STATION

TO NM-22 AND ENTERPRISE

NORTH

0 200' 400' 800'

1"=400'-0"

LIFT STATION FORCEMAN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

WA-DI PROPOSED PHASE A SEWER AND LIFT STATION IMPROVEMENTS

FIGURE 4-9

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TO MAIN VILLAGE

INDIAN SERVICE ROUTE 88

NEW 8" SEWER

NEW 8" SEWER

NEW 8" SEWER

EXISTING 10" SEWER

NEW 8" SEWER

NEW 8" SEWER

WA-DI HOUSING COMMUNITY

NEW WA-DI LIFT STATION

NEW 4" FORCEMAIN TO WWTP

INDIAN SERVICE ROUTE 88

NEW WASTEWATER TREATMENT PLANT

PRIMARY LIFT STATION

TO NM-22 AND ENTERPRISE

NORTH

0 200' 400' 800'

1"=400'-0"

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LIFT STATION FORCEMAN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

WA-DI PROPOSED PHASE B NORTH EXTENSION SEWERS AND LIFT STATION IMPROVEMENTS

FIGURE 4-10

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4.5.4 Screening of Alternatives

The potential locations for the new Wa-Di Lift Station identified in Alternatives 1 and 2 are within the confines of the existing community septic tank and leach field and are very near the location of the existing housing development in Wa-Di. In contrast, the location of the new Wa-Di Lift Station in Alternative 3 is remote from the existing housing development, would not impact the continued operation of the existing septic tank and leach field, and would allow for conversion of the existing septic tank and leach field area to a better use in the future. Alternative location 3 for the Wa-Di Lift Station is adjacent to existing power lines, which will minimize the cost of electrical service to the new lift station site, also. For these reasons, Santo Domingo has indicated a preference for Alternative 3.

The size of the forcemain from the Wa-Di Lift Station to the WWTP is selected as a 4-inch, which is the minimum size recommended by Ten State Standards. This size of forcemain will easily accommodate the projected flows and a larger forcemain would not be needed. As such, there are no alternatives to consider in the forcemain sizing for the Wa-Di Lift Station and forcemain facilities.

4.5.5 Environmental Impacts

The environmental impacts of the Wa-Di Lift Station, forcemain, and collection system are expected to be minimal. The areas proposed for construction have previously been disturbed and are generally in or near populated areas in Santo Domingo. The proposed forcemain from the new Wa-Di Lift Station to the new WWTP will be a small diameter shallow PVC pipe that will follow the alignment of ISR 88. The new Wa-Di Lift Station is proposed to be just east of ISR 88, as shown in Figure 4-8, in an area near the power lines. The wastewater collection system will be located in existing streets and through the existing leach field. Care will be required during excavation through the leach field, as this facility has failed and there will likely be sewage in the immediate vicinity of the leach lines.

4.5.6 Land Requirements and Permitting

The new Wa-Di Lift Station will require a wet well for the submersible pumps, a valve pit, control panel, and jib crane. It is also recommended that a small emergency generator be installed at the site to power the lift pumps during a power outage. These facilities will need to be accommodated in a fenced site dedicated by Santo Domingo for these purposes. The proposed alignment of the new forcemain to the WWTP is along the ISR 88 ROW. Authorization from IHS will be sought for the pipeline alignments that encroach upon ISR 88. Sewer lines that cross the railroad track will require permitting through the Rio Metro Regional Transit District (RMRTD).

4.5.7 Potential Construction Problems

The construction of the new facilities to provide wastewater service to Wa-Di will need to be coordinated with the construction of the new WWTP. Wastewater flows currently directed to the community septic tank will need to be diverted after the new lift station and WWTP have been commissioned. Construction of sewer lines through the existing leach field can occur after the existing septic tank and leach field are abandoned. The sewer line crossing the railroad tracks will need to be constructed in accordance with the requirements of the RMRTD.

4.5.8 Sustainability Considerations

4.5.8.1 Water and Energy Efficiency

The pipeline material and construction will be specified to minimize leakage in accordance with industry standards and prevent breakage, thus maximizing wastewater conveyance efficiency. The pipe diameter will be designed to minimize frictional losses to conserve energy while maintaining minimum velocities needed in a forcemain system to prevent deposition of solids and create a self-cleaning system.

4.5.8.2 Green Infrastructure

No green infrastructure is contemplated for the forcemain from the new Wa-Di Lift Station to the new WWTP or for the Wa-Di Lift Station.

4.5.9 Cost Estimates

The collection, pumping, and conveyance facilities for the Wa-Di Community and the associated estimated construction costs (not including Professional Services, NMGRT, or an inflation factor), as presented in Tables C-5 through C-10 in Appendix C, are summarized below:

• 8-inch north sewer extension and leach field site restoration	Table C-5	$ 234,800
• 8-inch sewers north of highway	Table C-6	$ 388,300
• Jack and bore crossing under highway and railroad tracks	Table C-7	$ 277,000
• 8-inch sewer to new Wa-Di Lift Station	Table C-8	$ 197,000
• Wa-Di Lift Station and site improvements	Table C-9	$ 797,800
• 4-inch forcemain from Wa-Di Lift Station to WWTP	Table C-10	$ 508,500
	TOTAL:	**$ 2,403,300**

The estimated annual O&M costs for the Wa-Di Lift Station, forcemain, and sewers, as presented in Table D-5 of Appendix D, is $20,600.

4.6 Enterprise Area Collection System, Lift Station, Discharge Forcemain, and Gravity Sewer

The existing Enterprise Area is comprised of six areas that have separate wastewater systems. Although NM 22 extends from I-25 in a northwesterly direction, for the purposes of this PER, the areas are generally referenced as being on the south side of NM 22 or on the north side. Three areas currently exist on south side of NM 22, including the Cedar Tree Community, the Santo Domingo High School, the Gas Station / Travel Center, and the Tribal Housing Authority. Existing areas on the north side of NM 22 include the Kewa Safety Complex, the Santo Domingo Health Center, and the Santo Domingo Early Childhood Learning Center. An overview of the proposed wastewater collection, pumping, and conveyance facilities is presented in Figure 4-11.

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GRAVITY SEWER TO WWTP
NEW 8" SEWER
EXISTING SAS
SEWER
EXISTING SEPTIC TANK AND LEACH FIELD
SANTO DOMINGO EARLY CHILDHOOD LEARNING CENTER
EXISTING MBR PLANT
NEW SEWER
EXISTING SEPTIC TANK
EXISTING LEACH FIELD
SANTO DOMINGO HEALTH CENTER
EXISTING MBR PLANT
NEW SEWER
EXISTING LEACH FIELD
SANTO DOMINGO HIGH SCHOOL
NEW SEWER
EXT. FM
EXISTING LIFT STATION
NEW FM
NEW FM
KEWA SAFETY COMPLEX
HIGH POINT
EXISTING LEACH FIELD & SEPTIC TANK
FORCEMAIN TO MH
SEWER FUTURE
SEWAGE POND
NEW ENTERPRISE AREA LIFT STATION 1
NEW SEWER
SANTO DOMINGO TRIBAL HOUSING AUTHORITY
EXISTING SAS
EXISTING MH
FUTURE SEWER
SCALE = 1000 FEET
TRAVEL CENTER
NORTH
Google Earth

LIFT STATION & FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

ENTERPRISE AREA LIFT STATION 1 TO WWTP
FIGURE 4-11

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4.6.1 Description

4.6.1.1 Cedar Tree Community

Wastewater from the Cedar Tree Community that is collected in gravity sewers constructed in the streets and conveyed to the community septic tank must be intercepted and redirected to a new gravity sewer line to be constructed along NM 22 and ISR 88 to the new WWTP. The proposed sewer lines to accommodate this area are illustrated in Figure 4-12.

4.6.1.2 Santo Domingo High School

Wastewater from the High School that is conveyed to the septic tank and leach field via pumped flows from the lift station are proposed to be intercepted and directed to the right-of-way (ROW) for NM 22, as shown in Figure 4-13. Once inside the ROW, it is proposed that an extension of the forcemain be constructed about 10 feet from the ROW fence towards a high point to the east. The pumped flows from the High School Lift Station would discharge into a new manhole at the beginning of a new gravity sewer installed at 10 feet from the ROW fence towards the low point to the east mid-way between the High School ball fields and the Santo Domingo Tribal Housing Authority. A new Enterprise Area Lift Station would be constructed at this low point to provide sewer service to the eastern portion of the Enterprise Area. This new gravity sewer line from the High School to the new Enterprise Area Lift Station would facilitate sewer service to what is currently vacant land to the east of the High School ball fields.

4.6.1.3 Gas Station / Travel Center and Tribal Housing Authority

It is proposed that a new gravity sewer be constructed from the Gas Station / Travel Center and the Santo Domingo Tribal Housing Authority west along the NM 22 ROW to the new Enterprise Area Lift Station. The new gravity sewer at the Gas Station / Travel Center and the Santo Domingo Tribal Housing Authority is illustrated in Figure 4-14.

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NEW 8" SEWER TO WWTP

10' FROM ROW FENCE

10' FROM ROW FENCE

NEW SEWER

HWY 22

NEW 8" SEWER

EXISTING SEWER

3

2

1

2

NEW 8" SEWER

6" SERVICE LATERAL

EXISTING SERVICE SEWER

4

EXISTING SEPTIC TANK

EXISTING LEACH FIELD

KEYED NOTES (#)

1. AFTER NEW SEWER IS IN PLACE, EXTEND EXISTING SERVICE LATERALS TO NEW SEWER.
2. ABANDON OLD SEWER IN-PLACE.
3. REMOVE EXISTING MANHOLE AND EXTEND EXISTING SEWER TO NEW 8" SEWER.
4. EXTEND EXISTING SEWER TO NEW 8" SEWER.

SCALE = 100 FEET

NORTH

LIFT STATION & FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

SEWERAGE CONCEPT FOR ENTERPRISE AREA - CEDAR TREE

FIGURE 4-12

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NEW FM

10' FROM ROW FENCE

NEW MH

NEW SEWER TO LIFT STATION

EXISTING LEACH FIELD & SEPTIC TANK

NEW FM

EXT. FM

EXISTING LIFT STATION

SCALE = 100 FEET

NORTH

LIFT STATION & FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

SEWERAGE FACILITIES AT HIGH SCHOOL AREA - HIGH SCHOOL

FIGURE 4-13

MOLZENCORBIN

TO SEWAGE POND

FUTURE SEWER

10' FROM ROW FENCE

NEW SEWER

FUTURE SEWER

FUTURE SEWER

EXISTING SAS

SCALE = 100 FEET

NORTH

LIFT STATION & FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

SEWERAGE CONCEPT FOR ENTERPRISE AREA - TRAVEL CENTER

FIGURE 4-14

MOLZENCORBIN

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DWG: NAME: FIGURE-4-14.dwg

4.6.1.4 Kewa Safety Complex

Pumped flows from the new Enterprise Area Lift Station are proposed to be directed across NM 22 then west at 10 feet from the ROW fence to a new manhole near the Kewa Safety Complex. From that point, all flows would flow by gravity to the new WWTP. Wastewater currently directed to the septic tank and leach field located north of the Safety Complex would be directed to the new gravity sewer, as shown in Figure 4-15.

4.6.1.5 Santo Domingo Health Center

Wastewater from the Health Center that is directed to the two septic tanks and leach fields located north of the complex can be intercepted and directed west towards the Santo Domingo Early Childhood Learning Center, as shown in Figure 4-16. The flows from these two septic tanks at the Santo Domingo Health Center and the flows from the Santo Domingo Early Childhood Learning Center can be combined before being directed to the new gravity sewer in the NM 22 ROW. In addition, the wastewater flows currently treated at the MBR package plant can be directed to the new sewer line serving the Kewa Safety Complex, as shown in Figure 4-15.

4.6.1.6 Santo Domingo Early Childhood Learning Center

The Santo Domingo Early Childhood Learning Center wastewater flows currently being treated at the Center's package MBR plant can be intercepted and directed to the new sewer described above for the two septic tanks serving the Santo Domingo Health Center. The sewerage concept for the Santo Domingo Early Childhood Learning Center is shown in Figure 4-17.

EXISTING SEPTIC TANK
EXISTING LEACH FIELD
EXISTING SEPTIC TANK
EXISTING LEACH FIELD
LEACH FIELD
NEW SEWER
EXISTING MBR PLANT
NEW SEWER
NEW SEWER
EXISTING LEACH FIELD
EXISTING SEPTIC TANK
NEW SEWER
EXISTING SEWER
KEWA SAFETY COMPLEX
SANTO DOMINGO HEALTH CENTER
NEW SEWER
NEW SEWER
10' FROM ROW FENCE
NEW FM
SCALE = 100 FEET
NORTH

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DWG: NAME: FIGURE-4-15.dwg

LIFT STATION & FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

SEWERAGE CONCEPT FOR ENTERPRISE AREA - SAFETY COMPLEX

FIGURE 4-15

MOLZENCORBIN

EXISTING LEACH FIELD

NEW SEWER

NEW SEWER

EXISTING SEPTIC TANK

EXISTING LEACH FIELD

NEW SEWER

EXISTING SEPTIC TANK

LEACH FIELD

LEACH FIELD

MBR PLANT

NEW SEWER

KEWA SAFETY COMPLEX

SANTO DOMINGO EARLY CHILDHOOD LEARNING CENTER

NEW SEWER

SANTO DOMINGO HEALTH CENTER

10' FROM ROW FENCE

SCALE = 100 FEET

N

LIFT STATION & FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

SEWERAGE CONCEPT FOR HEALTH CENTER AND KEWA SAFETY COMPLEX

FIGURE 4-16

MOLZENCORBIN

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EXISTING MBR PLANT
EXISTING SEWER
EXISTING MH
NEW 8" SEWER
LEACH FIELD
NEW SEWER
SEPTIC TANK
LEACH FIELD
NEW SEWER
SANTO DOMINGO EARLY CHILDHOOD LEARNING CENTER
NEW SEWER
SANTO DOMINGO HEALTH CENTER
10' FROM ROW FENCE
NEW 8" SEWER
NEW 8" SEWER
SCALE = 100 FEET
NORTH

SEWERAGE CONCEPT FOR EARLY CHILDHOOD LEARNING CENTER AND HEALTH CENTER

LIFT STATION & FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

FIGURE 4-17

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4.6.1.7 Gravity Sewer from Enterprise Area to the Wastewater Treatment Plant (WWTP)

The terrain from the Enterprise Area to the new WWTP site generally accommodates a gravity sewer to provide wastewater conveyance service for the Enterprise Area. For the most part, the alignment of the new gravity sewer will follow NM 22 until the alignment reaches ISR 88, at which point the new gravity sewer will be constructed along the western border of ISR 88. The terrain near the WWTP rises slightly just north of the dry arroyo that exists to the west of the WWTP site. At this point, the alignment of the new gravity sewer will need to deviate from the road to avoid overly deep excavations for the new sewer line construction.

4.6.2 Design Criteria

The key criteria for a lift station, forcemain, and gravity sewer are listed below:

- Limit submersible pump starts to 10 per hour (results in a minimum cycle time of 6 minutes).
- Provide a minimum storage volume in the lift station wet well to store 3 minutes of influent flow at a rate equal to one-half the capacity of the pump.
- Pump through the forcemain at a velocity that creates a minimum scouring velocity of 2 fps to resuspend solids in the forcemain, which equates to about 79 gpm for a 4-inch forcemain (Ten State Standards).
- Maximum velocity in forcemains of 8 fps to avoid high headloss and to protect valves (Ten State Standards).
- Minimum size for forcemains of 4-inch diameter (Ten State Standards).
- Friction Coefficient: Hazen-Williams "C" factor of a maximum of 120 for PVC and lined DIP (Ten State Standards).
- Minimum size for a public gravity sewer conveying raw wastewater of 8-inch (Ten State Standards).
- Minimum slope for gravity sewer of 0.40 feet per 100 feet for 8-inch and 0.28 feet per 100 feet for 10-inch (Ten State Standards).

4.6.2.1 Lift Station and Forcemain to Enterprise Area Gravity Sewer

The estimated current average day flow from the Enterprise Area that would contribute flow to the new Enterprise Area Lift Station is about 28 gpm (see Table 3-4), whereas the projected 20-year peak hour flow as presented in Table 3-5 estimated to be 212 gpm. The projected ultimate flow from the Enterprise Area matches the 20-year peak hour flow because the Enterprise Area is projected to build out within the 20-year period. Given the low initial flow rates and considering the minimum flow rate to achieve 2 fps scouring velocity in the minimum size pipe of 4-inches is about 79 gpm, a 4-inch forcemain from the new Enterprise Area Lift Station to the sewer manhole along NM 22 is recommended. The hydraulic analysis and tentative pump selection for pumping from the new Enterprise Area Lift Station is presented in Attachment I of Appendix B. As shown in Attachment I of Appendix B, a FLYGT™ Model NP 3127 SH 3 (11 HP) pump would provide 215 gpm with one pump in operation at full speed of 60 Hz. In addition, this pump could be operated at 40 Hz with a VFD, resulting in a pumping rate of 108 gpm. This flow rate exceeds the minimum flow rate of 79 gpm to achieve 2 fps for scouring velocity in the forcemain. As shown in Attachment I of Appendix B, the shaft HP can be reduced from 8.69 HP at 215 gpm and 60 Hz down to 2.48 HP at 108 gpm and 40 Hz. This variation in flow capacity allows for matching more closely the influent flow rate and minimizing the power costs associated with the lift station. The ability to vary the flow rate will be advantageous at the WWTP to avoid substantial variations in flow in the influent flows to the WWTP. FLYGT™ also offers a pump model in this size range that incorporates a VFD within the pump, as opposed to a separate VFD installed in the control panel at the site. The cost and operational implications of an integral VFD type pump compared to an external VFD will be evaluated in the design phase of the project.

4.6.2.2 Forcemain from Enterprise Area to the Wastewater Treatment Plant (WWTP)

The Cedar Tree Community is approximately 9,200 feet from the location of the new WWTP and it is not likely that this area will be developed in the future. As such, a possible alternative to a gravity sewer between the Enterprise Area and the WWTP is to pump all of the wastewater generated in the Enterprise Area to the WWTP, as illustrated in Figure 4-18. The advantage of this alternative is that a forcemain using a smaller diameter pipe than is required for a gravity sewer could be used and the forcemain could be installed to follow the terrain rather than consistent grades from manhole to manhole. If this alternative is viable, it would save a substantial amount of capital cost for the construction of the required facilities.

Two forcemain size options were considered, a 4-inch and a 6-inch. The 4-inch forcemain is the minimum size recommended by the Ten State Standards. There is approximately 230 feet of elevation change from the Enterprise Area to the WWTP, so this alternative would essentially equate to pumping downhill. For this concept to be viable, the pumping rate would have to be such that the forcemain flows full when the pumps are operating, and the velocity would need to exceed the scouring velocity requirement of 2 fps.

The hydraulic analyses associated with a 4-inch forcemain is included in Attachment J of Appendix B. As shown in Attachment J of Appendix B, the pumping rate would need to be a minimum of 145 gpm to create enough frictional headloss to equate to the available head from the difference in elevation. The system curve for a 4-inch forcemain is very steep in this situation and flows greater than 145 gpm create substantial TDH. To illustrate, at 200 gpm the TDH is 191 feet and requires a 35 HP pump. At 225 gpm, the TDH is 294 feet requiring a 72 HP pump and at 240 gpm, the TDH is 360 feet. There are no pumps available to accommodate the pumping conditions at 240 gpm. From Table 3-5, the estimated peak hour flow rate for the Enterprise Area at the 20-year projection is 434 gpm, so the option of using a 4-inch forcemain would be a short-term option at best for conveying the Enterprise Area wastewater flows to the WWTP.

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DWG: LOCATION: I:\Santo Domingo Pueblo\SDP21\12 Lift Stations-Forceman-Sewer\DWGS\Figures\
DWG: NAME: FIGURE-4-18.dwg

NEW 4" FORCEMAIN FROM WA-DI LIFT STATION

WASTEWATER TREATMENT PLANT

NEW 6" FORCEMAIN FROM GALISTEO LIFT STATION

PRIMARY LIFT STATION

NEW FORCEMAIN TO WWTP

ENTERPRISE AREA LIFT STATION 2

GRAVITY SEWER TO WWTP

SEWER

HOUSING COMMUNITY

NEW SEWERS

EXISTING SEPTIC TANK AND LEACH FIELD

EXISTING SEWERS

22

SCALE = 1000 FEET

NORTH

LIFT STATION & FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

ENTERPRISE AREA LIFT STATION 2
FIGURE 4-18

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The option of constructing a 6-inch forcemain from the Enterprise Area to the WWTP is evaluated in Attachment K of Appendix B. As shown in Attachment K of Appendix B, approximately 420 gpm would be required to create a full-flowing pipe condition with a 6-inch forcemain. From Table 3-5, the estimated ultimate peak hour flow rate from the Enterprise Area is projected to be 446 gpm, so this option would essentially equate to pumping at the ultimate projected peak hour flow rates each time the pump is operated. The impacts on the WWTP operations would be substantial with these significant variations in flow.

In addition to the pumping issues described above, the forcemain would require multiple pressure cleanouts along the route between the Enterprise Area and the WWTP. Special care would be required during O&M to address potential plugged pipe conditions and the pressures associated with up to 230 feet (100 pounds per square inch [psi]) of pressure on the forcemain.

Based on these considerations, a forcemain from the Enterprise Area to the WWTP can be screened out of further consideration.

4.6.3 Map

The overall recommended facilities for the Enterprise Area are summarized in Figure 4-11. Wastewater facility improvements to accommodate the Cedar Tree Community, the Santo Domingo High School, the Gas Station / Travel Center, and the Santo Domingo Tribal Housing Authority are shown in Figures 4-12, 4-13, and 4-14, respectively. Recommended facilities to serve the Kewa Safety Complex, the Santo Domingo Health Center, and the Early Childhood Learning Center are presented in Figures 4-15, 4-16, and 4-17, respectively. The gravity sewer to convey all wastewater from the Enterprise Area to the new WWTP is shown in Figure 4-19.

FORCEMAIN FROM
WA-DI LIFT STATION

PRIMARY LIFT
STATION

GRAVITY SEWER

WASTEWATER
TREATMENT
PLANT

FORCEMAIN FROM
GALISTEO LIFT STATION

SEWER TO WWTP

SEWER TO WWTP

GRAVITY SEWER
TO WWTP

SEWER

HOUSING
COMMUNITY

NEW SEWERS

EXISTING SEPTIC
TANK AND LEACH
FIELD

EXISTING
SEWERS

22

22

SCALE = 1000 FEET

NORTH

LIFT STATION & FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

GRAVITY SEWER FROM ENTERPRISE AREA TO WWTP

FIGURE 4-19

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DWG: NAME: FIGURE-4-19.dwg

4.6.4 Screening of Alternatives

As discussed above, the alternatives considered for conveying the wastewater from the Enterprise are to the WWTP were to either construct a gravity sewer to take advantage of the 230 feet of elevation change from the Enterprise Area to the WWTP or to install a lift station and pump the wastewater through a smaller diameter forcemain that could follow the terrain and minimize the construction cost of the conveyance facilities. The option of pumping the wastewater downhill through a forcemain was eliminated from further consideration due to the resulting operational challenges and the impacts on the WWTP operations.

4.6.5 Environmental Impacts

The environmental impacts of the Enterprise Area Lift Station, forcemain, collection system, and gravity sewer to the new WWTP are expected to be minimal. The areas proposed for construction have previously been disturbed. The Santo Domingo THPO has reviewed and approved the proposed alignments. Arroyo or road crossings would be installed using HDD or jack-and-bore methods to avoid disturbing the stream bed or road. A SWPPP would be filed and executed by the contractor to mitigate sediment runoff and other contaminants generated during construction.

4.6.6 Land Requirements and Permitting

The new Enterprise Area Lift Station will require a wet well for the submersible pumps, a valve pit, a control panel, and a jib crane. It is also recommended that a small emergency generator be installed at the site to power the lift pumps during a power outage. These facilities will need to be accommodated in a fenced site dedicated by Santo Domingo for these purposes. The proposed alignment of the new gravity sewers and forcemain from the Enterprise Area Lift Station to the new gravity sewer is along the NM 22 ROW. Authorization from the NMDOT will be sought for the pipeline alignments that encroach upon NM 22. The proposed alignment of the new gravity sewer to the WWTP is along the ISR 88 ROW. Authorization from IHS will be sought for the pipeline alignments that encroach upon ISR 88.

4.6.7 Potential Construction Problems

The construction of the new facilities to provide wastewater service to the Enterprise Area will need to be coordinated with the construction of the new WWTP. Wastewater flows currently directed to the community septic tanks and MBR package plants will need to be diverted after the new lift station, WWTP, and sewer lines have been commissioned. The sewer line crossing NM 22 and within the NM 22 ROW will need to be constructed in accordance with the requirements of the NMDOT.

4.6.8 Sustainability Considerations

4.6.8.1 Water and Energy Efficiency

The pipeline material and construction will be specified to minimize leakage in accordance with industry standards and prevent breakage, thus maximizing wastewater conveyance efficiency. The pipe diameter will be designed to minimize frictional losses to conserve energy while maintaining minimum velocities needed in a forcemain system to prevent deposition of solids and create a self-cleaning system. Selection of a 4-inch forcemain to convey wastewater from the new Enterprise Area Lift Station to the new gravity sewer to the WWTP allows for the implementation of VFDs which will facilitate matching the pumped flow rates closely to the influent flow rates.

4.6.8.2 Green Infrastructure

No green infrastructure is contemplated for the Enterprise Area Lift Station, the forcemain from the new Enterprise Area Lift Station to the new gravity sewer to the WWTP, for the gravity sewer lines in the Enterprise Area, or the gravity sewer to the new WWTP.

4.6.9 Cost Estimates

The collection, pumping, and conveyance facilities for the Enterprise Area and the associated estimated construction costs (not including Professional Services, NMGRT, or an inflation factor), as presented in Tables C-11 through C-21 in Appendix C, are summarized below:

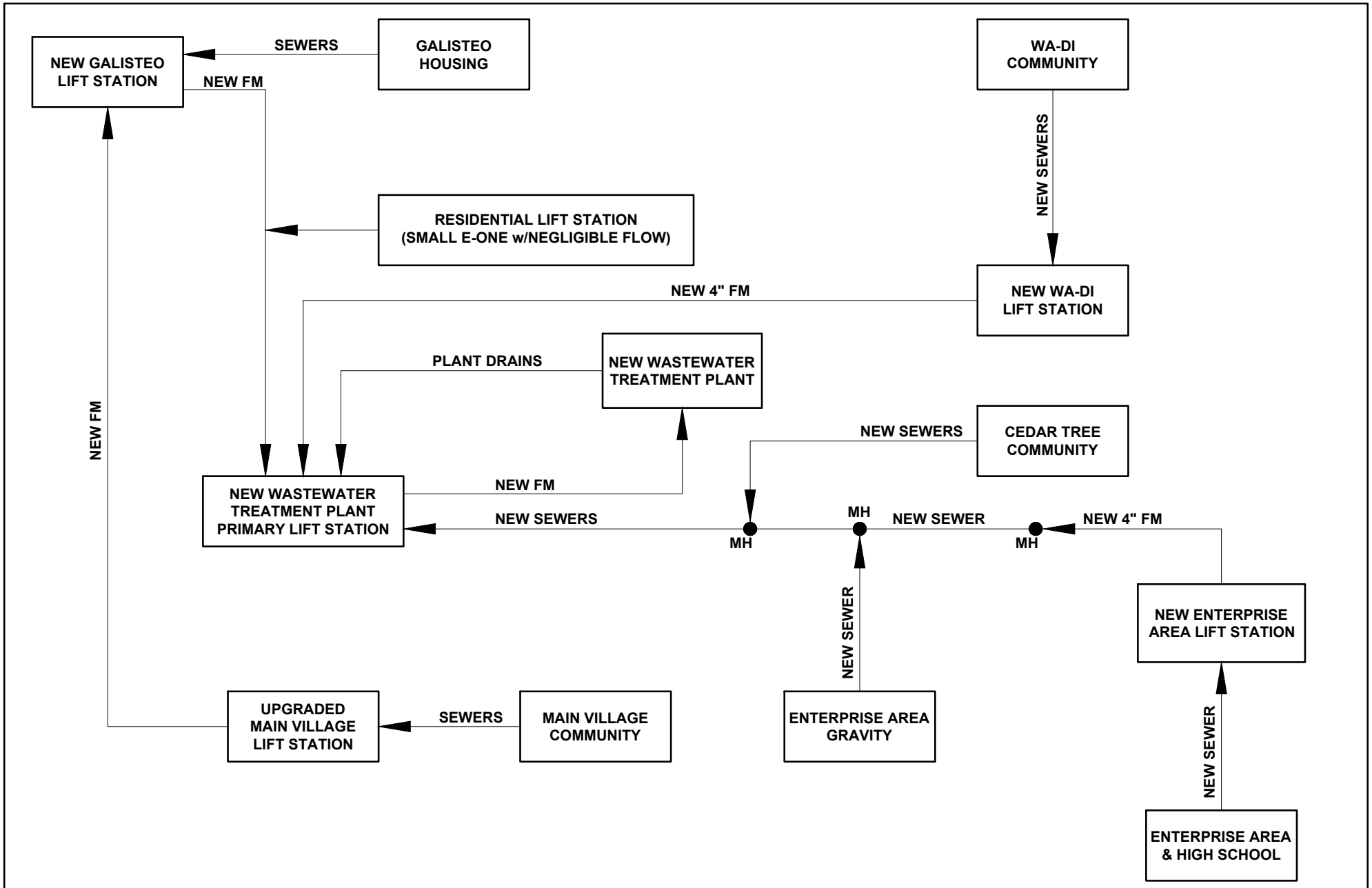
• 8-inch sewer east of highway near Kewa Safety Center	Table C-11	$ 422,800
• 8-inch sewer from Enterprise Area to near lift station	Table C-12	$ 397,300
• forcemain extension and 8-inch sewer from High School	Table C-13	$ 321,500
• Enterprise Area Lift Station and forcemain	Table C-14	$ 1,338,300
• 8-inch sewer for Cedar Tree Community in Enterprise Area	Table C-15	$ 426,100
• 8-inch sewer east of highway for Pueblo facilities	Table C-16	$ 579,600
• 8-inch sewer for Early Childhood Learning Center	Table C-17	$ 262,600
• 8-inch sewer for 2 septic tanks at Health Center	Table C-18	$ 194,800
• 8-inch sewer for Health Center	Table C-18	$ 239,300
• 8-inch sewer for Kewa Safety Complex	Table C-20	$ 65,700
• 8-inch sewer from north end of Enterprise Area to WWTP	Table C-21	$ 2,813,500
	TOTAL:	**$ 7,061,500**

The estimated annual O&M costs for the Enterprise Area Lift Station, forcemain, and sewers, as presented in Table D-6 of Appendix D, is $31,400.

5.0 SELECTION OF AN ALTERNATIVE

With the new WWTP being located at an elevation that is higher than the Main Village, the Galisteo Housing Area, and the Wa-Di Housing Area, the wastewater collection, pumping, and conveyance systems become complex and significantly interrelated. For example, the selection of the preferred alternative for the Main Village Lift Station has significant and direct impacts on the Galisteo Lift Station. Of particular importance is the selection of the size of the forcemains, which dictates the required pump selections at all lift stations. A schematic of the proposed sewage collection and treatment system for Santo Domingo is presented in Figure 5-1. This schematic is representative of the alternative analyses presented in Section 4.0. Figure 5-2 includes projected flow data from Section 3.0 along with pumping alternatives for different forcemain size alternatives.

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DWG. LOCATION: I:\Santo Domingo Pueblo\SDP211-12 Lift Stations-Forceman-Sewer\DWGS\Figures\
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LIFT STATION FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

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PROPOSED SEWAGE COLLECTION & TREATMENT SYSTEM
FIGURE 5-1

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DWG. LOCATION: I:\Santo Domingo Pueblo\SDP211-12 Lift Stations-Forcemain-Sewer\DWG\Figures\
DWG. NAME: FIGURE-5-2.dwg

NEW GALISTEO LIFT STATION

SEWERS

GALISTEO HOUSING

$Q_{avg-2021}$ = 18 gpm
$Q_{PkHr-20yr}$ = 55 gpm
$Q_{Pk\ Hr-Ultimate}$ = 117 gpm

NEW FM

Q_{min} for 2 fps Velocity: 176 gpm for 6" FM OR 314 gpm for 8" FM

GALISTEO to WWTP FM and LS Options:

$Q_{6"\ FM-Min}$ = 176 gpm w/VFD@60Hz 72 HP
$Q_{6"\ FM-Max\ 1\ Pump}$ = 364 gpm w/VFD@60Hz 72 HP
$Q_{6"\ FM-Max\ 2\ Pumps}$ = 385 gpm w/VFD@59Hz 72 HP

OR

$Q_{8"FM-Min}$ = 314 gpm w/VFD@54Hz 50 HP
$Q_{8"\ FM-Max\ 20-Yr}$ = 385 gpm w/VFD@58Hz 50 HP
$Q_{8"\ FM-Max\ 2\ Pumps}$ = 800 gpm w/VFD@60Hz 160 HP

Main Village to Galisteo FM and LS Options:

$Q_{8"FM-Min}$ = 314 gpm w/VFD@56Hz 45 HP
$Q_{8"\ FM-Max\ 20-Yr}$ = 330 gpm w/VFD@58Hz 45 HP

OR

$Q_{8"\ FM-Max\ 2\ Pumps}$ = 685 gpm w/VFD@60Hz 160 HP

$Q_{6"\ FM-Min}$ = 191 gpm w/VFD@40Hz 72 HP
$Q_{6"\ FM-Max}$ = 330 gpm w/VFD@56Hz 72 HP

NEW FM

Q_{min} for 2 fps Velocity: 176 gpm for 6" FM OR 314 gpm for 8" FM

RESIDENTIAL LIFT STATION
(SMALL E-ONE w/NEGLIGIBLE FLOW)

WA-DI COMMUNITY

$Q_{avg-2021}$ = 8 gpm
$Q_{PkHr-20yr}$ = 24 gpm
$Q_{Pk\ Hr-Ultimate}$ = 51 gpm

NEW SEWERS

NEW WA-DI LIFT STATION

$Q_{4"\ FM}$ = 95 gpm w/NP 3102 SH3 7.2 HP
(Note: VFD not feasible for 78.5 gpm min. 2 FPS velocity)

NEW 4" FM
Q_{min} for 2 fps Velocity = 78.5 gpm for 4" FM

PLANT DRAINS

75 gpm

NEW WASTEWATER TREATMENT PLANT

NEW WASTEWATER TREATMENT PLANT PRIMARY LIFT STATION

NEW FM (*See Below*)

NEW SEWERS

$Q_{avg-2021}$ = 32 gpm to 140 gpm
$Q_{PkHr-20yr}$ = 222 gpm to 434 gpm
$Q_{Pk\ Hr-Ultimate}$ = 235 gpm to 446 gpm

MH

MH

NEW SEWER

MH

NEW 4" FM

NEW SEWERS

CEDAR TREE COMMUNITY

$Q_{avg-2021}$ = 3.6 gpm
$Q_{PkHr-20yr}$ = 11 gpm
$Q_{Pk\ Hr-Ultimate}$ = 23 gpm

$Q_{4"\ FM-Min}$ = 108 gpm w/VFD@40Hz 11 HP
$Q_{4"\ FM-Max}$ = 215 gpm w/VFD@60Hz 11 HP

NEW ENTERPRISE AREA LIFT STATION

NEW SEWER

$Q_{avg-2021}$ = 28 gpm
$Q_{PkHr-20yr}$ = 212 gpm
$Q_{Pk\ Hr-Ultimate}$ = 212 gpm

ENTERPRISE AREA & HIGH SCHOOL

NEW SEWER

$Q_{avg-2021}$ = 28 gpm
$Q_{PkHr-20yr}$ = 212 gpm
$Q_{Pk\ Hr-Ultimate}$ = 212 gpm

ENTERPRISE AREA GRAVITY

UPGRADED MAIN VILLAGE LIFT STATION

SEWERS

$Q_{avg-2021}$ = 110 gpm
$Q_{PkHr-20yr}$ = 330 gpm
$Q_{Pk\ Hr-Ultimate}$ = 707 gpm

MAIN VILLAGE COMMUNITY

WWTP Primary Lift Station Pumping Ranges

For 6" FMs from MV & Galisteo:
$Q_{6"\ FM-Avg\ 2021}$ = 303 gpm to 471 gpm
OR
$Q_{6"\ FM-Pk\ Hr-20\ Yr}$ = 647 gpm to 968 gpm

For 8" FMs from MV & Galisteo:
$Q_{8"FM-Avg\ 2021}$ = 303 gpm to 471 gpm
$Q_{8"\ FM-Pk\ Hr-20\ Yr}$ = 702 gpm to 968 gpm
$Q_{8"\ FM-Pk\ Hr-Ultimate}$ = 1014 gpm to 1416 gpm

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LIFT STATION FORCEMAIN PER - SANTO DOMINGO PUEBLO, NEW MEXICO

PROPOSED SEWAGE COLLECTION & TREATMENT SYSTEM WITH FLOWS AND PUMPS

FIGURE 5-2

5.1 Life Cycle Cost Analysis

Using the estimated capital and annual O&M costs for each project component, a life cycle cost analysis is provided herein. The life cycle present worth value is determined by relating the estimated expenditures (present and future) in present dollars. An interest rate of 0.4 percent (the "real" discount rate for 20-year maturities taken from Appendix C of Office of Management and Budget (OMB) *Circular No. A-94 Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*, last revised in March 2022) will be used to calculate the present value for the proposed improvements. The equation for net present value (NPV) is shown below:

NPV = C + USPW(O&M) – SPPW(S)

Where:

NPV = Net present value,

C = Capital cost,

USPW(O&M) = Uniform series present worth of O&M costs, and

SPPW(S) = Single payment present worth of the salvage value.

Table 5-1 shows the NPV of the project components under consideration. The USPW factor for an interest rate (i) of 0.4% and a life cycle (n) of 20 years is calculated as follows:

$$\text{USPW Factor} = \frac{(1+i)^n-1}{i(1+i)^n}$$

$$\text{USPW Factor} = \frac{(1+0.004)^{20}-1}{0.004(1+0.004)^{20}}$$

$$\text{USPW Factor} = 19.18$$

This factor is multiplied by the annual O&M cost to present the annual expenses in a present worth dollar amount. None of the equipment associated with the alternatives is expected to have any salvage value at the end of its useful life.

TABLE 5-1
LIFE CYCLE COST ANALYSIS

PROJECT COMPONENT	DESCRIPTION	CAPITAL COST	O&M COST	SALVAGE VALUE	PPW (S)	NPV
Main Village Lift Station (MVLS)	Main Village Lift Station Upgrade	$ 947,000	$ 70,200	---	---	$ 2,293,000
Main Village - Galisteo Forcemain (MV-G FM)	Forcemain from Main Village Lift Station to Galisteo Lift Station	$ 2,862,000	$ 11,000	---	---	$ 3,073,000
Galisteo Lift Station (GLS)	Galisteo Lift Station	$ 1,522,000	$ 72,500	---	---	$ 2,913,000
Galisteo – Wastewater Treatment Plant Forcemain (G-WWTP FM)	Forcemain from Galisteo Lift Station to WWTP	$ 3,166,000	$ 10,800	---	---	$ 3,373,000
WA-DI	Wa-Di Lift Station, Forcemain to WWTP, and Sewers	$ 2,403,000	$ 20,600	---	---	$ 2,798,000
Enterprise Area (EA)	Enterprise Area Sewers, Lift Station, and Gravity Sewer to WWTP	$ 7,062,000	$ 31,400	---	---	$ 7,664,000
	TOTALS:	**$ 17,962,000**	**$ 216,500**	**---**	**---**	**$22,114,000**

5.2 Non-Monetary Factors

The primary non-monetary factors that impact the selection of the preferred alternatives include:

- O&M constraints.
- Impact on WWTP operations.
- Accommodation of future growth.

5.2.1 Operation and Maintenance (O&M) Considerations

With wastewater flows from the Main Village, the Galisteo Housing Area, and the Wa-Di Housing Area being pumped through forcemains to the new WWTP, a substantial portion of the flow to the WWTP will be intermittent in nature as the pumps cycle on and off. This operational

situation results in conditions where there is no flow in the forcemains periodically, allowing solids to settle in the forcemains until the pumps turn back on. To minimize O&M issues related to settled solids in the forcemains, it is essential that the scouring velocity criteria described in Section 4.0 be followed. Velocities in the forcemains less than 2 fps will lead to O&M requirements that could become costly and could potentially lead to plugged forcemains resulting in sewage overflows. As such, it is critical that the forcemains be self-cleaning to the greatest extent possible. As a reminder, the minimum flow rates for 4-inch, 6-inch, and 8-inch forcemains are 79 gpm, 176 gpm, and 314 gpm, respectively.

5.2.2 Impact on Wastewater Treatment Plant (WWTP) Operations

The selection of the forcemain sizes for the Main Village Lift Station and the Galisteo Lift Station have potential significant impacts on the operation of the new WWTP. As described in Section 4.0, selecting 6-inch forcemains allows for the implementation of VFDs on the lift pumps to match the pumping rates more closely to the influent flow rates. Selecting 8-inch forcemains requires pumping at nearly the 20-year peak hour flow rates, resulting in flows to the new WWTP that will intermittently spike between peak hour flows and very low flows that arrive by gravity from the Enterprise Area. The peak flows can be mitigated at the WWTP by constructing an Equalization Basin, which adds cost and operational complexity to the WWTP. By inspection, it is apparent that the capital cost associated with the 6-inch forcemains is less than the 8-inch forcemain alternative because the cost of piping, fittings, and valves for the 8-inch forcemains plus the cost of the Equalization Basin will be greater than the 6-inch forcemain alternatives.

5.2.3 Accommodation of Future Growth

The selection of the forcemain sizes for the Main Village Lift Station and the Galisteo Lift Station will significantly impact the ability of the initial facilities to accommodate future growth. Selecting 6-inch forcemains will accommodate the initial flows nicely and will reasonably accommodate the 20-year projected flows. However, 6-inch forcemains will not accommodate the ultimate flow projections. Alternatively, 8-inch forcemains can accommodate substantial

growth beyond the 20-year projections but may be viewed as being oversized for the initial flows through the 20-year projections.

5.3 Selected Alternatives

Through consultation with Santo Domingo regarding the balance of accommodation of future growth versus operational challenges associated with oversizing the facilities based on current and near-term projected flows, the consensus was to select 6-inch forcemains for the conveyance facilities from the Main Village Lift Station to the new Galisteo Lift Station and from the new Galisteo Lift Station to the new WWTP.

6.0 PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)

This project is intended to be implemented as soon as Santo Domingo can secure funding to design and construct the required facilities. At the time of the writing of this PER, Santo Domingo had successfully secured $3 million in grant funding from the Tribal Infrastructure Fund (TIF), administered by the New Mexico Indian Affairs Department, for the Wa-Di Community sewerage facilities. It is anticipated that a phased implementation of the required facilities will be required to match the scope of the improvements with the availability of funding.

6.1 Preliminary Project Design

The proposed project consists of four separate components that can either be implemented independently or in packages as funding allows. The four components relate to the four distinct service areas in the Santo Domingo service area, including the Main Village Lift Station and forcemain to the Galisteo Lift Station; the Galisteo Lift Station and forcemain to the new WWTP; the Wa-Di Lift Station, sewers, and forcemain to the new WWTP; and the Enterprise Area Lift Station, forcemains, gravity collection sewers, and gravity sewer to the new WWTP. The proposed project elements for these four areas are listed in the following paragraphs.

6.1.1 Main Village Lift Station and Forcemain to the Galisteo Lift Station

This proposed project component consists of the following elements:

- Replace existing 10 HP submersible pumps with 72 HP pumps.
- Replace existing wet well top with new concrete slab and hatch to accommodate the larger pumps.
- Replace discharge elbows and guide bars to accommodate the larger pumps.
- 75 kW emergency generator.
- Modifications to electrical power and controls.
- Install approximately 2.5 miles of 6-inch PVC forcemain.
- Install ten 6-inch double pressure cleanouts.

- Install five 6-inch isolation valves.
- Install five combination air release and vacuum stations at high points of the alignment.
- Directional drill under lined MRGCD Canal.
- Steel cased and erosion protected Galisteo Creek crossing.
- Gravel road and pavement removal and replacement.

6.1.2 Galisteo Lift Station and Forcemain to the New Wastewater Treatment Plant (WWTP)

This proposed project component consists of the following elements:

- Construct new wet well with 72 HP submersible pumps, concrete cover with access hatch, valve vault, coatings, and associated piping and valves.
- Construct monorail and frame with hoist assembly.
- Site work, including grading, subgrade, base course, and fencing.
- 75 kW emergency generator.
- Electrical power and controls.
- Install approximately 2.0 miles of 6-inch PVC forcemain.
- Install ten 6-inch double pressure cleanouts.
- Install eight 6-inch isolation valves.
- Install eleven combination air release and vacuum stations at high points of the alignment.
- Steel cased and erosion protected Galisteo Creek crossing.
- Jack and bore under ISR 88.
- Directional drill crossings at the irrigation canal adjacent to the new Galisteo Lift Station site, at the arroyo crossing south of ISR 88, and across Highway 22 at the intersection of ISR 88 and Highway 22.
- Construct new residential duplex grinder pump station with 2-inch high density polyethylene (HDPE) discharge, valves, and 4-inch PVC gravity sewer lateral.
- Gravel road and pavement removal and replacement.

6.1.3 Wa-Di Lift Station, Sewers, and Forcemain to the New Wastewater Treatment Plant (WWTP)

This proposed project component consists of the following elements:

- Construct new wet well with 7.2 HP submersible pumps, concrete cover with access hatch, valve vault, coatings, and associated piping and valves.
- Construct monorail and frame with hoist assembly.
- Site work, including grading, subgrade, base course, and fencing.
- 10 kW emergency generator.
- Electrical power and controls.
- Install approximately 0.5 miles of 4-inch PVC forcemain.
- Install approximately 0.4 miles of 8-inch PVC gravity sewer with 18 manholes.
- Jack and bore under ISR 88 and railroad tracks.
- Removal of community septic tank, leach field, and restoration of site.
- Gravel road and pavement removal and replacement.

6.1.4 Enterprise Area Lift Station, Forcemains, Gravity Collection Sewers, and Gravity Sewer to the New Wastewater Treatment Plant (WWTP)

This proposed project component consists of the following elements:

- Construct new wet well with 11 HP submersible pumps, concrete cover with access hatch, valve vault, coatings, and associated piping and valves.
- Construct monorail and frame with hoist assembly.
- Site work, including grading, subgrade, base course, and fencing.
- 10 kW emergency generator.
- Electrical power and controls.
- Install approximately 0.4 miles of 4-inch PVC forcemain.
- Install approximately 3.4 miles of 8-inch PVC gravity sewer with 70 manholes.
- Install five 4-inch double pressure cleanouts.

- Install two 4-inch isolation valves.
- Jack and bore under Highway 22 (three separate crossings).
- Gravel road and pavement removal and replacement.

6.2 Project Schedule

The schedule of the recommended facilities related to forcemains, lift stations, and gravity sewers as described in this PER will need to be closely coordinated and orchestrated with the implementation of the new WWTP. The WWTP will need to be constructed and commissioned prior to diverting any wastewater flows from the current methods of treatment and disposal. However, the diversion of wastewater to the new WWTP will need to occur immediately after commissioning the WWTP in order to develop and maintain the biological treatment processes that are required to successfully treat the wastewater for disposal.

As indicated above, the four project components can be implemented independently or in packages as funding is secured for the improvements. Table 6-1 presents a conceptual project schedule with a range of implementation timeframes. The range of implementation timeframes is intended to illustrate the potential schedules for each project if implemented individually and independently as well as if implemented as one overall project. The shorter duration times in Table 6-1 would be for each project if implemented independently, so the total time would be derived by adding the number of independent projects being pursued.

TABLE 6-1
PROJECT SCHEDULES FOR SANTO DOMINGO
LIFT STATIONS, FORCEMAINS, AND GRAVITY SEWERS

TASK	DURATIONS
Geotechnical Investigation and Survey	30 – 60 days
Design	180 – 240 days
Permitting / ROW / Easement	Concurrent with Survey and Design
Bid and Award	60 days
Construction	240 – 330 days
Closeout	30 days
Total:	**540 – 720 days**

6.3 Permit Requirements

6.3.1 Bureau of Indian Affairs (BIA)

A BIA Utility Permit application needs to be submitted to the BIA Southwest Region Division of Transportation. (SWR DOT). The BIA will need to research existing ROW and prepare a new service agreement for the proposed utility lines meeting requirements of 25 Code of Federal Regulations (CFR) Part §169 – Rights of Way Over Indian Lands.

A Categorical Exclusion (CE) will need to be completed and approved by BIA Southwest Region Division of Environmental, Safety and Cultural Resources Management (DESCRM). The CE review usually takes 8 weeks. Finally, SWR DOT will review the alignment for the depth and the encroachment of the sewer line as it crosses under and runs parallel to ISR 88.

The schedule should allow 4 to 5 months total for multiple department review. SWR DOT indicated that the permitting process should not be delayed if the agency is updated and involved with the progress of the project implementation.

SWR DOT indicated that they did not see any problems with the proposed alignment.

6.3.2 Middle Rio Grande Conservancy District (MRGCD)

The MRGCD does not issue licenses for improvements on pueblo land. Typically, they provide a Letter of Concurrence (LOC) to the Pueblo.

To obtain the LOC, the applicant needs to submit 60% plans with the license application form found on the MRGCD website. MRGCD requires that the utility be installed per their design standards.

Utilities running parallel to the MRGCD ROW may only be placed in the outer 5 feet of the ROW. The MRGCD requires top and bottom channel elevations on structures upstream and

downstream of a crossing to establish the elevation of the ditch at the crossing. This allows for changes in the ditch bottom elevation due to sedimentation or scour.

The schedule should allow 8 to 12 weeks for the MRGCD approval process.

MRGCD indicated that they did not see any problems with the proposed alignment.

6.3.3 New Mexico Department of Transportation (NMDOT)

An application needs to be submitted to NMDOT District 3 for a Utility Permit.

Prior to submission of the Utility Permit application, an Environmental Clearance Application needs to be submitted to the NMDOT Environmental Section. This application needs to include plans of crossings and alignments in NMDOT ROW.

Once the Environmental Section provides the Certificate of Environmental Clearance (CEC), the Utility Permit may be submitted to NMDOT District 3. The submittal needs to include the application form, Construction Drawings, the approved CEC and other items.

Drawings need to include NMDOT ROW, casing type and bore pit locations for crossings.

The schedule should allow 3 weeks for the CEC and 3 months for the Utility Permit, depending on comments. Environmental concerns can add additional delays.

NMDOT would not comment on whether they saw problems with the proposed alignment until detailed Construction Drawings are provided.

6.3.4 New Mexico Department of Transportation (NMDOT) Rail Bureau

An NMDOT Railroad ROW License for Pipeline Application needs to be submitted to the NMDOT Rail Bureau. The Application needs to include Construction Drawings and other items.

Work in Rail Road ROW will require worker protection, insurance, and flagging. Installation will require casing and directional boring or jack and bore. Geotechnical bore test holes at crossing pits will be required if the installation is larger than 26 inches. Minimum depth of utility installation shall be 36 inches from base of rail to top of casing. A casing will need to extend from ROW line to ROW line. Under track borings will need to be greater than 200 feet away from any railroad bridge, culvert, track switch, signal or other major structure. The underground facility must not be attached to railroad bridges, route facilities, drainage structures, cattle guards, or under buildings.

NMDOT did not comment on whether they saw problems with the proposed alignment.

The schedule should allow 3 months for approval of the Rail Bureau permit.

6.3.5 Public Service Company of New Mexico (PNM)

An encroachment agreement is required to install utility lines in PNM ROW. This agreement must be negotiated with the PNM ROW Bureau.

PNM will not comment on the proposed encroachment until they receive Drawings.

The schedule should allow 4 months for approval of the PNM encroachment agreement.

6.4 Sustainability Considerations

The facilities and equipment for this project will be specified using corrosion-resistant materials or will be coated with corrosion-resistant products to extend the design life of the facilities. Where available, premium efficiency motors will be specified to reduce the energy consumption of the pumping facilities. No green infrastructure is proposed for this project.

6.5 Total Project Cost Estimate (Engineer's Opinion of Probable Cost)

Estimated costs for the Main Village Lift Station and the forcemain from the Main Village Lift Station to the new Galisteo Lift Station are shown in Table 6-2. Note that there is a line item in the cost estimate for inflation. With the unprecedented impacts on the cost of materials and labor currently being experienced on construction projects, along with supply chain challenges, it seems appropriate to include a value for this line item of the cost estimate to account for these potential impacts to the project costs. The NMDOT is currently recommending a 40% inflation factor for projects at the 60% design level. Another option is to use published inflation values from an entity such as the Associated General Contractors of America (AGC). One such recent publication is the C*onstruction Inflation Alert, July 2022* (AGC), which is included in Appendix E for reference. In Figure 5 of Appendix E, the Bid Price producer price index (PPI) was climbing at a 19.8% year-over-year rate. While this inflation rate is half of the rate used by NMDOT, it appears to be a reasonable basis for including an inflation factor in the Santo Domingo forcemain and lift station project. Based on the above discussion and rounding the inflation factor to an even 20.0% as presented in Table 6-2, the estimated Construction Costs for the Main Village Lift Station and the forcemain from the Main Village Lift Station to the new Galisteo Lift Station are $4,858,000 and the estimated Professional Services Costs are $1,083,000 for a total estimated cost of $5,941,000.

Estimated costs for the Galisteo Lift Station and the forcemain from the Galisteo Lift Station to the new WWTP are shown in Table 6-3. Estimated Construction Costs are $5,976,000 and the estimated Professional Services Costs are $1,301,000 for a total estimated cost of $7,277,000. Refer to the discussion above regarding the inclusion of a line item in the cost estimate for inflation.

The estimated Construction and Professional Services for the wastewater collection, pumping, and conveyance facilities to serve the Wa-Di Community are summarized in Table 6-4. Estimated Construction Costs are $3,064,000 and the estimated Professional Services Costs are $771,000 for a total estimated cost of $3,835,000. Refer to the discussion above regarding the inclusion of a line item in the cost estimate for inflation.

Estimated costs for the gravity sewers in the Enterprise Area, the new Enterprise Area Lift Station, the forcemain facilities to extend the existing discharge from the High School Lift Station to the new gravity sewer and from the new Enterprise Area Lift Station, along with the gravity sewer to convey wastewater to the new WWTP are summarized in Table 6-5. Estimated Construction Costs are $9,002,000 and the estimated Professional Services Costs are $1,719,000 for a total estimated cost of $10,721,000. Refer to the discussion above regarding the inclusion of a line item in the cost estimate for inflation.

TABLE 6-2
ESTIMATED COSTS FOR MAIN VILLAGE LIFT STATION AND FORCEMAIN

ITEM NO.	DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
CONSTRUCTION SERVICES					
1	Main Village Lift Station Modifications and Site Improvements, Complete in Place (CIP).	LS	1	$ 855,000	$ 855,000
2	6-inch Forcemain from Main Village to Galisteo Lift Station, CIP.	LS	1	$ 2,584,000	$ 2,584,000
				Inflation Factor @ 20.0%:	$ 688,000
				Construction Services Subtotal:	$ 4,127,000
OTHER PROJECT CONSTRUCTION REQUIREMENTS					
Mobilization, Insurance, and Bonds		LOT	1	$ 206,000	$ 206,000
Demobilization and Submittal of All Closeout Documents		LOT	1	$ 21,000	$ 21,000
SWPPP		LS	1	$ 62,000	$ 62,000
Construction Staking Services by New Mexico Registered Surveyor		LS	1	$ 52,000	$ 52,000
Traffic Control		LS	1	$ 21,000	$ 21,000
Pre-Authorized Changes During Construction		ALLOW	1	$ 83,000	$ 83,000
				Other Project Construction Requirements Subtotal:	$ 445,000
				Construction Services and Other Project Construction Requirements Subtotal:	$ 4,572,000
				NMGRT @ 6.25%:	$ 286,000
				TOTAL CONSTRUCTION COST OPINION:	**$ 4,858,000**
PROFESSIONAL SERVICES					
MRGCD Encroachment and Crossing Permits					$ 20,000
United States Army Corps of Engineers (USACE) / Nationwide Permit					$ 15,000
Cultural Resources Inventory to State / THPO					$ 12,000
BIA Road Crossing and Encroachment Permits					$ 15,000
Utility Easements					$ 15,000
Engineering Design and Construction Fees					$ 632,000
Survey Fees					$ 45,000
Geotechnical Investigation Fees					$ 40,000
SUE Fees					$ 55,000
Construction Observation Fees (Full-time 6 Months at $26,000 / Month)					$ 156,000
				Professional Services Subtotal:	$ 1,005,000
				NMGRT @ 7. 75%:	$ 78,000
				TOTAL PROFESSIONAL SERVICES COST OPINION:	**$ 1,083,000**
SUMMARY					
Construction Cost Opinion					$ 4,858,000
Professional Services Opinion					$ 1,083,000
				TOTAL PROJECT COSTS AND FEES:	**$ 5,941,000**

TABLE 6-3
ESTIMATED COSTS FOR GALISTEO LIFT STATION AND FORCEMAIN

ITEM NO.	DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
CONSTRUCTION SERVICES					
3	Galisteo Lift Station and Site Improvements, CIP.	LS	1	$ 1,371,000	$ 1,371,000
4	6-inch Forcemain from Galisteo Lift Station to WWTP, CIP.	LS	1	$ 2,852,000	$ 2,852,000
				Inflation Factor @ 20.0%:	$ 845,000
				Construction Services Subtotal:	$ 5,068,000
OTHER PROJECT CONSTRUCTION REQUIREMENTS					
Mobilization, Insurance, and Bonds		LOT	1	$ 253,000	$ 253,000
Demobilization and Submittal of All Closeout Documents		LOT	1	$ 25,000	$ 25,000
SWPPP		LS	1	$ 76,000	$ 76,000
Construction Staking Services by New Mexico Registered Surveyor		LS	1	$ 63,000	$ 63,000
Traffic Control		LS	1	$ 38,000	$ 38,000
Pre-Authorized Changes During Construction		ALLOW	1	$ 101,000	$ 101,000
				Other Project Construction Requirements Subtotal:	$ 556,000
				Construction Services and Other Project Construction Requirements Subtotal:	$ 5,624,000
				NMGRT @ 6.25%:	$ 352,000
				TOTAL CONSTRUCTION COST OPINION:	**$ 5,976,000**
Professional Services					
USACE / Nationwide Permit					$ 15,000
Cultural Resources Inventory to State / THPO					$ 12,000
BIA Road Crossing and Encroachment Permits					$ 15,000
Utility Easements					$ 15,000
Railroad Crossing Permits					$ 25,000
Engineering Design and Construction Fees					$ 777,000
Survey Fees					$ 45,000
Geotechnical Investigation Fees					$ 40,000
SUE Fees					$ 55,000
Construction Observation Fees (Full-time 8 Months at $26,000 / Month)					$ 208,000
				Professional Services Subtotal:	$ 1,207,000
				NMGRT @ 7.75%:	$ 94,000
				TOTAL PROFESSIONAL SERVICES COST OPINION:	**$ 1,301,000**
SUMMARY					
Construction Cost Opinion					$ 5,976,000
Professional Services Opinion					$ 1,301,000
				TOTAL PROJECT COSTS AND FEES:	**$ 7,277,000**

TABLE 6-4
ESTIMATED COSTS FOR WA-DI LIFT STATION, FORCEMAIN, AND GRAVITY SEWERS

ITEM NO.	DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
CONSTRUCTION SERVICES					
5	8-Inch North Sewer Extension and Leach Field Site Restoration at Wa-Di, CIP.	LS	1	$ 211,000	$ 211,000
6	8-Inch Sewers North of Highway at Wa-Di, CIP.	LS	1	$ 349,000	$ 349,000
7	Jack and Bore Crossing Under Highway and Railroad Tracks, CIP.	LS	1	$ 249,000	$ 249,000
8	8-Inch Sewer from WA-DI to New Wa-Di Lift Station, CIP.	LS	1	$ 177,000	$ 177,000
9	Wa-Di Lift Station and Site Improvements, CIP.	LS	1	$ 717,000	$ 717,000
10	4-inch Forcemain from Wa-Di Lift Station to New WWTP, CIP.	LS	1	$ 457,000	$ 457,000
				Inflation Factor @ 20.0%:	$ 432,000
				Construction Services Subtotal:	$ 2,592,000
OTHER PROJECT CONSTRUCTION REQUIREMENTS					
Mobilization, Insurance, and Bonds		LOT	1	$ 130,000	$ 130,000
Demobilization and Submittal of All Closeout Documents		LOT	1	$ 13,000	$ 13,000
SWPPP		LS	1	$ 39,000	$ 39,000
Construction Staking Services by New Mexico Registered Surveyor		LS	1	$ 32,000	$ 32,000
Traffic Control		LS	1	$ 26,000	$ 26,000
Pre-Authorized Changes During Construction		ALLOW	1	$ 52,000	$ 52,000
				Other Project Construction Requirements Subtotal:	$ 292,000
				Construction Services and Other Project Construction Requirements Subtotal:	$ 2,884,000
				NMGRT @ 6.25%:	$ 180,000
				TOTAL CONSTRUCTION COST OPINION:	**$ 3,064,000**
PROFESSIONAL SERVICES					
Cultural Resources Inventory to State / THPO					$ 12,000
BIA Road Crossing and Encroachment Permits					$ 15,000
Utility Easements					$ 15,000
Railroad Crossing Permits					$ 25,000
Engineering Design and Construction Fees					$ 398,000
Survey Fees					$ 32,000
Geotechnical Investigation Fees					$ 28,000
SUE Fees					$ 35,000
Construction Observation Fees (Full-time 6 Months at $26,000 / Month)					$ 156,000
				Professional Services Subtotal:	$ 716,000
				NMGRT @ 7.75%:	$ 55,000
				TOTAL PROFESSIONAL SERVICES COST OPINION:	**$ 771,000**
SUMMARY					
Construction Cost Opinion					$ 3,064,000
Professional Services Cost Opinion					$ 771,000
				TOTAL PROJECT COSTS AND FEES:	**$ 3,835,000**

TABLE 6-5
ESTIMATED COSTS FOR ENTERPRISE AREA
LIFT STATION, FORCEMAIN, AND GRAVITY SEWERS

ITEM NO.	DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
CONSTRUCTION SERVICES					
11	8-inch Sewer East of Highway Near Kewa Safety Center, CIP.	LS	1	$ 380,000	$ 380,000
12	8-inch Sewer from Enterprise Center to Near Lift Station, CIP.	LS	1	$ 357,000	$ 357,000
13	Forcemain Extension and 8-inch Sewer from High School to Upstream of Lift Station, CIP.	LS	1	$ 289,000	$ 289,000
14	Enterprise Area Lift Station and Forcemain, CIP.	LS	1	$ 1,203,000	$ 1,203,000
15	8-inch Sewer for Enterprise Community, CIP.	LS	1	$ 383,000	$ 383,000
16	8-inch Sewer East of Highway for Pueblo Facilities, CIP.	LS	1	$ 521,000	$ 521,000
17	8-inch Sewer for Early Childhood Learning Center, CIP.	LS	1	$ 236,000	$ 236,000
18	8-inch Sewer for Health Center (Two Septic Tanks), CIP.	LS	1	$ 175,000	$ 175,000
19	8-inch Sewer for Health Center (MBR Plant), CIP.	LS	1	$ 215,000	$ 215,000
20	8-inch Sewer for Kewa Safety Complex, CIP.	LS	1	$ 59,000	$ 59,000
21	8-inch Sewer from North End of Enterprise Area to WWTP, CIP.	LS	1	$ 2,529,000	$ 2,529,000
				Inflation Factor @ 20.0%:	$ 1,269,000
				Construction Services Subtotal:	$ 7,616,000
OTHER PROJECT CONSTRUCTION REQUIREMENTS					
Mobilization, Insurance, and Bonds		LOT	1	$ 381,000	$ 381,000
Demobilization and Submittal of All Closeout Documents		LOT	1	$ 38,000	$ 38,000
SWPPP		LS	1	$ 114,000	$ 114,000
Construction Staking Services by New Mexico Registered Surveyor		LS	1	$ 95,000	$ 95,000
Traffic Control		LS	1	$ 76,000	$ 76,000
Pre-Authorized Changes During Construction		Allow	1	$ 152,000	$ 152,000
				Other Project Construction Requirements Subtotal:	$ 856,000
				Construction Services and Other Project Construction Requirements Subtotal:	$ 8,472,000
				NMGRT @ 6.25%:	$ 530,000
				TOTAL CONSTRUCTION COST OPINION:	**$ 9,002,000**
PROFESSIONAL SERVICES					
USACE / Nationwide Permit					$ 15,000
Cultural Resources Inventory to State / THPO					$ 12,000
NMDOT Encroachment and Crossing Permits					$ 20,000
BIA Road Crossing and Encroachment Permits					$ 15,000
Utility Easements					$ 15,000
Engineering Design and Construction Fees					$ 1,170,000
Survey Fees					$ 45,000
Geotechnical Investigation Fees					$ 40,000
SUE Fees					$ 55,000
Construction Observation Fees (Full-time 8 Months at $26,000 / Month)					$ 208,000
				Professional Services Subtotal:	$ 1,595,000
				NMGRT @ 7.75%:	$ 124,000
				TOTAL PROFESSIONAL SERVICES COST OPINION:	**$ 1,719,000**
SUMMARY					
Construction Cost Opinion					$ 9,002,000
Professional Services Opinion					$ 1,719,000
				TOTAL PROJECT COSTS AND FEES:	**$ 10,721,000**

A summary of the total project costs is provided in Table 6-6. As shown in Table 6-6, the total estimated Construction Costs are $22,900,000 and the estimated Professional Services Costs are $4,874,000 for a total estimated project cost of $27,774,000.

TABLE 6-6
SUMMARY OF ESTIMATED COSTS FOR ALL SERVICE AREA LIFT STATIONS, FORCEMAINS, AND GRAVITY SEWERS

DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
CONSTRUCTION SERVICES				
Main Village Lift Station and Forcemain				$ 4,572,000
Galisteo Lift Station and Forcemain				$ 5,624,000
Wa-Di Lift Station, Forcemain, and Gravity Sewers				$ 2,884,000
Enterprise Area Lift Station, Forcemain, and Gravity Sewers				$ 8,472,000
Construction Services Subtotal:				$ 21,552,000
NMGRT @ 6.25%:				$ 1,348,000
TOTAL CONSTRUCTION COST OPINION:				**$ 22,900,000**
PROFESSIONAL SERVICES				
Professional Services				$ 4,523,000
NMGRT @ 7.75%:				$ 351,000
TOTAL PROFESSIONAL SERVICES COST OPINION:				**$ 4,874,000**
SUMMARY				
Construction Cost Opinion				$ 22,900,000
Professional Services Opinion				$ 4,874,000
TOTAL PROJECT COSTS AND FEES:				**$ 27,774,000**

6.6 Annual Operating Budget

The following sections provide information on the current income generated by the water and sewer utilities for Santo Domingo and the annual O&M costs of the proposed project.

6.6.1 Income

Santo Domingo generates revenue for its water and sewer utilities from flat monthly rates for residential and commercial accounts, as indicated in Section 2.4. Santo Domingo's rate structure for water and sewer billing is a flat rate fee, as follows:

Residential: $40/month flat fee

Commercial: Flat fees ranging from $50/month to $1,200/month

There are currently 717 residential accounts and 23 commercial accounts.

6.6.2 Annual Operation and Maintenance (O&M) Costs

The anticipated O&M costs for the proposed project are summarized in Table 6-7. Supporting details for the estimated O&M costs are included in Appendix D.

TABLE 6-7
ANTICIPATED OPERATION AND MAINTENANCE (O&M) COSTS
FOR SANTO DOMINGO LIFT STATIONS, FORCEMAINS, AND SEWERS

PROJECT COMPONENT	DESCRIPTION	ANNUAL O&M COST
Main Village Lift Station (MVLS)	Main Village Lift Station Upgrade	$ 70,200
Main Village -Galisteo Forcemain (MV-G FM)	Forcemain from Main Village Lift Station to Galisteo Lift Station	$ 11,000
Galisteo Lift Station (GLS)	Galisteo Lift Station	$ 72,500
Galisteo – Wastewater Treatment Plant Forcemain (G-WWTP FM)	Forcemain from Galisteo Lift Station to WWTP	$ 10,800
WA-DI	Wa-Di Lift Station, Forcemain to WWTP, and Sewers	$ 20,600
Enterprise Area (EA)	Enterprise Area Sewers, Lift Station, and Gravity Sewer to WWTP	$ 31,400
	TOTAL ANNUAL EXPENSES:	**$ 216,500**

6.6.3 Debt Repayments

If the proposed project (including Professional Services) is financed with 100% loan proceeds at an interest rate of 3.0% for a term of 30 years, the annual debt service would be $1,196,000. Assuming a flat rate structure similar to the existing rate structure, the additional monthly cost of debt service would be approximately $128 per customer. The additional monthly cost per account of the combined annual O&M and debt service would be about $151. This monthly cost does not account for the O&M costs related to the WWTP or any debt service related to the implementation of the WWTP, and it does not account for costs associated with the water system, which is funded through the current flat rate structure. This amount would be financially burdensome to the members of Santo Domingo, highlighting the necessity for funding to come substantially from grant sources.

6.6.3 Reserves

Many funding agencies require entities to maintain a reserve account as part of the conditions to receive funding assistance. The USDA, for example, requires a reserve equivalent to one-tenth (1/10) of the annual debt payment.

7.0 CONCLUSIONS AND RECOMMENDATIONS

As part of Santo Domingo's comprehensive program to upgrade its wastewater collection, treatment, and disposal facilities, the lift stations, forcemains, and gravity sewers identified in this PER are essential to transition from the lagoon-based and septic tank and leach field-based facilities to a modern reliable wastewater treatment facility. The successful transition from the existing wastewater facilities to the new WWTP will require careful coordination to orchestrate the commissioning of the new facilities such that the new WWTP is constructed and ready to receive flows just prior to the completion of the pumping and conveyance facilities. However, successful operation of the new WWTP will be difficult if the timing runs long before the lift stations, forcemains, and gravity sewers identified in this PER are operational.

If phasing is necessary to match the availability of funding, the following order of implementation is recommended:

- Phase 1 – Construct the new WWTP and commission it for operation.
- Phase 2 – Construct the collection, pumping, and conveyance facilities associated with the Wa-Di Community.
- Phase 3 – Construct the new Galisteo Lift Station and forcemain to the new WWTP.
- Phase 4 – Construct the renovations to the existing Main Village Lift Station and the forcemain from the Main Village Lift Station to the new Galisteo Lift Station.
- Phase 5 – Construct the collection, pumping, and conveyance facilities for the Enterprise Area.

The anticipated flows from Wa-Di and the Galisteo Housing Area are relatively small in comparison to the flows from the Main Village. As such, from a practical perspective, it will be critical to move through Phases 1 – 4 above as quickly as possible, preferably with Phases 2 – 4 as one project or as nearly concurrently as possible. Phase 5, the facilities for the Enterprise Area, could be deferred until funding is secured and/or the projected growth entities in the Enterprise Area contribute funds to the implementation of the wastewater collection, pumping, and conveyance facilities.

