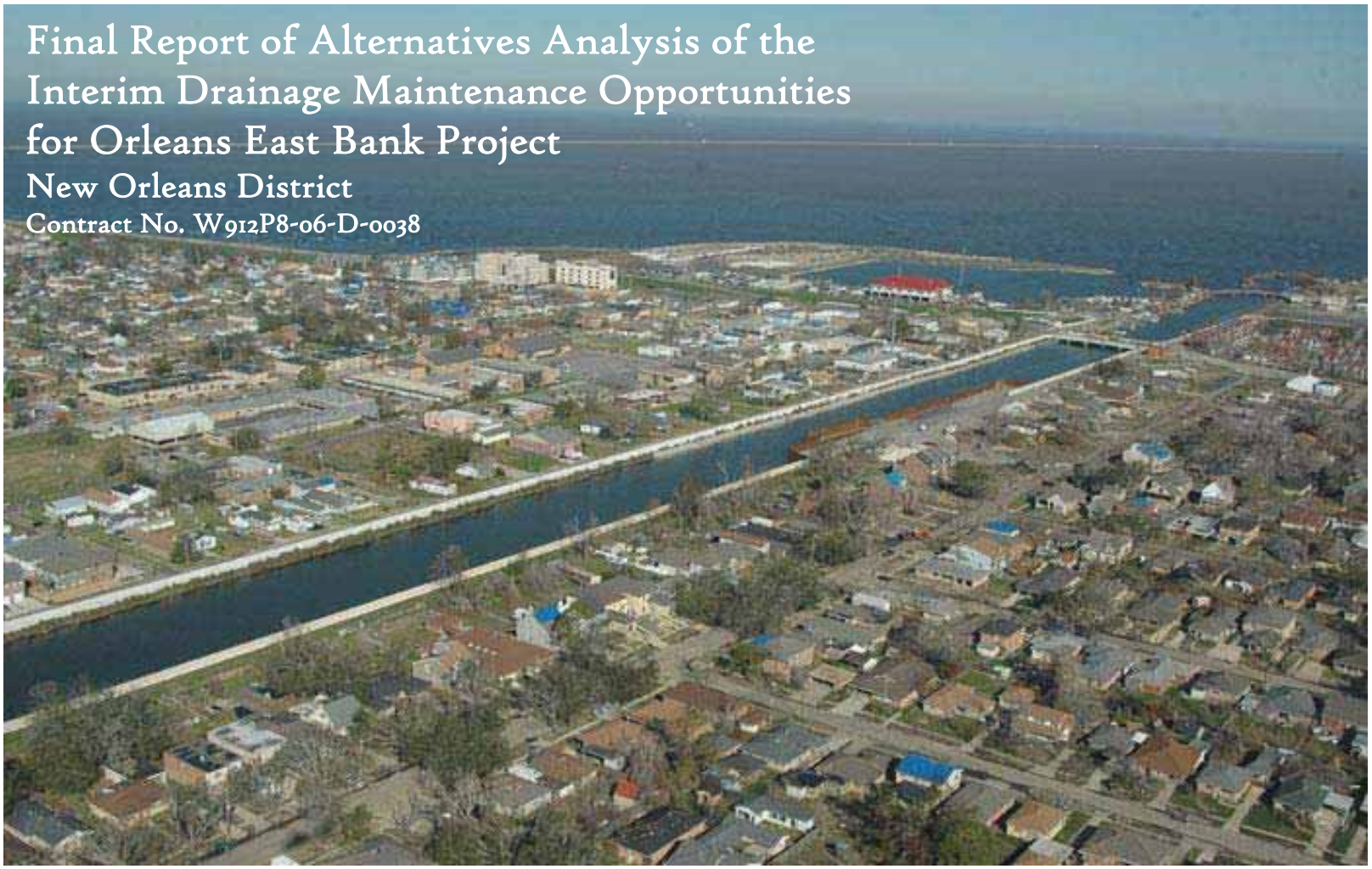
DMJM HARRIS | AECOM

Final Report of Alternatives Analysis of the Interim Drainage Maintenance Opportunities for Orleans East Bank Project

New Orleans District

Contract No. W912P8-06-D-0038



Prepared for
US Army Corps of Engineers
New Orleans District

Prepared by
DMJM Harris

August 18, 2006

Summary Report

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1.0 SUMMARY

The purpose of this Alternatives Analysis Report is to identify interim alternatives to the emergency temporary pumping at the temporary gate closures for each of the three outfall canals discharging into Lake Pontchartrain. The objective is to provide the capacity to minimize the risk of interior flooding of the project area during the hurricane gate closures, and prior to the scheduled completion of the construction and the operation of a permanent system in 2010.

For each outfall canal included in this study, the alternatives that meet the objective for that canal have been developed. These alternatives are briefly described and illustrated in this summary, including the estimated duration of the tasks required for implementation and an estimate of cost.

Twenty projects that provide additional drainage capacity in the project area were identified and evaluated. Various combinations of these projects were developed and further evaluated as alternatives to provide the capacity required at each outfall canal by gate closures during storm surge events.

Six Evaluation Factors were employed in evaluating the suitability of projects. Those that were not eliminated by one of the first three factors were considered suitable for use in the development of the alternatives. The six factors are listed below in order of priority. As stated above, the first three were used to eliminate unsuitable projects; the second three were used to compare the suitable projects to each other.

1. Timing – Projects that could not be operational prior to 2010 were eliminated.
2. Capacity Improvements - Projects that could not provide meaningful capacity improvement were eliminated.
3. Construction Impacts to System - Projects that could not be constructed without compromising the drainage system to an extent greater than it is already impacted were eliminated.

4. Long-term Utility – Consideration has been given to whether or not a project could contribute to a permanent solution.
5. Environmental Considerations – Consideration has been given to any environmental concerns that are specific to a project, and that may delay implementation.
6. Cost – Consideration has been given to the cost of the projects, but no projects have been eliminated based on cost.

No alternatives that could meet the capacity requirements of the outfall canals and become operational prior to June 2007 could be identified.

It is recommended that a study be undertaken to evaluate the capacity of the existing drainage outfall system in conjunction with the pumping at gate closures, the existing pump stations, and the conveyance channels. There is a need to study the capacity of the system prior to Katrina in comparison to the current system and the operational characteristics under varying storm events.

The following are the alternatives that were developed as a result of this study for each of the outfall canals. In Section 5.0, there is a more detailed discussion of the Alternatives Analysis and the development of these alternatives.

1.1 17th Street Canal Objective

The objective for the 17th Street Canal is to provide a capacity of 7,300 cfs, which is the capacity required to minimize interior storm water elevations.

1.1.1 17th Street Canal Alternative No. 1

Alternative No. 1 provides 7,300 cfs of capacity by combining the following three (3) projects:

Project No. 1 includes a new pump station and a new intake, with a capacity of 3,300 cfs, on the west side of the 17th St. Canal. It would discharge into Lake Pontchartrain. The current estimates are a cost of $56.3 million with completion in 29 months.

Project No. 11 includes a new pump station, with a capacity of 1,600 cfs, on the Monticello Canal, across from the existing Pritchard Pump Station. It would discharge through pipes to a new outfall at the Mississippi River. The current estimates are a cost of $73.3 million with completion in 29 months.

Project No. 16 includes a new pump station, with a capacity of 2,400 cfs, on the south side of Hoey's Canal near Jefferson Hwy. It would discharge through pipes to a new outfall at the Mississippi River. The current estimate is a cost of $105.6 million with completion in 29 months.

The current estimate for the 17th St. Canal Alternative No. 1 is a total cost of $241.0 million with completion in 29 months if all projects are constructed concurrently.

Alternative No. 1 is shown on **Map 1-1.** For more detailed information, see Section 5.1 or Project Nos. 1, 11, and 16 in **Appendix B – Projects**.

1.2 Orleans Ave. Canal Objective

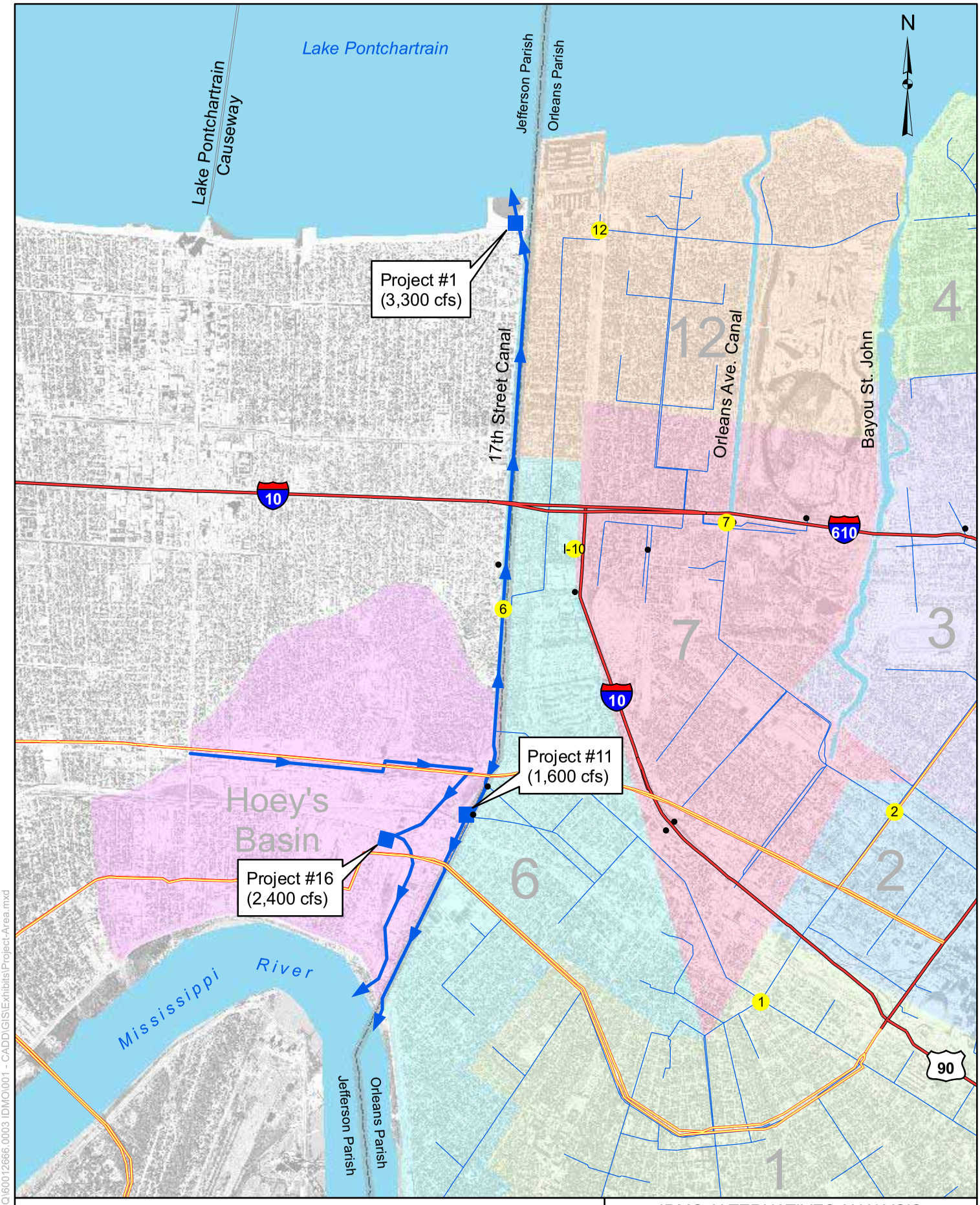
The objective for the Orleans Ave. Canal is to provide a capacity of 2,700 cfs, which is the capacity required to minimize interior storm water elevations.

1.2.1 Orleans Ave. Canal Alternative No. 1

Alternative No. 1 provides 2,700 cfs of capacity by completing Project No. 3 in conjunction with completion of a proposed SELA project.

Project No. 3 includes a new pump station at Lake Pontchartrain with a capacity of 2,700 cfs, on the east side of the Orleans Ave. Canal. It would discharge into the lake. The current estimate is a cost of $39.8 million with completion in 29 months.

The SELA project would extend a box culvert with a conveyance capacity of 1,000 cfs in the median of Orleans Ave. from Olga St. to DPS 7. This culvert would eliminate the



Legend:

- 5 — Drainage Basins
- Conveyance System
- 5 — Major Pump Stations
- Minor Pump Stations
- New Pump Station

IDMO ALTERNATIVES ANALYSIS

17TH STREET CANAL

SCALE: 1"=4000'	ALTERNATIVE NO. 1	MAP 1-1
DATE: 08/04/06		

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existing conveyance restrictions. The current estimate is a cost of $80.0 million with completion in 29 months.

The current estimate for the Orleans Ave. Canal Alternative No. 1 is a total cost of $119.8 million with completion in 29 months if the projects are constructed concurrently.

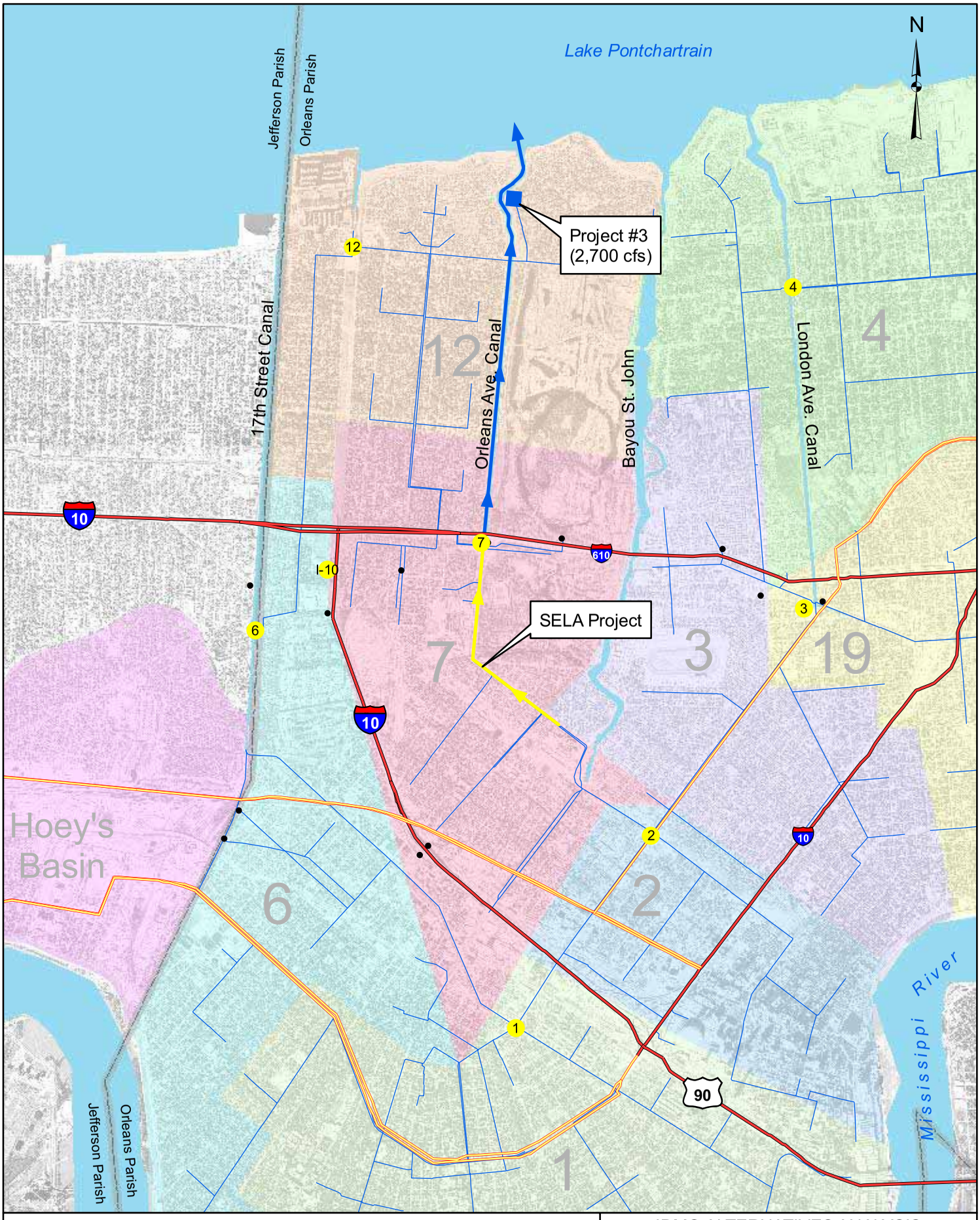
Alternative No. 1 is shown on **Map 1-2**. For more detailed information, see Section 5.2 or Project No. 3 in **Appendix B – Projects**.

1.2.2 Orleans Ave. Canal Alternative No. 2

Alternative No. 2 provides 2,700 cfs of capacity by combining the following two (2) projects:

Project No. 3 includes a new pump station at Lake Pontchartrain with a capacity of 1,600 cfs, on the east side of the Orleans Ave. Canal. (This pump station is in the same location as in Alternative No. 1, but has a smaller capacity.) It would discharge into the lake. The current estimate is a cost of $25.4 million with completion in 29 months.

Project No. 19 includes a new pump station with a capacity of 1,200 cfs and a new intake basin in the median of Jefferson Davis Pkwy. to discharge into Bayou St. John, another pump station at Lake Pontchartrain with a capacity of 1,100 cfs on the east side of the bayou that would discharge into the lake. The current estimate is a cost of $29.7 million with completion in 29 months.



Legend:

- 5 Drainage Basins
- Conveyance System
- 5 Major Pump Stations
- Minor Pump Stations
- New Pump Station

IDMO ALTERNATIVES ANALYSIS

ORLEANS AVENUE CANAL

SCALE: 1"=4000'	ALTERNATIVE NO. 1	MAP 1-2
DATE: 08/04/06		

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The current estimate for the Orleans Ave. Canal Alternative No. 2 is a total cost of $55.1 million with completion in 29 months if the projects are constructed concurrently.

Alternative No. 2 is shown on **Map 1-3**. For more detailed information, see Section 5.2 or Project Nos. 3 and 19 in Appendix B – Projects.

1.3 London Ave. Canal Objective

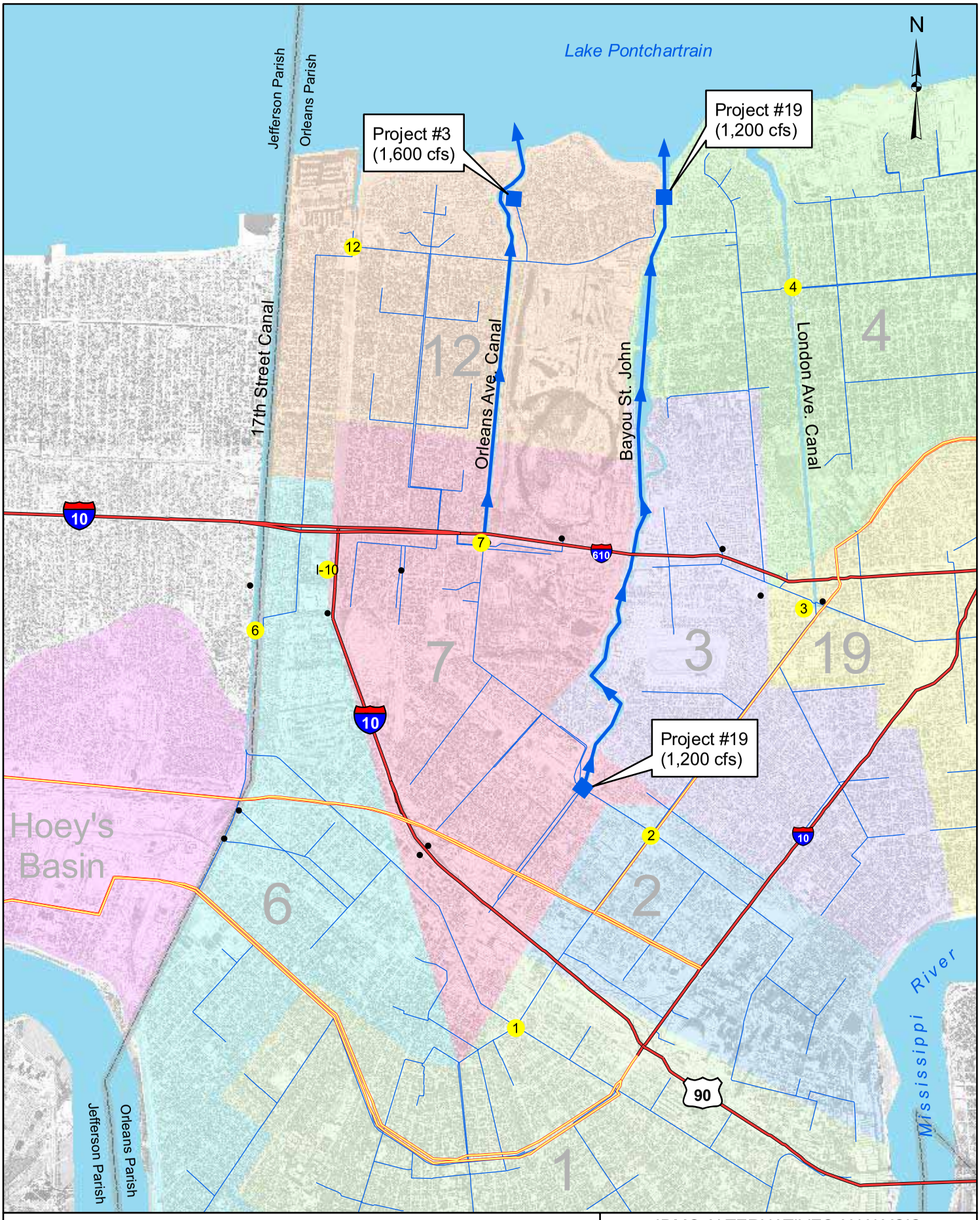
The objective for the London Ave. Canal is to provide a capacity of 4,800 cfs, which is the capacity required to minimize interior storm water elevations.

1.3.1 London Ave. Canal Alternative No. 1

Alternative No. 1 provides 4,800 cfs of capacity by combining the following two (2) projects:

Project No. 10 includes improvements to the Florida Ave. Canal to eliminate a conveyance restriction that allows a diversion of 1,100 cfs from the London Ave. Canal to the Florida Ave. Canal. It would discharge into the Inner Harbor Navigation Canal. The current estimate is a cost of $3.5 million with completion in 29 months.

Project No. 15 includes a new pump station with a capacity of 3,700 cfs at the eastern end of the Dwyer Canal. It also includes improvements to the conveyance channels on Prentiss, Peoples, and Dwyer. It would discharge into the Inner Harbor Navigation Canal. The current estimate is a cost of $81.7 million with completion in 29 months.



Legend:

- 5 — Drainage Basins
- Conveyance System
- 5 — Major Pump Stations
- Minor Pump Stations
- New Pump Station

IDMO ALTERNATIVES ANALYSIS

ORLEANS AVENUE CANAL

SCALE: 1"=4000'	ALTERNATIVE NO. 2	MAP 1-3
DATE: 08/04/06		

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The current estimate for the London Ave. Canal Alternative No. 1 is a total cost of $85.2 million with completion in 29 months if the projects are constructed concurrently.

Alternative No. 1 is shown on **Map 1-4**. For more detailed information, see Section 5.3 or Project Nos. 10 and 15 in **Appendix B – Projects**.

1.3.2 London Ave. Canal Alternative No. 2

Alternative No. 2 provides 4,800 cfs of capacity by completing Project No. 4.

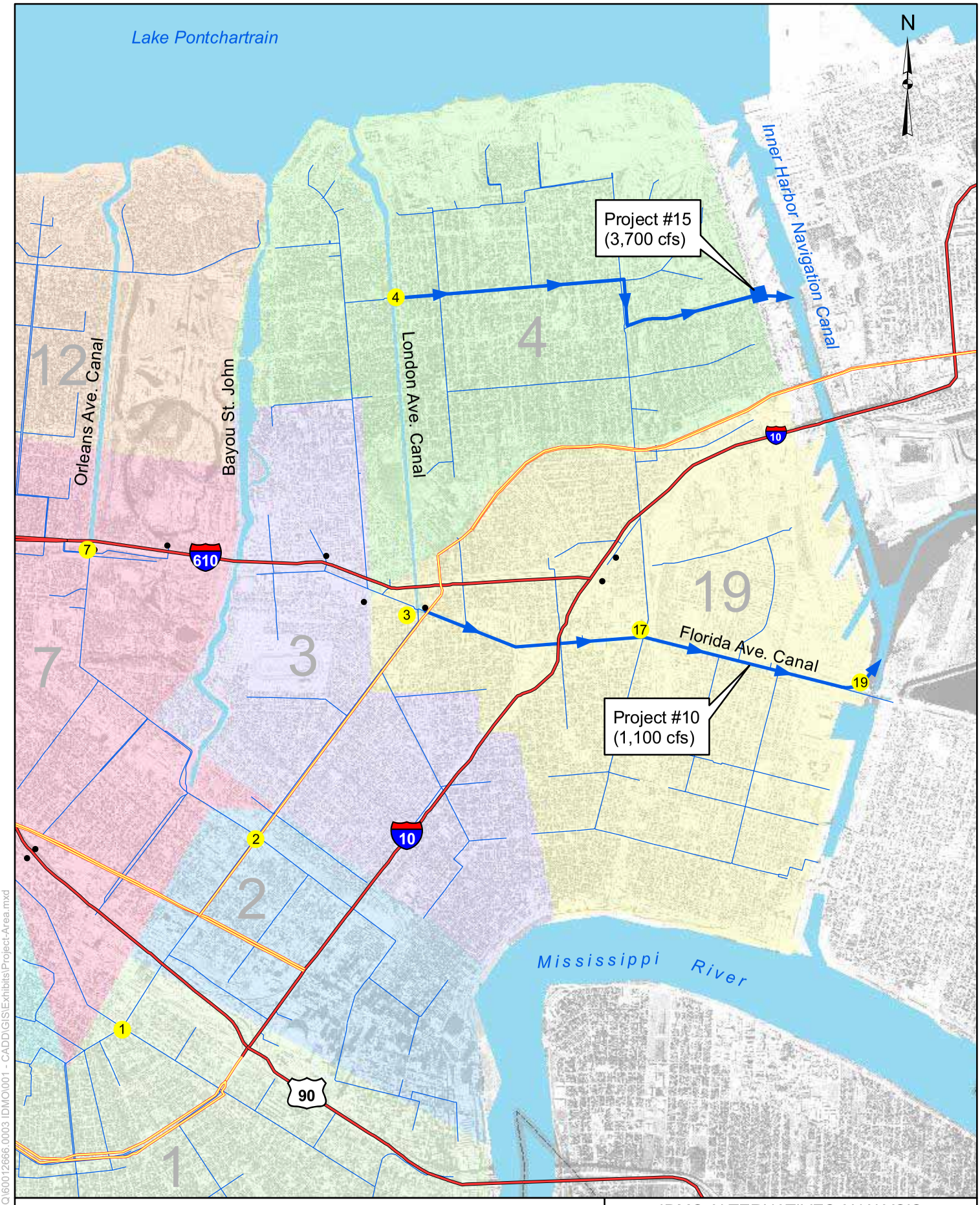
Project No. 4 includes a new pump station with a capacity of 4,800 cfs, on the east side of the London Ave. Canal at Lake Pontchartrain. It would discharge into the lake. The current estimate is a cost of $70.4 million with completion in 29 months.

The current estimate for the London Ave. Canal Alternative No. 2 is a total cost of $70.4 million with completion in 29 months.

Alternative No. 2 is shown on **Map 1-5**. For more detailed information, see Section 5.3 or Project No. 4 in **Appendix B – Projects**.