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APPENDIX A:

ENVIRONMENTAL RESOURCES PRESENT

ATTACHMENT A:

NATURAL RESOURCES CONSERVATION SERVICE RESULTS

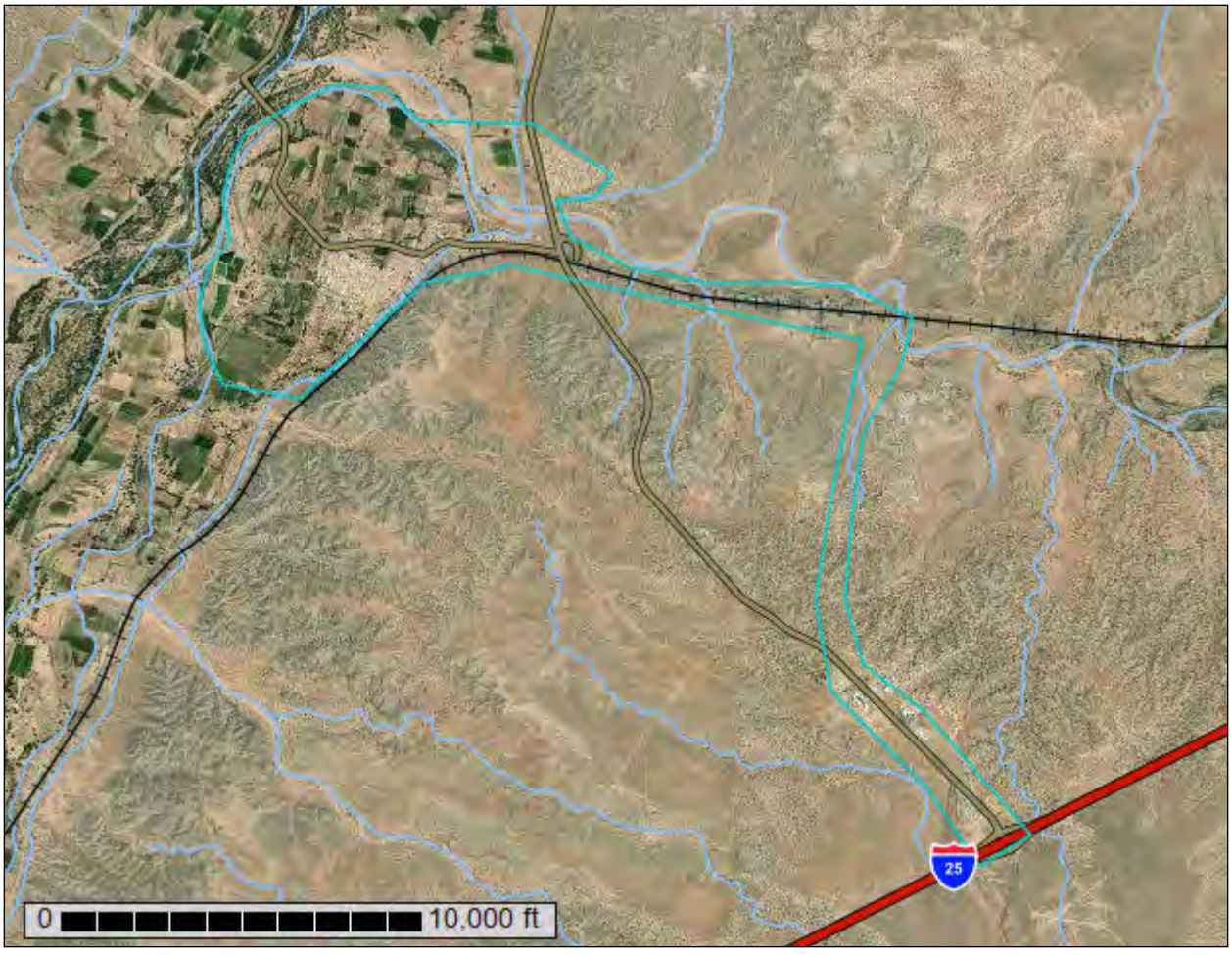
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties



April 12, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

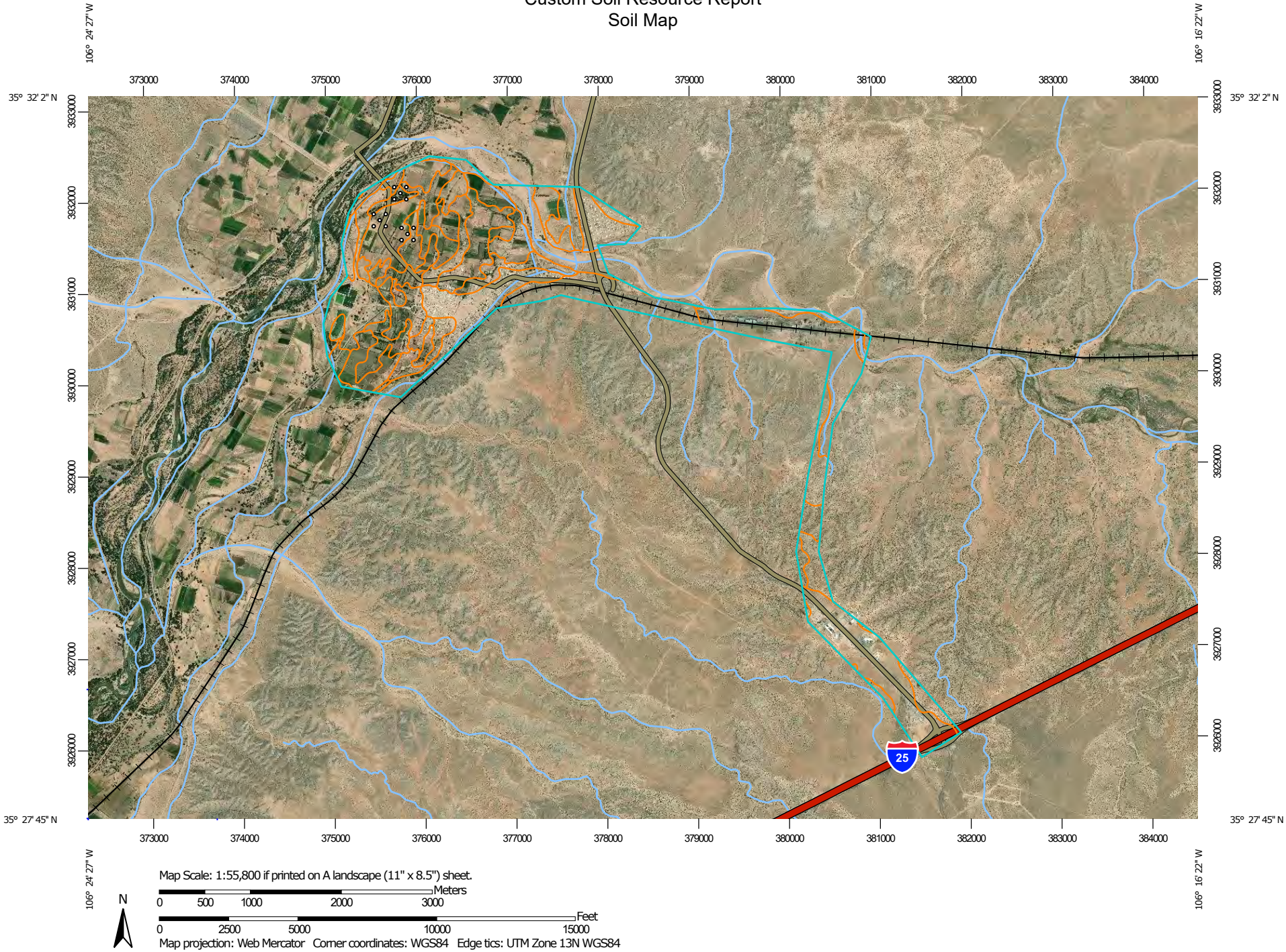
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties
Survey Area Data: Version 15, Sep 12, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Feb 3, 2015—Oct 13, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
11	Trail fine sandy loam, 0 to 1 percent slopes	36.8	1.9%
22	Aga silty clay loam, 0 to 1 percent slopes	30.1	1.6%
25	Gilco loam, 0 to 1 percent slopes	224.2	11.7%
27	Aga loam, 0 to 1 percent slopes	65.8	3.4%
31	Riverwash	106.8	5.6%
51	Sparham clay loam, 0 to 1 percent slopes	12.9	0.7%
53	Witt-Harvey association, 1 to 7 percent slopes	192.3	10.0%
54	Harvey-Cascajo association, 5 to 15 percent slopes	103.3	5.4%
66	Zia sandy loam, 3 to 6 percent slopes	385.9	20.1%
97	El Rancho clay loam, 0 to 2 percent slopes	82.2	4.3%
208	Sedillo very gravelly fine sandy loam, 25 to 55 percent slopes	164.4	8.6%
410	Zia loam, 0 to 1 percent slopes	151.9	7.9%
417	Jocity loam, 0 to 2 percent slopes	36.4	1.9%
418	Jocity clay loam, 0 to 2 percent slopes	109.4	5.7%
427	Aga loam, 1 to 3 percent slopes	28.8	1.5%
430	Trail loam, 1 to 3 percent slopes	128.8	6.7%
431	Trail loamy sand, 1 to 4 percent slopes	33.0	1.7%
434	Peralta loam, 1 to 3 percent slopes	12.9	0.7%
823	Gilco loam, 1 to 4 percent slopes, unprotected	3.9	0.2%
827	Aga loam, 1 to 3 percent slopes, unprotected	9.8	0.5%
Totals for Area of Interest		**1,919.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas

shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties

11—Trail fine sandy loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 1wlv
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 53 to 56 degrees F
Frost-free period: 140 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Trail and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Trail

Setting

Landform: Valley-floor remnants, flood plains, channels, alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Eolian deposits over stream alluvium derived from sandstone

Typical profile

Ap - 0 to 9 inches: fine sandy loam
C1 - 9 to 36 inches: stratified loamy sand to sandy loam
C2 - 36 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Moderate (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Minor Components

Aga
Percent of map unit: 5 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Gilco
Percent of map unit: 5 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Riverwash
Percent of map unit: 3 percent
Landform: Streams, channels
Hydric soil rating: Yes

Peralta
Percent of map unit: 2 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

22—Aga silty clay loam, 0 to 1 percent slopes

Map Unit Setting
National map unit symbol: 1wn1
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 53 to 55 degrees F
Frost-free period: 140 to 160 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Aga and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Aga

Setting
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Stream alluvium derived from igneous and sedimentary rock

Typical profile
A - 0 to 8 inches: silty clay loam
C1 - 8 to 24 inches: loam
2C2 - 24 to 60 inches: sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: C
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Minor Components

Gilco

Percent of map unit: 10 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Trail

Percent of map unit: 5 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

25—Gilco loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 1wnh
Elevation: 5,000 to 7,500 feet
Mean annual precipitation: 8 to 14 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 110 to 160 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Gilco and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilco

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Stream alluvium derived from igneous and sedimentary rock

Typical profile

Ap - 0 to 4 inches: loam
C1 - 4 to 34 inches: stratified silt loam to loam to fine sandy loam
C2 - 34 to 60 inches: stratified fine sandy loam to loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Minor Components

Aga

Percent of map unit: 10 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Sparham

Percent of map unit: 5 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

27—Aga loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 1wnm
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 53 to 55 degrees F
Frost-free period: 140 to 160 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Aga and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Aga

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Stream alluvium derived from igneous and sedimentary rock

Typical profile

A - 0 to 10 inches: loam
C1 - 10 to 23 inches: loam
2C2 - 23 to 43 inches: sand
2C3 - 43 to 60 inches: sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: B

Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Minor Components

Gilco

Percent of map unit: 10 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Trail

Percent of map unit: 5 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

31—Riverwash

Map Unit Setting

National map unit symbol: 1wp2
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 54 to 56 degrees F
Frost-free period: 140 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Riverwash: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Riverwash

Setting

Landform: Streams
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Stream alluvium derived from igneous and sedimentary rock

Typical profile

A - 0 to 6 inches: sand
C - 6 to 60 inches: stratified coarse sand to sandy loam

Properties and qualities

Slope: 0 to 3 percent
Drainage class: Somewhat poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Frequency of flooding: FrequentNone

Calcium carbonate, maximum content: 1 percent
Gypsum, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydric soil rating: Yes

Minor Components

Torrifluvents

Percent of map unit: 10 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F036XA005NM - Riverine Riparian
Hydric soil rating: Yes

51—Sparham clay loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 1wqn
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 8 to 16 inches
Mean annual air temperature: 53 to 56 degrees F
Frost-free period: 140 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Sparham and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sparham

Setting

Landform: Valley sides, flood plains, alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Stream alluvium derived from sandstone and shale

Typical profile

A - 0 to 6 inches: clay loam
C1 - 6 to 20 inches: clay loam

C2 - 20 to 36 inches: clay
C3 - 36 to 60 inches: clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 4 to 10 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Very slightly saline to strongly saline (2.0 to 16.0 mmhos/cm)
Sodium adsorption ratio, maximum: 30.0
Available water supply, 0 to 60 inches: High (about 11.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C/D
Ecological site: R036XB002NM - Clayey
Hydric soil rating: No

Minor Components

Gilco

Percent of map unit: 5 percent
Ecological site: R036XB002NM - Clayey
Hydric soil rating: No

Gilco, sandy substrata

Percent of map unit: 5 percent
Ecological site: R036XB002NM - Clayey
Hydric soil rating: No

Riverwash

Percent of map unit: 5 percent
Landform: Streams, channels
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: Yes

53—Witt-Harvey association, 1 to 7 percent slopes

Map Unit Setting

National map unit symbol: 1wqq
Elevation: 5,000 to 6,800 feet

Mean annual precipitation: 10 to 13 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 120 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Witt and similar soils: 55 percent
Harvey and similar soils: 30 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Witt

Setting

Landform: Mesas, fan remnants, bajadas
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits and alluvium derived from igneous and sedimentary rock

Typical profile

A - 0 to 3 inches: loam
BA - 3 to 6 inches: silt loam
Bt1 - 6 to 11 inches: silty clay loam
Bt2 - 11 to 18 inches: silty clay loam
Btk - 18 to 25 inches: silty clay loam
Bk1 - 25 to 39 inches: silt loam
Bk2 - 39 to 53 inches: silt loam
C - 53 to 60 inches: silt loam

Properties and qualities

Slope: 1 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C
Ecological site: R070CY109NM - Loamy
Hydric soil rating: No

Description of Harvey

Setting

Landform: Plateaus, mesas, bajadas

Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Nose slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Eolian deposits derived from sandstone over fan alluvium derived from basalt

Typical profile

A - 0 to 10 inches: loam
Bw - 10 to 28 inches: clay loam
Bk - 28 to 42 inches: sandy clay loam
C - 42 to 60 inches: sandy loam

Properties and qualities

Slope: 1 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R070CY108NM - Limy
Hydric soil rating: No

Minor Components

Ildefonso

Percent of map unit: 10 percent
Ecological site: R070CY108NM - Limy
Hydric soil rating: No

La fonda

Percent of map unit: 5 percent
Ecological site: R070CY109NM - Loamy
Hydric soil rating: No

54—Harvey-Cascajo association, 5 to 15 percent slopes

Map Unit Setting

National map unit symbol: 1wqr

Elevation: 5,200 to 6,800 feet
Mean annual precipitation: 10 to 13 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 120 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Harvey and similar soils: 45 percent
Cascajo and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Harvey

Setting

Landform: Plateaus, mesas, bajadas
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Nose slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Eolian deposits and alluvium derived from igneous and sedimentary rock

Typical profile

A - 0 to 2 inches: fine sandy loam
Bw - 2 to 11 inches: fine sandy loam
Bk - 11 to 23 inches: clay loam
C - 23 to 60 inches: sandy clay loam

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Ecological site: R070CY108NM - Limy
Hydric soil rating: No

Description of Cascajo

Setting

Landform: Ridges, knolls, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear

Across-slope shape: Linear
Parent material: Fan alluvium derived from sandstone

Typical profile

A - 0 to 3 inches: very gravelly sandy loam
AB - 3 to 9 inches: very gravelly sandy loam
Bk - 9 to 28 inches: very gravelly sand
C - 28 to 60 inches: very gravelly sand

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Gypsum, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R070CY119NM - Gravelly
Hydric soil rating: No

Minor Components

La fonda

Percent of map unit: 10 percent
Ecological site: R070CY109NM - Loamy
Hydric soil rating: No

Witt

Percent of map unit: 5 percent
Ecological site: R070CY109NM - Loamy
Hydric soil rating: No

66—Zia sandy loam, 3 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1wr6
Elevation: 5,000 to 6,500 feet
Mean annual precipitation: 8 to 13 inches
Mean annual air temperature: 52 to 56 degrees F

Frost-free period: 120 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Zia and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Zia

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits over fan alluvium derived from sandstone

Typical profile

A - 0 to 4 inches: sandy loam
C - 4 to 60 inches: sandy loam

Properties and qualities

Slope: 3 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: A
Ecological site: R035XA113NM - Sandy
Hydric soil rating: No

Minor Components

San mateo

Percent of map unit: 5 percent
Ecological site: R035XA120NM - Swale
Hydric soil rating: No

Cascajo

Percent of map unit: 5 percent
Ecological site: R035XG124NM - Hills
Hydric soil rating: No

Riverwash

Percent of map unit: 5 percent

Landform: Streams, channels
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: Yes

97—El Rancho clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1wry
Elevation: 5,100 to 6,900 feet
Mean annual precipitation: 8 to 13 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 120 to 160 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

El rancho and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of El Rancho

Setting

Landform: Stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Stream alluvium derived from sandstone and shale

Typical profile

Ap - 0 to 8 inches: clay loam
C - 8 to 60 inches: sandy clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Ecological site: R035XA112NM - Loamy
Hydric soil rating: No

Minor Components

Jocity

Percent of map unit: 8 percent
Ecological site: R035XA118NM - Bottomland
Hydric soil rating: No

Zia

Percent of map unit: 7 percent
Ecological site: R035XA113NM - Sandy
Hydric soil rating: No

208—Sedillo very gravelly fine sandy loam, 25 to 55 percent slopes

Map Unit Setting

National map unit symbol: 1wms
Elevation: 5,000 to 6,900 feet
Mean annual precipitation: 10 to 13 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 120 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Sedillo and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sedillo

Setting

Landform: Stream terraces, fan remnants, bajadas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fan alluvium derived from igneous and sedimentary rock

Typical profile

A - 0 to 2 inches: very gravelly fine sandy loam
Bt - 2 to 8 inches: very gravelly sandy clay loam
Bk1 - 8 to 12 inches: very gravelly sandy loam
Bk2 - 12 to 60 inches: extremely gravelly sandy loam

Properties and qualities

Slope: 25 to 55 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: R035XG114NM - Gravelly
Hydric soil rating: No

Minor Components

Ildefonso

Percent of map unit: 5 percent
Ecological site: R035XG129NM - Limy
Hydric soil rating: No

Pinavetes

Percent of map unit: 5 percent
Ecological site: R035XA115NM - Deep Sand
Hydric soil rating: No

Rock outcrop

Percent of map unit: 3 percent
Hydric soil rating: No

Zia

Percent of map unit: 2 percent
Ecological site: R035XA113NM - Sandy
Hydric soil rating: No

410—Zia loam, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 1wpz
Elevation: 5,000 to 5,500 feet
Mean annual precipitation: 10 to 13 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 120 to 140 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

Zia and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Zia

Setting

Landform: Stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Eolian deposits over stream alluvium derived from sandstone

Typical profile

A - 0 to 10 inches: loam
C - 10 to 60 inches: stratified sandy loam to fine sandy loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Moderate (about 8.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: R035XA112NM - Loamy
Hydric soil rating: No

Minor Components

Pinavetes

Percent of map unit: 10 percent
Landform: Valley sides, dunes
Ecological site: R035XA115NM - Deep Sand
Hydric soil rating: No

El rancho

Percent of map unit: 5 percent
Ecological site: R035XA112NM - Loamy
Hydric soil rating: No

417—Jocity loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1wq1
Elevation: 5,000 to 6,900 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 120 to 160 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Jocity and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Jocity

Setting

Landform: Flood plains, alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, rise
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Stream alluvium derived from igneous and sedimentary rock

Typical profile

Ap - 0 to 10 inches: loam
C1 - 10 to 26 inches: silty clay loam
C2 - 26 to 32 inches: loam
C3 - 32 to 50 inches: sandy clay loam
C4 - 50 to 56 inches: sandy loam
C5 - 56 to 60 inches: loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 2e

Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: C
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Minor Components

Zia
Percent of map unit: 5 percent
Ecological site: R042XA051NM - Sandy
Hydric soil rating: No

Aga
Percent of map unit: 5 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Sparham
Percent of map unit: 5 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

418—Jocity clay loam, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 1wq2
Elevation: 5,000 to 6,900 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 120 to 160 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition
Jocity and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Jocity

Setting
Landform: Flood plains, alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, rise
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Stream alluvium derived from igneous and sedimentary rock

Typical profile
A - 0 to 12 inches: clay loam
C1 - 12 to 30 inches: clay loam
C2 - 30 to 60 inches: stratified loamy sand to sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: C
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Minor Components

Gilco

Percent of map unit: 5 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Aga

Percent of map unit: 5 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Sparham

Percent of map unit: 3 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Zia

Percent of map unit: 2 percent
Ecological site: R042XA051NM - Sandy
Hydric soil rating: No

427—Aga loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 1wq9
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 53 to 55 degrees F

Frost-free period: 140 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Aga and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Aga

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Stream alluvium derived from igneous and sedimentary rock

Typical profile

A - 0 to 8 inches: loam
C1 - 8 to 28 inches: loam
2C2 - 28 to 60 inches: loamy fine sand

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Moderate (about 7.6 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: B
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Minor Components

Gilco

Percent of map unit: 10 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Jocity

Percent of map unit: 5 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

430—Trail loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 1wqc
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 53 to 55 degrees F
Frost-free period: 140 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Trail and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Trail

Setting

Landform: Valley-floor remnants, flood plains, channels, alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits over stream alluvium derived from sandstone

Typical profile

A - 0 to 10 inches: loam
C1 - 10 to 34 inches: loamy sand
C2 - 34 to 60 inches: stratified sand to fine sandy loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R042XA057NM - Bottomland

Hydric soil rating: No

Minor Components

Aga

Percent of map unit: 5 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Gilco

Percent of map unit: 5 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Peralta

Percent of map unit: 5 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

431—Trail loamy sand, 1 to 4 percent slopes

Map Unit Setting

National map unit symbol: 1wqd
Elevation: 5,000 to 6,200 feet
Mean annual precipitation: 8 to 12 inches
Mean annual air temperature: 52 to 56 degrees F
Frost-free period: 120 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Trail and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Trail

Setting

Landform: Valley-floor remnants, flood plains, channels, alluvial fans
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits over stream alluvium derived from sandstone

Typical profile

A - 0 to 10 inches: loamy sand
C - 10 to 60 inches: stratified loamy sand to sand to gravelly sand to fine sandy loam

Properties and qualities

Slope: 1 to 4 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (2.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R042XA054NM - Deep Sand
Hydric soil rating: No

Minor Components

El rancho

Percent of map unit: 5 percent
Ecological site: R042XA052NM - Loamy
Hydric soil rating: No

Aga

Percent of map unit: 5 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Riverwash

Percent of map unit: 3 percent
Landform: Streams, channels
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: Yes

Zia

Percent of map unit: 2 percent
Ecological site: R042XA051NM - Sandy
Hydric soil rating: No

434—Peralta loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 1wqg
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 8 to 10 inches

Mean annual air temperature: 53 to 55 degrees F
Frost-free period: 140 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Peralta and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peralta

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Stream alluvium derived from igneous and sedimentary rock

Typical profile

Ap - 0 to 10 inches: loam
C1 - 10 to 16 inches: very fine sandy loam
C2 - 16 to 20 inches: clay loam
C3 - 20 to 28 inches: fine sandy loam
C4 - 28 to 40 inches: loamy sand
C5 - 40 to 45 inches: silt loam
C6 - 45 to 60 inches: loamy fine sand

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 24 to 36 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)
Sodium adsorption ratio, maximum: 13.0
Available water supply, 0 to 60 inches: Moderate (about 7.9 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: C
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Minor Components

Aga

Percent of map unit: 10 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Gilco

Percent of map unit: 5 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

823—Gilco loam, 1 to 4 percent slopes, unprotected

Map Unit Setting

National map unit symbol: 1wrg
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 53 to 55 degrees F
Frost-free period: 140 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Gilco, unprotected, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilco, Unprotected

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Stream alluvium derived from igneous and sedimentary rock

Typical profile

Ap - 0 to 8 inches: loam
C - 8 to 60 inches: stratified fine sandy loam to loam to silt loam

Properties and qualities

Slope: 1 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Minor Components

Jocity

Percent of map unit: 6 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Aga

Percent of map unit: 5 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Trail

Percent of map unit: 2 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Peralta

Percent of map unit: 2 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

827—Aga loam, 1 to 3 percent slopes, unprotected

Map Unit Setting

National map unit symbol: 1wrh
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 53 to 56 degrees F
Frost-free period: 140 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Aga, unprotected, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Aga, Unprotected

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave

Across-slope shape: Linear
Parent material: Stream alluvium derived from igneous and sedimentary rock

Typical profile

A - 0 to 8 inches: loam
C1 - 8 to 28 inches: loam
2C2 - 28 to 60 inches: loamy fine sand

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Moderate (about 7.6 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 7c
Hydrologic Soil Group: B
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Minor Components

Gilco

Percent of map unit: 5 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Jocity

Percent of map unit: 3 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Riverwash

Percent of map unit: 3 percent
Landform: Streams, channels
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: Yes

Trail

Percent of map unit: 2 percent
Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

Peralta

Percent of map unit: 2 percent

Ecological site: R042XA057NM - Bottomland
Hydric soil rating: No

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ATTACHMENT B:
FEMA RESULTS

National Flood Hazard Layer FIRMette

FEMA

106°22'42"W 35°31'9"N



106°22'4"W 35°30'40"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/29/2022 at 7:09 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMette

FEMA

106°22'27"W 35°31'25"N



106°21'50"W 35°30'56"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/29/2022 at 7:11 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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National Flood Hazard Layer FIRMette

FEMA

106°21'15"W 35°31'29"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

106°20'37"W 35°31'1N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

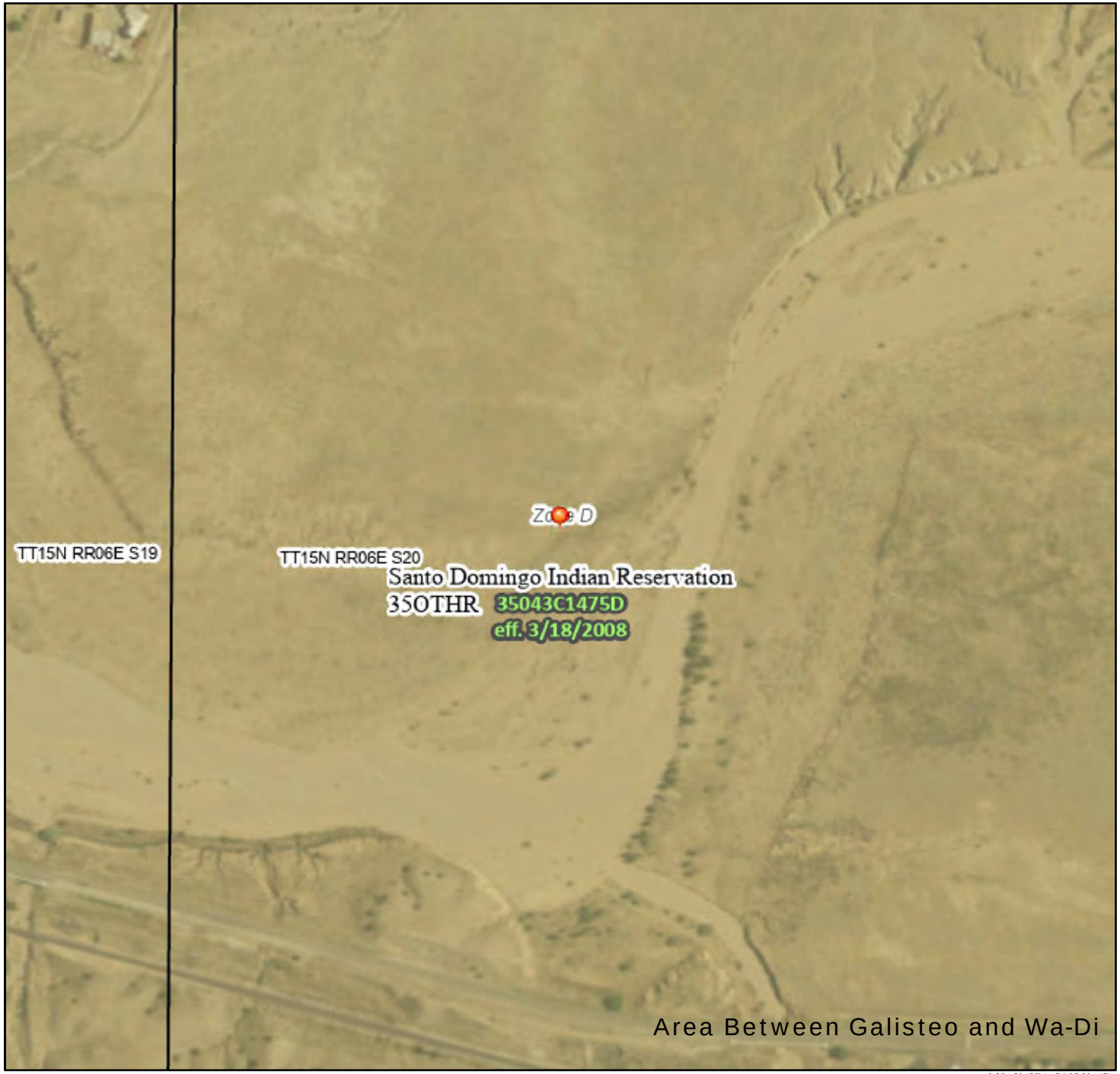
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/29/2022 at 7:13 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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National Flood Hazard Layer FIRMette

FEMA

106°20'20"W 35°31'13"N



106°19'42"W 35°30'44"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 — Cross Sections with 1% Annual Chance
- 17.5 — Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

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National Flood Hazard Layer FIRMette

FEMA

106°19'36"W 35°30'55"N



106°18'59"W 35°30'25"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

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National Flood Hazard Layer FIRMette

FEMA

106°18'51"W 35°28'38"N



106°18'13"W 35°28'9"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/29/2022 at 7:17 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMette

FEMA

106°19'16"W 35°29'4"N



0 250 500 1,000 1,500 2,000 Feet 1:6,000

106°18'38"W 35°28'35"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/29/2022 at 7:18 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMette

FEMA

106°19'53"W 35°29'31"N



106°19'16"W 35°29'2"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

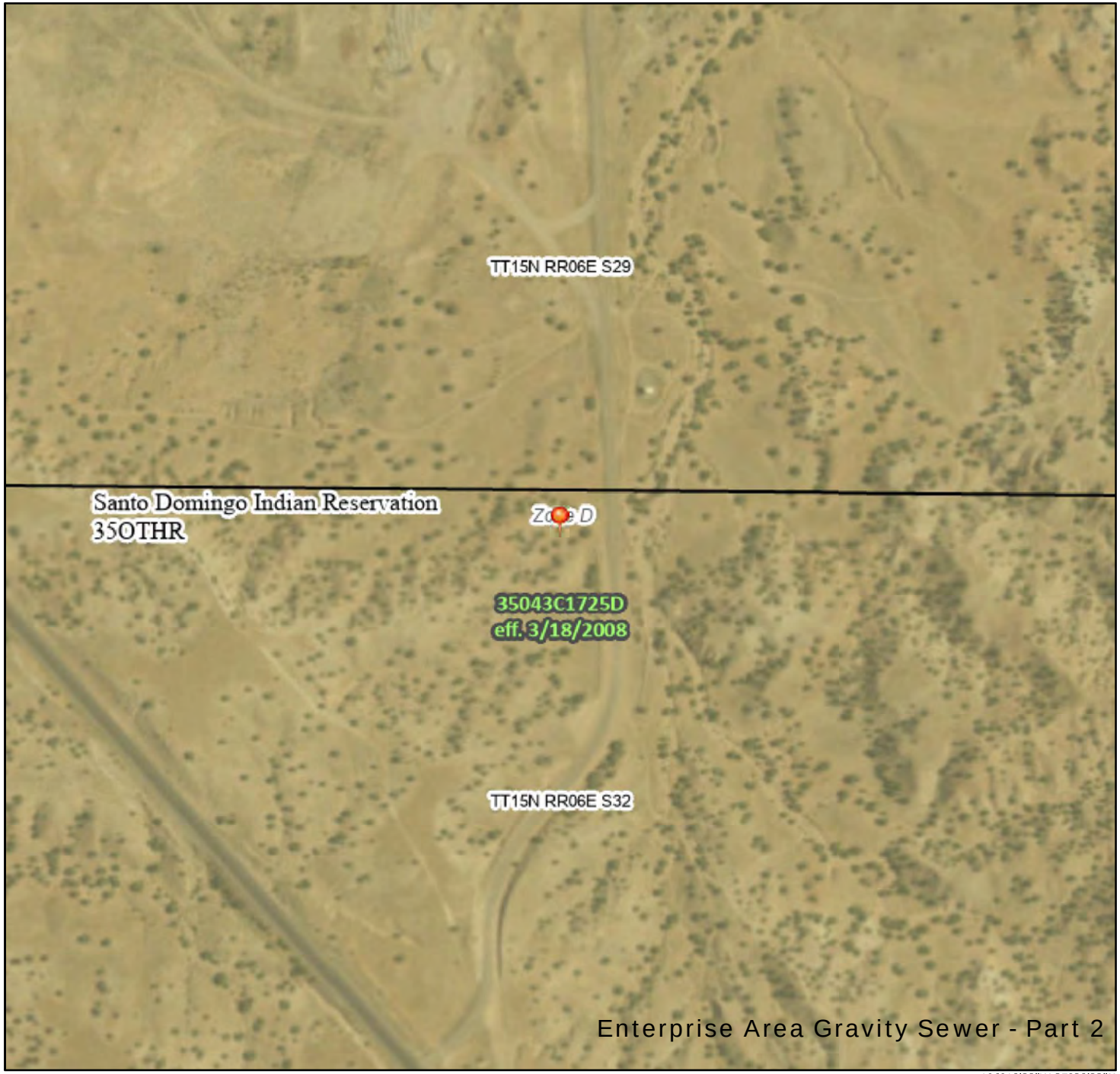
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/29/2022 at 7:20 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMette

FEMA

106°19'59"W 35°29'53"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

106°19'22"W 35°29'23"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

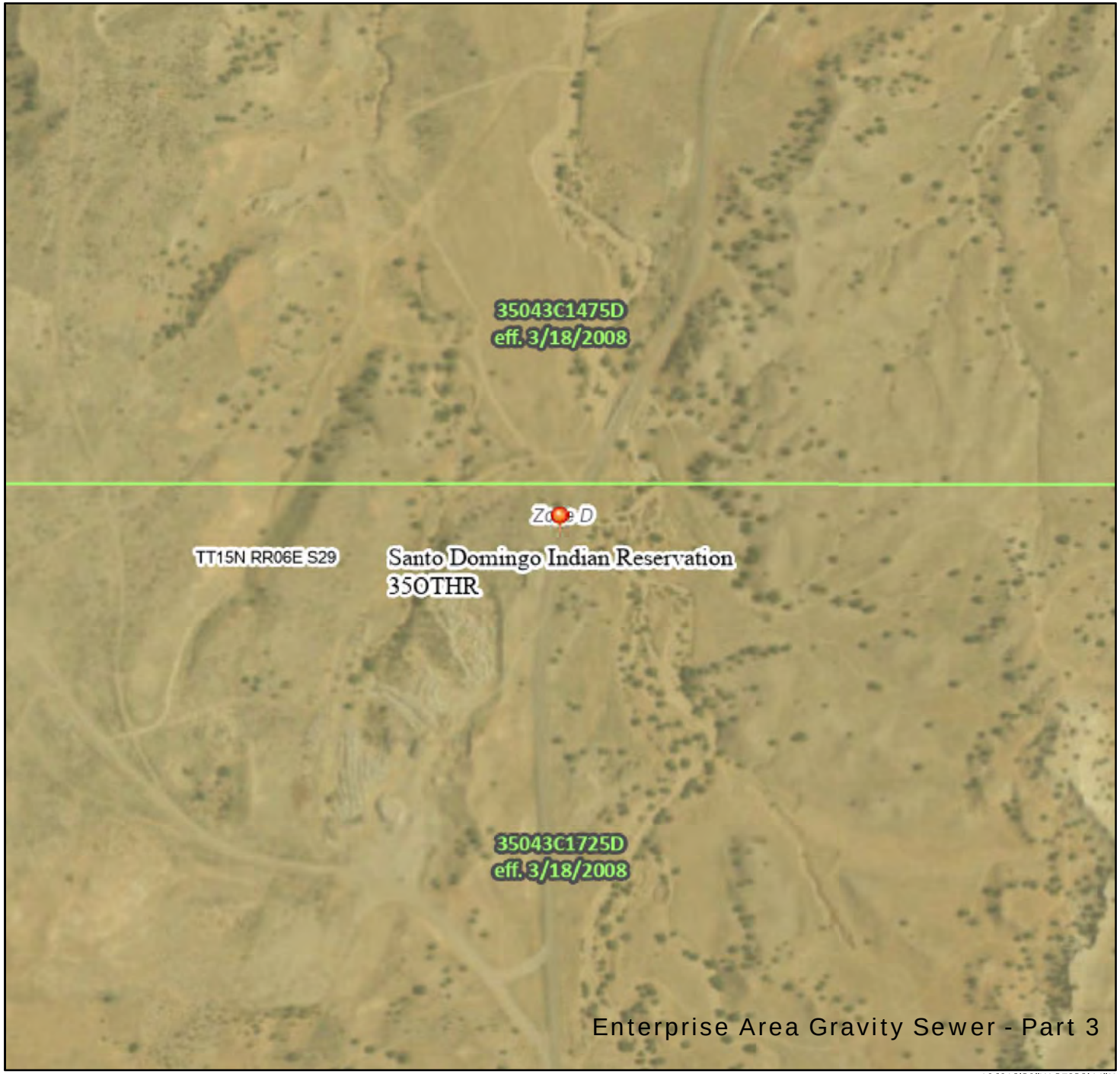
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This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

National Flood Hazard Layer FIRMette

FEMA

106°19'58"W 35°30'13"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

106°19'20"W 35°29'44"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/29/2022 at 7:25 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

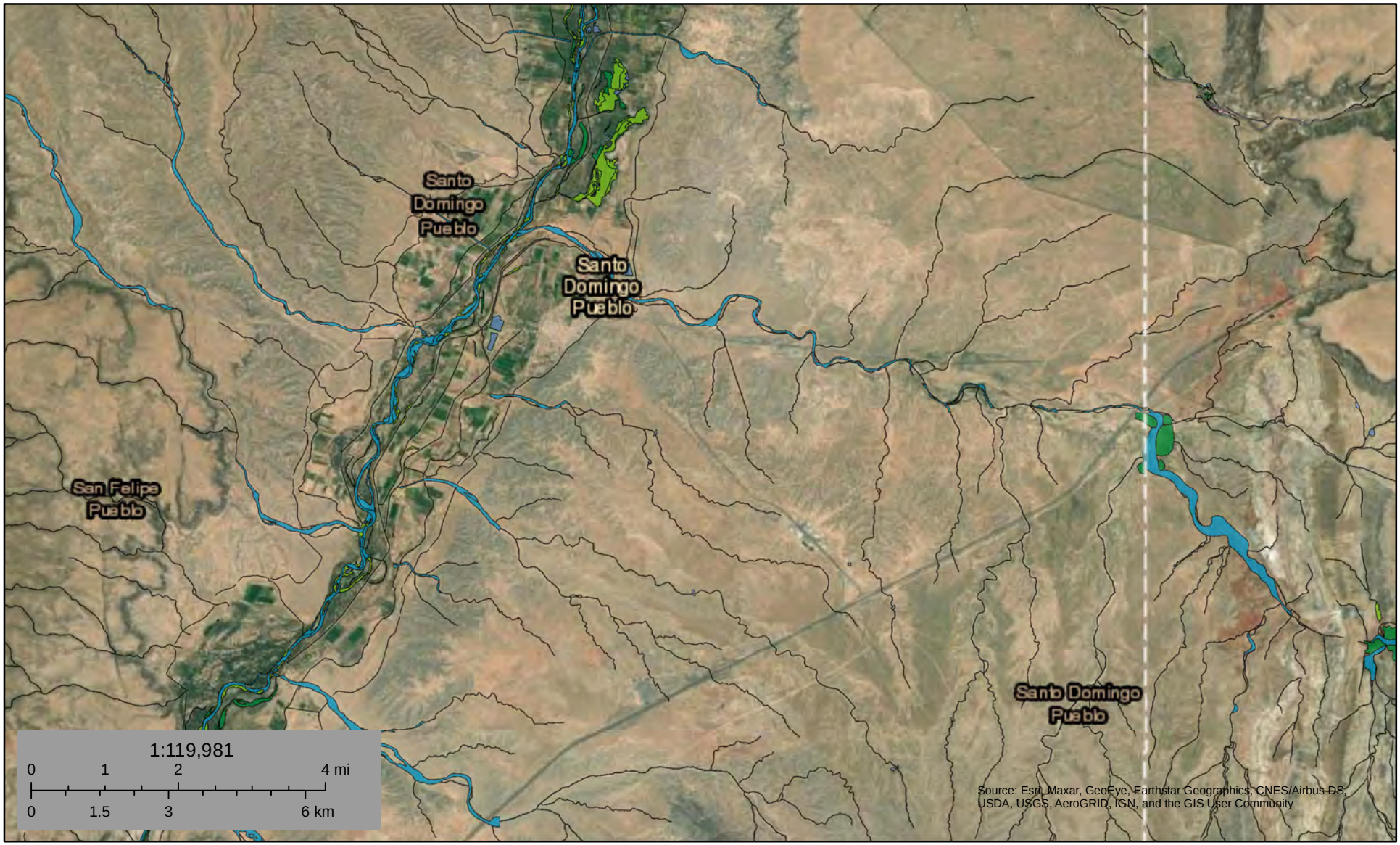
This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

ATTACHMENT C:

NATIONAL WETLANDS INVENTORY RESULTS

U.S. Fish and Wildlife Service
National Wetlands Inventory

Santo Domingo FM and LS



March 29, 2022

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

ATTACHMENT D:

U.S. FISH & WILDLIFE SERVICE IPaC RESULTS

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

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Location

Sandoval County, New Mexico



Local office

New Mexico Ecological Services Field Office

(505) 346-2525
(505) 346-2542

2105 Osuna Road Ne
Albuquerque, NM 87113-1001

http://www.fws.gov/southwest/es/NewMexico/
http://www.fws.gov/southwest/es/ES_Lists_Main2.html

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds

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NAME	STATUS
Mexican Spotted Owl Strix occidentalis lucida Wherever found There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/8196	Threatened
Southwestern Willow Flycatcher Empidonax traillii extimus Wherever found There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/6749	Endangered
Yellow-billed Cuckoo Coccyzus americanus There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/3911	Threatened

Fishes

NAME	STATUS
Rio Grande Cutthroat Trout Oncorhynchus clarkii virginalis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/920	Candidate
Rio Grande Silvery Minnow Hybognathus amarus There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/1391	Endangered

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

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THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN

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THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Cassin's Finch Carpodacus cassinii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9462	Breeds May 15 to Jul 15
Lesser Yellowlegs Tringa flavipes This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Lewis's Woodpecker Melanerpes lewis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9408	Breeds Apr 20 to Sep 30
Pinyon Jay Gymnorhinus cyanocephalus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9420	Breeds Feb 15 to Jul 15
Virginia's Warbler Vermivora virginiae This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9441	Breeds May 1 to Jul 31

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Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ

"Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

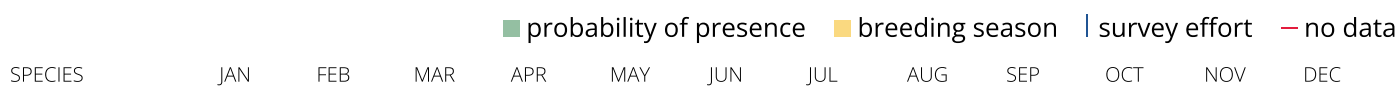
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

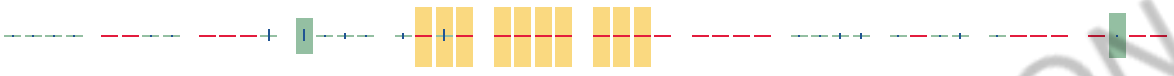
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Bald Eagle Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



Cassin's Finch BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Lesser Yellowlegs BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Lewis's Woodpecker BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Pinyon Jay BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



NOT FOR CONSULTATION

Virginia's Warbler BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds

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guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid

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or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

- PEM1/SS2A
- PEM1A

FRESHWATER FORESTED/SHRUB WETLAND

- PSS1A

FRESHWATER POND

- PUBK

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RIVERINE

- R2UBH
- R4SBA
- R5UBFx
- R4SBC
- R2USA
- R5UBH

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NOT FOR CONSULTATION

ATTACHMENT E:

BIOTA INFORMATION SYSTEM OF NEW MEXICO (BISON) RESULTS



Species of Greatest Conservation Need and Federal or State Threatened/Endangered

Sandoval

Taxonomic Group	# Species	Taxonomic Group	# Species
Amphibians	1	Birds	13
Fish	1	Mammals	3
Molluscs	2		

TOTAL SPECIES: 20

Common Name	Scientific Name	NMGF	US FWS	Critical Habitat	SGCN	Photo
Spotted Bat	Euderma maculatum	T			Y	View
Pacific Marten	Martes caurina	T			Y	View
Meadow Jumping Mouse	Zapus luteus luteus	E	E	Y	Y	View
Yellow-billed Cuckoo (western pop)	Coccyzus americanus occidentalis		T	Y	Y	View
Costa's Hummingbird	Calypte costae	T			Y	View
Broad-billed Hummingbird	Cynanthus latirostris	T			Y	View
Neotropic Cormorant	Phalacrocorax brasilianus	T			Y	View
Bald Eagle	Haliaeetus leucocephalus	T			Y	View
Common Black Hawk	Buteogallus anthracinus	T			Y	View
Mexican Spotted Owl	Strix occidentalis lucida		T	Y	Y	View
Peregrine Falcon	Falco peregrinus	T			Y	View
Northern Beardless-Tyrannulet	Camptostoma imberbe	E			Y	View
Southwestern Willow Flycatcher	Empidonax traillii extimus	E	E	Y	Y	View
Bell's Vireo	Vireo bellii	T			Y	View
Gray Vireo	Vireo vicinior	T			Y	View
Baird's Sparrow	Centronyx bairdii	T			Y	View
Jemez Mountains Salamander	Plethodon neomexicanus	E	E	Y	Y	View
Rio Grande Silvery Minnow	Hybognathus amarus	E	E	Y	Y	View
Wrinkled Marshsnail	Stagnicola caperata	E			Y	View
Paper Pondshell	Utterbackia imbecillis	E			Y	View

ATTACHMENT F:

NEW MEXICO RARE PLANTS LIST

NEW MEXICO RARE PLANTS

New Mexico Rare Plants

Rare Plant List

Search Parameters:
This search is not limited by plant name
Counties: SANDOVAL

Results found: 21

Export CSV Modify Search

Scientific Name	NMRPTC	FWS	State of NM	USFS	BLM	Navajo Nation	State Rank	Global Rank	Counties
Abronia bigelovii	R			SEN	SEN		S2	G2	RIO ARRIBA,SAN JUAN,SANDOVAL,SANTA FE
Astragalus cliffordii	R						S1	GNR	MCKINLEY,SAN JUAN,SANDOVAL
Astragalus feensis	R						S3	G3	BERNALILLO,HIDALGO,SANDOVAL,SANTA FE,TORRANCE
Astragalus knightii	R				SEN		S2	G2	SANDOVAL
Camissonia scapoidea	D						S4	G5	MCKINLEY,SAN JUAN,SANDOVAL
Dalea scariosa	D						S3	G3	BERNALILLO,SANDOVAL,SOCORRO,VALENCIA
Delphinium robustum	R			SEN			S2	G2G3	COLFAX,RIO ARRIBA,SANDOVAL,TAOS
Delphinium sapellonis	D						S3	G3	BERNALILLO,COLFAX,LOS ALAMOS,MORA,SAN MIGUEL,SANDOVAL,SANTA FE,TAOS,TORRANCE
Epipactis gigantea	D						S2?	G4	EDDY,GRANT,GUADALUPE,HARDING,LOS ALAMOS,OTERO,RIO ARRIBA,SAN JUAN,SAN MIGUEL,SANDOVAL,SANTA FE,SIERRA,TAOS,TORRANCE
Grindelia havardii	D						S3?	G4	CHAVES,EDDY,LINCOLN,SANDOVAL
Heuchera pulchella	R			SEN			S2	G2	BERNALILLO,SANDOVAL,TORRANCE

Scientific Name	NMRPTC	FWS	State of NM	USFS	BLM	Navajo Nation	State Rank	Global Rank	Counties
Lilium philadelphicum var. andinum			E				S3?	G5T4T5	COLFAX,LOS ALAMOS,OTERO,SAN MIGUEL,SANDOVAL,SANTA FE
Mentzelia springeri	R			SEN			S3	G3	LOS ALAMOS,SANDOVAL,SANTA FE
Muhlenbergia arsenei	D						S3	G5	BERNALILLO,LOS ALAMOS,MCKINLEY,SANDOVAL,SANTA FE
Phacelia sivinskii	R						S3	G3	CIBOLA,SANDOVAL,SANTA FE,SOCORRO,VALENCIA
Puccinellia parishii	R		E	SEN	SEN	GP 4	S1	G2G3	CATRON,CIBOLA,GRANT,HIDALGO,MCKINLEY,SA JUAN,SANDOVAL
Sclerocactus cloverae	D		E		SEN	GP 3	S3	G3	RIO ARRIBA,SAN JUAN,SANDOVAL
Sclerocactus papyracanthus	D						S4	G4	BERNALILLO,CIBOLA,DONA ANA,GRANT,LINCOLN,LOS ALAMOS,OTERO,RIO ARRIBA,SANDOVAL,SANTA FE,SIERRA,SOCORRO,TORRANCE
Silene plankii	R						S2	G2	BERNALILLO,DONA ANA,SANDOVAL,SIERRA,SOCORRO,TORRANCE
Spiranthes romanzoffiana	D						S2?	G5	RIO ARRIBA,SAN MIGUEL,SANDOVAL,SANTA FE,TAOS
Townsendia gypsophila	R		E		SEN		S2	G2	SANDOVAL

Click on any name in the list below or type any portion of the scientific or common name into the search box. The search uses wild cards before and after your terms, so for example, typing “vetch” (without the quotation marks) into the search box will bring up all records with vetch in either the scientific or common name. The search also allows for the use of the % and _ wild cards with the same behavior as a SQL LIKE clause

Note: This search function includes synonyms of scientific names. If you are familiar with a New Mexico rare plant under a certain scientific name, but do not see it in the list, try typing in the name you know, or any portion of it, to see if its nomenclature has been updated (e.g., Lesquerella aurea is now Physaria aurea).

Click here for more information about the list.

Scientific Name

Type a Scientific Name

Common Name

Type a Common Name

Strategy Species

Abronia bigelovii
Acarospora clauzadeana
Agalinis calycina
Agastache cana

Dropped Species

Abronia bolackii
Abutilon mollicomum
Abutilon wrightii
Acacia angustissima

County

LEA
LINCOLN
LOS ALAMOS
LUNA

Status

- ☐ USFWS
- ☐ State of NM
- ☐ USFS
- ☐ BLM
- ☐ Navajo Nation
- ☐ NMRPTC Rare
- ☐ Strategy Species

Conservation Ranks

NatureServe Global

G1
G1?
G1?Q
G1G2

Heritage State

S1
S1?
S1S2
S2

Overall Conservation Status

NONE
EFFECTIVELY CONSERVED
MODERATELY CONSERVED
UNDER CONSERVED

Search Reset

" Citation: New Mexico Rare Plant Technical Council. 1999. New Mexico Rare Plants. Albuquerque, NM: New Mexico Rare Plants Home Page. https://nmrareplants.unm.edu (Latest update: 29 Mar 2022).

Natural Heritage New Mexico

New Mexico Rare Plants

Contact Us

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ATTACHMENT G:

U.S. CENSUS DATA

An official website of the United States government

United States Census Bureau

QuickFacts

Sandoval County, New Mexico; New Mexico; United States

QuickFacts provides statistics for all states and counties, and for cities and towns with a ***population of 5,000 or more***.

Table

All Topics	Sandoval County, New Mexico	New Mexico	United States
Population Estimates, July 1 2021, (V2021)	**151,369**	**2,115,877**	**331,893,745**
PEOPLE			
Population			
Population Estimates, July 1 2021, (V2021)	**151,369**	**2,115,877**	**331,893,745**
Population estimates base, April 1, 2020, (V2021)	148,834	2,117,522	331,449,281
Population, percent change - April 1, 2020 (estimates base) to July 1, 2021, (V2021)	1.7%	-0.1%	0.1%
Population, Census, April 1, 2020	148,834	2,117,522	331,449,281
Population, Census, April 1, 2010	131,561	2,059,179	308,745,538
Age and Sex			
Persons under 5 years, percent	5.4%	5.8%	6.0%
Persons under 18 years, percent	22.8%	22.7%	22.3%
Persons 65 years and over, percent	18.5%	18.0%	16.5%
Female persons, percent	50.9%	50.5%	50.8%
Race and Hispanic Origin			
White alone, percent	78.2%	81.9%	76.3%
Black or African American alone, percent (a)	2.7%	2.6%	13.4%
American Indian and Alaska Native alone, percent (a)	14.1%	11.0%	1.3%
Asian alone, percent (a)	1.7%	1.8%	5.9%
Native Hawaiian and Other Pacific Islander alone, percent (a)	0.2%	0.2%	0.2%
Two or More Races, percent	3.1%	2.6%	2.8%
Hispanic or Latino, percent (b)	39.9%	49.3%	18.5%
White alone, not Hispanic or Latino, percent	42.5%	36.8%	60.1%
Population Characteristics			
Veterans, 2016-2020	10,686	141,558	17,835,456
Foreign born persons, percent, 2016-2020	5.2%	9.2%	13.5%
Housing			
Housing units, July 1, 2019, (V2019)	58,146	948,473	139,684,244
Owner-occupied housing unit rate, 2016-2020	80.0%	68.0%	64.4%
Median value of owner-occupied housing units, 2016-2020	$211,700	$175,700	$229,800
Median selected monthly owner costs -with a mortgage, 2016-2020	$1,391	$1,293	$1,621
Median selected monthly owner costs -without a mortgage, 2016-2020	$389	$360	$509
Median gross rent, 2016-2020	$1,114	$857	$1,096
Building permits, 2020	834	5,219[1]	1,471,141
Families & Living Arrangements			
Households, 2016-2020	52,504	792,755	122,354,219
Persons per household, 2016-2020	2.74	2.59	2.60
Living in same house 1 year ago, percent of persons age 1 year+, 2016-2020	88.9%	87.0%	86.2%
Language other than English spoken at home, percent of persons age 5 years+, 2016-2020	26.4%	33.5%	21.5%
Computer and Internet Use			
Households with a computer, percent, 2016-2020	91.7%	88.1%	91.9%
Households with a broadband Internet subscription, percent, 2016-2020	85.6%	77.9%	85.2%
Education			
High school graduate or higher, percent of persons age 25 years+, 2016-2020	90.9%	86.5%	88.5%
Bachelor's degree or higher, percent of persons age 25 years+, 2016-2020	31.0%	28.1%	32.9%

Health			
With a disability, under age 65 years, percent, 2016-2020	9.3%	10.9%	8.7%
Persons without health insurance, under age 65 years, percent	⚠ 9.0%	⚠ 12.0%	⚠ 10.2%
Economy			
In civilian labor force, total, percent of population age 16 years+, 2016-2020	58.9%	56.9%	63.0%
In civilian labor force, female, percent of population age 16 years+, 2016-2020	54.6%	53.5%	58.4%
Total accommodation and food services sales, 2012 ($1,000) (c)	160,981	4,349,672	708,138,598
Total health care and social assistance receipts/revenue, 2012 ($1,000) (c)	284,828	11,236,630	2,040,441,203
Total manufacturers shipments, 2012 ($1,000) (c)	D	29,102,352	5,696,729,632
Total retail sales, 2012 ($1,000) (c)	942,290	25,179,274	4,219,821,871
Total retail sales per capita, 2012 (c)	$6,950	$12,073	$13,443
Transportation			
Mean travel time to work (minutes), workers age 16 years+, 2016-2020	28.4	22.7	26.9
Income & Poverty			
Median household income (in 2020 dollars), 2016-2020	$65,071	$51,243	$64,994
Per capita income in past 12 months (in 2020 dollars), 2016-2020	$30,273	$27,945	$35,384
Persons in poverty, percent	⚠ 10.4%	⚠ 16.8%	⚠ 11.4%
BUSINESSES			
Businesses			
Total employer establishments, 2019	1,764	43,804	7,959,103
Total employment, 2019	24,998	644,537	132,989,428
Total annual payroll, 2019 ($1,000)	1,045,583	28,177,071	7,428,553,593
Total employment, percent change, 2018-2019	3.8%	2.1%	1.6%
Total nonemployer establishments, 2018	8,567	125,925	26,485,532
All firms, 2012	8,666	151,363	27,626,360
Men-owned firms, 2012	3,570	71,132	14,844,597
Women-owned firms, 2012	3,967	59,044	9,878,397
Minority-owned firms, 2012	3,368	60,622	7,952,386
Nonminority-owned firms, 2012	4,908	83,857	18,987,918
Veteran-owned firms, 2012	761	14,096	2,521,682
Nonveteran-owned firms, 2012	7,449	128,693	24,070,685
GEOGRAPHY			
Geography			
Population per square mile, 2010	35.5	17.0	87.4
Land area in square miles, 2010	3,710.65	121,298.15	3,531,905.43
FIPS Code	35043	35	1

About datasets used in this table

Value Notes

1. Includes data not distributed by county.

⚠ Estimates are not comparable to other geographic levels due to methodology differences that may exist between different data sources.

Some estimates presented here come from sample data, and thus have sampling errors that may render some apparent differences between geographies statistically indistinguishable. Click the Quick Info icon to the row in TABLE view to learn about sampling error.

The vintage year (e.g., V2021) refers to the final year of the series (2020 thru 2021). Different vintage years of estimates are not comparable.

Users should exercise caution when comparing 2016-2020 ACS 5-year estimates to other ACS estimates. For more information, please visit the 2020 5-year ACS Comparison Guidance page.

Fact Notes

(a) Includes persons reporting only one race
(c) Economic Census - Puerto Rico data are not comparable to U.S. Economic Census data
(b) Hispanics may be of any race, so also are included in applicable race categories

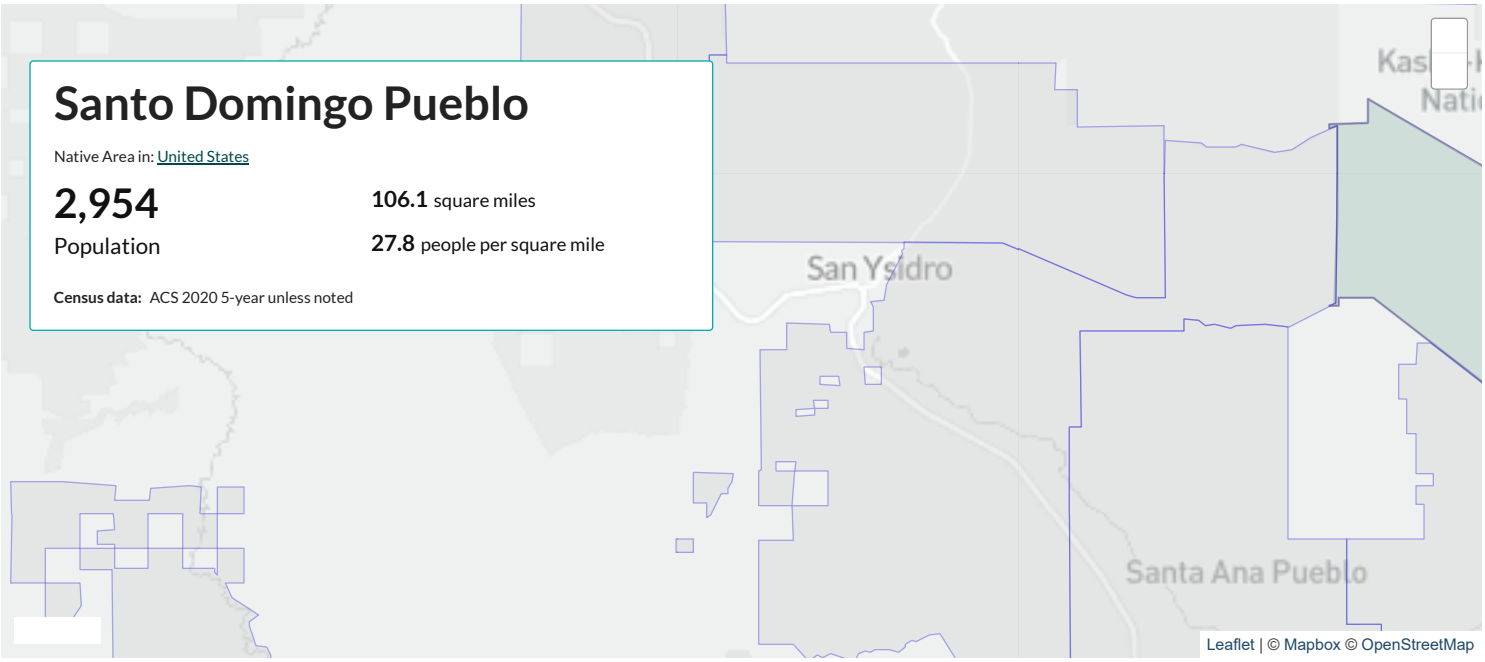
Value Flags

- Either no or too few sample observations were available to compute an estimate, or a ratio of medians cannot be calculated because one or both of the median estimates falls in the lowest or upper int open ended distribution.
F Fewer than 25 firms
D Suppressed to avoid disclosure of confidential information
N Data for this geographic area cannot be displayed because the number of sample cases is too small.
FN Footnote on this item in place of data
X Not applicable
S Suppressed; does not meet publication standards
NA Not available
Z Value greater than zero but less than half unit of measure shown

QuickFacts data are derived from: Population Estimates, American Community Survey, Census of Population and Housing, Current Population Survey, Small Area Health Insurance Estimates, Small Area Income and P Estimates, State and County Housing Unit Estimates, County Business Patterns, Nonemployer Statistics, Economic Census, Survey of Business Owners, Building Permits.

Census Reporter

Search for places, tables, topics, or glossaries Search



Santo Domingo Pueblo

Native Area in: United States

2,954
Population

106.1 square miles

27.8 people per square mile

Census data: ACS 2020 5-year unless noted

Find data for this place Search by table or column name...

Hover for margins of error and contextual data.

Demographics

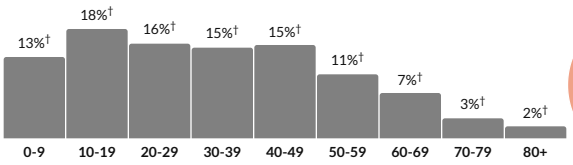
† Margin of error is at least 10 percent of the total value. Take care with this statistic.

Age

31.7
Median age

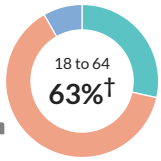
about 80 percent of the figure in United States: 38.2

Population by age range



Show data / Embed

Population by age category



Hide data / Embed

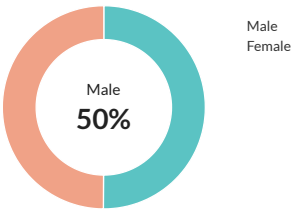
Population by age category (Table B01001) View table

Column	Santo Domingo Pueblo				United States			
Under 18	28.5%	±1.9%	842	±136.4	22.4%	±0%	73,296,738	±41,303.9
18 to 64	63.2%†	±11.5%	1,868	±196.9	61.5%	±0%	200,909,753	±67,571.5
65 and over	8.3%†	±1.2%	244	±51	16%	±0%	52,362,817	±49,416

Hide data

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

Sex



Show data / Embed

Race & Ethnicity



* Hispanic includes respondents of any race. Other categories are non-Hispanic.

Hide data / Embed

Table B03002 View table

Column	Santo Domingo Pueblo				United States			
White	0.7%†	±0.5%	22	±15	60.1%	±0%	196,251,375	±24,992
Black	0.1%†	±0.2%	2	±7	12.3%	±0%	39,994,653	±34,772
Native	77.5%	±4.6%	2,288	±363	0.6%	±0%	2,075,852	±8,182
Asian	0%	±0%	0	±13	5.6%	±0%	18,184,182	±22,818
Islander	0%	±0%	0	±13	0.2%	±0%	550,080	±4,814
Other	0%	±0%	0	±13	0.3%	±0%	1,017,604	±26,249

Column	Santo Domingo Pueblo				United States			
Two+	0.2%†	±0.3%	6	±9	2.8%	±0%	9,134,542	±54,603
Hispanic	21.5%†	±7.5%	636	±241	18.2%	±0%	59,361,020	±1,842

Hide data

Economics

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

Income

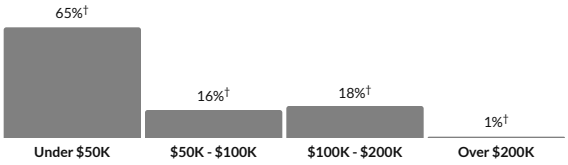
$14,417
Per capita income

about two-fifths of the amount in United States: $35,384

$36,540
Median household income

about three-fifths of the amount in United States: $64,994

Household income



Hide data / Embed

Household income (Table B19001) View table

Column	Santo Domingo Pueblo				United States			
Under $50K	65%†	±9.1%	393	±83.2	39.1%	±0.1%	47,785,414	±58,302.5
$50K - $100K	16.2%†	±6.4%	98	±41.9	30%	±0.1%	36,648,022	±63,450.6
$100K - $200K	18.2%†	±5.5%	110	±37.5	22.7%	±0.1%	27,817,092	±73,446.1
Over $200K	0.7%†	±0.8%	4	±5	8.3%	±0%	10,103,691	±51,548

Hide data

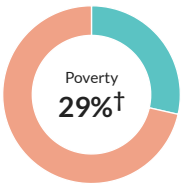
Poverty

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

22.5%
Persons below poverty line

more than 1.5 times the rate in United States: 12.8%

Children (Under 18)



Show data / Embed

Seniors (65 and over)



Hide data / Embed

Seniors (65 and over) (Table B17001) View table

Column	Santo Domingo Pueblo				United States			
Poverty	28.7%†	±10.3%	70	±29.3	9.3%	±0%	4,756,707	±16,262.5
Non-poverty	71.3%†	±9.2%	174	±43.7	90.7%	±0.1%	46,315,436	±17,287.6

Hide data

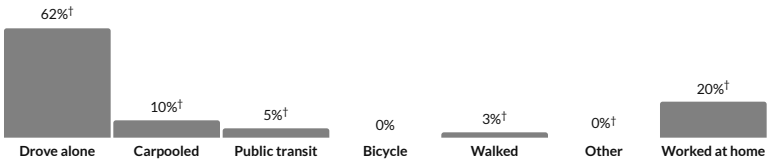
Transportation to work

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

36 minutes
Mean travel time to work

about 1.3 times the figure in United States: 26.9

Means of transportation to work



* Universe: Workers 16 years and over

Hide data / Embed

Means of transportation to work (Table B08006) View table

Column	Santo Domingo Pueblo				United States			
Drove alone	61.8%†	±7.1%	719	±160	74.9%	±0%	115,127,720	±133,106
Carpooled	9.6%†	±3%	112	±41	8.9%	±0%	13,605,122	±67,029
Public transit	5.3%†	±3.9%	62	±47	4.6%	±0%	7,044,886	±24,343
Bicycle	0%	±0%	0	±13	0.5%	±0%	783,484	±7,573
Walked	2.9%†	±2.1%	34	±25	2.6%	±0%	3,954,692	±17,264
Other	0.2%†	±0.4%	2	±5	1.3%	±0%	1,996,655	±15,218
Worked at home	20.1%†	±7.4%	234	±97	7.3%	±0%	11,153,095	±40,724

Hide data

Families

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

Households

605

Number of households

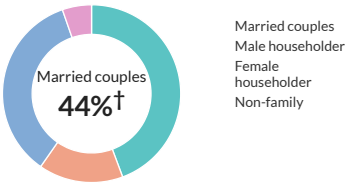
United States: 122,354,219

4.9

Persons per household

nearly double the figure in United States: 2.6

Population by household type



Hide data / Embed

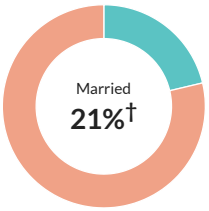
Population by household type (Table B11002) View table

Column	Santo Domingo Pueblo				United States			
Married couples	44.3%†	±7.6%	1,303	±296	60.1%	±0.2%	191,385,584	±566,833
Male householder	15.4%†	±5.1%	451	±165	6.4%	±0.1%	20,271,973	±191,631
Female householder	35%†	±9.1%	1,029	±307	16.4%	±0.1%	52,246,320	±289,541
Non-family	5.3%†	±1.7%	156	±55	17.1%	±0%	54,592,097	±123,973

Hide data

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

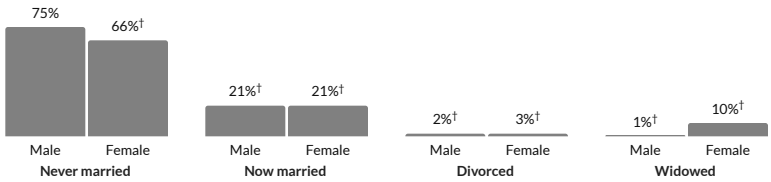
Marital status



* Universe: Population 15 years and over

Show data / Embed

Marital status, by sex



Hide data / Embed

Marital status, by sex (Table B12001) View table

Column	Santo Domingo Pueblo				United States			
Never married: Male	75.4%	±4.6%	835	±147	36.6%	±0.1%	47,510,293	±163,691
Never married: Female	66.4%†	±10.1%	802	±182	30.5%	±0.1%	41,518,358	±129,626
Now married: Male	21.4%†	±4.2%	237	±61	51.3%	±0.2%	66,596,845	±218,840
Now married: Female	21.2%†	±3.7%	256	±62	48.7%	±0.1%	66,208,251	±171,245
Divorced: Male	2.3%†	±1.5%	25	±17	9.5%	±0.1%	12,261,848	±62,536
Divorced: Female	2.6%†	±1.2%	31	±15	12.1%	±0%	16,506,099	±54,145
Widowed: Male	0.9%†	±1%	10	±11	2.6%	±0%	3,408,813	±12,245
Widowed: Female	9.9%†	±5.5%	119	±69	8.7%	±0%	11,821,660	±23,075

Hide data

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

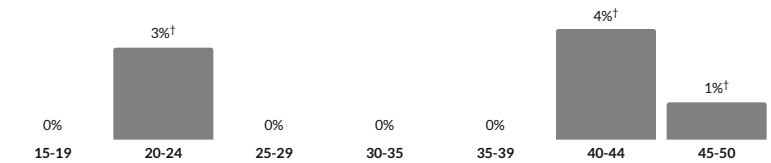
Fertility

1.3%

Women 15-50 who gave birth during past year

about one-quarter of the rate in United States: 5.2%

Women who gave birth during past year, by age group



* Universe: Women 15 to 50 years

Hide data / Embed

Women who gave birth during past year, by age group (Table B13016) View table

Column	Santo Domingo Pueblo				United States			
15-19	0%	±0%	0	±13	1.1%	±0%	117,386	±2,894
20-24	3%†	±4.6%	5	±8	6%	±0.1%	642,377	±5,973
25-29	0%	±0%	0	±13	9.5%	±0.1%	1,079,416	±8,668
30-35	0%	±0%	0	±13	10.5%	±0.1%	1,156,450	±11,182
35-39	0%	±0%	0	±13	6.4%	±0.1%	682,747	±7,670

Column	Santo Domingo Pueblo				United States			
40-44	3.5%†	±4.9%	4	±6	2.1%	±0%	209,488	±4,373
45-50	1.2%†	±1.8%	2	±3	0.8%	±0%	94,790	±2,918

Hide data

Housing

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

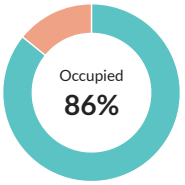
Units & Occupancy

705

Number of housing units

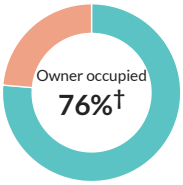
United States: 138,432,751

Occupied vs. Vacant



Show data / Embed

Ownership of occupied units



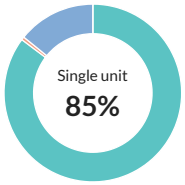
Hide data / Embed

Ownership of occupied units (Table B25003) View table

Column	Santo Domingo Pueblo				United States			
Owner occupied	76.4%†	±11.5%	462	±101	64.4%	±0.3%	78,801,376	±342,600
Renter occupied	23.6%†	±6%	143	±43	35.6%	±0.1%	43,552,843	±134,985

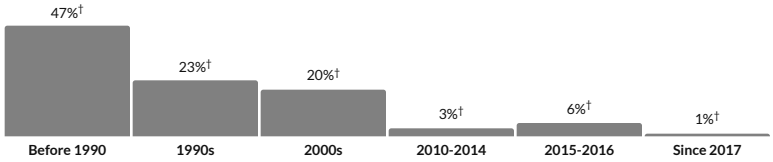
Hide data

Types of structure



Show data / Embed

Year moved in, by percentage of population



Hide data / Embed

Year moved in, by percentage of population (Table B25026) View table

Column	Santo Domingo Pueblo				United States			
Before 1990	46.7%†	±6.9%	1,372	±286.1	10%	±0%	31,865,364	±70,401.1
1990s	23.4%†	±7%	689	±229.9	11.5%	±0.1%	36,748,802	±145,441.6
2000s	19.7%†	±5.3%	578	±178	23.7%	±0.1%	75,550,780	±291,311.7
2010-2014	3.3%†	±2.2%	98	±64.8	21.5%	±0.1%	68,455,009	±280,197.6
2015-2016	5.7%†	±3.4%	168	±103.5	28.7%	±0.1%	91,322,630	±416,573.2
Since 2017	1.2%†	±1.9%	34	±54.6	4.6%	±0%	14,553,389	±112,185.7

Hide data

Value

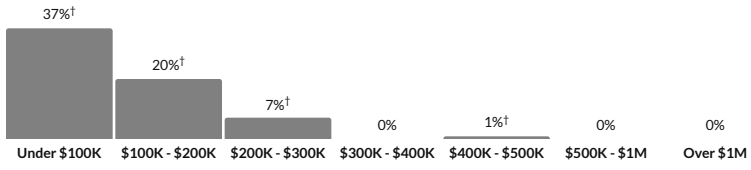
† Margin of error is at least 10 percent of the total value. Take care with this statistic.

$123,400

Median value of owner-occupied housing units

about half the amount in United States: $229,800

Value of owner-occupied housing units



Hide data / Embed

Value of owner-occupied housing units (Table B25075) View table

Column	Santo Domingo Pueblo				United States			
Under $100K	37.5%†	±15.7%	173	±81.6	17.6%	±0.1%	13,870,902	±36,966.3
$100K - $200K	20.1%†	±4.8%	93	±30.1	26%	±0.1%	20,457,379	±57,623.6
$200K - $300K	6.9%†	±6%	32	±28.6	20%	±0.1%	15,730,458	±58,450.1
$300K - $400K	0%	±0%	0	±13	12.9%	±0.1%	10,176,033	±43,678
$400K - $500K	0.7%†	±1.1%	3	±5	7.6%	±0%	5,997,303	±30,723
$500K - $1M	0%	±0%	0	±18.4	12.3%	±0.1%	9,682,662	±35,567.3
Over $1M	0%	±0%	0	±13	2%	±0%	1,551,648	±10,201

Hide data

Geographical mobility

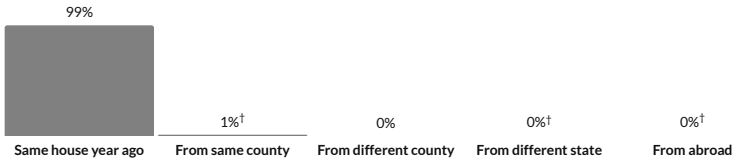
† Margin of error is at least 10 percent of the total value. Take care with this statistic.

1.3%

Moved since previous year

about 10 percent of the rate in United States: 13.8%

Population migration since previous year



Hide data / Embed

Population migration since previous year (Table B07003) View table

Column	Santo Domingo Pueblo				United States			
Same house year ago	98.7%	±1.3%	2,886	±427	86.2%	±0.1%	278,285,887	±172,568
From same county	0.9%†	±0.6%	25	±19	7.7%	±0%	24,840,584	±123,961
From different county	0%	±0%	0	±13	3.2%	±0%	10,445,339	±47,270
From different state	0%†	±0.1%	1	±2	2.3%	±0%	7,428,810	±36,590
From abroad	0.4%†	±0.4%	12	±13	0.6%	±0%	1,942,663	±18,880

Hide data

Social

Educational attainment

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

80.8%

High school grad or higher

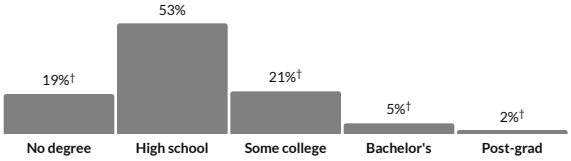
about 90 percent of the rate in United States: 88.5%

6.8%

Bachelor's degree or higher

about one-fifth of the rate in United States: 32.9%

Population by highest level of education



* Universe: Population 25 years and over

Hide data / Embed

Population by highest level of education (Table B15002) View table

Column	Santo Domingo Pueblo				United States			
No degree	19.2%†	±2.9%	337	±70.6	11.5%	±0%	25,562,680	±66,530.2
High school	53.3%	±3.1%	936	±145.7	26.7%	±0.1%	59,421,419	±153,144.2
Some college	20.7%†	±3%	363	±74.7	28.9%	±0.1%	64,496,416	±115,159.3
Bachelor's	5.1%†	±3.9%	90	±69.9	20.2%	±0.1%	45,034,610	±110,632.9
Post-grad	1.7%†	±1.8%	29	±32.3	12.7%	±0%	28,321,709	±97,773.2

Hide data

Language

N/A

Persons with language other than English spoken at home

Language at home, children 5-17

No data available

Language at home, adults 18+

No data available

Place of birth

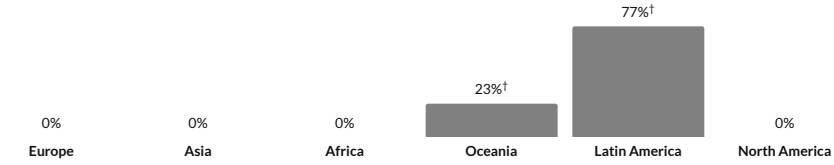
† Margin of error is at least 10 percent of the total value. Take care with this statistic.

0.4%

Foreign-born population

less than 10 percent of the rate in United States: 13.5%

Place of birth for foreign-born population



Hide data / Embed

Place of birth for foreign-born population (Table B05006) View table

Column	Santo Domingo Pueblo				United States			
Europe	0%	±0%	0	±13	10.8%	±0%	4,784,383	±22,830

Column	Santo Domingo Pueblo				United States			
Asia	0%	±0%	0	±13	31.3%	±0.1%	13,794,873	±37,779
Africa	0%	±0%	0	±13	5.4%	±0.1%	2,362,292	±21,586
Oceania	23.1%†	±23.8%	3	±4	0.6%	±0%	283,505	±5,130
Latin America	76.9%†	±41%	10	±10	50%	±0.1%	22,073,519	±91,539
North America	0%	±0%	0	±13	1.9%	±0%	826,548	±10,341

Hide data

† Margin of error is at least 10 percent of the total value. Take care with this statistic.

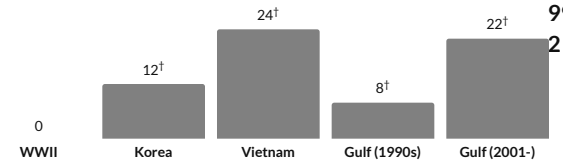
Veteran status

4.8%

Population with veteran status

about two-thirds of the rate in United States: 7.1%

Veterans by wartime service



101 Total veterans
99 Male
2 Female

* Civilian veterans who served during wartime only

Show data / Embed

Hover for margins of error and contextual data.

Citation: U.S. Census Bureau (2020). *American Community Survey 5-year estimates.* Retrieved from *Census Reporter Profile page for Santo Domingo Pueblo* <http://censusreporter.org/profiles/25000US3585-santo-domingo-pueblo/>

Census Reporter

Search for places, tables, topics, or glossaries Search

Sex by Age

Table Map Distribution Download data

Table B01001 Change

Add data for more places below; visualize or download this data with controls at right.

Selected geographies

Santo Domingo Pueblo Remove

United States Remove

Add a geography

Find a place

Add all native areas in ...