1.3.3 London Ave. Canal Alternative No. 3

Alternative No. 3 provides 4,800 cfs of capacity by combining the following two (2) projects:



Legend:

- 5 — Drainage Basins
- Conveyance System
- 5 — Major Pump Stations
- Minor Pump Stations
- New Pump Station

IDMO ALTERNATIVES ANALYSIS

LONDON AVENUE CANAL

SCALE: 1"=4000'	ALTERNATIVE NO. 1	MAP 1-4
DATE: 08/04/06		

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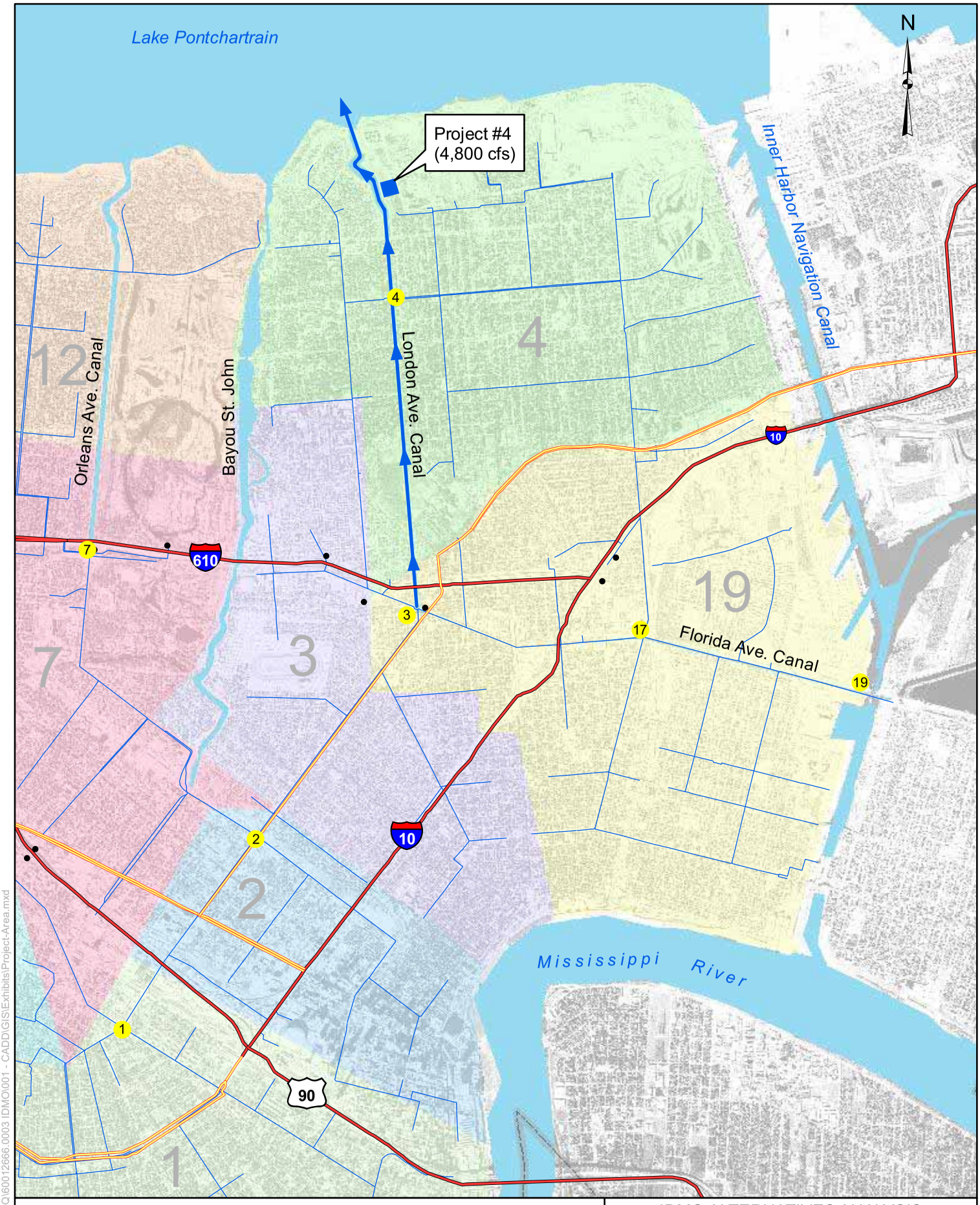

IDMO ALTERNATIVES ANALYSIS

LONDON AVENUE CANAL

SCALE: 1"=4000'	ALTERNATIVE NO. 2	MAP 1-5
DATE: 08/04/06		

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Project No. 4 includes a new pump station and a new intake, with a capacity of 1,100 cfs, on the east side of the London Ave. Canal at Lake Pontchartrain. (This pump station is in the same location as in Alternative No. 2, but has a smaller capacity.) It would discharge into the lake. The current estimate is a cost of $17.3 million with completion in 29 months.

Project No. 15 includes a new pump station with a capacity of 3,700 cfs at the eastern end of the Dwyer Canal. It also includes improvements to the conveyance channels on Prentiss, Peoples, and Dwyer. It would discharge into the Inner Harbor Navigation Canal. The current estimate is a cost of $81.7 million with completion in 29 months.

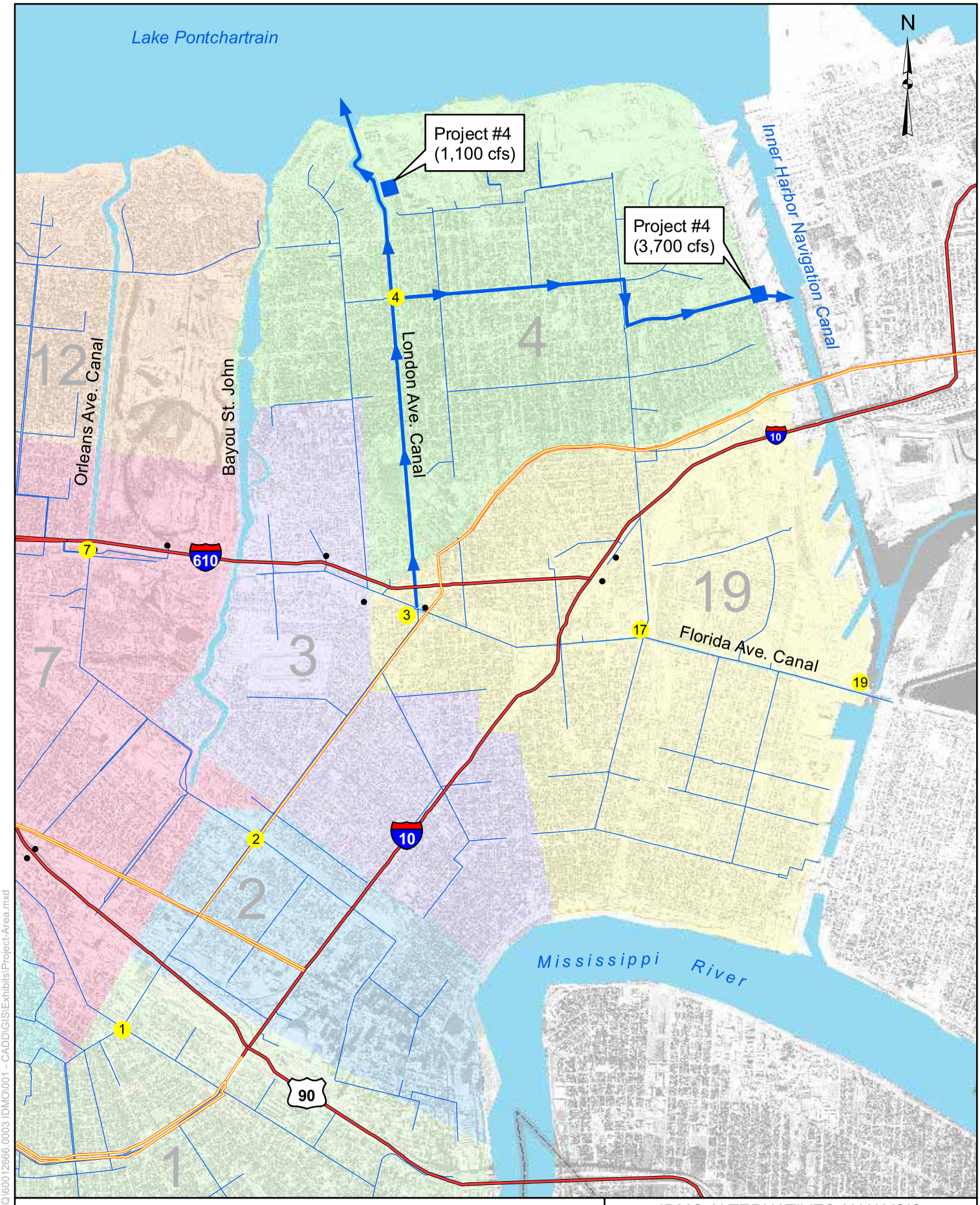
The current estimate for the London Ave. Canal Alternative No. 3 is a total cost of $99.0 million with completion in 29 months if the projects are constructed concurrently.

Alternative No. 3 is shown on **Map 1-6**. For more detailed information, see Section 5.3 or Project Nos. 4 and 15 in **Appendix B – Projects**.

1.3.4 London Ave. Canal Alternative No. 4

Alternative No. 4 provides 4,900 cfs of capacity by combining the following two (2) projects:

Project No. 15 includes a new pump station with a capacity of 3,700 cfs at the eastern end of the Dwyer Canal. It also includes improvements to the conveyance channels on



Legend:

- 5 Drainage Basins
- Conveyance System
- 5 Major Pump Stations
- Minor Pump Stations
- New Pump Station

IDMO ALTERNATIVES ANALYSIS

LONDON AVENUE CANAL

SCALE: 1"=4000'	ALTERNATIVE NO. 3	MAP 1-6
DATE: 08/04/06		

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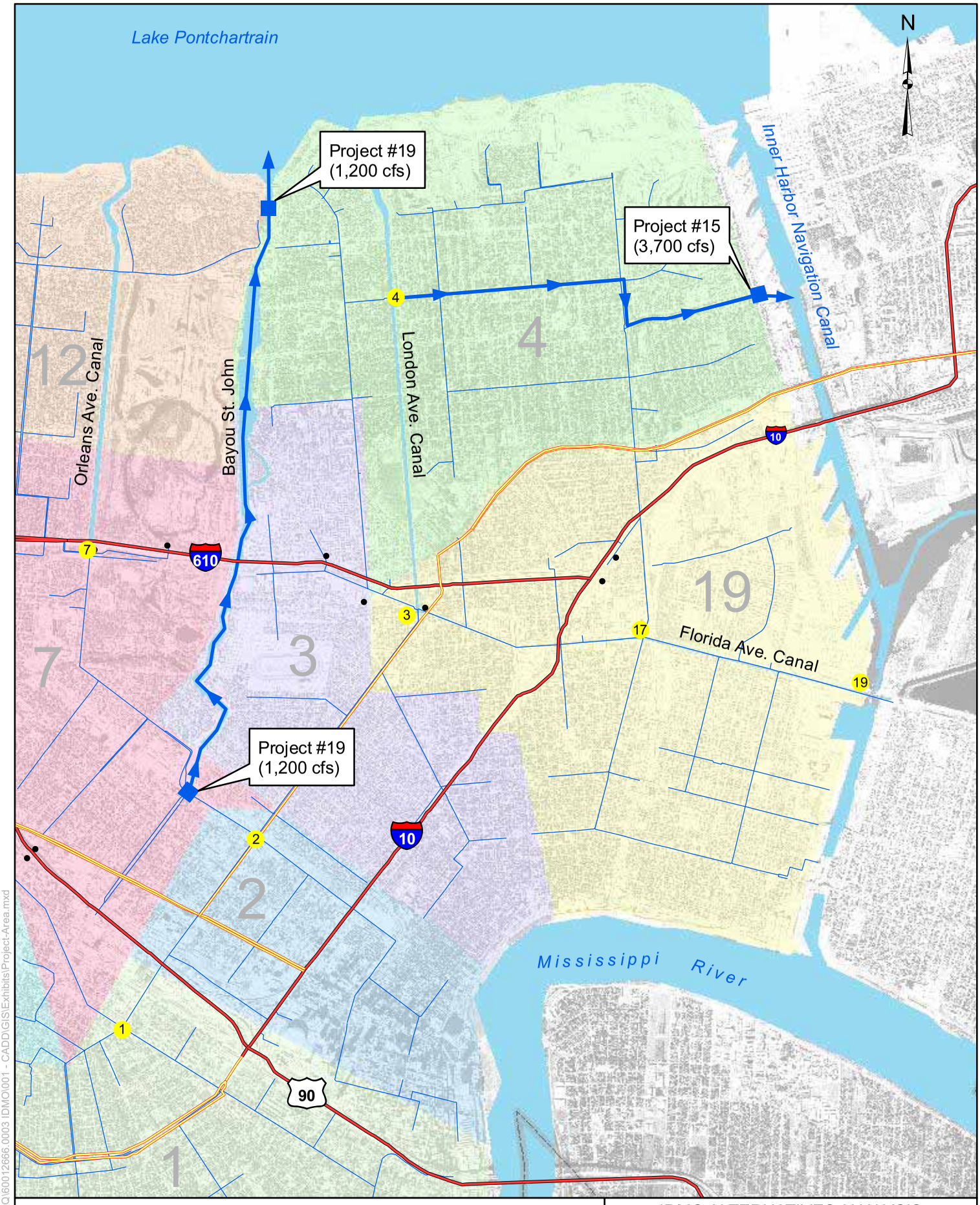
Prentiss, Peoples, and Dwyer. It would discharge into the Inner Harbor Navigation Canal. The current estimate is a cost of $81.7 million with completion in 29 months.

Project No. 19 includes a new pump station with a capacity of 1,200 cfs and a new intake basin in the median of Jefferson Davis Pkwy. to discharge into Bayou St. John, another pump station at Lake Pontchartrain with a capacity of 1,200 cfs on the east side of the bayou that would discharge into the lake. The current estimate is a cost of $29.7 million with completion in 29 months.

The current estimate for the London Ave. Canal Alternative No. 4 is a total cost of $111.4 million with completion in 29 months if the projects are constructed concurrently.

Alternative No. 4 is shown on **Map 1-7**. For more detailed information, see Section 5.3 or Project Nos. 15 and 19 in **Appendix B – Projects**.



IDMO ALTERNATIVES ANALYSIS

LONDON AVENUE CANAL

SCALE: 1"=4000'	ALTERNATIVE NO. 4	MAP 1-7
DATE: 08/04/06		

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Table 1-1

Alternatives and Projects by Canal

Canal	Alternative	Project	Description	cfs		Schedule in months	Cost in $000,000	
				Proj.	Alt.		Proj.	Alt.
17th St.	1	1	Add pumping capacity at the lake on the west side of 17th St Canal	3,300	7,300	29	$ 56.3	$241.0
		11	Redirect flow at Monticello Canal to the Mississippi River – Orleans Parish	1,600			$ 73.3	
		16	Redirect flow from Hoey's Basin to the Mississippi River – Jefferson Parish	2,400			$105.6	
Orleans Ave.	1	3A	Add pumping capacity of 2,700 cfs at the lake on Orleans Ave Canal	2,700	2,700	29	$ 39.8	$119.8
			SELA – add conveyance capacity on Orleans Ave from Olga St. to DPS 7.	1,000			$ 80.0	
	2	3B	Add pumping capacity of 1,700 cfs at the lake on Orleans Ave Canal	1,700	2,900	29	$ 25.4	$ 55.1
		19	Redirect flow from DPS 2 to Bayou St. John and pump to the lake	1,200			$ 29.7	
London Ave.	1	10	Divert flow from DPS 3 via Florida Canal to DPS 19	1,100	4,800	29	$ 3.5	$85.2
		15	Redirect DPS 4 to the Industrial Canal via Prentiss and Filmore	3,700			$ 81.7	
	2	4A	Add pumping capacity of 4,800 cfs at the lake on London Ave Canal	4,800	4,800	29	$ 70.4	$ 70.4
	3	4B	Add pumping capacity of 1,100 cfs at the lake on London Ave Canal	1,100	4,800	29	$ 17.3	$ 99.0
		15	Redirect DPS 4 to the Industrial Canal via Prentiss and Filmore	3,700			$ 81.7	
	4	15	Redirect DPS 4 to the Industrial Canal via Prentiss and Filmore	3,700	4,900	29	$ 81.7	$111.4
		19	Redirect flow from DPS 2 to Bayou St. John and pump to the lake	1,200			$ 29.7	

2.0 INTRODUCTION

The purpose of this Alternatives Analysis Report is to identify interim alternatives to the emergency temporary pumping at the temporary gate closures for each of the three outfall canals discharging into Lake Pontchartrain. The objective is to provide the capacity to minimize the risk of interior flooding of the project area during the hurricane gate closures, and prior to the scheduled completion of the construction and the operation of a permanent system in 2010.

The projects identified in this Report include alternative project concepts previously identified by the U. S. Army Corps of Engineers (USACE) and others, as well as those developed during the preparation of this Report. The concepts include the following general categories:

- Increase pump capacity and/or efficiency,
- Pump to the river,
- Pump to the Inner Harbor Navigation Canal (Industrial Canal),
- Detention of drainage flows, and
- Structural and non-structural detention areas.

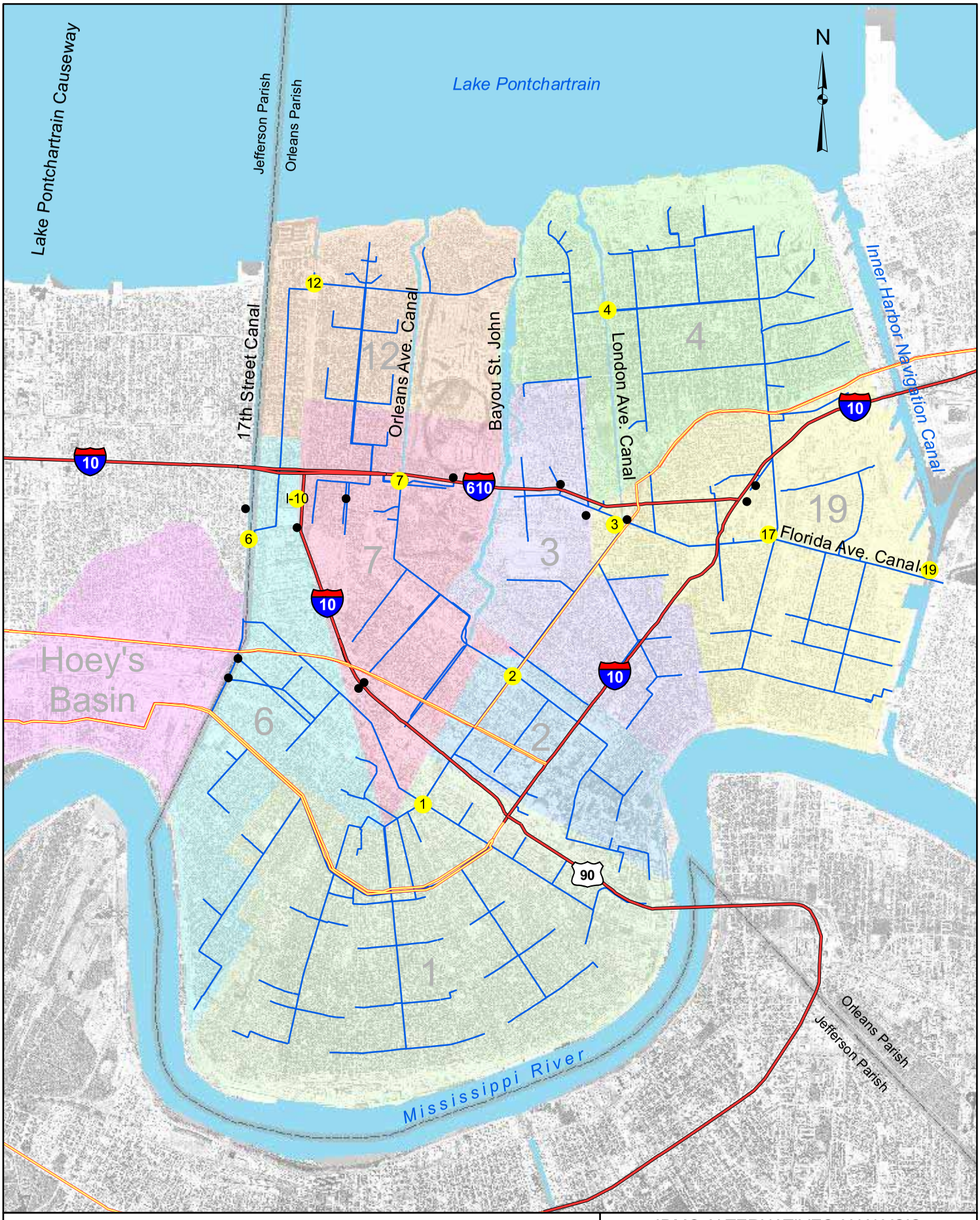
The intended product of this Alternatives Analysis is the identification of alternatives that have the ability to provide the required drainage capacity during the hurricane gate closure, while the drainage system is restricted pending the scheduled completion of the permanent flood protection and drainage systems in 2010.

The project area includes Orleans Parish (the City of New Orleans) on the east bank of the Mississippi River to the west of the Inner Harbor Navigation Canal (IHNC) or the Industrial Canal, as it is commonly referred to, and the portion of Jefferson Parish known as Hoey's Basin that discharges into the 17th St. Canal, as shown in **Map 2-1**.

A total of twenty (20) projects were identified, and the findings of the analysis are summarized in **Table 2-1**, which lists all projects, their estimated costs, and their status

regarding inclusion in an alternative. The Project Discussions of each individual project considered are found in Appendix B.

Subsequent sections of the Report present background conditions and the methodology employed. The final section of this report is the Alternatives Analysis developed for each canal.



Legend:

- 5 — Drainage Basins
- Conveyance System
- 5 — Major Pump Stations
- Minor Pump Stations

IDMO ALTERNATIVES ANALYSIS

PROJECT AREA

SCALE: 1"=6000'

DATE: 08/04/06

MAP 2-1

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Table 2-1

Projects, Estimated Costs, and Status

No.	Description	Cost in $000,000	Included in an Alternative
1	Add pumping capacity at lake on the west side of 17th St Canal	$ 56.3	Yes
2	Add pumping capacity at lake on the east side of 17th St Canal	$ 56.6	No
3A	Add pumping capacity at lake on Orleans Ave Canal 2,700 cfs	$ 39.8	Yes
3B	Add pumping capacity at lake on Orleans Ave Canal 1,700 cfs	$ 25.4	Yes
4A	Add pumping capacity at lake on London Ave Canal 4,800 cfs	$ 70.4	Yes
4B	Add pumping capacity at lake on London Ave Canal 1,100 cfs	$ 17.3	Yes
5	Convert 17th Street Canal to a Force Main to lake	$633.4	No
6	Convert Orleans Ave Canal to a Force Main to lake	$242.5	No
7	Convert London Ave Canal to a Force Main to lake	$423.8	No
8	Create detention in City Park to relieve Orleans Ave Canal	$ 4.2	No
9	Create detention in New Basin Canal from 17th St Canal	$ 11.4	No
10A	Divert flow from DPS 3 via Florida Canal to DPS 19 (Option C is completion of work as a component of a SELA project.)	$ 3.5	Yes
10B		$ 8.7	No
10C		$ 80.0	No
11	Redirect flow at Monticello Canal to the Mississippi River – Orleans Parish	$ 73.3	Yes
12	Redirect flow at DPS 2 to DPS 7, and add pumping capacity to DPS 7 and Lake end of the canal	$ 56.7	No
13	Redirect flow at DPS 2 to DPS 7 to City Park detention	$ 26.0	No
14	Redirect flow from DPS 1 to DPS 2	$ 31.3	No
15	Redirect DPS 4 to the Industrial Canal via Prentiss and Filmore	$ 81.7	Yes
16	Redirect flow from Hoey's Basin to the Mississippi River – Jefferson Parish	$105.6	Yes
17	Redirect DPS 3 to Bayou St. John and pump to lake	$ 27.9	No
18	Redirect flow from DPS 3 to Bayou St. John and to City Park	$ 27.5	No
19	Redirect flow from DPS 2 to Bayou St. John and pump to lake	$ 29.7	Yes
20	Redirect flow from DPS 2 to Bayou St. John and to City Park	$ 37.6	No

3.0 BACKGROUND

This Alternatives Analysis Report relates to the restoration and rehabilitation of both the drainage and the hurricane protection systems in the project area that were compromised by Hurricane Katrina.

3.1 Drainage System

The drainage system in New Orleans is operated by the Sewerage & Water Board (S&WB). It has evolved for more than a century as the city grew away from the Mississippi River and the natural ridges into relatively more low-lying areas.

There are nine (9) basins in the project area, all in New Orleans except Hoey's Basin, which is located in Jefferson Parish. Through a series of canals and culverts totaling approximately 180 miles in length, rainwater flows to 10 major Drainage Pump Stations (DPS) in New Orleans and to 14 minor ones in New Orleans plus the Canal St. Pump Station in Jefferson Parish on the 17th St. Canal, and from these it is discharged to four outfall canals. The number of basins discharging to each canal can be varied to some extent due to interconnections in the conveyance system. See **Map 2-1**.

- 17th St. Canal, approximately 3 miles in length, receives flow from three (3) basins, including the one in Jefferson Parish, and discharges into Lake Pontchartrain;

- Orleans Ave. Canal , approximately 2.4 miles in length, receives flow from two (2) basins and discharges into Lake Pontchartrain;

- London Ave. Canal , approximately 3.2 miles in length, receives flow from three (3) basins and discharges into Lake Pontchartrain; and

- Florida Ave. Canal, approximately 2.8 miles in length, receives flow from one (1) basin and discharges into the Inner harbor Navigation Canal (Industrial Canal).

The capacities of the three outfall canals that discharge to the lake have been compromised in association with the hurricane protection system. A summary description of the current condition of these three canals follows:

The 17th St. Canal lies on the boundary separating Orleans and Jefferson Parishes. It is located within Jefferson Parish, but it is owned by the New Orleans S&WB. The nominal capacity of DPS 6 on the 17th Street Canal is 9,480 cubic feet per second (cfs), and the S&WB and Jefferson Parish have plans to expand the capacity at DPS 6 by 2,000 cfs. Currently two other pump stations discharge into the canal between DPS 6 and the lake. These are the Canal Street Pump Station in Jefferson Parish, with a capacity of 160 cfs, and the I-10 Pump Station in New Orleans, with a capacity of 860 cfs. The I-10 station drains a critical evacuation route. The projected capacity for the canal is 9,600 cfs.

The Orleans Ave. Canal lies on the western edge of City Park in New Orleans, separating the park from the Lakeview area. DPS 7, with a nominal capacity of 2,200 cfs, pumps rainfall runoff into the canal. A SELA study presently under way is investigating the feasibility of improvements to DPS 7 and the conveyance capacity of the system that feeds the station.

The London Ave. Canal runs through the Gentilly area; the canal forms the western edge of the University of New Orleans campus between Robert E. Lee Blvd. and Lake Pontchartrain. DPS 3 (4,260 cfs) at N. Broad St. and Florida Ave. and DPS 4 (3,720 cfs) on the east side of the canal at Prentiss Ave. both pump into this canal. The S&WB has plans to construct a third station of 1,000 cfs capacity on the west side of the canal at Prentiss Ave. across the canal from DPS 4. The total capacity that must be handled by the canal is 4,800 cfs.

3.2 Hurricane Protection System

The hurricane protection system was constructed as part of the Lake Pontchartrain and Vicinity Hurricane Protection Project, initially authorized by Congress under the Flood Control Act of 1965. That project was intended to protect Orleans, Jefferson, St. Bernard, and St. Charles Parishes from flooding caused by a storm surge or rainfall associated with the Standard Project Hurricane (SPH), which was selected as the design hurricane.

The SPH, as defined in Volume III of the Interagency Performance Evaluation Team (IPET) report, is one that may be expected from the most severe combination of meteorological conditions that are considered reasonably characteristic for the region. Guidance on the selection of site specific storm meteorological parameters was initially given in National Hurricane Research Project Report No. 33 (US Weather Bureau, November 1959). The Weather Bureau and USACE jointly derived the specifications, criteria, procedures, and methods. The specifications for SPH were reviewed several times after 1959, and the Weather Bureau issues updates. After Hurricane Betsy in 1965, the Weather Bureau revised the wind field parameters, but did not change the other characteristics of the SPH (US Weather Bureau, August 1965, November 1965, February 1966). An additional update was published by NOAA in September 1979. The SPH recurrence interval is 100 years in Zone B, covering the gulf coast from Cameron, LA to Pensacola, FL.

As of May 2005, the Lake Pontchartrain and Vicinity Hurricane Protection Project included approximately 125 miles of levees, major floodwalls, flood-proofed bridges, and a mitigation dike on the western shore of the lake. The project was 90 percent complete in Orleans Parish and 70 percent complete in Jefferson Parish. The estimated completion date for the entire project was 2015. In recent years, questions have been raised about the ability of the project to withstand hurricanes with intensities greater than those assumed for the original design. In 2002, a pre-feasibility study on whether to strengthen

hurricane protection along the Louisiana coast was completed. A full feasibility study was estimated to take 5 years to complete.

Prior to Hurricane Katrina in August 2005, drainage in the project area of this analysis operated as outlined in the previous section 2.2.1. Katrina caused severe surge and wave conditions on the east side of the metropolitan area from Lake Pontchartrain to southern Plaquemines Parish. The east and south facing levees in New Orleans East and in St. Bernard and Plaquemines Parishes absorbed the brunt of the storm, experiencing surge and waves significantly beyond their design levels. Overtopping was common and persisted in the area for hours.

As the gauging instruments to measure water conditions were destroyed by Katrina, there are few measures to confirm the actual water levels resulting from the storm other than high-water marks. IPET used the Advanced Circulation (ADCIRC) model to estimate the surge levels that occurred at different locations around the region. High water marks were used to confirm the accuracy of the model results. Surge levels generally ranged from 10-12 feet in the project area along the south shore of Lake Pontchartrain.

Approximately 169 miles of the levees and floodwalls, including those constructed as part of the Lake Pontchartrain and Vicinity Hurricane Protection Project, were damaged by surge and waves generated by Katrina with 41 miles judged to be severely damaged. There were a total of 50 major breaches of which four were caused by foundation-induced failures and the remainder from a combination of overtopping and scour. Three of the foundation breaches occurred in the project area on the 17th St. and the London Ave. Canals.

The repairs of these canals have been broken into Phase I and Phase II floodwall repairs:

1. Phase I consists of temporary hurricane protection at the 17th St. Canal breach and the two London Ave. Canal breaches using steel sheet piling up to an elevation of +14 feet (NAVD 88 2004.65).

2. Phase II consists of returning the project to its pre-storm height plus overbuild including the following:

    - Construction of pile-founded, reinforced concrete T-wall monoliths on the same alignment as the original I-walls.

    - Replacement of the 600-foot length of rotated I-wall east of London Ave., south of the Robert E. Lee Bridge, with pile-founded T-wall monoliths.