United States

Divide Santo Domingo Pueblo into ...

census tracts
block groups
native areas (reservation)
native areas (off-reservation trust land)
ZIP codes

ACS 2020 5-year

Table universe: Total Population Switch to totals Click a row to highlight

Column →	Santo Domingo Pueblo		United States	
Male:	50.1%	±4.1%	49.2%	±0%
Under 5 years	4.1%	±1.6%	3.1%	±0%
5 to 9 years	3.6%	±1.4%	3.1%	±0%
10 to 14 years	5%	±1.9%	3.3%	±0%
15 to 17 years	4%	±1.9%	2%	±0%
18 and 19 years	1.6%	±0.9%	1.3%	±0%
20 years	0.6%	±0.6%	0.7%	±0%
21 years	0.2%	±0.4%	0.7%	±0%
22 to 24 years	2.7%	±1.3%	2%	±0%
25 to 29 years	2.7%	±1.3%	3.6%	±0%
30 to 34 years	5.3%	±1.4%	3.4%	±0%
35 to 39 years	3.1%	±1.3%	3.3%	±0%
40 to 44 years	2.4%	±1%	3.1%	±0%
45 to 49 years	4.2%	±1.5%	3.1%	±0%
50 to 54 years	3.3%	±1.2%	3.2%	±0%
55 to 59 years	2.3%	±0.8%	3.2%	±0%
60 and 61 years	0.9%	±0.7%	1.3%	±0%
62 to 64 years	0.7%	±0.5%	1.7%	±0%
65 and 66 years	0.6%	±0.4%	1.1%	±0%
67 to 69 years	0.5%	±0.4%	1.4%	±0%
70 to 74 years	0.8%	±0.4%	1.9%	±0%
75 to 79 years	0.9%	±0.7%	1.3%	±0%
80 to 84 years	0.5%	±0.4%	0.8%	±0%
85 years and over	0%	±0.4%	0.7%	±0%
Female:	49.9%	±3.8%	50.8%	±0%
Under 5 years	2.8%	±1.3%	2.9%	±0%
5 to 9 years	2.9%	±1.2%	3%	±0%
10 to 14 years	3.3%	±1.4%	3.2%	±0%
15 to 17 years	2.9%	±1.5%	1.9%	±0%
18 and 19 years	1.2%	±0.7%	1.3%	±0%
20 years	0.9%	±0.8%	0.7%	±0%

Citation: U.S. Census Bureau (2016-2020). *Sex by Age American Community Survey 5-year estimates.* Retrieved from <https://censusreporter.org>

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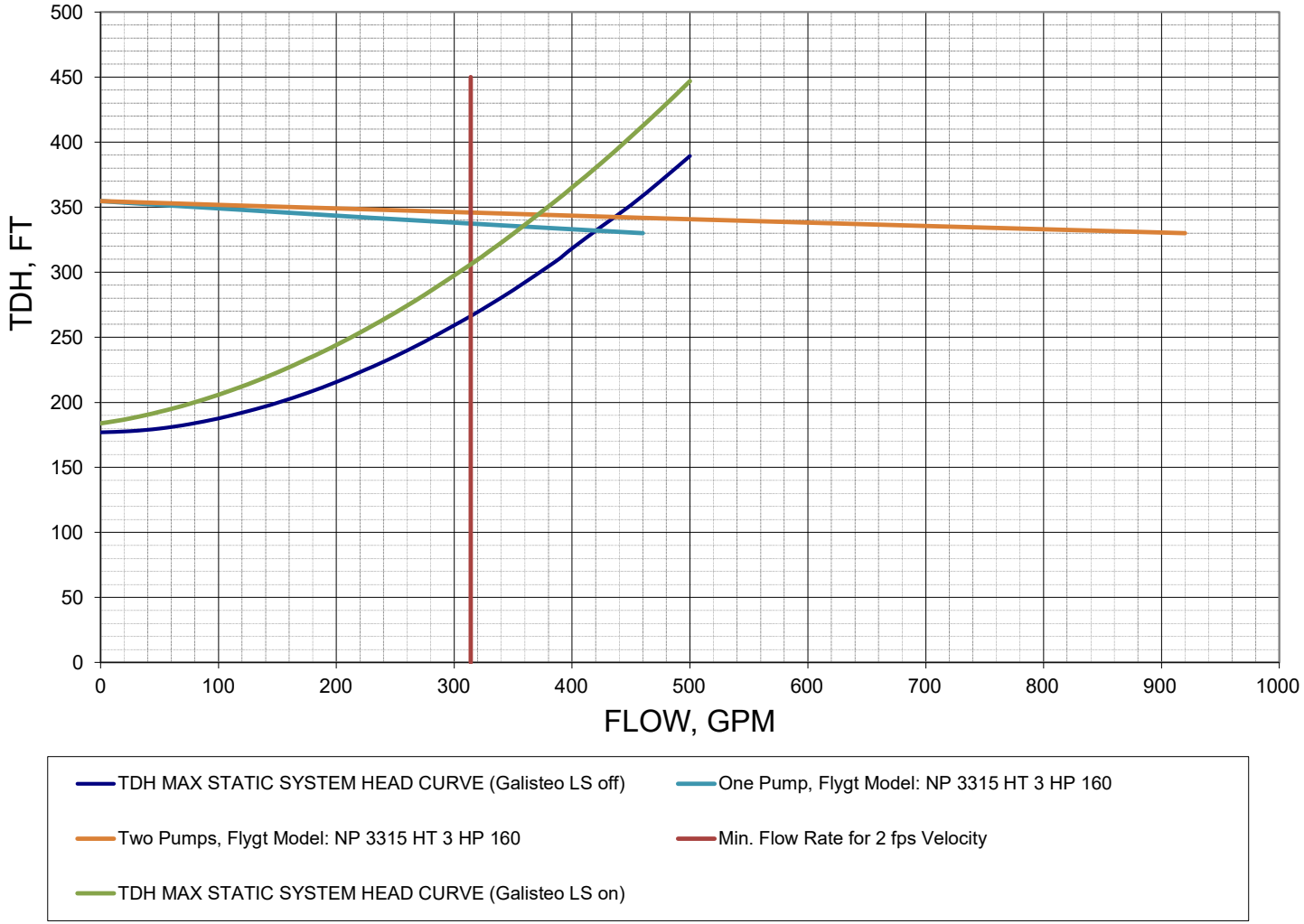
APPENDIX B:

LIFT STATION AND FORCEMAIN HYDRAULIC ANALYSES

ATTACHMENT A:

MAIN VILLAGE LIFT STATION
WITH 8-INCH FORCEMAIN TO WWTP
FOR 20-YEAR FLOW PROJECTIONS

SANTO DOMINGO
Main Village Lift Station to WWTP - 8" FM



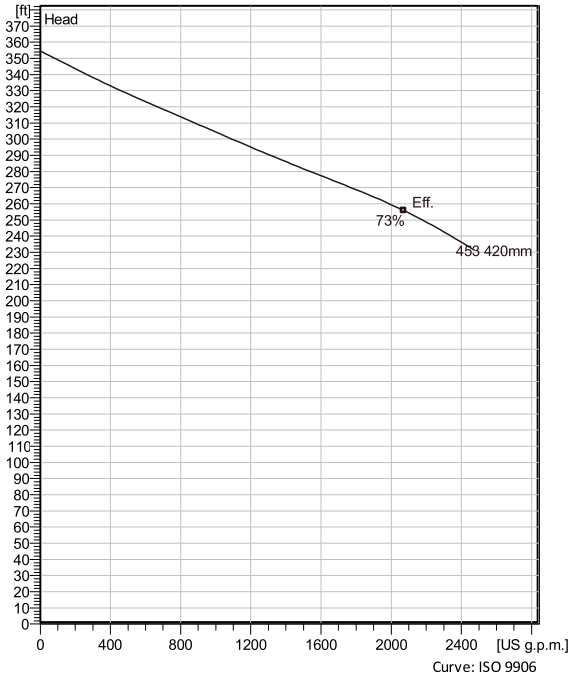
NP 3315 HT 3~ 453

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification



Curves according to: Water, pure Water, pure [100%], 39.2 °F, 62.42 lb/ft³, 1.6899E-5 ft²/s



Curve: ISO 9906

Configuration

Motor number
N3315.095 35-45-4AA-W 160hp

Installation type
P - Semi permanent, Wet

Impeller diameter
420 mm

Discharge diameter
6 inch

Pump information

Impeller diameter
420 mm

Discharge diameter
6 inch

Inlet diameter
200 mm

Maximum operating speed
1780 rpm

Number of blades
3

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron ™

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/7/2022	**Last update**	5/7/2022

NP 3315 HT 3~ 453

Technical specification

Motor - General

Motor number	Phases	Rated speed	Rated power
N3315.095 35-45-4AA-W 160hp	3~	1780 rpm	160 hp
ATEX approved	**Number of poles**	**Rated current**	**Stator variant**
FM	4	190 A	1
Frequency	**Rated voltage**	**Insulation class**	**Type of Duty**
60 Hz	460 V	H	S1
Version code			
095			

Motor - Technical

Power factor - 1/1 Load	Motor efficiency - 1/1 Load	Total moment of inertia	Starts per hour max.
0.83	94.7 %	32.5 lb ft²	15
Power factor - 3/4 Load	**Motor efficiency - 3/4 Load**	**Starting current, direct starting**	
0.78	95.4 %	1120 A	
Power factor - 1/2 Load	**Motor efficiency - 1/2 Load**	**Starting current, star-delta**	
0.68	95.6 %	375 A	

Project	**Created by**	Ron Mosher		
Block	**Created on**	5/7/2022	**Last update**	5/7/2022

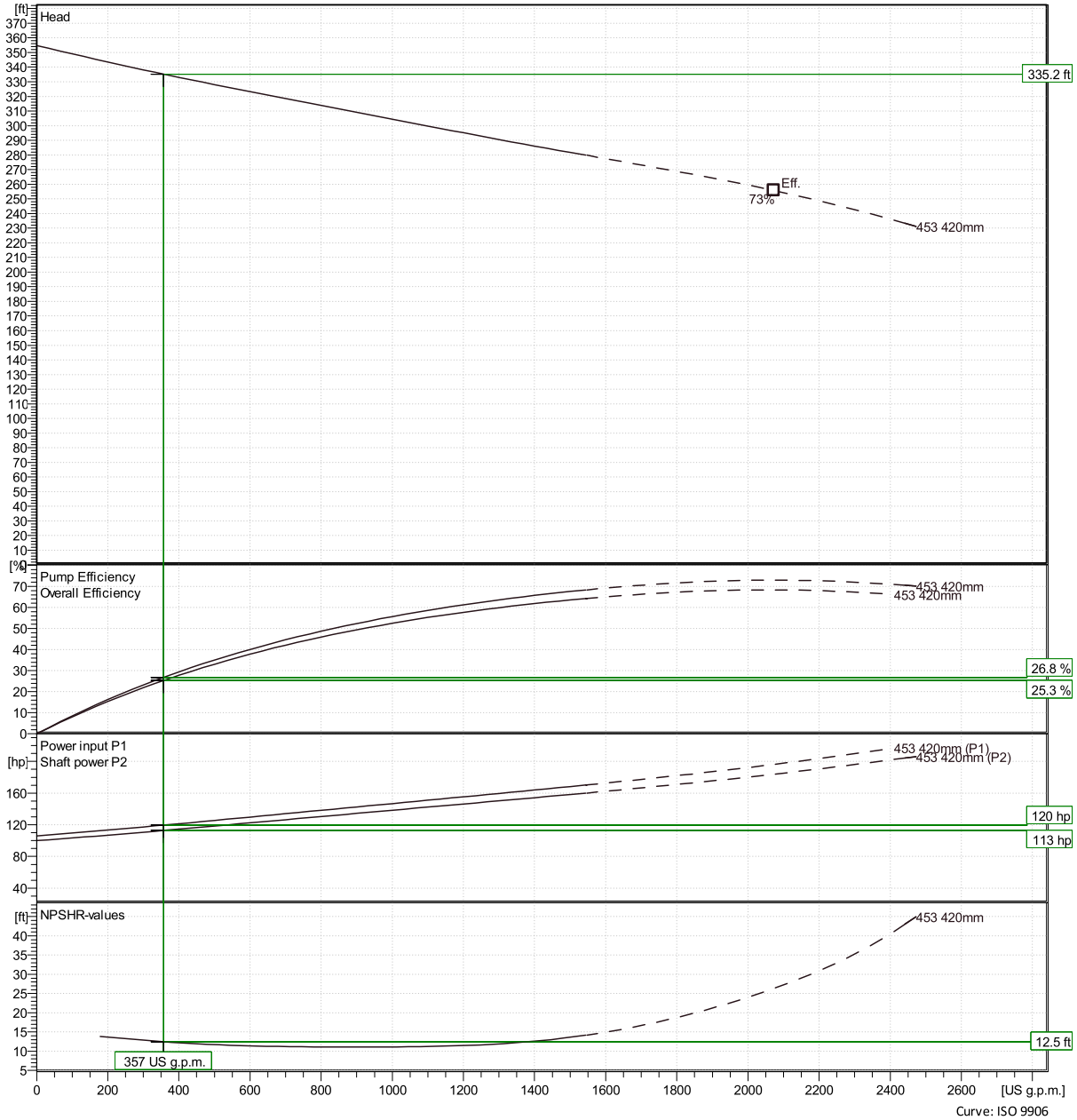
NP 3315 HT 3~ 453

Performance curve

Duty point

Flow	Head
357 US g.p.m.	335 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6899E-5 ft²/s



Curve: ISO 9906

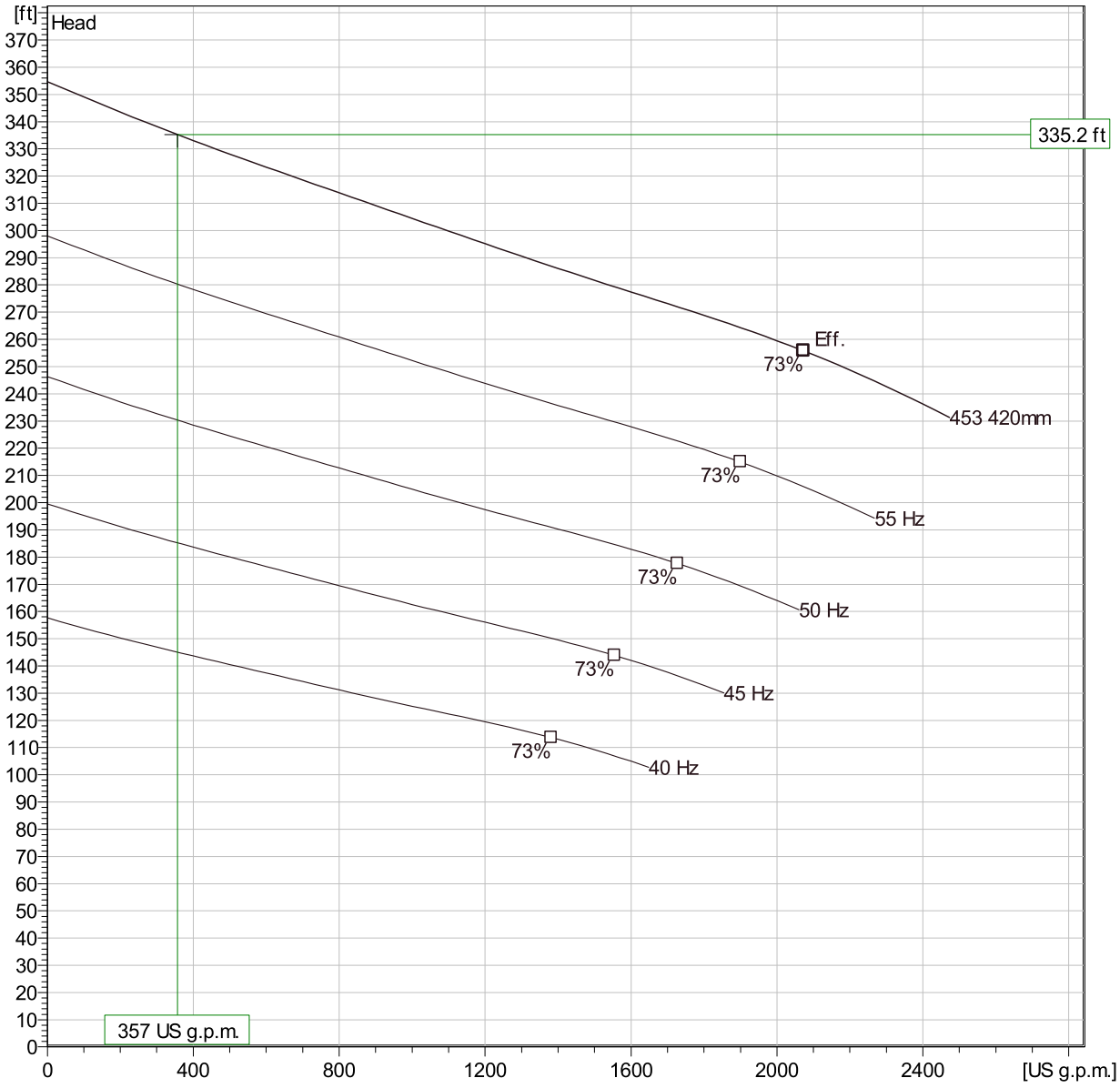
Ron Mosher

Created on 5/7/2022 **Last update** 5/7/2022

NP 3315 HT 3~ 453

Duty Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.69E-5ft²/s



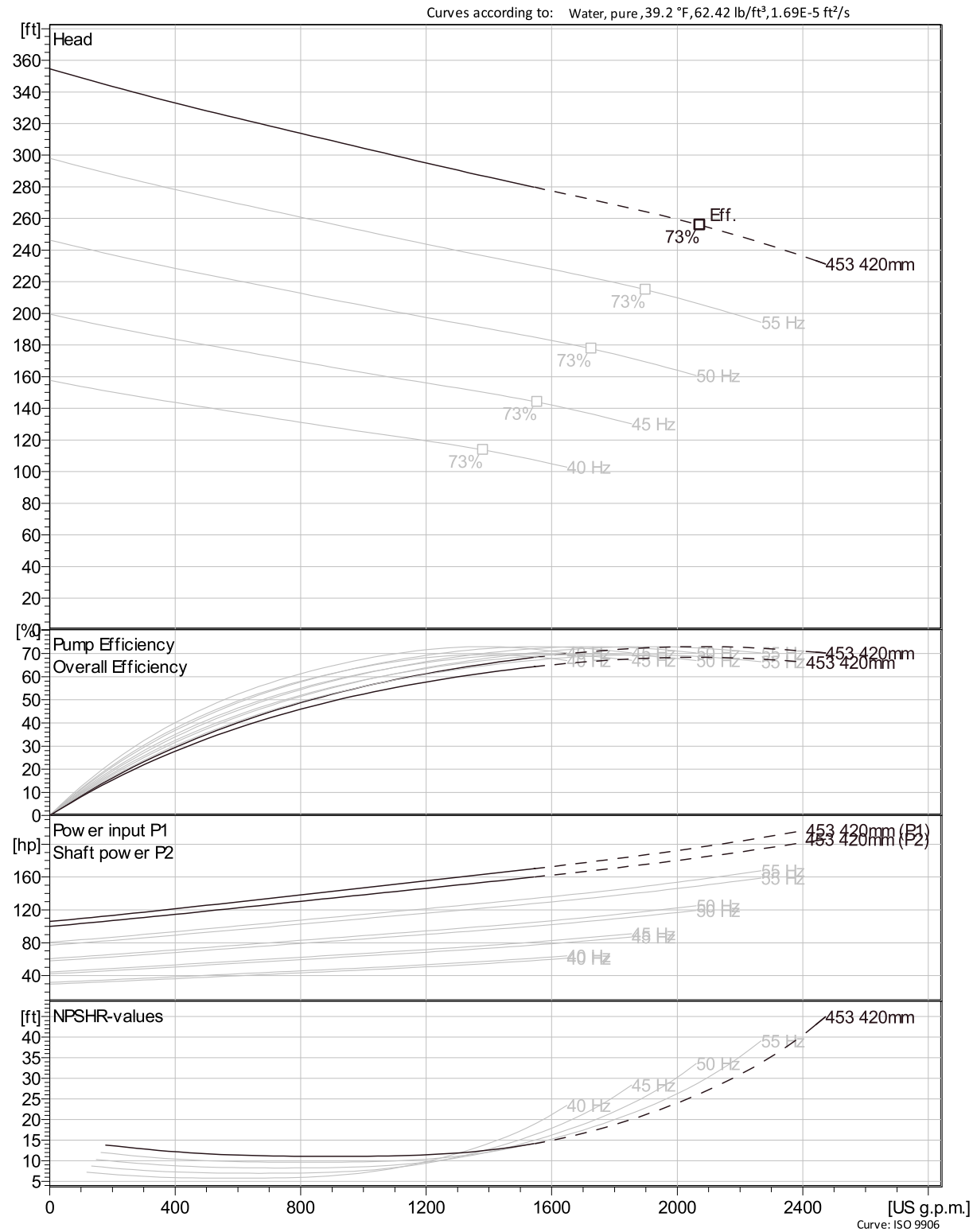
Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	357	335	113	357	335	113	26.8 %	4170	12.5

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/7/2022	**Last update**	5/7/2022

NP 3315 HT 3~ 453

VFD Curve

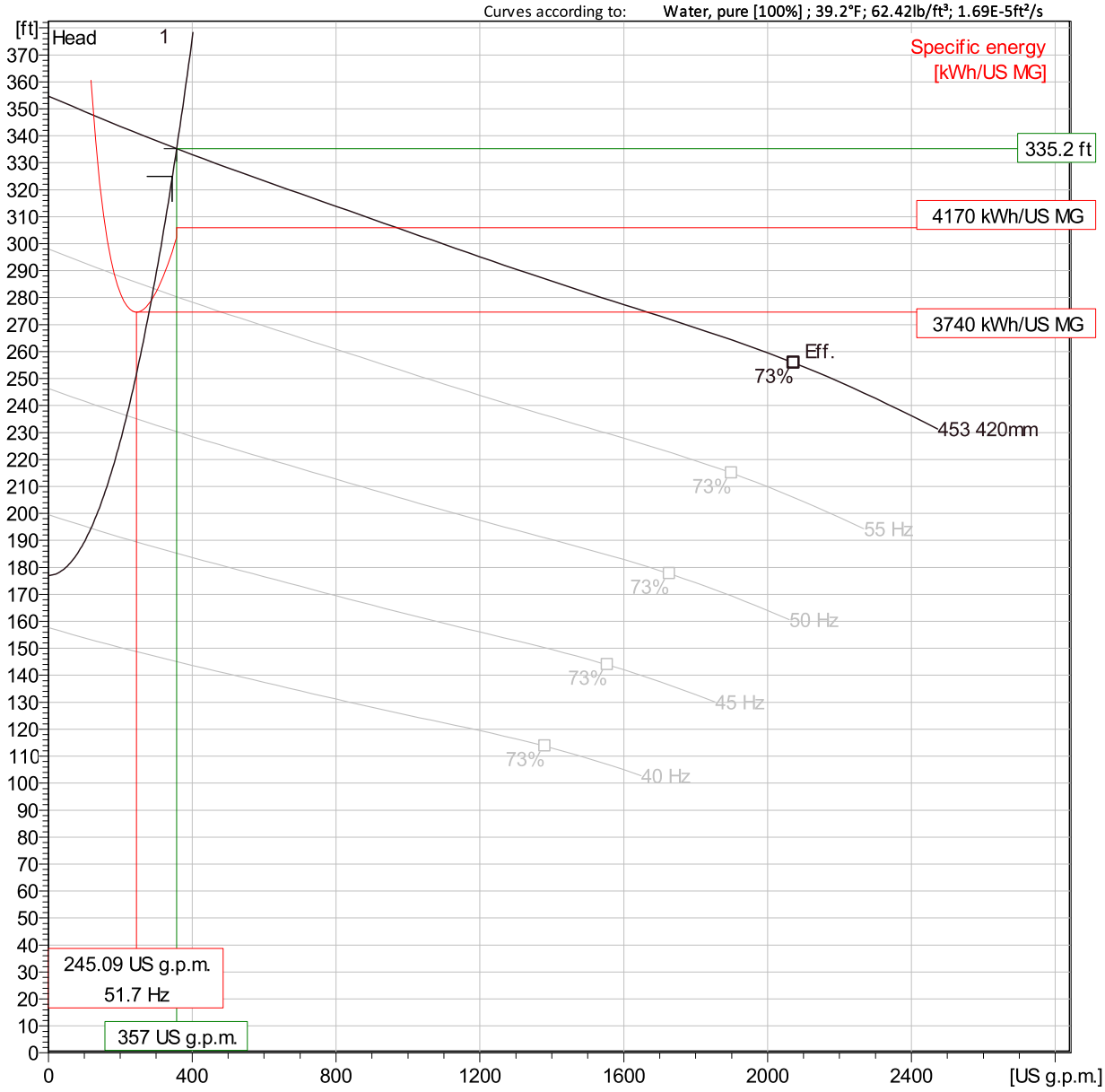


Project		**Created by**	Ron Mosher		
Block		**Created on**	5/7/2022	**Last update**	5/7/2022

NP 3315 HT 3~ 453

VFD Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.69E-5ft²/s



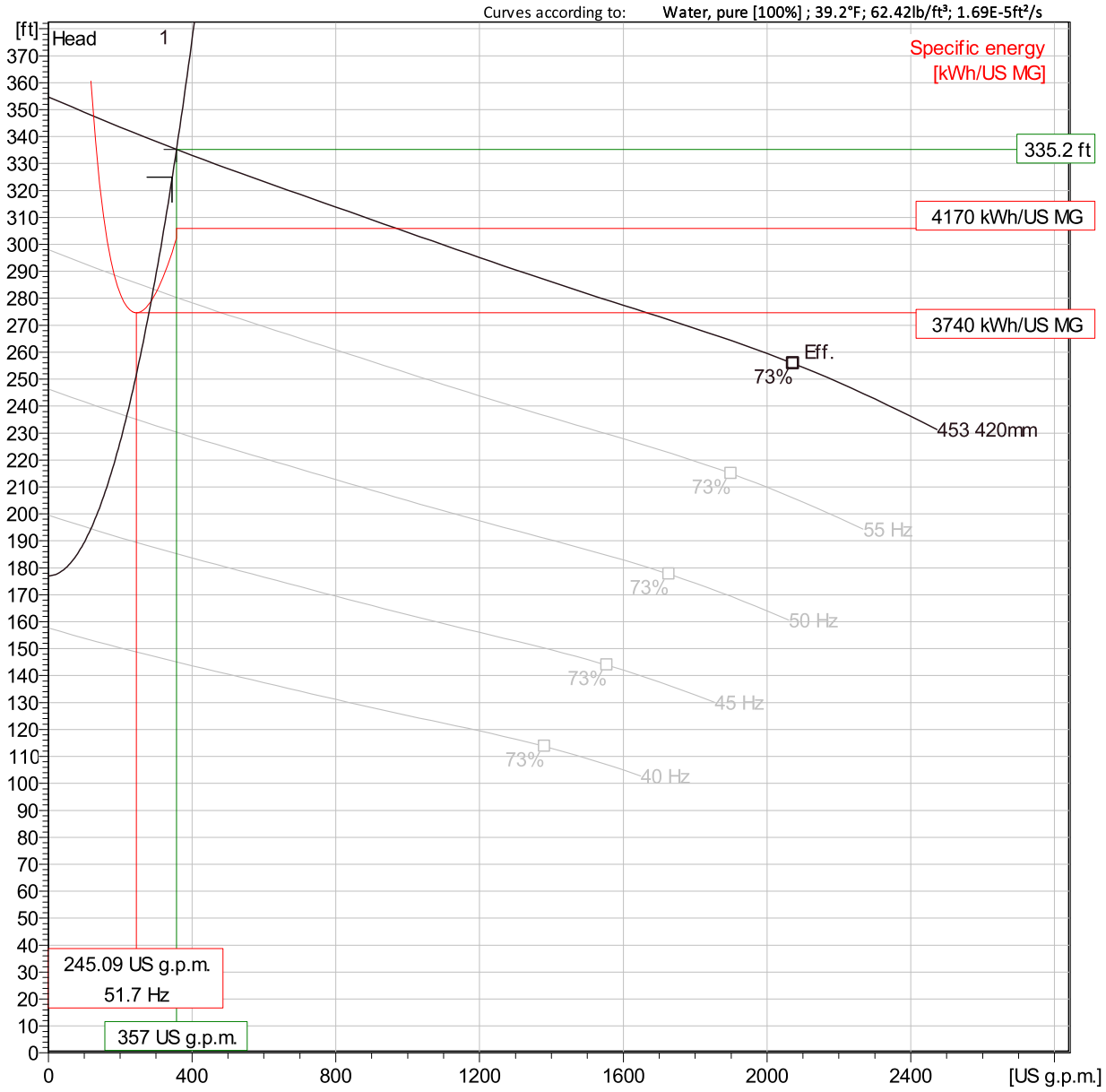
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	60 Hz	357	335	113	357	335	113	26.8 %	4170	12.5
1	55 Hz	292	283	85.8	292	283	85.8	24.4 %	4970	11.1
1	50 Hz	218	236	63.2	218	236	63.2	20.6 %	6490	9.83
1	45 Hz	119	195	44.5	119	195	44.5	13.1 %	11500	

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/7/2022	**Last update**	5/7/2022

NP 3315 HT 3~ 453

VFD Analysis



Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	40 Hz									

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/7/2022	**Last update**	5/7/2022

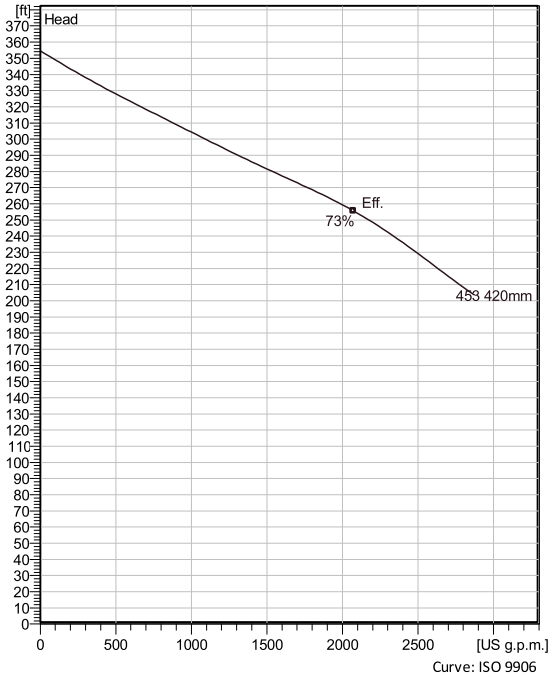
NP 3315 HT 3~ 453

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification



Curves according to: Water, pure Water, pure [100%], 39.2 °F, 62.42 lb/ft³, 1.6899E-5 ft²/s



Configuration

Motor number
N3315.090 35-45-4AA-W 160hp

Installation type
P - Semi permanent, Wet

Impeller diameter
420 mm

Discharge diameter
6 inch

Pump information

Impeller diameter
420 mm

Discharge diameter
6 inch

Inlet diameter
200 mm

Maximum operating speed
1780 rpm

Number of blades
3

Max. fluid temperature
40 °C

Materials

Impeller
Grey cast iron

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/8/2022	**Last update**	5/8/2022

NP 3315 HT 3~ 453

Technical specification

Motor - General

Motor number N3315.090 35-45-4AA-W 160hp	**Phases** 3~	**Rated speed** 1780 rpm	**Rated power** 160 hp
ATEX approved FM	**Number of poles** 4	**Rated current** 190 A	**Stator variant** 1
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 090			

Motor - Technical

Power factor - 1/1 Load 0.83	**Motor efficiency - 1/1 Load** 94.5 %	**Total moment of inertia** 31.7 lb ft²	**Starts per hour max.** 15
Power factor - 3/4 Load 0.78	**Motor efficiency - 3/4 Load** 95.0 %	**Starting current, direct starting** 1120 A	
Power factor - 1/2 Load 0.68	**Motor efficiency - 1/2 Load** 95.5 %	**Starting current, star-delta** 375 A	

Project	**Created by**	Ron Mosher		
Block	**Created on**	5/8/2022	**Last update**	5/8/2022

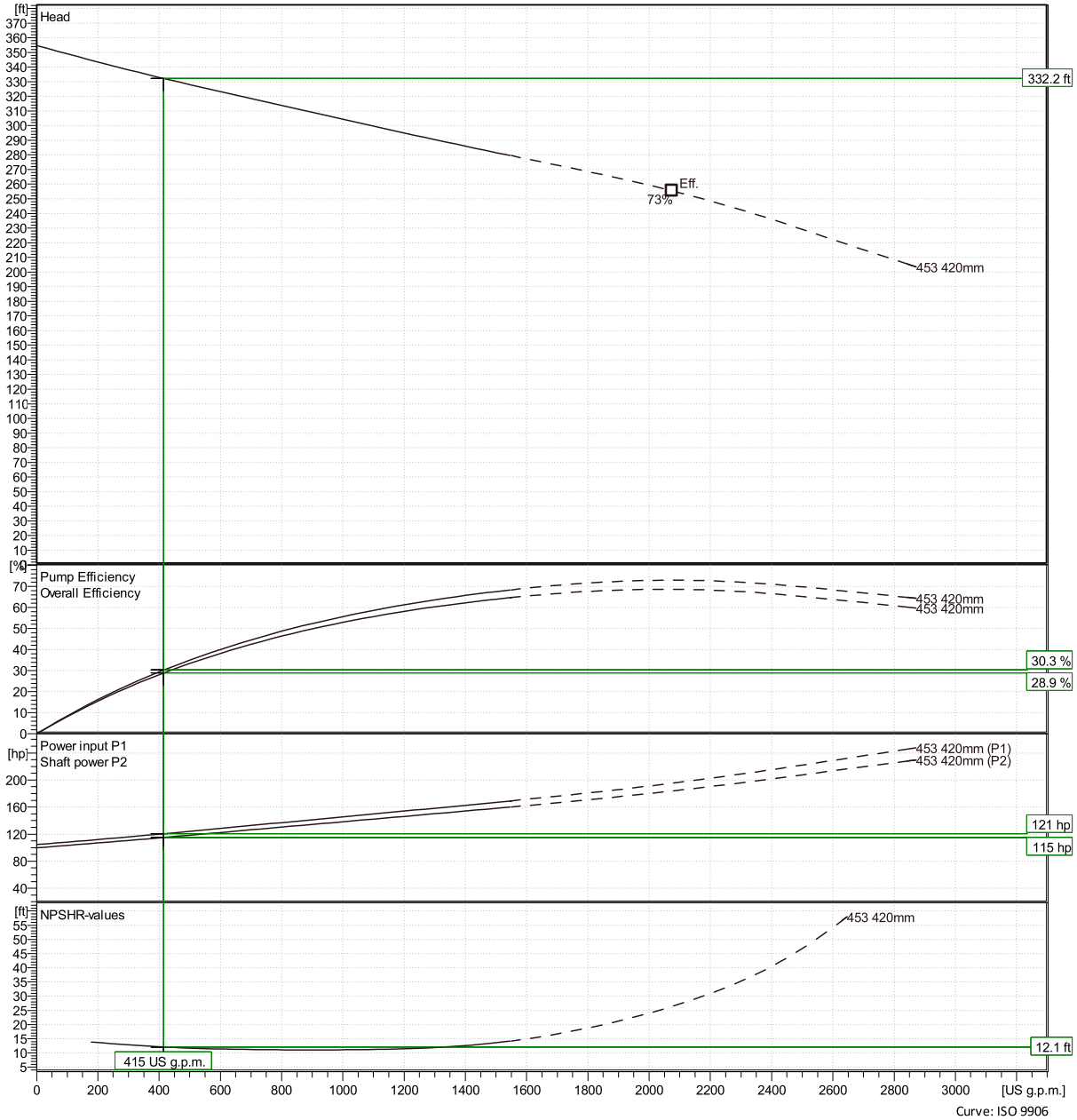
NP 3315 HT 3~ 453

Performance curve

Duty point

Flow	Head
415 US g.p.m.	332 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6899E-5 ft²/s



Curve: ISO 9906

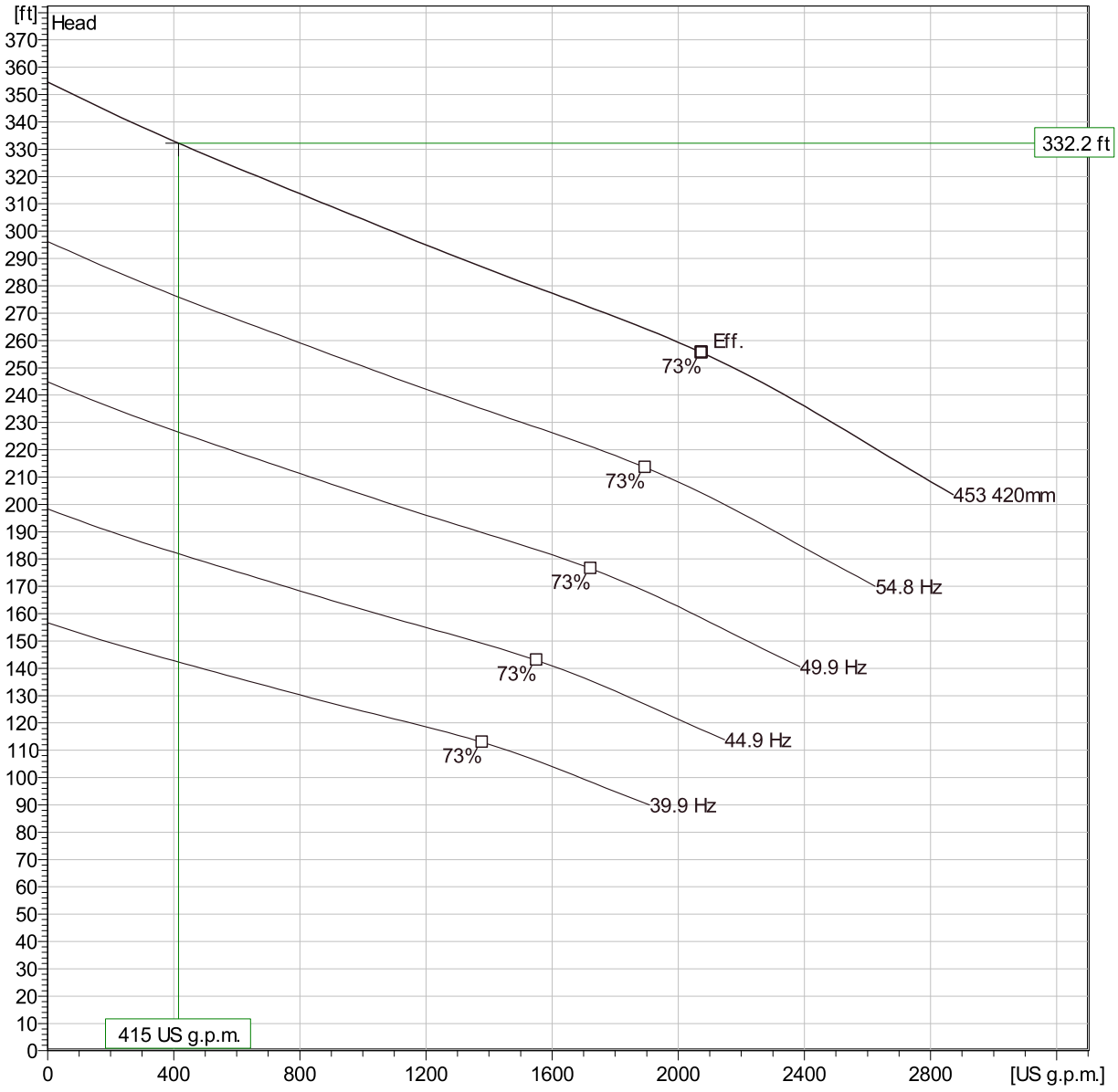
Ron Mosher

Created on 5/8/2022 **Last update** 5/8/2022

NP 3315 HT 3~ 453

Duty Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.69E-5ft²/s



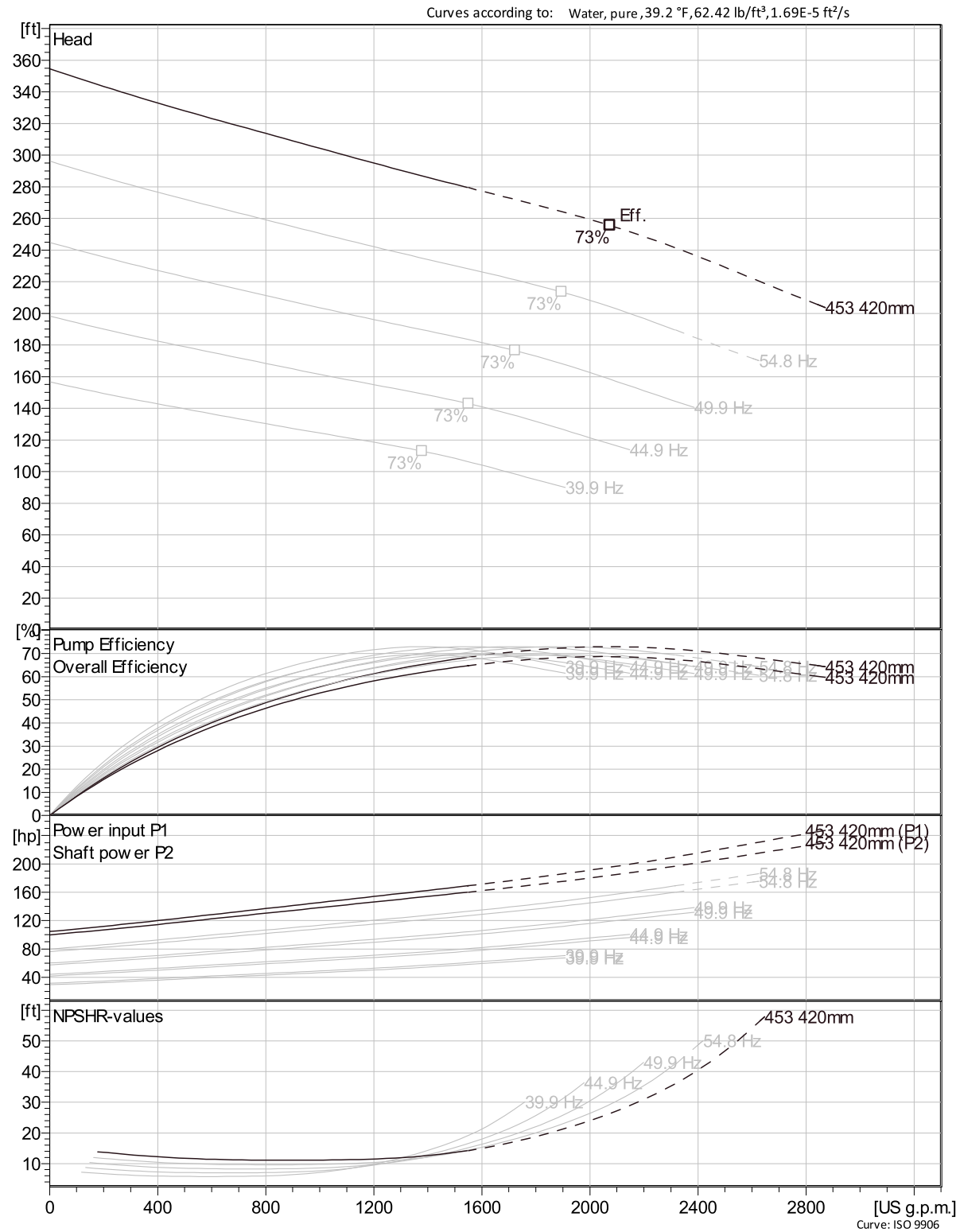
Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	415	332	115	415	332	115	30.3 %	3610	12.1

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/8/2022	**Last update**	5/8/2022

NP 3315 HT 3~ 453

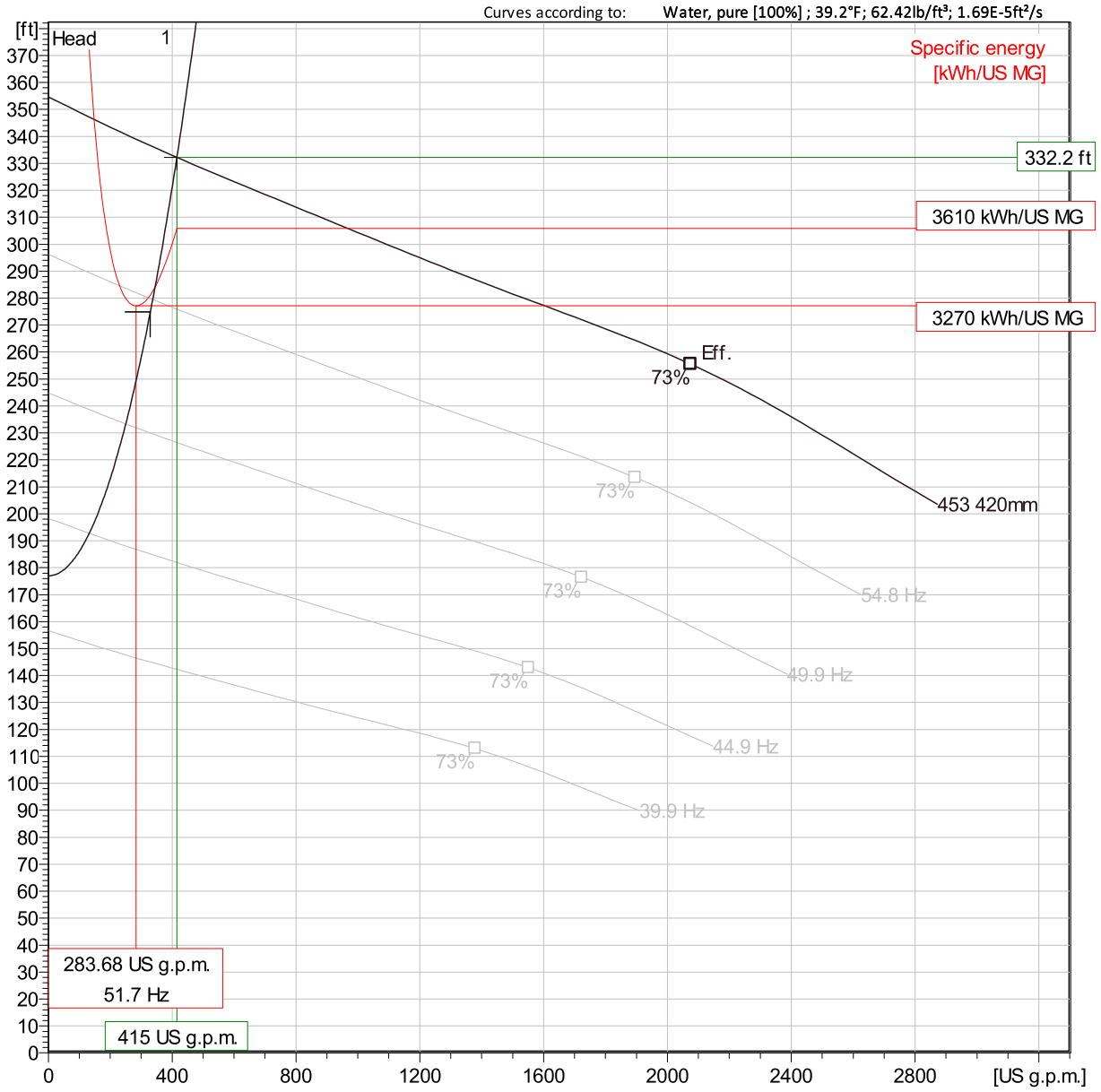
VFD Curve



Project		**Created by**	Ron Mosher		
Block		**Created on**	5/8/2022	**Last update**	5/8/2022

NP 3315 HT 3~ 453

VFD Analysis



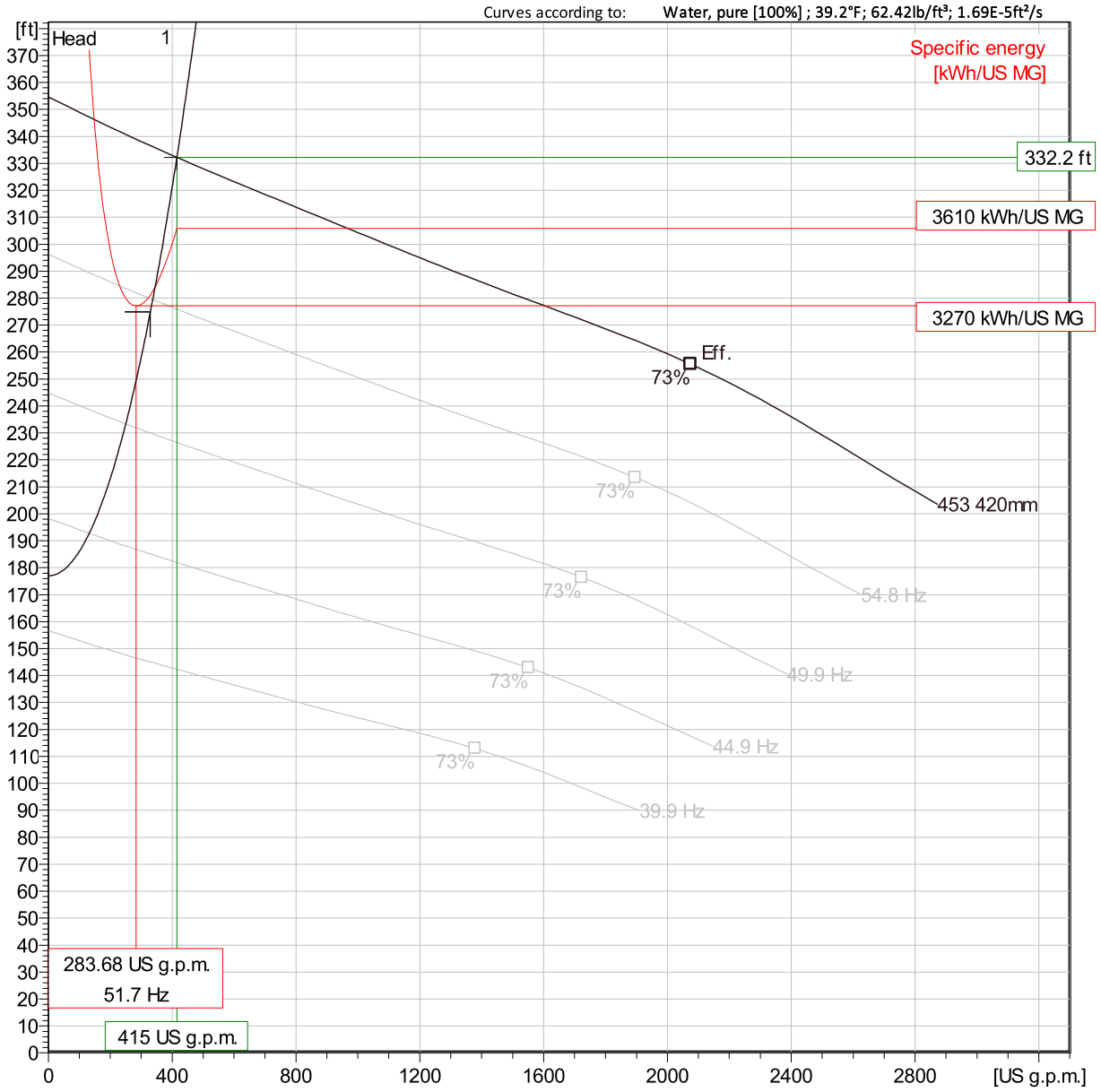
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	60 Hz	415	332	115	415	332	115	30.3 %	3610	12.1
1	54.8 Hz	337	279	86.5	337	279	86.5	27.6 %	4320	10.7
1	49.9 Hz	250	233	63.5	250	233	63.5	23.3 %	5650	9.56
1	44.9 Hz	132	193	44.3	132	193	44.3	14.6 %	10300	8.71

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/8/2022	**Last update**	5/8/2022

NP 3315 HT 3~ 453

VFD Analysis



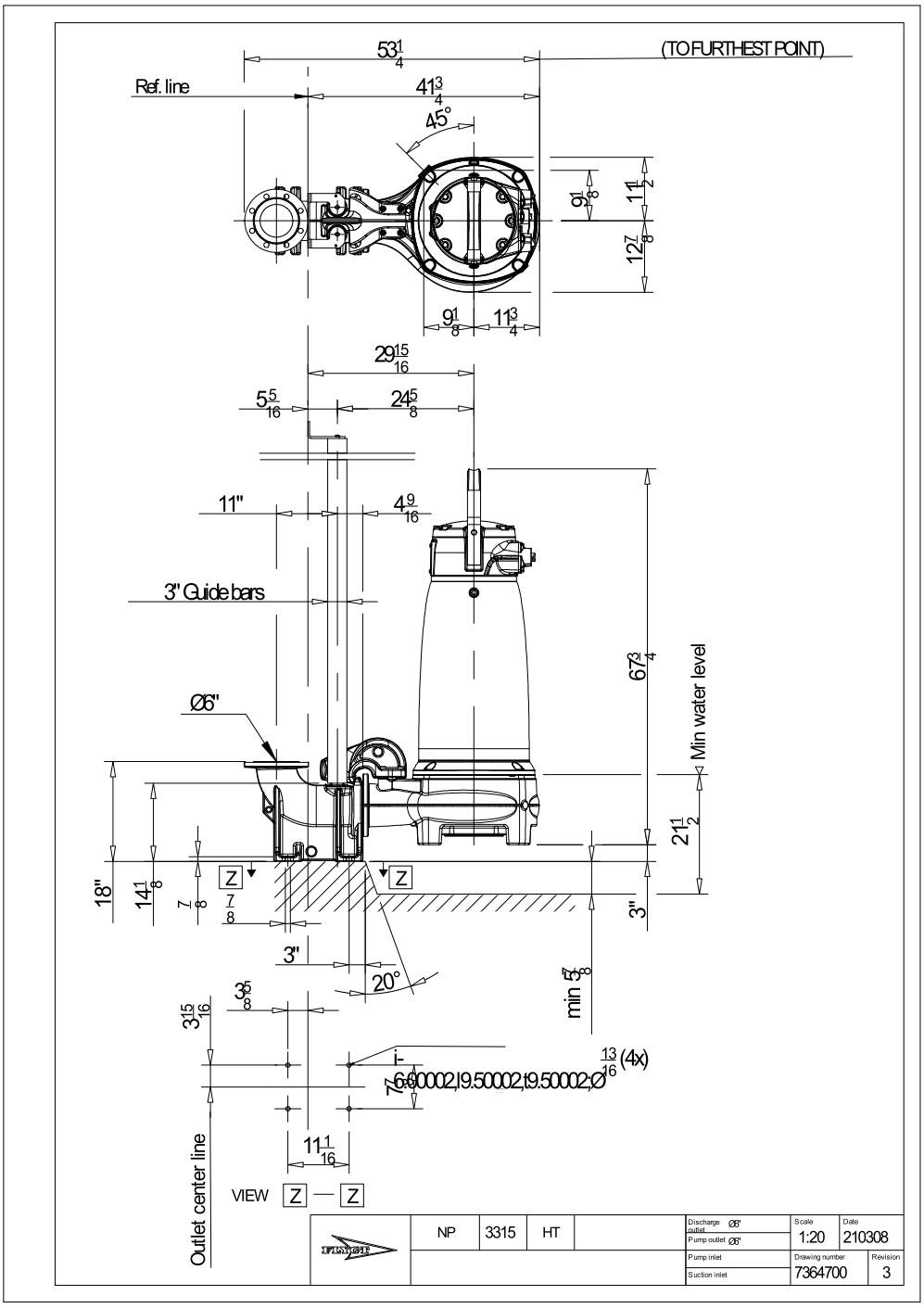
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	39.9 Hz									

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/8/2022	**Last update**	5/8/2022

NP 3315 HT 3~ 453

Dimensional drawing



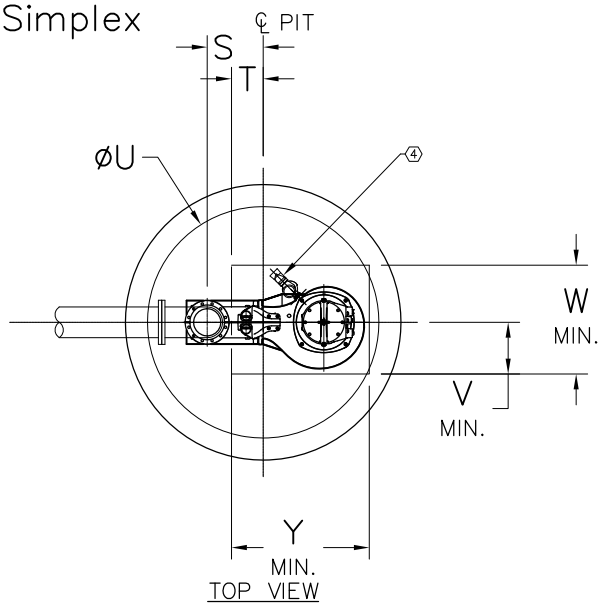
Project	**Created by**	Ron Mosher	
Block	**Created on**	5/7/2022	**Last update** 5/7/2022

NP-3315

⬡ NOTES:

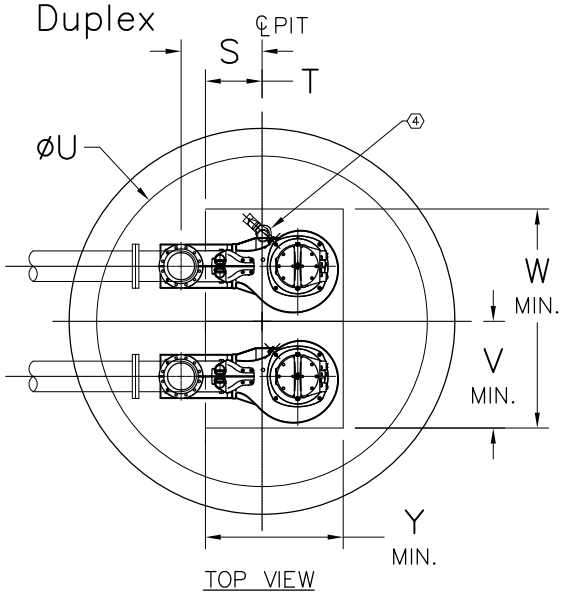
1. CONFIGURATION AND DIMS. SHOWN ARE SUGGESTED REQUIREMENTS ONLY. ALL DETAILS, INCLUDING SIZING OF PIT, TYPE, LOCATION AND ARRANGEMENT OF VALVES AND PIPING, ETC. ARE TO BE SPECIFIED BY THE CONSULTING ENGINEER AND ARE SUBJECT TO THEIR APPROVAL.
2. REFERENCE GENERIC DUPLEX LIFT STATION LAYOUT.
3. LOCATE ANCHOR BOLTS USING CLEAR INSIDE EDGE OF ACCESS FRAME AND PUMP CENTERLINE AS REFERENCE POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP TO ACCESS FRAME.
4. FLYGT MIX–FLUSH VALVE.

Simplex

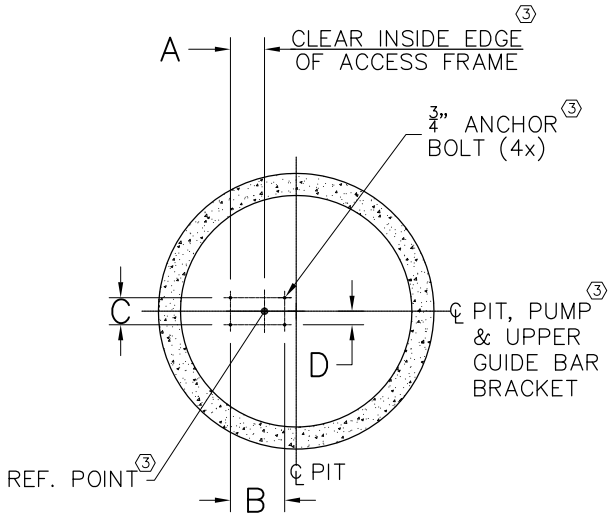


TOP VIEW

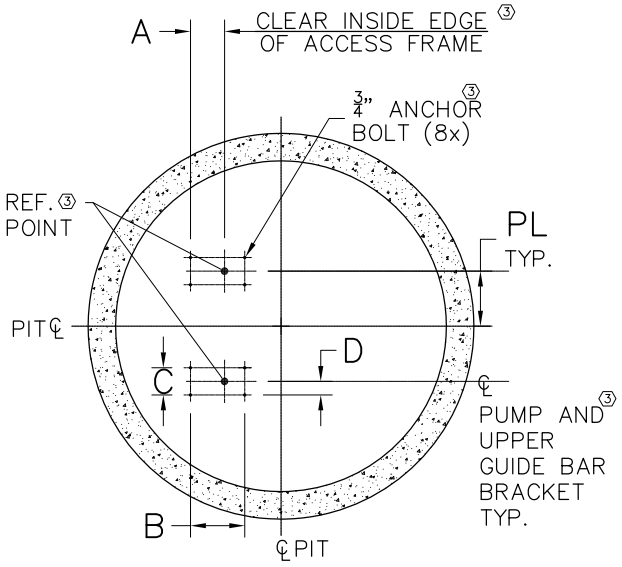
Duplex



TOP VIEW



BASE SECTION



BASE SECTION

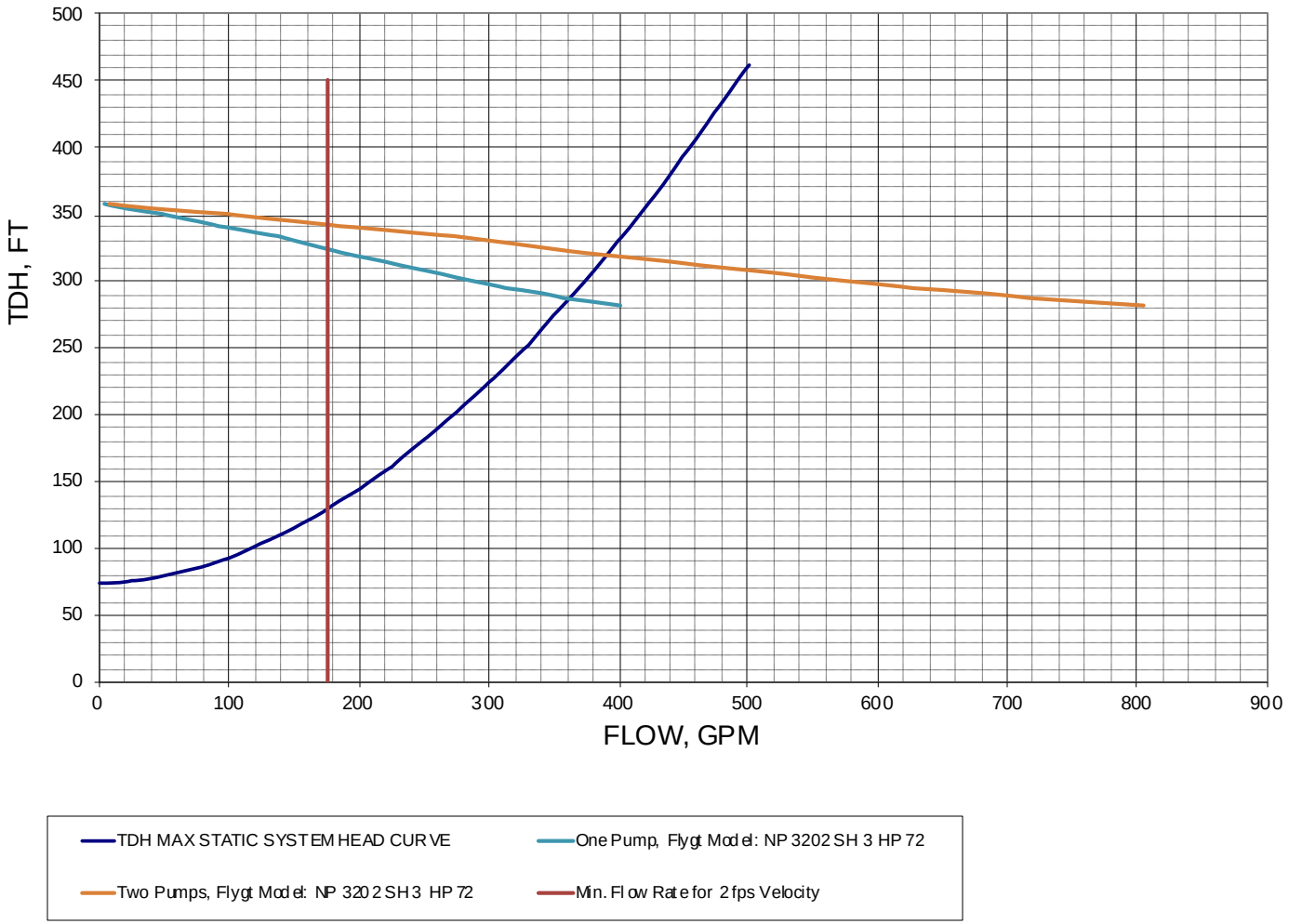
ALL DIMENSIONS ARE IN INCHES

NOM. SIZE	VERSION	A	B	C	D	SIMPLEX S	T	U	V	W	Y	DUPLEX S	T	U	PL	V	W	Y
6"	HT	3 5/8	11	8	4	19 1/2	13 7/8	72	15	35	44	17 1/2	11 7/8	84	16	31	67	44
10"	MT	12 3/8	19 11/16	10	5	20 1/4	11 1/2	84	18 3/4	39 1/2	50	29 1/2	20 1/2	120	20	38 3/4	79 1/2	50
12"	LT	7 5/8	19 11/16	18 1/4	9 1/8	22 3/4	12	96	21	42	52	24 1/4	12 3/8	120	23	44	88	52
14"	LT	16	25 5/8	23 3/4	11 7/8	33	19 3/4	120	24	45 1/2	59	33 1/4	19 3/4	144	26	50	97 1/2	59

ATTACHMENT B:

MAIN VILLAGE LIFT STATION
WITH 6-INCH FORCEMAIN TO GALISTEO LIFT STATION
FOR 20-YEAR FLOW PROJECTIONS

SANTO DOMINGO
Main Village Lift Station - 6" FM



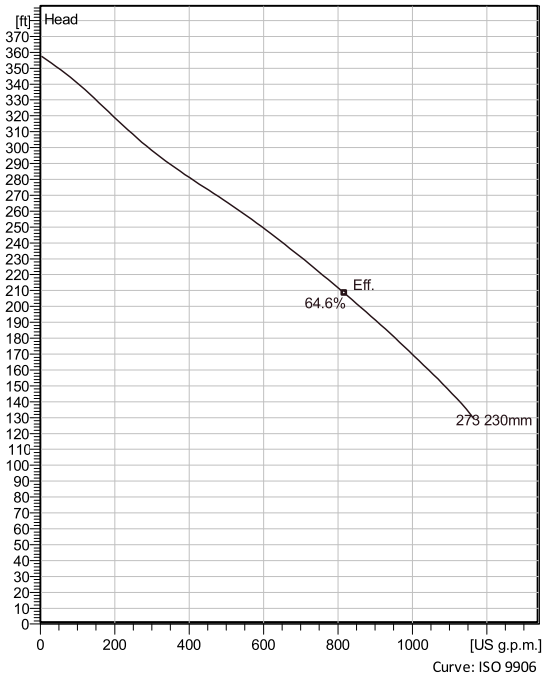
NP 3202 SH 3~ 273

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification



Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Configuration

Motor number
N3202.095 30-27-2AA-W 72hp

Installation type
P - Semi permanent, Wet

Impeller diameter
230 mm

Discharge diameter
4 inch

Pump information

Impeller diameter
230 mm

Discharge diameter
4 inch

Inlet diameter
150 mm

Maximum operating speed
3550 rpm

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron ™

Project		**Created by**	Ron Mosher	
Block		**Created on**	5/3/2022	**Last update** 5/3/2022

NP 3202 SH 3~ 273

Technical specification

Motor - General

Motor number N3202.095 30-27-2AA-W 72hp	**Phases** 3~	**Rated speed** 3550 rpm	**Rated power** 72 hp
ATEX approved FM	**Number of poles** 2	**Rated current** 78 A	**Stator variant** 1
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 095			

Motor - Technical

Power factor - 1/1 Load 0.93	**Motor efficiency - 1/1 Load** 92.5 %	**Total moment of inertia** 4.78 lb ft²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.92	**Motor efficiency - 3/4 Load** 93.0 %	**Starting current, direct starting** 550 A	
Power factor - 1/2 Load 0.88	**Motor efficiency - 1/2 Load** 92.5 %	**Starting current, star-delta** 183 A	

Project	**Created by**	Ron Mosher		
Block	**Created on**	5/3/2022	**Last update**	5/3/2022

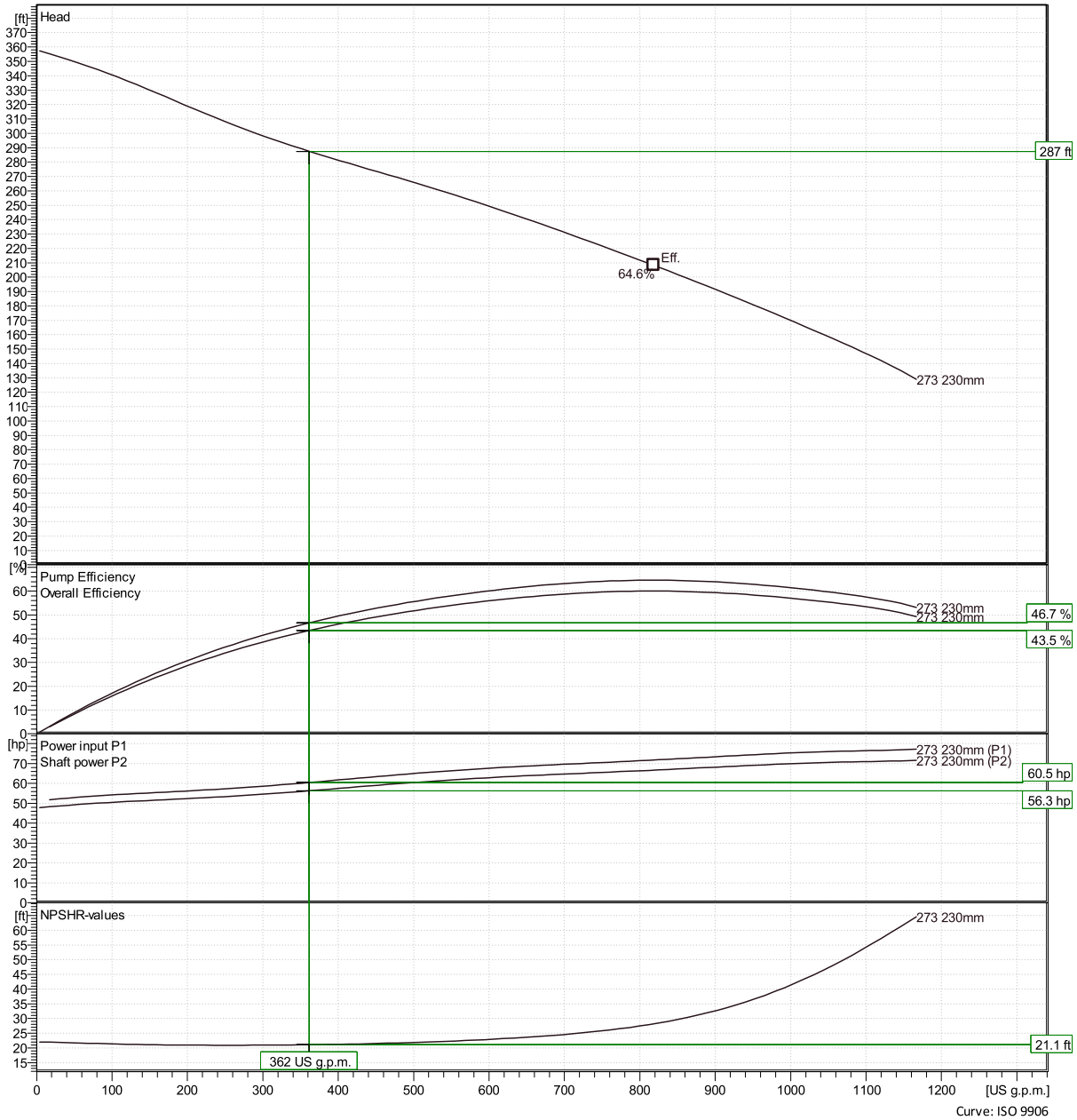
NP 3202 SH 3~ 273

Performance curve

Duty point

Flow	Head
362 US g.p.m.	287 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

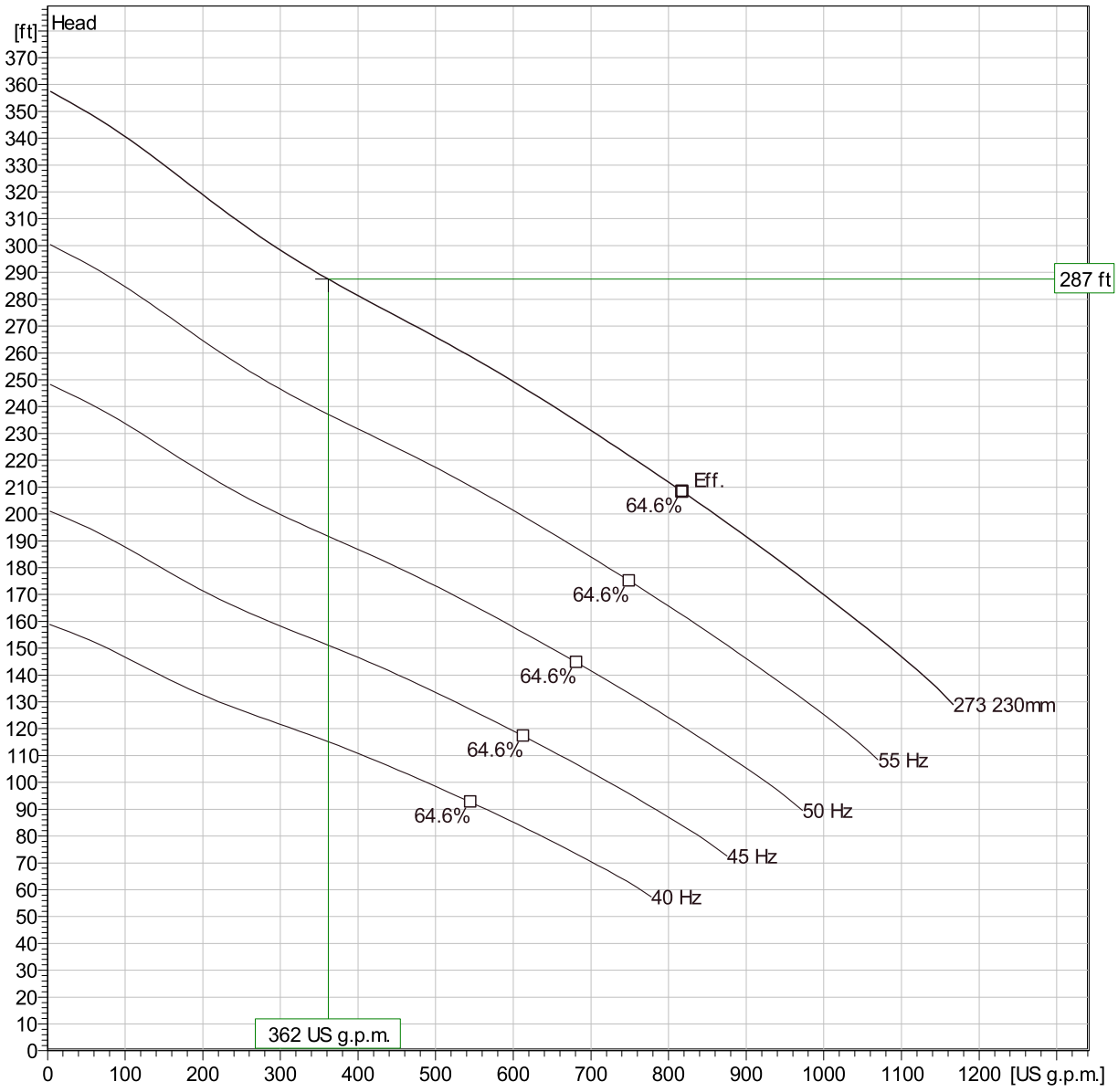
Ron Mosher

Created on 5/3/2022 **Last update** 5/3/2022

NP 3202 SH 3~ 273

Duty Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Operating characteristics

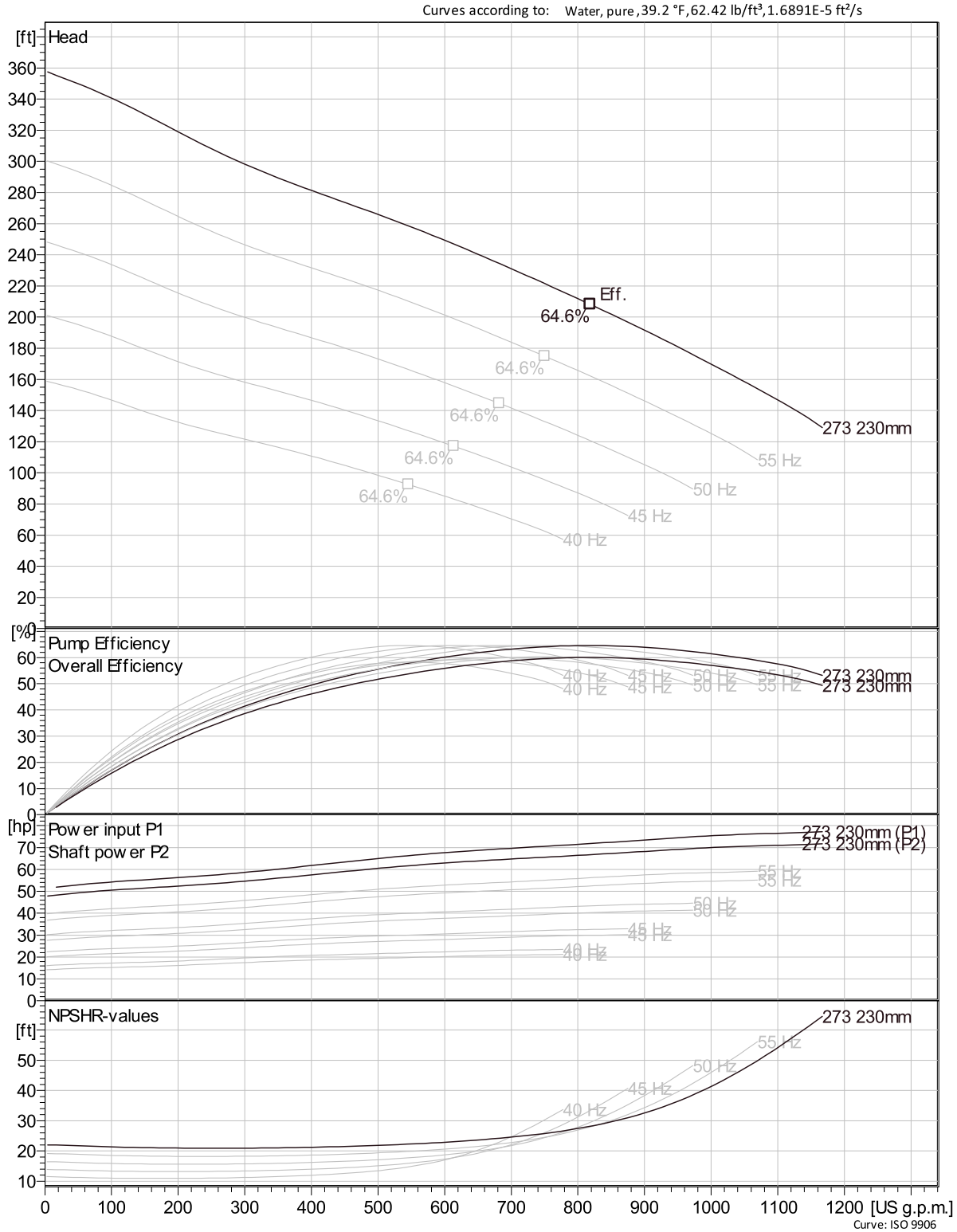
Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	362	287	56.3	362	287	56.3	46.7 %	2080	21.1

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/3/2022	**Last update**	5/3/2022

NP 3202 SH 3~ 273

VFD Curve

Curves according to: Water, pure ,39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s

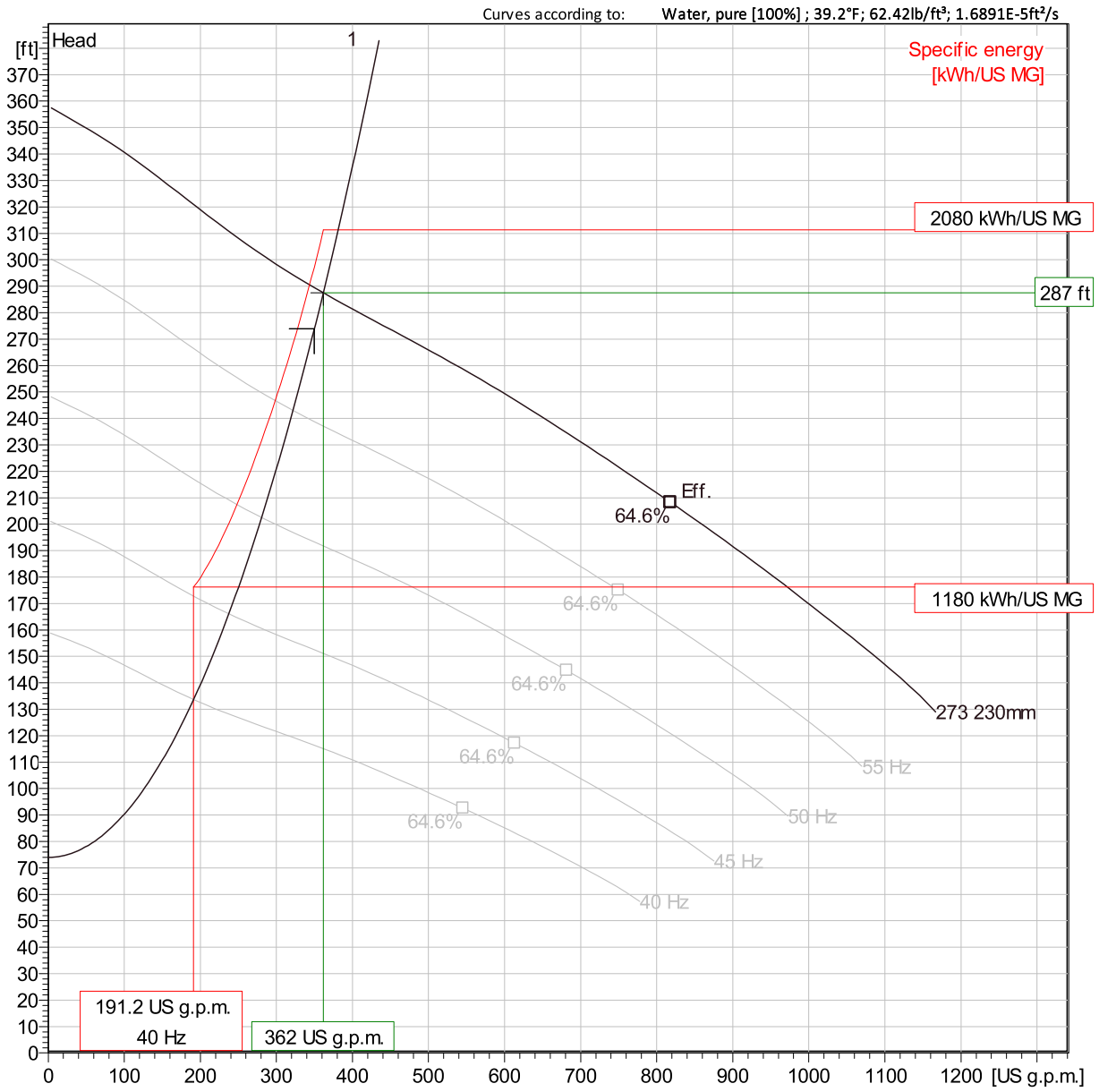


Curve: ISO 9906

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/3/2022	**Last update**	5/3/2022

NP 3202 SH 3~ 273

VFD Analysis



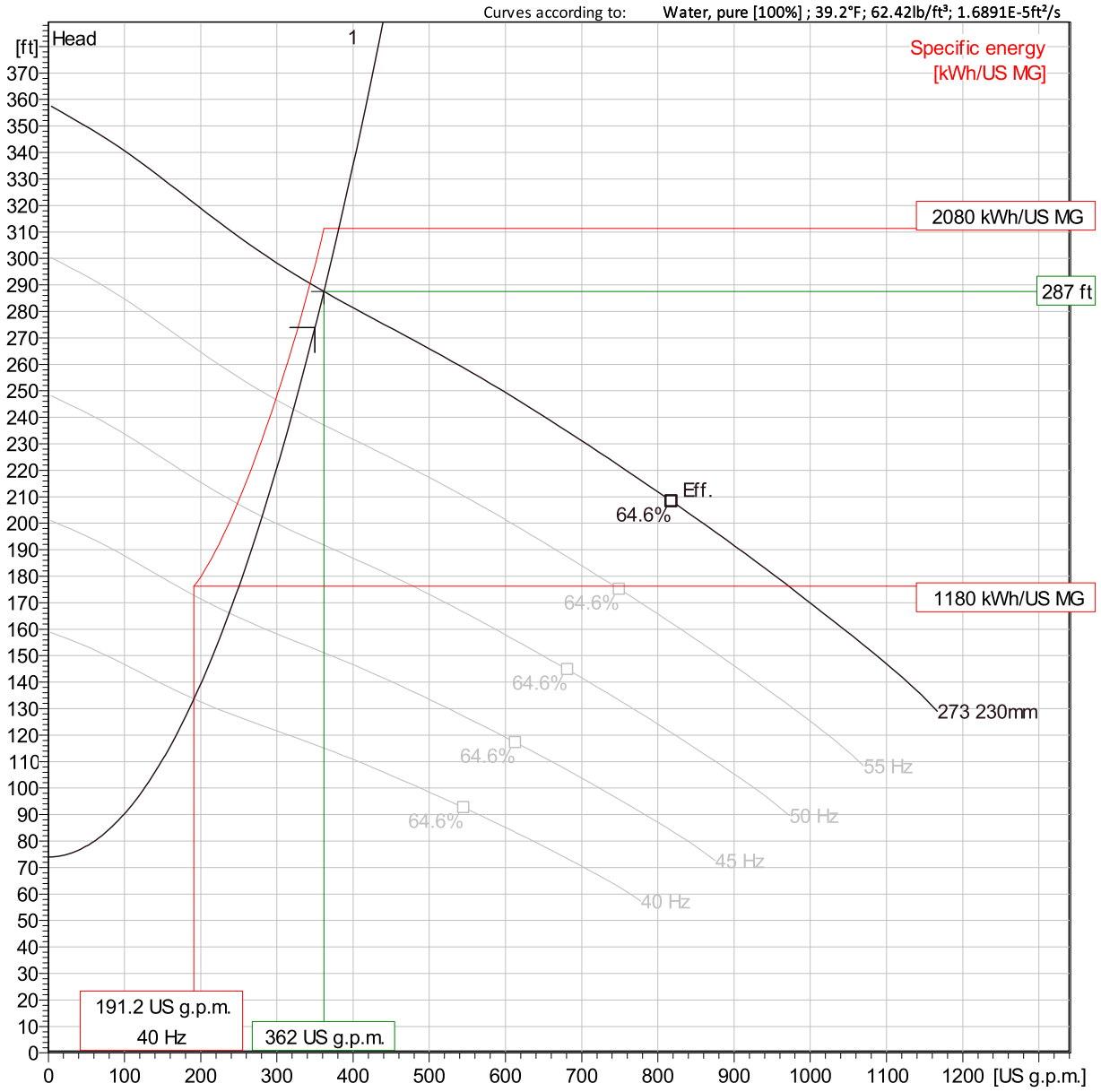
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	60 Hz	362	287	56.3	362	287	56.3	46.7 %	2080	21.1
1	55 Hz	322	243	43.2	322	243	43.2	45.9 %	2290	18.3
1	50 Hz	281	203	32.2	281	203	32.2	44.7 %	2570	15.7
1	45 Hz	237	166	23.2	237	166	23.2	42.9 %	2990	13.2

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/3/2022	**Last update**	5/3/2022

NP 3202 SH 3~ 273

VFD Analysis



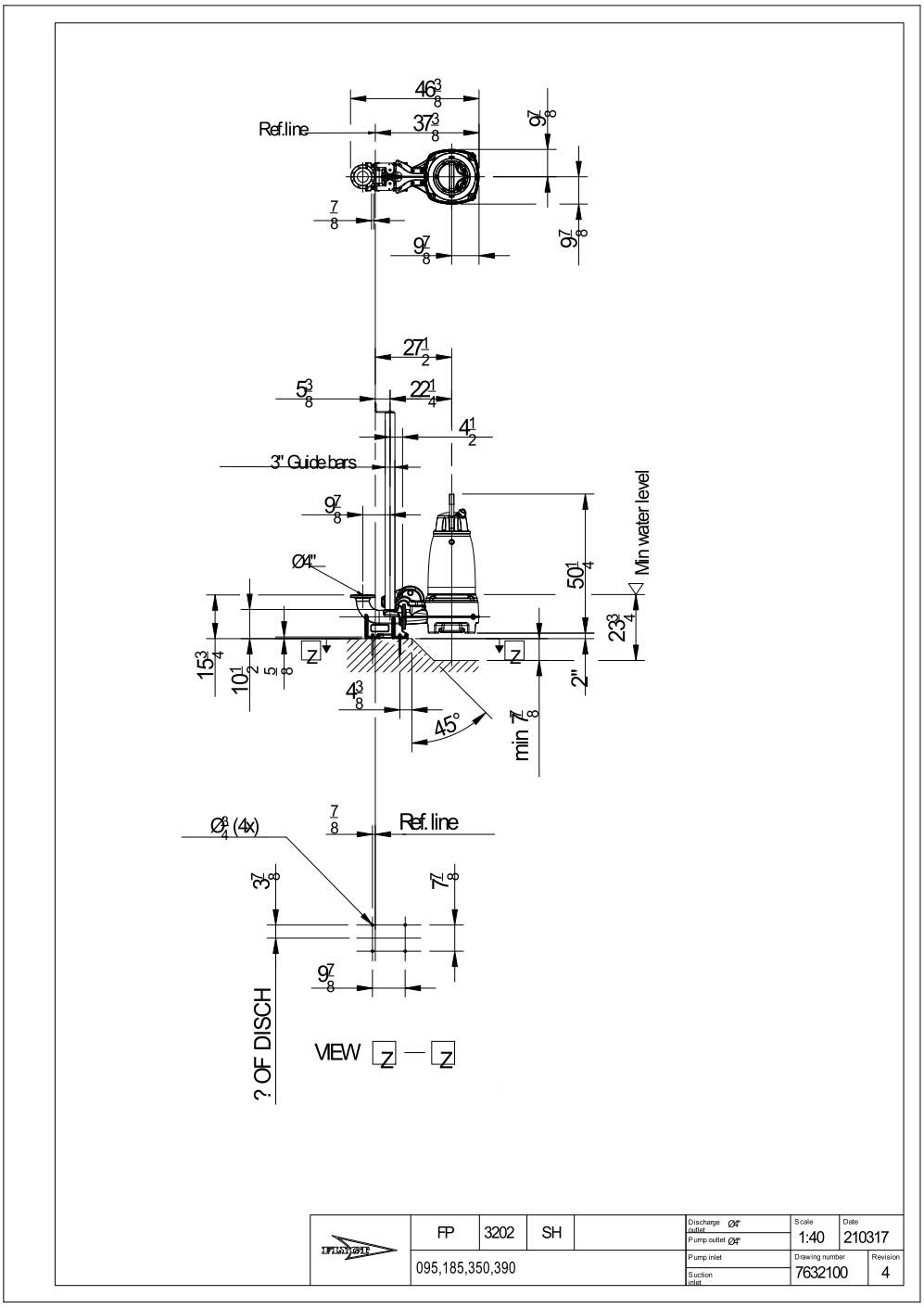
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	40 Hz	191	134	16.1	191	134	16.1	40.2 %	3650	10.9

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/3/2022	**Last update**	5/3/2022

NP 3202 SH 3~ 273

Dimensional drawing



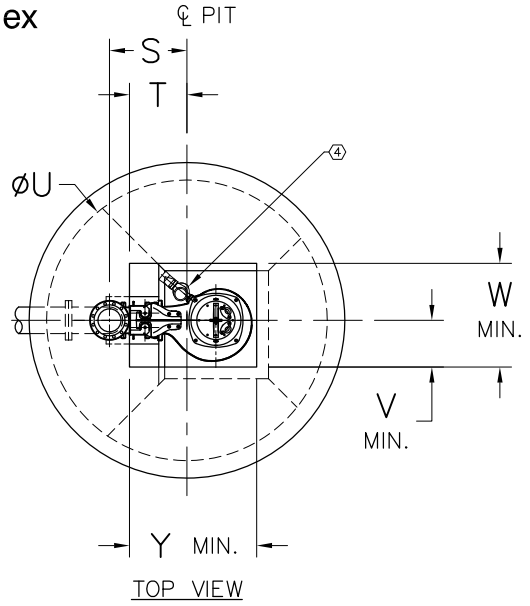
Project	**Created by**	Ron Mosher	
Block	**Created on**	5/3/2022	**Last update** 5/3/2022

FP/NP-3202

NOTES:

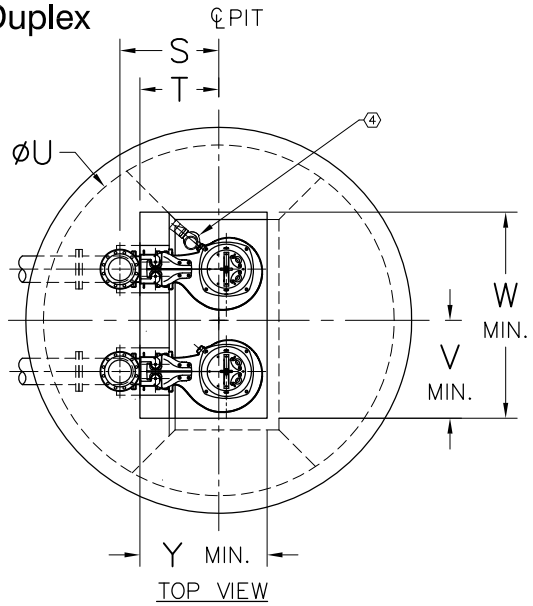
1. CONFIGURATION AND DIMS. SHOWN ARE SUGGESTED REQUIREMENTS ONLY. ALL DETAILS, INCLUDING SIZING OF PIT, TYPE, LOCATION AND ARRANGEMENT OF VALVES AND PIPING, ETC. ARE TO BE SPECIFIED BY THE CONSULTING ENGINEER AND ARE SUBJECT TO THEIR APPROVAL.
2. REFERENCE GENERIC DUPLEX LIFT STATION LAYOUT FOR ELEVATION VIEW.
3. LOCATE ANCHOR BOLTS USING INSIDE EDGE OF CLEAR OPENING AND PUMP CENTERLINE AS REFERENCE POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP TO CLEAR OPENING.
4. FLYGT MIX–FLUSH VALVE.