    - Backfill of areas scoured and eroded due to overtopping along the lakefront levee with compacted clay material.

    - Removal of woody material (trees and shrubs) from the levee right-of-way (ROW) and, if it is deemed a structural problem, from areas within 100 feet of the toe of the levee.

    - Installation of temporary gated structures at the lake on the 17th St., Orleans Ave., and London Ave. Canals that will be closed when storms with surge levels of 5 feet (NAVD 88 2004.65) are predicted. The gates have been designed to hold back waters up to 16 feet (NAVD 88 2004.65). The purpose of the gates is to relieve stress on the existing I-walls along both sides of the three canals. The gates will only be kept in a closed position during major storm events or high water events in the lake.

    - Install temporary by-pass pumps at the gate structures of these three canals to remove floodwater from the canals whenever the gates are closed.

3.3 Pumping during Gate Closures

During storm events with tidal surges expected to exceed elevation 5.0 (NAVD 88 2004.65) in Lake Pontchartrain, the interim storm gates would be closed before tide reaches 5.0. The pumping system will then operate with water levels in the outfall canals not exceeding elevation 5.0 for the 17th Street and London Avenue canals and 9.0 feet for the Orleans Avenue canal at the interior pumping stations.

The capacity of each pump in the system is a function of the static head of the system. The relationship between the capacity and the static head can be found on the operation curve for each pump. Therefore, water elevations above the normal lake level of +1.0 (NAVD 88 2004.65) cause a reduction in the pumping capacity of each of the pumping stations.

The Orleans Ave. Canal also has intake canal conveyance problems as well. The intake conveyance can only deliver approximately 1,700 cfs to DPS 7. This problem is being addressed by a SELA project to increase conveyance capacity of the intake canal.

The closure of the outfalls resulting from the gate closures requires pumping improvements to lift the discharges from the outfall canals to Lake Pontchartrain. **Table 3-3,** derived from data in Memorandum for Task Force Hope *Temporary Pumping Capacities at 17th St., London, and Orleans Canals*, 31 May 2006, identifies the projected capacity required to minimize interior storm water elevations estimated in the May 31 memorandum. These capacities have been determined by this Alternatives Analysis to be the target capacity to be achieved by the recommended alternative for each canal.

Table 3-1 Required Outfall Canal Capacities

Canal	Capacity Required to Minimize Interior Storm Water Elevations
17th St.	7,300 cfs
Orleans Ave.	2,700 cfs
London Ave.	4,800 cfs

4.0 METHODOLOGY

The tasks undertaken to prepare this Alternatives Analysis Report included:

- Identifying projects,
- Obtaining existing data,
- Performing field observations,
- Facilitating team meetings,
- Defining the projects, grouping them into alternatives, performing analyses, and preparing a summary,
- Preparing a rough order of magnitude cost estimate, and
- Developing alternatives for each canal that merit additional consideration.

4.1 Assumptions

The identification of projects, and their development into alternatives, was based on:

- Data furnished by the New Orleans District, USACE.
- Conditions in the field indicated on the data and maps provided by USACE.
- New field data generated for assessment of field conditions such as site availability, available utilities, and condition of existing facilities; and
- Best engineering judgment in many instances in lieu of more detailed studies and analysis due to time constraints.

If conflicting information was encountered, the most current IPET findings were used.

4.2 Process Management

To maintain input and interaction with the USACE throughout the project, the consultant implemented process management activities consisting of several workshops, weekly status updates and continual coordination, as needed.

- A brief narrative description, of the conditions that could be anticipated at the project location;

- Conceptual foundation systems based on engineering judgment for the conceptual structures at each site;

- Gross assumptions were made for water diversion and cofferdam arrangements to support a preliminary concept-level cost estimate; and

- Recommendations were developed for additional geotechnical investigations, analysis, and design to be accomplished during subsequent design phases.

4.3.4 Structural Considerations

Dimensions were estimated for structures and channels, and consideration also was given to the means of protecting structures during storm events to prevent damage.

4.3.5 Mechanical and Electrical Considerations

The mechanical and electrical requirements for proposed structures include an overview of mechanical/electrical equipment and approximate sizing; of pumps, hydraulic machinery, and other ancillary equipment; and of back-up power systems. **Appendix A** includes information concerning available pumps, estimated performance characteristics, and delivery times.

4.2.1 Brainstorming

At the inception of the study, a brainstorming session was held to identify individual projects. These included, but were not necessarily limited to, the following:

- Pump to the Mississippi River,
- Pump to the Industrial Canal (Inner Harbor Navigation Canal),
- Temporary detention storage of drainage flows, and
- Create either structural, or non-structural, detention areas.

4.2.2 Workshops and Communication

Three interactive workshops with key local officials including Orleans Parish Sewerage and Water Board technical staff, Jefferson Parish officials, project staff, and USACE were held:

- A kickoff meeting early in the project identification phase with local officials from the New Orleans Sewerage and Water Board and the Jefferson Parish Department of Public Works,

- A Progress Report session on July 27, 2006, and

- A third session after the USACE and the two local agencies reviewed the Draft Alternatives Analysis Report.

Weekly calls were made between USACE and project staff for status updates and key decision-making.

4.2.3 Submittals

Submittals included a Progress Report, this Draft Alternatives Analysis Report, and a final Alternatives Analysis Report.

A Public Presentation of the final Alternatives Analysis Report will be scheduled after review of the draft.

4.3 Data Gathering

Data was gathered by obtaining existing information from the USACE and other agencies and by field observation. The data sought for each project was used in the consideration of the issues discussed below.

4.3.1 Site Selection

New sites and rights-of-way for each project were approximated for the purposes of providing a conceptual layout and for cost estimates. In this process, considerations were made regarding the intended use of the site, the topographic conditions and location of existing flood control facilities, the potential for encountering HTRW sites, utility locations, major infrastructure relocation requirements, access during construction, and the effect on private property. All site and right-of-way elevations reported are relative to NAVD 88 (2004.65).

4.3.2 Hydraulic Considerations

The hydrologic/hydraulic regimes, Lake Pontchartrain, and canal water levels developed and provided by the USACE were used as the basis for development of the hydraulic design parameters applicable to each project considered. For purposes of this study, the maximum storm surge elevation in Lake Pontchartrain was established at +12.0 feet (NAVD 88 2004.65) and the storm surge in the Mississippi River and the Industrial Canal was established at +15.0 feet (NAVD 88 2004.65). These parameters were established by the USACE for this study.

4.3.3 Geotechnical Considerations

The geotechnical evaluation included:

4.3.6 Construction Considerations

It was assumed that drainage operation must be maintained during construction. Within the time allotted, previous studies, model study reports, data and records related to the construction and operation of the drainage and hurricane protection systems were studied. The analysis of each project was incremental, considering each project as a stand-alone action, as opposed to the cumulative. On the other hand, each alternative, some including several projects, was developed and analyzed in light of its potential cumulative benefit to the drainage system.

4.3.7 Environmental Considerations

Environmental considerations were identified in two ways. NEPA requirements were considered in light of the emergency conditions that currently apply, and consideration was given to environmental issues that are unique to specific projects or groups of projects.

4.3.8 Order of Magnitude Cost Estimates

For each project, an order of magnitude cost estimate for implementation was prepared. The estimates are based on costs for recent similar projects for which data was available. Included in the estimates were design, construction including equipment, site costs, and any estimates of cost associated with environmental concerns specific to the project.

4.3.9 Further Considerations

Potential constraints and risks associated with the implementation of the projects, and other issues that are not easily categorized, are identified under Further Considerations. Examples of these considerations include difficulty in obtaining necessary equipment or required sites or right-of-way, and coordination with private entities such as railroads for construction impacts.

4.3.10 Timeline for Project Implementation

For each project, an estimate of the duration of the implementation process was developed. Durations and sequences were estimated major features such as engineering & design; plans & specs; environmental compliance; lands, easements, rights-of-way, relocations, damages (LERRD'S); the contractual process; and construction, including delivery of pumps and other essential equipment.

4.4 Evaluation Factors

In evaluating each project, six factors were considered.

1. Timing

   This is considered the most significant factor because the purpose of this Report is to identify alternatives to support interim pumping prior to the scheduled completion of permanent improvements in the drainage and hurricane protection systems for the project area. Projects that cannot be operational prior to 2010 were not considered suitable for inclusion in an alternative.

2. Capacity Improvements

   Of approximately equal significance is the consideration of capacity improvement. The added capacity for discharge into Lake Pontchartrain, the Mississippi River, or the Industrial Canal by a project must be a meaningful contribution to the alleviation of the capacity concerns regarding one of the outfall canals that discharge to the lake.

3. Construction Impacts to System

   It must be possible to construct a project without compromising the drainage system to an extent greater than it is already impacted. Projects unable to meet this test were considered unsuitable.

4. Long-term Utility

   Unlike the previous three factors, failure to meet this test did not cause a project to be eliminated. Those projects and alternatives that provide a contribution to the long term improvement of the drainage and/or hurricane protection systems, however, should be recognized. The contribution could range from, on one hand, a permanent component as initially constructed to, on the other hand, a source of land or equipment that, once acquired, could be redeveloped, or relocated elsewhere, as part of the permanent systems.

5. Environmental Considerations

   Although most environmental issues apply more or less equally to all the projects and alternatives, there are specific issues of Environmental Justice, cultural resources, and the Scenic River designation of Bayou St. John, that should be considered when comparing the alternatives. If two alternatives for the same canal are generally equivalent for the previous evaluation factors, the environmental issues should be used in considering which is to advance.

6. Cost

   Like long-term utility and environmental considerations, cost is a relative measure to assist in comparing the projects and alternatives. No projects or alternatives were eliminated or recommended based on the estimate of cost.

The projects were evaluated during their development to assure that each project contributed to at least one viable alternative that would contribute to the objective of at least one canal. If a project was evaluated and determined to no longer be a contribution

to a viable alternative, no further work was done from that time in consideration of the key elements.

5.0 ALTERNATIVES ANALYSIS

5.1 Alternatives Analysis for the 17th Street Canal

Objective

The objective is to provide for a capacity of 7,300 cfs of storm water runoff for the basins which currently contribute to the 17th Street Canal. 7,300 cfs is the capacity required to minimize interior storm water elevations. Outlined below are the Alternatives which achieve this objective.

Alternative No. 1

Alternative No. 1 consists of three (3) individual Projects (Project No. 1, Project No. 11 & Project No. 16) when combined achieve the objective of providing 7,300 cfs., for the 17th Street Canal. Project No. 1 consists of constructing a new pump station, with a capacity of 3,300 cfs, on the west side of the 17th Street Canal at Lake Pontchartrain. Project No. 11 consists of constructing a new pump station, with a capacity of 1,600 cfs, on the west bank of the Monticello Canal, across from the existing Pritchard Pump Station and pumping to a new outfall at the Mississippi River. Project No. 16 consist of constructing a new pump station on the south bank of Hoey's Canal, with a capacity of 2,400 cfs, near Jefferson Highway and pumping to a new outfall at the Mississippi River. The locations of the projects are indicated on the **Map 5-1.** The scope of each project is described below. For more detailed information, please refer to the Projects Section of this report.

5.1.1 Alternative No. 1

Project No. 1.: Add pumping capacity at the lake to the west side of the 17th St. Canal

This project provides 3,300 cfs discharge capacity to the 17th Street Canal. It will be necessary to construct an intake basin to the northwest of the canal direction of flow that would leave the canal channel immediately south of the Old Hammond Hwy. bridge. The intake basin would be a concrete U-shaped canal 30' wide by 15' deep in order to accommodate the flow. The pump arrays would discharge into the lake between the US Coast Guard Station and the gates now under construction. A slab bridge would be built over the proposed U-shaped canal at Old Hammond Hwy. The floodwall along the 17th Street Canal would require removal and reconstruction at the proposed intake. Some developed property along Lake Ave. and II Tonys Restaurant on Old Hammond Hwy. would be relocated by the intake basin.

The proposed pump station would house three 1,000 cfs horizontal pumps and one 300 cfs vertical pump. It is proposed to use ITT-AC pumps. ITT-AC 300cfs pumps have an estimated delivery time of 48 weeks. ITT-AC 1000cfs pumps have an estimated delivery time of 72 weeks.

Under this project the 17th Street Canal would be operated with a water surface elevation of 1.0 NAVD88 at the intake. This level would provide pumping capacity at DPS 6 equivalent to conditions existing during normal "gate open" times. All pump drives would be diesel with back-up generation for engine control panels and auxiliary equipment. Fuel storage would be based on consumption for projected storm periods.

It is estimated that upon the beginning of the Engineering & Design, this project could be completed in approximately 29 months. The addition of this pump station could either complement the pumps already on site or become a permanent drainage solution. This project would provide a great benefit to the community that would offset the residential and commercial takings. When combined with Project No. 11 and Project No. 16, Project

No. 1 becomes a viable solution of achieving the objective of 7,300 cfs for the 17th Street Canal.

Project No. 11 : Redirect flow from DPS 6 to the River (Orleans Parish)

In order to reduce the amount of flow to DPS 6, a pump station would be built across the canal from the Pritchard Pump Station. An intake basin would collect water for the pump station that would have a capacity of 1600 cfs and a total dynamic head of 37 ft. Two 10' diameter pipes 8,500' in length, carrying 800 cfs per pipe, will convey water discharged from the proposed pump station to the Mississippi River via the following route. From the pump station, the pipes will direct the water south towards Jefferson Highway along the west side of the floodwall. The pipes will span over Jefferson Highway by means of a pipe bridge and will proceed towards the River on the east side on the levee along Monticello Avenue. Pipe bridges will then be required to span over Willow Street, the railroad tracks, and River Road / Oak Street. The pipes will go over the levee and discharge into the river down stream of the existing raw water intake for the city of New Orleans.

This proposed pump station would house 1 ITT-AC high-head 1,000 cfs horizontal pump and 2 ITT-AC high-head 300 cfs horizontal pumps. ITT-AC high-head 1000 cfs pumps have an estimated delivery time of 60 weeks. ITT-AC high-head 300 cfs high-head pumps have an estimated delivery time of 48 weeks.

It is estimated that upon the beginning of the Engineering & Design, this project could be completed in approximately 29 months. The addition of this pump station complements the proposed SELA project, Along Claiborne. This project implemented in conjunction with Project No. 16 would allow both Orleans Parish and Jefferson Parish to operate separate drainage systems. When combined with Project No. 1 and Project No. 16, Project No. 11 becomes a viable solution of achieving the objective of 7,300 cfs for the 17th Street Canal.

Project No. 16 : Redirect flow from Hoey's basin to Mississippi River (Jefferson Parish)

The proposed work is to divert 2400 CFS of storm water run-off from the Hoey's Basin. The pump station will be located on the south bank of Hoey's Canal. An intake basin would be constructed at the proposed pump station. The pump station would have a capacity of 2,600 cfs. Three 10' diameter pipes, 5,500' in length, carrying 800 cfs per pipe, will convey water discharged from the proposed pump station to the Mississippi River. The required total system head is 32 ft. The route of the pipeline would pass under the Kansas City Southern Railroad which leads to the river front, be constructed overhead at the crossing of Jefferson Highway and then proceed, above ground, along the east edge of an asphalt parking lot on property leased to Bridgewater Properties. At the south end of this property the force main would be bored under the CN/ICG which leads to the river front. The line would come out of the ground and be constructed above ground to Dakin Street where it would turn towards River Road. Dakin Street would be closed permanently. The line would cross River Road on an aerial crossing, cross the Mississippi River levee and discharge into the river. An appropriate discharge fendering system would be constructed at the river bank and would be designed to achieve siphonic recovery to improve overall efficiency.

A box culvert will be added from the east end of Geisenheimer culvert to the north of Hoey's Canal through Airline Dr. From where the box ties into the Hoey's Canal, the canal will be widened toward the proposed pump station to convey 2400 cfs.

This proposed pump station would house 2 ITT-AC high-head 1,000 cfs horizontal pump and 2 ITT-AC high-head 300 cfs horizontal pumps. ITT-AC high-head 1000 cfs pumps have an estimated delivery time of 60 weeks. ITT-AC high-head 300 cfs high-head pumps have an estimated delivery time of 48 weeks.

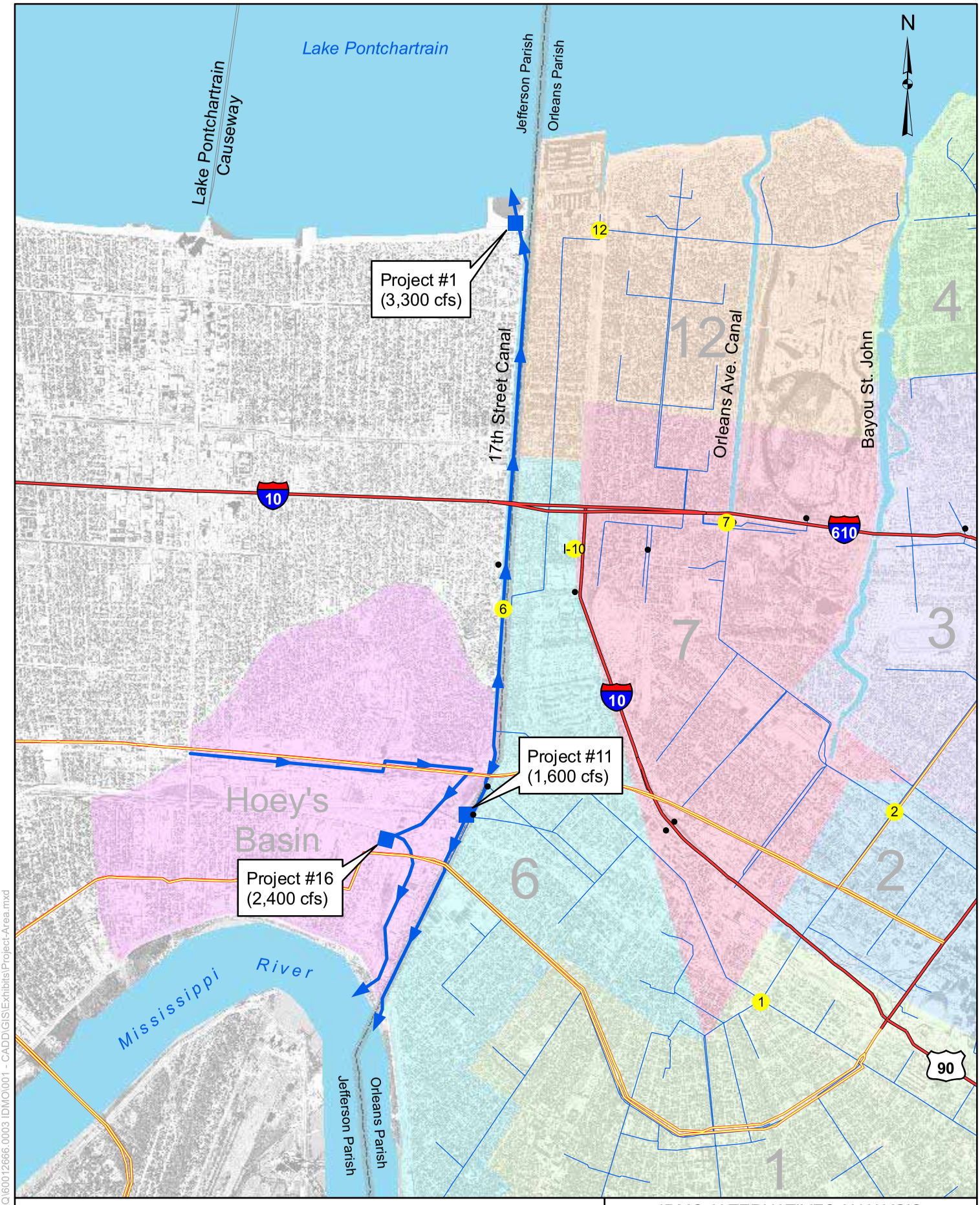
It is estimated that upon the beginning of the Engineering & Design, this project could be completed in approximately 29 months. This project implemented in conjunction with Project No. 11 would allow both Orleans Parish and Jefferson Parish to operate separate

drainage systems. When combined with Project No. 1 and Project No. 11, Project No. 16 becomes a viable solution of achieving the objective of 7,300 cfs for the 17th Street Canal.

Summary

Alternative No. 1 provides a viable solution to achieve the objective of 7,300 cfs for the 17th Street Canal. Provided the three (3) projects are constructed simultaneously, Alternative No. 1 could be completed in approximately 29 months. The estimated cost for completing Alternative No. 1 is $241.0 million.

It is estimated that upon the beginning of the Engineering & Design, this project could be completed in approximately 29 months. The addition of this pump station could either complement the pumps already on site or become a permanent drainage solution. This project would provide a great benefit to the community that would offset the residential and commercial takings. When combined with Project No. 11 and Project No. 16, Project No. 1 becomes a viable solution of achieving the objective of 7,300 cfs for the 17th Street Canal.



Legend:

- 5 — Drainage Basins
- Conveyance System
- 5 — Major Pump Stations
- Minor Pump Stations
- New Pump Station

IDMO ALTERNATIVES ANALYSIS

17TH STREET CANAL

SCALE: 1"=4000'	ALTERNATIVE NO. 1	MAP 5-1
DATE: 08/04/06		

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5.2 Alternatives Analysis for the Orleans Avenue Canal

Objective

The objective is to provide for a capacity of 2,700 cfs of storm water run-off for the basins which currently contribute to the Orleans Ave Canal. 2,700 cfs is the capacity required to minimize interior storm water elevations. There are currently conveyance limitations upstream of DPS 7. Provided the SELA project, which upgrades the Orleans Ave. Box to provide convergence to DPS 7 is constructed, the objective of 2,700 cfs for the Orleans Ave Canal can be achieved. Outlined below are the Alternatives which achieve this objective.

Alternative No. 1

Alternative No. 1 consists of one (1) Project (Project No. 3) which achieves the objective of providing 2,700 cfs., for the Orleans Ave Canal. Project No. 3 consists of constructing a new pump station, with a capacity of 2,700 cfs, to the east side of the Orleans Ave. Canal at Lake Pontchartrain. The locations of the projects are indicated on the **Map 5-2.** The scope of each project is described in detail after the description of all alternatives. For more detailed information, please refer to the Projects Section of this report.

Alternative No. 2

Alternative No. 2 consists of two (2) individual Projects (Project No. 3 & Project No. 19) when combined achieve the objective of providing 2,700 cfs., for the Orleans Ave Canal. Project No. 3 under this Alternative would consist of constructing a new pump station, with a capacity of 1,600 cfs, to the east side of the Orleans Ave. Canal at Lake Pontchartrain. Project No. 19 consists of diverting a portion of the flow discharged from DPS 2 to Bayou St. John via the existing and a proposed open channel paralleling Lafitte St. and discharging into Lake Pontchartrain. Pump stations will be required at both the north and south ends of Bayou St. John. The proposed pump station at the north end of Bayou St. John will be located on the east of the existing gate structure. The locations of the projects are indicated on the **Map 5-3.** The scope of each project is described in detail after the description of all alternatives. For more detailed information, please refer to the Projects Section of this report.

The individual Projects which make up the Alternatives are described below.

5.2.1 Alternative No. 1

Project No. 3: Add pumping capacity at the lake on the Orleans Avenue Canal

Proposed Work

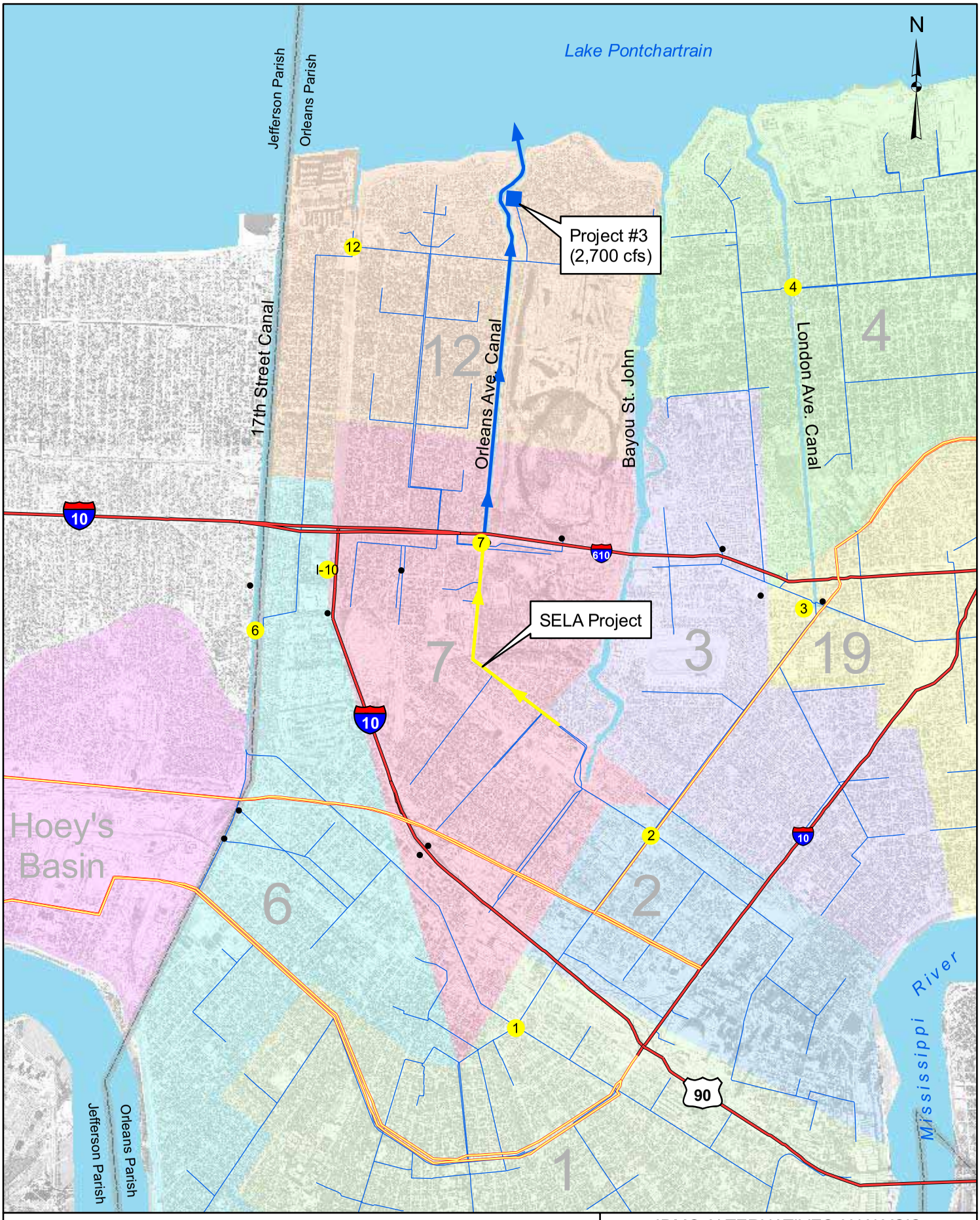
Project No. 3 under this Alternative would consist of the construction of a pump station with a capacity of 2,900 cfs just east of the existing gate structure. Intake and outfall basins would be built on either side of the pump station to feed water to the pumps. A 15 ft platform extension would be installed to provide an access road to the existing gate structure installed in the canal. The pump station would be designed to provide for future expansion, and the levee would be relocated to accommodate the expanded pump station.

There is a SELA project, which has been designed to upgrade the existing Orleans Ave. box culvert. The proposed SELA project will correct the existing conveyance problem to DPS 7. Provided the proposed SELA project is constructed, the objective of 2,700 cfs for the Orleans Ave Canal can be achieved with Project No. 3.

Under this project the Orleans Ave Canal would be operated with a water surface elevation of 1.0 NAVD88 at the lake. This level would provide pumping capacity at DPS 7 equivalent to conditions existing during normal "gate-open" times. All pump drives would be diesel with back-up generation for engine control panels and auxiliary equipment. Fuel storage would be based on consumption for projected storm periods.

The proposed pump station would house two ITT-AC 1,000 cfs horizontal pumps and three 300 ITT-AC cfs vertical pumps. ITT-AC 300 cfs pumps have an estimated delivery time of 48 weeks. ITT-AC 1000 cfs pumps have an estimated delivery time of 72 weeks.

It is estimated that upon the beginning of the Engineering & Design, this project could be completed in approximately 29 months. The addition of this pump station could either complement the pumps already on site or become a permanent drainage solution, with the ability to add future capacity. This project would provide a great benefit to the community. Project No. 1 is a viable solution of achieving the objective of 2,700 cfs for the Orleans Ave. Canal.



Legend:

- 5 — Drainage Basins
- Conveyance System
- 5 — Major Pump Stations
- Minor Pump Stations
- New Pump Station

IDMO ALTERNATIVES ANALYSIS

ORLEANS AVENUE CANAL

SCALE: 1"=4000'	ALTERNATIVE NO. 1	MAP 5-2
DATE: 08/04/06		

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5.2.2 Alternative No. 2

Project No. 3 : Add pumping capacity at the lake on the Orleans Avenue Canal

Proposed Work

Project No. 3 is described in detail above for Alternative No. 2. The only difference is the proposed pump station would have a capacity of 1600 cfs.

The proposed pump station would house one 1,000 ITT-AC cfs horizontal pump and two ITT-AC 300 cfs vertical pumps. ITT-AC 300 cfs pumps have an estimated delivery time of 48 weeks. ITT-AC 1000 cfs pumps have an estimated delivery time of 72 weeks.

It is estimated that upon the beginning of the Engineering & Design, this project could be completed in approximately 29 months. The addition of this pump station could either complement the pumps already on site or become a permanent drainage solution, with the ability to add future capacity. This project would provide a great benefit to the community. When combined with Project No. 19, Project No. 3 is a viable solution of achieving the objective of 2,700 cfs for the Orleans Ave. Canal.

Project No. 19 : Add pumping capacity at the lake on the Orleans Ave. Canal

Proposed Work

The 1,200 cfs flow from DPS 2 could be diverted into Bayou St. John via the existing Lafitte St. Canal and a 10’ x 22’ channel that would be added parallel to the existing canal on the north side. Four MWI low head 300 cfs pumps would be placed at the foot of Bayou St. John to pump the 1,200 cfs of water into the bayou with an intake basin in the median of Jefferson Davis Pkwy. between Lafitte and Conti Sts. A box culvert would be required at the proposed Moss St. Crossing. The two sluice gates north of Robert E. Lee Blvd. would be removed, and a new 10’ x 20’ channel, paralleling the existing channel, would be constructed.

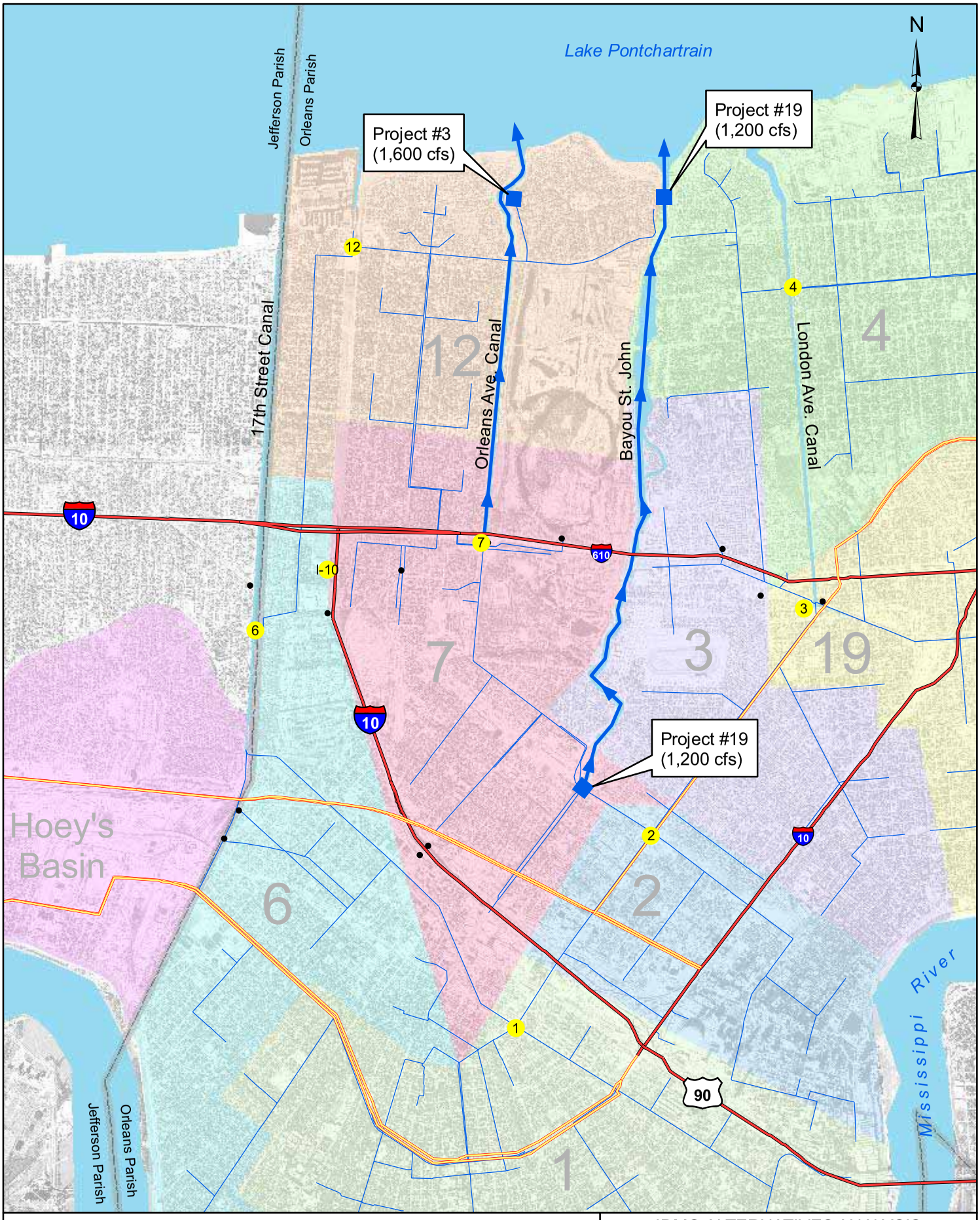
A second new pump station, including intake and discharge basins, would be located just east of the existing gate structure at the outlet of Bayou St. John. This proposed pump

stations would house four ITT-AC 300 cfs pumps. ITT-AC 300 cfs pumps have an estimated delivery time of 48 weeks.

It is estimated that upon the beginning of the Engineering & Design, this project could be completed in approximately 29 months. Visual concerns relative to both Section 106 and the Scenic River permit could be avoided through context sensitive architectural design. When combined with Project No. 3, Project No. 19 becomes a viable solution of achieving the objective of 2,700 cfs for the Orleans Ave. Canal.

Summary of Alternative No. 2

Alternative No. 2 provides a viable solution to achieve the objective of 2,700 cfs for the Orleans Ave. Canal. Provided the two (2) projects are constructed simultaneously, Alternative No. 2 could be completed in approximately 29 months. The estimated cost for completing Alternative No. 2 is $55.1 million.



Legend:

- 5 — Drainage Basins
- Conveyance System
- 5 — Major Pump Stations
- Minor Pump Stations
- New Pump Station

IDMO ALTERNATIVES ANALYSIS

ORLEANS AVENUE CANAL

SCALE: 1"=4000'	ALTERNATIVE NO. 2	MAP 5-3
DATE: 08/04/06		

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5.3 Alternatives Analysis for the London Avenue Canal

Objective

The objective is to provide for a capacity of 4,800 cfs of storm water run-off for the basins which currently contribute to the London Ave Canal. 4,800 cfs is the capacity required to minimize interior storm water elevations. Outlined below are the Alternatives which achieve this objective.

Alternative No. 1

Alternative No. 1 consists of two (2) individual Projects (Project No. 10 & Project No. 15) when combined achieve the objective of providing 4,800 cfs, for the London Ave Canal. Project No. 10 consists of diverting 1,100 cfs from DPS 3 to DPS 19 for pumping to the Inner Harbor Navigation Canal IHNC. Project No. 15 consists of diverting flow of DPS 4 from London Ave. Canal to the Inner Harbor Navigation Canal (IHNC) via Prentiss, Peoples & Dwyer rights-of-way and discharging into the IHNC via a new pump station. The locations of the projects are indicated on **Map 5-4**. The scope of each Project is described in detail after the description of all Alternatives. For more detailed information, please refer to the Projects Section of this report.

Alternative No. 2

Alternative No. 2 consists of one (1) Project (Project No. 4) which achieves the objective of providing 4,800 cfs for the London Ave. Canal. Project No. 4 consists of constructing a new pump station with a capacity of 4,800 cfs on the east side of the of the London Ave. Canal at Lake Pontchartrain. The locations of the projects are indicated on **Map 5-5.** The scope of each Project is described in detail after the description of all Alternatives. For more detailed information, please refer to the Projects Section of this report.

Alternative No. 3

Alternative No. 3 consists of two (2) individual Projects (Project No. 4 & Project No. 15) when combined achieve the objective of providing 4,800 cfs for the London Ave Canal. Project No. 4 consists of constructing a new pump station, with a capacity of 1,100 cfs

on the east side of the of the London Ave. Canal at Lake Pontchartrain. Project No. 15 consists of diverting flow of DPS 4 from London Ave. Canal to the Inner Harbor Navigation Canal (IHNC) via Prentiss, Peoples & Dwyer rights-of-way and discharging into the IHNC via a new pump station. The locations of the projects are indicated on the **Map 5-6.** The scope of each Project is described in detail after the description of all Alternatives. For more detailed information, please refer to the Projects Section of this report.

Alternative No. 4

Alternative No. 4 consists of two (2) individual Projects (Project No. 15 & Project No. 19) when combined achieve the objective of providing 4,800 cfs for the London Ave Canal. Project No. 15 consists of diverting flow of DPS 4 from London Ave. Canal to the Inner Harbor Navigation Canal (IHNC) via Prentiss, Peoples & Dwyer rights-of-way and discharging into the IHNC via a new pump station. Project No. 19 consists of diverting a portion of the flow discharged from DPS 2 to Bayou St. John via the existing and a proposed open channel paralleling Lafitte St. and discharging into Lake Pontchartrain via a proposed pump station to the east of the existing gate structure on Bayou St. John. The locations of the projects are indicated on the **Map 5-7**. The scope of each Project is described in detail after the description of all Alternatives. For more detailed information, please refer to the Projects Section of this report.

The individual Projects which make up the Alternatives are discussed in more detail below.

5.3.1 Alternative No. 1

Project No. 10: Redirect flow from DPS 3 to the Florida Ave. Canal to DPS 19

Modifications are needed at DPS 3 to prevent the discharge from the two 550 cfs pumps from spilling back into the intake basin and recycling through the pump station. The gate which directs water to the Florida Ave Canal may also require modification to allow the full 1,100 cfs to flow downstream. There is also an existing point of major constriction along the Florida Ave. Canal from Louisa St. to Piety St. This project requires the

construction of a 20' x 10' concrete box culvert, parallel to the existing box culvert, between Louisa St. and Piety St., to alleviate the existing constriction. This Project would also require relocation of an existing 48" steel water line.

There is an existing SELA project which has been designed for the widening of the Florida Ave. Canal. Another option for Project No. 10 would be to expedite the construction of the segment of the SELA project, from Louisa St. to Piety St.

It is estimated that upon conception of the Engineering & Design, this project could be completed in approximately 12 months. This project would remove the existing constriction of flow that minimizes the conveyance capability of the Florida Ave. Canal. The costs of the proposed box culvert along with the improvements to the wall and gates at DPS 3 are small compared to the other projects evaluated. The proposed work would compliment the planned SELA improvements to the Florida Ave. Canal. The improved capacity of the Florida Ave. Canal restores the flexibility to the municipal drainage system to divert flow into the London Ave. Canal. When combined with Project No. 15, Project No. 10 becomes a viable solution of achieving the objective of 4,800 cfs for the London Ave. Canal.

Project No. 15: Redirect flow of DPS 4 from London Avenue Canal to the Inner Harbor Navigation Canal (IHNC) via Prentiss, Peoples & Dwyer Rights-of-way

Storm water run-off from the drainage basin that flows to DPS 4 will be redirected using the existing drainage system toward a proposed pump station located at the eastern terminus of the Dwyer ROW. The proposed pump station would discharge into the IHNC. The proposed pump station would have a 3,600 cfs capacity. The pumps would discharge the water into five discharge tubes, each 9 feet in diameter, which would be routed over the levee and the railroad track into the Industrial Canal. A discharge basin would be required on the west bank of the IHNC.

To direct the water to the proposed pump station, the Dwyer Canal would be replaced with a 12' deep concrete paved channel. Two 10' x 16' box culverts will be added to cross under the railroad track to connect the People's Ave. Canal and Dwyer Canal. A junction box would be required at the intersection of these two proposed culverts with the intersection of the existing Peoples Ave. box culvert and canal.

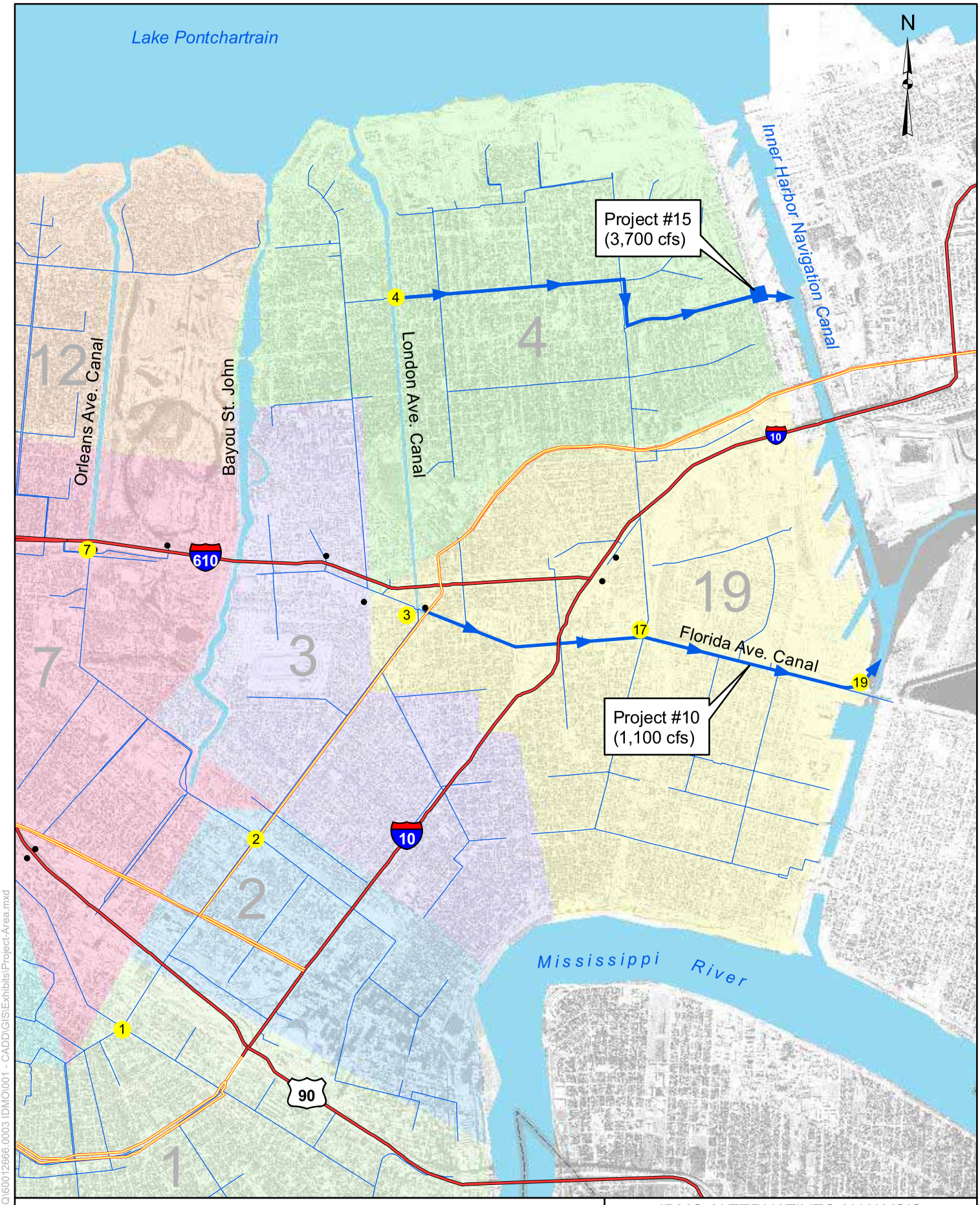
When the gate at London Ave. Canal and Lake Pontchartrain is closed, DPS 4 would be shut down, and the water would be redirected to the proposed pumping station.

This proposed pump station would house 3 ITT-AC 1,000 cfs horizontal pumps and 2 ITT-AC 300 cfs pumps. ITT-AC 1000 cfs high-head pumps have an estimated delivery time of 60 weeks. ITT-AC 300 cfs high-head pumps have an estimated delivery time of 48 weeks.

It is estimated that upon conception of the Engineering & Design, this project could be completed in approximately 29 months. The proposed pump station would create an alternate outfall for the drainage basin and could become a permanent part of the drainage system. When combined with Project No. 10, Project No. 15 becomes a viable solution of achieving the objective of 4,800 cfs for the London Ave. Canal.

Summary of Alternative No. 1

Alternative No. 1 provides a viable solution to achieve the objective of 4,800 cfs for the London Ave. Canal. Provided the two (2) projects are constructed simultaneously, Alternative No. 1 could be completed in approximately 29 months. The estimated cost for completing Alternative No. 1 is $85.2 million.



Legend:

- 5 — Drainage Basins
- Conveyance System
- 5 — Major Pump Stations
- Minor Pump Stations
- New Pump Station

IDMO ALTERNATIVES ANALYSIS

LONDON AVENUE CANAL

SCALE: 1"=4000'	ALTERNATIVE NO. 1	MAP 5-4
DATE: 08/04/06		

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5.3.2 Alternative No. 2

Project No. 4 : Add pumping capacity at the lake on London Avenue Canal

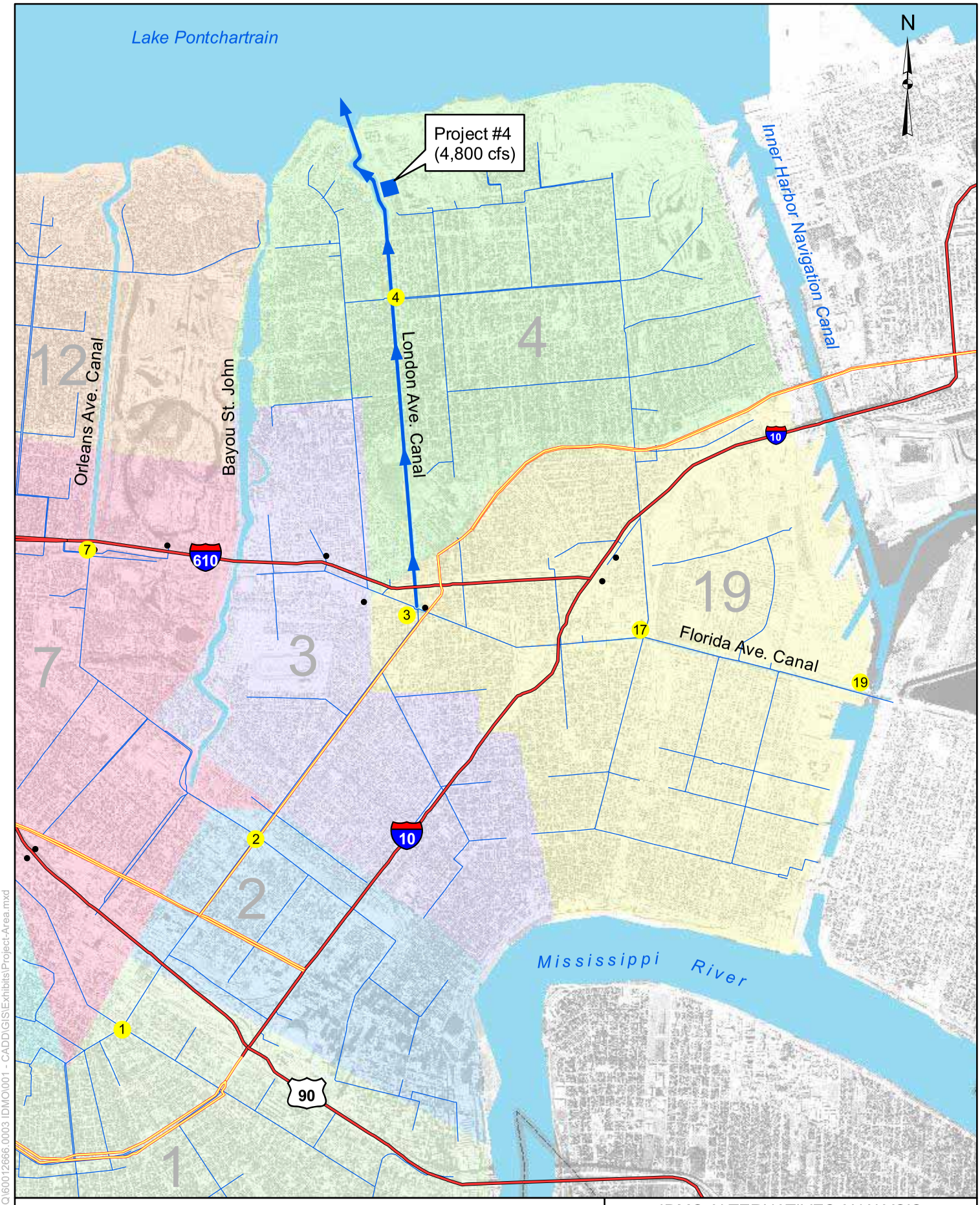
The proposed work is to install a pump station on the East Bank of London Avenue Canal

A pump station would be constructed just east of the existing gate structure. Part of the existing cofferdam will be removed to construct this pump station. An intake and an outfall basin would be built on either side of the pump station to feed water to the pumps. The pump station would be built to provide for future expansion. The levee would be relocated to accommodate the pump station. The excavation and pump house can be constructed while the pumps are on order.

The capacity for the proposed pump station would be 4,900 cfs. The proposed pump station would house 4 ITT-AC 1,000 cfs horizontal pumps and 3 ITT-AC 300 cfs pumps. ITT-AC 1000 cfs high-head pumps have an estimated delivery time of 60 weeks. ITT-AC 300 cfs high-head pumps have an estimated delivery time of 48 weeks.

This project for the London Ave. Canal would be operated with a water surface elevation of 1.0 NAVD88 at the intake. This level would provide pumping capacity at DPS 3 and DPS 4 equivalent to conditions existing during normal “gate open” times.

It is estimated that upon conception of the Engineering & Design, this project could be completed in approximately 29 months. The addition of a pump station adjacent to the closure gate at the outfall of the London Avenue Canal would compliment the pumps already in place. It could also become a permanent drainage solution with the flexibility to add capacity as needed. Project No. 4 is a viable solution of achieving the objective of 4,800 cfs for the London Ave. Canal.



Legend:

- 5 — Drainage Basins
- Conveyance System
- 5 — Major Pump Stations
- Minor Pump Stations
- New Pump Station

IDMO ALTERNATIVES ANALYSIS

LONDON AVENUE CANAL

SCALE: 1"=4000'	ALTERNATIVE NO. 2	MAP 5-5
DATE: 08/04/06		

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5.3.3 Alternative No. 3

Project No. 4: Add pumping capacity at the lake on London Avenue Canal

Project No. 4 is described in detail for Alternative No. 3, above. The only difference for Alternative No. 4 is the proposed pump station would have a capacity of 1,200 cfs. The proposed pump station would house 4 ITT-AC 300 cfs pumps. ITT-AC 300 cfs high-head pumps have an estimated delivery time of 48 weeks.

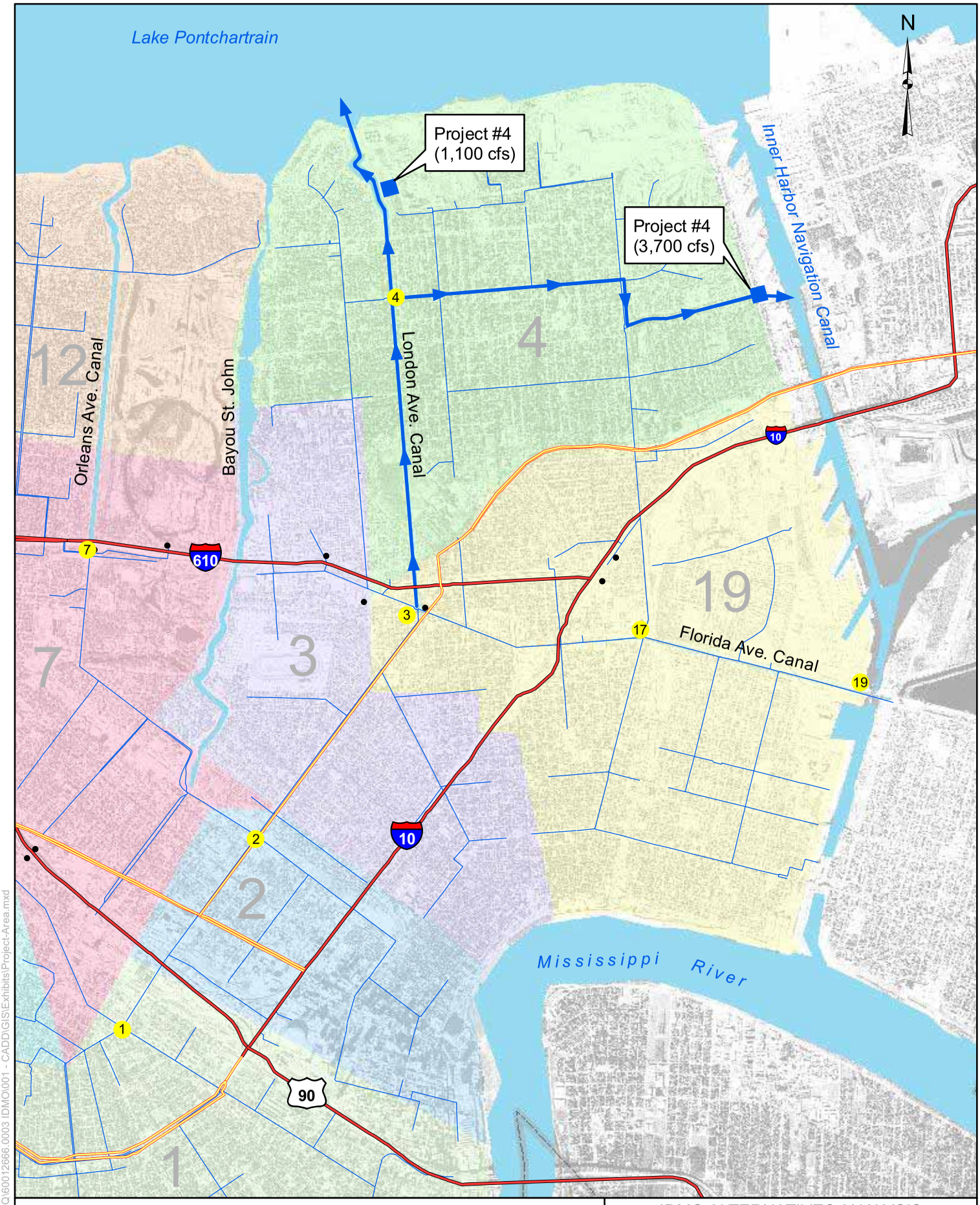
It is estimated that upon conception of the Engineering & Design, this project could be completed in approximately 29 months. The addition of a pump station adjacent to the closure gate at the outfall of the London Avenue Canal would compliment the pumps already in place. It could also become a permanent drainage solution with the flexibility to add capacity as needed. When combined with Project No. 15, Project No. 4 becomes a viable solution of achieving the objective of 4,800 cfs for the London Ave. Canal.

Project No. 15: Redirect flow of DPS 4 from London Avenue Canal to the Inner Harbor Navigation Canal (IHNC) via Prentiss, Peoples & Dwyer Rights-of-way

Project No. 15 is described in detail in Alternative No. 2 above. When combined with Project No. 4, Project No. 15 becomes a viable solution of achieving the objective of 4,800 cfs for the London Ave. Canal.

Summary of Alternative No. 3

Alternative No. 3 provides a viable solution to achieve the objective of 4,800 cfs for the London Ave. Canal. Provided the two (2) projects are constructed simultaneously, Alternative No. 3 could be completed in approximately 29 months. The estimated cost for completing Alternative No. 3 is $99.0 million.



Legend:

- 5 — Drainage Basins
- Conveyance System
- 5 — Major Pump Stations
- Minor Pump Stations
- New Pump Station

IDMO ALTERNATIVES ANALYSIS

LONDON AVENUE CANAL

SCALE: 1"=4000'	ALTERNATIVE NO. 3	MAP 5-6
DATE: 08/04/06		

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5.3.4 Alternative No. 4

Project No. 15 : Redirect flow of DPS 4 from London Avenue Canal to the Inner Harbor Navigation Canal (IHNC) via Prentiss, Peoples & Dwyer Rights-of-way

Project No. 15 is described in detail in Alternative No. 2 above. When combined with Project No. 4, Project No. 15 becomes a viable solution of achieving the objective of 4,800 cfs for the London Ave. Canal.