Simplex

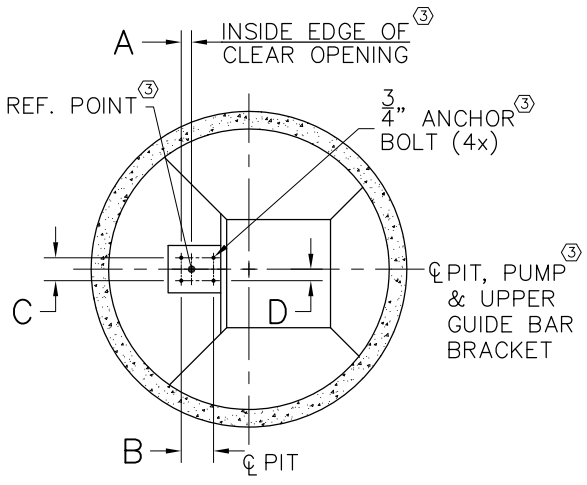


TOP VIEW

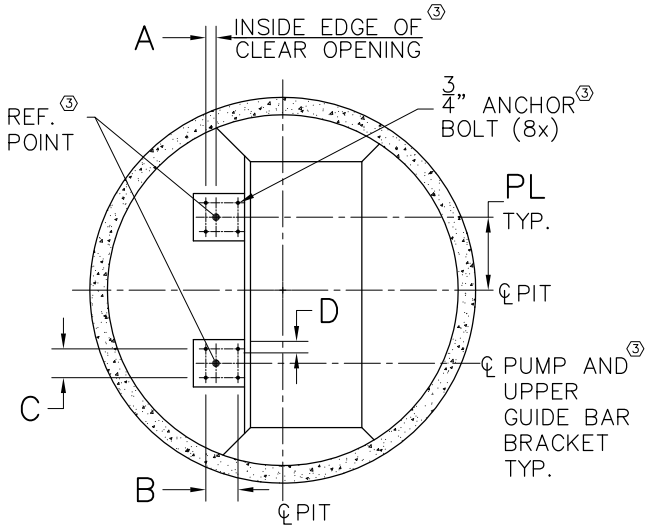
Duplex



TOP VIEW



BASE SECTION



BASE SECTION

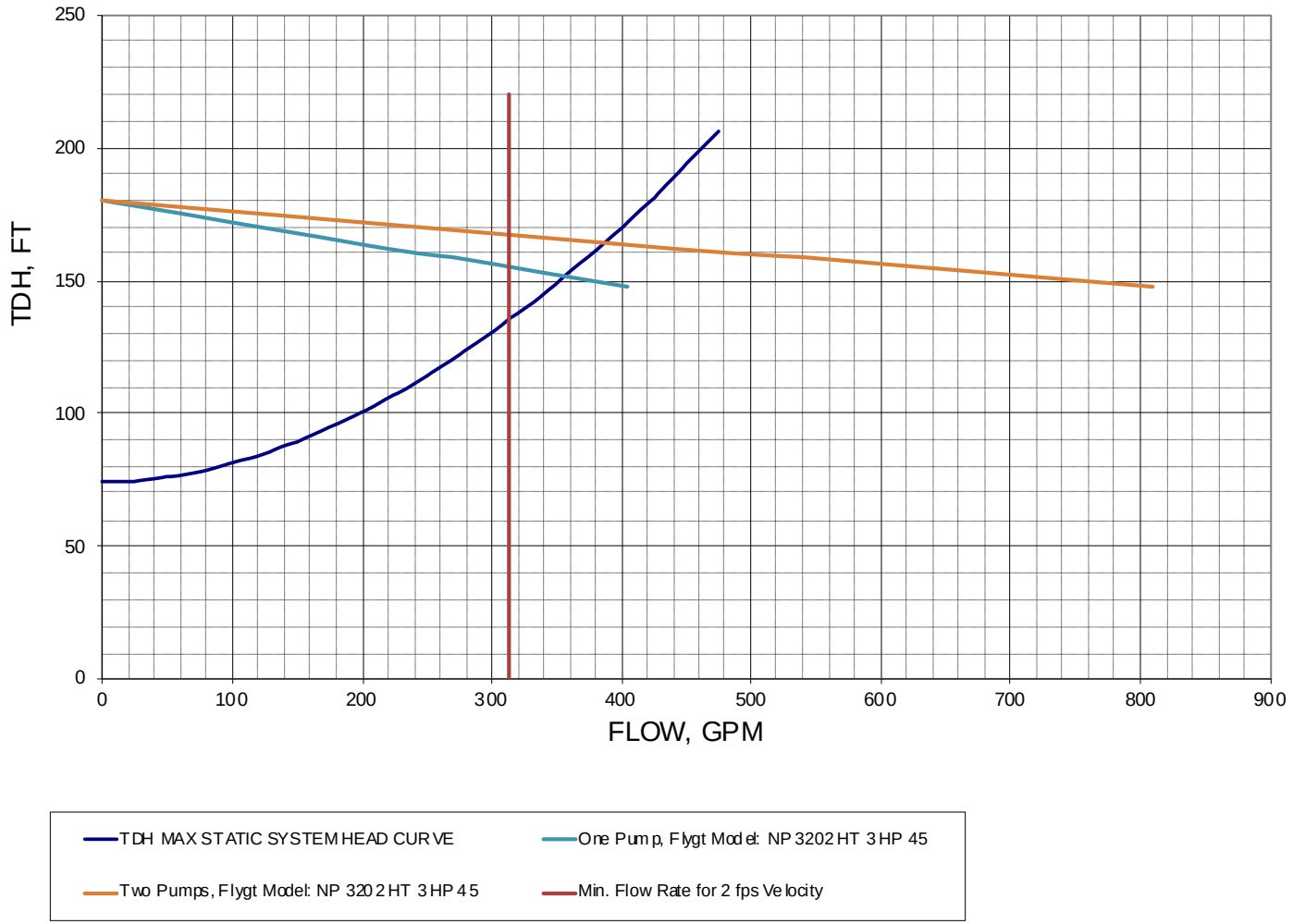
ALL DIMENSIONS ARE IN INCHES

MODEL	NOM. SIZE	VERSION	A	B	C	D	SIMPLEX S	T	U	V	W	Y	DUPLEX S	T	U	PL	V	W	Y
FP/NP	4"	SH	7/8	9 7/8	6	3	16	11 5/8	60	11 3/4	23 1/2	39	16	11 5/8	72	12	23 3/4	47 1/2	39
FP/NP	4"	HT	7/8	9 7/8	6	3	25 3/4	21 1/2	84	14	34	40 3/4	28	23 3/4	96	15	29	64	40 3/4
FP/NP	6"	HT	2 3/8	11	10	5	22 7/8	17 1/4	84	14	34	40 1/2	23 1/2	17 7/8	96	15	29	64	40 1/2
FP/NP	8"	MT	3 1/2	11	10	5	20 1/8	13 1/4	84	16	35 1/2	43 1/2	33 7/8	27	120	17 1/2	33 1/2	70 1/2	43 1/2
NP	12"	LT	7 1/2	19 3/4	20 3/4	10 3/8	33	21 1/4	120	20 1/2	41 1/2	52	35 1/4	23 1/2	144	28	48 1/2	97 1/2	52

ATTACHMENT C:

MAIN VILLAGE LIFT STATION
WITH 8-INCH FORCEMAIN TO GALISTEO LIFT STATION
FOR 20-YEAR FLOW PROJECTIONS

SANTO DOMINGO
Main Village Lift Station - 8" FM



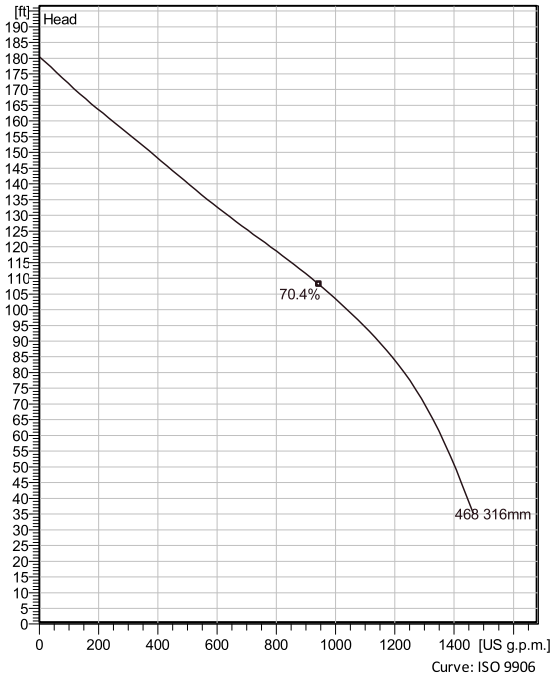
NP 3202 HT 3~ 468

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification



Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Configuration

Motor number
N3202.095 30-19-4AA-W 45hp

Installation type
P - Semi permanent, Wet

Impeller diameter
316 mm

Discharge diameter
4 inch

Pump information

Impeller diameter
316 mm

Discharge diameter
4 inch

Inlet diameter
200 mm

Maximum operating speed
1770 rpm

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron ™

Project		**Created by**	Ron Mosher	
Block		**Created on**	5/3/2022	**Last update** 5/3/2022

NP 3202 HT 3~ 468

Technical specification

Motor - General

Motor number N3202.095 30-19-4AA-W 45hp	**Phases** 3~	**Rated speed** 1770 rpm	**Rated power** 45 hp
ATEX approved FM	**Number of poles** 4	**Rated current** 51 A	**Stator variant** 4
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 095			

Motor - Technical

Power factor - 1/1 Load 0.91	**Motor efficiency - 1/1 Load** 90.5 %	**Total moment of inertia** 8.22 lb ft²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.89	**Motor efficiency - 3/4 Load** 91.5 %	**Starting current, direct starting** 315 A	
Power factor - 1/2 Load 0.82	**Motor efficiency - 1/2 Load** 91.5 %	**Starting current, star-delta** 105 A	

Project	**Created by**	Ron Mosher		
Block	**Created on**	5/3/2022	**Last update**	5/3/2022

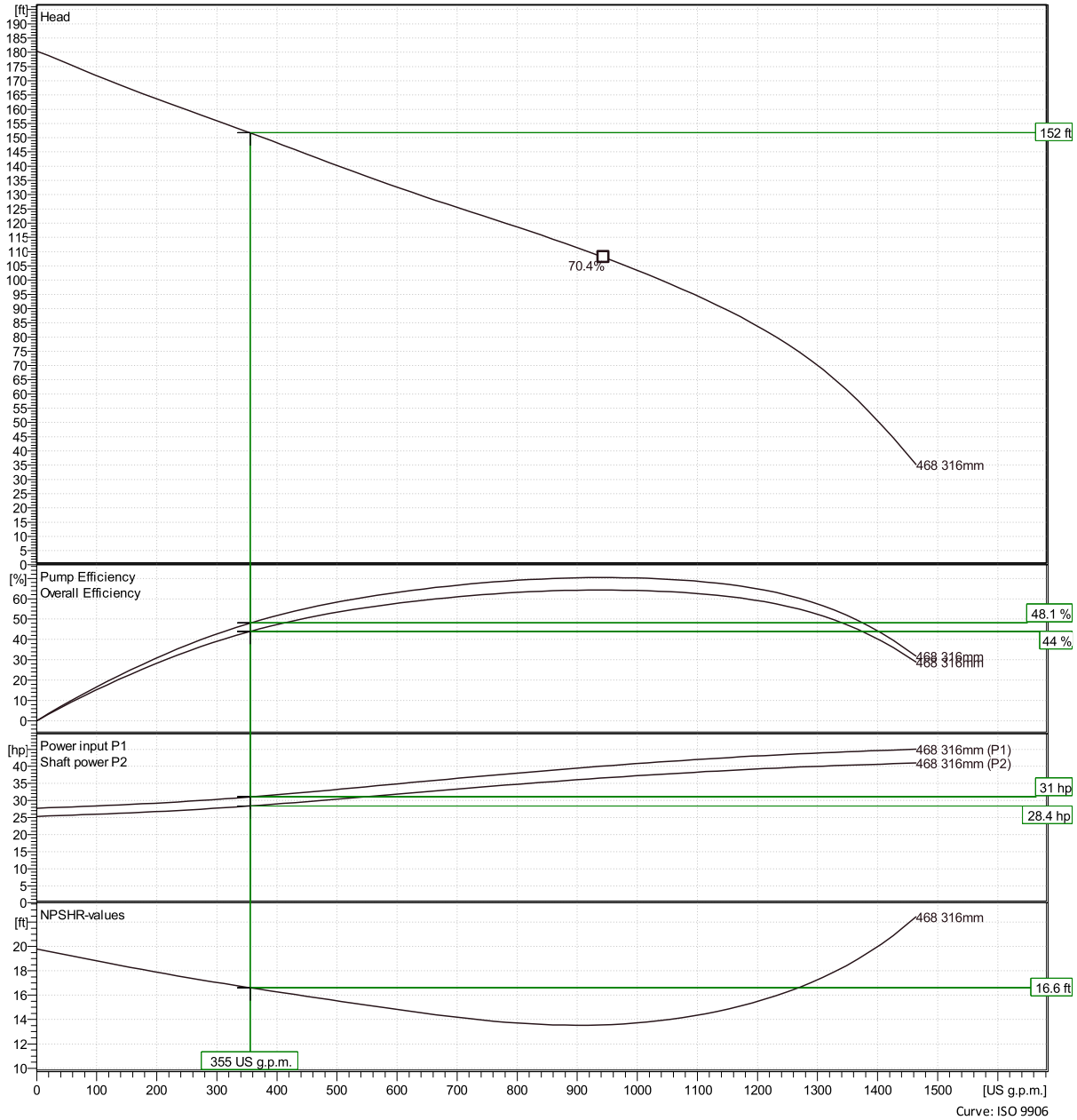
NP 3202 HT 3~ 468

Performance curve

Duty point

Flow	Head
355 US g.p.m.	152 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

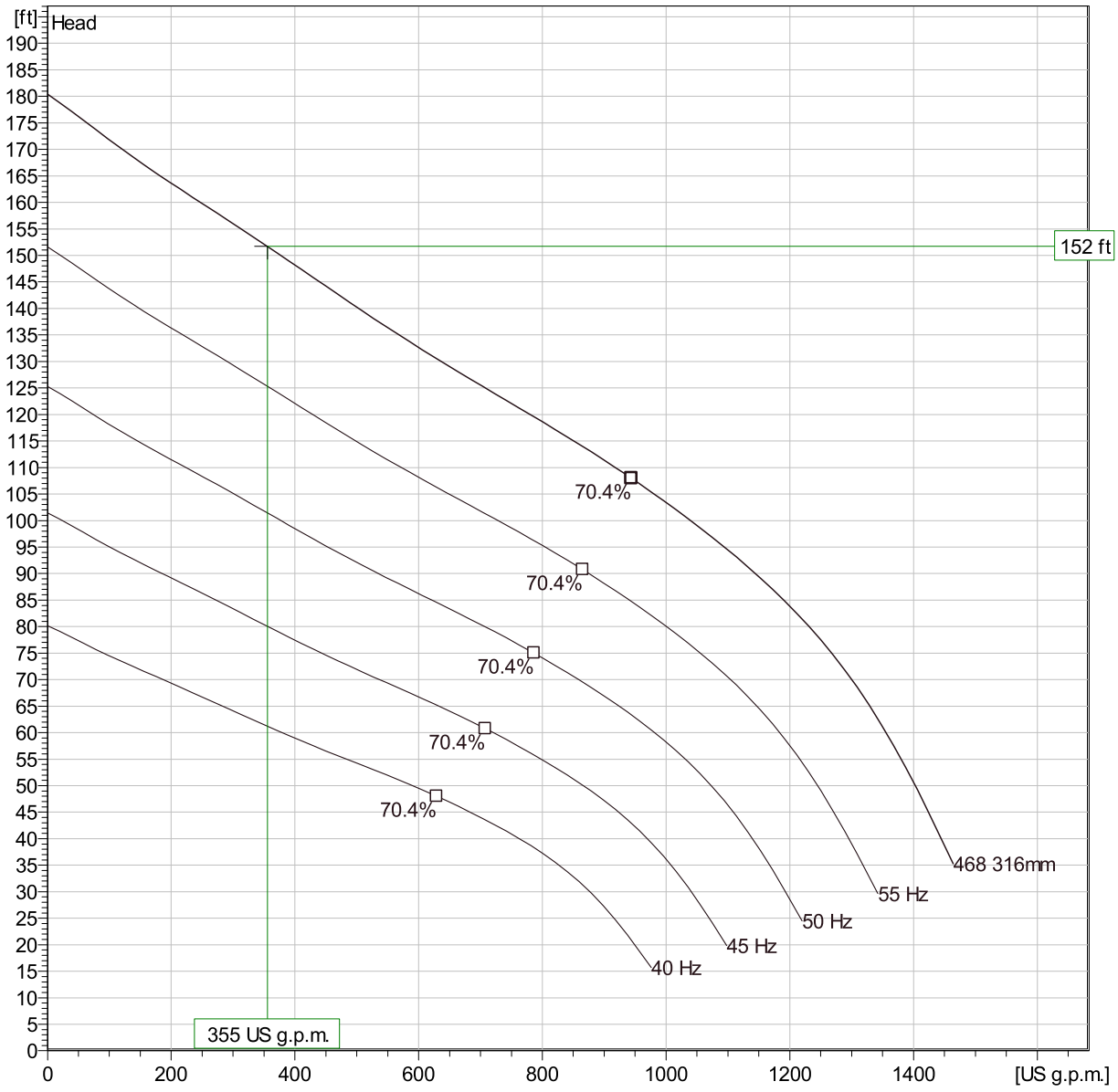
Ron Mosher

Created on 5/3/2022 **Last update** 5/3/2022

NP 3202 HT 3~ 468

Duty Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



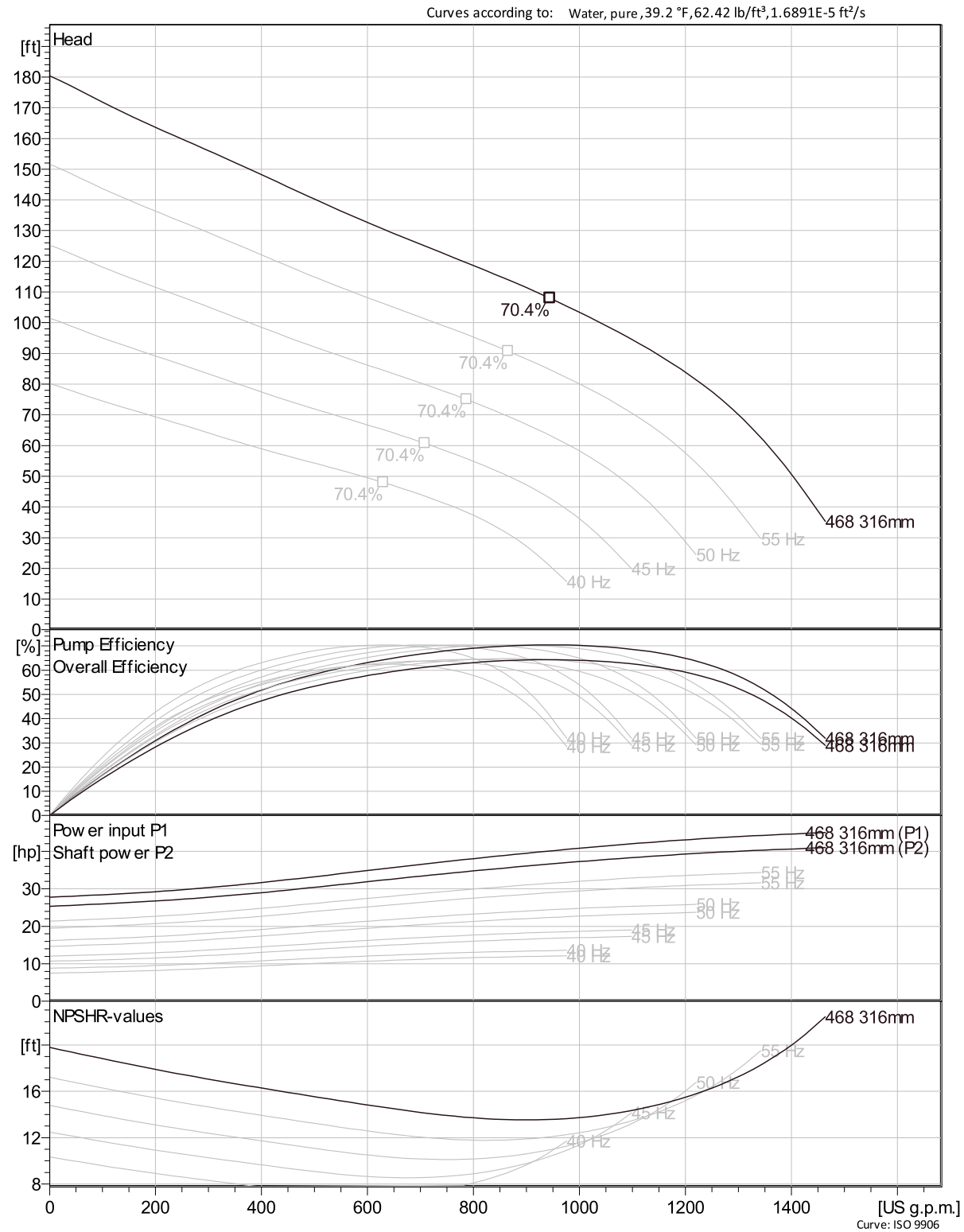
Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	355	152	28.4	355	152	28.4	48.1 %	1090	16.6

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/3/2022	**Last update**	5/3/2022

NP 3202 HT 3~ 468

VFD Curve

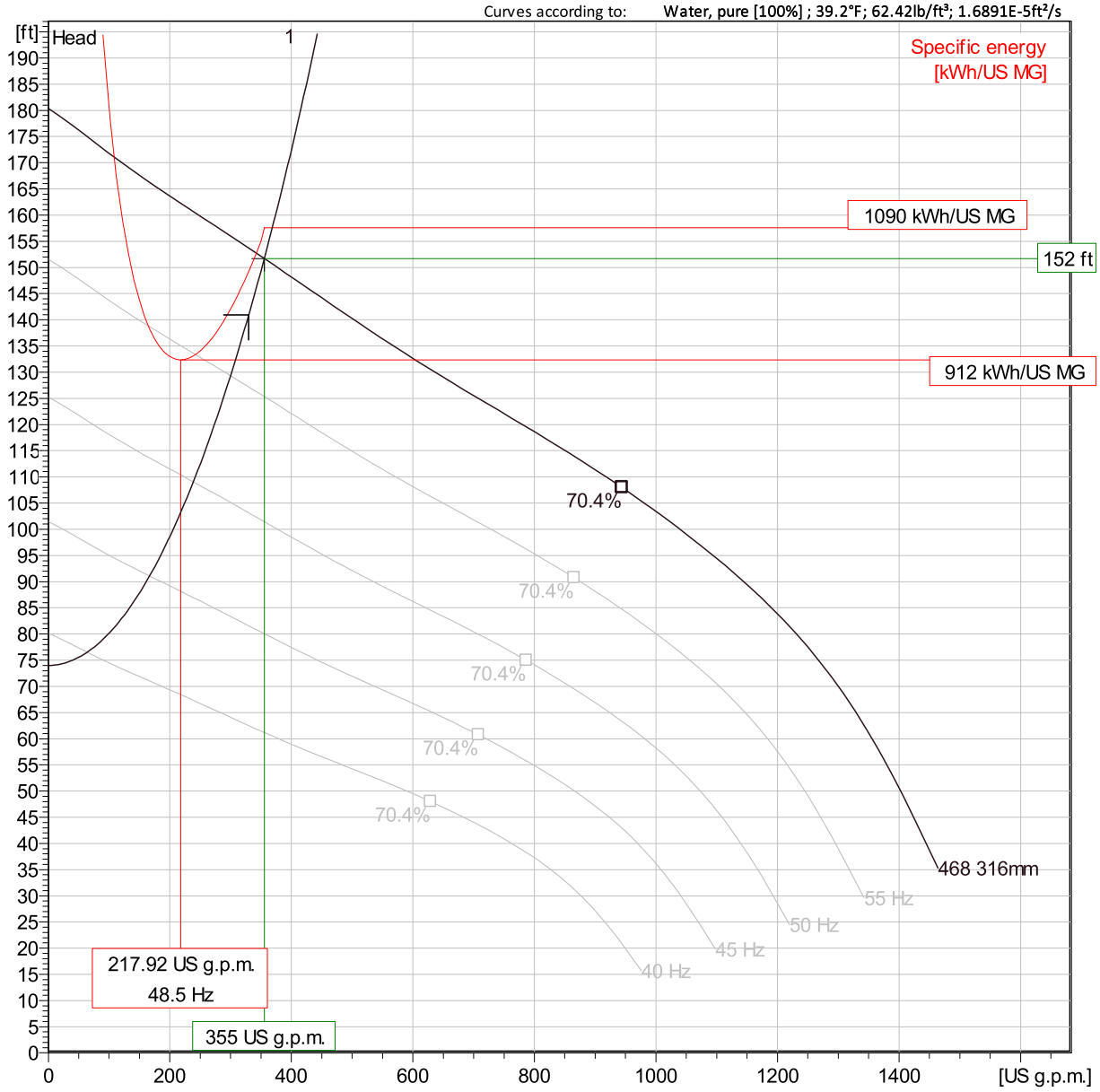


Project		**Created by**	Ron Mosher		
Block		**Created on**	5/3/2022	**Last update**	5/3/2022

NP 3202 HT 3~ 468

VFD Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Operating Characteristics

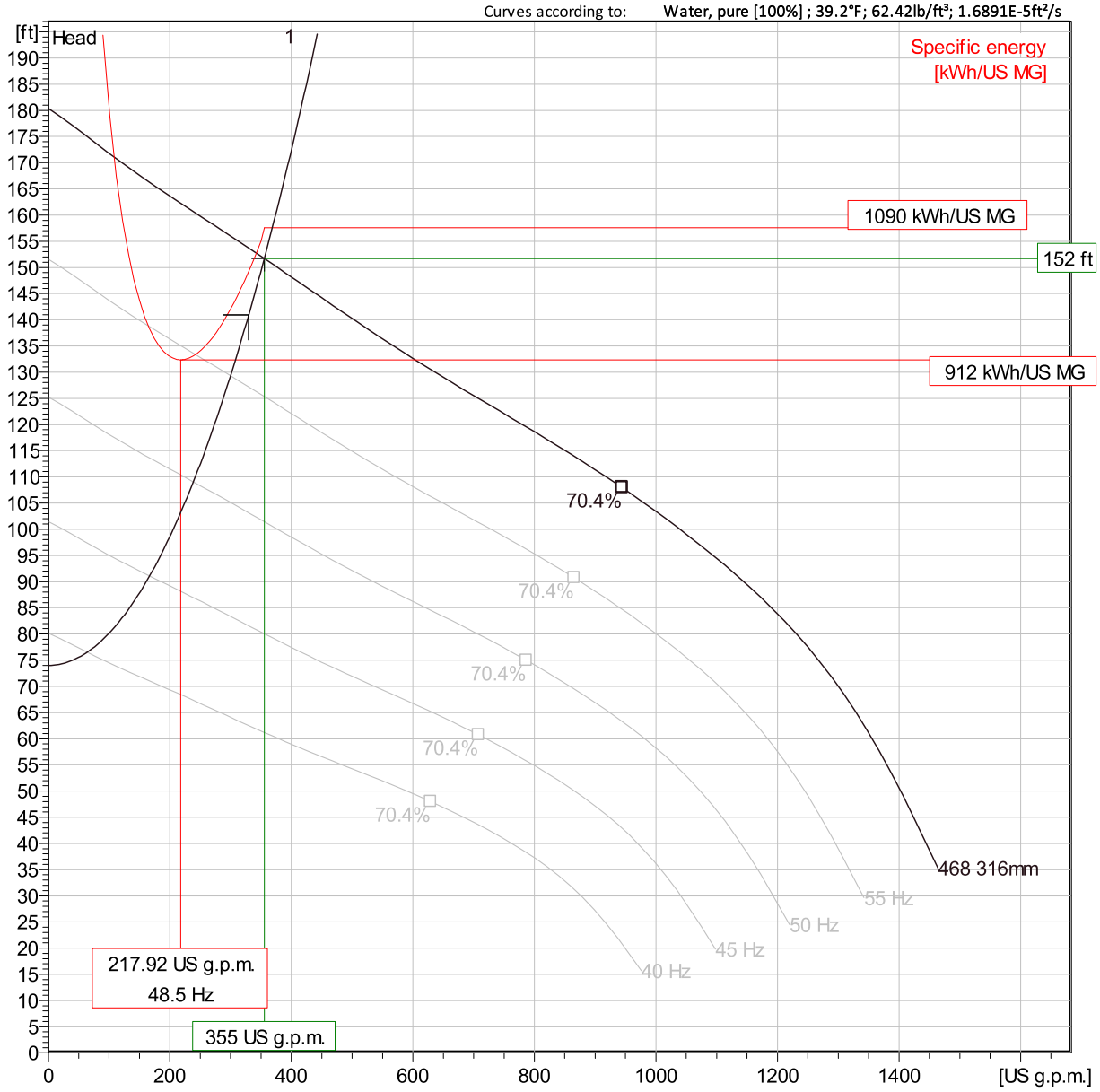
Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	60 Hz	355	152	28.4	355	152	28.4	48.1 %	1090	16.6
1	55 Hz	300	129	21.6	300	129	21.6	45.4 %	1260	14.6
1	50 Hz	239	109	16	239	109	16	41.3 %	1540	12.8
1	45 Hz	167	91.1	11.4	167	91.1	11.4	33.8 %	2160	11.2

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/3/2022	**Last update**	5/3/2022

NP 3202 HT 3~ 468

VFD Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



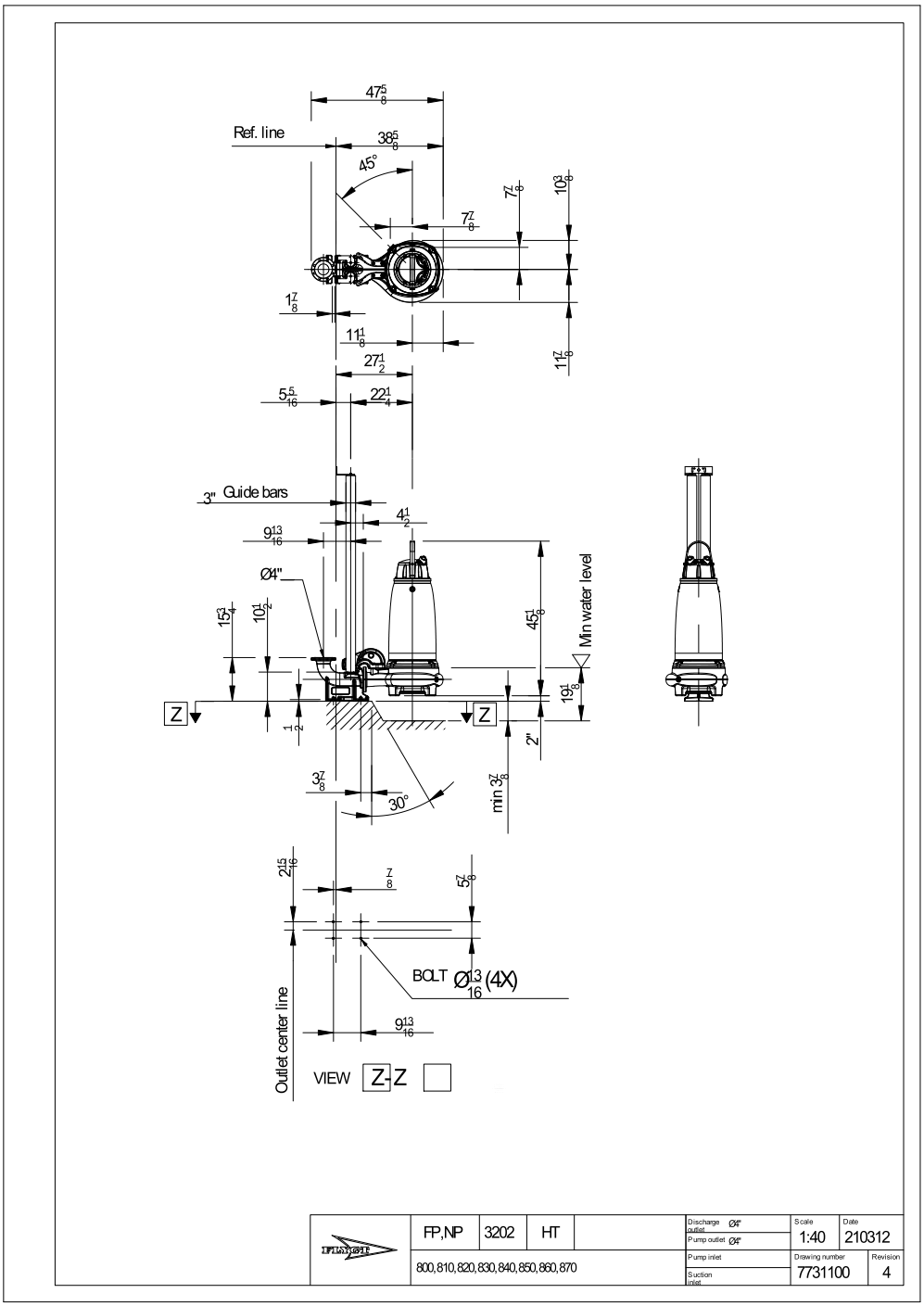
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	40 Hz	63.9	76.5	7.69	63.9	76.5	7.69	16.1 %	5480	9.85

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/3/2022	**Last update**	5/3/2022

NP 3202 HT 3~ 468

Dimensional drawing



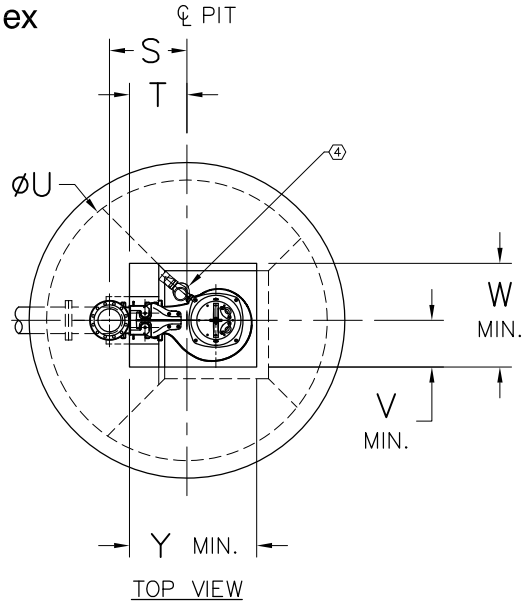
Project	**Created by**	Ron Mosher	
Block	**Created on**	5/3/2022	**Last update** 5/3/2022

FP/NP-3202

NOTES:

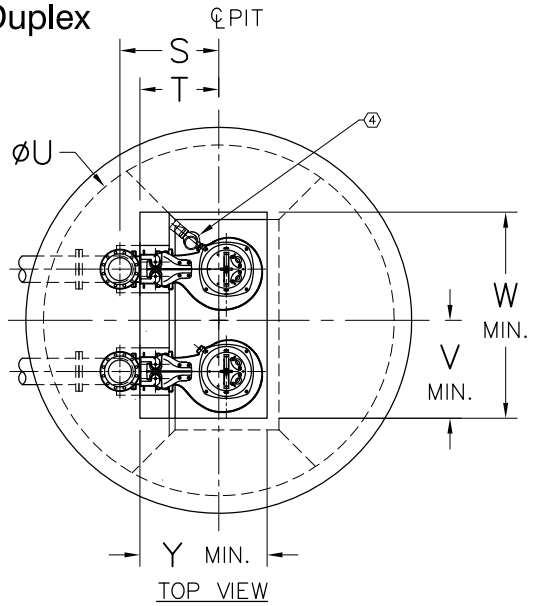
1. CONFIGURATION AND DIMS. SHOWN ARE SUGGESTED REQUIREMENTS ONLY. ALL DETAILS, INCLUDING SIZING OF PIT, TYPE, LOCATION AND ARRANGEMENT OF VALVES AND PIPING, ETC. ARE TO BE SPECIFIED BY THE CONSULTING ENGINEER AND ARE SUBJECT TO THEIR APPROVAL.
2. REFERENCE GENERIC DUPLEX LIFT STATION LAYOUT FOR ELEVATION VIEW.
3. LOCATE ANCHOR BOLTS USING INSIDE EDGE OF CLEAR OPENING AND PUMP CENTERLINE AS REFERENCE POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP TO CLEAR OPENING.
4. FLYGT MIX–FLUSH VALVE.

Simplex

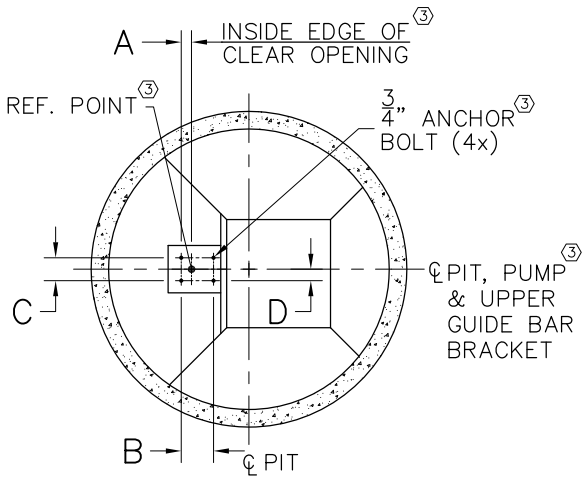


TOP VIEW

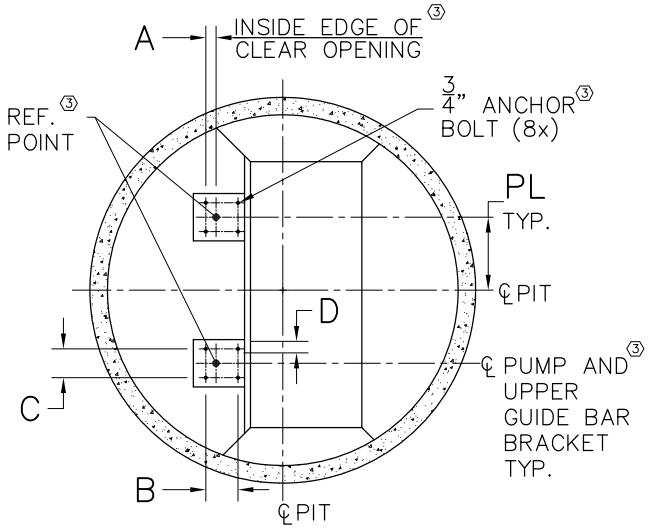
Duplex



TOP VIEW



BASE SECTION



BASE SECTION

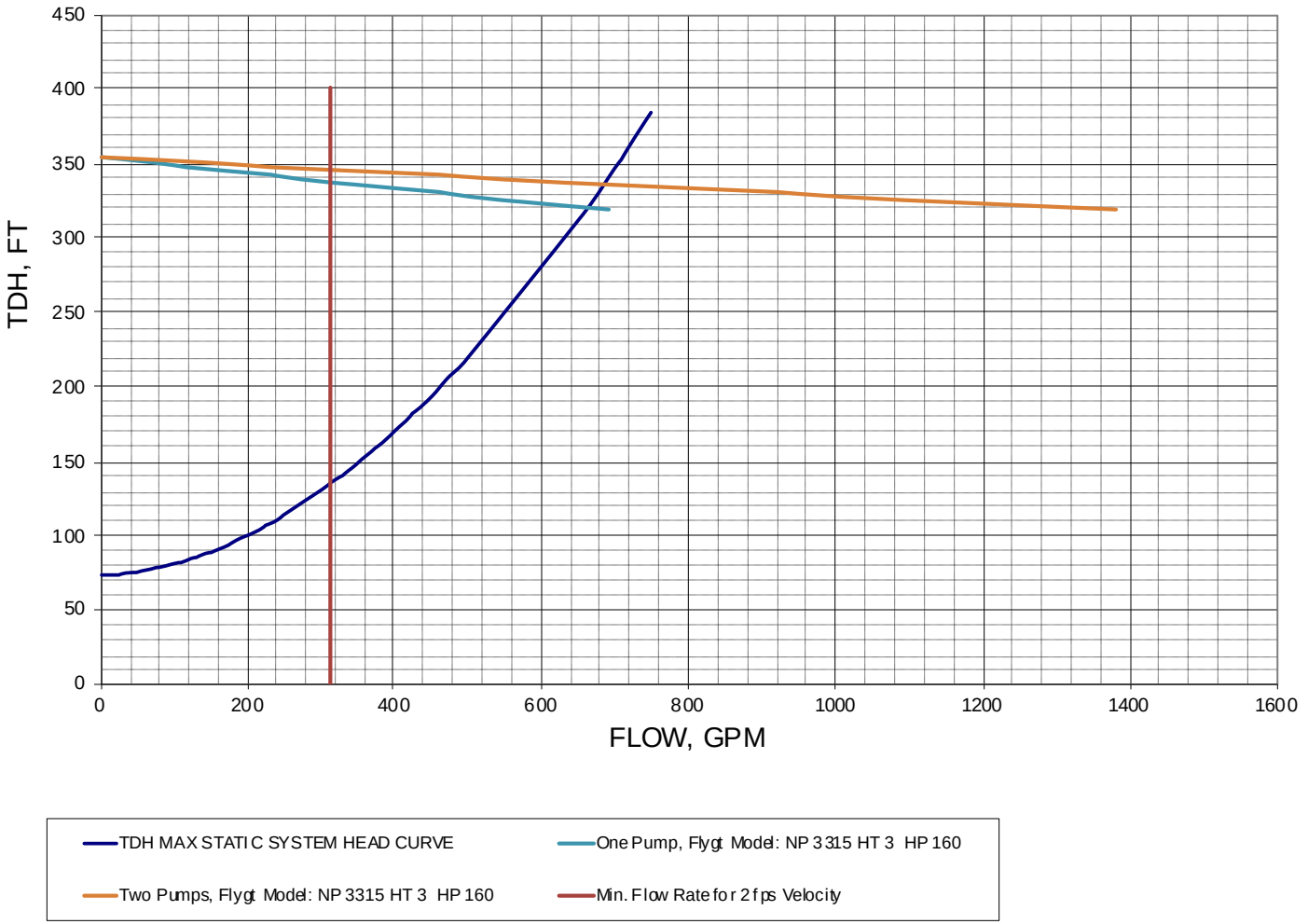
ALL DIMENSIONS ARE IN INCHES

MODEL	NOM. SIZE	VERSION	A	B	C	D	SIMPLEX S	T	U	V	W	Y	DUPLEX S	T	U	PL	V	W	Y
FP/NP	4"	SH	7/8	9 7/8	6	3	16	11 5/8	60	11 3/4	23 1/2	39	16	11 5/8	72	12	23 3/4	47 1/2	39
FP/NP	4"	HT	7/8	9 7/8	6	3	25 3/4	21 1/2	84	14	34	40 3/4	28	23 3/4	96	15	29	64	40 3/4
FP/NP	6"	HT	2 3/8	11	10	5	22 7/8	17 1/4	84	14	34	40 1/2	23 1/2	17 7/8	96	15	29	64	40 1/2
FP/NP	8"	MT	3 1/2	11	10	5	20 1/8	13 1/4	84	16	35 1/2	43 1/2	33 7/8	27	120	17 1/2	33 1/2	70 1/2	43 1/2
NP	12"	LT	7 1/2	19 3/4	20 3/4	10 3/8	33	21 1/4	120	20 1/2	41 1/2	52	35 1/4	23 1/2	144	28	48 1/2	97 1/2	52

ATTACHMENT D:

MAIN VILLAGE LIFT STATION
WITH 8-INCH FORCEMAIN TO GALISTEO LIFT STATION
FOR ULTIMATE FLOW PROJECTIONS

SANTO DOMINGO
Main Village Lift Station - 8" FM



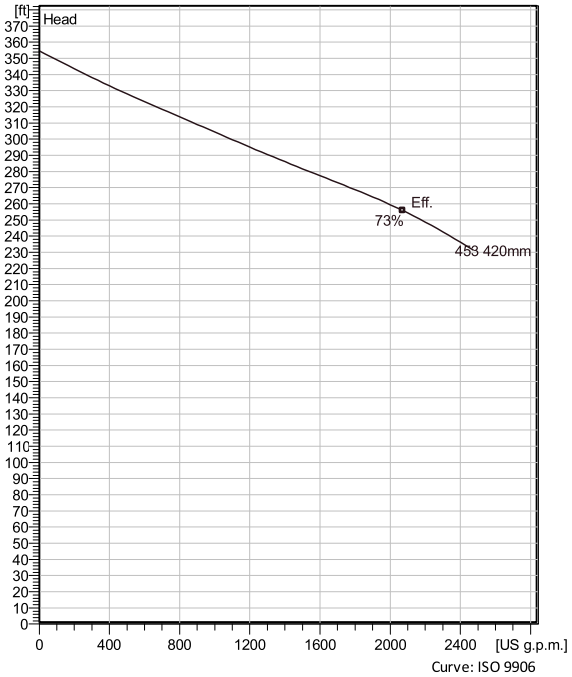
NP 3315 HT 3~ 453

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification



Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Configuration

Motor number
N3315.095 35-45-4AA-W 160hp

Installation type
P - Semi permanent, Wet

Impeller diameter
420 mm

Discharge diameter
6 inch

Pump information

Impeller diameter
420 mm

Discharge diameter
6 inch

Inlet diameter
200 mm

Maximum operating speed
1780 rpm

Number of blades
3

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron ™

Project		**Created by**	Ron Mosher	
Block		**Created on**	4/28/2022	**Last update** 4/28/2022

NP 3315 HT 3~ 453

Technical specification

Motor - General

Motor number N3315.095 35-45-4AA-W 160hp	**Phases** 3~	**Rated speed** 1780 rpm	**Rated power** 160 hp
ATEX approved FM	**Number of poles** 4	**Rated current** 190 A	**Stator variant** 1
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 095			

Motor - Technical

Power factor - 1/1 Load 0.83	**Motor efficiency - 1/1 Load** 94.7 %	**Total moment of inertia** 32.5 lb ft²	**Starts per hour max.** 15
Power factor - 3/4 Load 0.78	**Motor efficiency - 3/4 Load** 95.4 %	**Starting current, direct starting** 1120 A	
Power factor - 1/2 Load 0.68	**Motor efficiency - 1/2 Load** 95.6 %	**Starting current, star-delta** 375 A	

Project	**Created by**	Ron Mosher		
Block	**Created on**	4/28/2022	**Last update**	4/28/2022

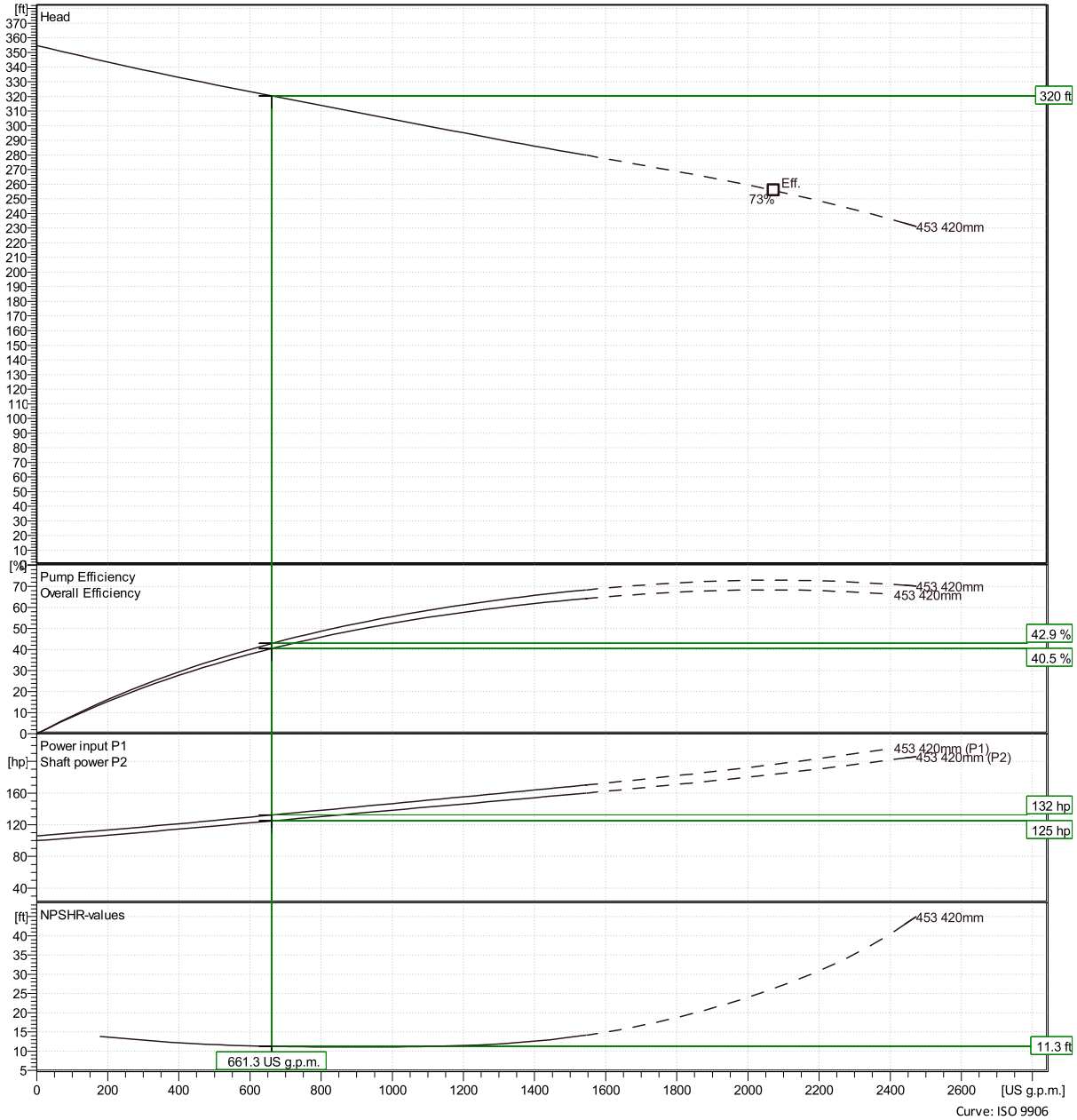
NP 3315 HT 3~ 453

Performance curve

Duty point

Flow	Head
661 US g.p.m.	320 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

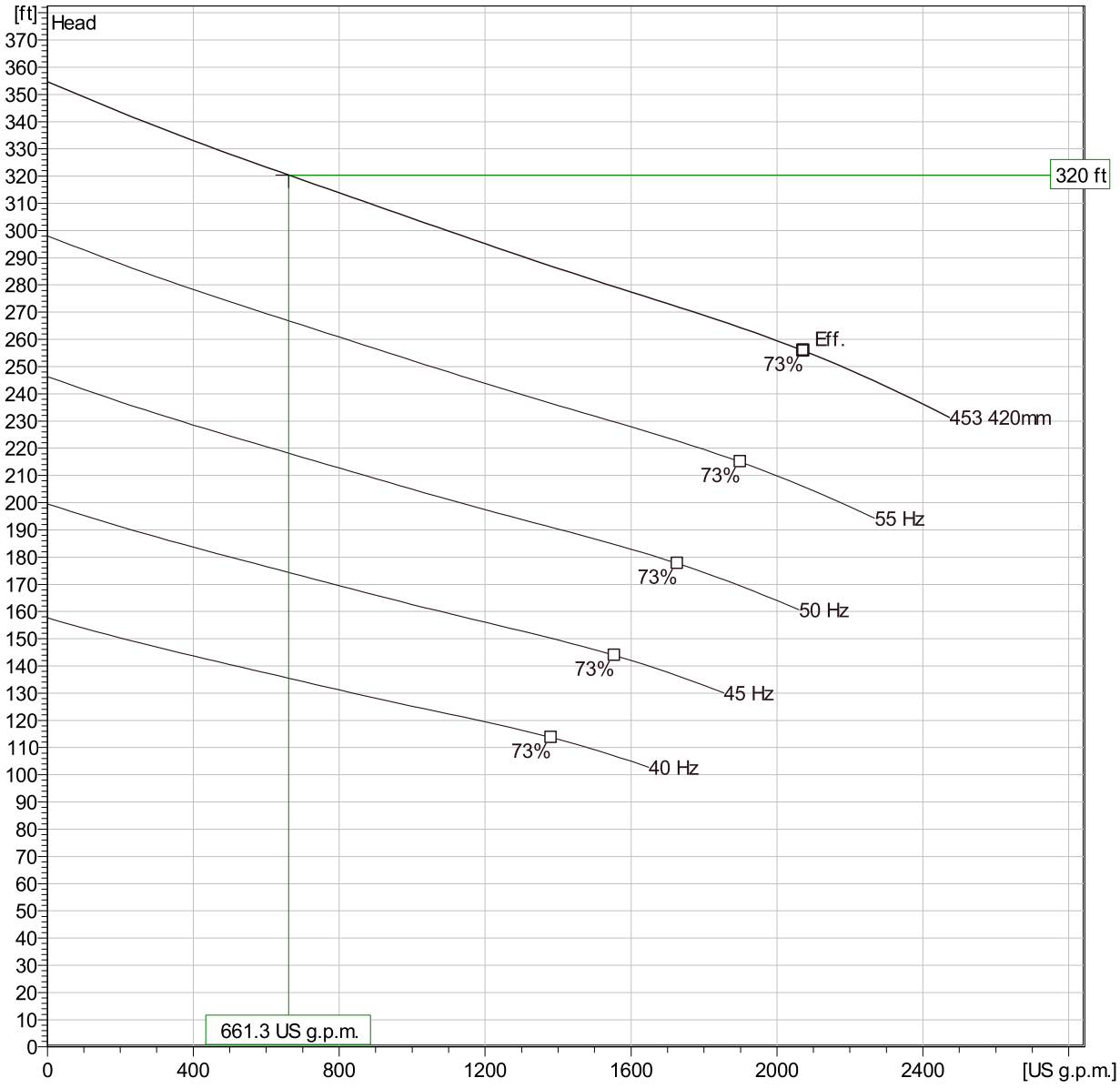
Ron Mosher

Created on 4/28/2022 **Last update** 4/28/2022

NP 3315 HT 3~ 453

Duty Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



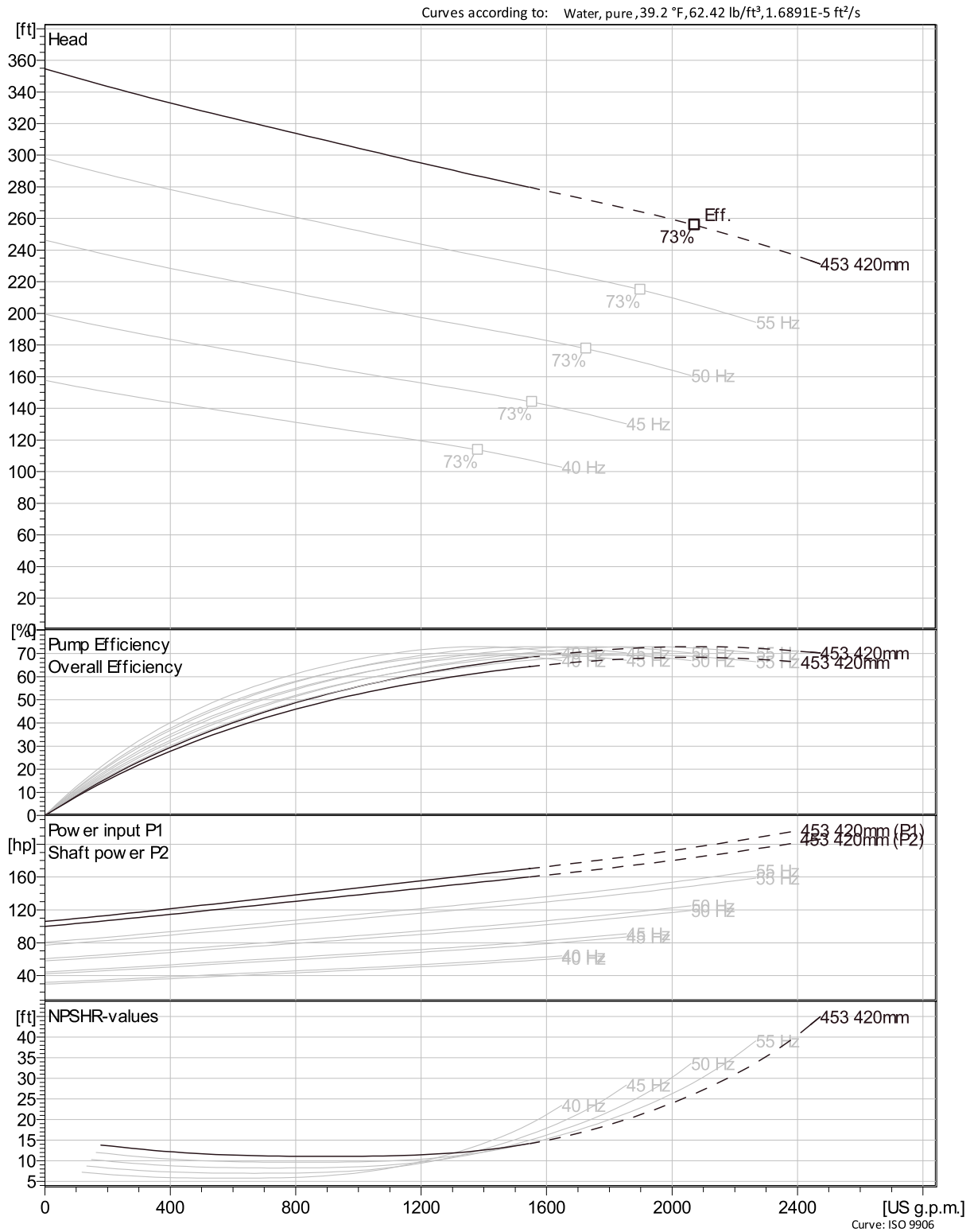
Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	661	320	125	661	320	125	42.9 %	2490	11.3

Project		**Created by**	Ron Mosher		
Block		**Created on**	4/28/2022	**Last update**	4/28/2022

NP 3315 HT 3~ 453

VFD Curve

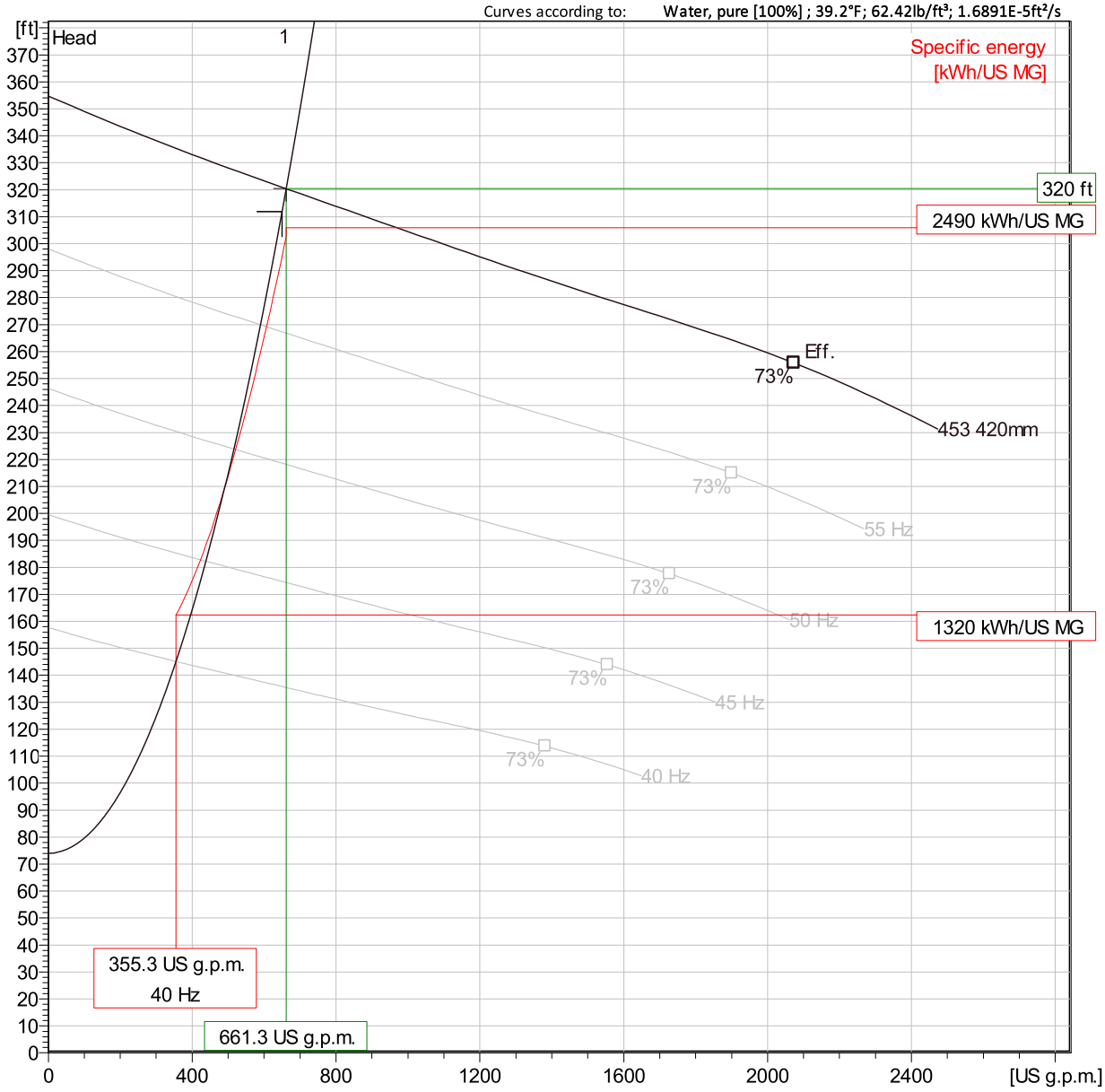


Project		**Created by**	Ron Mosher		
Block		**Created on**	4/28/2022	**Last update**	4/28/2022

NP 3315 HT 3~ 453

VFD Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



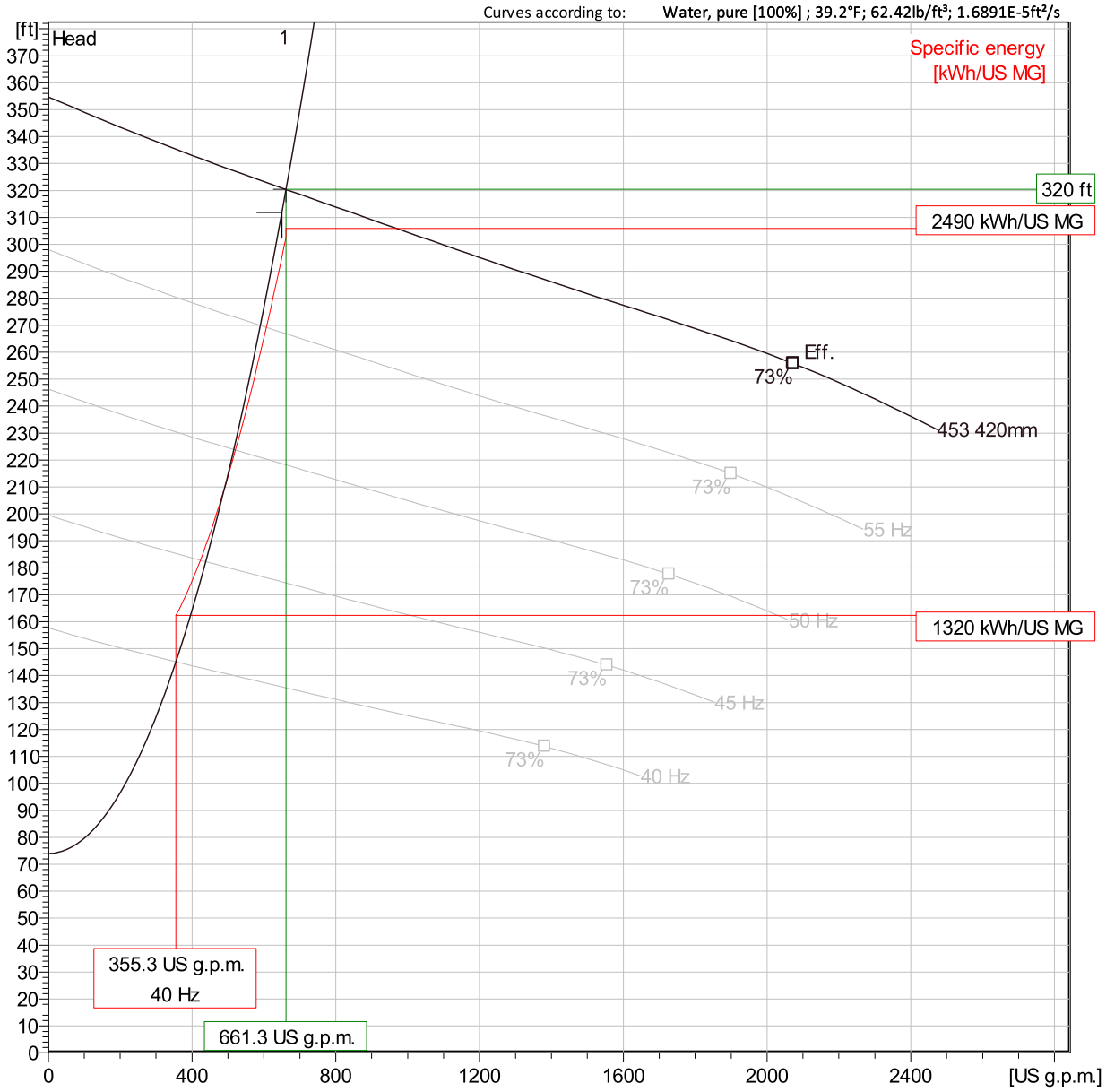
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	60 Hz	661	320	125	661	320	125	42.9 %	2490	11.3
1	55 Hz	590	270	95.6	590	270	95.6	42.1 %	2720	9.83
1	50 Hz	516	224	71.3	516	224	71.3	41 %	3040	8.47
1	45 Hz	438	182	51.4	438	182	51.4	39.3 %	3490	7.21

Project		**Created by**	Ron Mosher		
Block		**Created on**	4/28/2022	**Last update**	4/28/2022

NP 3315 HT 3~ 453

VFD Analysis



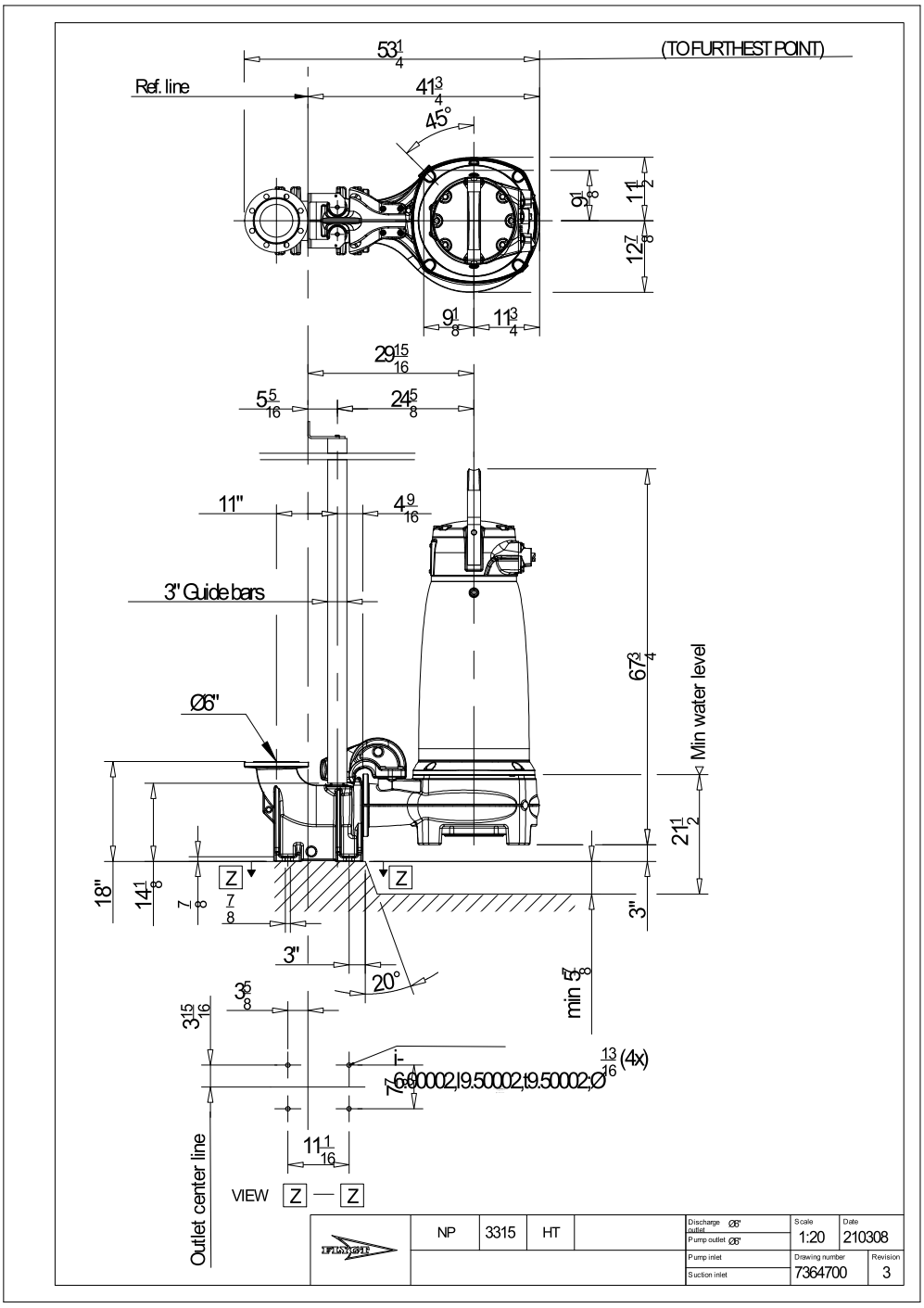
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	40 Hz	355	145	35.5	355	145	35.5	36.8 %	4180	6.06

Project		**Created by**	Ron Mosher		
Block		**Created on**	4/28/2022	**Last update**	4/28/2022

NP 3315 HT 3~ 453

Dimensional drawing



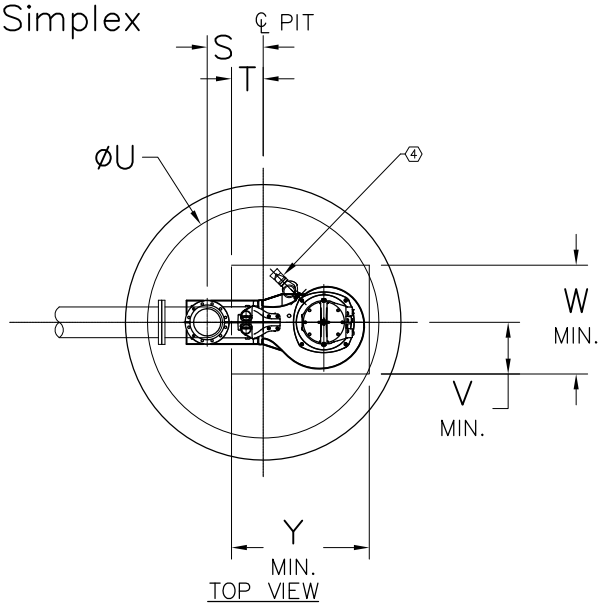
Project		**Created by**	Ron Mosher
Block		**Created on**	4/28/2022 **Last update** 4/28/2022

NP-3315

⬡ NOTES:

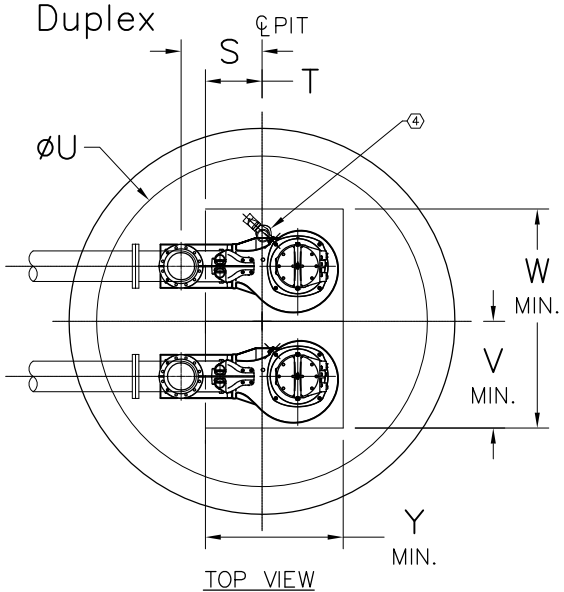
1. CONFIGURATION AND DIMS. SHOWN ARE SUGGESTED REQUIREMENTS ONLY. ALL DETAILS, INCLUDING SIZING OF PIT, TYPE, LOCATION AND ARRANGEMENT OF VALVES AND PIPING, ETC. ARE TO BE SPECIFIED BY THE CONSULTING ENGINEER AND ARE SUBJECT TO THEIR APPROVAL.
2. REFERENCE GENERIC DUPLEX LIFT STATION LAYOUT.
3. LOCATE ANCHOR BOLTS USING CLEAR INSIDE EDGE OF ACCESS FRAME AND PUMP CENTERLINE AS REFERENCE POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP TO ACCESS FRAME.
4. FLYGT MIX–FLUSH VALVE.