Project No. 19: Add pumping capacity at the lake on the Orleans Ave. Canal

Proposed Work

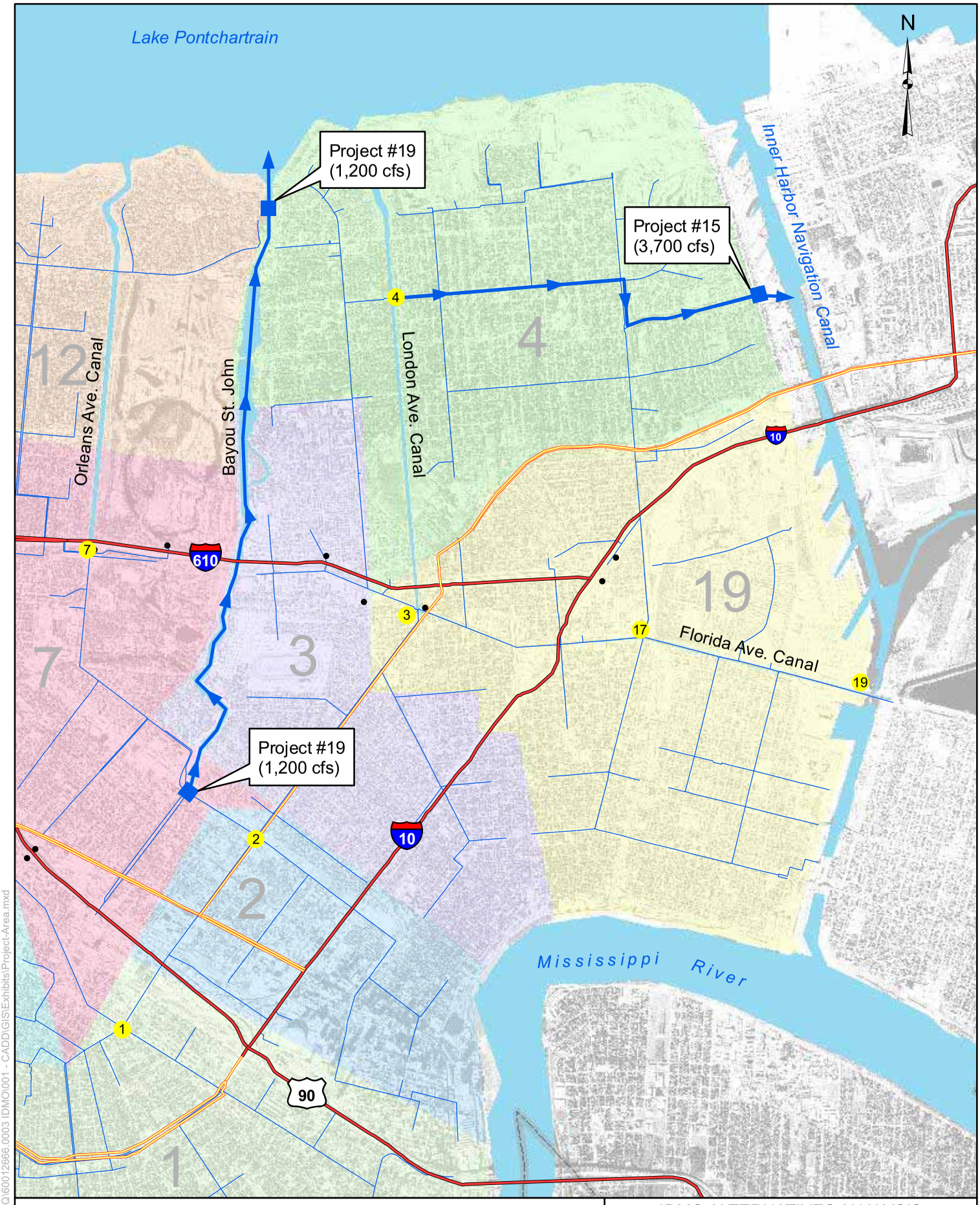
The 1,200 cfs flow from DPS 2 would be diverted into Bayou St. John via the existing Lafitte St. Canal and a 10' x 22' channel that would be added parallel to the existing canal on the north side. Four MWI low head 300 cfs pumps would be placed at the foot of Bayou St. John to pump the 1,200 cfs of water into the bayou with an intake basin in the median of Jefferson Davis Pkwy. between Lafitte and Conti Streets. A box culvert would be required at the proposed Moss St. Crossing. The two sluice gates just north of Robert E. Lee Blvd. would be removed, and a new 10' x 20' box culvert, paralleling the existing channel, would be constructed.

A second new pump station, including intake and discharge basins, would be located just east of the existing gate structure at the outlet of Bayou St. John. Each of the proposed pump stations would house four 300 cfs pumps. It is proposed to use ITT-AC pumps. ITT-AC 300 cfs pumps have an estimated delivery time of 48 weeks.

It is estimated that upon conception of the Engineering & Design, this project could be completed in approximately 29 months. Visual concerns relative to both Section 106 and the Scenic River permit could be avoided through context sensitive architectural design. When combined with Project No. 15, Project No. 19 becomes a viable solution of achieving the objective of 4,800 cfs for the London Ave. Canal.

Summary of Alternative No. 4

Alternative No. 4 provides a viable solution to achieve the objective of 4,800 cfs for the Orleans Ave. Canal. Provided the two (2) projects are constructed simultaneously, Alternative No. 4 could be completed in approximately 29 months. The estimated cost for completing Alternative No. 4 is $111.4 million.



Legend:

- 5 — Drainage Basins
- Conveyance System
- 5 — Major Pump Stations
- Minor Pump Stations
- New Pump Station

IDMO ALTERNATIVES ANALYSIS

LONDON AVENUE CANAL

SCALE: 1"=4000'	ALTERNATIVE NO. 4	MAP 5-7
DATE: 08/04/06		

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Table 5-1

Alternatives and Projects by Canal

Canal	Alternative	Project	Description	cfs		Schedule in months	Cost in $000,000	
				Proj.	Alt.		Proj.	Alt.
17th St.	1	1	Add pumping capacity at the lake on the west side of 17th St Canal	3,300	7,300	29	$ 56.3	$241.1
		11	Redirect flow at Monticello Canal to the Mississippi River – Orleans Parish	1,600			$ 73.3	
		16	Redirect flow from Hoey's Basin to the Mississippi River – Jefferson Parish	2,400			$105.6	
Orleans Ave.	1	3A	Add pumping capacity of 2,700 cfs at the lake on Orleans Ave Canal	2,700	2,700	29	$ 39.8	$119.8
			SELA – add conveyance capacity on Orleans Ave from Olga St. to DPS 7.	1,000			$ 80.0	
	2	3B	Add pumping capacity of 1,700 cfs at the lake on Orleans Ave Canal	1,700	2,900	29	$ 25.4	$ 55.1
		19	Redirect flow from DPS 2 to Bayou St. John and pump to the lake	1,200			$ 29.7	
London Ave.	1	10	Divert flow from DPS 3 via Florida Canal to DPS 19	1,100	4,800	29	$ 3.5	$85.2
		15	Redirect DPS 4 to the Industrial Canal via Prentiss and Filmore	3,700			$ 81.7	
	2	4A	Add pumping capacity of 4,800 cfs at the lake on London Ave Canal	4,800	4,800	29	$ 70.4	$ 70.4
	3	4B	Add pumping capacity of 1,100 cfs at the lake on London Ave Canal	1,100	4,800	29	$ 17.3	$ 99.0
		15	Redirect DPS 4 to the Industrial Canal via Prentiss and Filmore	3,700			$ 81.7	
	4	15	Redirect DPS 4 to the Industrial Canal via Prentiss and Filmore	3,700	4,900	29	$ 81.7	$111.4
		19	Redirect flow from DPS 2 to Bayou St. John and pump to the lake	1,200			$ 29.7	

Project No. 1

Add pumping capacity at lake to the west side of the 17th St. Canal

Objective

The objective of this project is to increase the pumping capacity at the 17th St. Canal and Lake Pontchartrain by adding a pumping station and intake basin at the West side of the 17th St. Canal. This pumping station could be temporary or permanent.

Existing Conditions

The 17th Street Canal is located on the west side of the city and straddles the Orleans Parish and Jefferson Parish lines. Three pump stations discharge a total of 10,500 cfs into the 17th Street Canal during normal rainfall events.

A gate structure and temporary pumps are under construction where the 17th St. Canal discharges into Lake Pontchartrain. **See Plate 1-1**, Location Layout. The gate is intended to protect the canal from storm surges and the pumps are intended to discharge storm water otherwise contained in the canal by the gate. Scheduled to be in operation by October 31, 2006, these pumps have a nominal capacity of 6,000 cfs.

Proposed Work

This project provides additional discharge capacity to the 17th Street Canal. It will be necessary to construct an intake basin to the northwest of the canal direction of flow that would leave the canal channel immediately south of the Old Hammond Hwy. bridge. The intake basin would be a concrete U-shaped canal 30' wide by 15' deep in order to accommodate the flow. The pump arrays would discharge into the lake between the US Coast Guard Station and the gates now under construction. A slab bridge would be built over the proposed U-shaped canal at Old Hammond Hwy.. The floodwall along the 17th Street Canal would require removal and reconstruction at the proposed intake. Some developed property along Lake Ave. and II Tonys Restaurant on Old Hammond Hwy. would be relocated by the intake basin.

Construct a pump station housing three 1,000 cfs horizontal pumps and one 300 cfs vertical pump. This could be a temporary installation, or it could be designed to be combined into a future permanent pump station.

The recommended capacity to minimize impacts on interior storm water elevations is 7,300 cfs. Therefore, an additional pumping capacity of, at least, 3,300-7,300 cfs is

needed in the 17th St. Canal, depending on alternate projects selected in conjunction with this project. Under this project the 17th Street Canal would be operated with a water surface elevation of 1.0 NAVD88 at the lake. This level would provide pumping capacity at DPS 6 equivalent to conditions existing during normal "gate open" times. All pump drives would be diesel with back-up generation for engine control panels and auxiliary equipment. Fuel storage would be based on consumption for projected storm periods.

Geotechnical Considerations

- Subsoil Conditions

  Based on borings made in the general area, subsoil conditions at the proposed construction site on the west side of the 17th Street Canal near the Old Hammond Highway would be expected to consist of several feet of surface improvement, underlain by a highly compressible stratum of soft organic clay or humus to about the 10 ft. depth. The subsoils below this primarily consist of very soft to soft clays to about the 65 ft. depth. However, a sand layer would be expected between about the 35 and 40 ft. depths. Beginning at the 65 ft. depth, Pleistocene age soils were encountered and primarily consist of medium dense sand and silty sand to about the 80 ft. depth and then preconsolidated medium stiff to stiff clay below this to at least the 100 ft. depth below ground surface.

- Conceptual Foundation System

  Based on the subsoil conditions described above, it is believed that all important structures should be supported on driven piles. For timber, or composite, piles supporting the pump station and pipe bents on the lake side, a capacity of about 15 tons (FS = 2.0) in compression should be available. This is based on a 70 to 75 ft. long timber, or composite, pile (below existing grade). Piles used to support the open channel would have a capacity of several tons less for the same pile tip depth. For piles subjected to uplift and lateral loading, a composite timber pile should not be considered. Higher capacities on the order of 30 to 50 tons would be available if steel "H" or pipe piles or prestressed concrete piles are used for support. These type piles would probably be required for the proposed bridge at

Old Hammond Highway. They should also be considered if a greater design life than typically provided by timber piles is desired.

- Water Diversion and Cofferdam Arrangement

  Some specialized form of cofferdam system would be required where the U-shaped channel ties into the 17th Street Canal floodwalls south of Old Hammond Highway. A more conventional cofferdam system would be required to construct the U-shaped channel between 17th Street Canal and the proposed pump platform. For cost estimating purposes, a sheet pile penetration of about 60 ft. below ground surface would be expected. The cofferdam should be internally braced at least at one location near the top of the cofferdam walls. Some form of forced dewatering (deep wells, well points, etc.) would probably be required to dewater the shallow sands that would be expected at about the 35 to 40 ft. depth below ground surface.

- Additional Geotechnical Investigations

  In general, the existing geotechnical data that has been developed for the 17th Street Canal floodwall and the existing interim closure structure should be used in the analysis of the proposed new construction. In addition to this, at least soil borings near the intersection with 17th Street Canal, at the proposed bridge and at the proposed pump platform should be made to supplement that data. Geotechnical analyses with the regard to the compression, tension and lateral capacities of piles would be needed for support of the various elements of the structures. Analyses would also be needed relative to the temporary retaining structures (structural and dewatering). Geotechnical analyses should also be made for the specialized cofferdam where the u-shaped channel ties into the 17th Street Canal.

Structural Considerations

- The foundations of the new bridge crossing at Old Hammond Hwy. shall be supported on steel piles to reduce vibration and settlement within the area.
- All foundations shall be designed in accordance with the Geotechnical Report's recommendations. The engine deck for the pump station would be elevated one foot above the base flood elevation as shown on the FIRM map.

- The intake and discharge basins (open concrete channel) shall be sized to accommodate the hydraulic requirements of this report.

Due to the location and orientation of the pump station architectural considerations shall be coordinated with local agencies. As for the structural integrity of the pump station, all components of the structure shall be designed in accordance with the state and local building code requirements and be able to withstand winds in excess of 150 mph. The foundation shall be supported on composite timber piles (due to water table fluctuations) while the open channel (intake and discharge basins) will be founded on timber piles.

Mechanical/Electrical Considerations

- Mechanical

  The pump station will require three (3) 1000 cfs horizontal pumps, diesel driven with the motors rated at 2000 HP. Sufficient fuel storage would need to be provided at the site to operate the pumps for up to 36 hours.

- Electric Service

  The local electric service is provided by Entergy. The anticipated electrical load at the pump station is including:

  - One (1) 300 cfs vertical pump, motor rated at 700HP, medium voltage or approximate 520 KW
  - Balance of facility loads including power, lighting and auxiliary systems at approximate 300 KW. The electrical system will be stepped down to 480V and 120/208V with transformers and local distribution panels.

  The peak demand in the pumps station is approximate at 0.8 MW. Two service feeders shall be provided by Entergy for redundancy. In case of loss of one feeder the other feeder shall be capable of providing power for the entire pump station demand. Main Substation will consist of MV vacuum type breakers and metering devices to meet Entergy standards. Service availability will be coordinated with Entergy during the design development.

- Standby Power

  Standby power source will be required in case of total black-out on utility grid occurs coincidence with the flood event. There are two options for providing standby power.

- Option A: Locally installed 1-1MW diesel generator to meet the peak demand. The generator will be specified for continuous duty with sufficient fuel storage to operate the pumps up to 36 hours.
- Option B: Select 2MW diesel generators as a module centrally located on a hardened infrastructure to ensure availability. The total generation capacity shall be sufficient to provide backup power to all new pump stations. The fuel storage to operate the pumps up to 36 hours. The advantage on this option is that centralization of generators will make system more reliable and flexible and easier for maintenance. The initial installation cost will be lower because the central generation capacity will be lower than sum of generation capacity at each pump station. But additional cost for transmission from central station to each pump station will be added.

Construction Considerations

- Since the work site is outside the canal in both options, some work can be done in the dry.
- Sheet pile will be required for all excavations. During construction, the contractor will have to protect the existing levees on the lake and the canal.
- Traffic on Old Hammond Hwy must be maintained during construction of the channel and bridge.
- Temporary sheet piling can may used as an alternative for providing stability of the existing levee at the junction points of:
  1) the existing levee and intake basin and
  2) the pump station or pump platforms and levee interface.
- As for the existing roadway, the construction of the bridge shall be phased so that traffic, to some degree, can be maintained. The bridge shall be built prior to the construction of the levee.
- Prior to the construction, the Contractor shall implement a construction procedure that will not impose on the integrity of the existing canal and levee.

Environmental Considerations

This project, like all the others, would satisfy the requirements of NEPA through a supplement to EA #433.

Order of Magnitude Cost Estimate

Cost Estimate - Project 1	
Environmental	$0
Right-of-Way Acquisition	$4,000,000
Design	$4,181,737
Construction	$48,089,977
Total	**$56,271,714**

Roadmap/Timeline

Design – This would be divided into two phases that would be initiated concurrently, M&E and Civil. The M&E would include a fast-track specification of pumps and other equipment with long lead time deliveries. M&E fast-track should take 2 months and other design should take 4 months.

Environmental Clearance – Concurrent with design

Permits – The permits required concern water quality, and are issued by LDNR, this should be coordinated among the agencies to take no more than one month after final design is completed and be concurrent with the construction bid process.

LERRD – Land required for the pump station and relocated levee is owned by various owners. ROW to install the improvement would have to be purchased from these owners. This must be concurrent with Design and could be the critical path of the Civil design.

Construction – The 3300 cfs pump station proposed would take approximately 18 months to complete. The pump station should be ready for pump installation within 18 months.

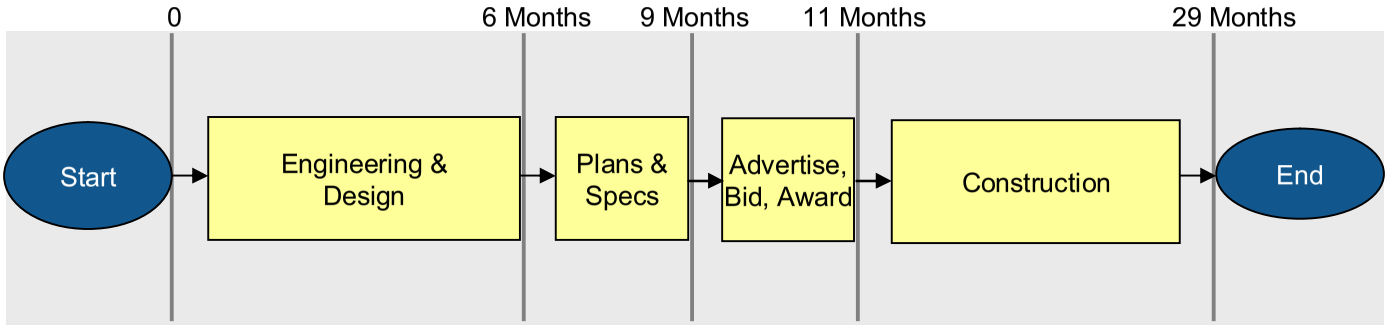
Further Considerations

- The pump station could be combined into a more permanent drainage solution.
- There would be minimal impact to the existing flow in the channel.
- Much of the work could be accomplished in the dry.
- A permanent pump station could be located on the canal while this site continues to operate in the interim.
- Relocation costs would include II Tonys Restaurant on Old Hammond Hwy. and much of the development on the first block of Lake Ave. on the east side of that street.

Conclusions

It is recommended that this project should be analyzed further for possible implementation. The addition of the pump station could either complement the pumps already on site or become a permanent drainage solution. This project would provide a great benefit to the community that would offset the residential and commercial takings.

Project 1



Environmental Compliance – Potential environmental issues, as discussed in the "Environmental Consideration" section, can be addressed during the engineering and design phase in order to keep off the critical path.

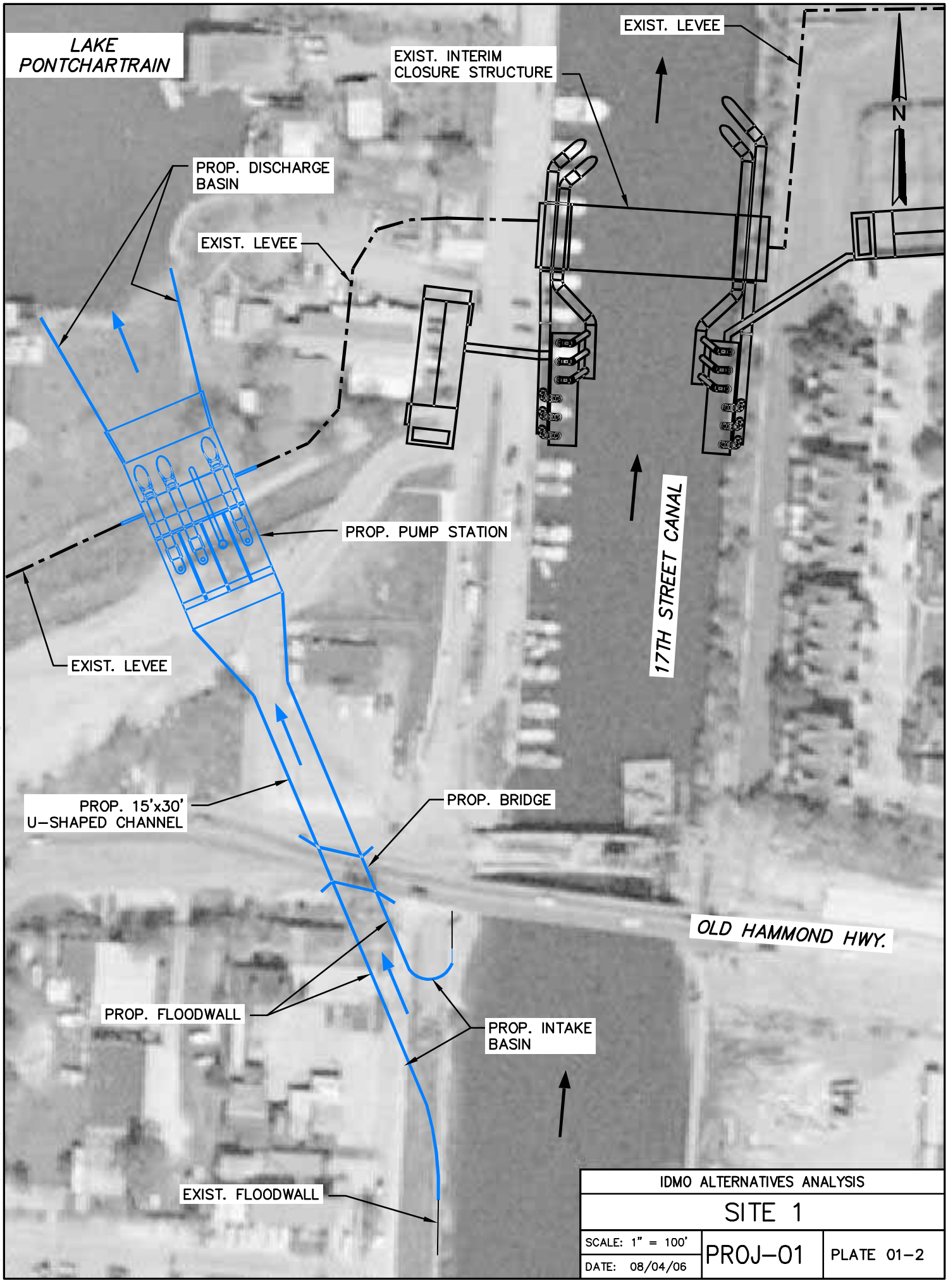
LERRD's – Any potential LERRD's , as discussed in the "Proposed Work" section, can be addressed during the engineering and design phase in order to provide for construction without causing delay.

Pump Procurement – Specifics on pumps can be identified early in the engineering and design phase in order to be delivered on-site, when needed, without causing delay. This should be done concurrent with overall schedule. This is not a critical path item in this flow chart. (estimated 18 month lead time required)

IDMO ALTERNATIVES ANALYSIS

LOCATION LAYOUT

SCALE: 1" = 2000'	PROJ-01	PLATE 01-1
DATE: 08/04/06		



IDMO ALTERNATIVES ANALYSIS		
SITE 1		
SCALE: 1" = 100'	PROJ-01	PLATE 01-2
DATE: 08/04/06		

Looking across Old Hammond Hwy from the lake side to 17th Street Canal

Proposed pumping station to be built behind II Tonys

Gate/Pump construction at 17th Street Canal/Lake Ponchartrain.

Site of proposed pumping station/gate.

Outfall of proposed pumping station/gate to Lake Ponchartrain

Looking from where proposed pump station/gate to 17th Street Canal.

Project No. 3

Add pumping capacity at lake on the Orleans Avenue Canal

Objective

The objective of this project is to increase the pumping capacity at the Orleans Avenue Canal and Lake Pontchartrain by adding a pumping station and intake basin at the East side of the Orleans Ave Canal. This pumping station could be temporary or permanent. The pumping station would be designed to operate at canal elevations substantially the same as non-storm event levels to provide the maximum pumping capacity at Drainage Pump Station 7.

Existing Conditions

The Orleans Ave. Canal flows from DPS 7 to Lake Pontchartrain. It is an open earthen channel with concrete floodwalls. The safe water elevation in the canal is 9 ft NGVD. A gate structure has been installed near the outfall to protect the canal from intrusion of the lake during a storm surge. Temporary pumps with a nominal capacity of 2,000 cfs have been placed at the gate to maintain drainage while the gates are closed.

The maximum capacity DPS 7 is 2,700 cfs, but the pump station is not able to perform at its maximum capability due to conveyance restrictions on the protected side. The actual maximum capacity at DPS 7 is 1,700 cfs.

Proposed Work

If the conveyance problem is corrected, extra pumps at the gate location would be necessary to discharge the additional 1000 cfs beyond the capacity of the temporary pumps.

Install a Pump Station on the East Side of Orleans Canal

Construct a pump station with a capacity of 1,700-2,700 cfs just east of the gate structure. The pump station would consist of two 1,000 cfs horizontal pumps and three 300 cfs vertical pumps. Intake and outfall basins would be built on either side of the pump station to feed water to the pumps. A 15 ft platform extension would be installed to provide an access road to the existing gate structure installed in the canal. The pump station would be designed to provide for future expansion, and the levee would be relocated to accommodate the expanded pump station. Total added pumping capacity would be 1,700-2,700 cfs. See **Plate 3-2**.

The capacity required for this project would depend on the alternate selected for the London Avenue Canal and whether improvements are made on the intake of Drainage Pumping Station No. 7.

Under this project the Orleans Ave Canal would be operated with a water surface elevation of 1.0 NAVD88 at the lake. This level would provide pumping capacity at DPS 7 equivalent to conditions existing during normal "gate-open" times.

Geotechnical Considerations

- Subsoil Conditions

  Based on available borings made in the general area, the subsoil conditions at the proposed construction site where Orleans Avenue Canal flows into Lake Pontchartrain would be expected to consist of about 10 ft. of fill material that was placed in the mid 1930's when that area of land was reclaimed by dredging operations. This fill material probably consists of granular material. The subsoils below the fill would also be expected to primarily consist of sand to about the 30 to 40 ft. depth. These granular soils would be underlain by normally consolidated clays to about the 60 ft. depth where the Pleistocene age soils would be expected to occur. These Pleistocene age soils would primarily consist of preconsolidated medium stiff to stiff clays to at least the 100 ft. depth below ground surface, but they could also include interbedded strata of medium dense to dense sand.

- Conceptual Foundation System

  Based on the subsoil conditions described above, it is believed that the pump station, as well as the intake and outfall basins, should be supported on driven piles. For timber, or composite, piles supporting the pump station, a capacity of 15 tons (F.S. = 2.0) in compression should be available. This is based on a 60 to 70 ft. long timber, or composite, pile (below existing grade). Piles used to support the intake and outfall basins would have a capacity of several tons less for the same pile tip depth. For piles subjected to uplift and lateral loading, a composite timber pile should not be considered. Higher capacities on the order of 30 to 50 tons would be available if steel "H" or pipe piles or prestressed concrete piles are used for support. These type piles should also be considered if a greater design life than typically provided by timber piles is desired. It is believed that the

relocated levee to the east side of the proposed pump platform could be constructed with normal procedures. Side slopes of 1 vertical on 3 horizontal on the canal side and 1 vertical of 4 horizontal on the land side should be satisfactory. However, it may be necessary to utilize high strength geotextile fabric to preclude the need of constructing wide stability berms on both sides of the levee should the subsoil conditions be inadequate to support the weight of the levee without them.

- Water Diversion and Cofferdam Arrangement

  The intake and discharge basins for the new pump platform would have to be constructed within cofferdams, internally braced at least at one location near the top of the cofferdam walls. For cost estimating purposes, a sheet pile penetration of about 60 ft. below ground surface would be expected. Some form of forced dewatering (deep wells, well points, etc.) would probably be required to dewater the shallow sands that would be expected down to about the 30 to 40 ft. depth below ground surface.

- Additional Geotechnical Investigations

  In general, the existing geotechnical data that has been developed for the existing gates and cellular cofferdams in the area should be used in the analysis of the proposed new construction. In addition to this, at least three (3) new soil borings, one at the proposed pump platform and one on both sides of the platform should be made to supplement that data. Geotechnical analyses with regard to compression, tension and lateral capacities of piles would be needed for support of the various elements of the pump facility. Analyses would also be needed relative to the stability and underseepage of the relocated levee. This should include consideration of the stability relative to the inflow and outfall canal of the new pump station and the effect of dredging of the inflow and outfall canals on the existing levee stability. In addition, analyses would be needed for the temporary retaining structure (structural and dewatering).

Structural Considerations

- Pump foundations shall be supported on composite timber piles due to water table fluctuations.

- All foundations shall be designed in accordance with the Geotechnical Report's recommendations.
- The pumps have been sized to accommodate the hydraulic requirements of this report.
- For relocation and orientate the existing engine platform see **Plate 3-2**.
- As for the structural integrity of the pump platform, along with the intake and outfall basins, and engine platforms (new and relocated), all components of the structure shall be designed in accordance with the state and local building code requirements and be able to withstand winds in excess of 150 mph. Their foundations shall be supported on composite timber piles due to water table fluctuations.
- All foundations shall be designed in accordance with the Geotechnical Report's recommendations.
- The engine deck for the pump station and engine platform would be elevated a minimum of one foot above the base flood elevation as shown on the FIRM map.
- Reconstruction of the levee at the proposed pump house shall be in accordance with the Geotechnical Report's recommendations.

Mechanical/Electrical Considerations

- Mechanical

  The pump station will require two (2) 1000 cfs horizontal pumps, diesel driven with the motors rated at 2000 HP. Sufficient fuel storage would need to be provided at the site to operate the pumps for up to 36 hours.

- Electric Service

  The local electric service is provided by Entergy. The anticipated electrical load at the pump station is including:

  - Three (3) 300 cfs vertical pump, motor rated at 700HP, medium voltage or approximate 1,560 KW
  - Balance of facility loads including power, lighting and auxiliary systems at approximate 300 KW. The electrical system will be stepped down to 480V and 120/208V with transformers and local distribution panels.

  The peak demand in the pumps station is approximate at 1.9 MW. Two service feeders shall be provided by Entergy for redundancy. In case of loss of one feeder the other feeder shall be capable of providing power for the entire pump station

demand. Main Substation will consist of MV vacuum type breakers and metering devices to meet Entergy standards. Service availability will be coordinated with Entergy during the design development.