Simplex

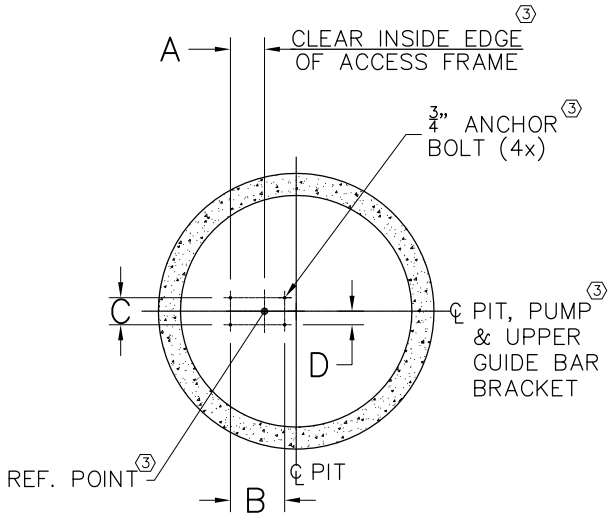


TOP VIEW

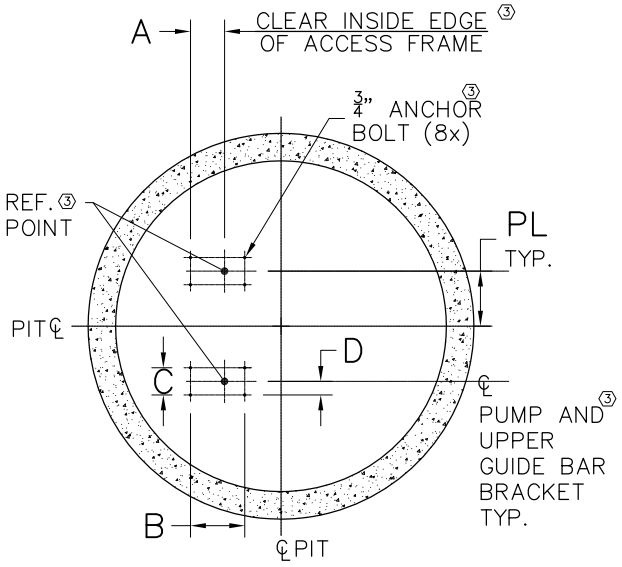
Duplex



TOP VIEW



BASE SECTION



BASE SECTION

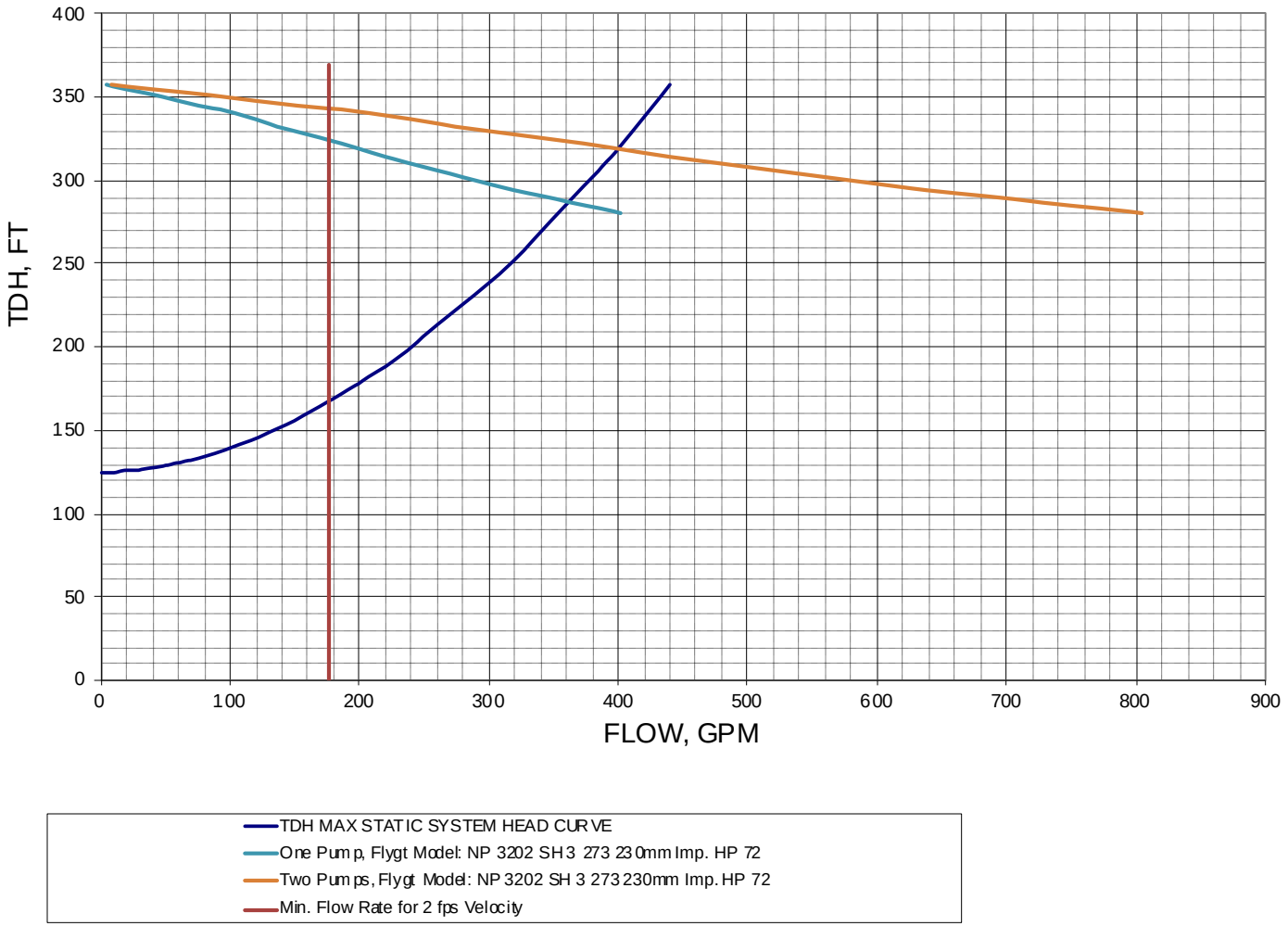
ALL DIMENSIONS ARE IN INCHES

NOM. SIZE	VERSION	A	B	C	D	SIMPLEX S	T	U	V	W	Y	DUPLEX S	T	U	PL	V	W	Y
6"	HT	3 5/8	11	8	4	19 1/2	13 7/8	72	15	35	44	17 1/2	11 7/8	84	16	31	67	44
10"	MT	12 3/8	19 11/16	10	5	20 1/4	11 1/2	84	18 3/4	39 1/2	50	29 1/2	20 1/2	120	20	38 3/4	79 1/2	50
12"	LT	7 5/8	19 11/16	18 1/4	9 1/8	22 3/4	12	96	21	42	52	24 1/4	12 3/8	120	23	44	88	52
14"	LT	16	25 5/8	23 3/4	11 7/8	33	19 3/4	120	24	45 1/2	59	33 1/4	19 3/4	144	26	50	97 1/2	59

ATTACHMENT E:

GALISTEO LIFT STATION
WITH 6-INCH FORCEMAIN TO WWTP SITE
FOR 20-YEAR FLOW PROJECTIONS

SANTO DOMINGO PUEBLO
Galisteo Lift Station - 6" FM



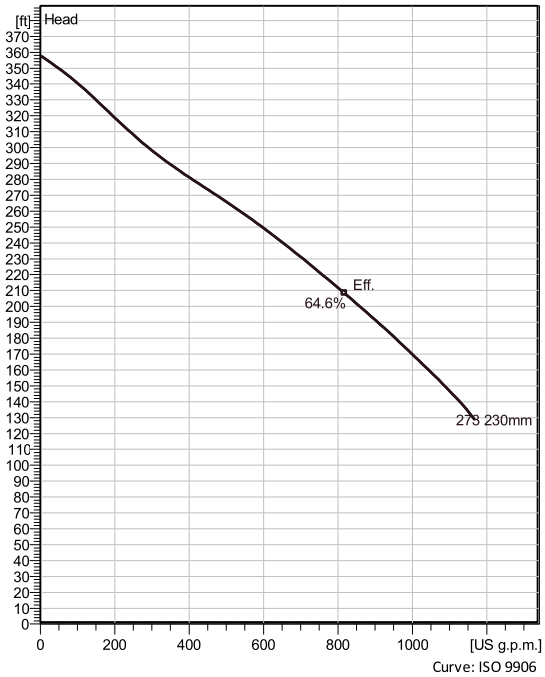
NP 3202 SH 3~ 273

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification



Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Configuration

Motor number
N3202.095 30-27-2AA-W 72hp

Installation type
P - Semi permanent, Wet

Impeller diameter
230 mm

Discharge diameter
4 inch

Pump information

Impeller diameter
230 mm

Discharge diameter
4 inch

Inlet diameter
150 mm

Maximum operating speed
3550 rpm

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron ™

Project		**Created by**	Ron Mosher	
Block		**Created on**	4/28/2022	**Last update** 4/28/2022

NP 3202 SH 3~ 273

Technical specification

Motor - General

Motor number N3202.095 30-27-2AA-W 72hp	**Phases** 3~	**Rated speed** 3550 rpm	**Rated power** 72 hp
ATEX approved FM	**Number of poles** 2	**Rated current** 78 A	**Stator variant** 1
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 095			

Motor - Technical

Power factor - 1/1 Load 0.93	**Motor efficiency - 1/1 Load** 92.5 %	**Total moment of inertia** 4.78 lb ft²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.92	**Motor efficiency - 3/4 Load** 93.0 %	**Starting current, direct starting** 550 A	
Power factor - 1/2 Load 0.88	**Motor efficiency - 1/2 Load** 92.5 %	**Starting current, star-delta** 183 A	

Project	**Created by**	Ron Mosher		
Block	**Created on**	4/28/2022	**Last update**	4/28/2022

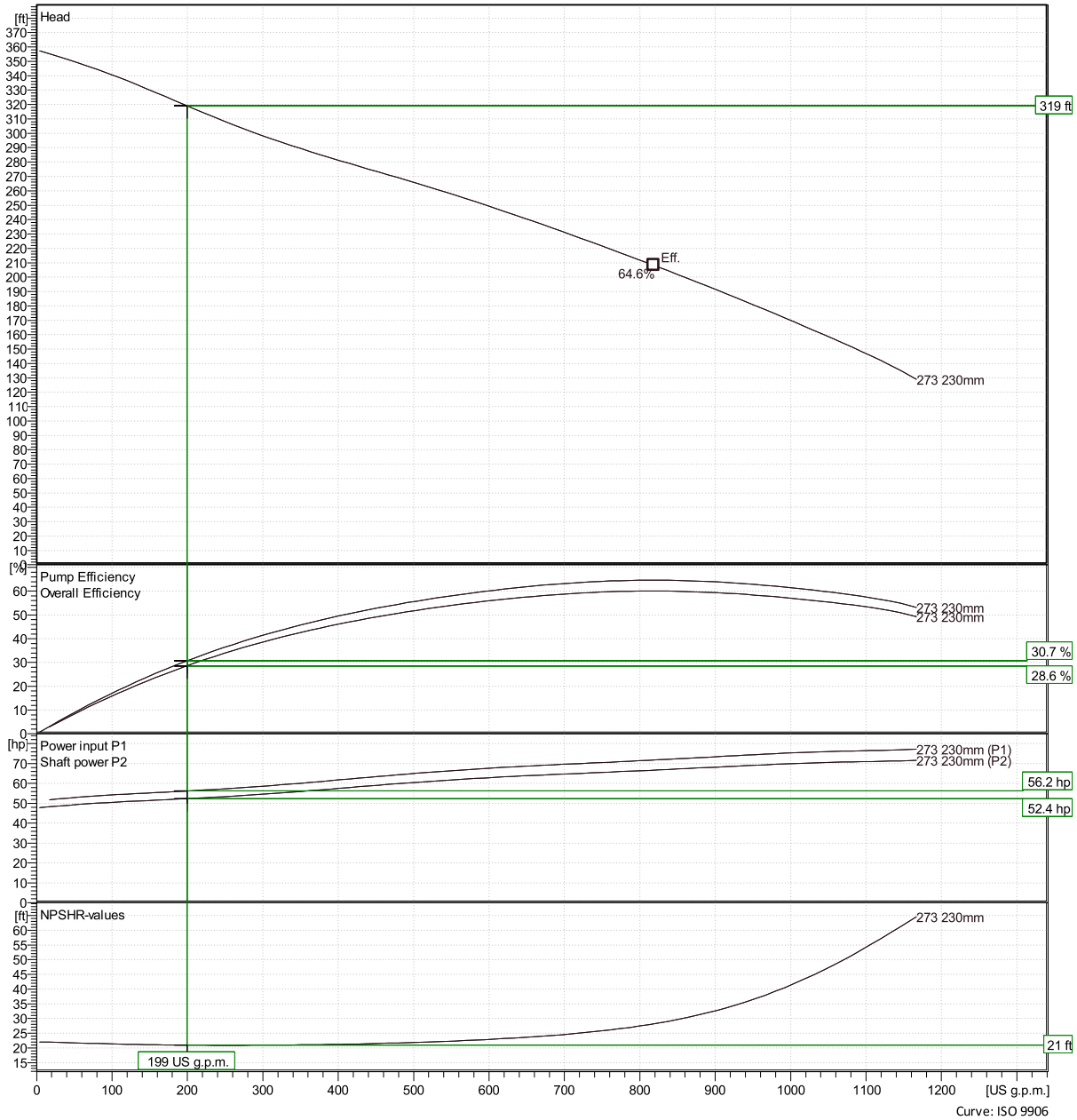
NP 3202 SH 3~ 273

Performance curve

Duty point

Flow	Head
199 US g.p.m.	319 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

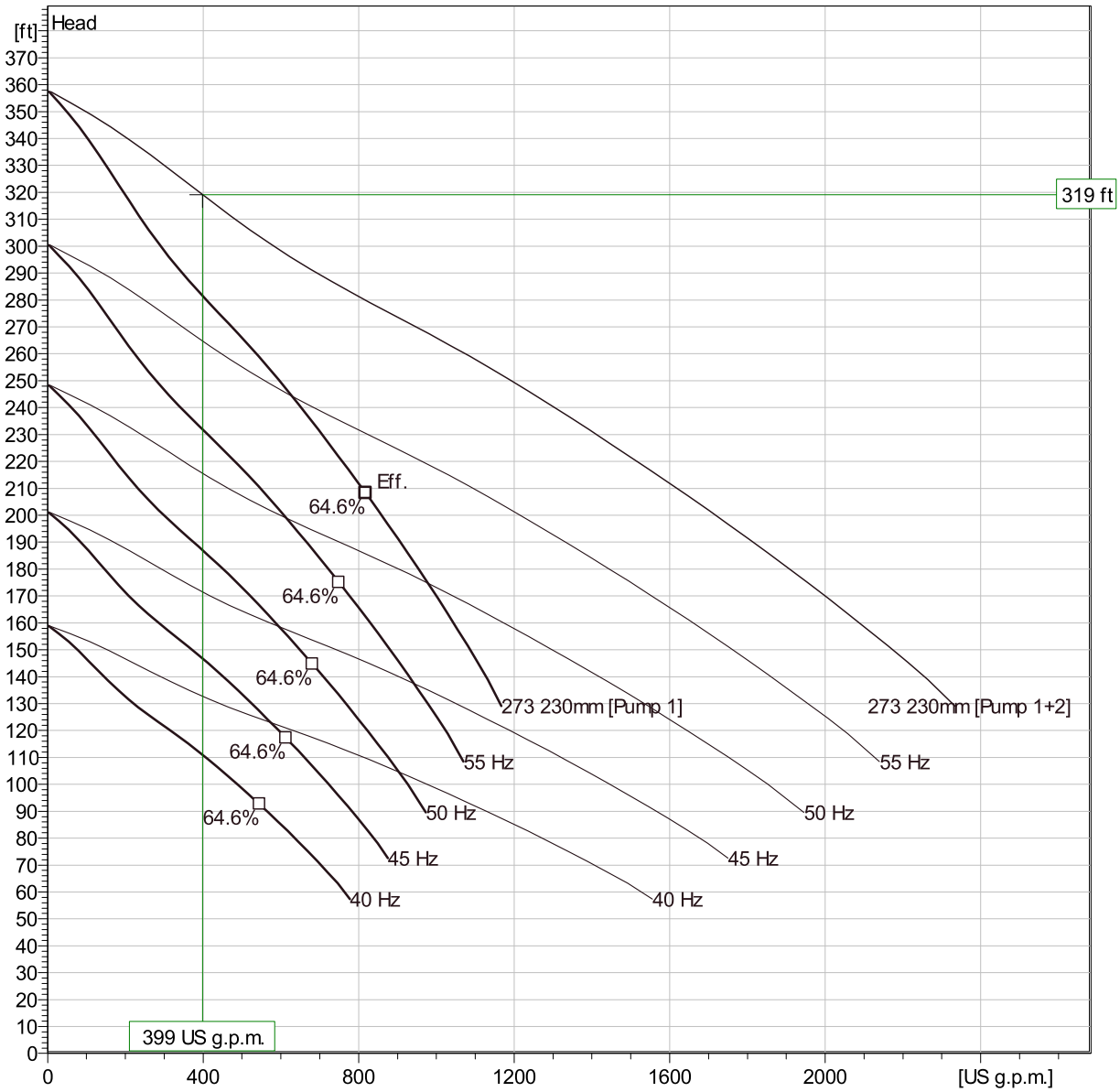
Ron Mosher

Created on 4/28/2022 **Last update** 4/28/2022

NP 3202 SH 3~ 273

Duty Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



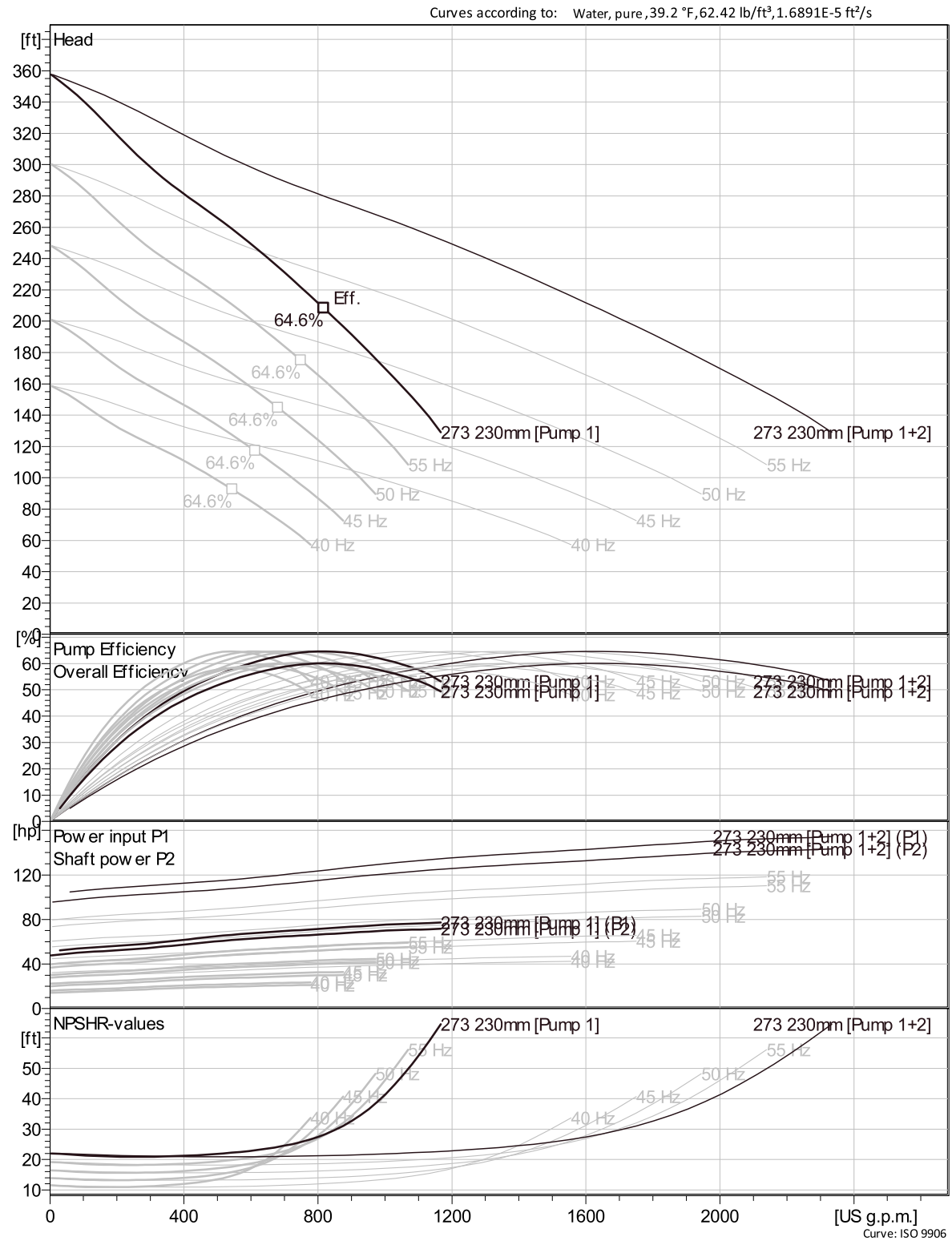
Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
2 / 1	199	319	52.4	399	319	105	30.7 %	3510	21
1 / 1	364	287	56.4	364	287	56.4	46.9 %	2070	21.1

Project		**Created by**	Ron Mosher		
Block		**Created on**	4/28/2022	**Last update**	4/28/2022

NP 3202 SH 3~ 273

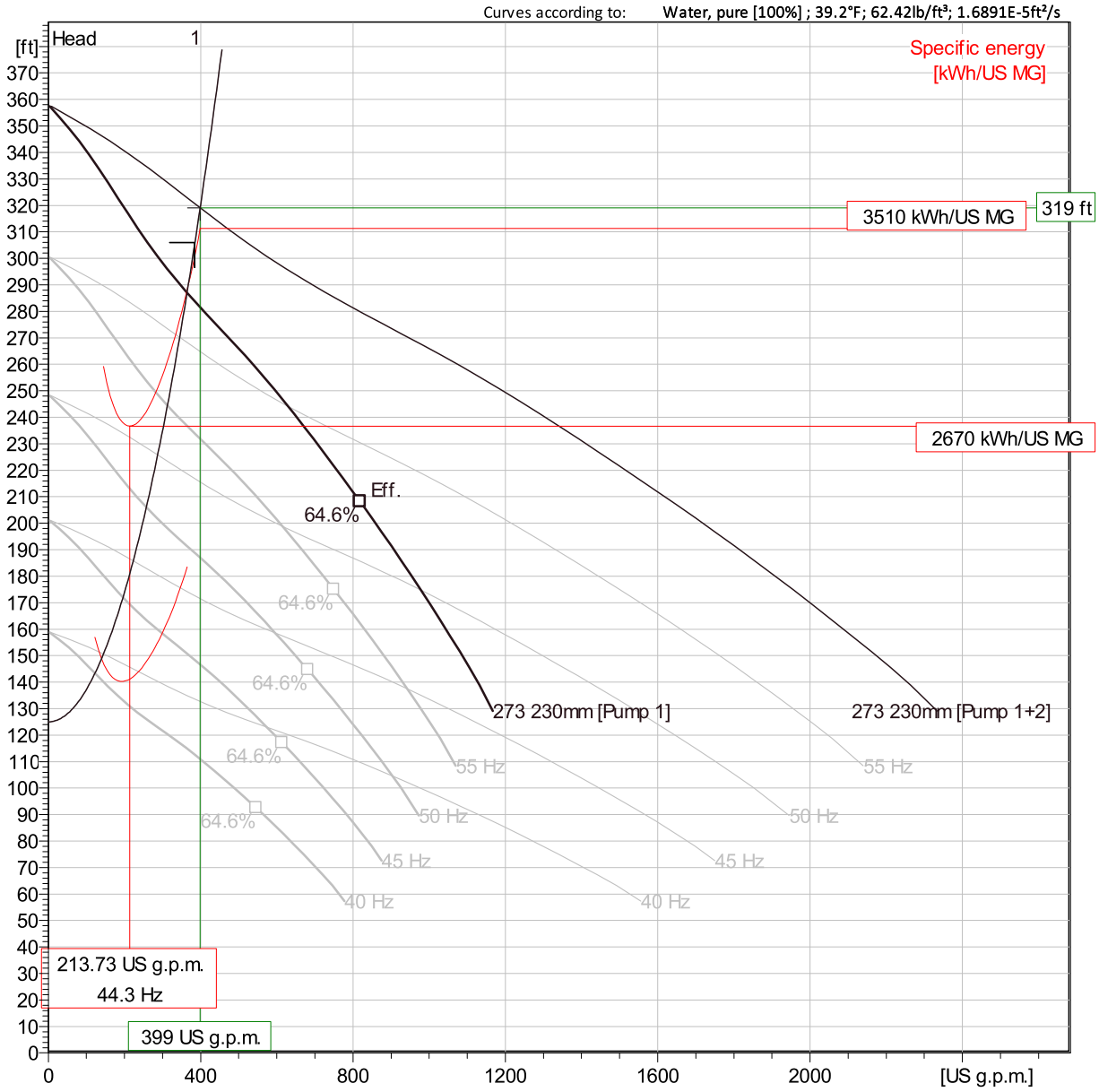
VFD Curve



Project		**Created by**	Ron Mosher		
Block		**Created on**	4/28/2022	**Last update**	4/28/2022

NP 3202 SH 3~ 273

VFD Analysis



Operating Characteristics

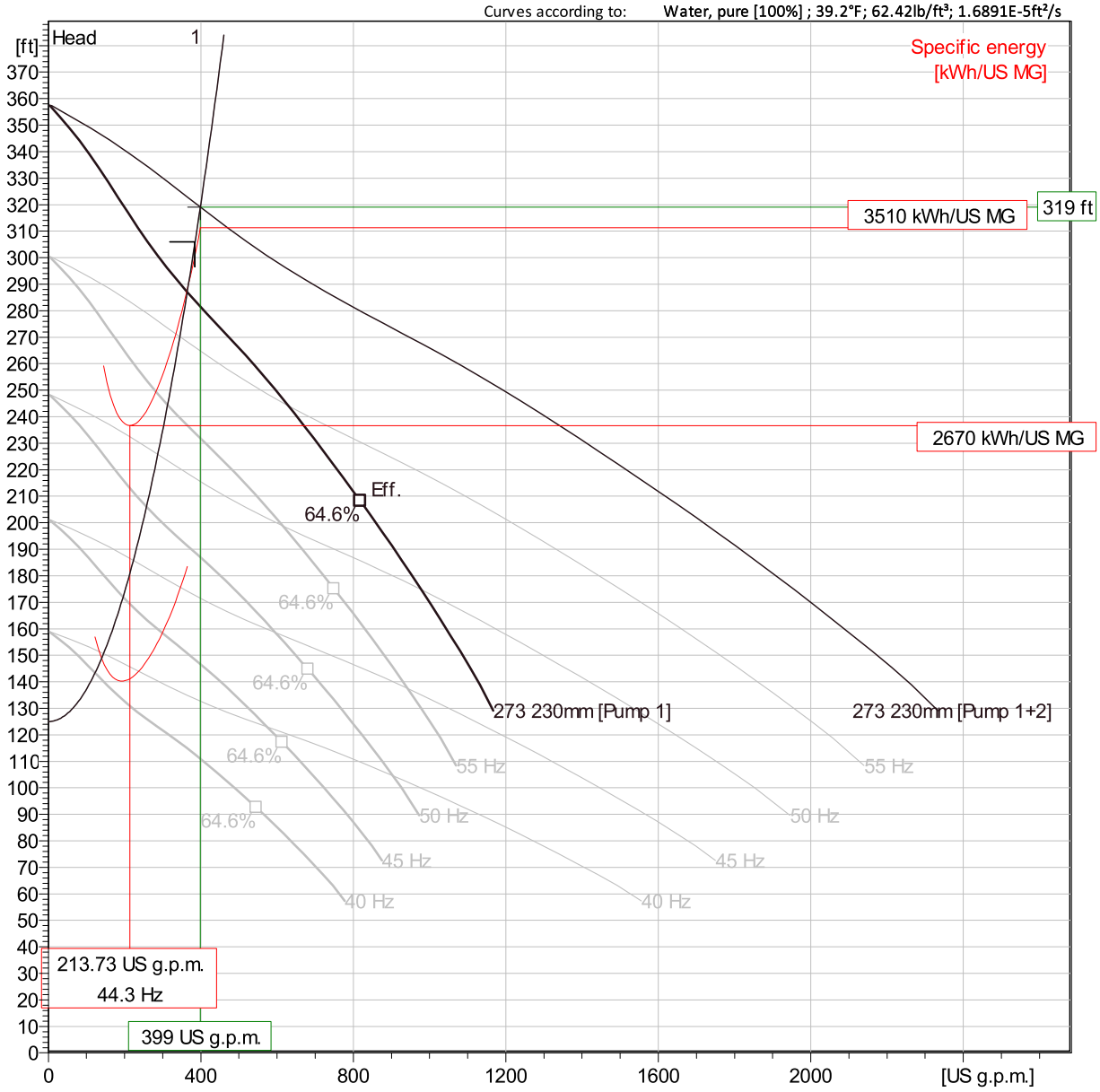
Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
2 / 1	60 Hz	199	319	52.4	399	319	105	30.7 %	3510	21
2 / 1	55 Hz	172	270	40.2	345	270	80.4	29.3 %	4020	18.3
2 / 1	50 Hz	144	226	30	287	226	60	27.3 %	4770	15.7
2 / 1	45 Hz	112	186	21.7	223	186	43.4	24.2 %	6070	13.3

Project		**Created by**	Ron Mosher		
Block		**Created on**	4/28/2022	**Last update**	4/28/2022

NP 3202 SH 3~ 273

VFD Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Operating Characteristics

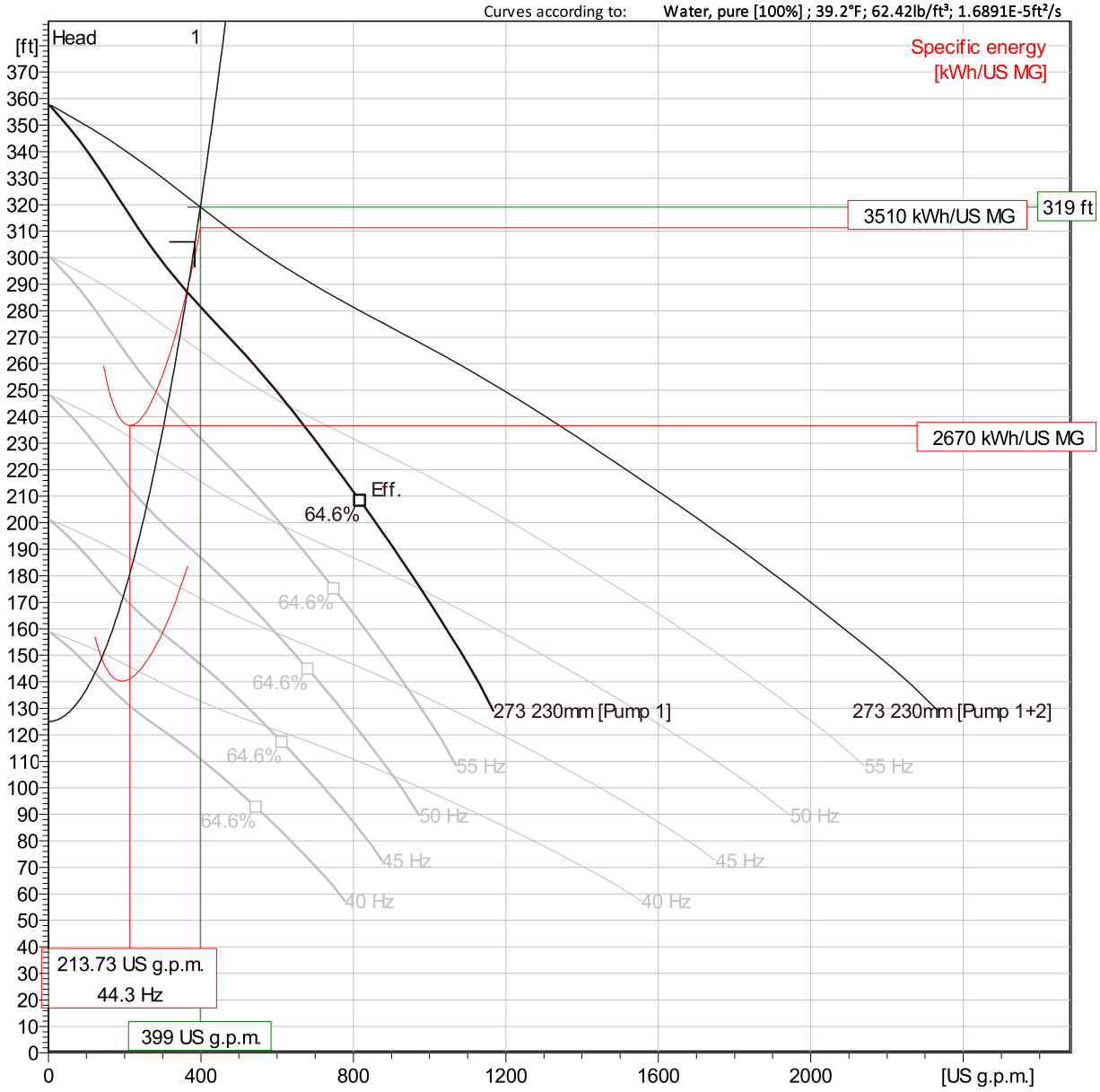
Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
2 / 1	40 Hz	72.4	151	15	145	151	30	18.4 %	9190	11.1
1 / 1	60 Hz	364	287	56.4	364	287	56.4	46.9 %	2070	21.1
1 / 1	55 Hz	313	244	42.9	313	244	42.9	45.1 %	2340	18.3
1 / 1	50 Hz	258	206	31.7	258	206	31.7	42.3 %	2780	15.7

Project		**Created by**	Ron Mosher		
Block		**Created on**	4/28/2022	**Last update**	4/28/2022

NP 3202 SH 3~ 273

VFD Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



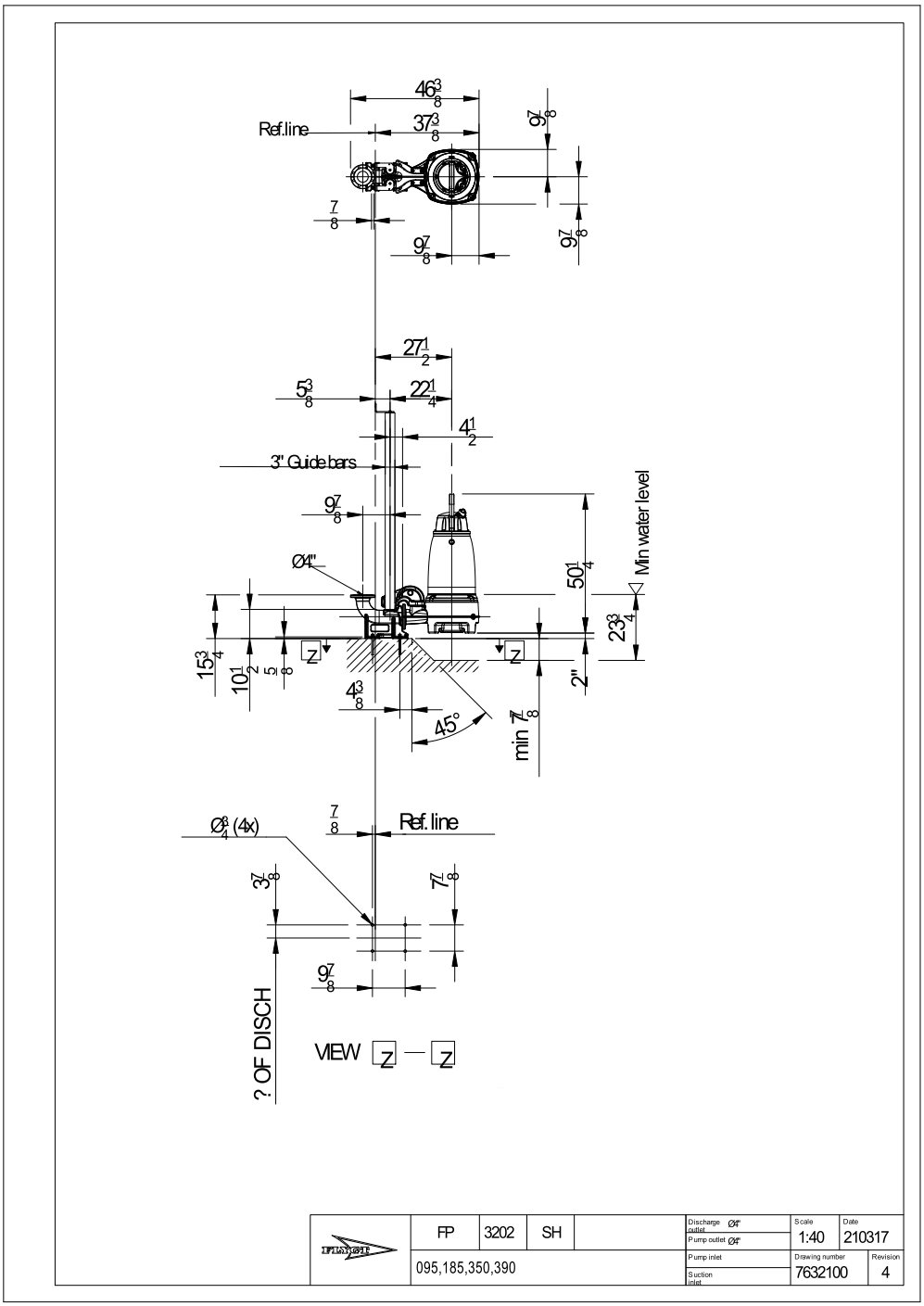
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1 / 1	45 Hz	196	172	22.6	196	172	22.6	37.7 %	3560	13.2
1 / 1	40 Hz	123	143	15.4	123	143	15.4	28.8 %	5550	11

Project		**Created by**	Ron Mosher		
Block		**Created on**	4/28/2022	**Last update**	4/28/2022

NP 3202 SH 3~ 273

Dimensional drawing

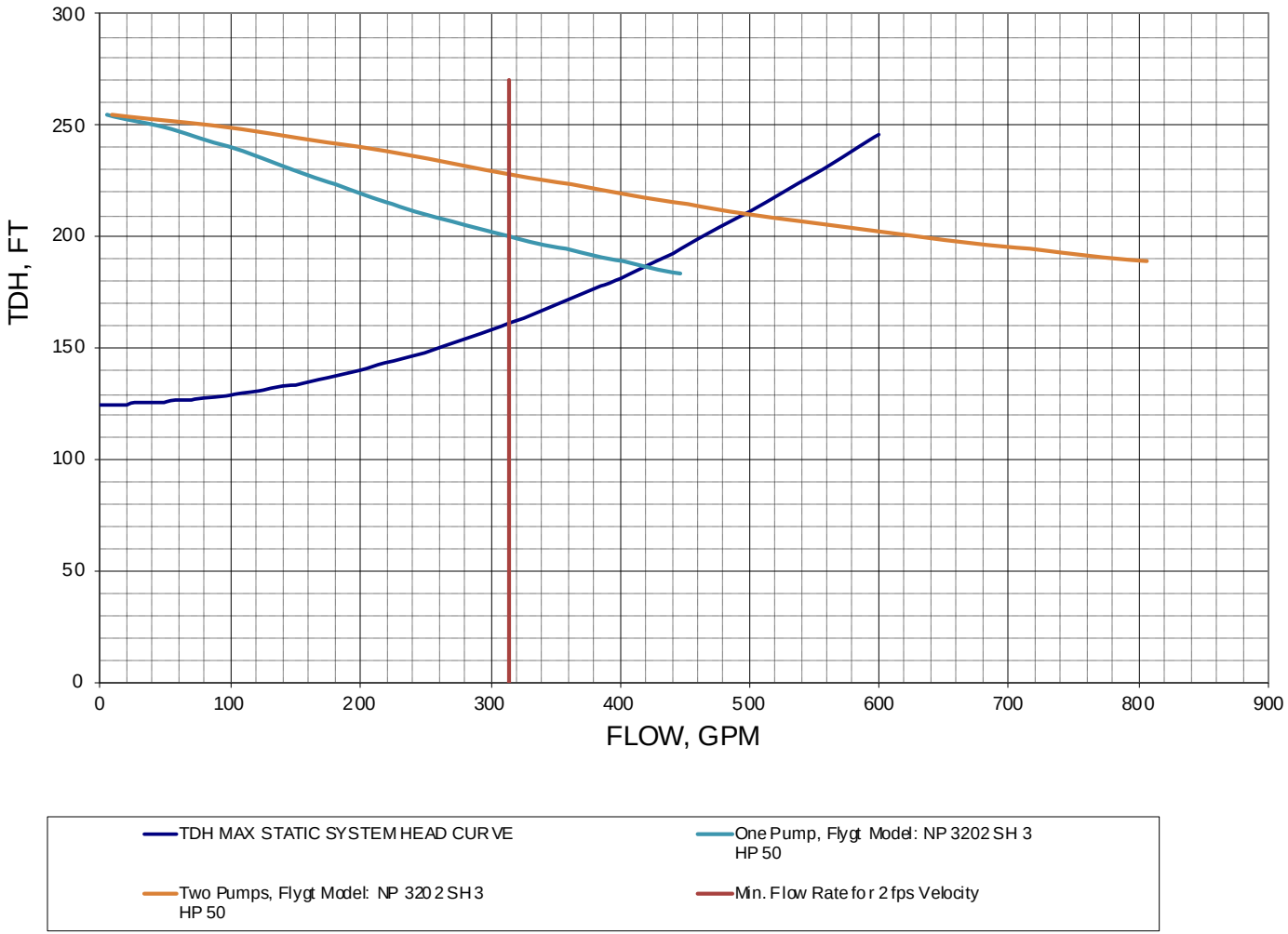


Project	**Created by**	Ron Mosher	
Block	**Created on**	4/28/2022	**Last update** 4/28/2022

ATTACHMENT F:

GALISTEO LIFT STATION
WITH 8-INCH FORCEMAIN TO WWTP SITE
FOR 20-YEAR FLOW PROJECTIONS

SANTO DOMINGO PUEBLO
Galisteo Lift Station - 8" FM



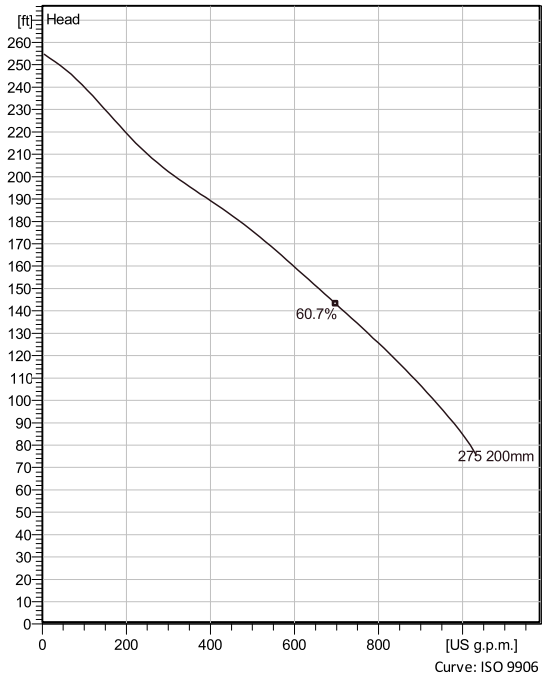
NP 3202 SH 3~ 275

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification



Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Configuration

Motor number
N3202.830 30-40-2KE-W IE3 50hp

Installation type
P - Semi permanent, Wet

Impeller diameter
200 mm

Discharge diameter
4 inch

Pump information

Impeller diameter
200 mm

Discharge diameter
4 inch

Inlet diameter
150 mm

Maximum operating speed
3545 rpm

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron ™

Project		**Created by**	Ron Mosher	
Block		**Created on**	4/29/2022	**Last update** 4/29/2022

NP 3202 SH 3~ 275

Technical specification

Motor - General

Motor number N3202.830 30-40-2KE-W IE3 50hp	**Phases** 3~	**Rated speed** 3545 rpm	**Rated power** 50 hp
ATEX approved FM	**Number of poles** 2	**Rated current** 53 A	**Stator variant** 4
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 830			

Motor - Technical

Power factor - 1/1 Load 0.94	**Motor efficiency - 1/1 Load** 93.9 %	**Total moment of inertia** 5.24 lb ft²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.94	**Motor efficiency - 3/4 Load** 94.6 %	**Starting current, direct starting** 320 A	
Power factor - 1/2 Load 0.92	**Motor efficiency - 1/2 Load** 94.8 %	**Starting current, star-delta** 107 A	

Project	**Created by**	Ron Mosher		
Block	**Created on**	4/29/2022	**Last update**	4/29/2022

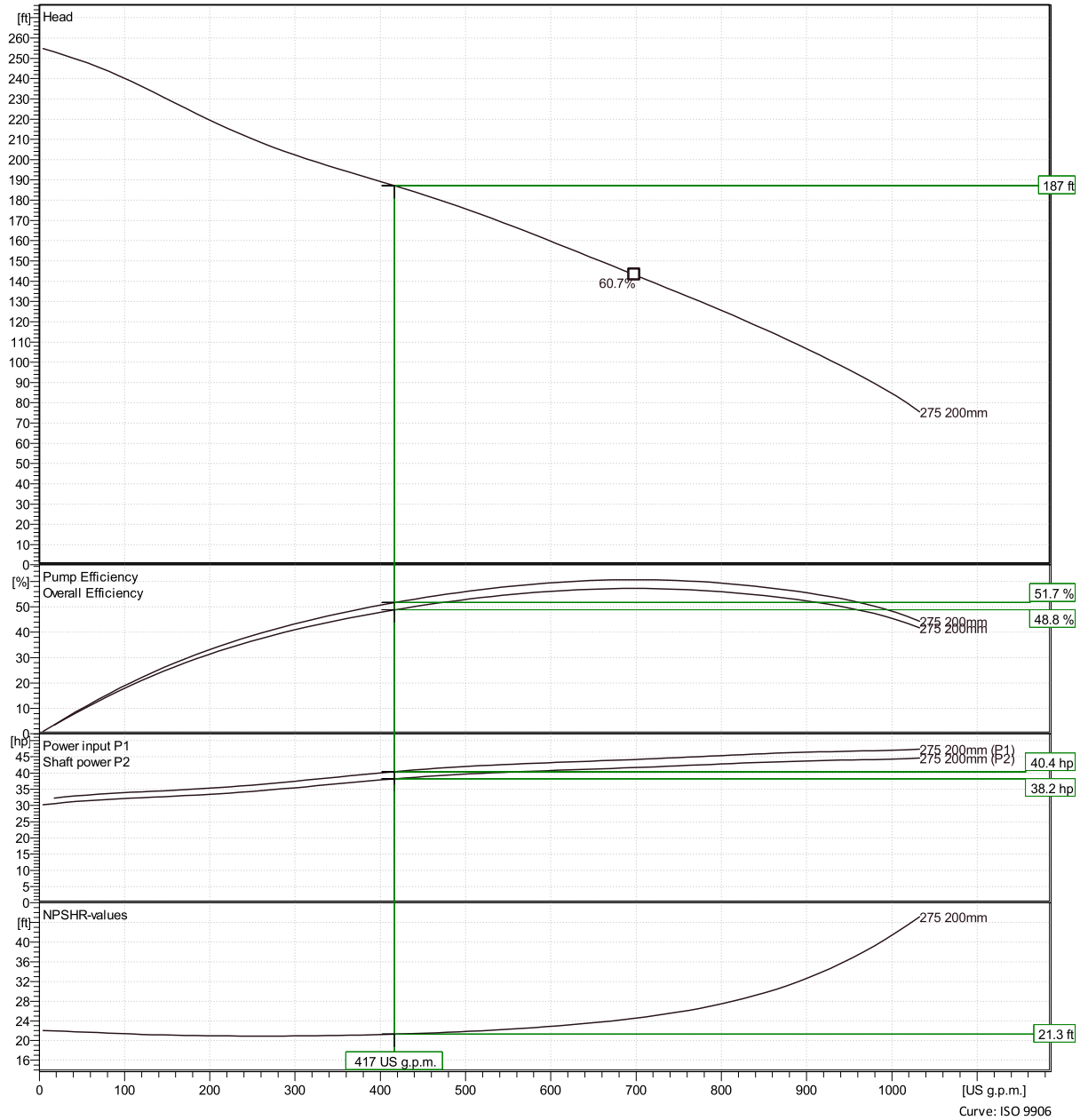
NP 3202 SH 3~ 275

Performance curve

Duty point

Flow	Head
417 US g.p.m.	187 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

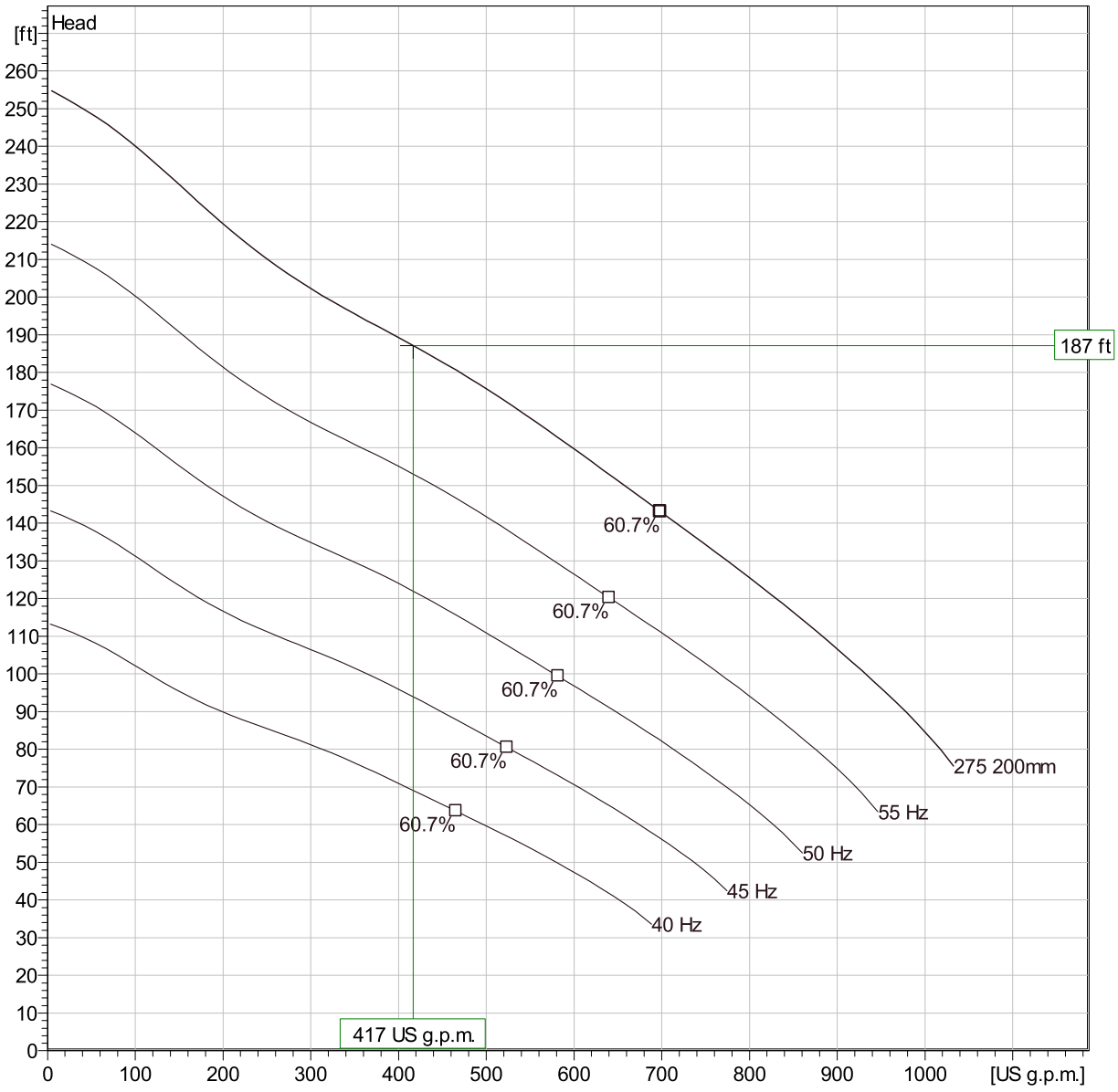
Ron Mosher

Created on 4/29/2022 **Last update** 4/29/2022

NP 3202 SH 3~ 275

Duty Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Operating characteristics

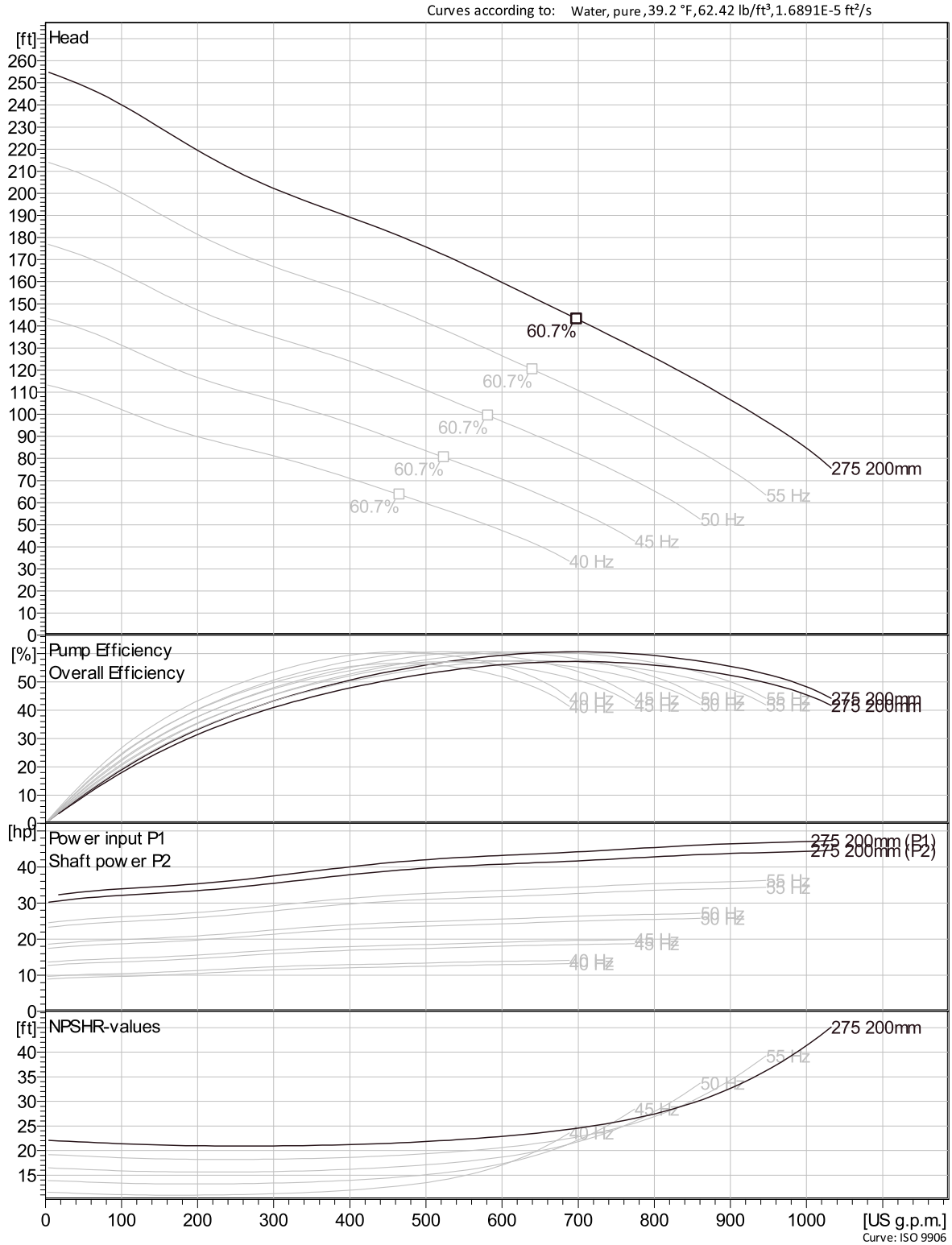
Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	417	187	38.2	417	187	38.2	51.7 %	1210	21.3

Project		**Created by**	Ron Mosher		
Block		**Created on**	4/29/2022	**Last update**	4/29/2022

NP 3202 SH 3~ 275

VFD Curve

Curves according to: Water, pure ,39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s

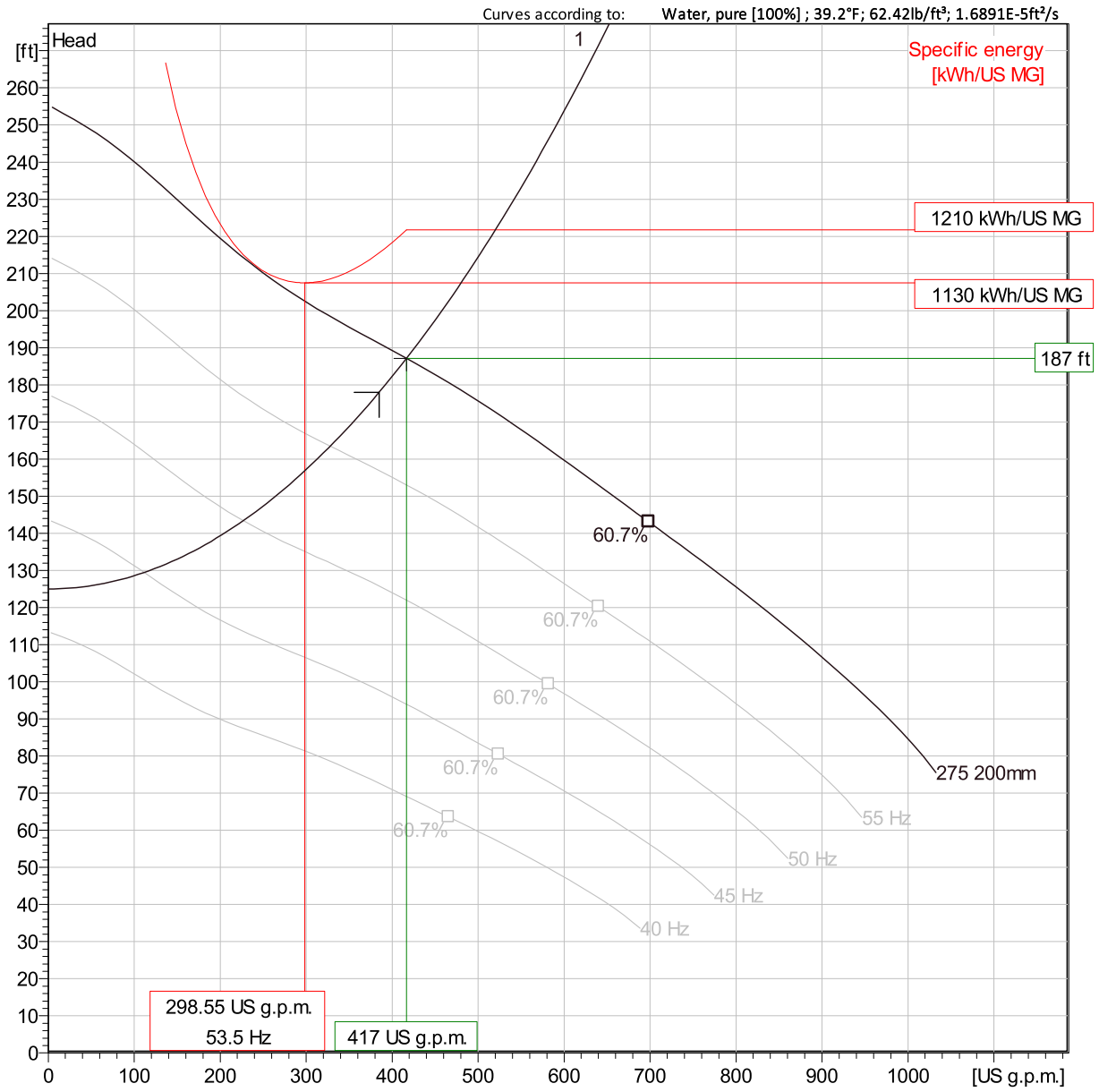


Curve: ISO 9906

Project		**Created by**	Ron Mosher		
Block		**Created on**	4/29/2022	**Last update**	4/29/2022

NP 3202 SH 3~ 275

VFD Analysis



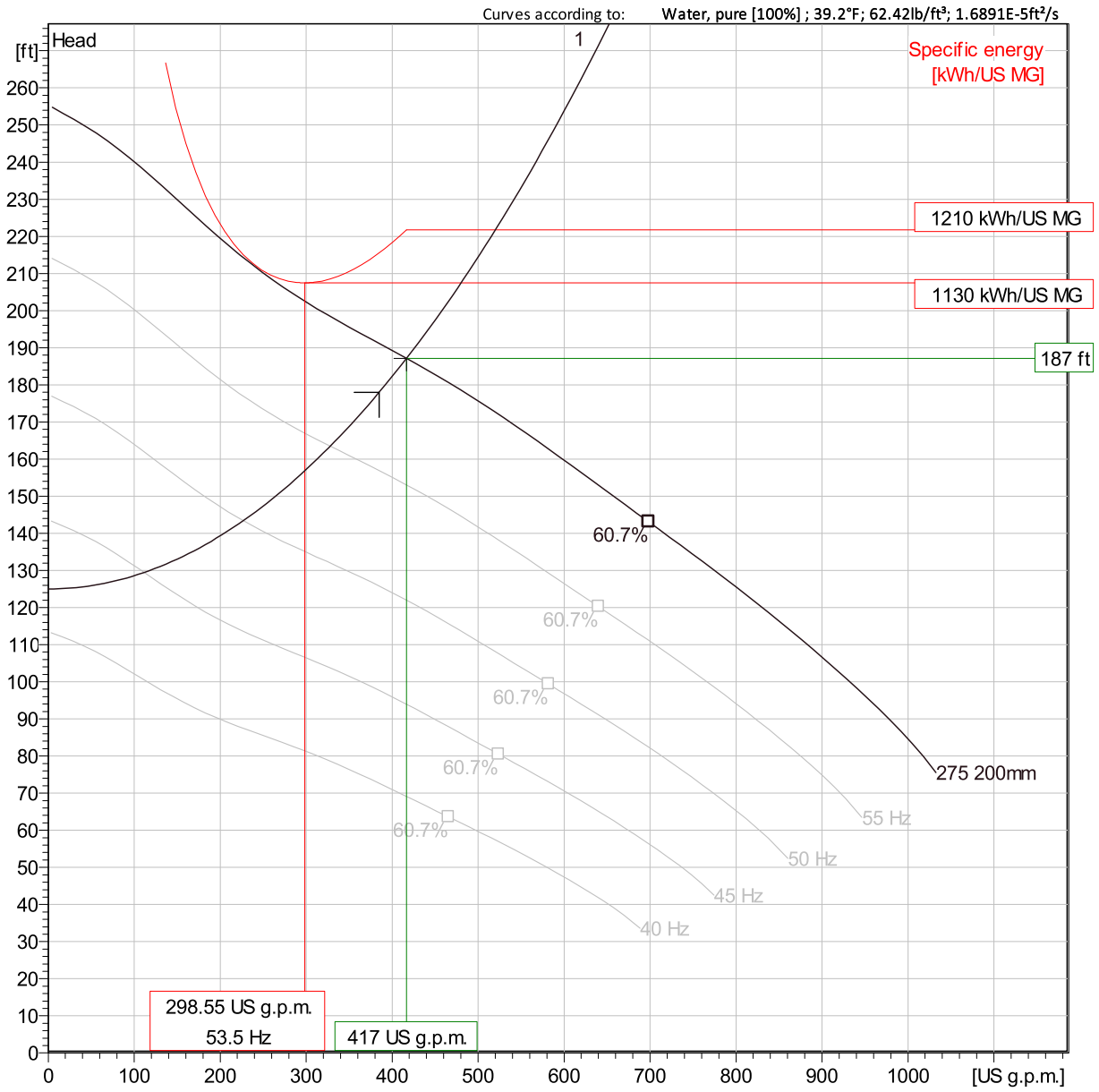
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	60 Hz	417	187	38.2	417	187	38.2	51.7 %	1210	21.3
1	55 Hz	328	163	28.4	328	163	28.4	47.8 %	1450	18.3
1	50 Hz	227	143	20.2	227	143	20.2	40.8 %	1960	15.6
1	45 Hz	112	129	13.8	112	129	13.8	26.5 %	3800	13.3

Project		**Created by**	Ron Mosher		
Block		**Created on**	4/29/2022	**Last update**	4/29/2022

NP 3202 SH 3~ 275

VFD Analysis



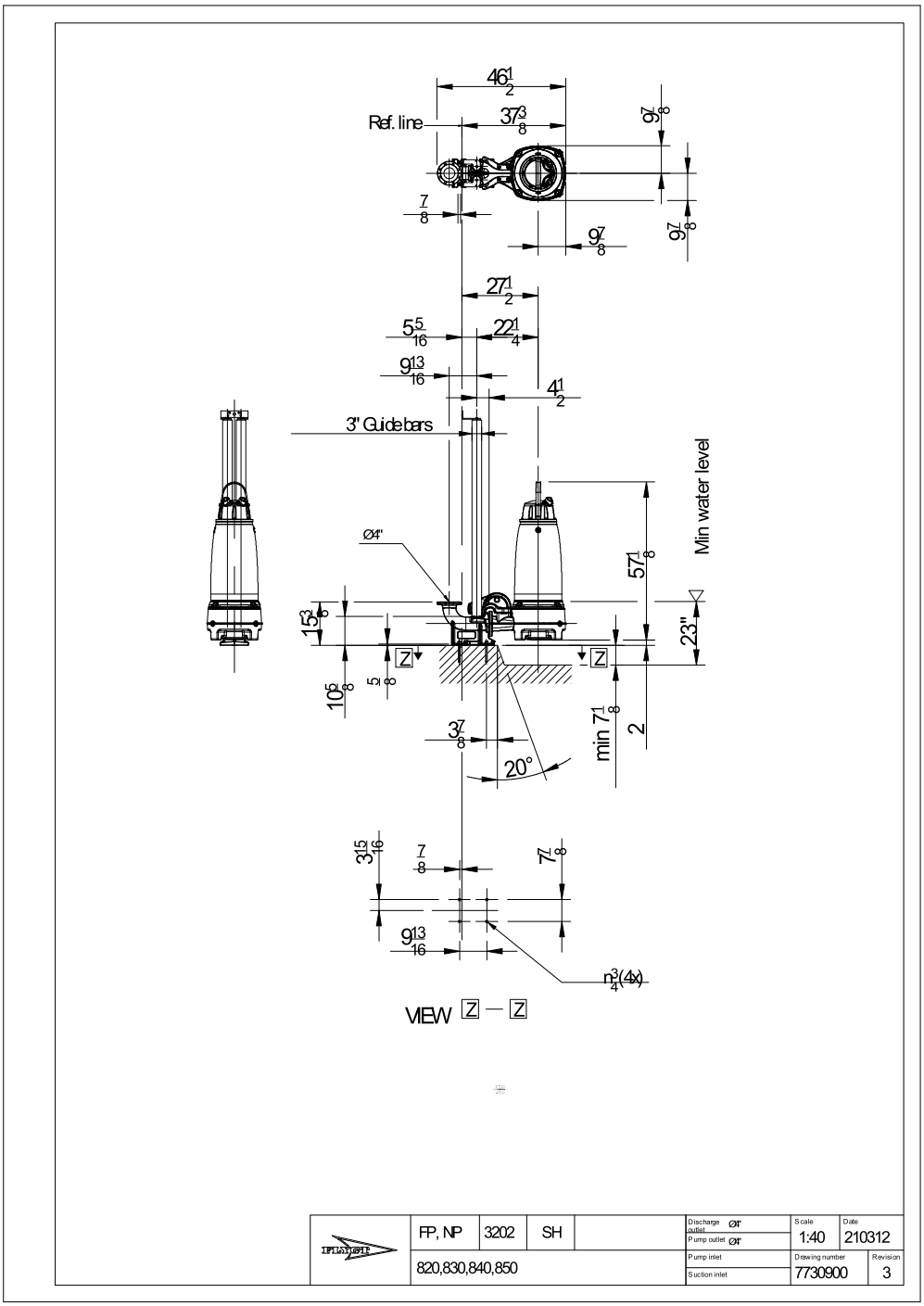
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	40 Hz									

Project		**Created by**	Ron Mosher		
Block		**Created on**	4/29/2022	**Last update**	4/29/2022

NP 3202 SH 3~ 275

Dimensional drawing



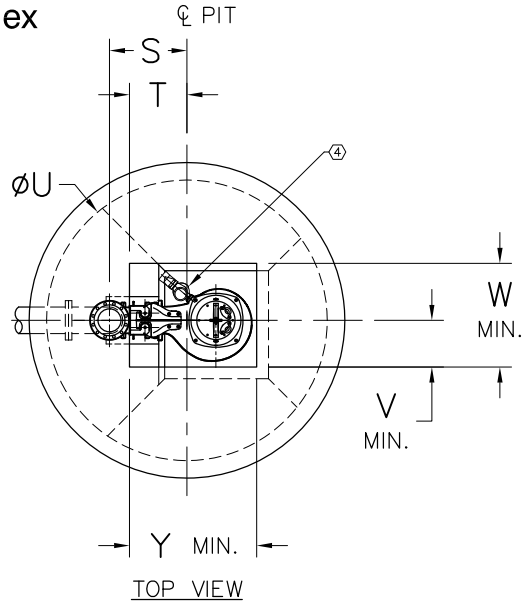
Project	**Created by**	Ron Mosher	
Block	**Created on**	4/29/2022	**Last update** 4/29/2022

FP/NP-3202

NOTES:

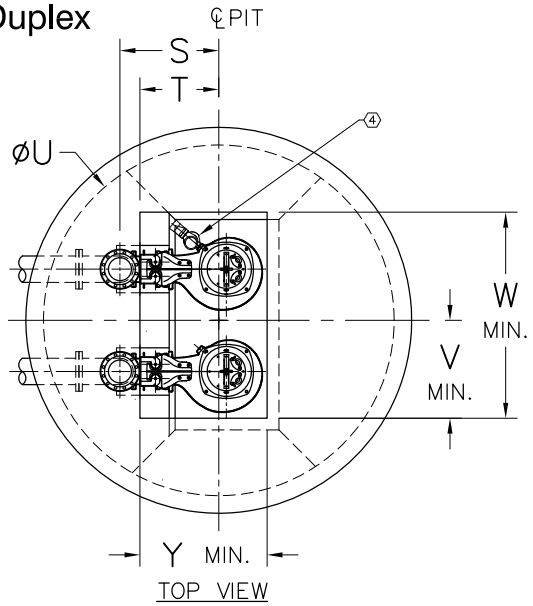
1. CONFIGURATION AND DIMS. SHOWN ARE SUGGESTED REQUIREMENTS ONLY. ALL DETAILS, INCLUDING SIZING OF PIT, TYPE, LOCATION AND ARRANGEMENT OF VALVES AND PIPING, ETC. ARE TO BE SPECIFIED BY THE CONSULTING ENGINEER AND ARE SUBJECT TO THEIR APPROVAL.
2. REFERENCE GENERIC DUPLEX LIFT STATION LAYOUT FOR ELEVATION VIEW.
3. LOCATE ANCHOR BOLTS USING INSIDE EDGE OF CLEAR OPENING AND PUMP CENTERLINE AS REFERENCE POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP TO CLEAR OPENING.
4. FLYGT MIX–FLUSH VALVE.

Simplex

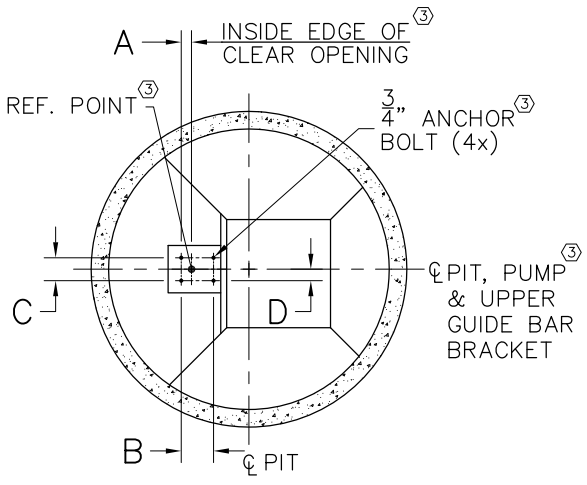


TOP VIEW

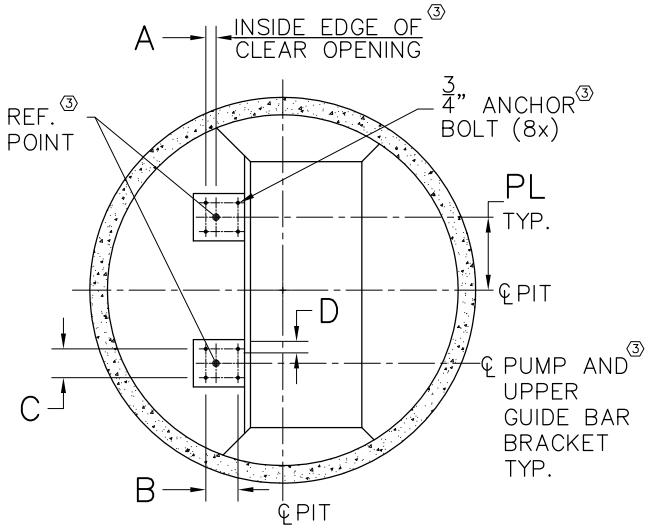
Duplex



TOP VIEW



BASE SECTION



BASE SECTION

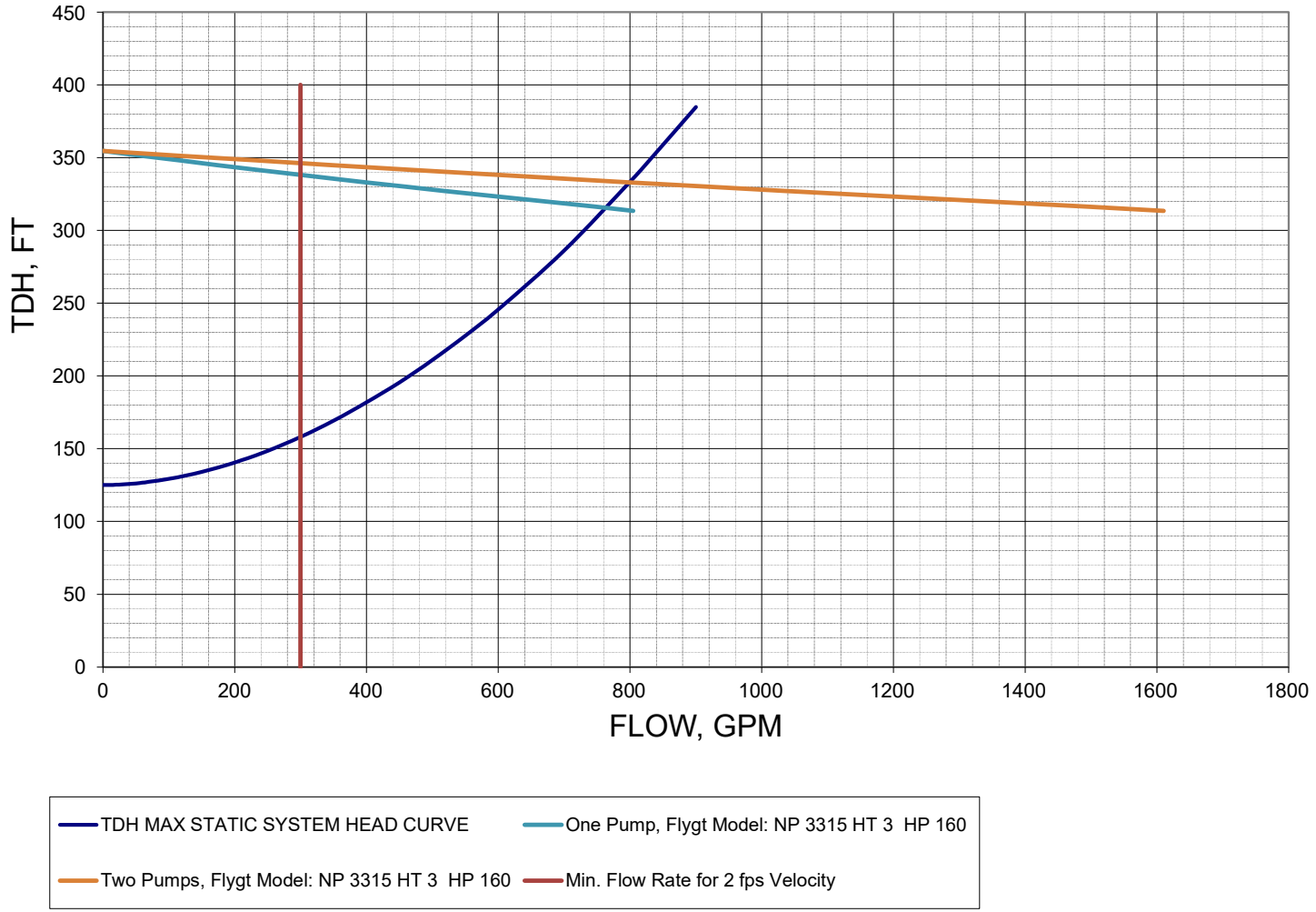
ALL DIMENSIONS ARE IN INCHES

MODEL	NOM. SIZE	VERSION	A	B	C	D	SIMPLEX S	T	U	V	W	Y	DUPLEX S	T	U	PL	V	W	Y
FP/NP	4"	SH	7/8	9 7/8	6	3	16	11 5/8	60	11 3/4	23 1/2	39	16	11 5/8	72	12	23 3/4	47 1/2	39
FP/NP	4"	HT	7/8	9 7/8	6	3	25 3/4	21 1/2	84	14	34	40 3/4	28	23 3/4	96	15	29	64	40 3/4
FP/NP	6"	HT	2 3/8	11	10	5	22 7/8	17 1/4	84	14	34	40 1/2	23 1/2	17 7/8	96	15	29	64	40 1/2
FP/NP	8"	MT	3 1/2	11	10	5	20 1/8	13 1/4	84	16	35 1/2	43 1/2	33 7/8	27	120	17 1/2	33 1/2	70 1/2	43 1/2
NP	12"	LT	7 1/2	19 3/4	20 3/4	10 3/8	33	21 1/4	120	20 1/2	41 1/2	52	35 1/4	23 1/2	144	28	48 1/2	97 1/2	52

ATTACHMENT G:

GALISTEO LIFT STATION
WITH 8-INCH FORCEMAIN TO WWTP SITE
FOR ULTIMATE FLOW PROJECTIONS

SANTO DOMINGO PUEBLO
Galisteo Lift Station - 8" FM



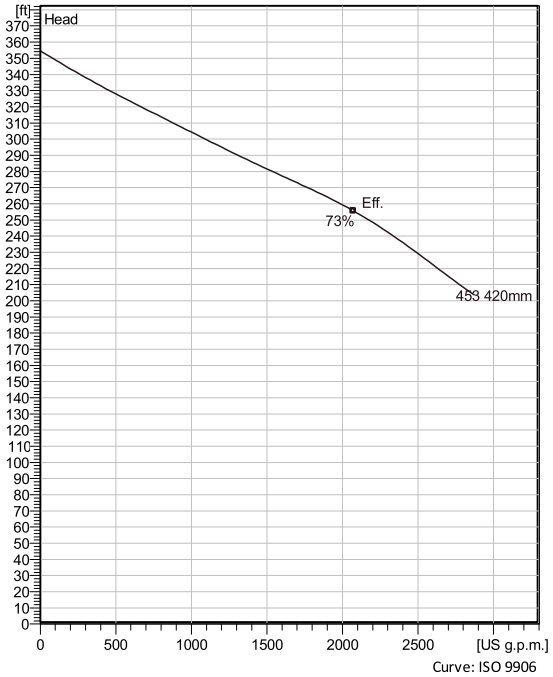
NP 3315 HT 3~ 453

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification



Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Configuration

Motor number
N3315.090 35-45-4AA-W 160hp

Installation type
P - Semi permanent, Wet

Impeller diameter
420 mm

Discharge diameter
6 inch

Pump information

Impeller diameter
420 mm

Discharge diameter
6 inch

Inlet diameter
200 mm

Maximum operating speed
1780 rpm

Number of blades
3

Max. fluid temperature
40 °C

Materials

Impeller
Grey cast iron

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/9/2022	**Last update**	5/9/2022

NP 3315 HT 3~ 453

Technical specification

Motor - General

Motor number N3315.090 35-45-4AA-W 160hp	**Phases** 3~	**Rated speed** 1780 rpm	**Rated power** 160 hp
ATEX approved FM	**Number of poles** 4	**Rated current** 190 A	**Stator variant** 1
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 090			

Motor - Technical

Power factor - 1/1 Load 0.83	**Motor efficiency - 1/1 Load** 94.5 %	**Total moment of inertia** 31.7 lb ft²	**Starts per hour max.** 15
Power factor - 3/4 Load 0.78	**Motor efficiency - 3/4 Load** 95.0 %	**Starting current, direct starting** 1120 A	
Power factor - 1/2 Load 0.68	**Motor efficiency - 1/2 Load** 95.5 %	**Starting current, star-delta** 375 A	

Project	**Created by**	Ron Mosher		
Block	**Created on**	5/9/2022	**Last update**	5/9/2022

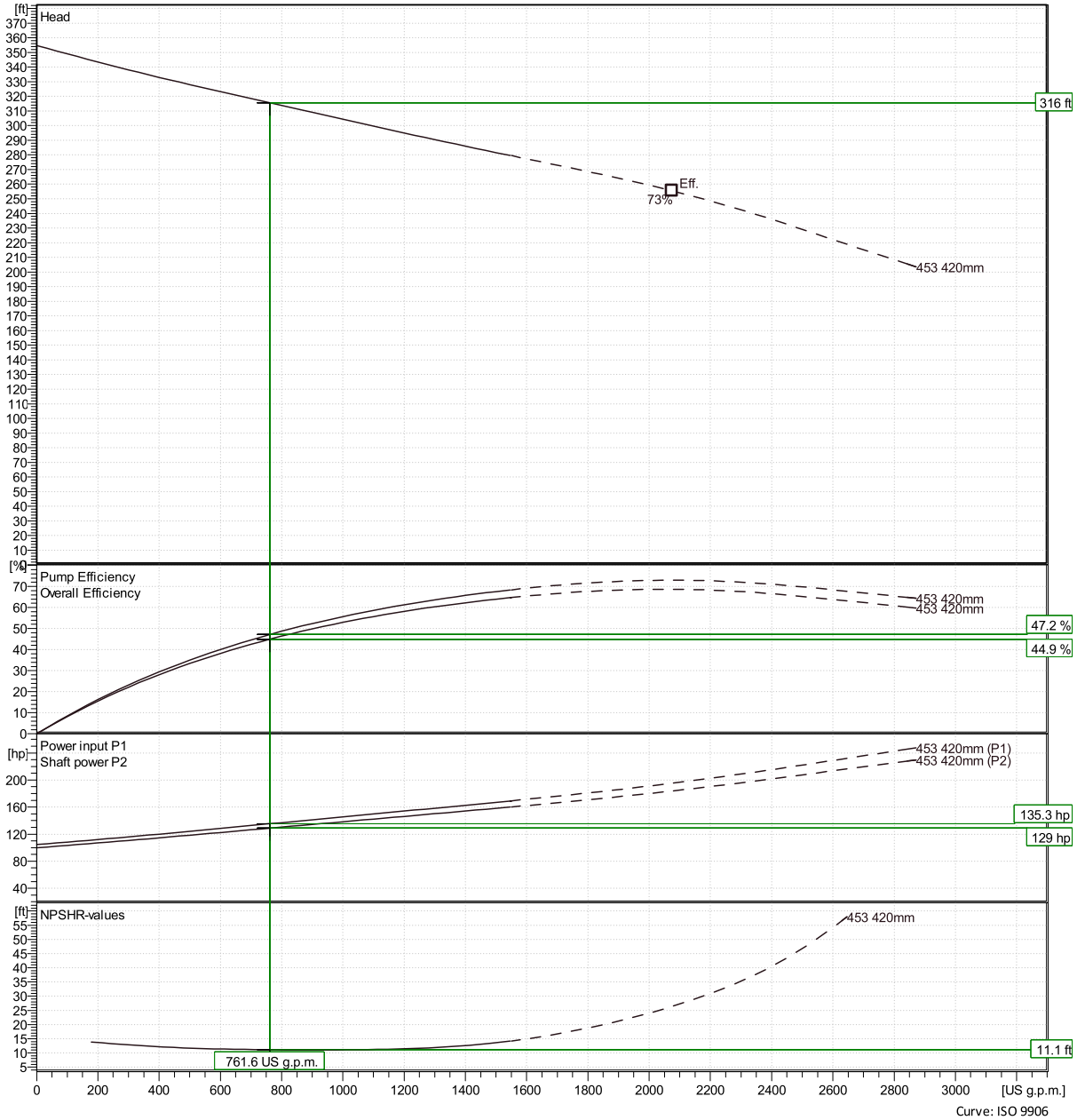
NP 3315 HT 3~ 453

Performance curve

Duty point

Flow	Head
762 US g.p.m.	316 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

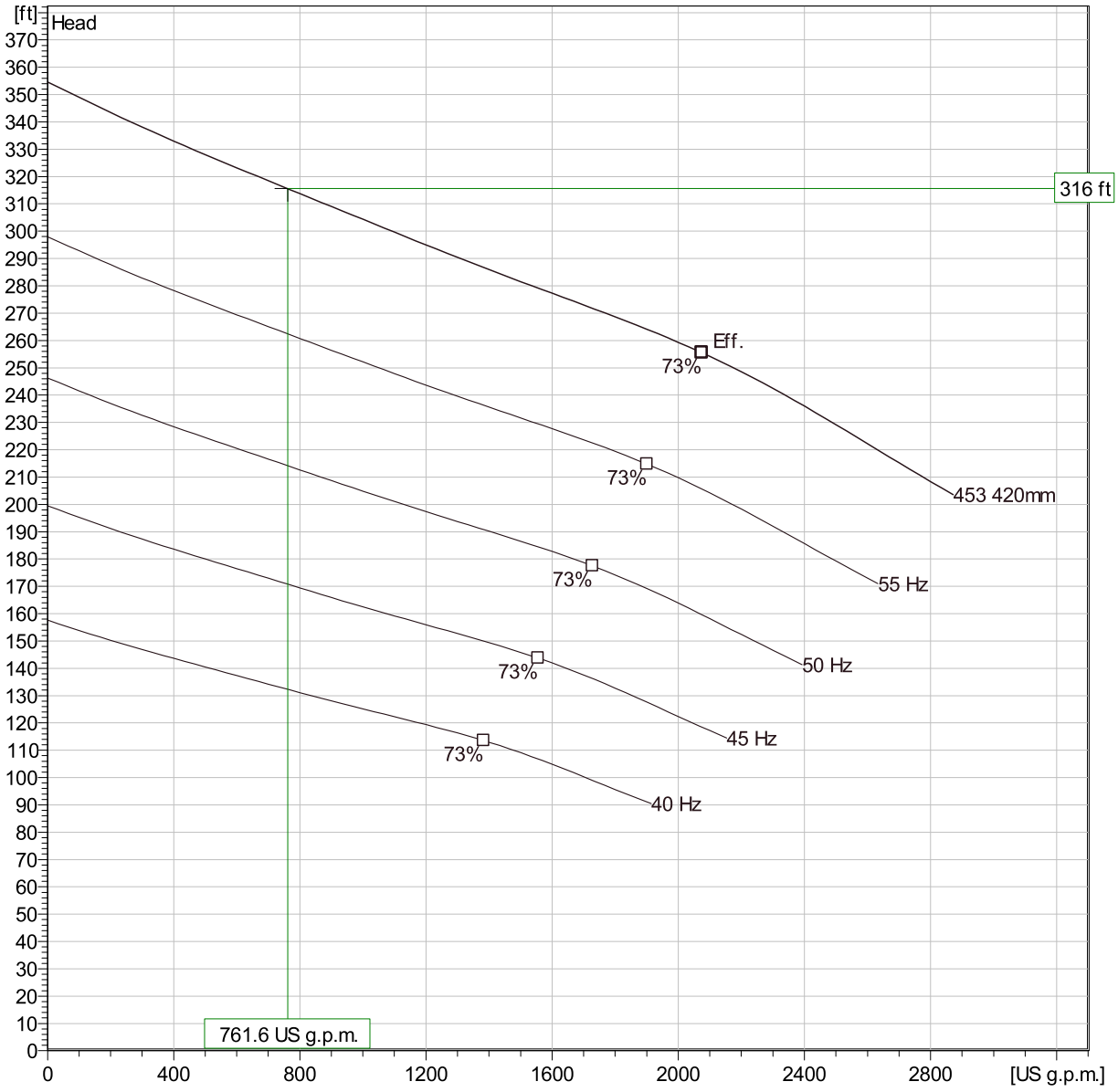
Ron Mosher

Created on 5/9/2022 **Last update** 5/9/2022

NP 3315 HT 3~ 453

Duty Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Operating characteristics