- Standby Power

  Standby power source will be required in case of total black-out on utility grid occurs coincidence with the flood event. There are two options for providing standby power.

  - Option A: Locally installed 1-2 MW diesel generator to meet the peak demand. The generator will be specified for continuous duty with sufficient fuel storage to operate the pumps up to 36 hours.
  - Option B: Central Generation Plant. See description on Project 1.

Construction Considerations

All excavations will have to be supported with sheet piles.

The contractor will have to protect the existing levee during construction until the relocated levee is complete.

In all options, the site preparation could be accomplished while the pumps are on order.

- Prior to the construction, the Contractor shall implement construction procedures that will not impose on the integrity of the existing canal and its gate structures and levees.
- Temporary sheet piling can may used as an alternative for providing stability of the existing levee at the junction points of the new levee and intake/outfall basins.

Environmental Considerations

This project, like all the others, would satisfy the requirements of NEPA through a supplement to EA #433.

For this project, additional consultation with the SHPO is required because the proposed pumping station is in a neighborhood that may be eligible for the NRHP.

Order of Magnitude Cost Estimate

Cost Estimate - Project 3A	
Environmental	$5,000
Right-of-Way Acquisition	$0
Design	$3,181,809
Construction	$36,590,805
Total	**$39,777,614**

Cost Estimate - Project 3B	
Environmental	$5,000
Right-of-Way Acquisition	$0
Design	$2,031,809
Construction	$23,365,805
Total	**$25,402,614**

Roadmap/Timeline

Design – This would be divided into two phases that would be initiated concurrently, M&E and Civil. The M&E would include a fast-track specification of pumps and other equipment with long lead time deliveries. M&E fast-track should take 2 months and other design should take 4 months.

Environmental Clearance – Concurrent with design

Permits – The permits required concern water quality, and are issued by LDNR, this should be coordinated among the agencies to take no more than one month after final design is completed and be concurrent with the construction bid process.

LERRD – Land required for the pump station and relocated levee is within the drainage ROW. There would be no extra ROW acquisition required.

Construction – The 2700 cfs pump station proposed would take approximately 18 months to complete, and 1700 cfs pump station proposed would take approximately 16 months to complete. The pump station should be ready for pump installation within 18 months.

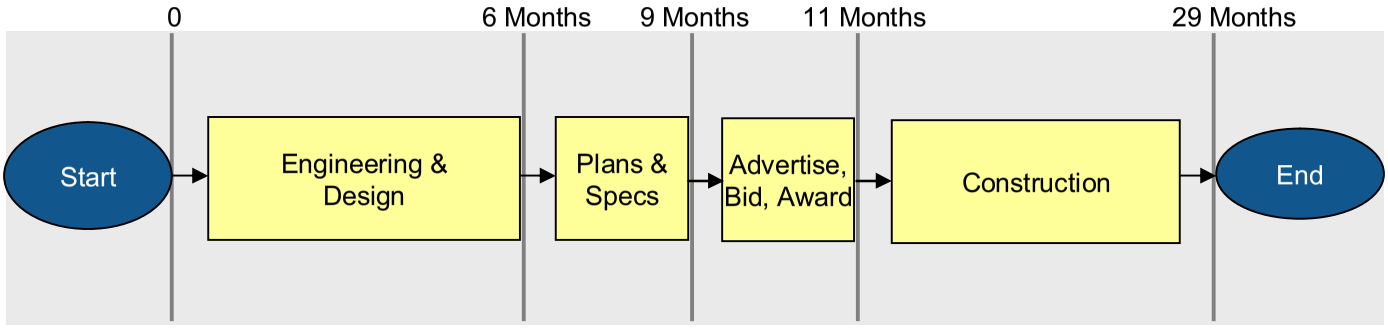
Show Stoppers

For the additional pump station to be effective, conveyance issues would have to be corrected upstream. Therefore, this project must be built in conjunction with other recommended projects to improve flow into the Orleans Avenue Canal.

Conclusion

This project is recommended for further study. The addition of a pump station adjacent to the closure gate at the outfall of the Orleans Avenue Canal would complement the pumps already in place. It could also be a permanent drainage solution with the flexibility to add capacity as needed.

Project 3A
2700 cfs

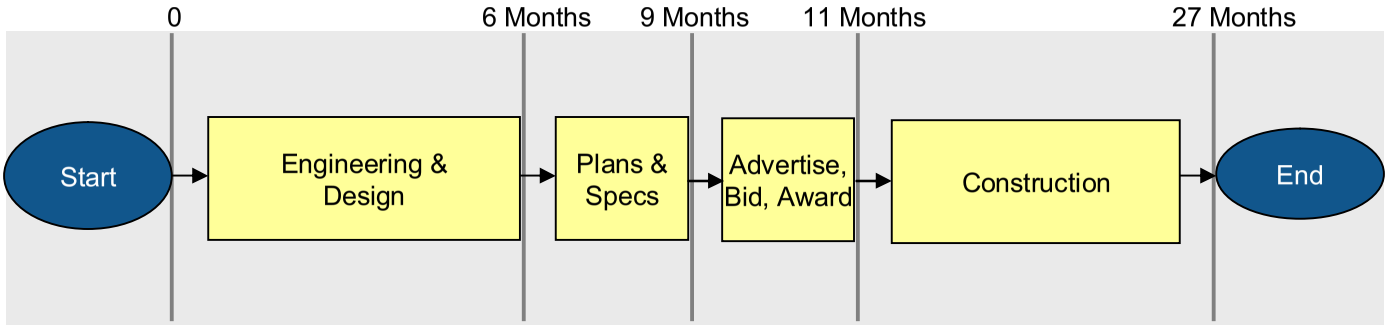


Environmental Compliance – Potential environmental issues, as discussed in the "Environmental Consideration" section, can be addressed during the engineering and design phase in order to keep off the critical path.

LERRD's – Any potential LERRD's , as discussed in the "Proposed Work" section, can be addressed during the engineering and design phase in order to provide for construction without causing delay.

Pump Procurement – Specifics on pumps can be identified early in the engineering and design phase in order to be delivered on-site, when needed, without causing delay. This should be done concurrent with overall schedule. This is not a critical path item in this flow chart. (estimated 18 month lead time required)

Project 3B
1700 cfs



Environmental Compliance – Potential environmental issues, as discussed in the "Environmental Consideration" section, can be addressed during the engineering and design phase in order to keep off the critical path.

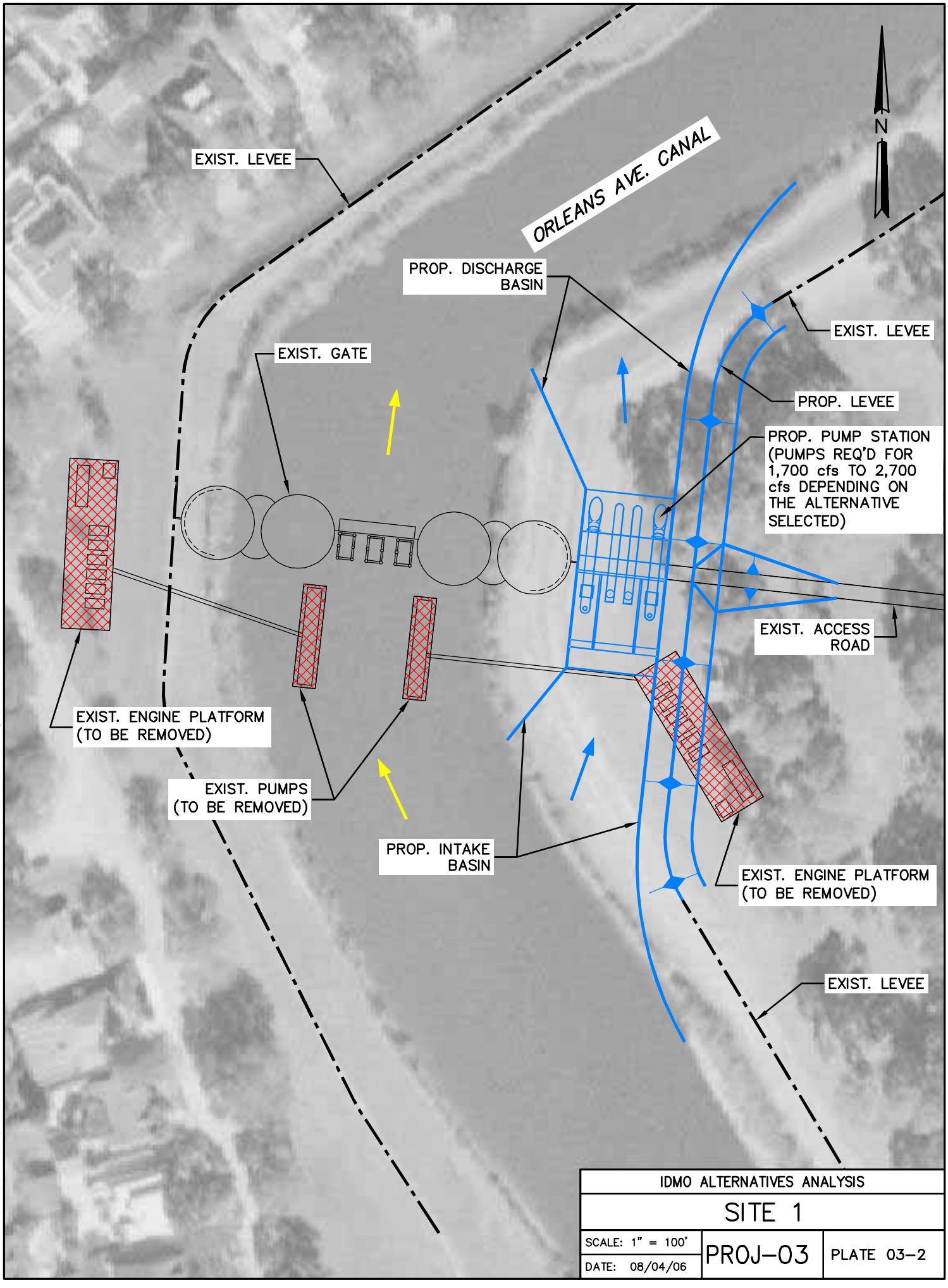
LERRD's – Any potential LERRD's , as discussed in the "Proposed Work" section, can be addressed during the engineering and design phase in order to provide for construction without causing delay.

Pump Procurement – Specifics on pumps can be identified early in the engineering and design phase in order to be delivered on-site, when needed, without causing delay. This should be done concurrent with overall schedule. This is not a critical path item in this flow chart. (estimated 18 month lead time required)

IDMO ALTERNATIVES ANALYSIS

LOCATION LAYOUT

SCALE: 1" = 2000'	PROJ-03	PLATE 03-1
DATE: 08/04/06		



IDMO ALTERNATIVES ANALYSIS		
SITE 1		
SCALE: 1" = 100'	PROJ-03	PLATE 03-2
DATE: 08/04/06		

Orleans Avenue Canal Gate (Looking at the south side of Orleans Avenue Canal gate.)

Orleans Avenue Canal (Looking North)

Project No. 4

Add pumping capacity at the lake on London Avenue Canal

Objective

The objective of this project is to increase the conveyance capacity of the London Avenue Canal by adding an intake basin and pumps to the east side of the London Avenue Canal to discharge into the lake when the floodgates are closed. These pumps could be temporary or permanent. The pumping station would be designed to operate at canal elevations substantially the same as non-storm event levels to provide the maximum pumping capacity at Drainage Pump Station 3 and 4.

Existing Conditions

The London Ave. Canal runs through Gentilly from DPS 3 northward to the lake. There are two pumping stations that discharge into the London Ave. Canal, DPS 3 at the southern terminus of the canal at Florida Avenue and N. Broad Street and DPS 4 at Prentiss Ave. on the east bank of the canal.

DPS 3 contains seven pumps with a combined capacity of 4,260 cfs. The pumps include five horizontal pumps, and two centrifugal pumps. The pumps are driven by seven 25 Hz electric motors.

DPS 4 contains six pumps with a combined capacity of 3,720 cfs. The pumps include three horizontal pumps, two centrifugal pumps and one vertical constant duty pump. The pumps are driven by four 25 Hz and two 60 Hz electric motors. DPS 4 also contains a 10’ and 2’ steel siphon over the canal to bring water from the west bank of the canal to the pump station with a capacity of 1,000 cfs.

A gate structure and temporary pumps are under construction where the London Ave. Canal discharges into Lake Pontchartrain. See Plate 04-1, Location Layout. The gate is intended to protect the canal from storm surges and the pumps are intended to discharge storm water otherwise contained in the canal by the gate. Scheduled to be in operation by October 31, 2006, these pumps have a combined capacity of 4,400 cfs. The London Ave. Canal has a theoretical conveyance capability of 7,980 cfs, as referenced from Memorandum for Task Force Hope, dated May 31, 2006. Previous studies indicate that a total capacity of 4,800 cfs would minimize impacts on interior storm water elevations.

Therefore, an additional pumping capacity of at least 400 cfs in the London Ave. Canal is needed.

Proposed Work

The proposed work is to install a pump station on the East Bank of London Avenue Canal A pump station would be built just east of the gate structure. Part of the existing cofferdam will be removed to construct this pump station. An intake and an outfall basin would be built on either side of the pump station to feed water to the pumps. The pump station would be built to provide for future expansion. The levee would be relocated to accommodate the pump station. The excavation and pump house can be constructed while the pumps are on order. Total added pumping capacity is 1,100 to 4,800 cfs. This would allow for the existing temporary pumps to be removed. See **Plate 04-2**.

This project for the London Ave. Canal would be operated with a water surface elevation of 1.0 NAVD88 at the lake. This level would provide pumping capacity at DPS 3 and 4 equivalent to conditions existing during normal "gate open" times.

Geotechnical Considerations

- Subsoil Conditions

  Based on available soil borings in the general area, the subsoil conditions at the project location are anticipated to consist of very soft to soft clay and organic clay to about the 15 ft. depth. The subsoil below this are more granular in character and generally consist of medium dense to very dense sands to about the 40 ft. depth. These sands are underlain by normally consolidated clay to about the 65 to 75 ft. depth where a stratum of dense to very dense sand was encountered. This sand stratum extends to at least the 100 ft. depth.

- Conceptual Foundation System

  Based on these subsoil conditions described above, it is believed that the pump station, as well as the intake and outfall basins, should be supported on driven piles. For timber, or composite, piles supporting the pump station, a capacity of 15 tons (F.S. = 2.0) in compression should be available. This is based on a 60 to 70 ft. long timber, or composite, pile (below existing grade). Piles used to support the intake and outfall basins would have a capacity of several tons less for the same pile tip elevation. For piles subjected to uplift and lateral loading, a

composite timber pile should not be considered. Higher capacities on the order of 30 to 50 tons would be available if steel "H" or pipe piles or prestressed concrete piles are used for support. These type piles should also be considered if a greater design life than typically provided by timber piles is desired. It is believed that the relocated levee to the east side of the proposed pump platform could be constructed with normal procedures. Side slopes of 1 vertical on 3 horizontal on the canal side and 1 vertical of 4 horizontal on the land side should be satisfactory. However, it may be necessary to utilize high strength geotextile fabric to preclude the need of constructing wide stability berms on both sides of the levee should the subsoil conditions be inadequate to support the weight of the levee without them.

- Water Diversion and Cofferdam Arrangement

  The intake and discharge basins for the new pump platform would have to be constructed within cofferdams, internally braced at least at one location near the top of the cofferdam walls. For cost estimating purposes, a sheet pile penetration of about 60 ft. below ground surface would be expected. Some form of forced dewatering (deep wells, well points, etc.) would probably be required to dewater the shallow sands that would be expected down to about the 40 ft. depth below ground surface.

- Additional Geotechnical Investigations

  In general, the existing geotechnical data that has been developed for the existing gates and cellular cofferdams should be used in the analysis of the proposed new construction. In addition to this at least three (3) new soils borings, one at the proposed pump platform and one on both sides of the platform should be made to supplement that data. Geotechnical analyses with regard to compression, tension and lateral capacities of piles would be needed for support of the various elements of the pump facility. Analyses would also be needed relative to the stability and underseepage of the relocated levee. This should include consideration of the stability relative to the inflow and outfall canal of the new pump station and the effect of dredging of the inflow and outfall canals on the existing levee stability.

In addition, analyses would be needed for the temporary retaining structures (structural and dewatering).

Structural Considerations

- As for the structural integrity of the pump platform, along with the intake and discharge basins, and engine platforms, both new and relocated, all components of the structure shall be designed in accordance with the state and local building code requirements and be able to withstand winds in excess of 150 mph.
- Their foundations shall be supported on composite timber piles due to water table fluctuations.
- All foundations shall be designed in accordance with the Geotechnical Report's recommendations.
- The engine platform for would be elevated a minimum of one foot above the base flood elevation as shown on the FIRM map.
- Reconstruction of the levee at the proposed pump house shall be in accordance with the Geotechnical Report's recommendations.

Mechanical/Electrical Considerations

- Mechanical

  The pump station will require four (4) 1000 cfs horizontal pumps, diesel driven with the motors rated at 2000 HP. Sufficient fuel storage would need to be provided at the site to operate the pumps for up to 36 hours.

- Electric Service

  The local electric service is provided by Entergy. The anticipated electrical load at the pump station is including:

  - Three (3) 300 cfs vertical pump, motor rated at 700HP, medium voltage or approximate 1,560 KW
  - Balance of facility loads including power, lighting and auxiliary systems at approximate 300 KW. The electrical system will be stepped down to 480V and 120/208V with transformers and local distribution panels.

  The peak demand in the pumps station is approximate at 1.9 MW. Two service feeders shall be provided by Entergy for redundancy. In case of loss of one feeder the other feeder shall be capable of providing power for the entire pump station

demand. Main Substation will consist of MV vacuum type breakers and metering devices to meet Entergy standards. Service availability will be coordinated with Entergy during the design development.

- Standby Power

  Standby power source will be required in case of total black-out on utility grid occurs coincidence with the flood event. There are two options for providing standby power.

  - Option A: Locally installed 1-1.5 MW diesel generator to meet the peak demand. The generator will be specified for continuous duty with sufficient fuel storage to operate the pumps up to 36 hours.
  - Option B: Central Generation Plant. See description on Project 1.

Construction Considerations

- Prior to the construction of the additional engine platform and pump station foundations, the Contractor shall implement a construction procedure that will not impose on the integrity of the existing canal and levee.
- Temporary sheet piling can may used as an alternative for providing stability of the existing levee at the junction points of the new levee and intake/outfall basins.
- In addition, the Contractor should take precautions when removing the existing temporary pumps from the canal.

Environmental Considerations

This project, like all the others, would satisfy the requirements of NEPA through a supplement to EA #433.

For this project, additional consultation with the SHPO is required because the proposed pumping station is in a neighborhood that may be eligible for the NRHP.

Order of Magnitude Cost Estimate

Cost Estimate - Project 4 (A)	
Environmental	$5,000
Right-of-Way Acquisition	$0
Design	$5,635,590
Construction	$64,809,280
Total	**$70,449,870**

Cost Estimate - Project 4 (B)	
Environmental	$5,000
Right-of-Way Acquisition	$0
Design	$1,380,590
Construction	$15,876,780
Total	**$17,262,370**

Road Map/Time line

Design – This would be divided into two phases that would be initiated concurrently, M&E and Civil. The M&E would include a fast-track specification of pumps and other equipment with long lead time deliveries. M&E fast-track should take 2 months and other design should take 4 months.

Environmental Clearance – Concurrent with design

Permits – The permits required concern water quality, and are issued by LDNR, this should be coordinated among the agencies to take no more than one month after final design is completed and be concurrent with the construction bid process.

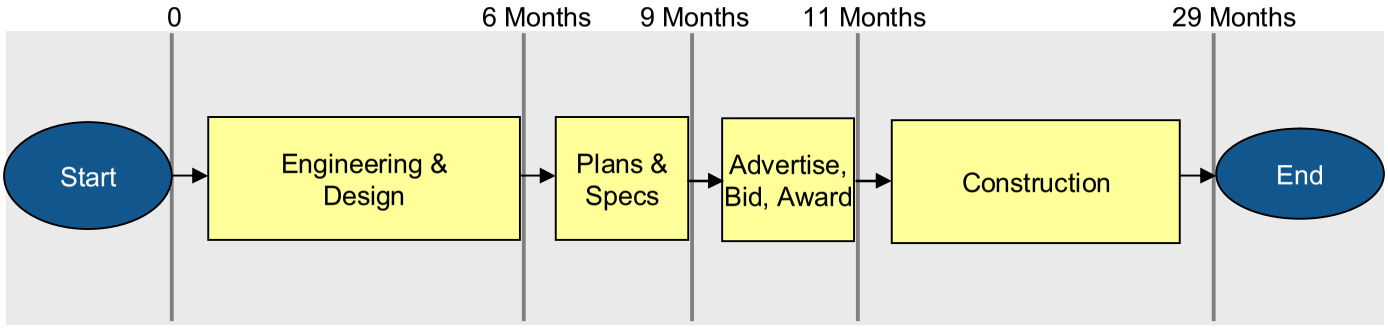
LERRD – Land required for the pump station and relocated levee is owned by the University of New Orleans. ROW to install the improvement would have to be purchased from the university. This must be concurrent with Design and could be the critical path of the Civil design.

Construction –The 4800 cfs pump station proposed would take approximately 18 months to complete, and 1100 cfs pump station proposed would take approximately 15 months to complete. The pump station should be ready for pump installation within 18 months.

Conclusion

This project is recommended for further study. The addition of a pump station adjacent to the closure gate at the outfall of the London Avenue Canal would complement the pumps already in place. It could also be a permanent drainage solution with the flexibility to add capacity as needed.

Project 4A
4800 cfs

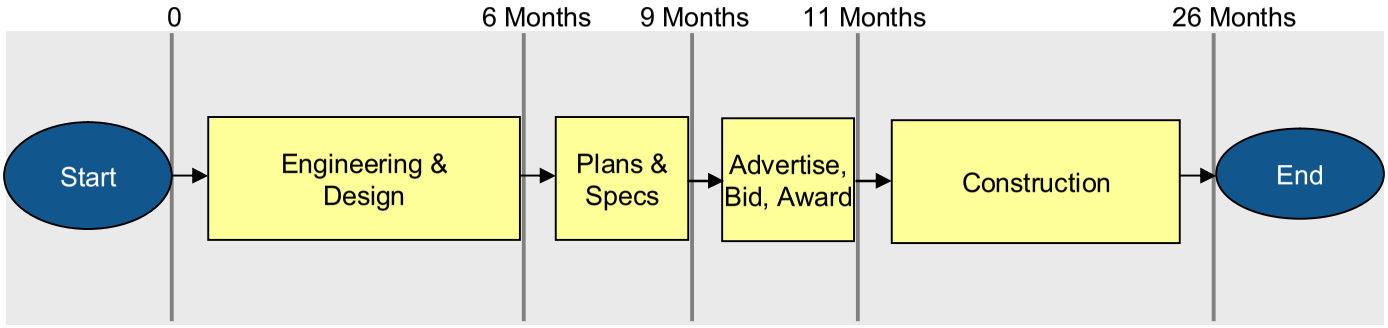


Environmental Compliance – Potential environmental issues, as discussed in the "Environmental Consideration" section, can be addressed during the engineering and design phase in order to keep off the critical path.

LERRD's – Any potential LERRD's , as discussed in the "Proposed Work" section, can be addressed during the engineering and design phase in order to provide for construction without causing delay.

Pump Procurement – Specifics on pumps can be identified early in the engineering and design phase in order to be delivered on-site, when needed, without causing delay. This should be done concurrent with overall schedule. This is not a critical path item in this flow chart. (estimated 18 month lead time required)

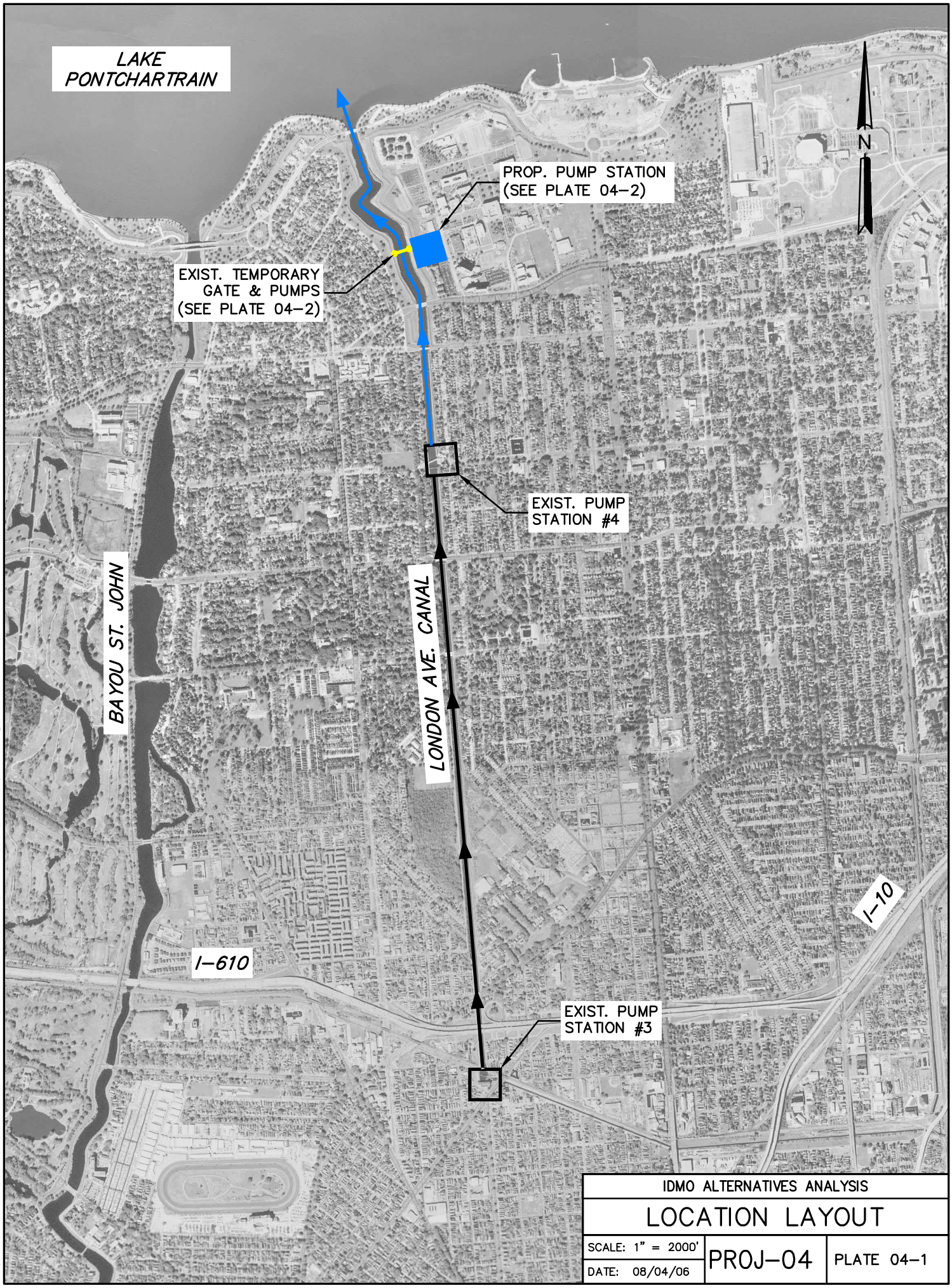
Project 4B
1100 cfs



Environmental Compliance – Potential environmental issues, as discussed in the "Environmental Consideration" section, can be addressed during the engineering and design phase in order to keep off the critical path.

LERRD's – Any potential LERRD's , as discussed in the "Proposed Work" section, can be addressed during the engineering and design phase in order to provide for construction without causing delay.

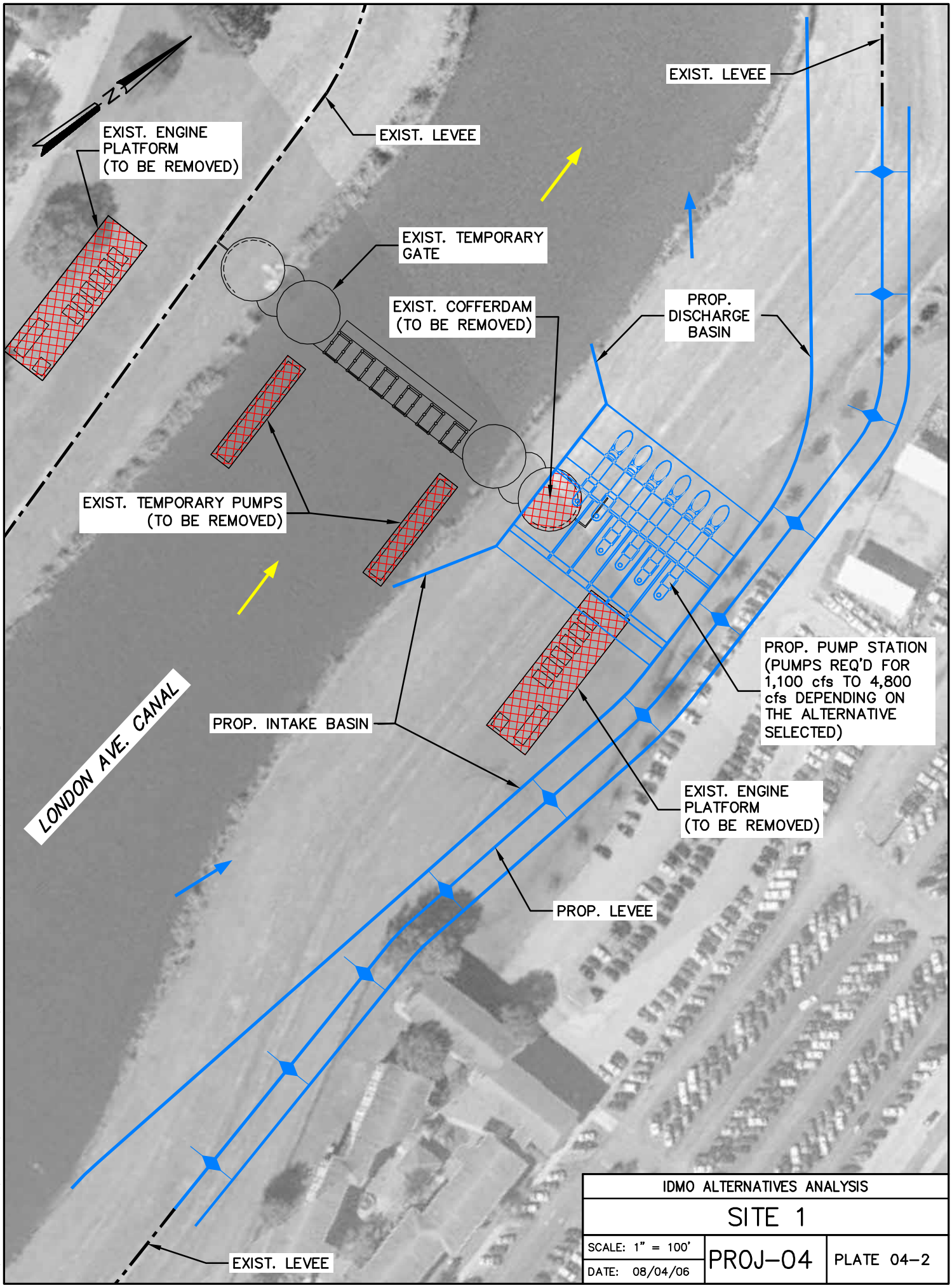
Pump Procurement – Specifics on pumps can be identified early in the engineering and design phase in order to be delivered on-site, when needed, without causing delay. This should be done concurrent with overall schedule. This is not a critical path item in this flow chart. (estimated 12 month lead time required)



IDMO ALTERNATIVES ANALYSIS

LOCATION LAYOUT

SCALE: 1" = 2000'	PROJ–04	PLATE 04–1
DATE: 08/04/06		



IDMO ALTERNATIVES ANALYSIS		
SITE 1		
SCALE: 1" = 100'	PROJ-04	PLATE 04-2
DATE: 08/04/06		

London Avenue Canal Gate (Looking southwest, from the lake side)

Discharge tubes on the east bank of canal (Looking southwest, from the lake side)

London Avenue Canal Gate (Looking northeast, from the canal side)

Temporary pumps on the west bank of canal (Looking northeast, from the canal side)

Project No. 10

Divert Flow from DPS 3 to Florida Ave. Canal to DPS 19

Objective

The objective of this project is to reduce pumping requirements on the London Avenue Canal at Lake Pontchartrain by diverting 1,100 cfs that is discharged from DPS 3 into the Florida Ave. Canal, which flows to DPS 19 and discharges into the Industrial Canal.

Existing Conditions

The Industrial Canal is a 5.5 mile waterway located within the limits of the City of New Orleans that connects the Mississippi River and Lake Pontchartrain. Although it is referred to as the "Industrial Canal" both by commercial mariners and by landside residents, its proper name is the Inner Harbor Navigation Canal (IHNC).

DPS 3 is located in the intersection of N. Broad St. and Florida Ave which contains five horizontal pumps; three of these pumps empty into the London Ave. Canal. The other two are capable of pumping 1,100 cfs (two 550 cfs pumps) into the Florida Ave. Canal draining east to DPS 19. The efficiency of these latter two pumps is compromised, however, by a site limitation. The concrete wall between the discharge flume and the intake basin at the Florida Avenue Canal is too short and allows water from the discharge flume of the two 550 cfs pumps to spill back into the intake basin. This causes the water to recycle and reduces the pumping capacity of the station. Modifications to the discharge flume, and possibly other elements of the station, would be required to allow the full 1,100 cfs to enter the Florida Ave Canal.

DPS 19 is located at the end of the Florida Ave Canal and pumps into the Industrial Canal. It consists of five pumps (three horizontal, 1050 cfs each, and two vertical, 250 cfs each) capable of up to 3,650 cfs of flow into the INHC.

The Florida Ave Canal is an open channel concrete structure 25' at the base with vertical walls approximately 7' on either side. From DPS 3 to DPS 19, the canal measures approximately 14,000 linear feet. It has been determined that the canal is capable of handling a flow of approximately 2,100 cfs up to Peoples Avenue Canal, which also contributes to Florida Ave Canal, and approximately 3,200 cfs from that point to the DPS 19. Along the Florida Ave Canal, there are three railroad bridges, a pedestrian bridge, a roadway bridge, and a box culvert. The 10' x 25' box culvert at Louisa St and Piety St is

a major constriction as it only handles 1,700 cfs of flow. This causes the water to overflow the canal banks and flood the adjacent neighborhood.

At this time, a Florida Ave Canal expansion has been designed which rebuilds the entire canal with a base of 43.5' and walls at a height of 13.5'

Proposed Work

Modifications are needed at DPS 3 to prevent the discharge from the two 550 cfs pumps from spilling back into the intake basin and recycling through the pump station. The gate that allows water to be directed to the Florida Ave Canal may also require modification to allow the full 1,100 cfs to flow through. This project includes these modifications to DPS 3 and three options for improvements in the capacity of the Florida Canal:

Option A

Place a 20' x 10' box underneath from Louisa St. to Piety St. adjacent to the existing box. See **Plate 10a-1** Location Layout, **Plate 10a-2**, Proposed Culvert and Plate **10a-3**, Typical Section. This extra culvert would increase the flow by 1,300 cfs at the major point of constriction from Louisa St. to Piety St. This option would require the removal and relocation of a 48" steel water line. It would also require removing the north shoulder of Florida Ave in order to relocate that steel water line.

Option B

Place six 300 cfs pumps at Louisa St. and run pipes on a pipe bridge over Louisa St. and Piety St. The pumps would be located west of Louisa St. in a small intake basin to the north of the existing Florida Ave Canal. Six 60" pipes would tie into two larger pipes and carry the water over both Louisa St. and Piety St. and discharge back into the Florida Ave Canal at the end of the existing box culvert east of Piety St. See Plate **10b-1**, Location Layout, and **Plate 10b-2**, Additional Pumps.

Option C

Fast-track the planned expansion of the Florida Ave. Currently, under the SELA program, there are plans to expand the Florida Avenue Canal from Deer St. to DPS 19. See **Plate 10c-1**, Location Layout, **Plate 10c-2**, Canal Widening & Reconstruction - Layout 1, **Plate 10c-3**, Canal Widening & Reconstruction - Layout 2 and **Plate 10c-4**, Typical Section.

Geotechnical Considerations

- Subsoil Conditions

  Based on borings made with in the general area, subsoil conditions at the proposed construction site along Florida Avenue Canal between Louisiana and Piety Streets would be expected to consist of very soft to soft clay, organic clay or humus to about the 10 ft. depth. The subsoils below this depth consist of very soft to soft clay to about the 55 ft. depth where a stratum of dense to very dense sand would be expected. Based on available data, this sand stratum extends to at least the 100 ft. depth below ground surface.

- Conceptual Foundation System

  Project 10 has several options that include below ground box culverts, new pumps and an above ground pipe bridge. All of these type structures should be supported on piles driven to firm embedment into the dense to very dense sand stratum. For timber piles supporting the pump station and pipe bents, a capacity of about 20 to 25 tons (F.S. = 2.0) in compression should be available. Piles used to support the below ground box culvert would have a capacity of several tons less for the same pile tip depth. Higher capacities on the order of 50 tons would be available if steel "H" or pipe piles or prestressed concrete piles are used for support. These type piles should also be considered if a greater design life than typically provided by timber piles is desired.

- Water Diversion and Cofferdam Arrangement

  The underground box culvert would have to be constructed within a cofferdam, internally braced at least at one location at the top of the cofferdam walls. For cost estimating purposes, a sheet pile penetration of about 50 ft. below ground surface would be expected. Considering the depth to the dense to very dense sand stratum, forced dewatering would probably not be required. The cofferdam should be able to be dewatered with normal sumps and pumps.

- Additional Geotechnical Investigations

  While not known with certainty, there may be sufficient geotechnical data that was prepared for the planned expansion of the Florida Avenue Canal. If this is unavailable, then soil borings on at least about 300 ft. spacings should be

performed with at least one at the proposed Pump Platform. Geotechnical analyses with regard to compression, tension and lateral capacities of piles would be needed for support of the various elements of the pump facility and pipe bents. Analyses were also be needed relative to the temporary retaining structures (structural and dewatering).

Structural Considerations

All box culverts and canals have been sized to accommodate the hydraulic requirements of this report.

Option A

The new box culvert shall be designed in accordance with the Geotechnical Report's recommendations. As for the structural integrity of the box culverts, their foundations shall be supported on timber piles.

Option B

A pipe support structure (bridge) shall be built to facilitate the two 6' diameter (above ground) pipes, which run from the proposed pump to the existing Florida Ave. Canal, See Plate 10b-3, Support Details. In addition, the pump platform foundations shall be supported on composite timber piles (due to water table fluctuations) while the intake basin will be founded on timber piles. All foundations shall be designed in accordance with the Geotechnical Report's recommendations.

Option C

Since this alternate is just the implementation of the proposed Florida Ave. Canal widening all structural consideration has been documented within the contract drawings and specifications.

Mechanical/Electrical Considerations

N/A

Construction Considerations

The Florida Ave Canal is a major utility corridor that includes the Norfolk Southern railroad tracks, a 72" sewer force main, a 54" sewer force main, a 48" water force main, a major power transmission line installation, and several electrical distribution lines that will cause major construction issues.

Options A and C would could have major costs associated with utility relocations.

Option A would only require the relocation of the water force main. Traffic maintenance during construction would need to be addressed since the excavation will extend into the westbound lane of Florida Ave and that shoulder would have to be removed for relocation of utilities.

Prior to the construction of the new box culvert, the Contractor shall implement a construction procedure that will not impose on the structural integrity of the existing adjacent box culvert 15' beyond junction points. Temporary sheet piling be may used as an alternative for providing stability of the existing culvert along Florida Ave. See Plate 10a-3 "Typical Section".

Prior to the construction of the proposed pump platforms, the Contractor shall implement a construction procedure that will not impose on the structural integrity of the existing canal. Temporary sheet piling can may used as an alternative for providing stability of the existing canal at the junction point of the intake basin.

Environmental Considerations

This project, like all the others, would satisfy the requirements of NEPA through a supplement to EA #433.

It appears that that the area along Florida Ave. may be an environmental justice area. A determination must be made and actions taken accordingly.

Order of Magnitude Cost Estimate

Option A

Cost Estimate - Project 10 (A)

Environmental	$5,000
Right-of-Way Acquisition	$0
Design	$285,796
Construction	$3,286,658
Total	**$3,577,454**

Option B

Cost Estimate - Project 10 (B)	
Environmental	$5,000
Right-of-Way Acquisition	$0
Design	$695,931
Construction	$8,003,211
Total	**$8,704,143**

Option C

As of July 2002, the total project cost for the Florida Avenue Canal Expansion from Deers St. to DPS 19 was $60.5 million. The total project consists of four phases. Currently, two of these four phases are to be let within the next few months (August–October 2006). These two phases start at Piety St. and continue through to DPS 19 and have been recently estimated to cost ~$80 million. By using the information on the original cost estimate and comparing w/ the current estimate for two of the four phases, the entire project from Deer St. to DPS 19 is estimated to cost ~$130 million.

Roadmap / Timeline

Option A

Design – It should take approximately 4 months to complete the design.

Environmental Clearance – Potential environmental justice issues could impact the critical path of the project. See Environmental Considerations.

Permits – The permits required concern water quality, and are issued by LDNR, this should be coordinated among the agencies to take no more than one month after final design is completed and be concurrent with the construction bid process.

LERRD – Land required is within the existing right-of-way. There is a water line relocation that could be a critical path item during construction.

Construction – The proposed work would take approximately 4 months to complete.

Option B

This option is not recommended for further study.

Option C

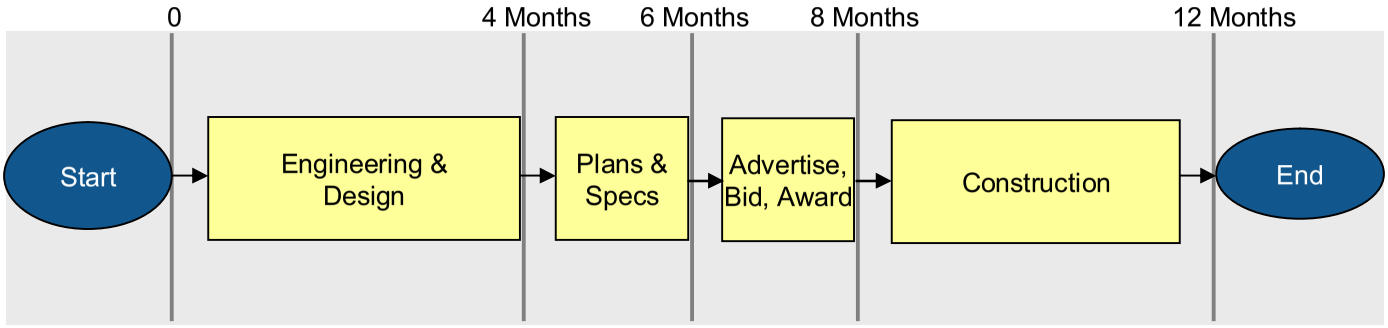
Two phases of the work covered under the SELA program will be advertised in September 2006. Construction of the two phases should be complete in 18 months.

Conclusion

Option A of this project is recommended for further study for the following reasons:

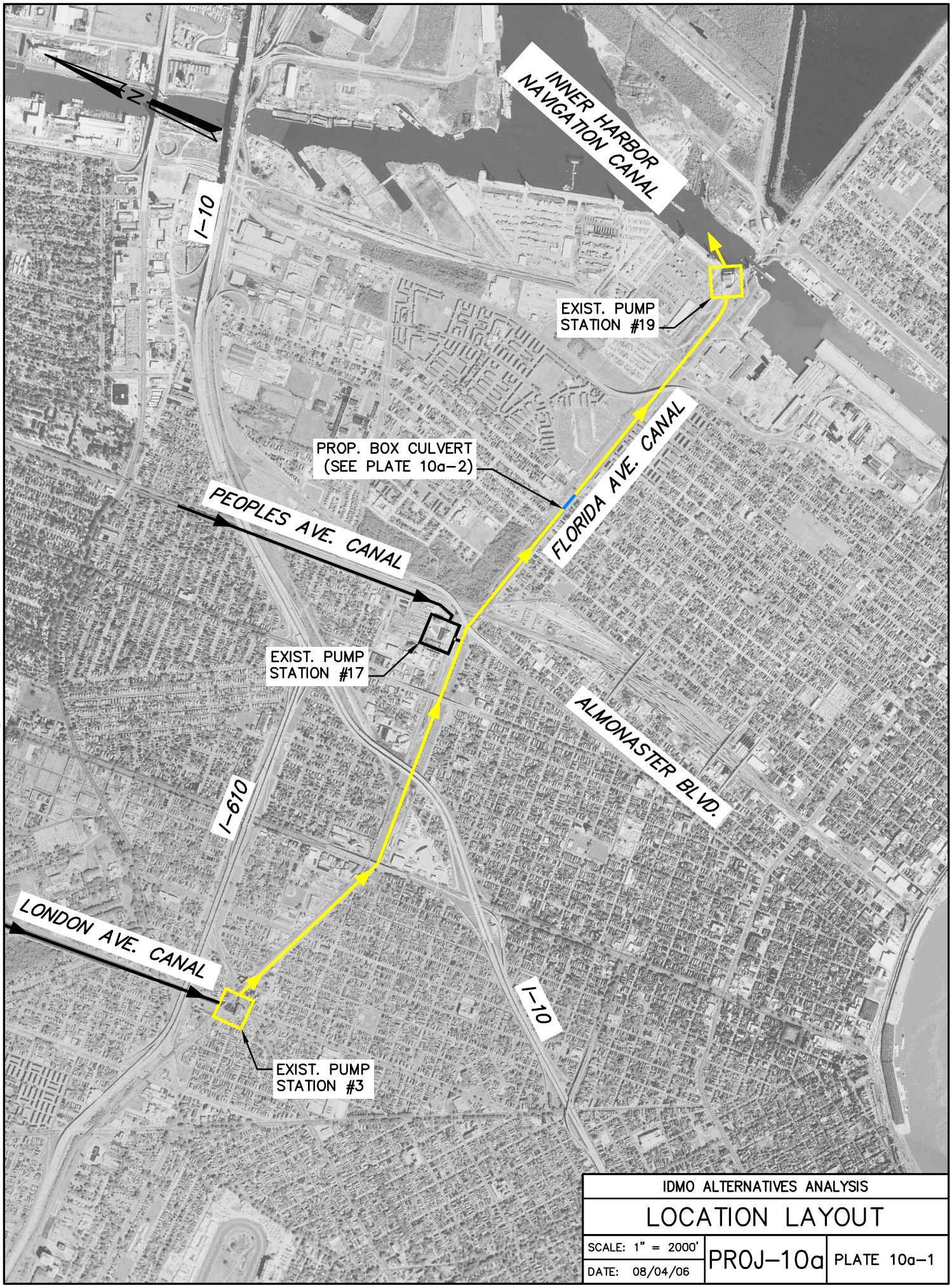
1. The addition of a parallel box culvert at Louisa St. would remove the current constriction of flow that minimizes the capacity of the channel.
2. The cost for the additional box culvert at Louisa St. and the wall and gate improvements at DPS 3 are small compared to other projects.
3. The work would complement the SELA improvements to the Florida Avenue Canal.
4. The improved capacity in the channel restores the flexibility to the municipal drainage system to bypass water around the London Avenue Canal.

Project 10A



Environmental Compliance – Potential environmental issues, as discussed in the "Environmental Consideration" section, can be addressed during the engineering and design phase in order to keep off the critical path.

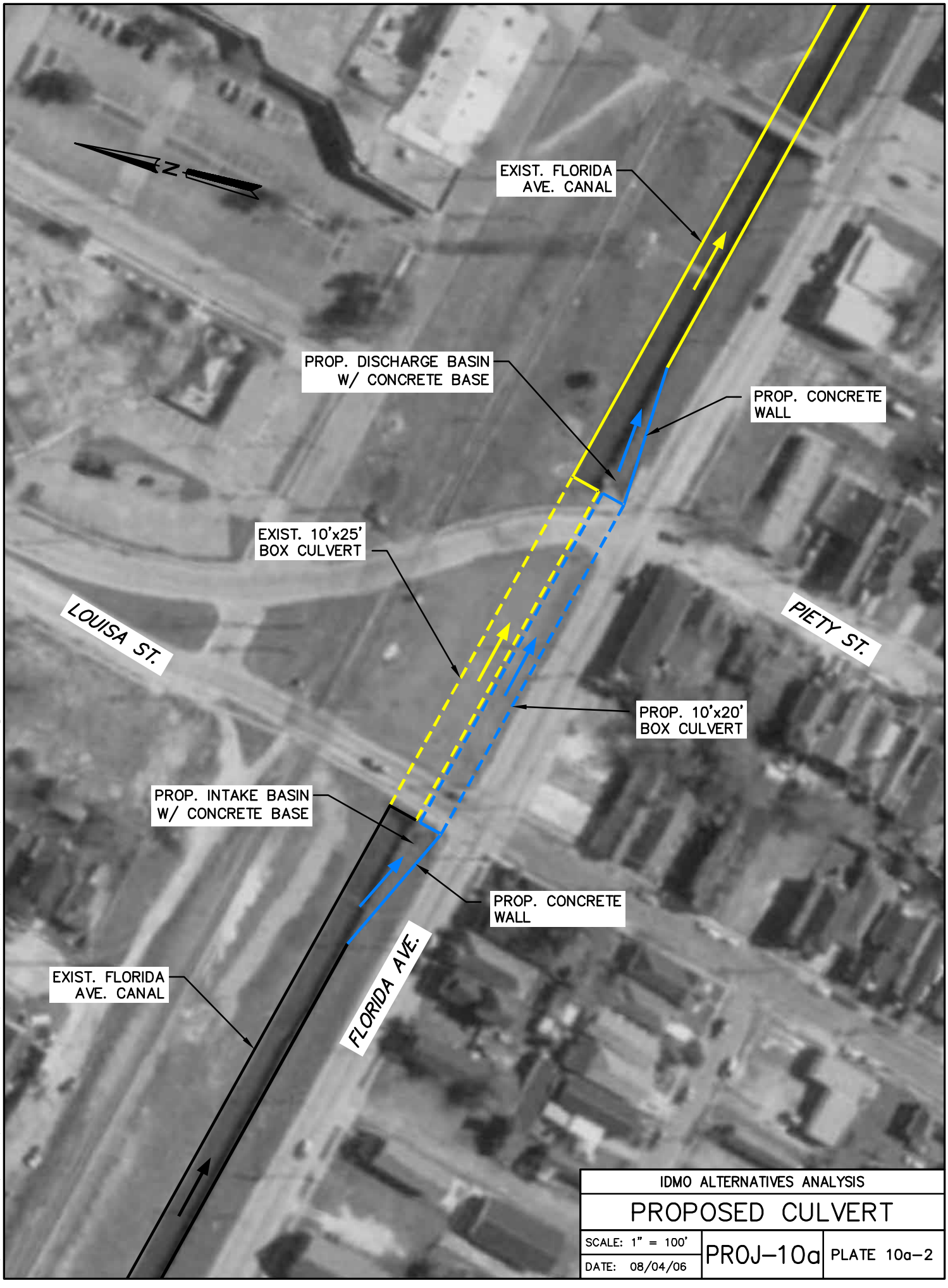
LERRD's – Any potential LERRD's , as discussed in the "Proposed Work" section, can be addressed during the engineering and design phase in order to provide for construction without causing delay. Coordination on utility requirements is essential.



IDMO ALTERNATIVES ANALYSIS

LOCATION LAYOUT

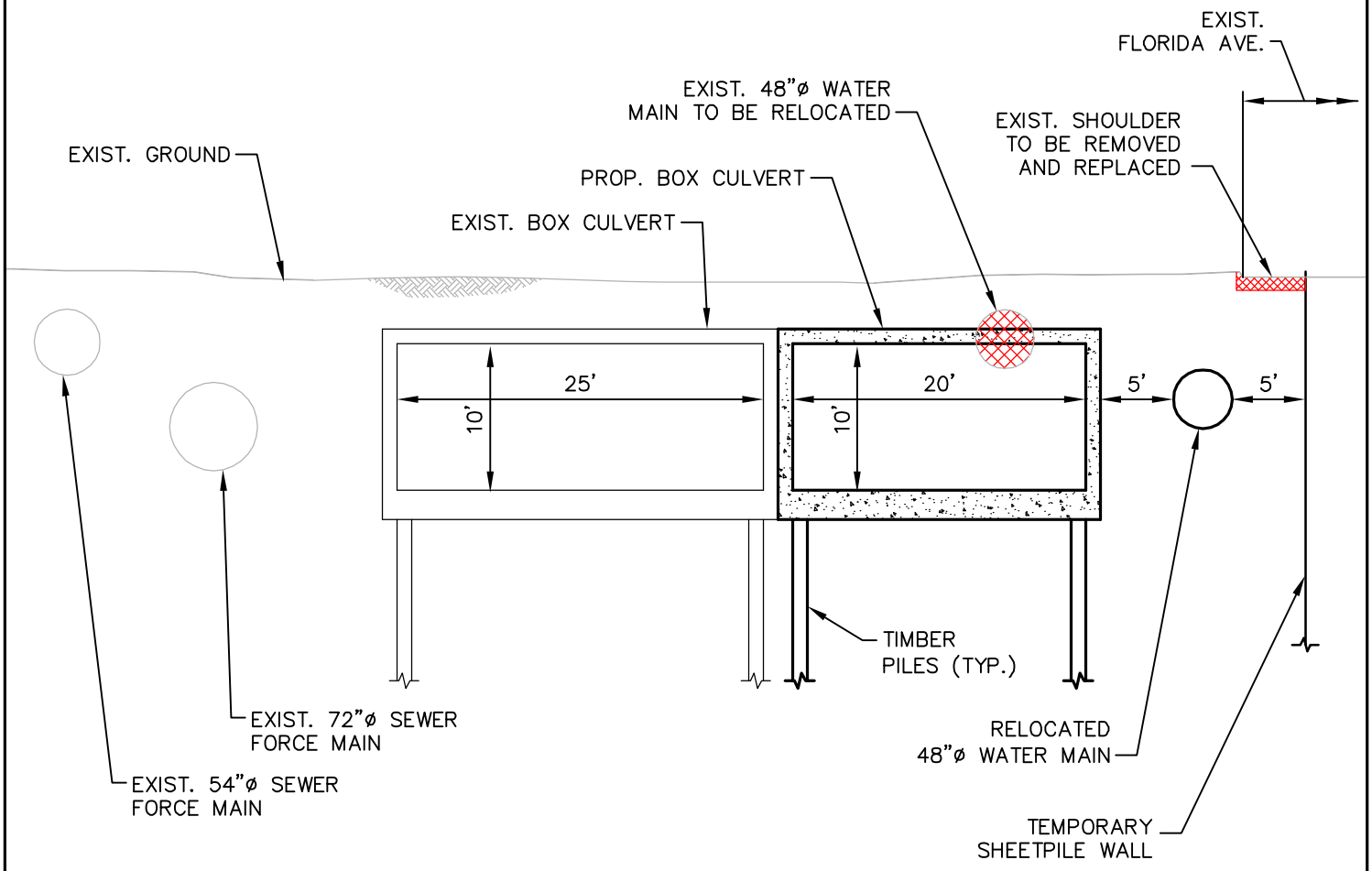
SCALE: 1" = 2000'	PROJ-10a	PLATE 10a-1
DATE: 08/04/06		



IDMO ALTERNATIVES ANALYSIS

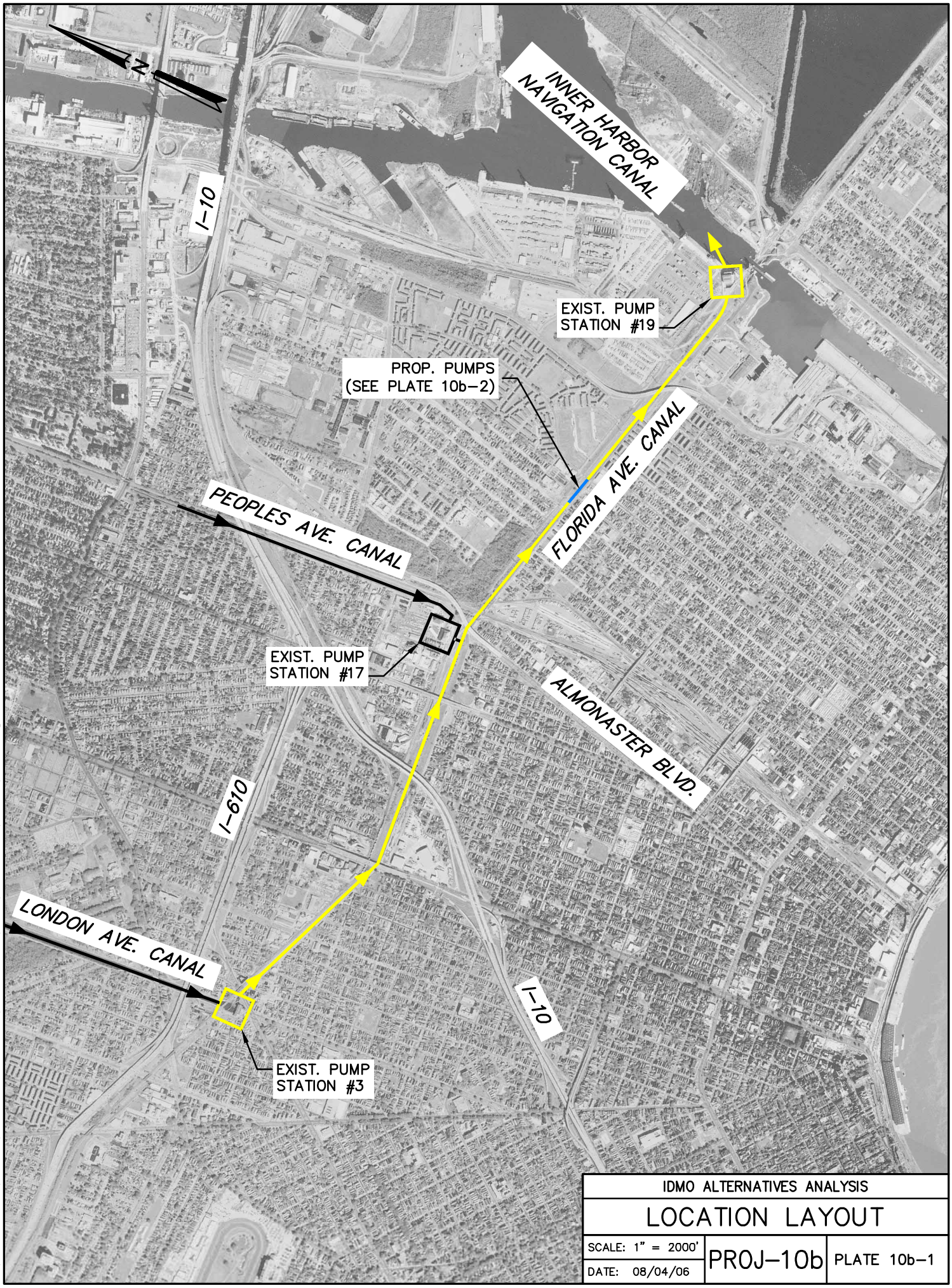
PROPOSED CULVERT

SCALE: 1" = 100'	PROJ-10a	PLATE 10a-2
DATE: 08/04/06		



PROP. 10'x20' BOX CULVERT
TYPICAL SECTION
N.T.S.