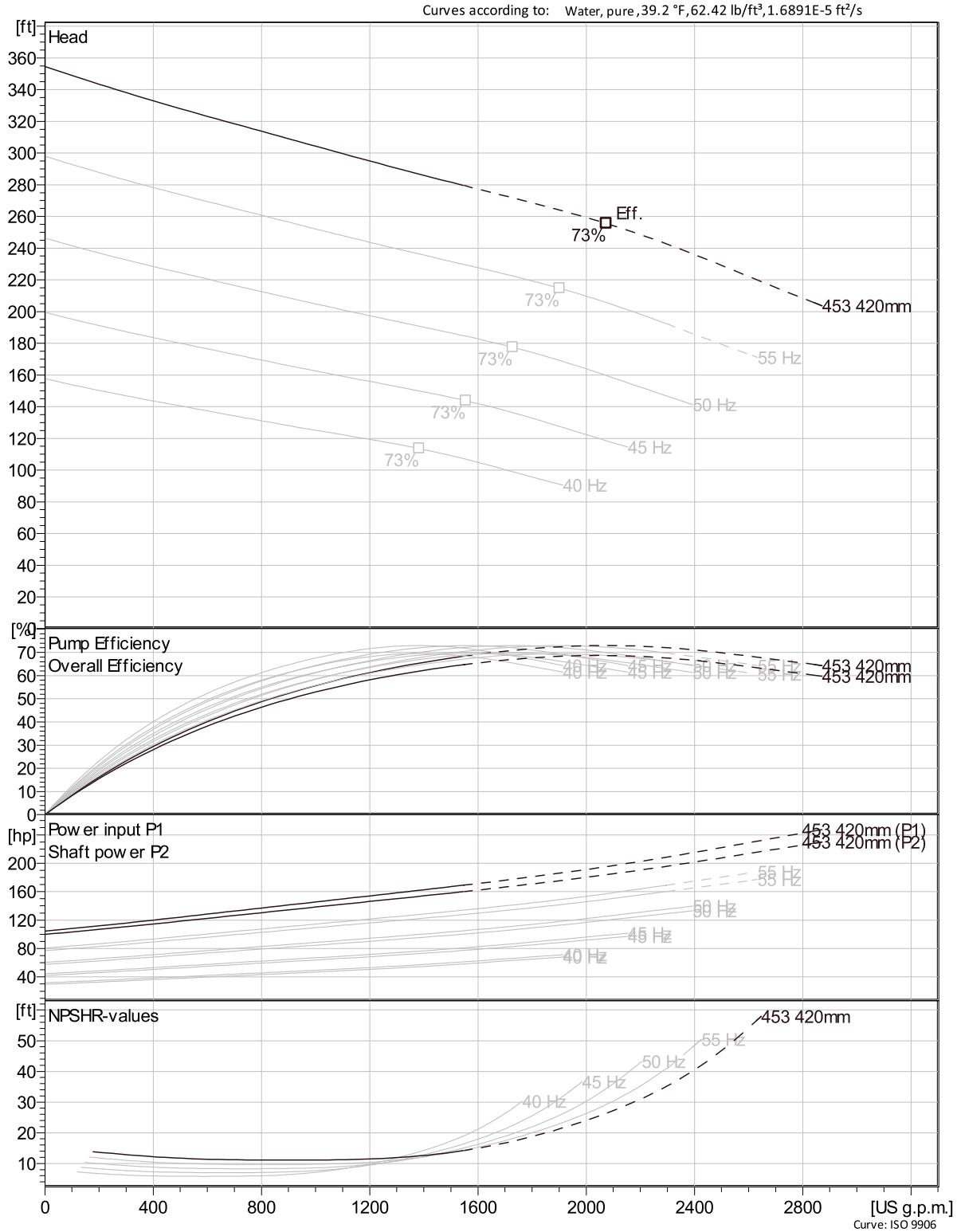
Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	762	316	129	762	316	129	47.2 %	2210	11.1

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/9/2022	**Last update**	5/9/2022

NP 3315 HT 3~ 453

VFD Curve

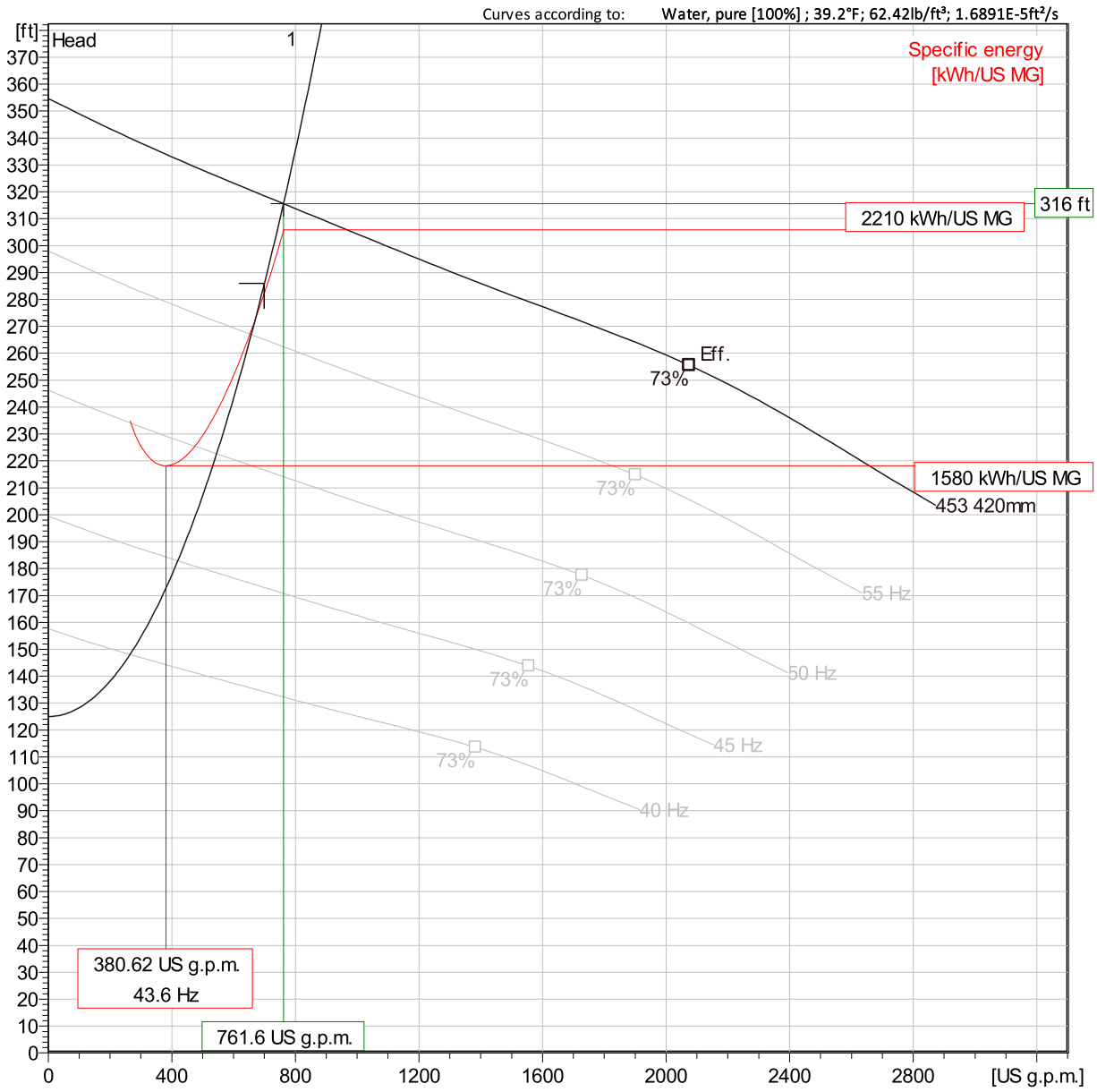
Curves according to: Water, pure ,39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Project		**Created by**	Ron Mosher		
Block		**Created on**	5/9/2022	**Last update**	5/9/2022

NP 3315 HT 3~ 453

VFD Analysis



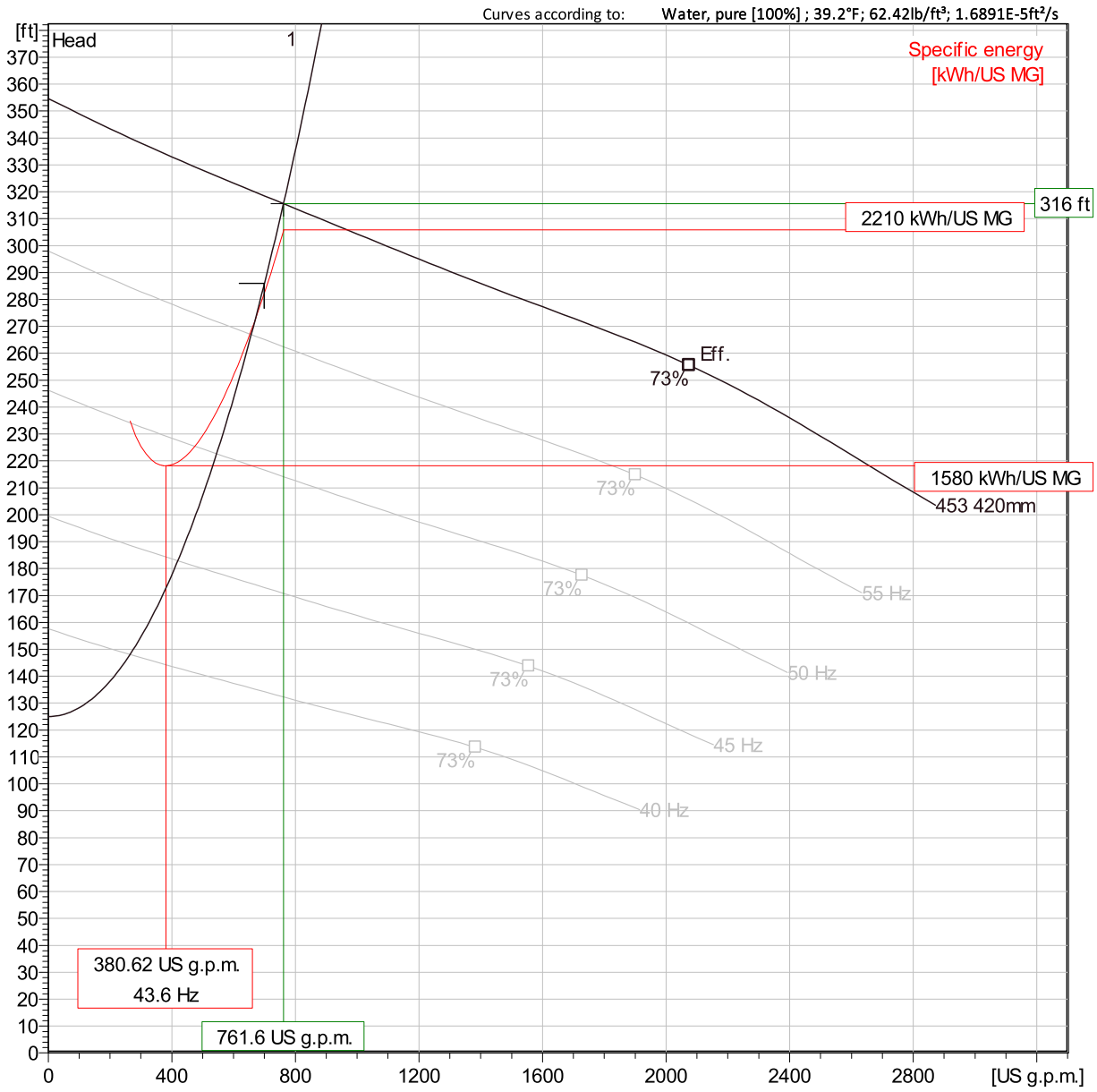
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	60 Hz	762	316	129	762	316	129	47.2 %	2210	11.1
1	55 Hz	657	267	97.9	657	267	97.9	45.3 %	2470	9.72
1	50 Hz	545	223	72.1	545	223	72.1	42.6 %	2870	8.42
1	45 Hz	420	183	51	420	183	51	38.1 %	3580	7.26

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/9/2022	**Last update**	5/9/2022

NP 3315 HT 3~ 453

VFD Analysis



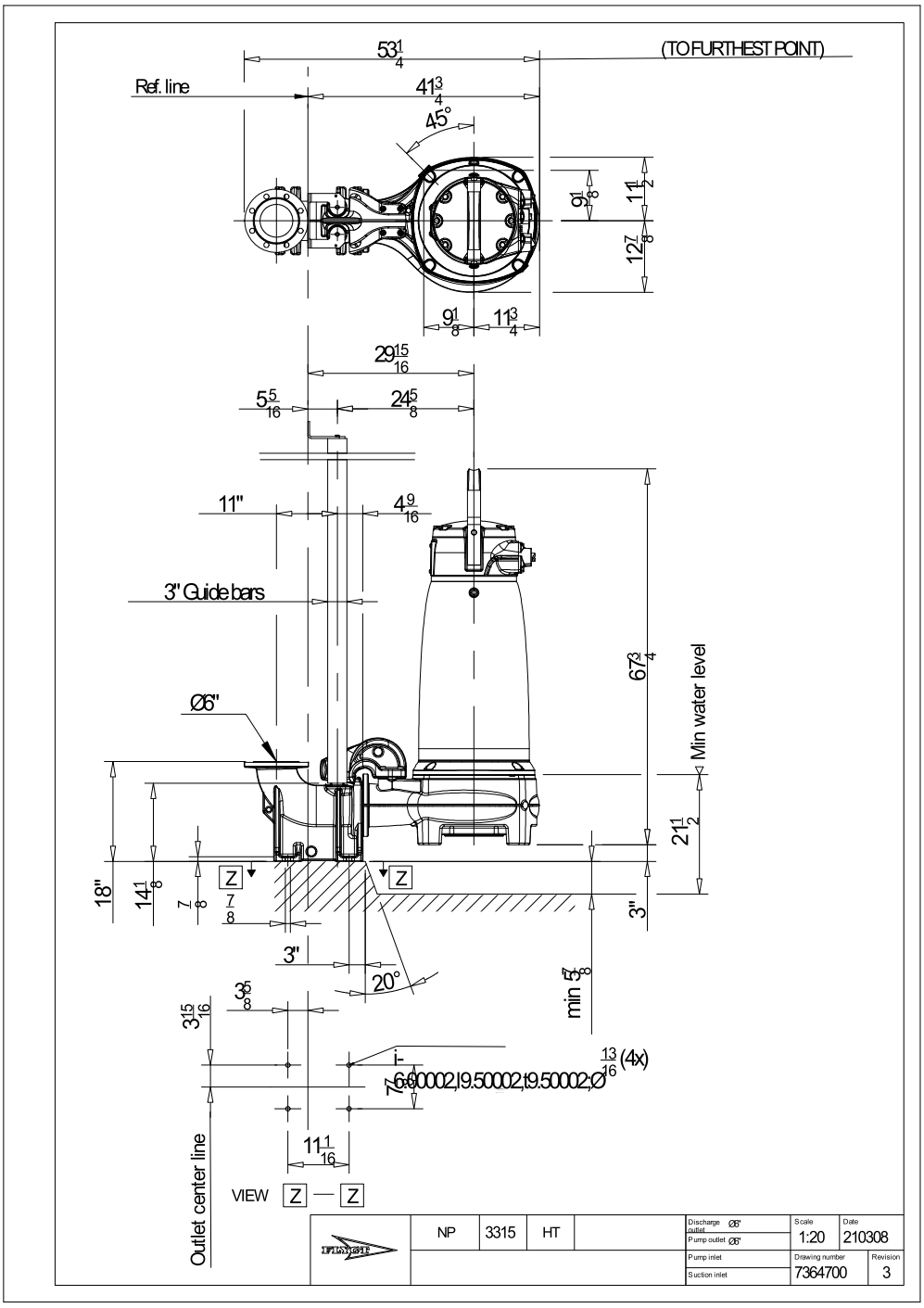
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	40 Hz	265	148	33.9	265	148	33.9	29.3 %	5370	6.39

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/9/2022	**Last update**	5/9/2022

NP 3315 HT 3~ 453

Dimensional drawing



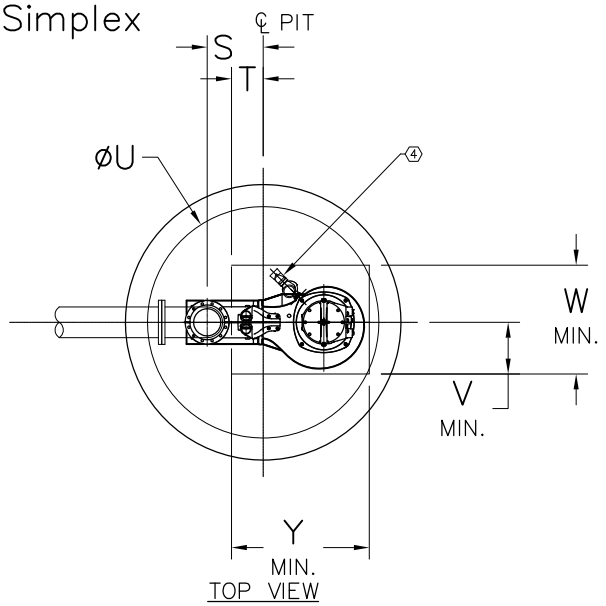
Project	**Created by**	Ron Mosher	
Block	**Created on**	5/9/2022	**Last update** 5/9/2022

NP-3315

⬡ NOTES:

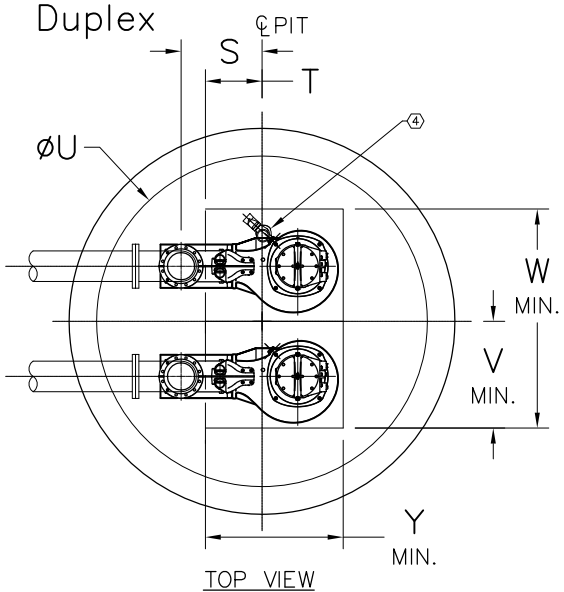
1. CONFIGURATION AND DIMS. SHOWN ARE SUGGESTED REQUIREMENTS ONLY. ALL DETAILS, INCLUDING SIZING OF PIT, TYPE, LOCATION AND ARRANGEMENT OF VALVES AND PIPING, ETC. ARE TO BE SPECIFIED BY THE CONSULTING ENGINEER AND ARE SUBJECT TO THEIR APPROVAL.
2. REFERENCE GENERIC DUPLEX LIFT STATION LAYOUT.
3. LOCATE ANCHOR BOLTS USING CLEAR INSIDE EDGE OF ACCESS FRAME AND PUMP CENTERLINE AS REFERENCE POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP TO ACCESS FRAME.
4. FLYGT MIX–FLUSH VALVE.

Simplex

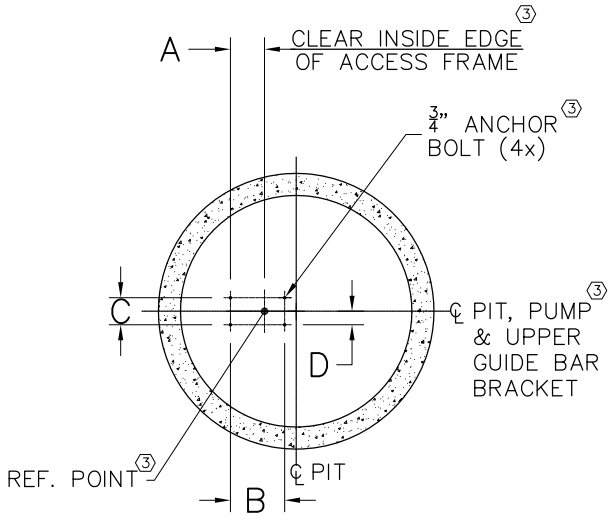


TOP VIEW

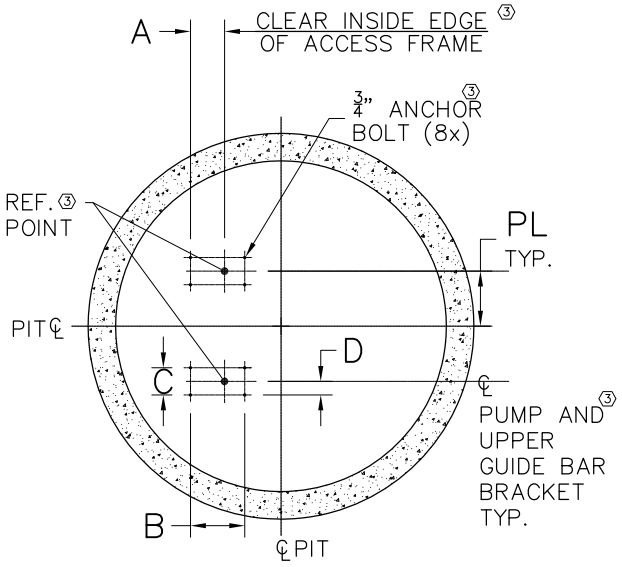
Duplex



TOP VIEW



BASE SECTION



BASE SECTION

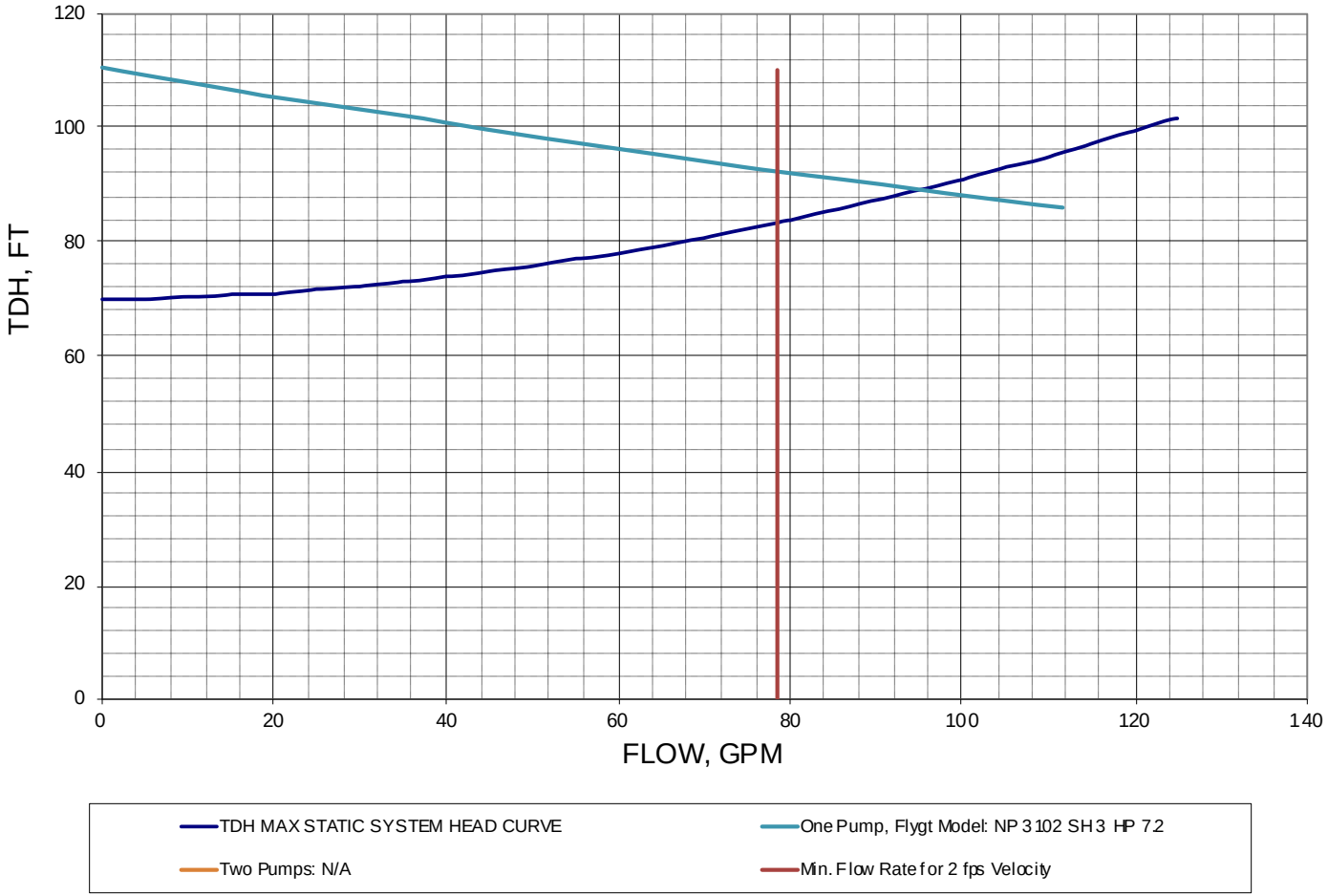
ALL DIMENSIONS ARE IN INCHES

NOM. SIZE	VERSION	A	B	C	D	SIMPLEX S	T	U	V	W	Y	DUPLEX S	T	U	PL	V	W	Y
6"	HT	3 5/8	11	8	4	19 1/2	13 7/8	72	15	35	44	17 1/2	11 7/8	84	16	31	67	44
10"	MT	12 3/8	19 11/16	10	5	20 1/4	11 1/2	84	18 3/4	39 1/2	50	29 1/2	20 1/2	120	20	38 3/4	79 1/2	50
12"	LT	7 5/8	19 11/16	18 1/4	9 1/8	22 3/4	12	96	21	42	52	24 1/4	12 3/8	120	23	44	88	52
14"	LT	16	25 5/8	23 3/4	11 7/8	33	19 3/4	120	24	45 1/2	59	33 1/4	19 3/4	144	26	50	97 1/2	59

ATTACHMENT H:

WA-DI LIFT STATION
WITH 4-INCH FORCEMAIN TO WWTP SITE

SANTO DOMINGO PUEBLO
Wa-Di Lift Station



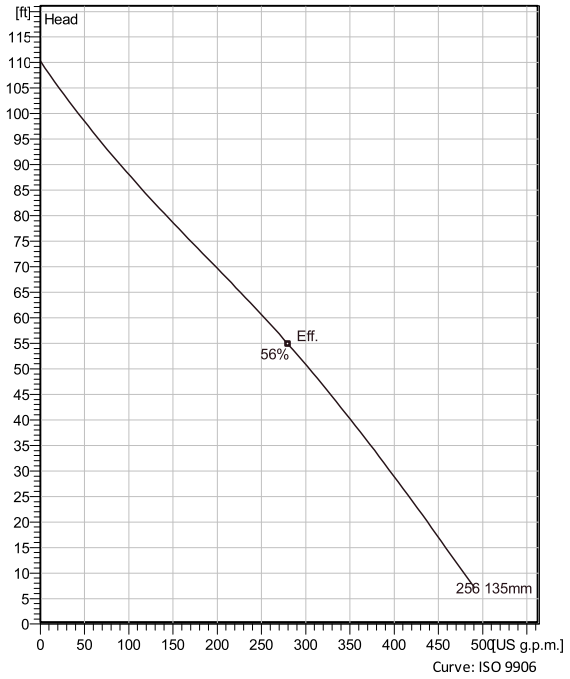
NP 3102 SH 3~ Adaptive 256

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification



Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Configuration

Motor number
N3102.930 18-10-2AS-W IE3 7.2hp

Installation type
P - Semi permanent, Wet

Impeller diameter
135 mm

Discharge diameter
3 inch

Pump information

Impeller diameter
135 mm

Discharge diameter
3 inch

Inlet diameter
100 mm

Maximum operating speed
3600 rpm

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron ™

Stator housing material
Grey cast iron

Project	**Created by**	Ron Mosher	
Block	**Created on**	4/28/2022 **Last update**	4/28/2022

NP 3102 SH 3~ Adaptive 256

Technical specification

Motor - General

Motor number N3102.930 18-10-2AS-W IE3 7.2hp	**Phases** 3~	**Rated speed** 3600 rpm	**Rated power** 7.2 hp
ATEX approved FM	**Number of poles** 2	**Rated current** 8.9 A	**Stator variant** 70
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 930			

Motor - Technical

Power factor - 1/1 Load 0.84	**Motor efficiency - 1/1 Load** 89.5 %	**Total moment of inertia** 0.254 lb ft²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.80	**Motor efficiency - 3/4 Load** 89.4 %	**Starting current, direct starting** 74 A	
Power factor - 1/2 Load 0.70	**Motor efficiency - 1/2 Load** 87.2 %	**Starting current, star-delta** 24.7 A	

Project	**Created by**	Ron Mosher		
Block	**Created on**	4/28/2022	**Last update**	4/28/2022

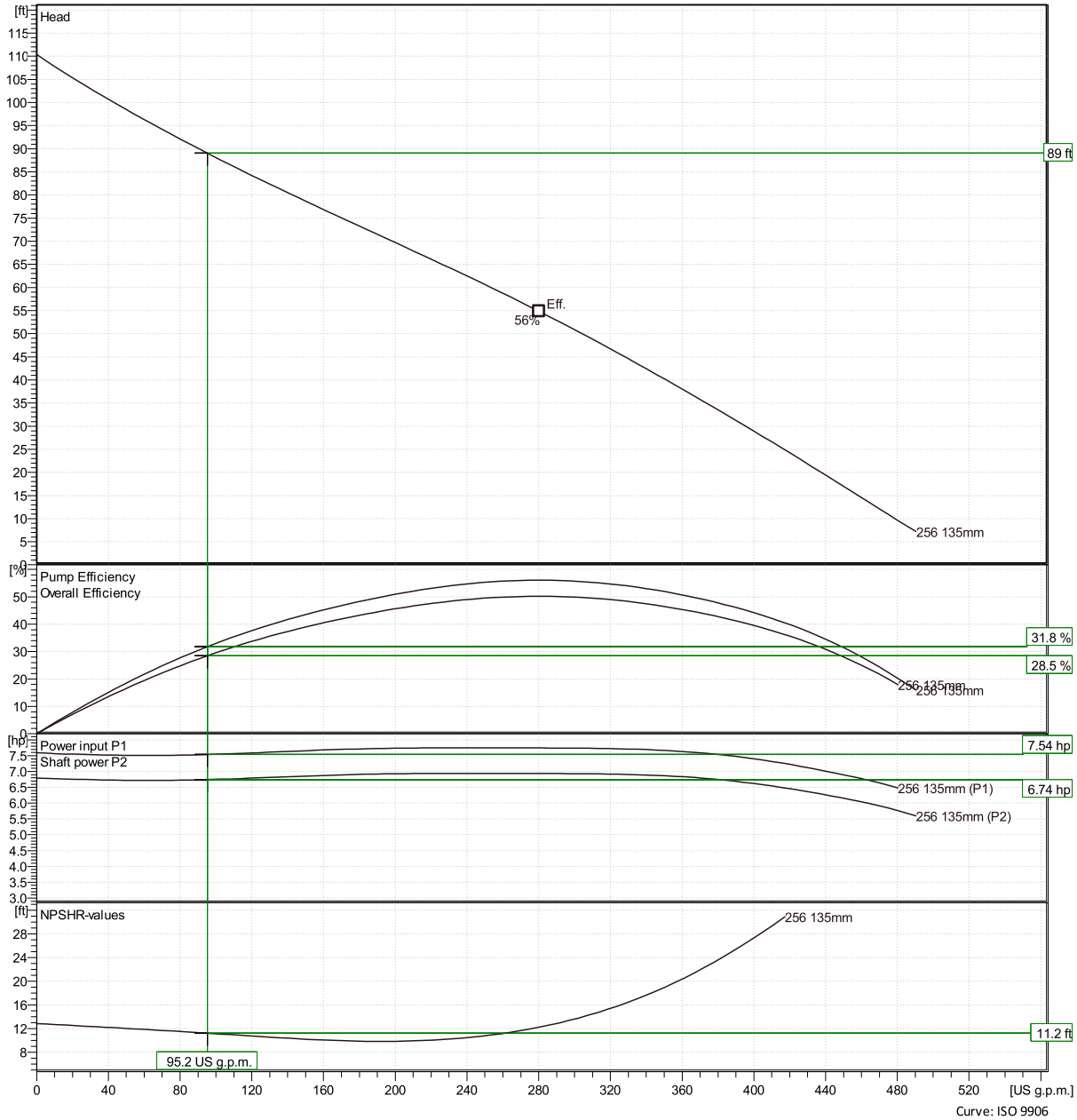
NP 3102 SH 3~ Adaptive 256

Performance curve

Duty point

Flow	Head
95.2 US g.p.m.	89 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

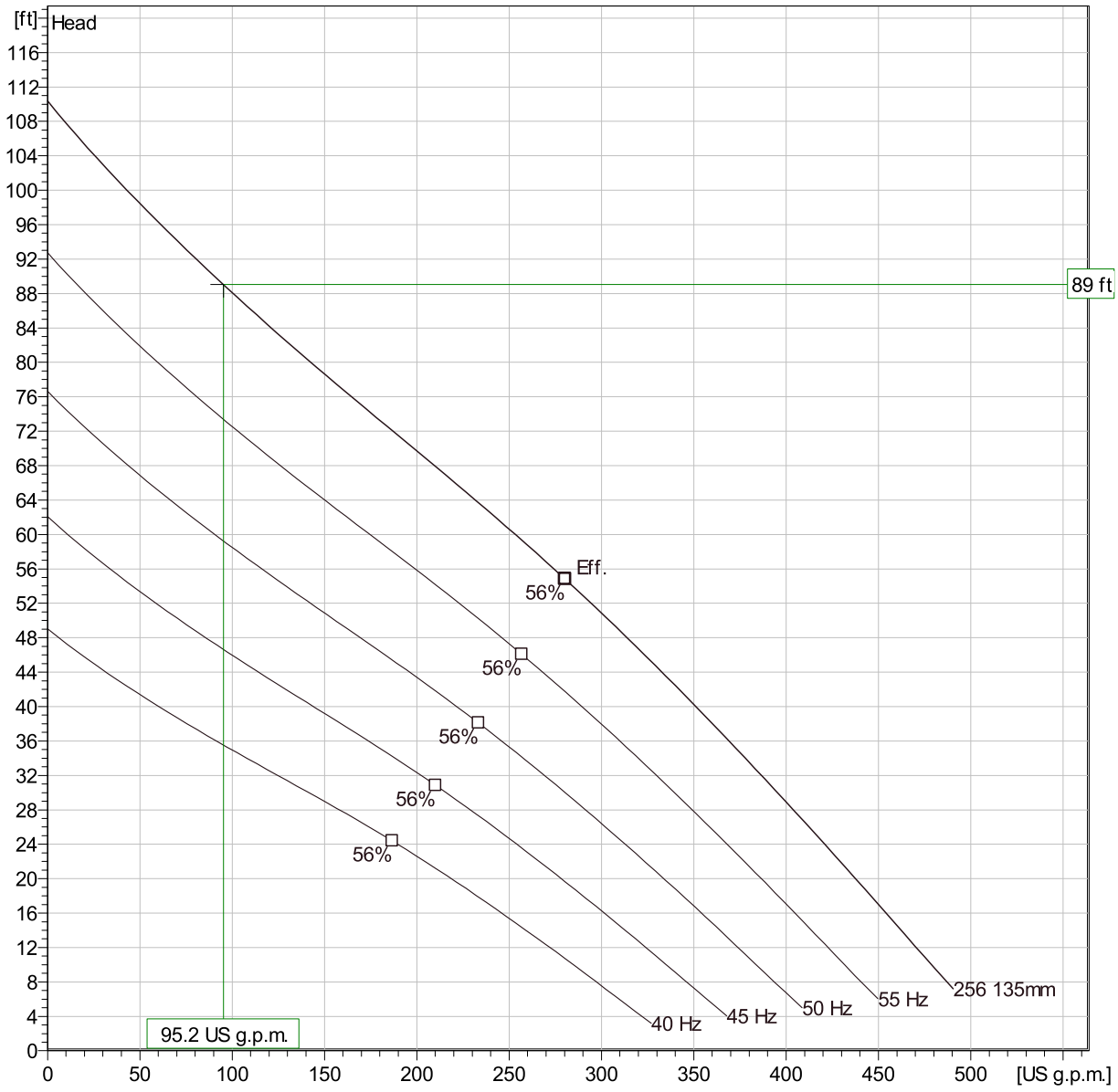
Ron Mosher

Created on 4/28/2022 **Last update** 4/28/2022

NP 3102 SH 3~ Adaptive 256

Duty Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



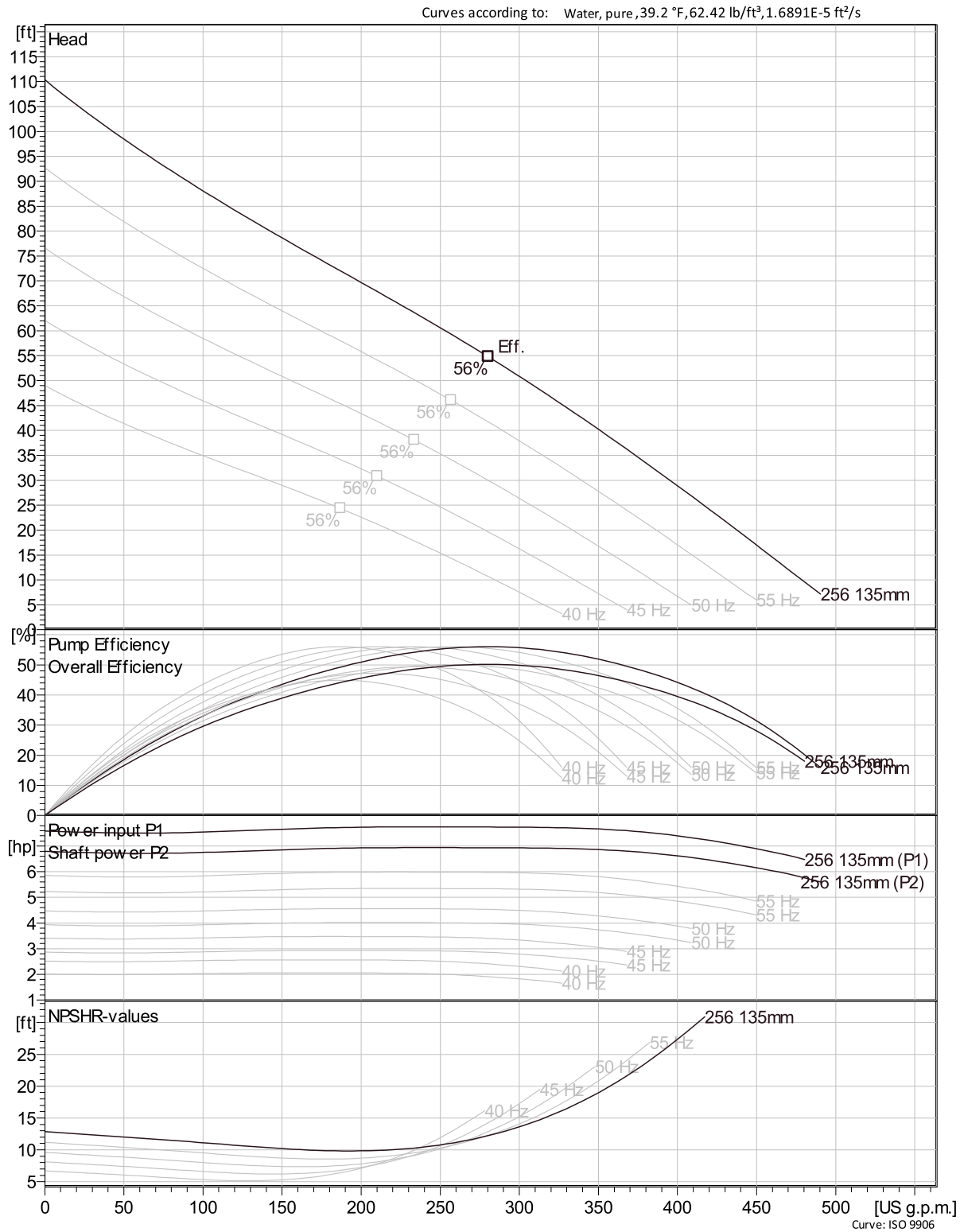
Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	95.2	89	6.74	95.2	89	6.74	31.8 %	983	11.2

Project		**Created by**	Ron Mosher		
Block		**Created on**	4/28/2022	**Last update**	4/28/2022

NP 3102 SH 3~ Adaptive 256

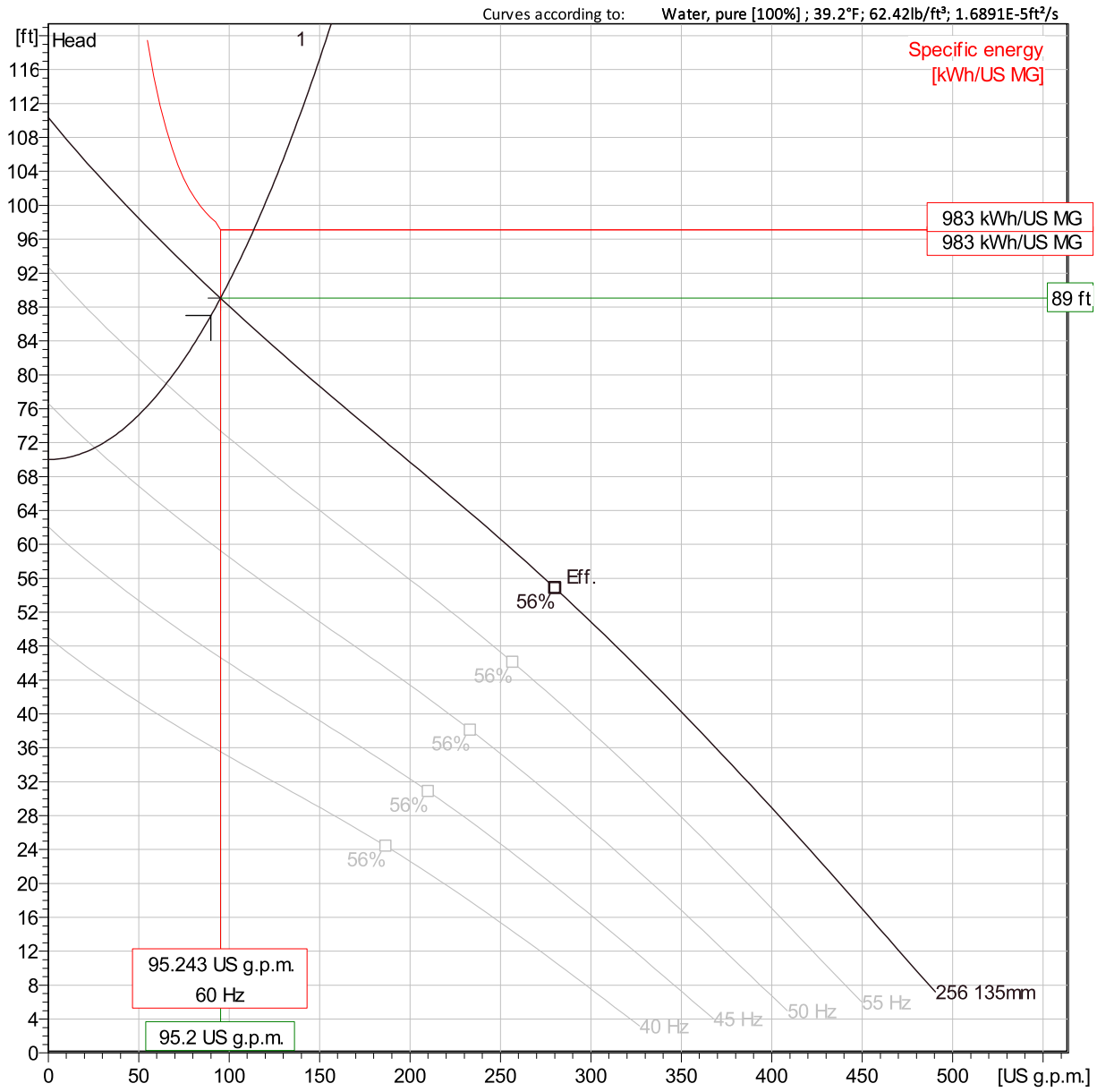
VFD Curve



Project		**Created by**	Ron Mosher		
Block		**Created on**	4/28/2022	**Last update**	4/28/2022

NP 3102 SH 3~ Adaptive 256

VFD Analysis



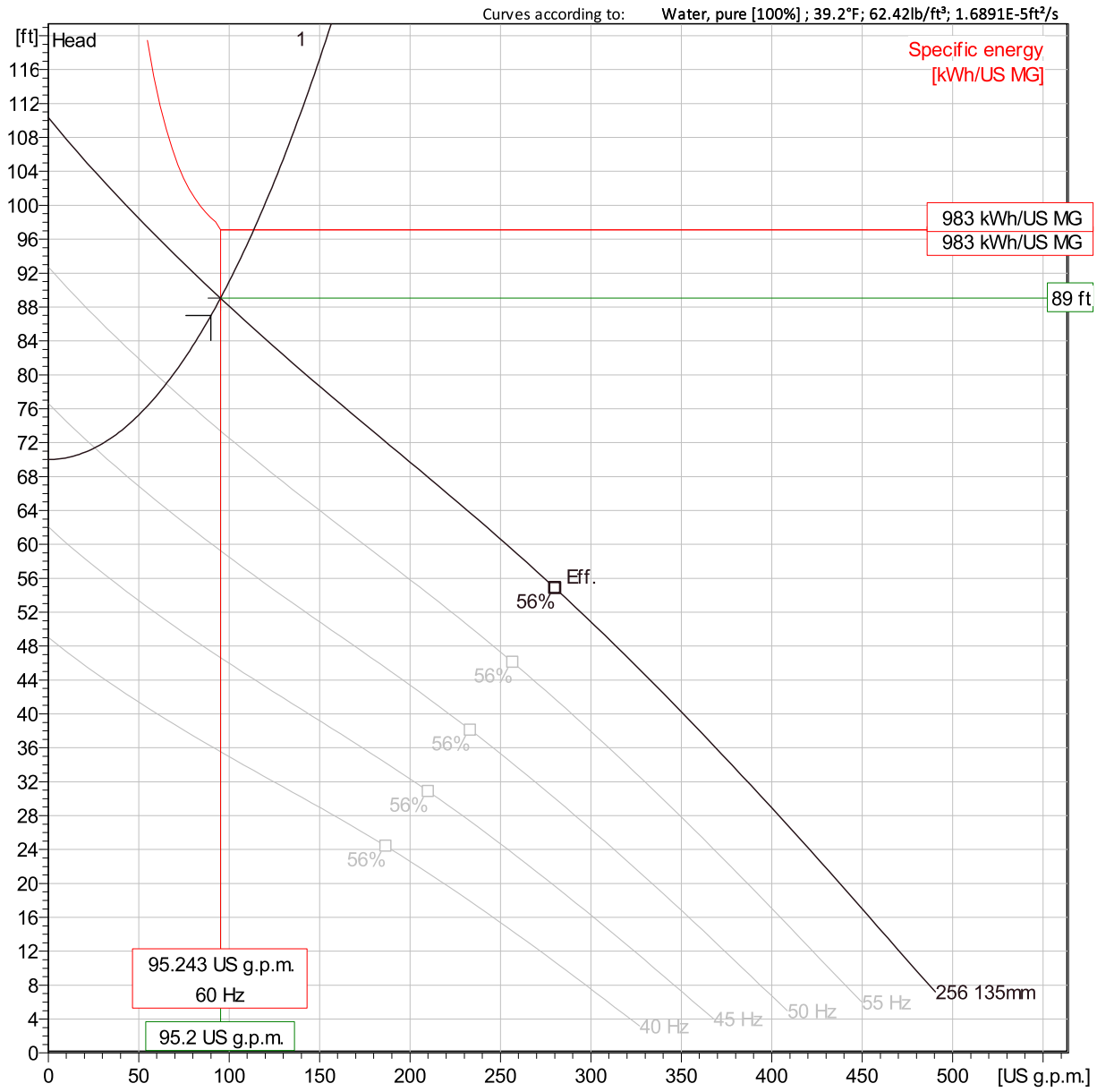
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	60 Hz	95.2	89	6.74	95.2	89	6.74	31.8 %	983	11.2
1	55 Hz	65.2	78.9	5.18	65.2	78.9	5.18	25.2 %	1430	10.1
1	50 Hz	25.7	71.4	3.9	25.7	71.4	3.9	11.9 %	3650	9.22
1	45 Hz									

Project		**Created by**	Ron Mosher		
Block		**Created on**	4/28/2022	**Last update**	4/28/2022

NP 3102 SH 3~ Adaptive 256

VFD Analysis



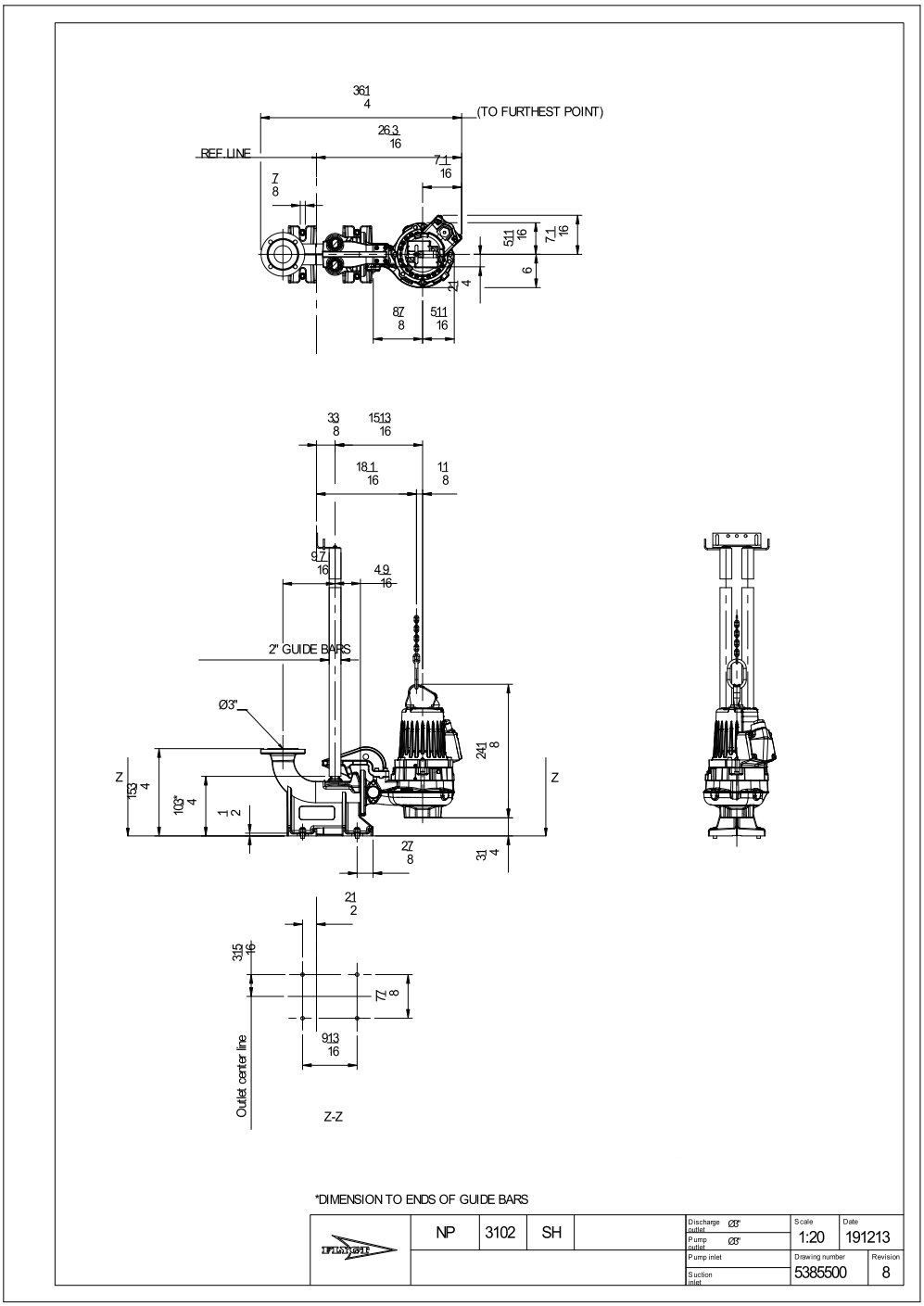
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	40 Hz									

Project		**Created by**	Ron Mosher		
Block		**Created on**	4/28/2022	**Last update**	4/28/2022

NP 3102 SH 3~ Adaptive 256

Dimensional drawing



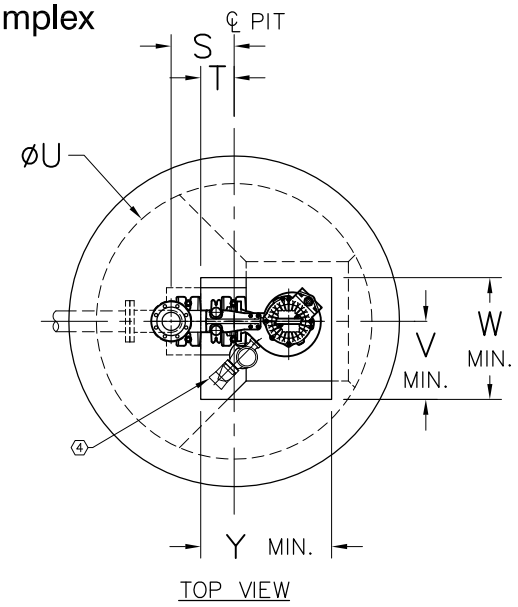
Project	**Created by**	Ron Mosher	
Block	**Created on**	4/28/2022	**Last update** 4/28/2022

CP/DP/NP-3102

NOTES:

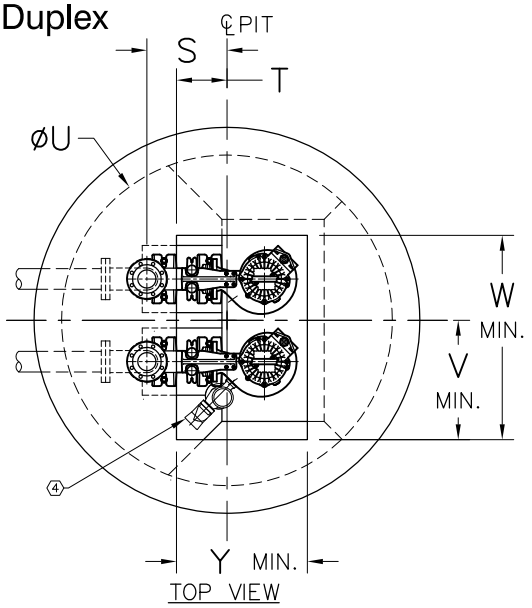
1. CONFIGURATION AND DIMS. SHOWN ARE SUGGESTED REQUIREMENTS ONLY. ALL DETAILS, INCLUDING SIZING OF PIT, TYPE, LOCATION AND ARRANGEMENT OF VALVES AND PIPING, ETC. ARE TO BE SPECIFIED BY THE CONSULTING ENGINEER AND ARE SUBJECT TO THEIR APPROVAL.
2. REFERENCE GENERIC DUPLEX LIFT STATION LAYOUT FOR ELEVATION VIEW.
3. LOCATE ANCHOR BOLTS USING INSIDE EDGE OF CLEAR OPENING AND PUMP CENTERLINE AS REFERENCE POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP TO CLEAR OPENING.
4. FLYGT MIX–FLUSH VALVE.

Simplex

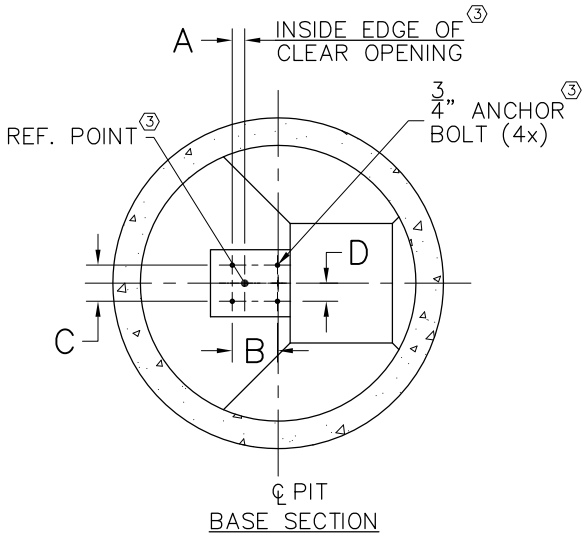


TOP VIEW

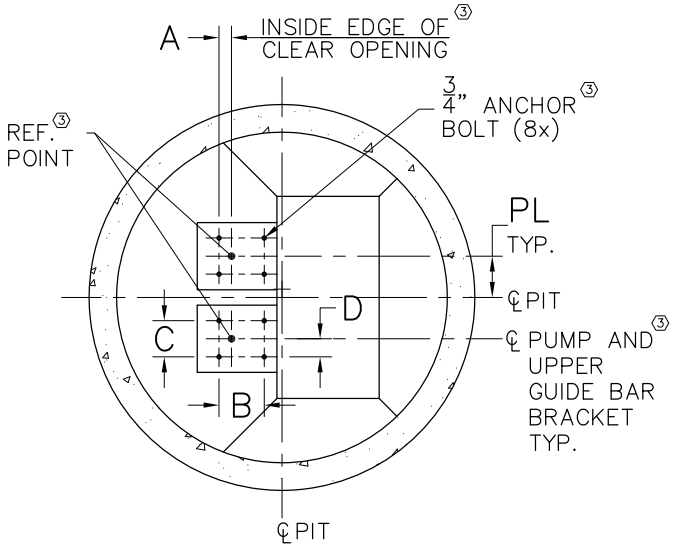
Duplex



TOP VIEW



BASE SECTION



BASE SECTION

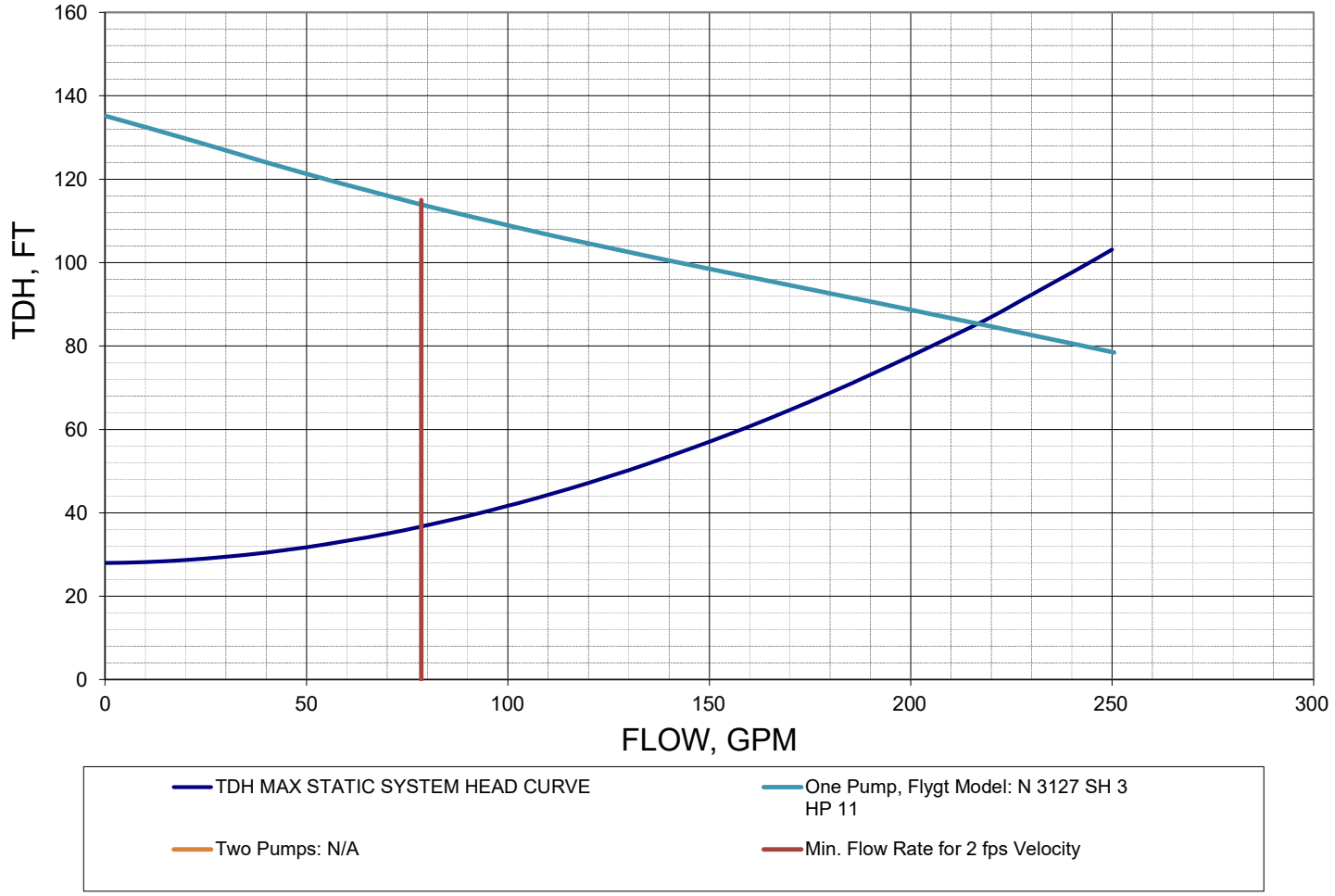
ALL DIMENSIONS ARE IN INCHES

MODEL	NOM. SIZE	VERSION					SIMPLEX						DUPLEX						
			A	B	C	D	S	T	U	V	W	Y	S	T	U	PL	V	W	Y
CP/NP	3"	HT/SH	2 3/8	9 7/8	8	4	15 5/8	9 1/2	60	17	26 1/2	28 1/2	19 3/8	13 1/4	72	9	26	44 1/2	28 1/2
CP/DP/NP	4"	MT	2 3/4	9 7/8	8	4	13 3/4	7 1/4	60	17	26 1/2	28 1/2	17 1/2	11	72	9	26	44 1/2	28 1/2
CP/NP	4"	LT	2 3/4	9 7/8	8	4	13 3/4	7 1/4	60	16	25 1/2	28 1/2	17 1/2	11	72	9	25	43 1/2	28 1/2
CP/NP	6"	LT	4 1/4	11	10	5	11	3 3/8	60	17 1/2	27	28 1/2	14 3/8	6 3/4	72	9	26 1/2	45	28 1/2
CP	8"	LT	5 1/2	11	10	5	8 7/8	0	60	17 1/2	27	28 1/2	11 3/8	2 1/2	72	9	26 1/2	45	28 1/2

ATTACHMENT I:

ENTERPRISE AREA LIFT STATION
WITH 4-INCH FORCEMAIN TO GRAVITY SEWER TO WWTP SITE

SANTO DOMINGO PUEBLO
Enterprise Area Lift Station



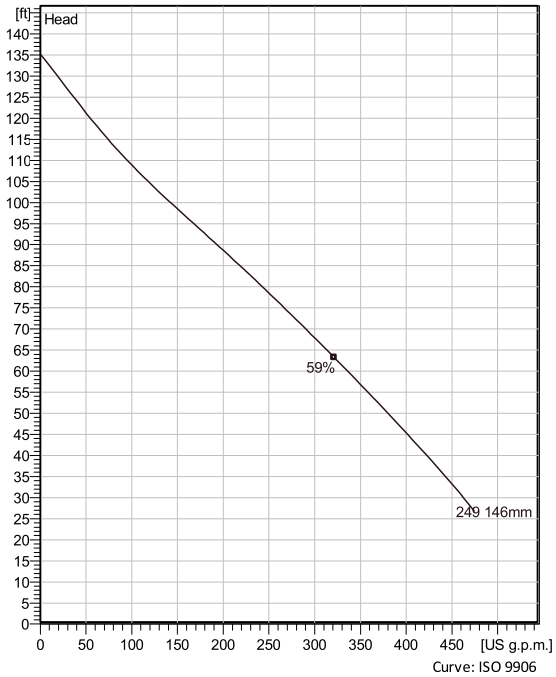
NP 3127 SH 3~ Adaptive 249

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification



Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Configuration

Motor number
N3127.070 21-11-2AL-W 11hp

Installation type
P - Semi permanent, Wet

Impeller diameter
146 mm

Discharge diameter
3 inch

Pump information

Impeller diameter
146 mm

Discharge diameter
3 inch

Inlet diameter
80 mm

Maximum operating speed
3495 rpm

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron ™

Stator housing material
Grey cast iron

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/9/2022	**Last update**	5/9/2022

NP 3127 SH 3~ Adaptive 249

Technical specification

Motor - General

Motor number N3127.070 21-11-2AL-W 11hp	**Phases** 3~	**Rated speed** 3495 rpm	**Rated power** 11 hp
ATEX approved FM	**Number of poles** 2	**Rated current** 13 A	**Stator variant** 12
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 070			

Motor - Technical

Power factor - 1/1 Load 0.92	**Motor efficiency - 1/1 Load** 87.6 %	**Total moment of inertia** 0.434 lb ft²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.90	**Motor efficiency - 3/4 Load** 88.4 %	**Starting current, direct starting** 110 A	
Power factor - 1/2 Load 0.85	**Motor efficiency - 1/2 Load** 87.7 %	**Starting current, star-delta** 36.7 A	

Project	**Created by**	Ron Mosher		
Block	**Created on**	5/9/2022	**Last update**	5/9/2022

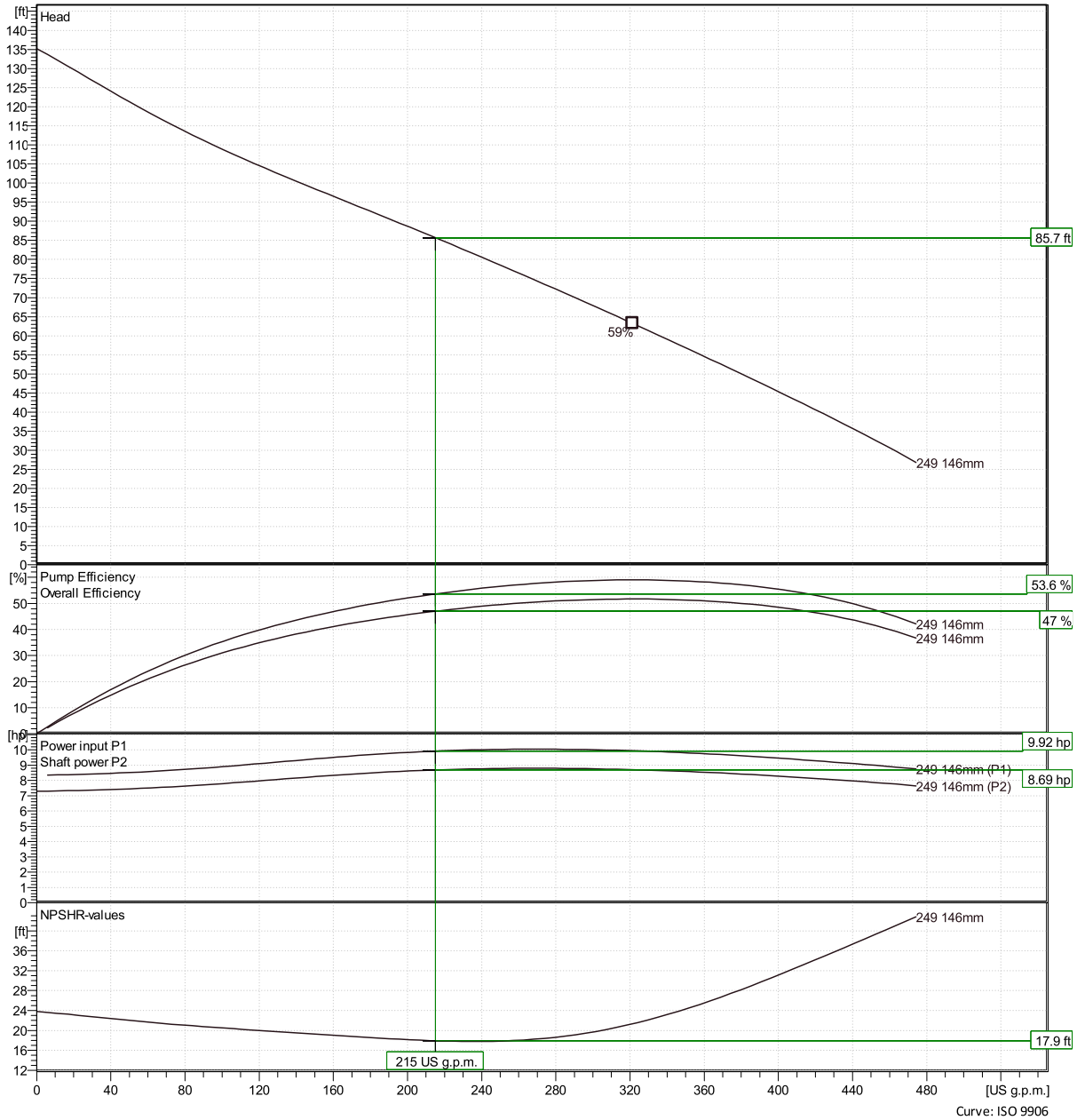
NP 3127 SH 3~ Adaptive 249

Performance curve

Duty point

Flow	Head
215 US g.p.m.	85.7 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



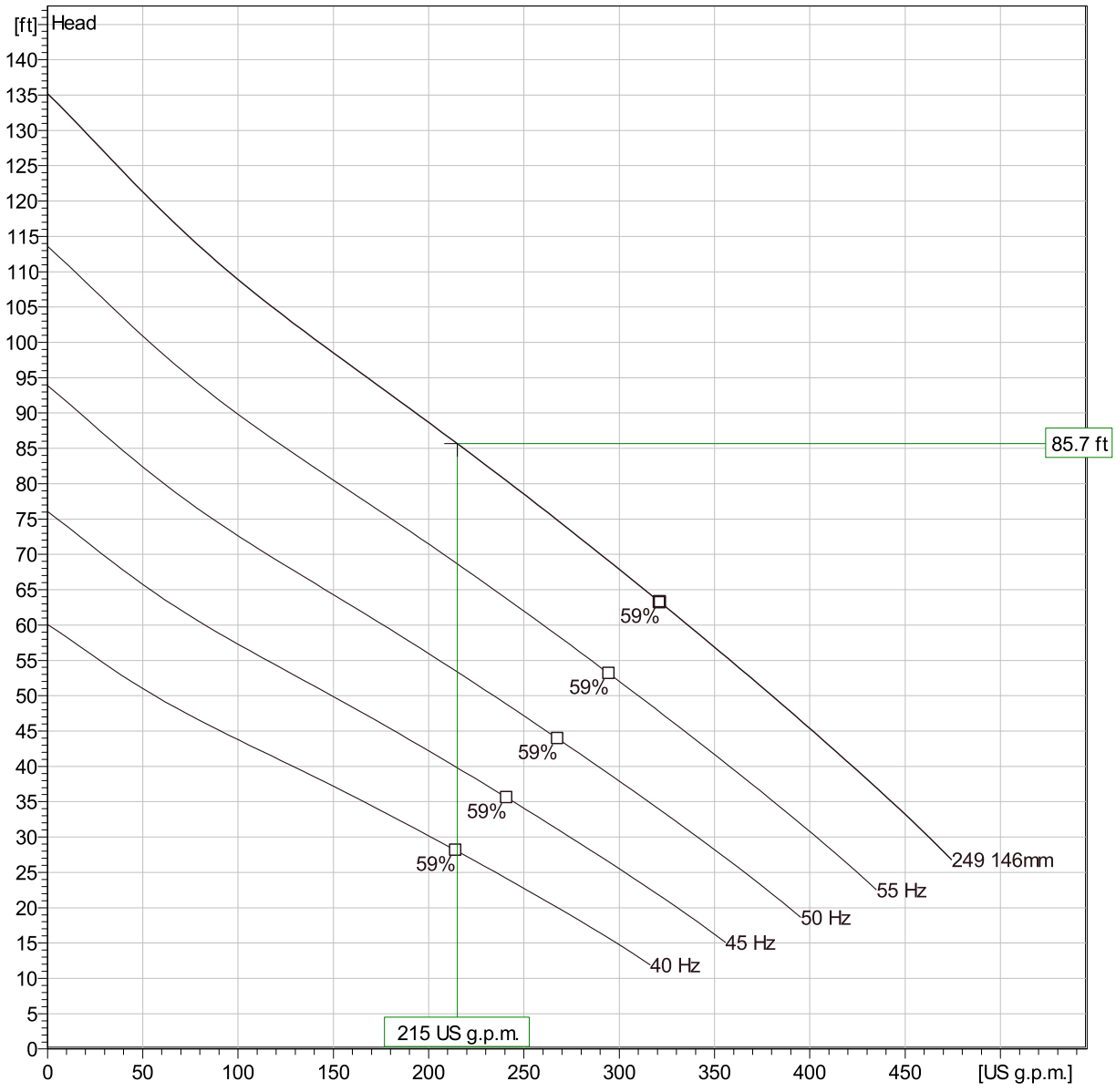
Curve: ISO 9906

	Ron Mosher		
Created on	5/9/2022	**Last update**	5/9/2022

NP 3127 SH 3~ Adaptive 249

Duty Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Operating characteristics

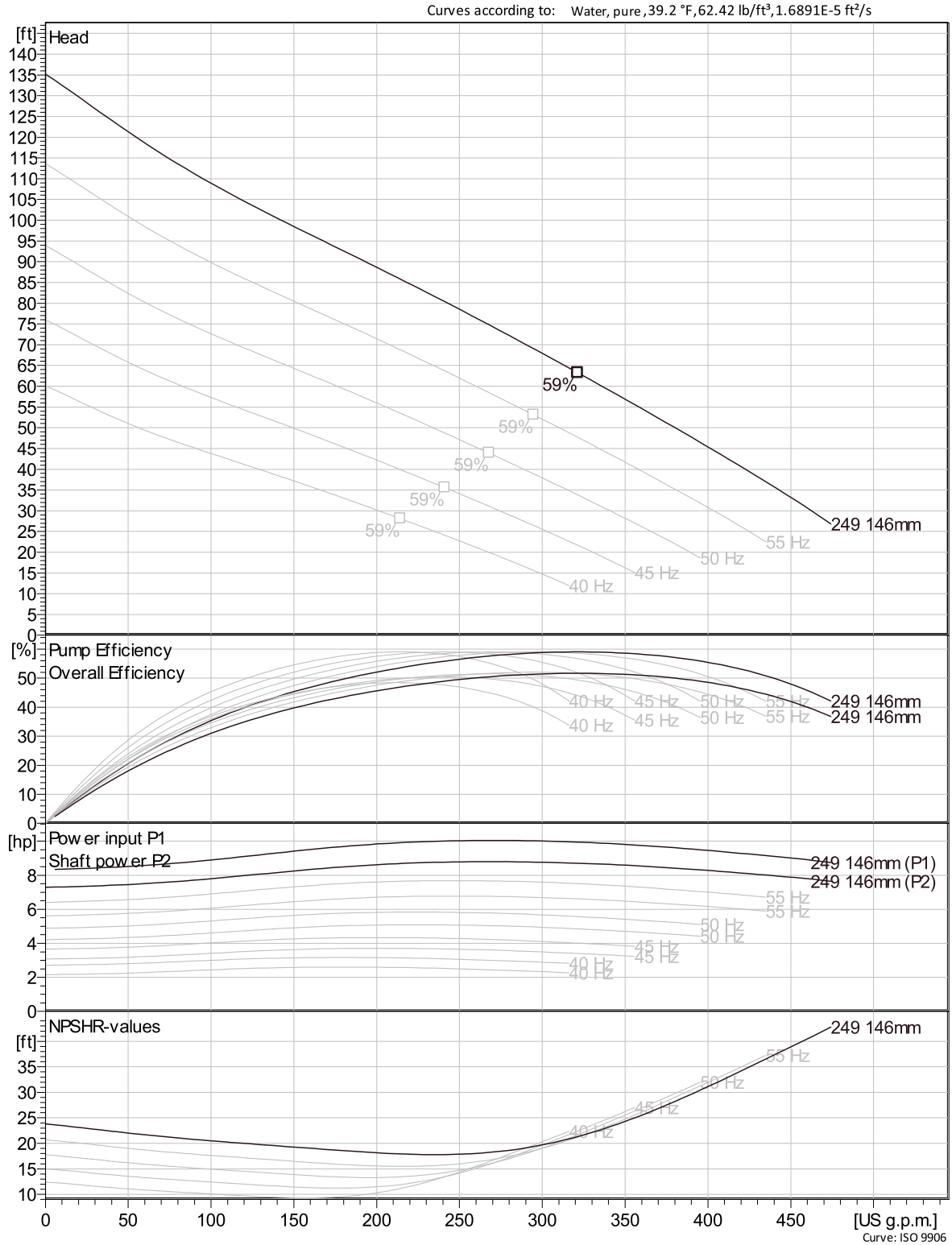
Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	215	85.7	8.69	215	85.7	8.69	53.6 %	573	17.9

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/9/2022	**Last update**	5/9/2022

NP 3127 SH 3~ Adaptive 249

VFD Curve

Curves according to: Water, pure ,39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s

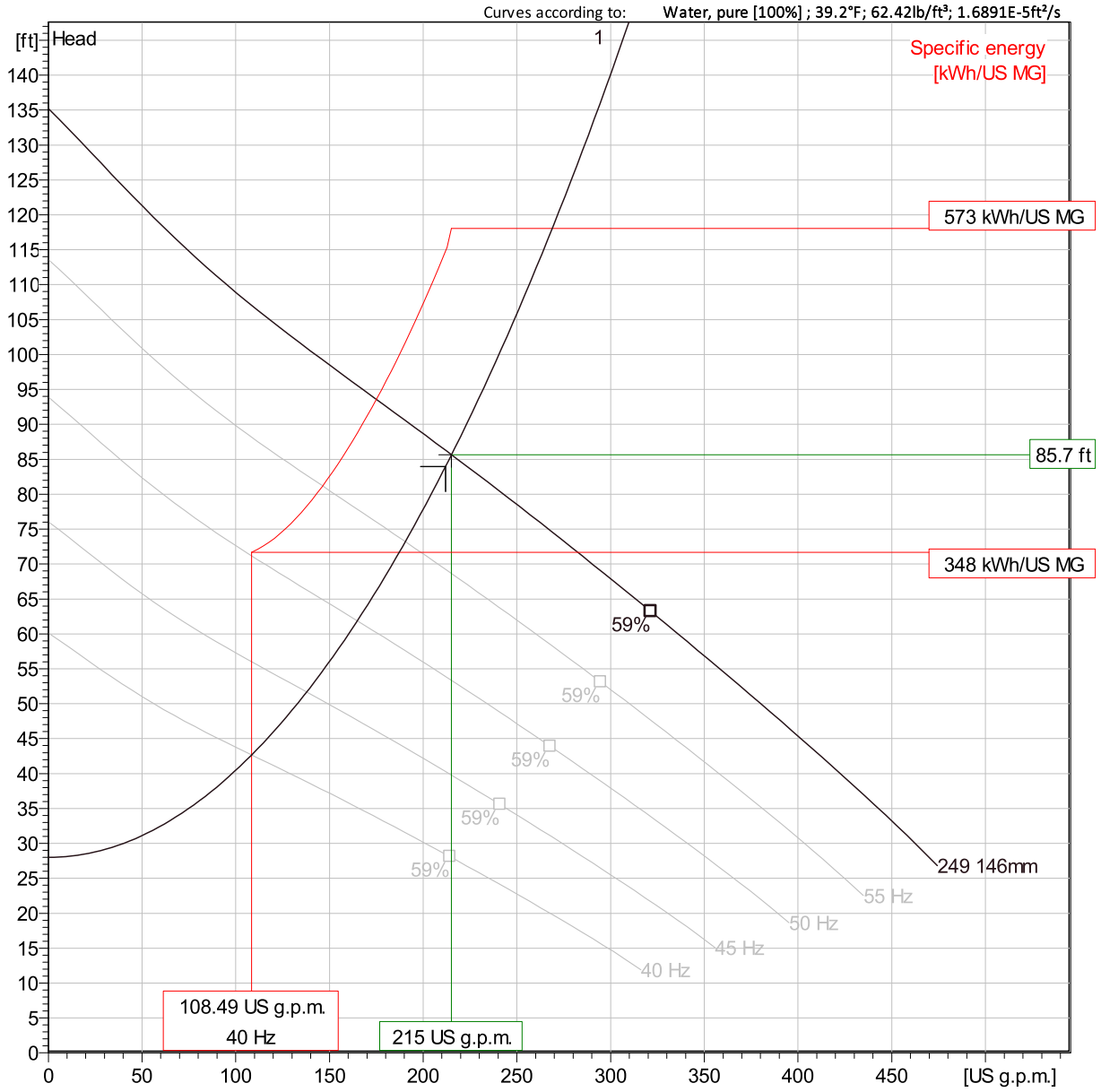


Curve: ISO 9906

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/9/2022	**Last update**	5/9/2022

NP 3127 SH 3~ Adaptive 249

VFD Analysis



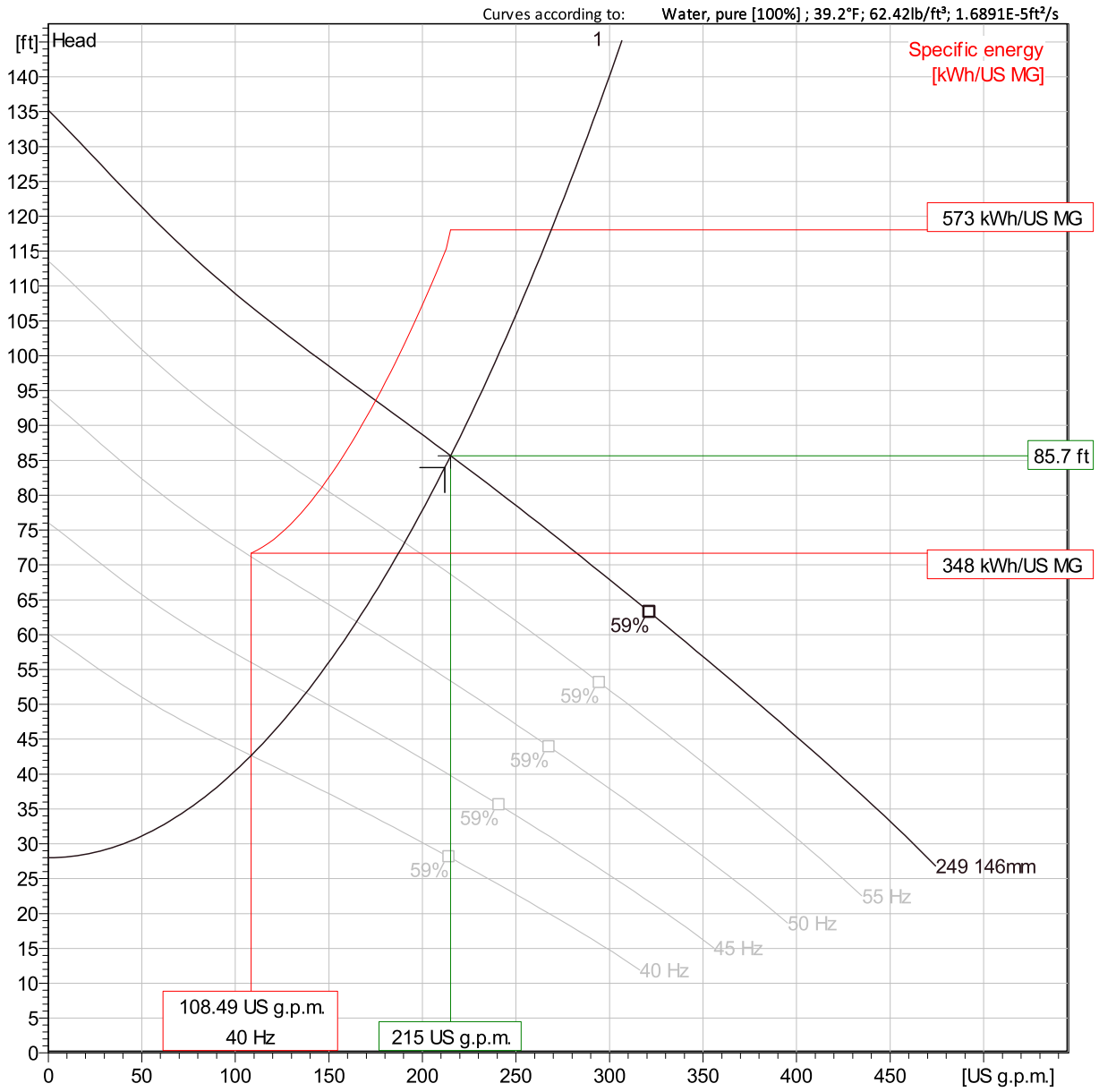
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	60 Hz	215	85.7	8.69	215	85.7	8.69	53.6 %	573	17.9
1	55 Hz	190	73.2	6.67	190	73.2	6.67	52.9 %	637	15.7
1	50 Hz	165	61.9	4.98	165	61.9	4.98	51.8 %	720	13.6
1	45 Hz	138	51.7	3.59	138	51.7	3.59	50.1 %	837	11.7

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/9/2022	**Last update**	5/9/2022

NP 3127 SH 3~ Adaptive 249

VFD Analysis



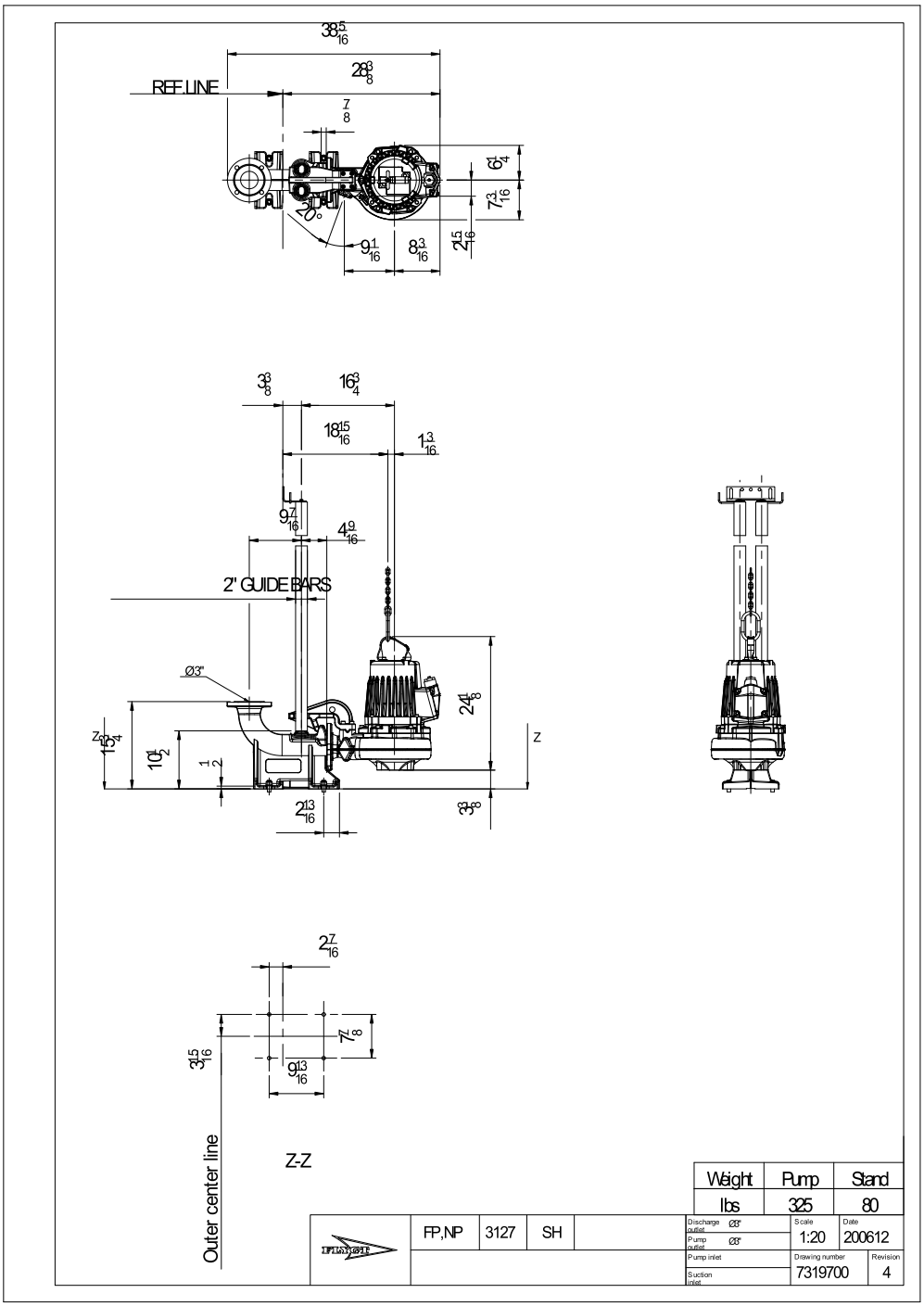
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	40 Hz	108	42.7	2.48	108	42.7	2.48	47.3 %	1030	9.91

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/9/2022	**Last update**	5/9/2022

NP 3127 SH 3~ Adaptive 249

Dimensional drawing



Project	**Created by**	Ron Mosher	
Block	**Created on**	5/9/2022	**Last update** 5/9/2022

FLYGT
a xylem brand

Issued: 11/11 Supersedes: 1/11

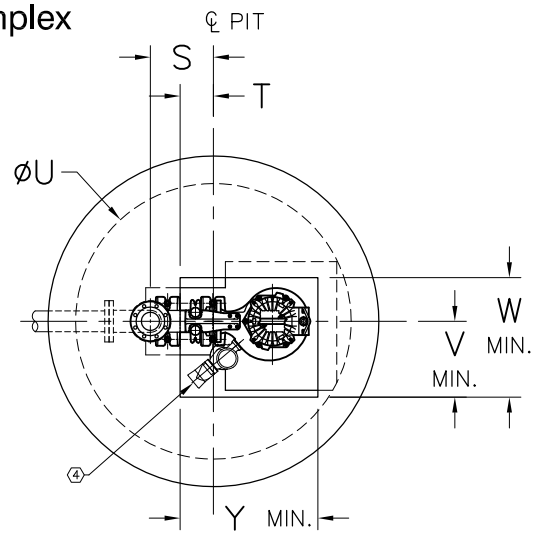
6820180

CP/DP/FP/NP-3127

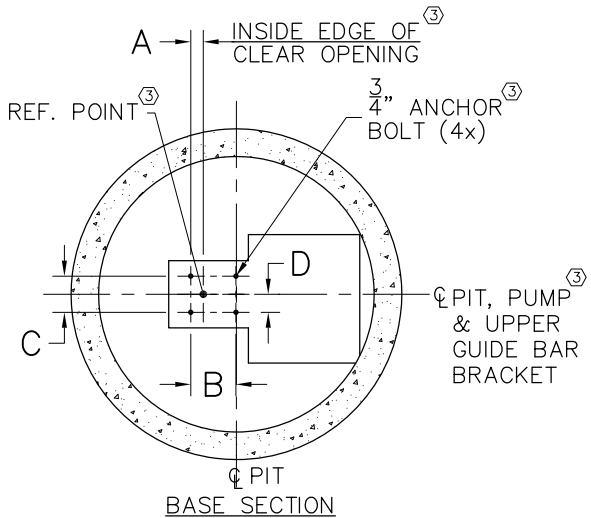
NOTES:

1. CONFIGURATION AND DIMS. SHOWN ARE SUGGESTED REQUIREMENTS ONLY. ALL DETAILS, INCLUDING SIZING OF PIT, TYPE, LOCATION AND ARRANGEMENT OF VALVES AND PIPING, ETC. ARE TO BE SPECIFIED BY THE CONSULTING ENGINEER AND ARE SUBJECT TO THEIR APPROVAL.
2. REFERENCE GENERIC DUPLEX LIFT STATION LAYOUT FOR ELEVATION VIEW.
3. LOCATE ANCHOR BOLTS USING INSIDE EDGE OF CLEAR OPENING AND PUMP CENTERLINE AS REFERENCE POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP TO CLEAR OPENING.
4. FLYGT MIX–FLUSH VALVE.

Simplex

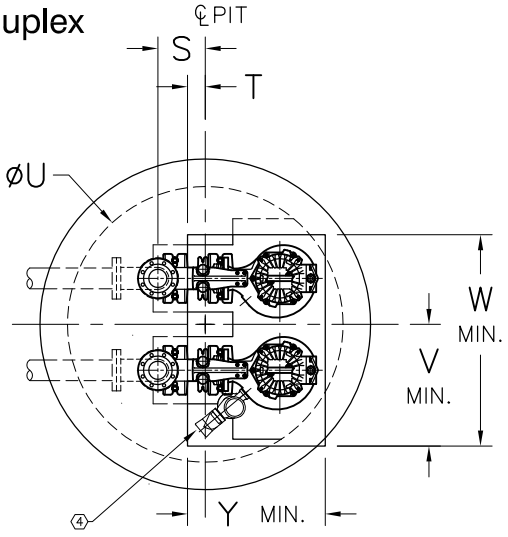


TOP VIEW

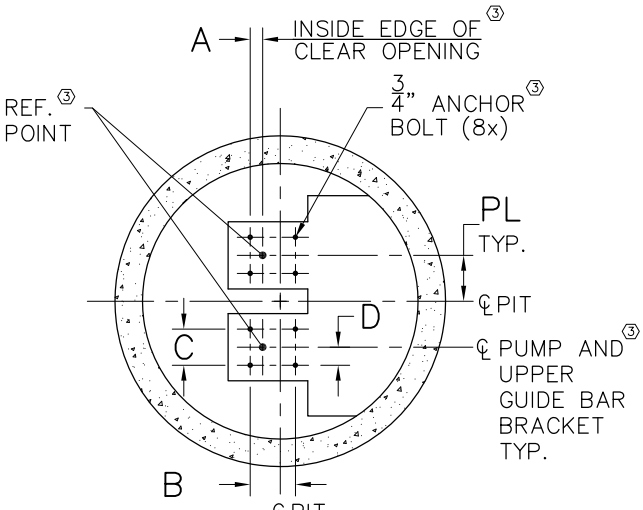


BASE SECTION

Duplex



TOP VIEW



BASE SECTION

ALL DIMENSIONS ARE IN INCHES

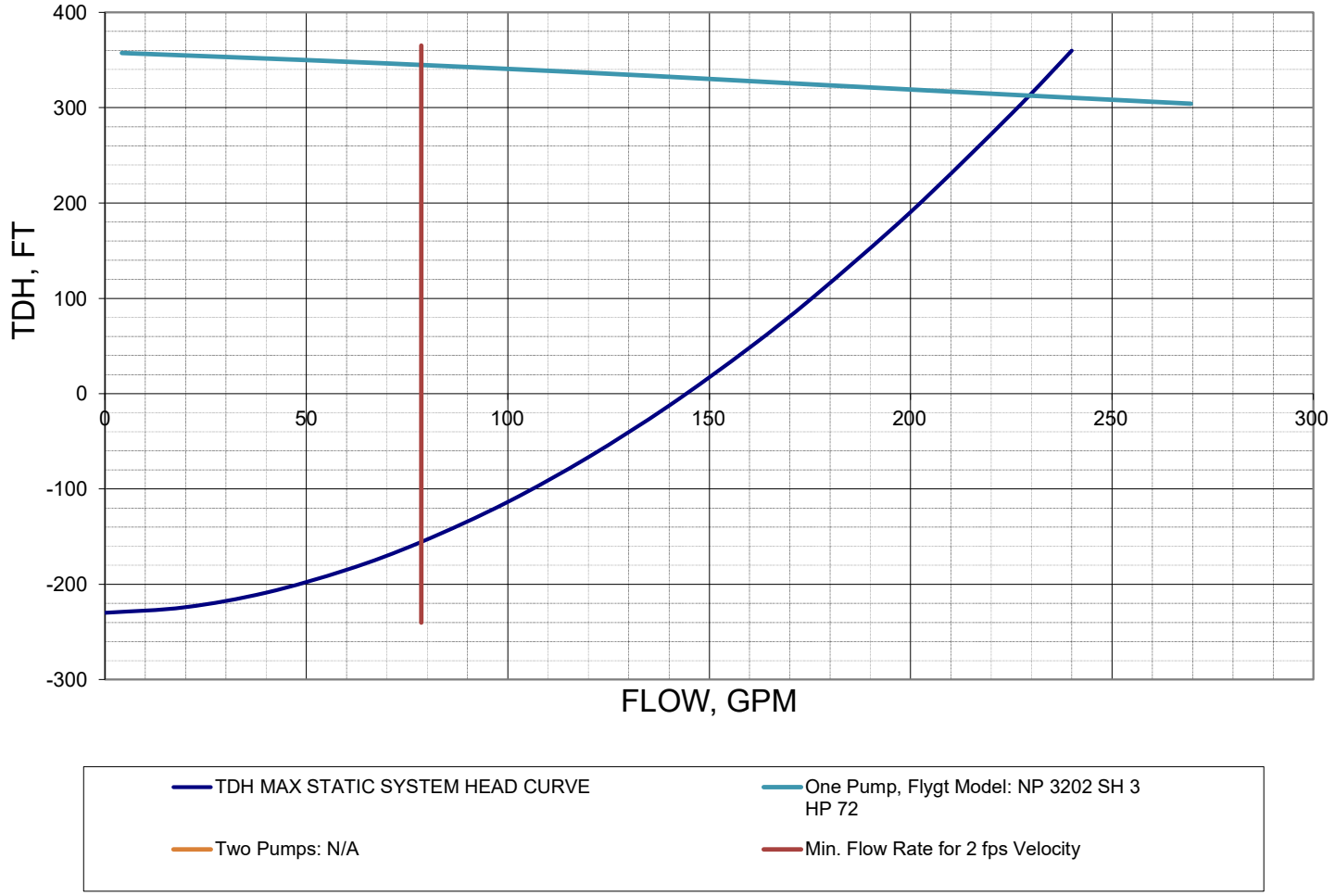
	MODEL	NOM. SIZE	VERSION	A	B	C	D	SIMPLEX S	T	U	V	W	Y	DUPLEX S	T	U	PL	V	W	Y
	FP/NP	3"	SH	2 3/8	9 7/8	8	4	15 1/4	9 1/4	60	17 1/2	26	30	19 3/8	13 3/8	72	8 1/2	26	43	30
***	CP	4"	HT	2 3/4	9 7/8	8	4	13 3/4	7 1/4	60	18 1/2	28	30	17	10 1/2	72	10	28 1/2	48	30
****	CP/NP	4"	HT	2 3/4	9 7/8	8	4	13 3/4	7 1/4	60	18 1/2	28	30	17	10 1/2	72	10	28 1/2	48	30
	DP	4"	MT	2 3/4	9 7/8	8	4	13 3/4	7 1/4	60	10 1/4	29	29	17	10 1/2	72	10	20 1/4	49	29
	CP/NP	4"	MT	2 3/4	9 7/8	8	4	13 3/4	7 1/4	60	16 1/2	26	30	17	10 1/2	72	10	28 1/2	46	30
*	CP/NP	6"	MT	4 3/8	11	10	5	11	3 3/8	60	16 1/4	26	30	13 1/4	5 5/8	72	11	28 1/2	48	30
**	CP/NP	6"	MT	4 3/8	11	10	5	11	3 3/8	60	17 1/2	26 1/2	30	13 1/2	5 7/8	72	11	28 1/2	48 1/2	30
	CP/NP	6"	LT	5 1/2	11	10	5	16	8 3/8	72	11 1/2	26 1/2	32	15 1/4	8 1/4	72	11	22 1/2	48 1/2	32
	CP/NP	8"	MT	5 1/2	11	10	5	14 3/8	5 1/2	72	17 1/2	26 1/2	30	10 1/4	1 3/8	72	11	28 1/2	48 1/2	30
	CP/NP	8"	LT	5 1/2	11	10	5	14 3/8	5 1/2	72	11 1/2	27 1/2	32	10 1/4	1 3/8	72	11	22 1/2	49 1/2	32

* WITH 4" VOLUTE OUTLET
** WITH 6" VOLUTE OUTLET
*** WITH 462 OR 463 IMPELLER
**** WITH 481, 483–485, 487–489 IMPELLER

ATTACHMENT J:

ENTERPRISE AREA LIFT STATION
TO WWTP SITE VIA 4-INCH FORCEMAIN

SANTO DOMINGO PUEBLO
Enterprise Area LS to WWTP - 4" FM



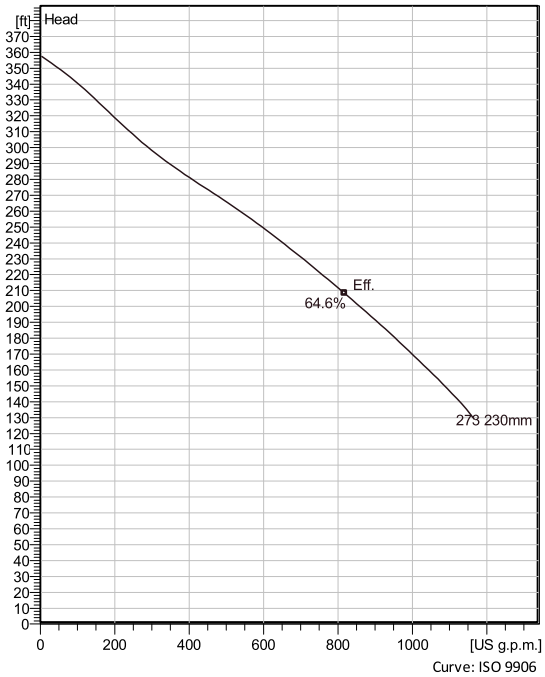
NP 3202 SH 3~ 273

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification



Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Configuration

Motor number
N3202.095 30-27-2AA-W 72hp

Installation type
P - Semi permanent, Wet

Impeller diameter
230 mm

Discharge diameter
4 inch

Pump information

Impeller diameter
230 mm

Discharge diameter
4 inch

Inlet diameter
150 mm

Maximum operating speed
3550 rpm

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron ™

Project		**Created by**	Ron Mosher	
Block		**Created on**	5/23/2022	**Last update** 5/23/2022

NP 3202 SH 3~ 273

Technical specification

Motor - General

Motor number N3202.095 30-27-2AA-W 72hp	**Phases** 3~	**Rated speed** 3550 rpm	**Rated power** 72 hp
ATEX approved FM	**Number of poles** 2	**Rated current** 78 A	**Stator variant** 1
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 095			

Motor - Technical

Power factor - 1/1 Load 0.93	**Motor efficiency - 1/1 Load** 92.5 %	**Total moment of inertia** 4.78 lb ft²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.92	**Motor efficiency - 3/4 Load** 93.0 %	**Starting current, direct starting** 550 A	
Power factor - 1/2 Load 0.88	**Motor efficiency - 1/2 Load** 92.5 %	**Starting current, star-delta** 183 A	

Project	**Created by**	Ron Mosher		
Block	**Created on**	5/23/2022	**Last update**	5/23/2022

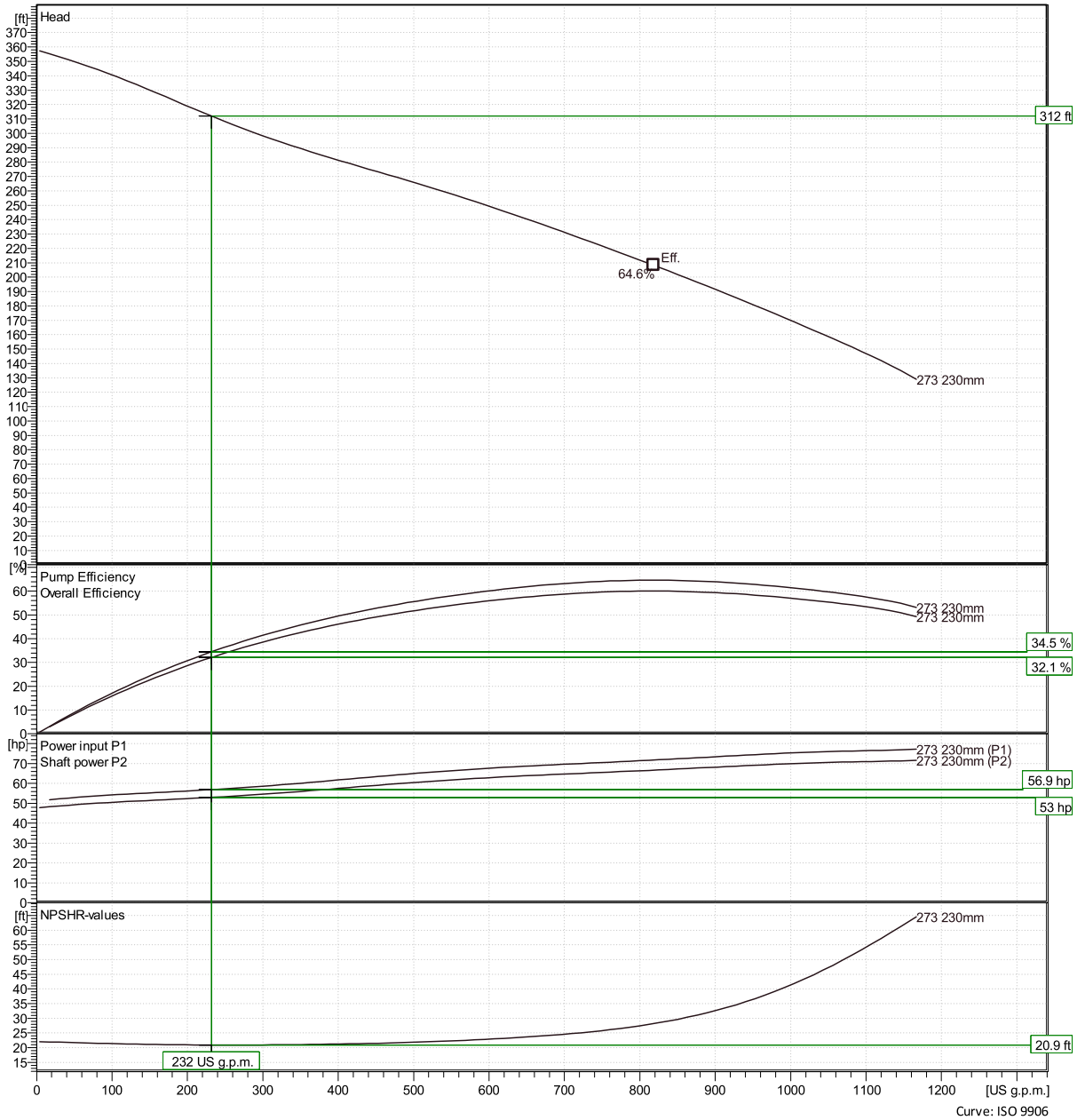
NP 3202 SH 3~ 273

Performance curve

Duty point

Flow	Head
232 US g.p.m.	312 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

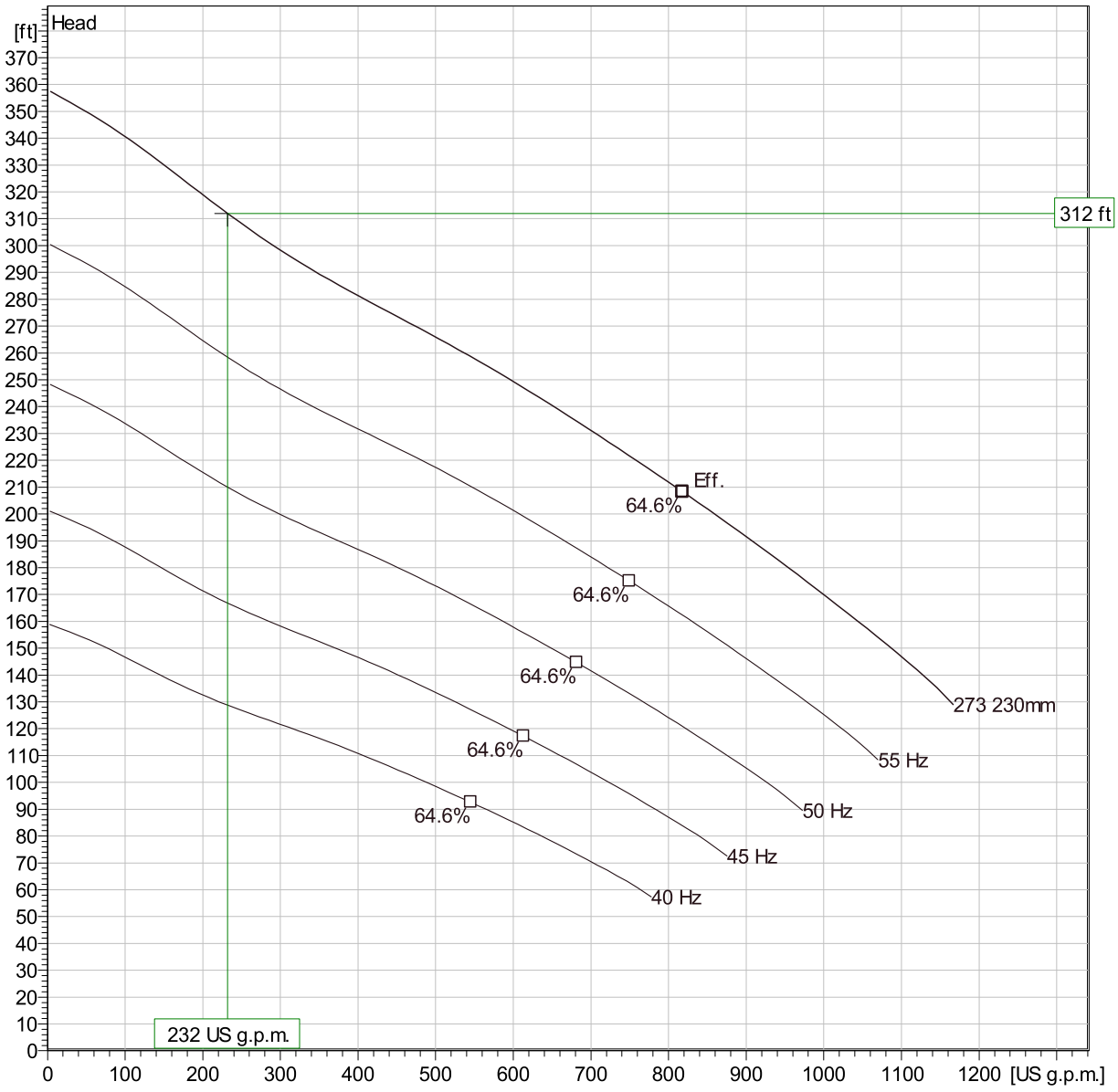
Ron Mosher

Created on 5/23/2022 **Last update** 5/23/2022

NP 3202 SH 3~ 273

Duty Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Operating characteristics

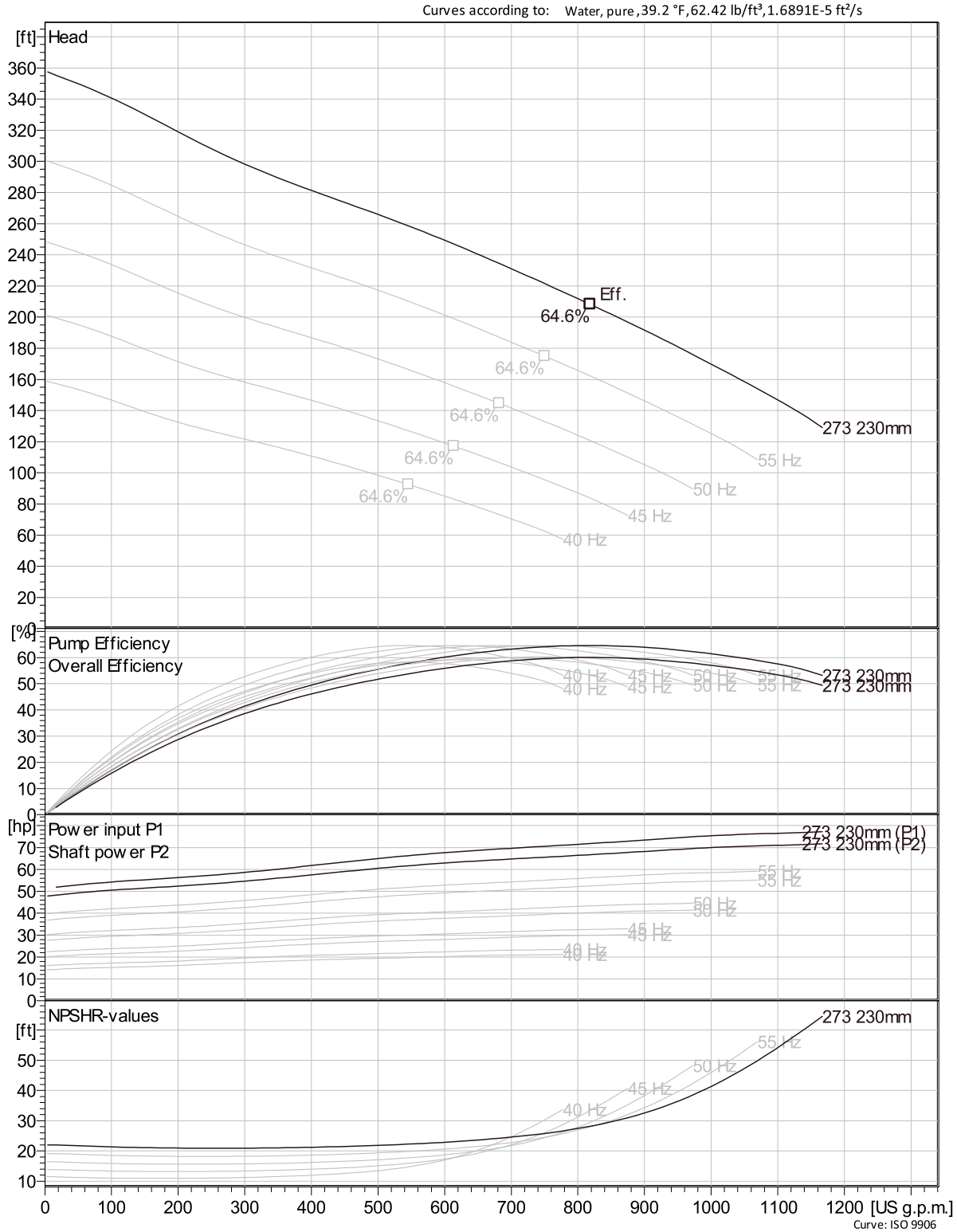
Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	232	312	53	232	312	53	34.5 %	3050	20.9

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/23/2022	**Last update**	5/23/2022

NP 3202 SH 3~ 273

VFD Curve

Curves according to: Water, pure ,39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



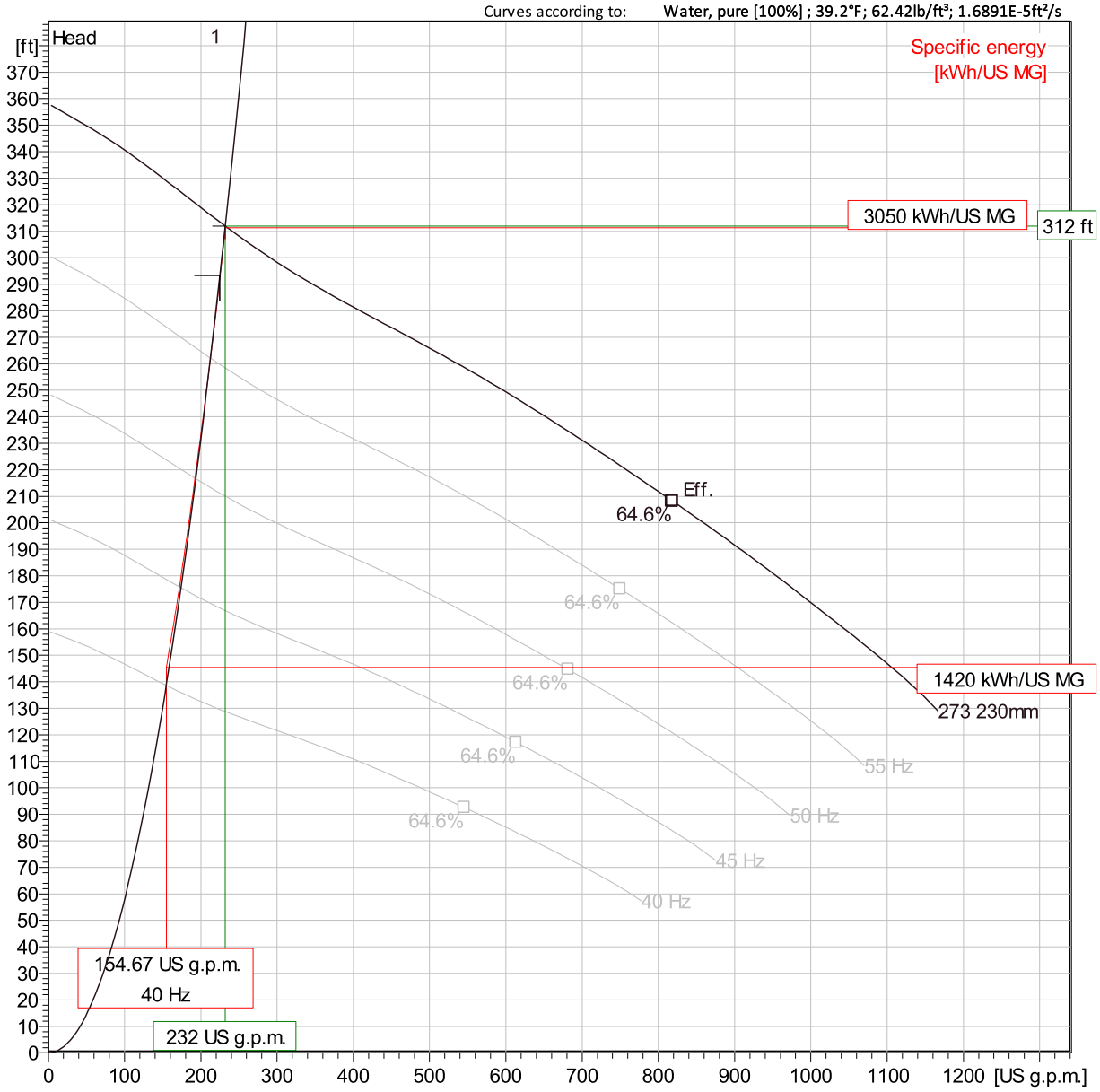
Curve: ISO 9906

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/23/2022	**Last update**	5/23/2022

NP 3202 SH 3~ 273

VFD Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



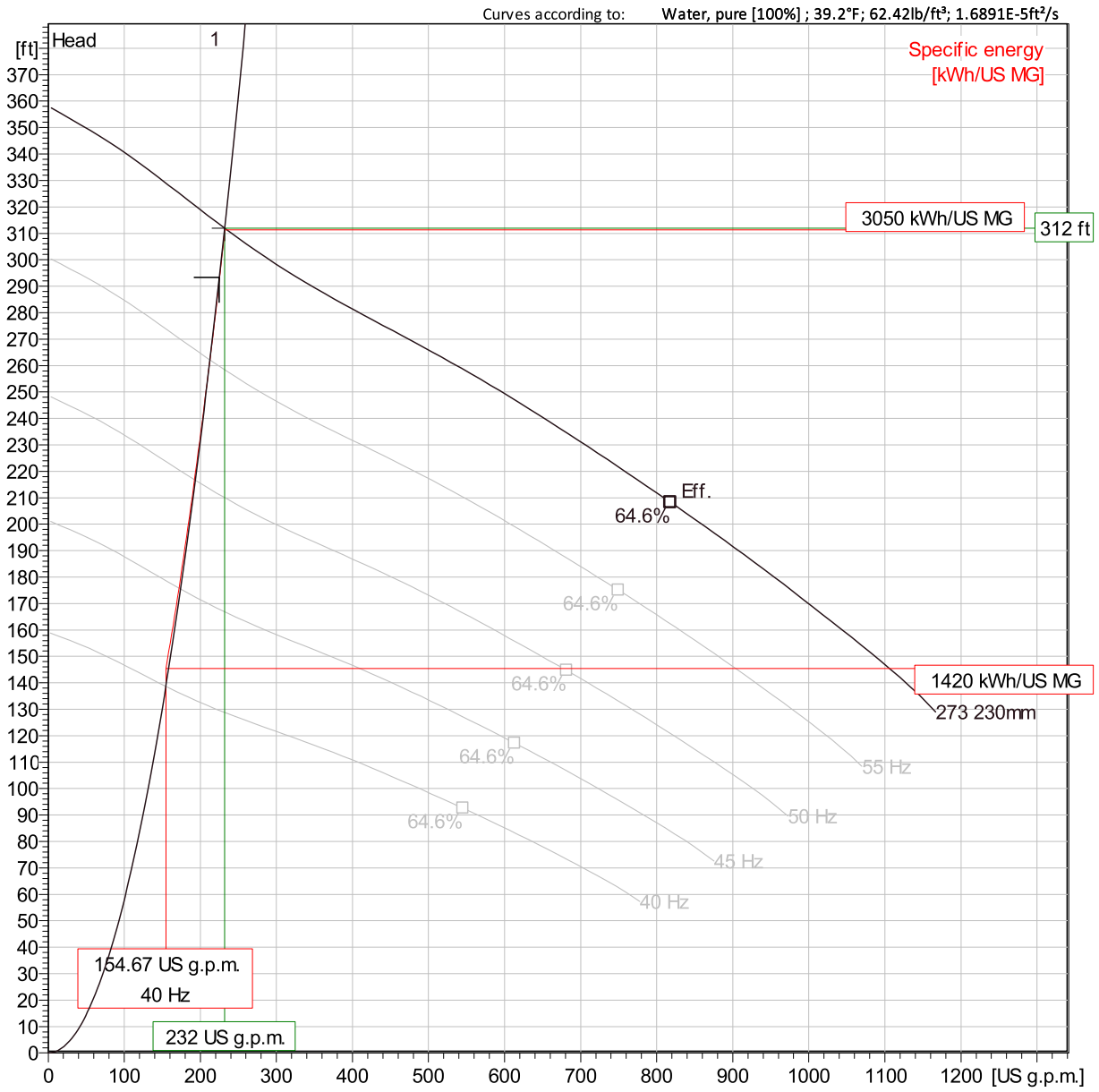
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	60 Hz	232	312	53	232	312	53	34.5 %	3050	20.9
1	55 Hz	213	262	40.8	213	262	40.8	34.5 %	3300	18.2
1	50 Hz	193	217	30.7	193	217	30.7	34.5 %	3610	15.6
1	45 Hz	174	175	22.4	174	175	22.4	34.5 %	3980	13.2

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/23/2022	**Last update**	5/23/2022

NP 3202 SH 3~ 273

VFD Analysis



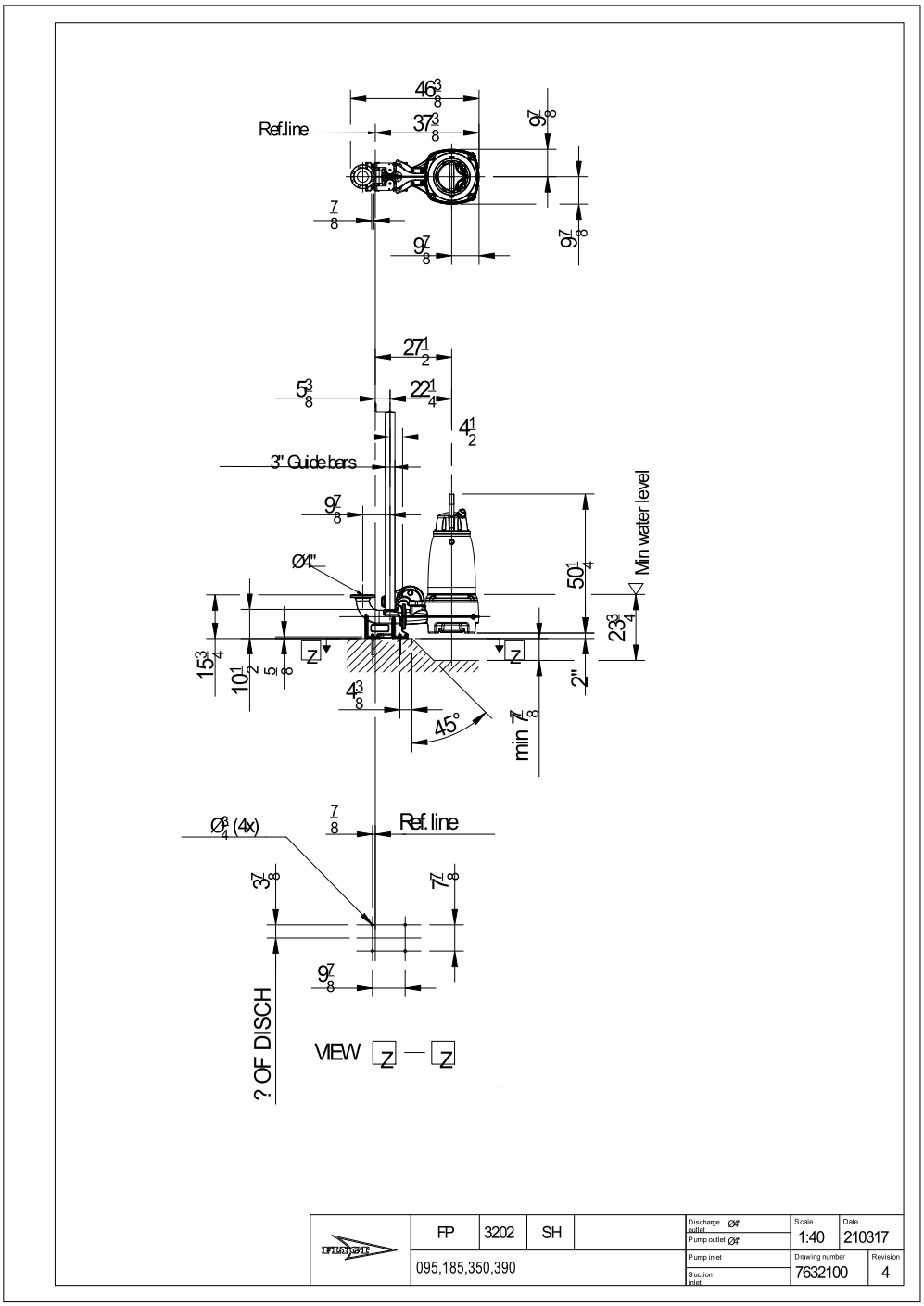
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	40 Hz	155	139	15.7	155	139	15.7	34.5 %	4450	10.9

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/23/2022	**Last update**	5/23/2022

NP 3202 SH 3~ 273

Dimensional drawing



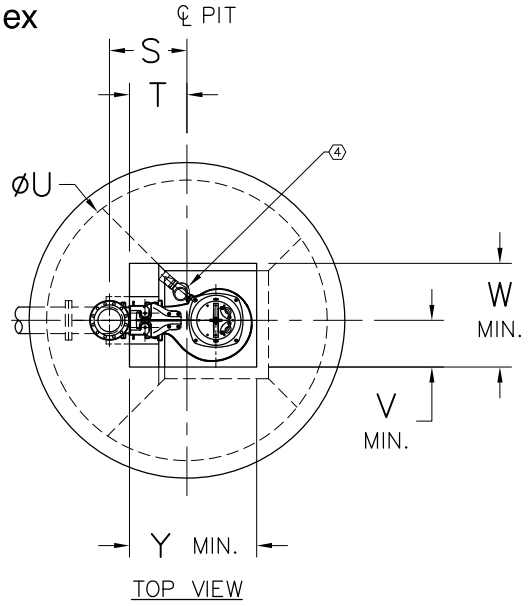
Project	**Created by**	Ron Mosher	
Block	**Created on**	5/23/2022	**Last update** 5/23/2022

FP/NP-3202

NOTES:

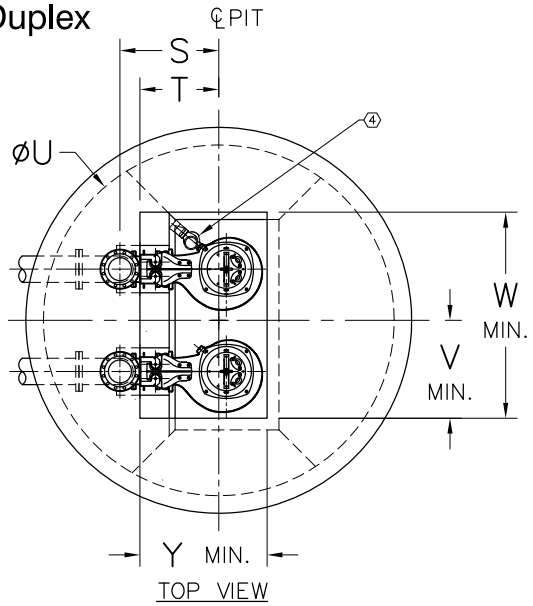
1. CONFIGURATION AND DIMS. SHOWN ARE SUGGESTED REQUIREMENTS ONLY. ALL DETAILS, INCLUDING SIZING OF PIT, TYPE, LOCATION AND ARRANGEMENT OF VALVES AND PIPING, ETC. ARE TO BE SPECIFIED BY THE CONSULTING ENGINEER AND ARE SUBJECT TO THEIR APPROVAL.
2. REFERENCE GENERIC DUPLEX LIFT STATION LAYOUT FOR ELEVATION VIEW.
3. LOCATE ANCHOR BOLTS USING INSIDE EDGE OF CLEAR OPENING AND PUMP CENTERLINE AS REFERENCE POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP TO CLEAR OPENING.
4. FLYGT MIX–FLUSH VALVE.

Simplex

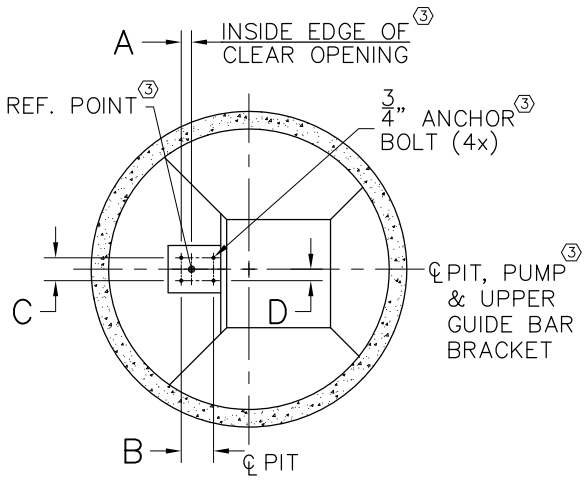


TOP VIEW

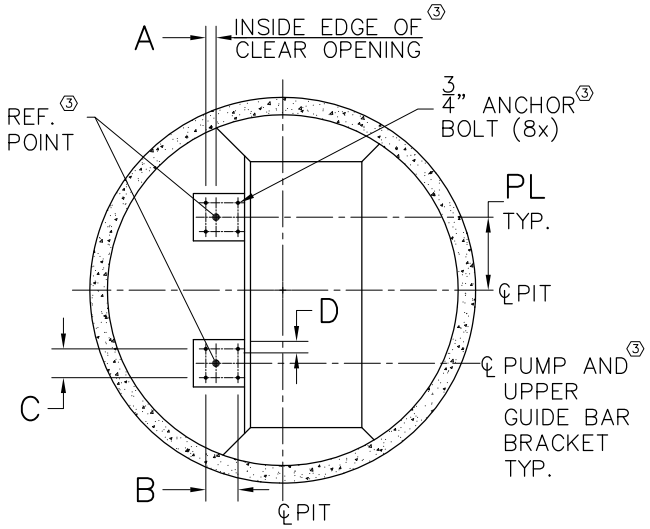
Duplex



TOP VIEW



BASE SECTION



BASE SECTION

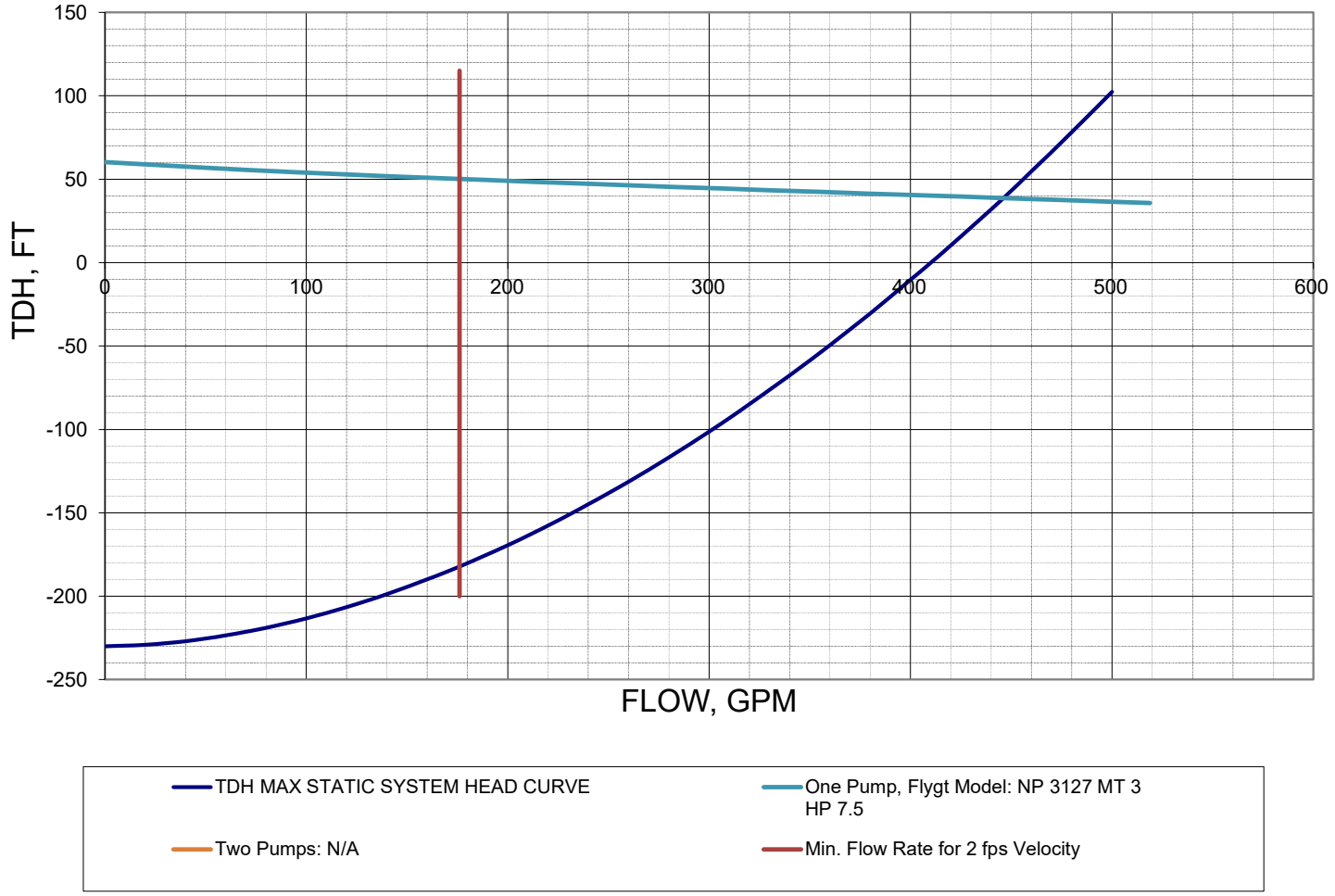
ALL DIMENSIONS ARE IN INCHES

MODEL	NOM. SIZE	VERSION	A	B	C	D	SIMPLEX S	T	U	V	W	Y	DUPLEX S	T	U	PL	V	W	Y
FP/NP	4"	SH	7/8	9 7/8	6	3	16	11 5/8	60	11 3/4	23 1/2	39	16	11 5/8	72	12	23 3/4	47 1/2	39
FP/NP	4"	HT	7/8	9 7/8	6	3	25 3/4	21 1/2	84	14	34	40 3/4	28	23 3/4	96	15	29	64	40 3/4
FP/NP	6"	HT	2 3/8	11	10	5	22 7/8	17 1/4	84	14	34	40 1/2	23 1/2	17 7/8	96	15	29	64	40 1/2
FP/NP	8"	MT	3 1/2	11	10	5	20 1/8	13 1/4	84	16	35 1/2	43 1/2	33 7/8	27	120	17 1/2	33 1/2	70 1/2	43 1/2
NP	12"	LT	7 1/2	19 3/4	20 3/4	10 3/8	33	21 1/4	120	20 1/2	41 1/2	52	35 1/4	23 1/2	144	28	48 1/2	97 1/2	52

ATTACHMENT K:

ENTERPRISE AREA LIFT STATION
TO WWTP SITE VIA 6-INCH FORCEMAIN

SANTO DOMINGO PUEBLO
Enterprise Area LS to WWTP - 6" FM



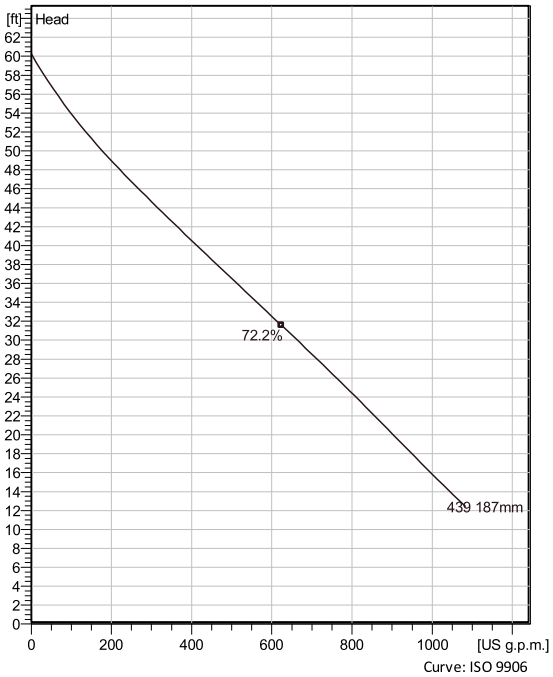
NP 3127 MT 3~ Adaptive 439

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

Technical specification



Curves according to: Water, pure Water, pure [100%], 39.2 °F, 62.42 lb/ft³, 1.6891E-5 ft²/s



Configuration

Motor number
N3127.070 21-10-4AL-W 7.5hp

Installation type
P - Semi permanent, Wet

Impeller diameter
187 mm

Discharge diameter
6 inch

Pump information

Impeller diameter
187 mm

Discharge diameter
6 inch

Inlet diameter
150 mm

Maximum operating speed
1750 rpm

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron ™

Stator housing material
Grey cast iron

Project	**Created by**	Ron Mosher	
Block	**Created on**	5/23/2022 **Last update**	5/23/2022

NP 3127 MT 3~ Adaptive 439

Technical specification

Motor - General

Motor number N3127.070 21-10-4AL-W 7.5hp	**Phases** 3~	**Rated speed** 1750 rpm	**Rated power** 7.5 hp
ATEX approved FM	**Number of poles** 4	**Rated current** 9.6 A	**Stator variant** 12
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 070			

Motor - Technical

Power factor - 1/1 Load 0.88	**Motor efficiency - 1/1 Load** 83.8 %	**Total moment of inertia** 1.01 lb ft²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.85	**Motor efficiency - 3/4 Load** 84.7 %	**Starting current, direct starting** 58 A	
Power factor - 1/2 Load 0.77	**Motor efficiency - 1/2 Load** 83.7 %	**Starting current, star-delta** 19.3 A	

Project	**Created by**	Ron Mosher		
Block	**Created on**	5/23/2022	**Last update**	5/23/2022

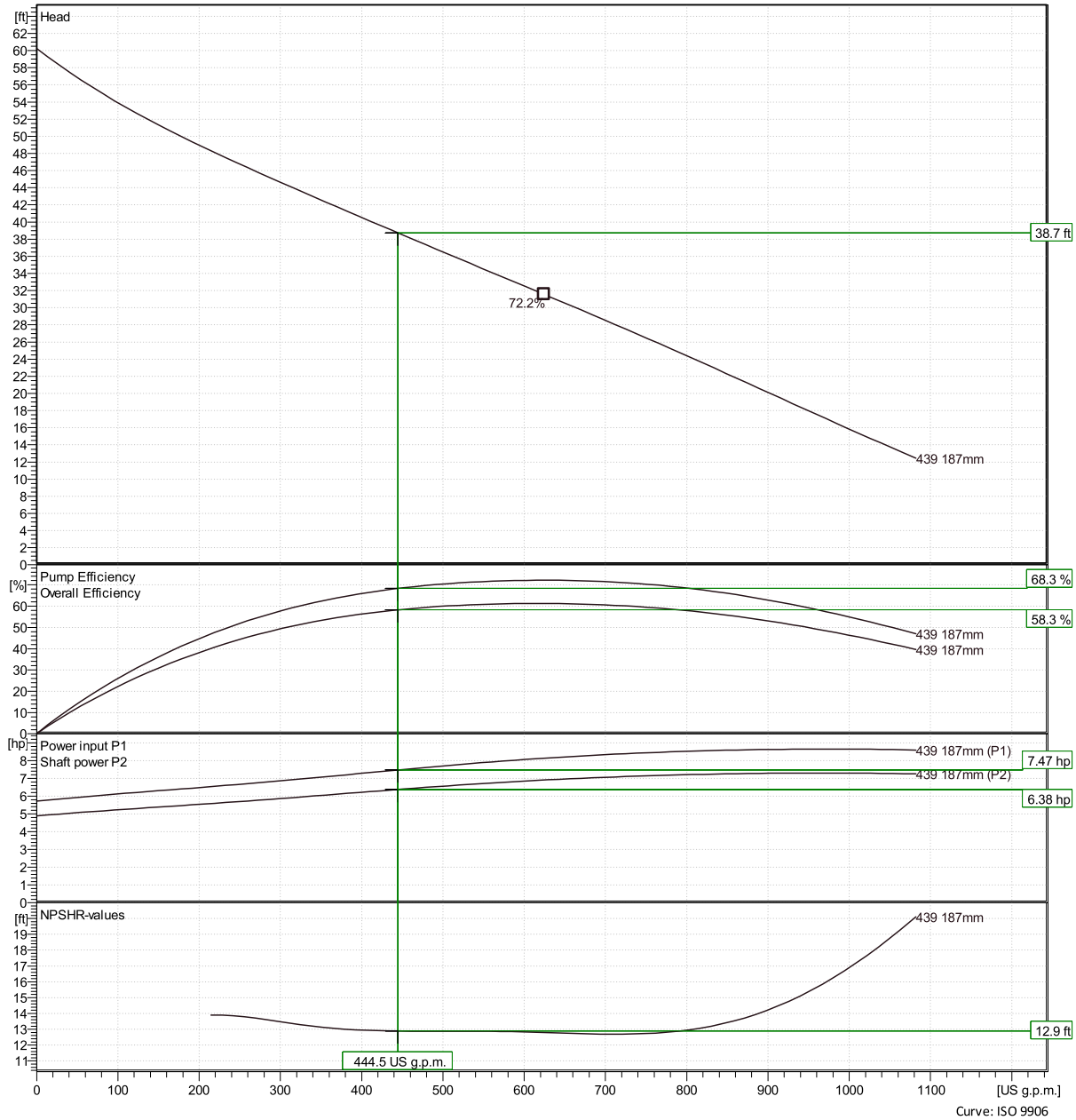
NP 3127 MT 3~ Adaptive 439

Performance curve

Duty point

Flow	Head
444 US g.p.m.	38.7 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



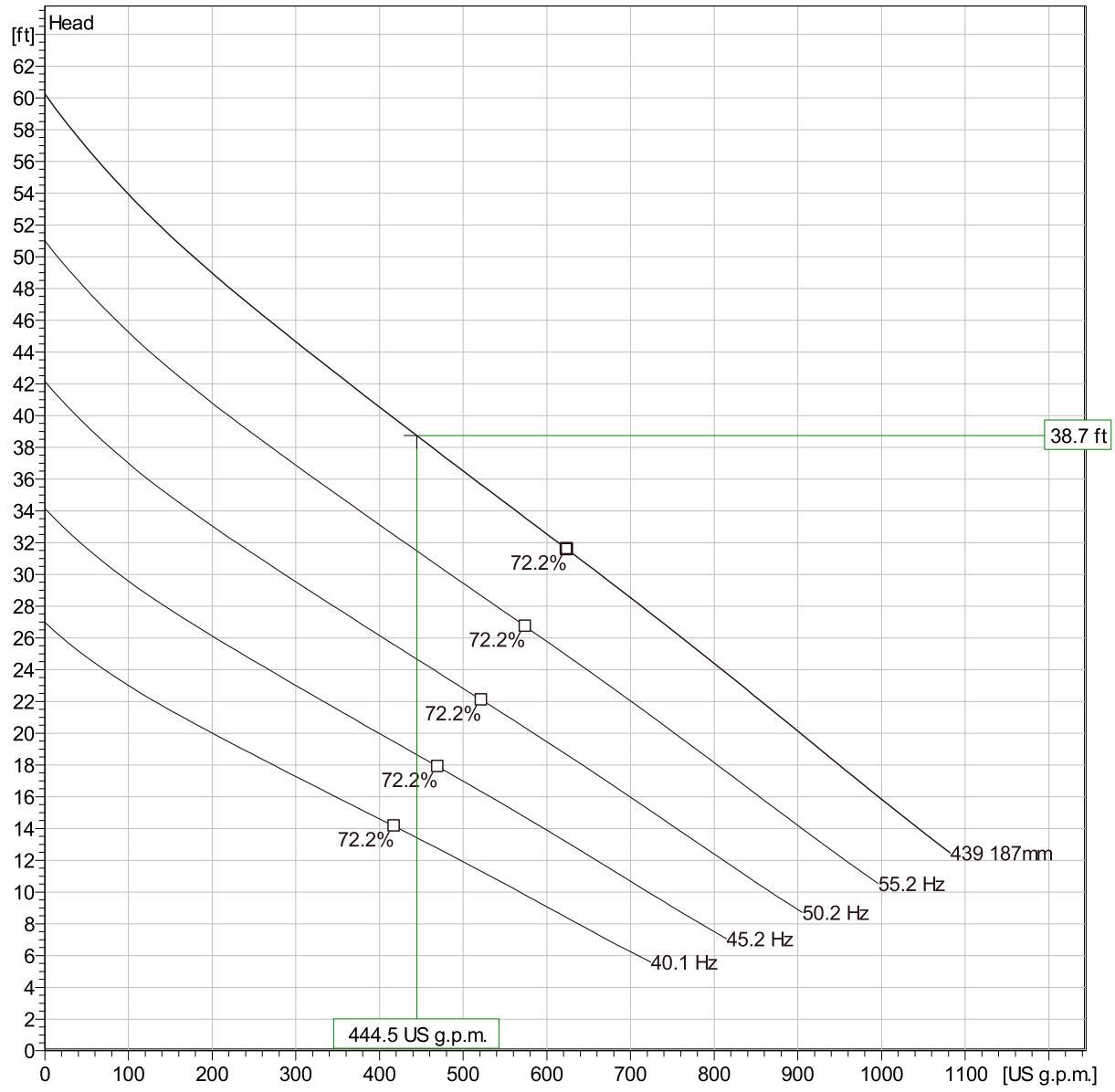
Curve: ISO 9906

	Ron Mosher		
Created on	5/23/2022	**Last update**	5/23/2022

NP 3127 MT 3~ Adaptive 439

Duty Analysis

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



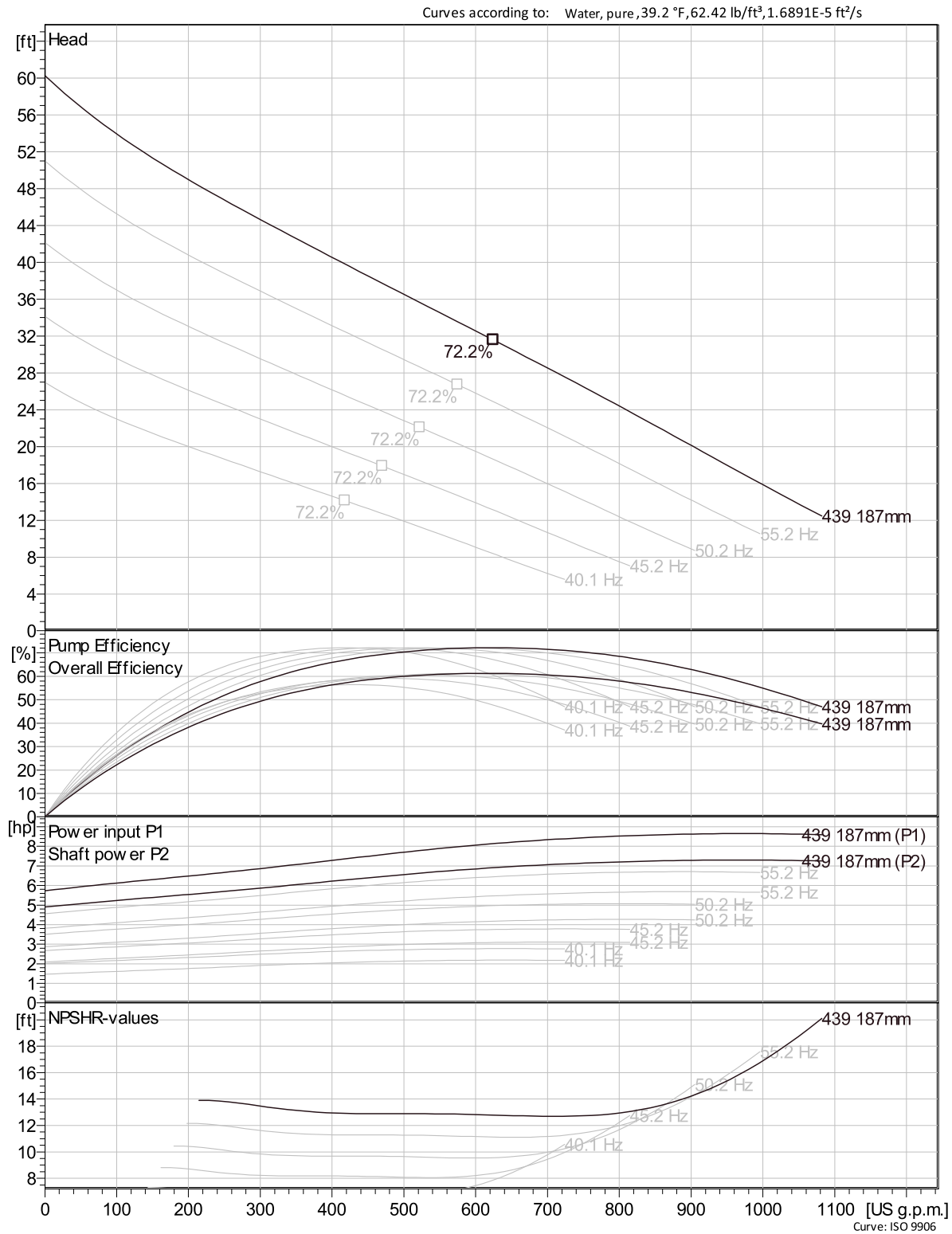
Operating characteristics

Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	444	38.7	6.38	444	38.7	6.38	68.3 %	209	12.9

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/23/2022	**Last update**	5/23/2022

NP 3127 MT 3~ Adaptive 439

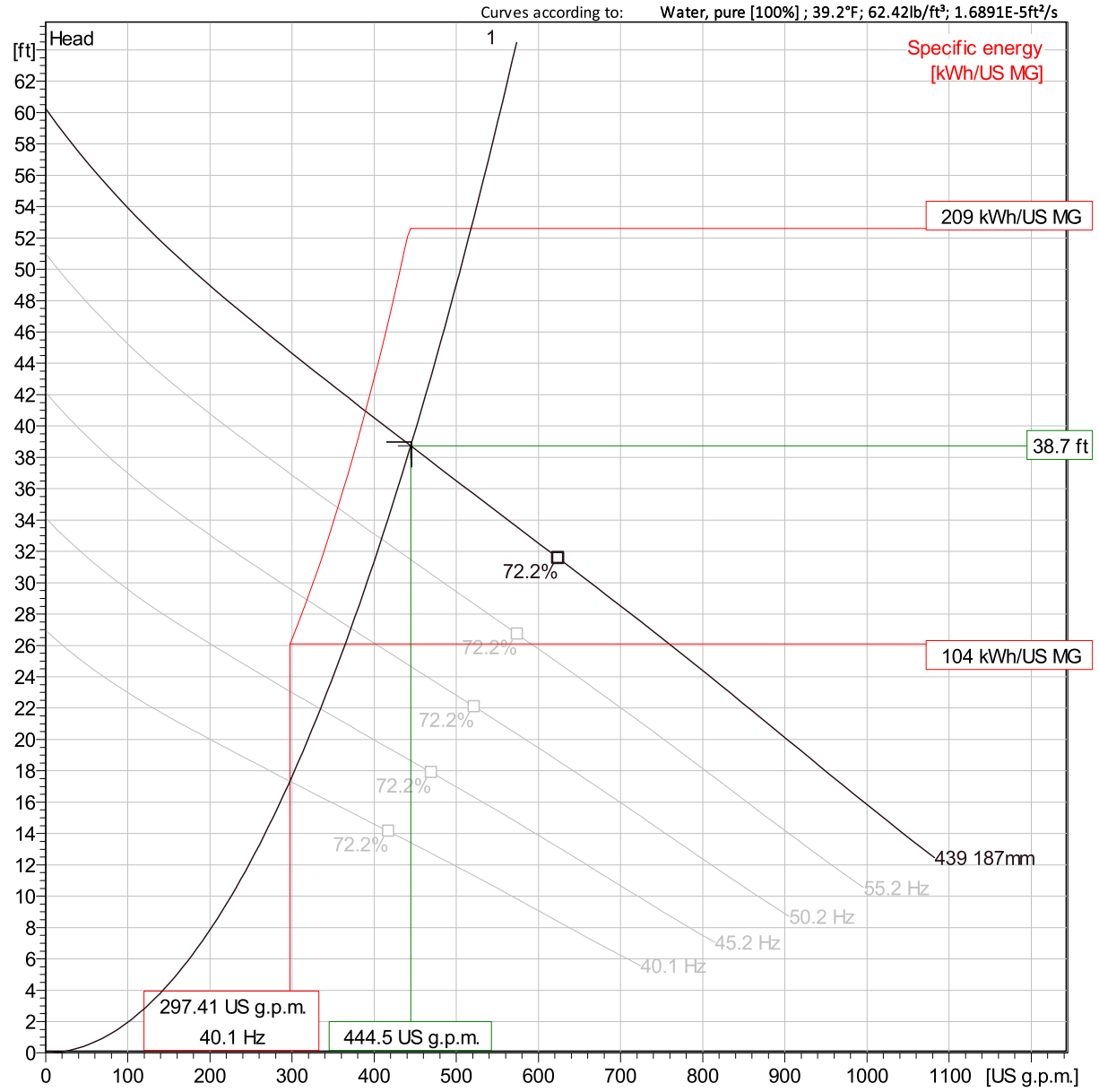
VFD Curve



Project		**Created by**	Ron Mosher		
Block		**Created on**	5/23/2022	**Last update**	5/23/2022

NP 3127 MT 3~ Adaptive 439

VFD Analysis



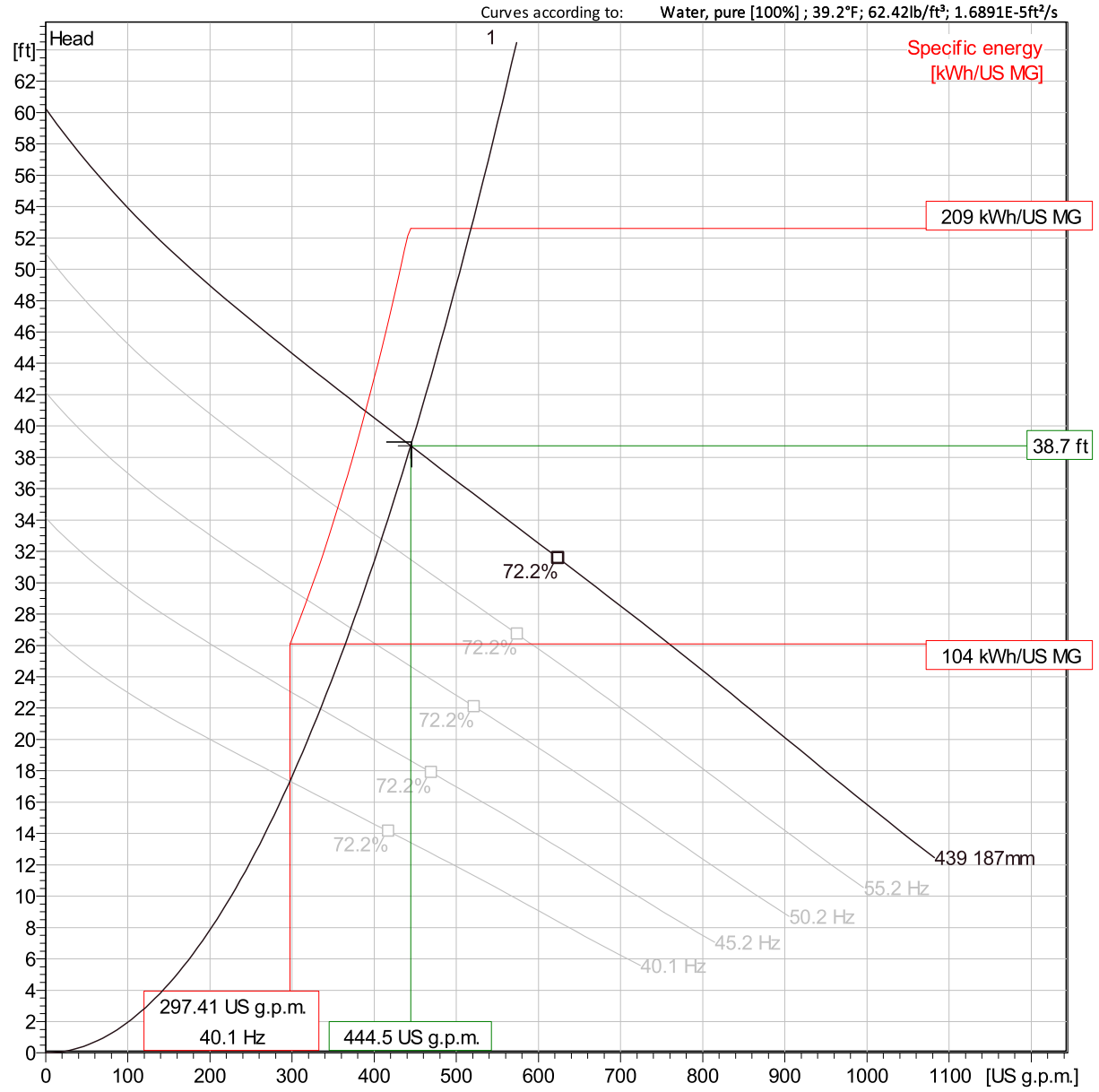
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	60 Hz	444	38.7	6.38	444	38.7	6.38	68.3 %	209	12.9
1	55.2 Hz	409	32.8	4.96	409	32.8	4.96	68.3 %	222	11.3
1	50.2 Hz	372	27.1	3.73	372	27.1	3.73	68.3 %	239	9.69
1	45.2 Hz	335	21.9	2.72	335	21.9	2.72	68.3 %	260	8.19

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/23/2022	**Last update**	5/23/2022

NP 3127 MT 3~ Adaptive 439

VFD Analysis



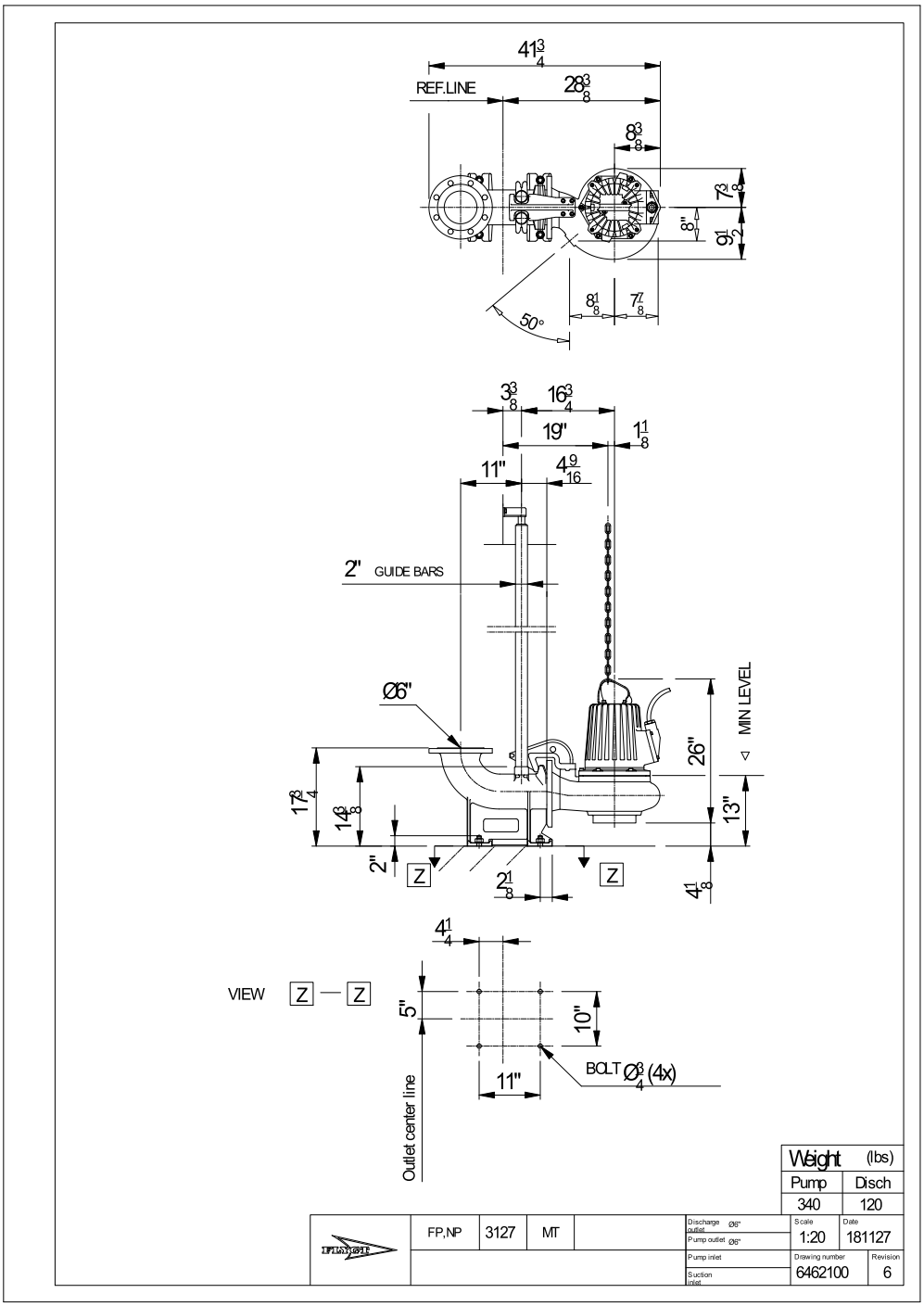
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	40.1 Hz	297	17.3	1.91	297	17.3	1.91	68.3 %	286	6.78

Project		**Created by**	Ron Mosher		
Block		**Created on**	5/23/2022	**Last update**	5/23/2022

NP 3127 MT 3~ Adaptive 439

Dimensional drawing



Project	**Created by**	Ron Mosher	
Block	**Created on**	5/23/2022	**Last update** 5/23/2022

FLYGT
a xylem brand

Issued: 11/11 Supersedes: 1/11

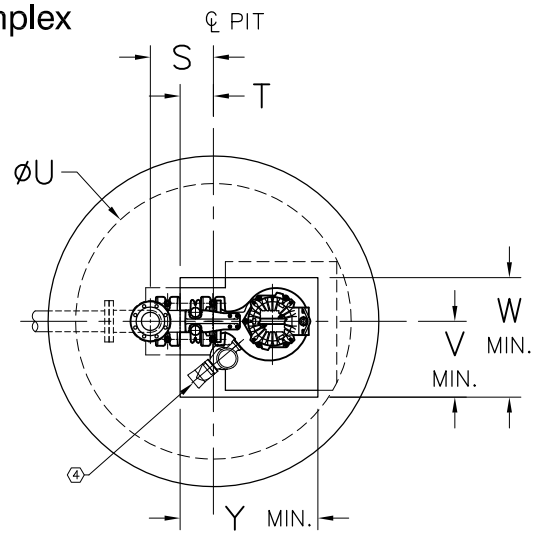
6820180

CP/DP/FP/NP-3127

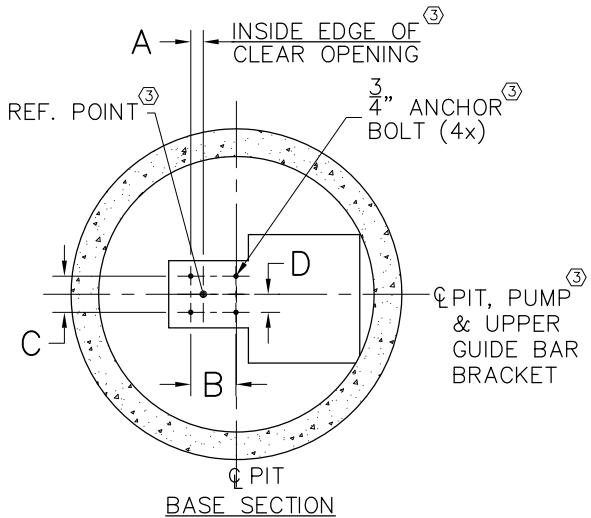
NOTES:

1. CONFIGURATION AND DIMS. SHOWN ARE SUGGESTED REQUIREMENTS ONLY. ALL DETAILS, INCLUDING SIZING OF PIT, TYPE, LOCATION AND ARRANGEMENT OF VALVES AND PIPING, ETC. ARE TO BE SPECIFIED BY THE CONSULTING ENGINEER AND ARE SUBJECT TO THEIR APPROVAL.
2. REFERENCE GENERIC DUPLEX LIFT STATION LAYOUT FOR ELEVATION VIEW.
3. LOCATE ANCHOR BOLTS USING INSIDE EDGE OF CLEAR OPENING AND PUMP CENTERLINE AS REFERENCE POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP TO CLEAR OPENING.
4. FLYGT MIX–FLUSH VALVE.

Simplex

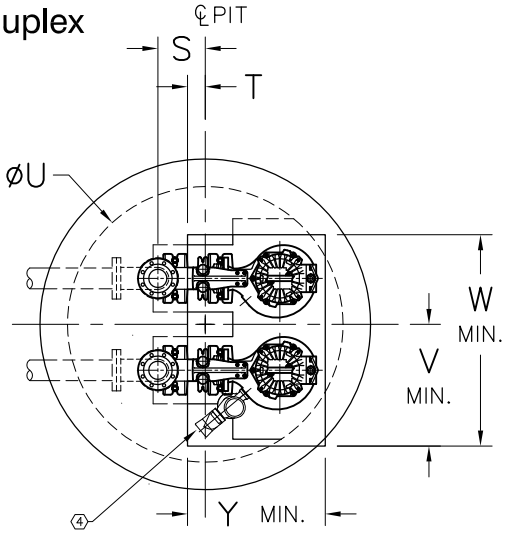


TOP VIEW

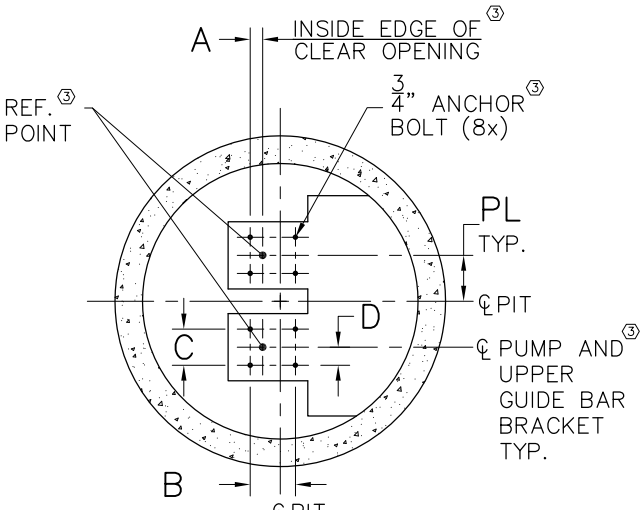


BASE SECTION

Duplex



TOP VIEW



BASE SECTION

ALL DIMENSIONS ARE IN INCHES

	MODEL	NOM. SIZE	VERSION	A	B	C	D	SIMPLEX S	T	U	V	W	Y	DUPLEX S	T	U	PL	V	W	Y
	FP/NP	3"	SH	2 3/8	9 7/8	8	4	15 1/4	9 1/4	60	17 1/2	26	30	19 3/8	13 3/8	72	8 1/2	26	43	30
***	CP	4"	HT	2 3/4	9 7/8	8	4	13 3/4	7 1/4	60	18 1/2	28	30	17	10 1/2	72	10	28 1/2	48	30
****	CP/NP	4"	HT	2 3/4	9 7/8	8	4	13 3/4	7 1/4	60	18 1/2	28	30	17	10 1/2	72	10	28 1/2	48	30
	DP	4"	MT	2 3/4	9 7/8	8	4	13 3/4	7 1/4	60	10 1/4	29	29	17	10 1/2	72	10	20 1/4	49	29
	CP/NP	4"	MT	2 3/4	9 7/8	8	4	13 3/4	7 1/4	60	16 1/2	26	30	17	10 1/2	72	10	28 1/2	46	30
*	CP/NP	6"	MT	4 3/8	11	10	5	11	3 3/8	60	16 1/4	26	30	13 1/4	5 5/8	72	11	28 1/2	48	30
**	CP/NP	6"	MT	4 3/8	11	10	5	11	3 3/8	60	17 1/2	26 1/2	30	13 1/2	5 7/8	72	11	28 1/2	48 1/2	30
	CP/NP	6"	LT	5 1/2	11	10	5	16	8 3/8	72	11 1/2	26 1/2	32	15 1/4	8 1/4	72	11	22 1/2	48 1/2	32
	CP/NP	8"	MT	5 1/2	11	10	5	14 3/8	5 1/2	72	17 1/2	26 1/2	30	10 1/4	1 3/8	72	11	28 1/2	48 1/2	30
	CP/NP	8"	LT	5 1/2	11	10	5	14 3/8	5 1/2	72	11 1/2	27 1/2	32	10 1/4	1 3/8	72	11	22 1/2	49 1/2	32

* WITH 4" VOLUTE OUTLET
** WITH 6" VOLUTE OUTLET
*** WITH 462 OR 463 IMPELLER
**** WITH 481, 483–485, 487–489 IMPELLER

APPENDIX C:

CONSTRUCTION COST ESTIMATES

TABLE C-1

Item 1: Main Village Lift Station Modifications and Site Improvements 06/01/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM	UNIT	QUANT	UNIT PRICE	AMOUNT
Equipment				
Submersible Pumps and Accessories 5/27/2022 Two pumps, discharge elbows, railing, 42x48 covers, grip eye, duplex pump control panels, level transmitter, float switches, NEMA 4X stainless steel junction box, startup.	ls	1	$231,500	$231,500
Contractor Markup	ls	15.00%	$231,500	$34,725
Contractor Installation	ls	45.00%	$231,500	$104,175
Electrical Work				
Standby Generator, 75kw, includes installation and testing	ls	1	$74,000	$74,000
Contractor Markup	ls	20.00%	$74,000	$14,800
3 Phase Power Service Expansion	ls	1	$11,000	$11,000
Removals and Modifications				
Remove Existing Pumps and Guide Rails	days	4	$2,100	$8,400
Remove Existing Electrical Equipment	days	4	$2,800	$11,200
Remove Existing Wet Well Cover	days	2	$3,800	$7,600
New Wet Well Cover	cy	3	$1,800	$5,400
Bypass Pumping	day	60	$1,400	$84,000
SiteWork				
Minor grading, generator pad, subgrade, base course	ls	1	$15,000	$15,000
SUBTOTAL				$601,800
Undefined Elements 15.00%				$90,270
General Conditions/Shakedown 2.00%				$12,036
Contingencies/Contractor Factor 25.00%				$150,450

TOTAL	**$855,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$42,800
Demobilization and Project Closeout Documents (0.5%)	$4,300
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$12,800
Construction Staking Service (1.25%)	$10,700
Traffic Control (0.5%)	$4,300
Pre-Authorized Changes During Construction (2%)	$17,100
Total Non-Construction Items	$92,000

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$947,000**

TABLE C-2

Item 2: 6-inch Forcemain from Main Village to Galisteo Lift Station 05/25/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM		UNIT	QUANT	UNIT PRICE	AMOUNT
6-inch Forcemain (Total Distance)		lf	13,400		
Trench Work, 4ft bury		lf	12,970	$30	$389,100
6" DI Pipe: material costs		lf	12970	$25.00	$324,250
Contractor Markup		ls	25.00%	$324,250	$81,063
Fittings:					
6" DI Fittings		lf	12,970	$2	$25,940
6" Pipe Restraint Joint Devices		ea	140	$180	$25,200
Installation/Contractor Markup		ls	1.25	$456,453	$570,566
6" Pressure Cleanout Double		ea	10	$2,000	$20,000
6" Isolation Valves (Plug Valves, mj ends)		ea	5	$1,400	$7,000
Combination Air Release and Vacuum Stations		ea	5	$18,000	$90,000
Directional Drill under Lined Canal and Ditch		lf	130	$110	$14,300
Trench Casing under Galisteo Creek		lf	300	$100	$30,000
Scour Cutoff Walls under Galisteo Creek		lf	200	$230	$46,000
Concrete Encasement		lf	200	$70	$14,000
Other					
Clearing and Grubbing		lf	13,400	$0.50	$6,700
Pressure Testing		lf	13,400	$1	$13,400
Revegetation Seeding		lf	12,970	$0.75	$9,728
Gravel Road Removal and Replacement		sy	2,978	$50	$148,889
Pavement Removal and Replacement		sy	33	$100	$3,333
SUBTOTAL					$1,819,500
Undefined Elements	15.00%				$272,925
General Conditions/Shakedown	2.00%				$36,390
Contingencies/Contractor Factor	25.00%				$454,875

TOTAL	**$2,584,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$129,200
Demobilization and Project Closeout Documents (0.5%)	$12,900
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$38,800
Construction Staking Service (1.25%)	$32,300
Traffic Control (0.5%)	$12,900
Pre-Authorized Changes During Construction (2%)	$51,700
Total Non-Construction Items	$277,800

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$2,861,800**

TABLE C-3

Item 4: 6-inch Forcemain from Galisteo Lift Station to WWTP 06/29/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM	UNIT	QUANT	UNIT PRICE	AMOUNT
6-inch Forcemain (Total Distance)	lf	11,550		
Trench Work, 4ft bury	lf	10,380	$30	$311,400
6" DI Pipe: material costs	lf	10380	$25.00	$259,500
Contractor Markup	ls	25.00%	$259,500	$64,875
Fittings:				
6" DI Fittings	lf	10,380	$3	$25,950
6" Pipe Restraint Joint Devices at Bends/Valves	ea	120	$180	$21,600
Installation/Contractor Markup	ls	1.25	$371,925	$464,906
6" Pressure Cleanout Double	ea	10	$2,000	$20,000
6" Isolation Valves (Plug Valves, mj ends)	ea	8	$1,400	$11,200
Combination Air Release and Vacuum Stations	ea	11	$18,000	$198,000
Directional Drill under Drain Channel N. end of siphon	lf	40	$110	$4,400
Trench casing under Galisteo Creek north of Route 88	lf	350	$100	$35,000
Scour Cutoff Walls under Galisteo Creek	lf	300	$230	$69,000
Concrete Encasement	lf	300	$70	$21,000
				$0
Jack and Bore under ISR 88	lf	110	$950	$104,500
Directional Drill across Arroyo Crossing south of Route 88	lf	90	$110	$9,900
Directional Drill across Hwy 22	lf	270	$110	$29,700
Jack and Bore under Railroad Tracks	lf	110	$950	$104,500
Arroyo Crossing under Arroyo south of RR tracks (trench casing)	lf	100	$100	$10,000
Scour Cutoff Walls under Arroyo	lf	100	$230	$23,000
Concrete Encasement	lf	100	$70	$7,000
New Residential Lift Station, Forcemain, Lateral				
Lift Station: Duplex Grinder Pump Station				
Material Costs	ls	1	$9,000	$9,000
Installation including earthwork	ls	1	$9,000	$9,000
Electrical Service, Pole, and Meter (220V, single phase)	ls	1	$10,000	$10,000
Forcemain:				
Trench Work, 4ft bury	lf	20	$20	$400
2" HDPE Pipe: material costs	lf	20	$18	$360
Contractor Markup	ls	25.00%	$360	$90
2" Plug Valve	ea	1	$400	$400
2" Check Valve	ea	1	$300	$300
4" Lateral:				

TABLE C-3

ITEM		UNIT	QUANT	UNIT PRICE	AMOUNT
Trench Work, 4ft bury		lf	640	$20	$12,800
4" PVC Pipe: material costs		lf	640	$15	$9,600
Contractor Markup		ls	25.00%	$9,600	$2,400
Directional Drill under ISR 88		lf	100	$110	$11,000
Other					$0
Clearing and Grubbing		lf	10,380	$0.50	$5,190
Pressure Testing		lf	11,550	$1	$11,550
Revegetation Seeding		lf	10,380	$0.75	$7,785
Removal and Replacement of Pedestrian Walkway Features		ls	1	$50,000	$50,000
Gravel Road Removal and Replacement		sy	1,256	$50	$62,778
1130 length	10 width	1256 sq yards			
Pavement Removal and Replacement		sy	100	$100	$10,000
180 length	5 width	100 sq yards			
SUBTOTAL					$2,008,100
Undefined Elements	15.00%				$301,215
General Conditions/Shakedown	2.00%				$40,162
Contingencies/Contractor Factor	25.00%				$502,025

TOTAL	**$2,852,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$142,600
Demobilization and Project Closeout Documents (0.5%)	$14,300
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$42,800
Construction Staking Service (1.25%)	$35,700
Traffic Control (0.75%)	$21,400
Pre-Authorized Changes During Construction (2%)	$57,000
Total Non-Construction Items	$313,800

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$3,165,800**

TABLE C-4

Item 3: Galisteo Lift Station and Site Improvements 06/29/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM	UNIT	QUANT	UNIT PRICE	AMOUNT
Equipment				
Submersible Pumps and Accessories 5/27/2022	ls	1	$244,500	$244,500
Two pumps, discharge elbows, railing, 42x48 covers, grip eye, duplex pump control panels, level transmitter, float switches, NEMA 4S junction box, 6" check valves, 6" plug valves, startup.				
Contractor Markup	ls	15.00%	$244,500	$36,675
Contractor Installation	ls	45.00%	$244,500	$110,025
Electrical Work				
Standby Generator, 75kw, includes installation and testing	ls	1	$74,000	$74,000
Contractor Markup	ls	20.00%	$74,000	$14,800
3 Phase Power Service	ls	1	$100,000	$100,000
Structural Work				
Existing Inlet Manhole: approx 15ft deep				
LS Wet Well Depth 19 ft				
6ft dia precast barrels	vf	19	$900	$17,100
Concrete top and base	cy	8	$1,000	$8,000
Valve Vault: 6 ft dia precast barrels	vf	6	$900	$5,400
Concrete top and base	cy	6	$1,000	$6,000
Flow Meter Vault: 6 ft dia precast barrels	vf	6	$900	$5,400
Concrete top and base	cy	6	$1,000	$6,000
Excavation and Backfill				
Excavation	cy	1200	$15	$18,000
Ordinary Backfill	cy	1165	$18	$20,970
Compaction	cy	1165	$10	$11,650
Select Fill	cy	1000	$38	$38,000
Gravel Layer	cy	64	$30	$1,920
			$90,540	
Structural - Metal Work & Hoist				
Monorail and frame $12,242	ls	1.4	$18,400	$25,760
Hoist assembly: 1/2 ton (installed)	ls	1	$7,600	$7,600
Hoist assembly: Contractor markup	ls	0.3	$7,600	$2,280
Piping				
Piping, fittings, gauges, pipe supports, brackets	ls	1	$25,000	$25,000
Piping: Installation & Profit	ls	1.5	$25,000	$37,500
Flow Meter	ls	1	$9,000	$9,000
Yard piping trenching and backfilling	ls	1	$15,000	$15,000
Cleanouts	ea	2	$3,500	$7,000
Interior Coating System				
walls: 6' dia 540 area 19 height	sf	540	$20	$10,800

TABLE C-4

ITEM			UNIT	QUANT	UNIT PRICE	AMOUNT
floor			sf	30	$10	$300
Pipe Painting			ls	1	$4,000	$4,000
Sitework						
Subgrade Prep, 12"	80	80	sy	711	$30	$21,333
Aggregate Base Course, 6"			sy	711	$40	$28,444
Site Grading, and Earthwork			ls	1	$30,000	$30,000
Chain Link Fence			lf	320	$60	$19,200
Chain Link Gate			ls	1	$4,000	$4,000
				subtotal	$102,978	
SUBTOTAL						$965,658
Undefined Elements		15.00%				$144,849
General Conditions/Shakedown		2.00%				$19,313
Contingencies/Contractor Factor		25.00%				$241,414

TOTAL	**$1,371,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$68,600
Demobilization and Project Closeout Documents (0.5%)	$6,900
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$20,600
Construction Staking Service (1.25%)	$17,100
Traffic Control (0.75%)	$10,300
Pre-Authorized Changes During Construction (2%)	$27,400
Total Non-Construction Items	$150,900

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$1,521,900**

TABLE C-5

Item 5: 8" North Sewer Extension and Leach Field Site Restoration at Wa-Di 05/25/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM		UNIT	QUANT	UNIT PRICE	AMOUNT
8" Sewer, 9ft deep to 12ft deep, including pipe, trenching, backfill, complete in place.		lf	270	$55	$14,850
4ft Diameter Manholes, 9ft to 12ft deep, including all materials and interior coating, complete in place.		ea	6	$11,000	$66,000
Remove Existing Septic Tank, Leach Field, and Restoration of Site		ls	1	$64,000	$64,000
Pavement Removal and Replacement, complete in place.		sy	40	$100	$4,000
SUBTOTAL					$148,850
Undefined Elements	15.00%				$22,328
General Conditions/Shakedown	2.00%				$2,977
Contingencies/Contractor Facto	25.00%				$37,213

TOTAL	**$211,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$10,600
Demobilization and Project Closeout Documents (0.5%)	$1,100
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$3,200
Construction Staking Service (1.25%)	$2,600
Traffic Control (1.0%)	$2,100
Pre-Authorized Changes During Construction (2%)	$4,200
Total Non-Construction Items	$23,800

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$234,800**

TABLE C-6

Item 6: 8-inch Sewers North of Highway at Wa-Di 05/25/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM		UNIT	QUANT	UNIT PRICE	AMOUNT
8" Sewer, 5ft deep to 9ft deep, including pipe, trenching, backfill, complete in place.		lf	1,150	$50	$57,500
4ft Diameter Manholes, 5ft to 9ft deep, including all materials and interior coating, complete in place.		ea	6	$11,000	$66,000
Pavement removal and replacement 1100 10 1220		sy	1220	$100	$122,022
SUBTOTAL					$245,522
Undefined Elements	15.00%				$36,828
General Conditions/Shakedown	2.00%				$4,910
Contingencies/Contractor Factor	25.00%				$61,381

TOTAL	**$349,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$17,500
Demobilization and Project Closeout Documents (0.5%)	$1,700
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$5,200
Construction Staking Service (1.25%)	$4,400
Traffic Control (1.0%)	$3,500
Pre-Authorized Changes During Construction (2%)	$7,000
Total Non-Construction Items	$39,300

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$388,300**

TABLE C-7

Item 7: Jack & Bore Crossing Under Highway and Railroad Tracks at Wa-Di 05/25/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM		UNIT	QUANT	UNIT PRICE	AMOUNT
J&B for Average Installation					
Materials					
16" steel casing		lf	200	$162	$32,400
Casing spacer for 16" Casing		ea	31	$130	$4,018
End Seals for 16" Casing		ea	2	$97	$194
8" HDPE fused		lf	220	$27	$5,940
Corrosion Protection		ls	1	$2,500	$2,500
Subtotal Materials				$45,052	
Contractor Markup		ls	0.4	$45,052	$18,021
Contractor Installation		ls	1.50	$45,052	$67,578
Subtotal				$130,651	
Cost per foot	$653.25				
Pushing Pit (30'Lx20'W): 20 ft deep	w/shoring	cy	450	$100	$45,000
SUBTOTAL					$175,651
Undefined Elements	15.00%				$26,348
General Conditions/Shakedown	2.00%				$3,513
Contingencies/Contractor Facto	25.00%				$43,913

TOTAL	**$249,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$12,500
Demobilization and Project Closeout Documents (0.5%)	$1,200
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$3,700
Construction Staking Service (1.25%)	$3,100
Traffic Control (1.0%)	$2,500
Pre-Authorized Changes During Construction (2%)	$5,000
Total Non-Construction Items	$28,000

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$277,000**

TABLE C-8

Item 8: 8" Sewer from WA-DI to New Wa-Di Lift Station 05/25/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM		UNIT	QUANT	UNIT PRICE	AMOUNT
8" Sewer, 12ft deep to 17ft deep, including pipe, trenching, backfill, complete in place.		lf	730	$60	$43,800
4ft Diameter Manholes, 12ft to 17ft deep, including all materials and interior coating, complete in place.		ea	6	$13,500	$81,000
Existing Manhole Modifications for New Outlet.		ea	1	$5,000	$5,000
Pavement Removal & Replacement, complete in place.		sy	40	$100	$4,000
SUBTOTAL					$133,800
Undefined Elements	15.00%				$20,070
General Conditions/Shakedown	2.00%				$2,676
Contingencies/Contractor Factor	15.00%				$20,070

TOTAL	**$177,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$8,900
Demobilization and Project Closeout Documents (0.5%)	$900
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$2,700
Construction Staking Service (1.25%)	$2,200
Traffic Control (1.0%)	$1,800
Pre-Authorized Changes During Construction (2%)	$3,500
Total Non-Construction Items	$20,000

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$197,000**

TABLE C-9

Item 9: Wa-Di Lift Station and Site Improvements 06/29/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM	UNIT	QUANT	UNIT PRICE	AMOUNT
Equipment				
Submersible Pumps and Accessories 5/27/2022 Two pumps, discharge elbows, railing, 30x48 covers, grip eye, duplex pump control panels, level transmitter, float switches, NEMA 4S junction box, 4" check valves, 4" plug valves, startup.	ls	1	$63,000	$63,000
Contractor Markup	ls	15.00%	$63,000	$9,450
Contractor Installation	ls	45.00%	$63,000	$28,350
Electrical Work				
Standby Generator, 10kw, includes installation and testing	ls	1	$44,000	$44,000
Contractor Markup	ls	20.00%	$44,000	$8,800
3 Phase Power Service	ls	1	$20,000	$20,000
Structural Work				
Concrete	cy	45	$1,050	$47,250
6ft dia precast MH	vf	24	$900	$21,600
6ft dia precast MH for Valve Vault	vf	6	$900	$5,400
6ft dia precast MH for Meter Vault	vf	6	$900	$5,400
Structural - Metal Work & Hoist				
Monorail and frame $12,242	ls	1.4	$18,400	$25,760
Hoist assembly: 1/4 ton (installed)	ls	1	$5,400	$5,400
Hoist assembly: Contractor markup	ls	0.3	$5,400	$1,620
Excavation and Backfill				
Excavation	cy	1100	$15	$16,500
Ordinary Backfill	cy	1075	$18	$19,350
Compaction	cy	1075	$10	$10,750
Select Fill	cy	1000	$38	$38,000
Gravel Layer	cy	64	$30	$1,920
			$86,520	
Piping				
8" Inlet				
8" DI wall pipe, pe x pe, 6 ft long	ea	1	$298	$298
Pump Discharge				
Fittings				
4" 90 bend, flg	ea	2	$79	$158
4" mega flange	ea	10	$79	$790
Pipe Spools				
4" DI, flg x pe, 3ft - 4in long	ea	2	$150	$300
4" DI, flg x flg, 17ft long	ea	2	$323	$646
4" DI, flg x pe, 2ft - 9in long	ea	2	$92	$184
4" DI, flg x flg, 4ft long	ea	2	$142	$284
4" DI, flg x pe, 3ft long	ea	2	$92	$184
Yard Piping				

TABLE C-9

Item 9: Wa-Di Lift Station and Site Improvements 06/29/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM				UNIT	QUANT	UNIT PRICE	AMOUNT
4" DI Sleeve, mj ends				ea	4	$50	$200
4" 45 degree bend, mj ends				ea	1	$47	$47
8x4 reducer, mj ends				ea	2	$57	$114
8x8x4 wye, mj ends				ea	1	$312	$312
4" mega lugs				ea	3	$27	$81
Pipe Spools							
4" DI, pe x pe, 1ft long				ea	1	$22	$22
4" DI, pe x pe, 2ft long				lf	1	$30	$30
4" DI, pe x pe, 4ft long				ea	1	$40	$40
8" DI, 1ft long				lf	4	$50	$200
Other Improvements							
Pressure gauge assembly				ea	1	$300	$300
Flow Meter				ls	1	$9,000	$9,000
Adjustable pipe supports				ea	2	$150	$300
Pipe brackets				ea	2	$450	$900
Subtotal: Piping						$14,390	n/a
2022 Price: Adder						$8,100	($6,290)
Piping: Installation				ls	0.5	$8,100	$4,050
Yard piping trenching and backfilling				ls	1	$5,000	$5,000
Interior Waterproofing System							
walls: 6' dia	18.8 sf/ft	24 height	452.34	sf	452.34	$15	$6,785
floor				sf	64	$10	$640
Interior Painting							
walls: 6' dia	18.8 sf/ft	6 height	113.085	sf	113.085	$10	$1,131
Pipe Painting				ls	1	$4,000	$4,000
SiteWork							
Subgrade Prep, 12"		80	80	sy	711	$30	$21,333
Aggregate Base Course, 6"				sy	711	$40	$28,444
Site Grading				ls	1	$30,000	$30,000
Chain Link Fence				lf	320	$60	$19,200
Chain Link Gate				ls	1	$4,000	$4,000
					subtotal	$102,978	
SUBTOTAL							$505,234
Undefined Elements			15.00%				$75,785
General Conditions/Shakedown			2.00%				$10,105
Contingencies/Contractor Factor			25.00%				$126,308

TOTAL	**$717,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$35,900
Demobilization and Project Closeout Documents (0.5%)	$3,600
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$10,800
Construction Staking Service (1.25%)	$9,000

TABLE C-9

Item 9: Wa-Di Lift Station and Site Improvements 06/29/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM	UNIT	QUANT	UNIT PRICE	AMOUNT
Traffic Control (1.0%)				$7,200
Pre-Authorized Changes During Construction (2%)				$14,300
			Total Non-Construction Items	$80,800

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$797,800**

TABLE C-10

Item 10: 4-inch Forcemain from Wa-Di Lift Station to New WWTP 05/25/22

Santo Domingo Pueblo - Cost Estimates for WA-DI Sewerage Improvements

ITEM			UNIT	QUANT	UNIT PRICE	AMOUNT
4-inch Forcemain			lf	2,350		
Trench Work, 4ft bury			lf	2,350	$20	$47,000
4" PVC Pipe: material costs			lf	2350	$6.62	$15,557
Contractor Markup			ls	30.00%	$15,557	$4,667
Fittings:						$0
4" DI bends, mj ends,			ea	6	$95	$570
4" mega lugs			ea	12	$35	$420
4" Pipe Restraint Joint Devices			ea	15	$120	$1,800
Installation/Contractor Markup			ls	1.5	$23,014	$34,521
4" Pressure Cleanout Double			ea	4	$2,000	$8,000
Pavement Removal and Replacement			sy	2,400	$80	$192,000
2160 length	10 width	2400 sq yards				
Reclamation Seeding			ls	1	$17,606	$17,606
SUBTOTAL						$322,100
Undefined Elements		15.00%				$48,315
General Conditions/Shakedown		2.00%				$6,442
Contingencies/Contractor Factor		25.00%				$80,525

TOTAL	**$457,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$22,900
Demobilization and Project Closeout Documents (0.5%)	$2,300
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$6,900
Construction Staking Service (1.25%)	$5,700
Traffic Control (1.0%)	$4,600
Pre-Authorized Changes During Construction (2%)	$9,100
Total Non-Construction Items	$51,500

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$508,500**

TABLE C-11

Item 11: 8-inch Sewer East of Highway Near Kewa Safety Center 05/25/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM		UNIT	QUANT	UNIT PRICE	AMOUNT
8" Sewer, 6ft deep to 12ft deep, including pipe, trenching, backfill, complete in place.		lf	630	$90	$56,700
4ft Diameter Manholes, 6ft to 12ft deep, including all materials and interior coating, complete in place.		ea	3	$11,000	$33,000
Jack and bore crossing under highway for 8" Sewer		lf	180	$950	$171,000
Other					
Clearing and Grubbing		lf	630	$5	$3,150
Revegetation Seeding		lf	630	$6	$3,780
SUBTOTAL					$267,630
Undefined Elements	15.00%				$40,145
General Conditions/Shakedown	2.00%				$5,353
Contingencies/Contractor Factor	25.00%				$66,908

TOTAL	**$380,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$19,000
Demobilization and Project Closeout Documents (0.5%)	$1,900
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$5,700
Construction Staking Service (1.25%)	$4,800
Traffic Control (1.0%)	$3,800
Pre-Authorized Changes During Construction (2%)	$7,600
Total Non-Construction Items	$42,800

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$422,800**

TABLE C-12

Item 12: 8-inch Sewer from Enterprise Area to Near Lift Station 05/25/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM		UNIT	QUANT	UNIT PRICE	AMOUNT
8" Sewer, 10ft deep to 20ft deep, including pipe, trenching, backfill, complete in place.		lf	1,410	$100	$141,000
4ft Diameter Manholes, 10ft to 15ft deep, including all materials and interior coating, complete in place.		ea	5	$13,000	$65,000
4ft Diameter Manholes, 15ft to 20ft deep, including all materials and interior coating, complete in place.		ea	2	$15,000	$30,000
Other					
Clearing and Grubbing		lf	1,410	$5	$7,050
Revegetation Seeding		lf	1,410	$6	$8,460
SUBTOTAL					$251,510
Undefined Elements	15.00%				$37,727
General Conditions/Shakedown	2.00%				$5,030
Contingencies/Contractor Factor	25.00%				$62,878

TOTAL	**$357,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$17,900
Demobilization and Project Closeout Documents (0.5%)	$1,800
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$5,400
Construction Staking Service (1.25%)	$4,500
Traffic Control (1.0%)	$3,600
Pre-Authorized Changes During Construction (2%)	$7,100
Total Non-Construction Items	$40,300

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$397,300**

TABLE C-13

Item 13: Forcemain Extension & 8-inch Sewer from High School to Upstream of Lift Station

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates 05/25/22

ITEM		UNIT	QUANT	UNIT PRICE	AMOUNT
8" Sewer, 6ft deep to 12ft deep, including pipe, trenching, backfill, complete in place.		lf	1,160	$90	$104,400
4ft Diameter Manholes, 6ft to 12ft deep, including all materials and interior coating, complete in place.		ea	3	$13,000	$39,000
4" Forcemain Extension		ls	780	$45	$35,100
Pressure Cleanout for Forcemain		ea	2	$2,000	$4,000
Other					
Clearing and Grubbing		lf	1,940	$5	$9,700
Revegetation Seeding		lf	1,940	$6	$11,640
SUBTOTAL					$203,840
Undefined Elements	15.00%				$30,576
General Conditions/Shakedown	2.00%				$4,077
Contingencies/Contractor Factor	25.00%				$50,960

TOTAL	**$289,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$14,500
Demobilization and Project Closeout Documents (0.5%)	$1,400
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$4,300
Construction Staking Service (1.25%)	$3,600
Traffic Control (1.0%)	$2,900
Pre-Authorized Changes During Construction (2%)	$5,800
Total Non-Construction Items	$32,500

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$321,500**

TABLE C-14

Item 14: Enterprise Area Lift Station and Forcemain 06/29/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM				UNIT	QUANT	UNIT PRICE	AMOUNT
Equipment							
Submersible Pumps and Accessories 5/27/2022				ls	1	$94,000	$94,000
Two pumps, discharge elbows, railing, 30x48 covers, grip eye, duplex pump control panels, level transmitter, float switches, NEMA 4S junction box, 4" check valves, 4" plug valves, startup.							
Contractor Markup				ls	15.00%	$94,000	$14,100
Contractor Installation				ls	45.00%	$94,000	$42,300
Electrical Work							
Standby Generator, 10kw, includes installation and testing				ls	1	$44,000	$44,000
Contractor Markup				ls	20.00%	$44,000	$8,800
3 Phase Power Service				ls	1	$50,000	$50,000
Structural Work							
Existing Inlet Manhole: approx 24ft deep							
LS Wet Well Depth: 24 ft							
6ft dia precast barrels				vf	24	$900	$21,600
Concrete top and base				cy	9	$1,000	$9,000
Valve Vault: 6 ft dia precast barrels				vf	6	$900	$5,400
Concrete top and base				cy	6	$1,000	$6,000
Flow Meter Vault: 6 ft dia precast barrels				vf	6	$900	$5,400
Concrete top and base				cy	6	$1,000	$6,000
Structural - Metal Work & Hoist							
Monorail and frame $12,242				ls	1.4	$18,400	$25,760
Hoist assembly: 1/4 ton (installed)				ls	1	$5,400	$5,400
Hoist assembly: Contractor markup				ls	0.3	$5,400	$1,620
Excavation and Backfill							
Excavation				cy	1350	$15	$20,250
Ordinary Backfill				cy	1315	$18	$23,670
Compaction				cy	1315	$10	$13,150
Select Fill				cy	1000	$38	$38,000
Gravel Layer				cy	64	$30	$1,920
						$96,990	
Piping							
Piping, fittings, gauges, pipe supports, brackets				ls	1	$18,000	$18,000
Piping: Installation & Profit				ls	1.5	$18,000	$27,000
Flow Meter				ls	1	$7,000	$7,000
Yard piping trenching and backfilling				ls	1	$12,000	$12,000
Cleanouts				ea	2	$2,800	$5,600
Interior Waterproofing System							
walls: 6' dia	18.8 sf/ft	24 height	452.34	sf	452.34	$20	$9,047
floor				sf	64	$10	$640

TABLE C-14

Item 14: Enterprise Area Lift Station and Forcemain 06/29/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM			UNIT	QUANT	UNIT PRICE	AMOUNT
Pipe Painting			ls	1	$4,000	$4,000
SiteWork						
Subgrade Prep, 12"	80	80	sy	711	$30	$21,333
Aggregate Base Course, 6"			sy	711	$40	$28,444
Site Grading, and Earthwork			ls	1	$30,000	$30,000
Chain Link Fence			lf	320	$60	$19,200
Chain Link Gate			ls	1	$4,000	$4,000
				subtotal	$102,978	
Forcemain						
4-inch Forcemain (Total Distance)			lf	1,300		
Trench Work, 4ft bury			lf	1,300	$20	$26,000
4" DI Pipe: material costs			lf	1300	$8.00	$10,400
Contractor Markup			ls	25.00%	$10,400	$2,600
Jack and bore crossing under highway for 4" FM (12" casing)			lf	160	$750	$120,000
Fittings:						
4" DI Fittings			lf	1,300	$2	$2,600
4" Pipe Restraint Joint Devices			ea	10	$120	$1,200
Installation/Contractor Markup			ls	1.25	$16,800	$21,000
4" Pressure Cleanout Double			ea	3	$2,000	$6,000
4" Isolation Valves (Plug Valves, mj ends)			ea	2	$1,200	$2,400
Combination Air Release and Vacuum Stations			ea	1	$18,000	$18,000
Other						
Clearing and Grubbing			lf	1,300	$5	$6,500
Revegetation Seeding			lf	1,300	$6	$7,800
SUBTOTAL						$847,135
Undefined Elements		15.00%				$127,070
General Conditions/Shakedown		2.00%				$16,943
Contingencies/Contractor Factor		25.00%				$211,784

TOTAL	**$1,203,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$60,200
Demobilization and Project Closeout Documents (0.5%)	$6,000
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$18,000
Construction Staking Service (1.25%)	$15,000
Traffic Control (1.0%)	$12,000
Pre-Authorized Changes During Construction (2%)	$24,100
Total Non-Construction Items	$135,300

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$1,338,300**

TABLE C-15

Item 15: 8-inch Sewer for Cedar Tree Community in Enterprise Area 05/25/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM		UNIT	QUANT	UNIT PRICE	AMOUNT
8" Sewer, 6ft deep to 9ft deep, including pipe, trenching, backfill, complete in place.		lf	440	$50	$22,000
4ft Diameter Manholes, 6ft to 9ft deep, including all materials and interior coating, complete in place.		ea	4	$11,000	$44,000
Gravel removal and replacement 310 22 756		sy	756	$50	$37,789
Jack and bore crossing under highway for 8" Sewer (16" casing)		lf	160	$950	$152,000
Connect existing service lateral to new sewer		ea	7	$1,800	$12,600
<u>Other</u>					
Clearing and Grubbing		lf	100	$5	$500
Revegetation Seeding		lf	100	$6	$600
SUBTOTAL					$269,489
Undefined Elements	15.00%				$40,423
General Conditions/Shakedown	2.00%				$5,390
Contingencies/Contractor Factor	25.00%				$67,372

TOTAL	**$383,000**

<u>Non-Construction Items</u>	
Mobilization and Insurance (5%)	$19,200
Demobilization and Project Closeout Documents (0.5%)	$1,900
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$5,700
Construction Staking Service (1.25%)	$4,800
Traffic Control (1.0%)	$3,800
Pre-Authorized Changes During Construction (2%)	<u>$7,700</u>
Total Non-Construction Items	$43,100

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$426,100**

TABLE C-16

Item 16: 8-inch Sewer East of Highway for Pueblo Facilities 05/25/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM		UNIT	QUANT	UNIT PRICE	AMOUNT
8" Sewer, 9ft deep to 15ft, including pipe, trenching, backfill, complete in place.		lf	2,610	$100	$261,000
4ft Diameter Manholes, 9ft to 15ft deep, including all materials and interior coating, complete in place.		ea	7	$11,000	$77,000
Other					
Clearing and Grubbing		lf	2,610	$5	$13,050
Revegetation Seeding		lf	2,610	$6	$15,660
SUBTOTAL					$366,710
Undefined Elements	15.00%				$55,007
General Conditions/Shakedown	2.00%				$7,334
Contingencies/Contractor Factor	25.00%				$91,678

TOTAL	**$521,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$26,100
Demobilization and Project Closeout Documents (0.5%)	$2,600
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$7,800
Construction Staking Service (1.25%)	$6,500
Traffic Control (1.0%)	$5,200
Pre-Authorized Changes During Construction (2%)	$10,400
Total Non-Construction Items	$58,600

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$579,600**

TABLE C-17

Item 17: 8-inch Sewer for Early Childhood Learning Center 05/25/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM		UNIT	QUANT	UNIT PRICE	AMOUNT
8" Sewer, 8ft deep to 12ft deep, including pipe, trenching, backfill, complete in place.		lf	630	$90	$56,700
4ft Diameter Manholes, 8ft to 12ft deep, including all materials and interior coating, complete in place.		ea	6	$13,000	$78,000
Pavement removal and replacement 20 26 9		sy	58	$100	$5,778
Other					
Clearing and Grubbing		lf	630	$4	$2,205
Revegetation Seeding		lf	630	$6	$3,780
Remove and Replace CMU Wall (6ft high)		ls	1	$9,000	$9,000
Remove and Replace Sidewalk and Pavement		ls	1	$7,000	$7,000
Manhole Modifications		ls	1	$4,000	$4,000
SUBTOTAL					$166,463
Undefined Elements	15.00%				$24,969
General Conditions/Shakedown	2.00%				$3,329
Contingencies/Contractor Factor	25.00%				$41,616

TOTAL	**$236,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$11,800
Demobilization and Project Closeout Documents (0.5%)	$1,200
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$3,500
Construction Staking Service (1.25%)	$3,000
Traffic Control (1.0%)	$2,400
Pre-Authorized Changes During Construction (2%)	$4,700
Total Non-Construction Items	$26,600

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$262,600**

TABLE C-18

Item 18: 8-inch Sewer for Health Center (2 Septic Tanks) 05/25/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM		UNIT	QUANT	UNIT PRICE	AMOUNT
8" Sewer, 8ft deep to 12ft deep, including pipe, trenching, backfill, complete in place.		lf	740	$90	$66,600
4ft Diameter Manholes, 8ft to 12ft deep, including all materials and interior coating, complete in place.		ea	4	$13,000	$52,000
Other					
Revegetation Seeding		lf	740	$6	$4,440
SUBTOTAL					$123,040
Undefined Elements	15.00%				$18,456
General Conditions/Shakedown	2.00%				$2,461
Contingencies/Contractor Factor	25.00%				$30,760
TOTAL					**$175,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$8,800
Demobilization and Project Closeout Documents (0.5%)	$900
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$2,600
Construction Staking Service (1.25%)	$2,200
Traffic Control (1.0%)	$1,800
Pre-Authorized Changes During Construction (2%)	$3,500
Total Non-Construction Items	$19,800

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$194,800**

TABLE C-19

Item 19: 8-inch Sewer for Health Center (MBR Plant) 05/25/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM		UNIT	QUANT	UNIT PRICE	AMOUNT
8" Sewer, 8ft deep to 12ft deep, including pipe, trenching, backfill, complete in place.		lf	800	$90	$72,000
4ft Diameter Manholes, 8ft to 12ft deep, including all materials and interior coating, complete in place.		ea	5	$13,000	$65,000
Pavement removal and replacement 20 26 9		sy	58	$100	$5,778
Other					
Clearing and Grubbing		lf	800	$5	$4,000
Revegetation Seeding		lf	800	$6	$4,800
SUBTOTAL					$151,578
Undefined Elements	15.00%				$22,737
General Conditions/Shakedown	2.00%				$3,032
Contingencies/Contractor Factor	25.00%				$37,894

TOTAL	**$215,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$10,800
Demobilization and Project Closeout Documents (0.5%)	$1,100
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$3,200
Construction Staking Service (1.25%)	$2,700
Traffic Control (1.0%)	$2,200
Pre-Authorized Changes During Construction (2%)	$4,300
Total Non-Construction Items	$24,300

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$239,300**

TABLE C-20

Item 20: 8-inch Sewer for Kewa Safety Complex 05/25/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM		UNIT	QUANT	UNIT PRICE	AMOUNT
8" Sewer, 8ft deep to 12ft deep, including pipe, trenching, backfill, complete in place.		lf	160	$90	$14,400
4ft Diameter Manholes, 8ft to 12ft deep, including all materials and interior coating, complete in place.		ea	2	$13,000	$26,000
Other					
Revegetation Seeding		lf	160	$6	$960
SUBTOTAL					$41,360
Undefined Elements	15.00%				$6,204
General Conditions/Shakedown	2.00%				$827
Contingencies/Contractor Factor	25.00%				$10,340
TOTAL					**$59,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$3,000
Demobilization and Project Closeout Documents (0.5%)	$300
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$900
Construction Staking Service (1.25%)	$700
Traffic Control (1.0%)	$600
Pre-Authorized Changes During Construction (2%)	$1,200
Total Non-Construction Items	$6,700

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$65,700**

TABLE C-21

Item 21: 8-inch Sewer from North End of Enterprise Area to WWTP 05/25/22

Santo Domingo Pueblo - PER Sewerage System Alternatives Cost Estimates

ITEM		UNIT	QUANT	UNIT PRICE	AMOUNT
8" Sewer, 9ft deep to 15ft deep, including pipe, trenching, backfill, complete in place.		lf	9,410	$100	$941,000
4ft Diameter Manholes, 8ft to 15ft deep, including all materials and interior coating, complete in place.		ea	29	$14,000	$406,000
Pavement removal and replacement 9,410 13 13590 assume 25%		sy	3398	$100	$339,756
Other					
Clearing and Grubbing		lf	9,410	$4	$37,640
Revegetation Seeding		lf	9,410	$6	$56,460
SUBTOTAL					$1,780,856
Undefined Elements	15.00%				$267,128
General Conditions/Shakedown	2.00%				$35,617
Contingencies/Contractor Factor	25.00%				$445,214

TOTAL	**$2,529,000**

Non-Construction Items	
Mobilization and Insurance (5%)	$126,500
Demobilization and Project Closeout Documents (0.5%)	$12,600
Storm Water Pollution Prevention Plan (SWPPP) (1.5%)	$37,900
Construction Staking Service (1.25%)	$31,600
Traffic Control (1.0%)	$25,300
Pre-Authorized Changes During Construction (2%)	$50,600
Total Non-Construction Items	$284,500

TOTAL CONSTRUCTION AND NON-CONSTRUCTION ITEMS	**$2,813,500**

APPENDIX D:

OPERATION AND MAINTENANCE (O&M) COST ESTIMATES

TABLE D-1

SANTO DOMINGO PUEBLO LIFT STATIONS & FORCEMAINS
ENGINEER'S OPINION OF PROBABLE OPERATION AND MAINTENANCE COSTS
MAIN VILLAGE LIFT STATION

1	Electricity and SCADA Control System		
	Pump Size, hp	72	hp
	Pump Size, kW	53.7	kW
	Sewage Pump Flow	362	gpm
	Average Day Flow	121	gpm at Year 2032
	Percent Pump On Time	33.4	%
	Hours Pumping per Day	8.0	hr/d
	Power Consumption per Day	431	kWh/d
	Power Consumption per Year	157,200	kWh/yr
	Cost Electricity	$0.15	$/kWh
	Annual Cost Electricity	**$23,600**	**$/year**
	SCADA Control System Annual Fee	**$1,000**	**$/year**
2	Diesel Fuel for Emergency Generator and Vehicle Costs		
	Annual amount of diesel fuel	100	gallons/year
	Unit cost of diesel fuel	$7.00	$/gallon
	Annual Cost Diesel Fuel	**$700**	
	Vehicle Miles per Week	50	
	Vehicle Cost per Mile, incl. fuel	$1.50	
	Annual Vehicle Costs	**$3,900**	
	Total Fuel and Vehicle Costs	**$4,600**	
3	Labor		
	Hours per week, Lift Station	5	hr/wk
	Hour per week, Driving	2.5	hr/wk
	Total hours per year	390	hr/year
	Cost Per Hour	$100	$/hr
	Annual Cost Labor	**$39,000**	**$/year**
4	Combined Annual Expenses		
	Annual Cost Electricity		$23,600
	Annual SCADA Control System Fee		$1,000
	Annual Cost Diesel Fuel and Vehicles		$4,600
	Annual Cost Labor		$39,000
	Short-Lived Assets		$1,000
	Administrative and Misc Expenses		$1,000
	Total Annual Expenses		**$70,200**

TABLE D-2

SANTO DOMINGO PUEBLO LIFT STATIONS & FORCEMAINS
ENGINEER'S OPINION OF PROBABLE OPERATION AND MAINTENANCE COSTS
MAIN VILLAGE LS TO GALISTEO LS FORCEMAIN

1	Pipeline and Valve Maintenance		
	Flushing ($10,000 every 5 years)	$2,000	$/year
	Vehicle Miles per Week	6	
	Vehicle Cost per Mile, incl. fuel	$1.50	
	Annual Vehicle Costs	**$500**	
	Valve and Cleanout Rehab. ($5,000 every 10 years)	$500	$/year
	Annual Cost Maintenance	**$3,000**	$/year
2	Labor		
	Pipeline length	2.9	miles
	Hours per week, pipeline and valve inspection	1	hr/wk
	Hours per week, Driving	0.25	hr/wk
	Total hours per year	65.0	hr/year
	Cost Per Hour	$100	$/hr
	Annual Cost Labor	**$6,500**	**$/year**
3	Combined Annual Expenses		
	Annual Cost Maintenance		$3,000
	Annual Cost Labor		$6,500
	Short-Lived Assets		$1,000
	Administrative and Misc Expenses		$500
	Total Annual Expenses		**$11,000**

TABLE D-3

SANTO DOMINGO PUEBLO LIFT STATIONS & FORCEMAINS
ENGINEER'S OPINION OF PROBABLE OPERATION AND MAINTENANCE COSTS
GALISTEO LS TO WWTP FORCEMAIN

1	Pipeline and Valve Maintenance		
	Flushing ($10,000 every 5 years)	$2,000	$/year
	Vehicle Miles per Week	4	
	Vehicle Cost per Mile, incl. fuel	$1.50	
	Annual Vehicle Costs	**$300**	
	Valve and Cleanout Rehab. ($5,000 every 10 years)	$500	$/year
	Annual Cost Maintenance	**$2,800**	$/year
2	Labor		
	Pipeline length	2.2	miles
	Hours per week, pipeline and valve inspection	1	hr/wk
	Hours per week, Driving	0.25	hr/wk
	Total hours per year	65.0	hr/year
	Cost Per Hour	$100	$/hr
	Annual Cost Labor	**$6,500**	**$/year**
3	Combined Annual Expenses		
	Annual Cost Maintenance		$2,800
	Annual Cost Labor		$6,500
	Short-Lived Assets		$1,000
	Administrative and Misc Expenses		$500
	Total Annual Expenses		**$10,800**

TABLE D-4

SANTO DOMINGO PUEBLO LIFT STATIONS & FORCEMAINS
ENGINEER'S OPINION OF PROBABLE OPERATION AND MAINTENANCE COSTS
GALISTEO LIFT STATION

1	Electricity and SCADA Control System		
	Pump Size, hp	72	hp
	Pump Size, kW	53.7	kW
	Sewage Pump Flow	362	gpm
	Average Day Flow	141	gpm at Year 2032
	Percent Pump On Time	39.0	%
	Hours Pumping per Day	9.3	hr/d
	Power Consumption per Day	502	kWh/d
	Power Consumption per Year	183,200	kWh/yr
	Cost Electricity	$0.15	$/kWh
	Annual Cost Electricity	**$27,500**	**$/year**
	SCADA Control System Annual Fee	**$1,000**	**$/year**
2	Diesel Fuel for Emergency Generator and Vehicle Costs		
	Annual amount of diesel fuel	100	gallons/year
	Unit cost of diesel fuel	$7.00	$/gallon
	Annual Cost Diesel Fuel	**$700**	
	Vehicle Miles per Week	30	
	Vehicle Cost per Mile, incl. fuel	$1.50	
	Annual Vehicle Costs	**$2,300**	
	Total Fuel and Vehicle Costs	**$3,000**	
3	Labor		
	Hours per week, Lift Station	5	hr/wk
	Hour per week, Driving	2.5	hr/wk
	Total hours per year	390	hr/year
	Cost Per Hour	$100	$/hr
	Annual Cost Labor	**$39,000**	**$/year**
4	Combined Annual Expenses		
	Annual Cost Electricity		$27,500
	Annual SCADA Control System Fee		$1,000
	Annual Cost Diesel Fuel and Vehicles		$3,000
	Annual Cost Labor		$39,000
	Short-Lived Assets		$1,000
	Administrative and Misc Expenses		$1,000
	Total Annual Expenses		**$72,500**

TABLE D-5

SANTO DOMINGO PUEBLO LIFT STATIONS & FORCEMAINS
ENGINEER'S OPINION OF PROBABLE OPERATION AND MAINTENANCE COSTS
WA-DI LIFT STATION, FORCEMAIN, AND GRAVITY SEWERS

1	Electricity and SCADA Control System		
	Pump Size, hp	7	hp
	Pump Size, kW	5.4	kW
	Sewage Pump Flow	95	gpm
	Average Day Flow	9	gpm at Year 2032
	Percent Pump On Time	9.5	%
	Hours Pumping per Day	2.3	hr/d
	Power Consumption per Day	12	kWh/d
	Power Consumption per Year	4,500	kWh/yr
	Cost Electricity	$0.15	$/kWh
	Annual Cost Electricity	**$700**	**$/year**
	SCADA Control System Annual Fee	**$1,000**	**$/year**
2	Diesel Fuel for Emergency Generator and Vehicle Costs		
	Annual amount of diesel fuel	20	gallons/year
	Unit cost of diesel fuel	$7.00	$/gallon
	Annual Cost Diesel Fuel	**$140**	
	Vehicle Miles per Week	15	
	Vehicle Cost per Mile, incl. fuel	$1.50	
	Annual Vehicle Costs	**$1,200**	
	Total Fuel and Vehicle Costs	**$1,340**	
3	Labor		
	Hours per week, Lift Station	2	hr/wk
	Hour per week, Driving	1.0	hr/wk
	Total hours per year	156	hr/year
	Cost Per Hour	$100	$/hr
	Annual Cost Labor	**$15,600**	**$/year**
4	Combined Annual Expenses		
	Annual Cost Electricity		$700
	Annual SCADA Control System Fee		$1,000
	Annual Cost Diesel Fuel and Vehicles		$1,340
	Annual Cost Labor		$15,600
	Short-Lived Assets		$1,000
	Administrative and Misc Expenses		$1,000
	Total Annual Expenses		**$20,600**

TABLE D-6

SANTO DOMINGO PUEBLO LIFT STATIONS & FORCEMAINS
ENGINEER'S OPINION OF PROBABLE OPERATION AND MAINTENANCE COSTS
ENTERPRISE AREA LIFT STATION, FORCEMAIN, AND GRAVITY SEWERS

1	Electricity and SCADA Control System		
	Pump Size, hp	11	hp
	Pump Size, kW	8.2	kW
	Sewage Pump Flow	215	gpm
	Average Day Flow	49	gpm at Year 2032
	Percent Pump On Time	22.8	%
	Hours Pumping per Day	5.5	hr/d
	Power Consumption per Day	45	kWh/d
	Power Consumption per Year	16,400	kWh/yr
	Cost Electricity	$0.15	$/kWh
	Annual Cost Electricity	**$2,500**	**$/year**
	SCADA Control System Annual Fee	**$1,000**	**$/year**
2	Diesel Fuel for Emergency Generator and Vehicle Costs		
	Annual amount of diesel fuel	30	gallons/year
	Unit cost of diesel fuel	$7.00	$/gallon
	Annual Cost Diesel Fuel	**$210**	
	Vehicle Miles per Week	30	
	Vehicle Cost per Mile, incl. fuel	$1.50	
	Annual Vehicle Costs	**$2,300**	
	Total Fuel and Vehicle Costs	**$2,510**	
3	Labor		
	Hours per week, Lift Station	3	hr/wk
	Hour per week, Driving	1.5	hr/wk
	Total hours per year	234	hr/year
	Cost Per Hour	$100	$/hr
	Annual Cost Labor	**$23,400**	**$/year**
4	Combined Annual Expenses		
	Annual Cost Electricity		$2,500
	Annual SCADA Control System Fee		$1,000
	Annual Cost Diesel Fuel and Vehicles		$2,510
	Annual Cost Labor		$23,400
	Short-Lived Assets		$1,000
	Administrative and Misc Expenses		$1,000
	Total Annual Expenses		**$31,400**

APPENDIX E:

AGC JULY 2022 CONSTRUCTION INFLATION ALERT

AGC
THE CONSTRUCTION ASSOCIATION

JULY

2022

CONSTRUCTION INFLATION ALERT

For more than two years the U.S. construction industry has been buffeted by unprecedented increases in materials costs, supply-chain bottlenecks, and a tight labor market. To help project owners, government officials, and the public understand how these conditions are affecting contractors and their workers, the Associated General Contractors of America (AGC) has posted frequent updates of the Construction Inflation Alert.

Several recent developments have raised the specter of a sharp slowdown or even a recession in the U.S. economy. Inflation is at a 40-year high, sapping consumers' purchasing power despite elevated wage increases. Major stock indexes have declined sharply—a frequent but not foolproof harbinger of recession. A growing number of companies have announced layoffs, although the job market remains vibrant, as indicated by large monthly employment increases, near-record job openings, and a persistently low unemployment rate

However, a recession is far from certain. Demand for infrastructure, manufacturing, and power construction appears to be strong and likely to strengthen further, perhaps for several years to come. In any case, the cost of construction materials and labor does not generally move in sync with the overall economy. In short, owners should not assume that delaying projects will enable them to avoid volatility and disruptions in construction costs, delivery times, and labor supply, even if the economy slows significantly.

Meanwhile, Russia's ongoing attack on Ukraine and Western sanctions against Russia have disrupted production and transport of dozens of commodities. China's prolonged lockdown of Shanghai and other areas in an attempt to control the spread of covid has also affected production and shipping. New variants of covid, as well as a growing number of people with lingering or recurrent symptoms ("long-haul covid"), add to uncertainty about labor supply.

This version of the Alert is the seventh update since the first edition was posted in March 2021—an indication that the situation remains far from "normal." This document will continue to be revised to keep it timely as conditions affecting demand for construction, labor supply, and materials costs and availability change. Each new version is posted here: https://www.agc.org/learn/construction-data/agc-construction-inflation-alert

Please send comments and feedback, along with "Dear Valued Customer" letters or other information about materials costs and supply-chain issues, to AGC of America's chief economist, Ken Simonson, ken.simonson@agc.org.

Recent changes in input costs

Previous editions of this guide have highlighted the extreme runup in materials costs that began in early 2020. More recently, prices have moved in divergent directions for different materials. But, on balance, they continue to climb at a much higher rate than the consumer price index.

The extent of these increases is documented by the Bureau of Labor Statistics (BLS). BLS posts producer price indexes (PPIs) around the middle of each month for thousands of products and services (at www.bls.gov/ppi). Most PPIs are based on the prices that sellers say they charged for a specific item on the 11th day of the preceding month. Producers include manufacturers and fabricators, intermediaries such as steel service centers and distributors, and providers of services ranging from design to trucking.

Figure 1 shows the magnitude of the increases for seven widely used categories of construction inputs. From April 2020, the low point for prices of many goods during the early stage of the pandemic, to June 2022, the PPI for steel mill products more than doubled (up 124% in 26 months). There were increases of more than 60% in the indexes for copper and brass mill shapes (up 68%) and lumber and plywood (up 61%). PPIs rose by more than half for plastic construction products (up 55%) and aluminum mill shapes (up 53%). The index for gypsum products increased 44% and the PPI for truck transportation climbed 40%. Numerous other indexes rose by more than the 23% increase in the "bid price" index.

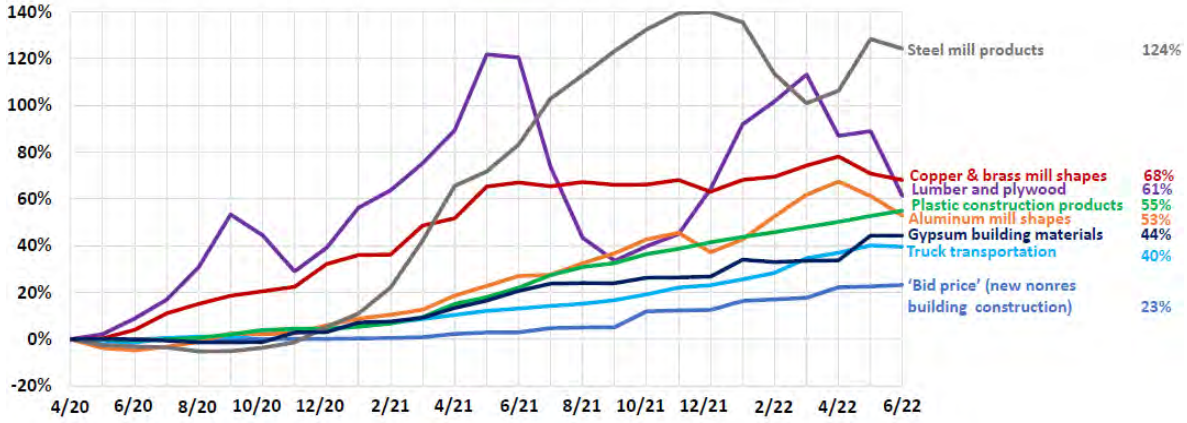
124%

The PPI for steel mill products rose 124% in 26 months

Figure 1

PPIs for construction bid prices and selected inputs

cumulative change in PPIs, April 2020-June 2022 (not seasonally adjusted)



Source: Bureau of Labor Statistics, producer price indexes, www.bls.gov/ppi

Supply-chain issues

From the first days of the pandemic, availability and delivery times for materials have been never-ending headaches for construction firms. Problems began as early as February 2020, when factories in China and northern Italy were shut down, causing shortages of items as diverse as elevator parts, floor tiles, and kitchen appliances. Two years later, another round of covid-related restrictions in China disrupted production and shipping from that country.

Russia's attack on Ukraine, Western countermeasures against Russia, and diversions or blockages of cargo ships are impeding or cutting off supplies of items as diverse as pig iron used in steelmaking, neon for lasers used in semiconductor manufacturing and other applications, and Ukrainian clay used in producing ceramic tile exported to the U.S. from Italy and Spain. Some of these impacts are far down the supply chain from the actual construction item. For instance, a producer of electrical switchgear reported in May that the time for delivering products from its plant had doubled from 20 weeks to 40, in part because of difficulty acquiring a fire-retardant chemical produced in Europe that goes into a plastic resin used to make the housing for its switchgear.

Adding to these pandemic- and conflict-induced problems, a series of unusual mishaps interfered with output or delivery of numerous goods. The biggest impact for construction came from the severe freeze in Texas in February 2021 that damaged all of the petrochemical plants producing resins for a host of construction plastics. Damage to the electrical grid in Louisiana from Hurricane Ida last September further interfered with the production of some plastics inputs. Some cement plants have incurred unusually long outages, in part because of delays in sourcing replacement parts.

466,000

The number of job openings at the end of May, a record for the month

Contractors have also been affected by the much-publicized shortage of computer chips. Not only is the construction industry a major buyer of pickup trucks that are in short supply, but deliveries of construction equipment also have been held up by a lack of semiconductors.

Contractors have reported being quoted exceptionally long lead times and/or allocations (less-than-full shipments, generally tied to previously ordered quantities) for inputs as varied as electrical transformers, traffic signal equipment, highway striping paint, wallboard, insulation, windows, and roofing fasteners. Strong demand, plant outages, and truck driver shortages have meant long delays in completing ready-mix concrete pours in several states in the Southeast and West.

So far, there is little sign that the supply chain will consistently improve before 2023—or even 2024, in the case of some computer chips. While the lead time for some items has shortened, deliveries for many materials remain delayed or unpredictable. In fact, the expiration of labor contracts for West Coast longshore workers and rail workers nationwide could result in new disruptions of shipments later this year.

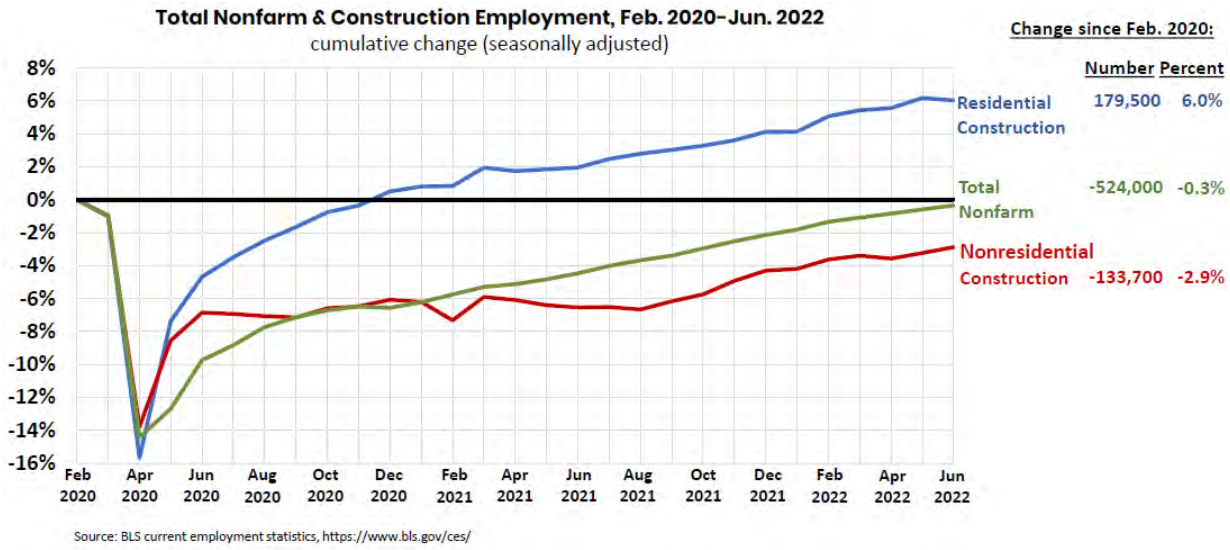
Labor supply and cost

Construction employment has bounced back well from the early months of the pandemic. However, construction firms are far short of the number of workers they have been seeking. They have partially closed the gap by getting more overtime from the workers they have, but this cannot continue indefinitely.

The construction industry lost 1.1 million employees from February to April 2020—a 15% decline in just two months. While both residential and nonresidential construction employment rebounded somewhat in May 2020, employment stalled for more than a year after that among nonresidential firms—nonresidential building and specialty trade contractors plus civil and heavy engineering construction firms. During that period, thousands of experienced workers moved into residential construction (homebuilding and remodeling), found jobs in other sectors, or left the workforce completely.

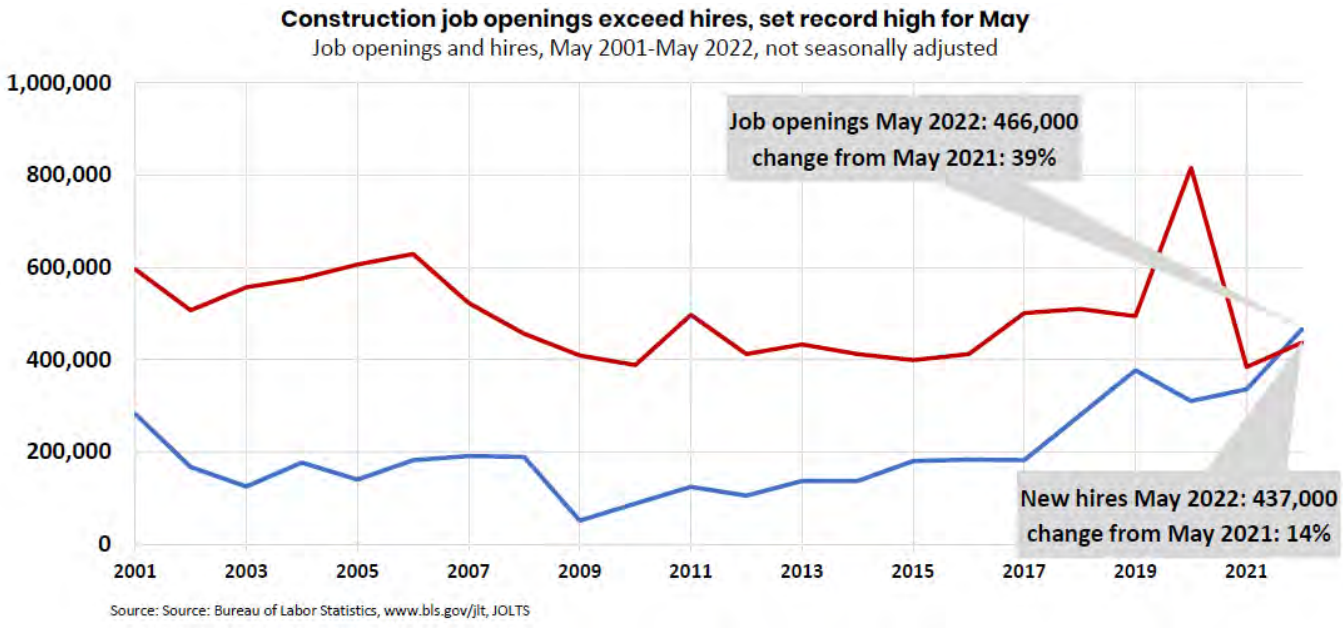
By June 2022, seasonally adjusted construction employment totaled 7,670,000—modestly higher than the 7,624,000 employed in February 2020. But there was a large shift between residential and nonresidential subsectors. Compared to February 2020 levels, residential construction firms had added nearly 180,000 workers, while employment in nonresidential construction was still down 134,000 employees or 2.9%, as shown in Figure 2.

Figure 2



There is strong evidence that the construction industry would have added many more workers if they had been available. Job openings in construction at the end of May totaled 466,000 (not seasonally adjusted), a jump of 130,000 or 39% from a year earlier and by far the largest May total in the 22-year history of the data, as shown in Figure 3. In fact, job openings exceeded the 437,000 workers hired in May, implying that construction firms would have hired twice as many workers that month as they were able to, if there had been enough qualified applicants.

Figure 3



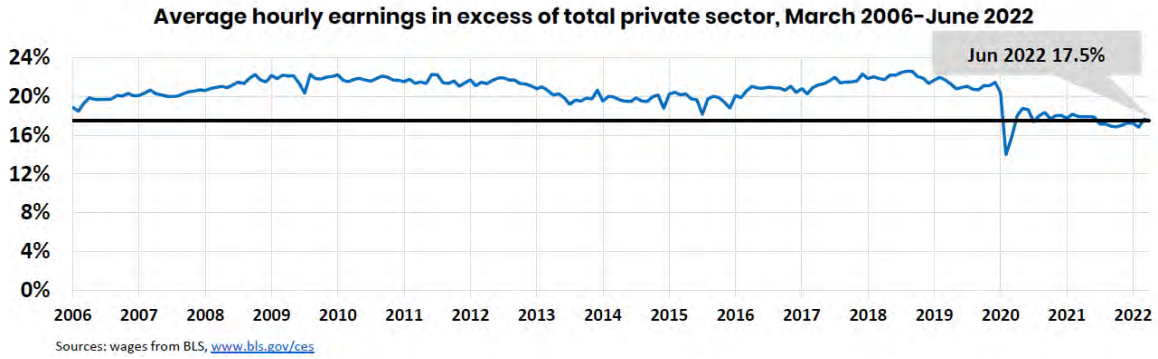
In order to attract, retain, and bring back workers, construction firms are raising pay. Average hourly earnings in construction for "production and nonsupervisory employees"—mainly hourly craft workers—rose 6.0% from June 2021 to June 2022. That compared with increases of 4.0% in the previous 12 months and 2.8% in the 12 months ending in June 2000.

Despite the acceleration in wages, construction pay has not risen as fast as in other industries. Historically, as shown in Figure 4, contractors paid a "premium" to attract workers willing to work in the conditions, locations, and hours required for construction. Specifically, average hourly earnings for production workers in construction typically averaged 20% to 23% more than for all private sector employees, up until the onset of the pandemic. This premium shrank to less that 18% since the start of the pandemic as restaurants, warehouses, delivery services, and other industries drastically increased pay. Other sectors were also able to offer greater flexibility regarding hours and worksites, including work from home, that are not possible for construction.

Figure 4

Wage premium for construction has shrunk

- "Premium" for construction wages relative to total private sector has shrunk from 20-23% pre-pandemic to 17.5% for production & nonsupervisory employees as other sectors boost pay, benefits and offer flexible hours and locations
- Implications: Contractors will have raise pay still more, pay more overtime, invest more in labor-saving software and equipment



Sources: wages from BLS, www.bls.gov/ces

These differences imply that construction wages will have to rise even more steeply to restore (and perhaps expand) the pay "premium." In addition, it is likely that contractors will pay more overtime to make up for the workers they don't have. They may also turn more to offsite production and onsite drones, robotics, 3-D printers, and other ways of reducing the number or skill level of the workers they employ.

Changes in bid prices

The extreme runup in so many input costs caused financial hardship for many contractors and subcontractors, especially for those whose purchases are concentrated in materials with extra-steep increases.

BLS posts several PPIs for new nonresidential construction. Since every construction project is unique, it is not possible to collect prices for identical construction "products" in the same way as for most goods and services. Instead, the agency creates "bid price" PPIs (BLS refers to them as output price indexes) through a two-step process. Each quarter it receives data from construction cost-estimating firms regarding the cost of a package of installed components or "assemblies" of a particular nonresidential building. Every month BLS asks a fixed group of contractors the amount of overhead and profit they would charge to erect that building—the same building that contractor was asked about previously. BLS combines the answers from a set of contractors to create PPIs for new warehouse, school, office, industrial, and healthcare building construction, along with a weighted average of these building types for an overall index for new nonresidential building construction.

BLS also creates PPIs for inputs to construction--weighted averages of the cost of materials and services purchased for every type of project.

As shown in Figure 5, the PPI for bid prices rose at the same rate as the PPI for inputs from September 2019 to September 2020, 1.8% year-over-year. The bid-price PPI continued rising at a modest rate through mid-2021, while the year-over-year change in input prices accelerated to more than 24% by June 2021.

Since mid-2001, the bid-price PPI also has accelerated considerably, as contractors attempt to pass on their rising materials and labor costs. By June 2022, the bid-price index was climbing at a 19.8% year-over-year rate, compared to 16.8% for the PPI for inputs to new nonresidential construction.

Figure 5



Source: Bureau of Labor Statistics, producer price indexes, www.bls.gov/ppi

The bid-price index only indicates the price contractors propose for new starts. On projects for which they had already submitted a bid or begun work, contractors were stuck with paying elevated materials prices that they could not pass on.

What's next for bid prices?

There is no fixed relationship between input costs and bid prices. For every firm and time period, the relationship depends on specific market conditions and expectations.

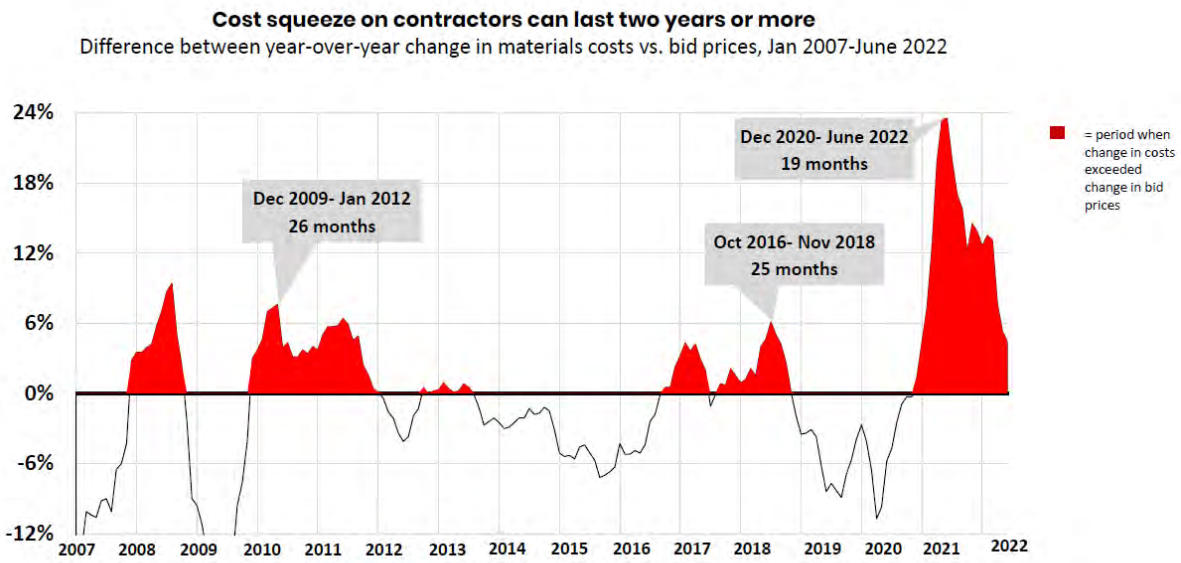
However, it is possible to look at past relationships. Figure 6 shows the difference between the year-over-year change in the PPI for materials costs for goods inputs to construction and the bid-price index for new school construction. The areas in red indicate periods in which the year-over-year change in the PPI for exceeded the bid-price PPI for schools. (Similar patterns exist for the bid-price indexes for new warehouse, office, industrial and healthcare buildings.)

Materials costs outran bid prices for as long as 26 months from late 2009 to early 2012 and for 25 months from late 2016 to late 2018. The current gap hasn't lasted as long but the peak was more than twice as high as in previous episodes, indicating the pain for contractors has been that much more intense.

26 months

The year-over-year change in materials costs may exceed the change in bid prices for 2 years or more

Figure 6



Source: Source: Bureau of Labor Statistics, www.bls.gov/ppi, producer price indexes for goods inputs to nonresidential construction (material costs) and new school building construction (bid prices)

What can contractors and owners do?

Contractors can provide project owners with timely and credible third-party information about changes in relevant material costs and supply-chain snarls that may impact the cost and completion time for a project that is underway or for which a bid has already been submitted.

Owners can authorize appropriate adjustments to design, completion date, and payments to accommodate or work around these impediments. Nobody welcomes a higher bill, but the alternative of having a contractor go out of business because of impossible costs or timing is likely to be worse for many owners.

For projects that have not been awarded or started, owners should start with realistic expectations about current costs and the likelihood of increases. They should provide potential bidders with accurate and complete design information to enable bidders to prepare bids that minimize the likelihood of unpleasant surprises for either party.

Owners and bidders may want to consider price-adjustment clauses that would protect both parties from unanticipated swings in materials prices. Such contract terms can enable the contractor to include a smaller contingency in its bid, while providing the owner an opportunity to share in any savings from downward price movements (as has occurred recently with lumber, diesel fuel, and some metals prices). The ConsensusDocs set of contract documents (www.consensusdocs.org) is one source of industry-standard model language for such terms. The ConsensusDocs website includes a price escalation resource center (https://www.consensusdocs.org/price-escalation-clause/).

The parties may also want to discuss the best timing for ordering materials and components. Buying items earlier than usual can provide protection against cost increases. But purchase before use entails paying sooner for the items; potentially paying for storage, security against theft and damage, and insurance; and the possibility of design changes that make early purchase unwise.

Conclusion

The construction industry is in the midst of a period of exceptionally steep and fast-rising costs for a variety of materials, compounded by major supply-chain disruptions and difficulty finding enough workers—a combination that threatens the financial health of many contractors. No single solution will resolve the situation, but there are steps that government officials, owners, and contractors can take to lessen the pain.

Federal trade policy officials can act immediately to end tariffs and quotas on imported products and materials. With many U.S. mills and factories already at capacity, bringing in more imports at competitive prices will cool the overheated price spiral and enable many users of products that are in short supply to avoid layoffs and shutdowns.

The federal government can improve the labor supply by allowing employers to sponsor more foreign-born workers to fill positions for which there are not enough qualified applicants. In addition, the federal government should fund and approve more apprenticeship and training programs to enable students and career-switchers to acquire the skills needed for construction trades.

Officials at all levels of government should review all regulations, policies, and enforcement actions that may be unnecessarily driving up costs and slowing importation, domestic production, transport, and delivery of raw materials, components, and finished goods.

Owners need to recognize that fast-changing materials costs and availability require a quick decision regarding bids and requests for changes. For new and planned projects, owners should expect quite different pricing from previous estimates. They may want to consider building in more flexibility regarding design, timing, or cost-sharing.

Contractors need, more than ever, to closely monitor costs and delivery schedules for materials and to communicate information with owners, both before submitting bids and throughout the construction process.

Materials prices do eventually reverse course. Owners and contractors alike will benefit when that happens. Until then, cooperation and communication can help reduce the damage.

AGC resources

This document will be updated if market conditions warrant. Check for the latest edition at:
https://www.agc.org/learn/construction-data/agc-construction-inflation-alert for the latest edition

The AGC website, www.agc.org, has a variety of resources available to contractors, owners, and others wanting to know more about the construction industry.

AGC posts tables showing changes in PPIs and national, state, and metro construction employment each month at:
https://www.agc.org/learn/construction-data

AGC's Data DIGest is a weekly one-page summary of economic news relevant to construction. Subscribe at:
https://store.agc.org/Store/Store/StoreLayouts/Item_Detail.aspx?iProductCode=4401
or email chief economist Ken Simonson at ken.simonson@agc.org.

Construction documents are available for viewing and purchase from ConsensusDocs at www.consensusdocs.org, including the price escalation resource center, www.consensusdocs.org/price-escalation-clause/