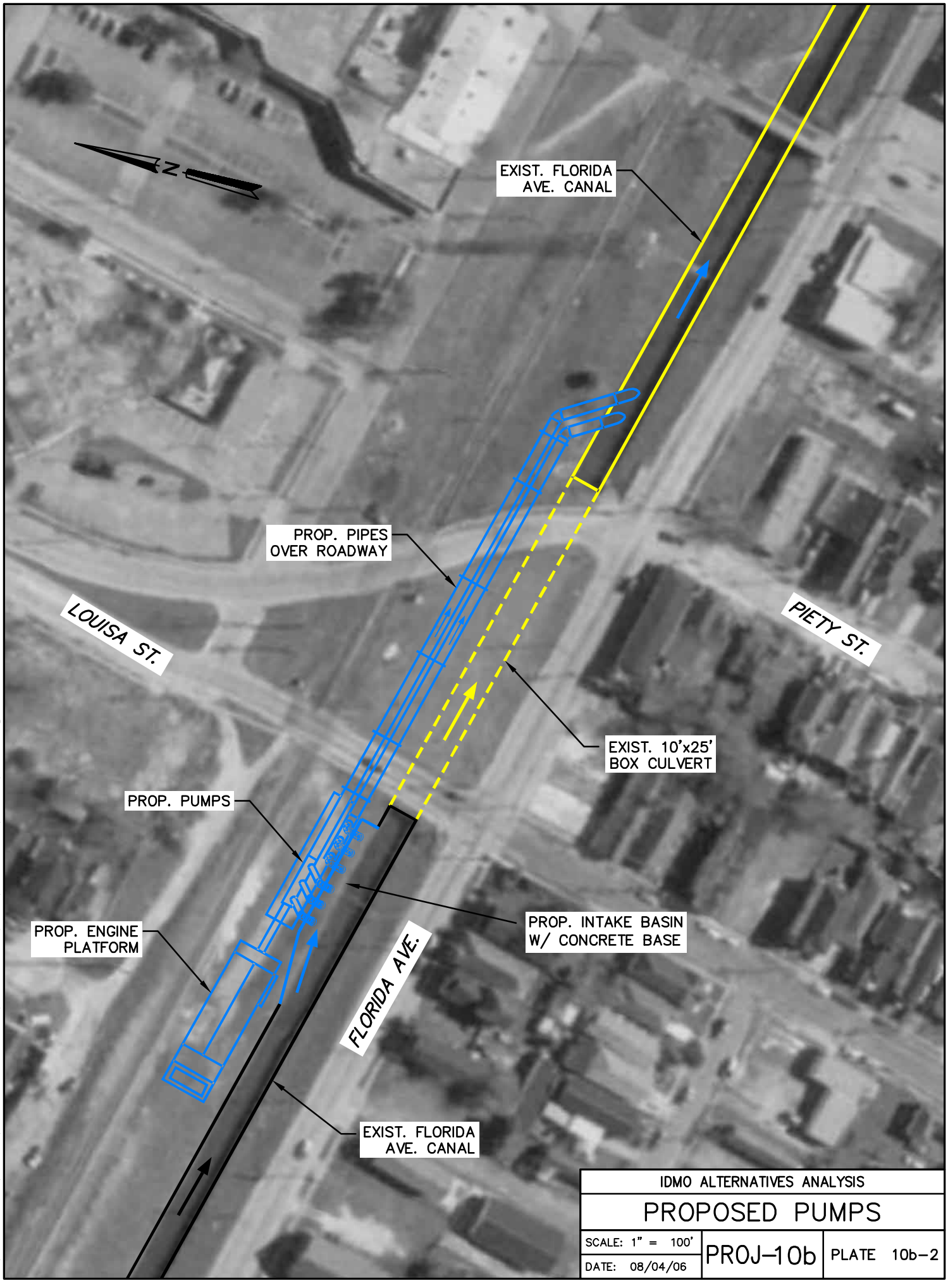
IDMO ALTERNATIVES ANALYSIS		
10'x20' CULVERT SECTION		
SCALE: 1" = N.T.S.	PROJ-10a	PLATE 10a-3
DATE: 08/04/06		



IDMO ALTERNATIVES ANALYSIS

LOCATION LAYOUT

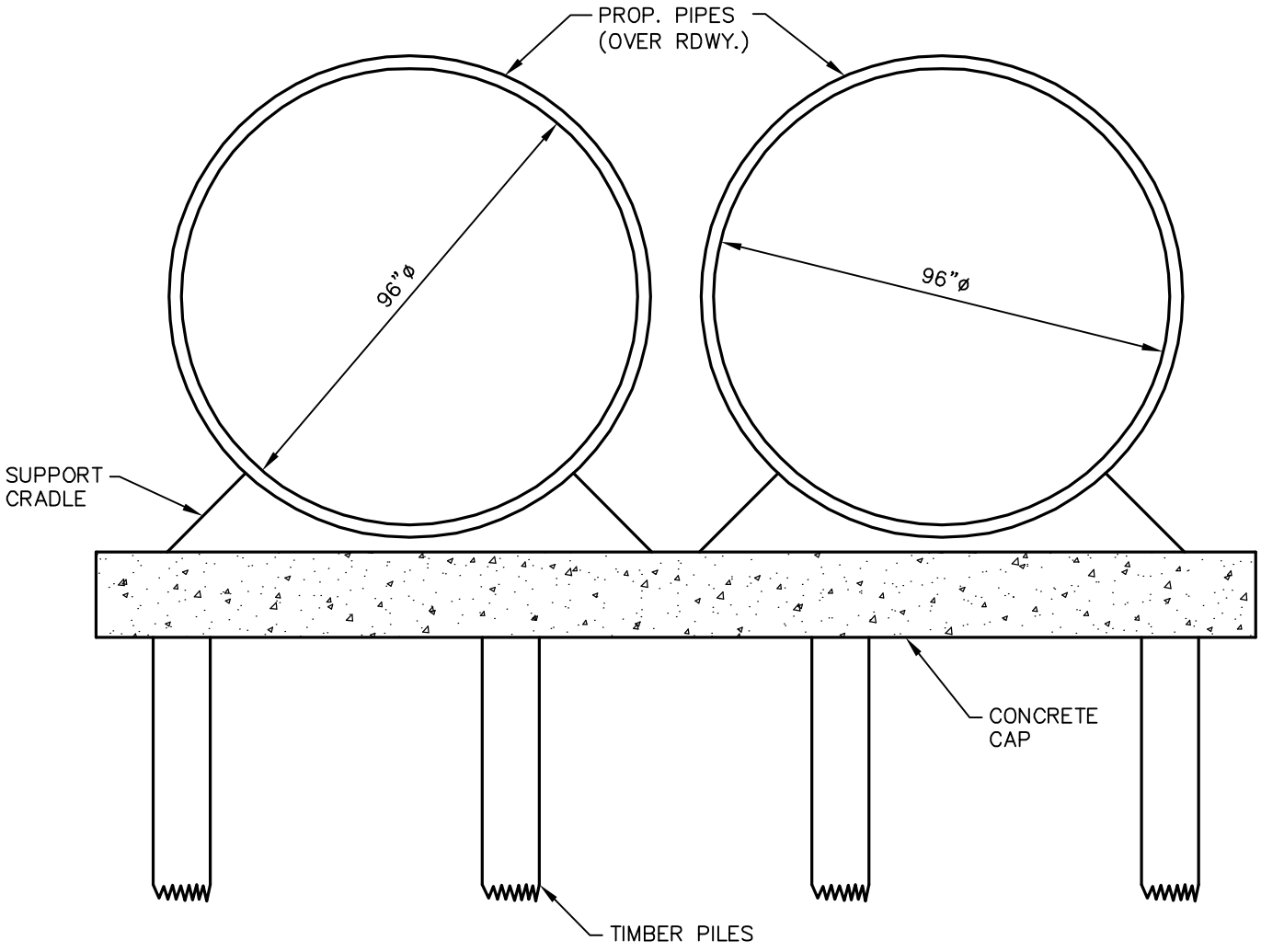
SCALE: 1" = 2000'	PROJ-10b	PLATE 10b-1
DATE: 08/04/06		



IDMO ALTERNATIVES ANALYSIS

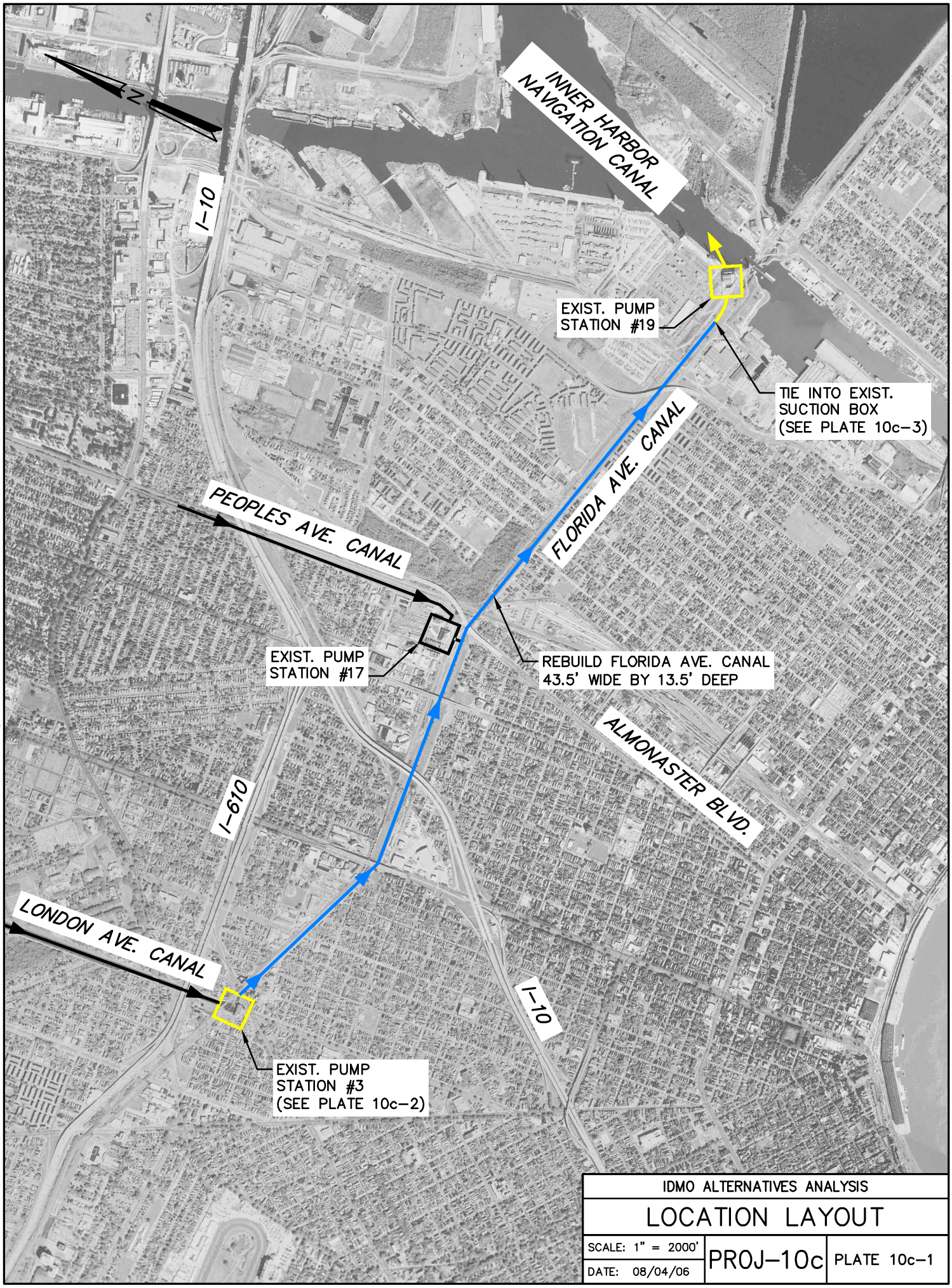
PROPOSED PUMPS

SCALE: 1" = 100'	PROJ-10b	PLATE 10b-2
DATE: 08/04/06		



TYPICAL SUPPORT FOR PROP. PIPES

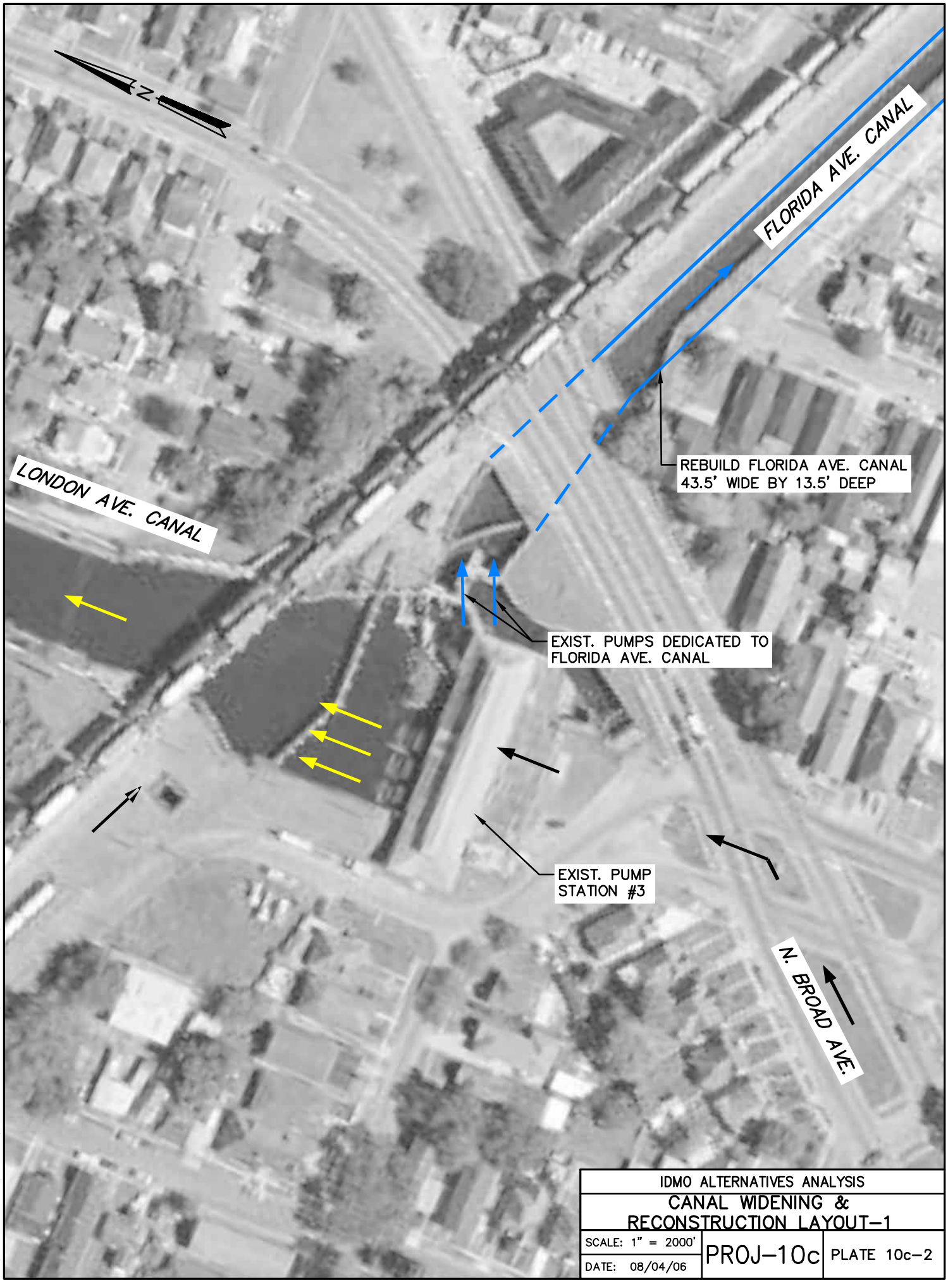
IDMO ALTERNATIVES ANALYSIS		
PIPE SUPPORT DETAIL		
SCALE: 1" = 1'-0"	PROJ-10b	PLATE 10b-3
DATE: 08/04/06		



IDMO ALTERNATIVES ANALYSIS

LOCATION LAYOUT

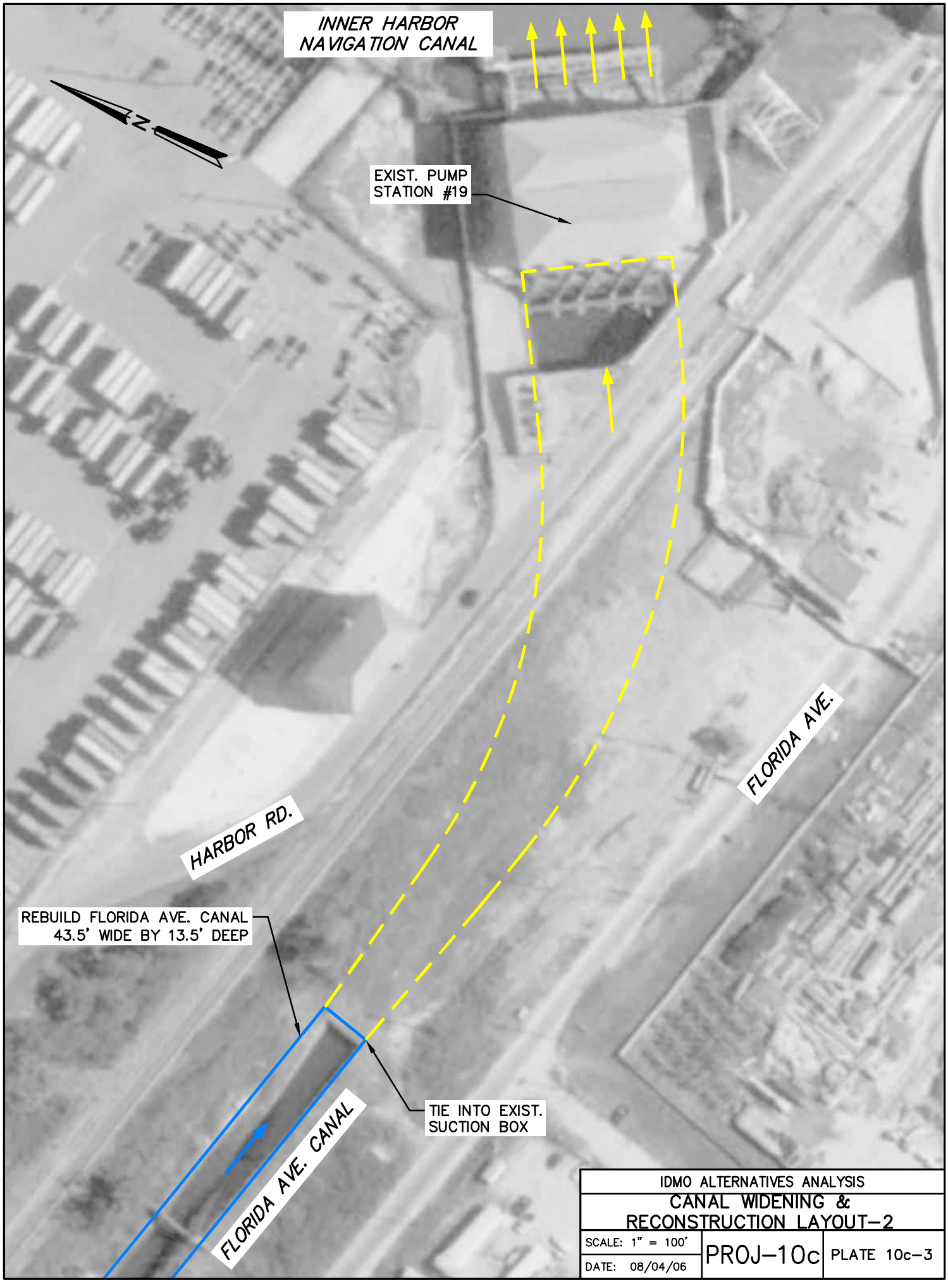
SCALE: 1" = 2000'	PROJ-10c	PLATE 10c-1
DATE: 08/04/06		



IDMO ALTERNATIVES ANALYSIS

CANAL WIDENING & RECONSTRUCTION LAYOUT-1

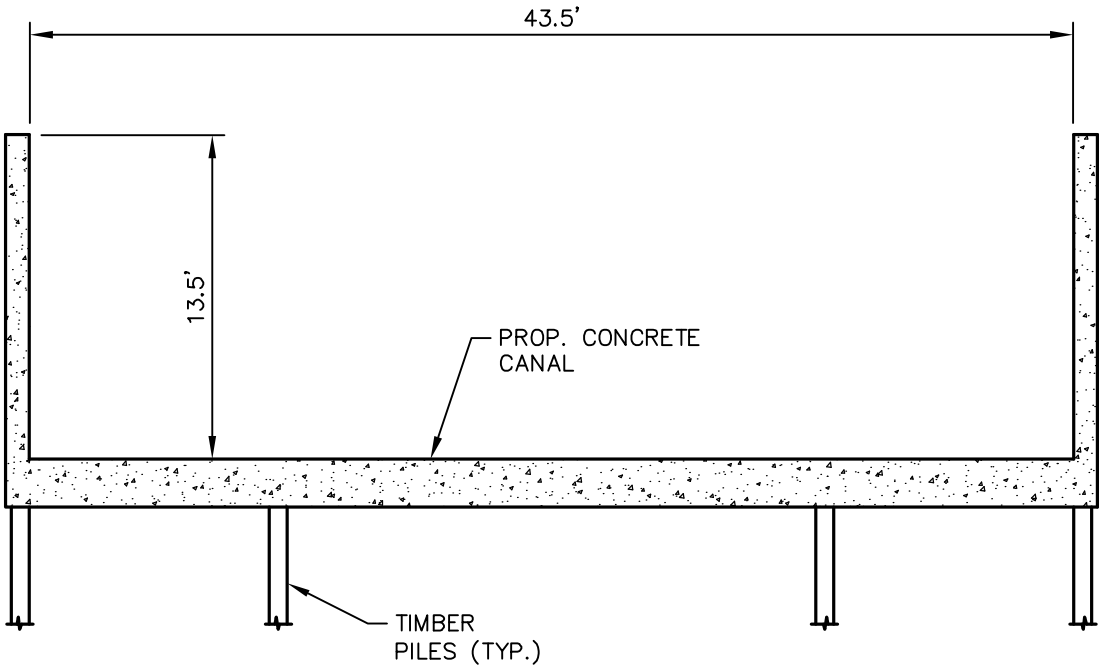
SCALE: 1" = 2000'	PROJ-10c	PLATE 10c-2
DATE: 08/04/06		



IDMO ALTERNATIVES ANALYSIS

CANAL WIDENING & RECONSTRUCTION LAYOUT–2

SCALE: 1" = 100'	PROJ–10c	PLATE 10c–3
DATE: 08/04/06		



FLORIDA AVE. CANAL
TYPICAL SECTION
N.T.S.

IDMO ALTERNATIVES ANALYSIS		
TYPICAL SECTION		
SCALE: 1" = N.T.S.	PROJ-10c	PLATE 10c-4
DATE: 08/04/06		

Pump Station No. 3 - Discharge into London Avenue Canal – 3000 cfs total

Pump Station No. 3 - Discharge into Florida Avenue Canal – 1100 cfs total

Beginning of Florida Avenue Canal from Pump Station No. 3

Florida Avenue Canal towards Pump Station No. 19

Florida Avenue Canal w/ Pump Station No. 19 in the background

Pump Station No. 19 Intake

Project No. 11

Redirect flow at Monticello Canal to the Mississippi River - Orleans Parish

Objective

The objective of this project is to reduce pumping needs by 1600 cfs at the 17th Street Canal at Lake Pontchartrain by pumping water from the Monticello Canal into the Mississippi River.

Existing Conditions

The Monticello Canal is a concrete channel that flows north along the Orleans Parish and Jefferson Parish boundary between S. Claiborne Avenue and the Palmetto Canal.. There is a 10' x 20' box culvert that discharges into the canal at the southern end just north of S. Claiborne Ave. The Monticello Canal flows into the 17th Street Canal and is pumped by DPS 6.

Two small pump stations discharge water into the Monticello Canal. The Pritchard Pump Station, located on Monticello Ave. at Pritchard Pl., contains 3 vertical pumps that are driven by three 60 Hz motors and has a nominal capacity of 250 cfs. The Monticello Pump Station, located on Oleander St., contains 3 vertical pumps that are driven by three 60 Hz motors and has a capacity of 210 cfs.

DPS 6, located on Orpheum Ave. at the beginning on the 17th Street Canal has a capacity of 9,480 cfs. It contains nine horizontal and six vertical pumps that are driven by seven 25 Hz motors and eight 60 Hz motors. DPS 6 discharges into the 17th Street. Canal that flows north and ultimately discharges into Lake Pontchartrain.

DPS 1, located in the intersection of S. Broad St. and Martin Luther King Jr. Blvd. has a capacity of 6,825 cfs. It contains 7 horizontal and 3 centrifugal pumps that are driven by 25 Hz electric motors. The tributary area into DPS 1 is 5,600 acres. The water discharged from DPS 1 can be pumped to the Palmetto Canal or to DPS 2.

Proposed Work

In order to reduce the amount of flow to DPS 6, a pump station would be built across the canal from the Pritchard Pump Station. An intake basin would collect water for the pump station that would consist of three pumps (1-1000 cfs and 2-300 cfs) with a total capacity of 1600 cfs and a total dynamic head of 37 ft. Two 10' diameter pipes, carrying 800 cfs

per pipe, will convey water discharged from the proposed pump station to the Mississippi River via the following route. From the pump station, the pipes will direct the water south towards Jefferson Highway along the west side of the floodwall. The pipes will span over Jefferson Highway by means of a pipe bridge and will proceed towards the River on the east side on the levee along Monticello Avenue. Pipe bridges will then be required to span over Willow Street, the railroad tracks, and River Road / Oak Street. The pipes will go over the levee and discharge into the river down stream of the raw water intake for the city of New Orleans.

Geotechnical Considerations

- Subsoil Conditions

  Based on borings made in the general area, the subsoil conditions at the site of the proposed Pump Station (north side) generally consist of very soft to medium stiff clay that extends to about the 55 ft. depth where Pleistocene age soils were encountered. These Pleistocene age soils generally consist of alternating strata of stiff to very stiff clay and compact sandy silt to at least the 100 ft. depth below ground surface. On the Mississippi River side (south) the subsoils would be expected to consist primarily of soft to medium stiff clay to about the 70 to 80 ft. depth where dense to very dense sand would be expected. This sand should extend to at least the 100 ft. depth below ground surface.

- Conceptual Foundations System

  Based on the subsoil conditions described above, it is believed that the pump station and pipe bents should be supported on driven piles. For timber, or composite, piles, a capacity of about 20 tons (F.S. = 2.0) in compression should be available. This is based on a 60 to 65 ft. long timber, or composite, pile (below existing grade). Timber piles used for support of the pump station intake basin would have a capacity of several tons less for the same pile tip depth. Higher capacities on the order of 30 to 50 tons would be available if steel “H” or pipe piles or prestressed concrete piles are used for support. These type piles should also be considered if greater design life than typically provided by timber piles is desired.

- Water Diversion and Cofferdam Arrangement

  The intake basin for the pump station would have to be constructed within a cofferdam, internally braced at least at one location at the top of the cofferdam walls. For cost estimating purposes, a sheet pile penetrated of about 50 ft. below ground surface would be expected. Based on the subsoil conditions, it is believed that a forced dewatering system would probably not be required and seepage into the cofferdam excavation could be effectively controlled with normal sumps and pumps.

- Additional Geotechnical Investigations

  Soil borings for this Project should be made along the project alignment on about 300 ft. spacings, starting at the proposed Pump Station and ending at the Mississippi River. Geotechnical analyses with regard to compression, tension and lateral capacity of piles would be needed for support of the pump station, intake basin and pipe bents. Analyses would also be needed relative to the temporary retaining structure (structural and dewatering) for the intake basin.

Structural Considerations

Due to the location and orientation of the pump station architectural considerations shall be coordinated with local agencies. As for the structural integrity of the pump station, all components of the structure shall be designed in accordance with the state and local building code requirements and be able to withstand winds in excess of 150 mph. The engine deck for the pump stations would be elevated one foot above the base flood elevation as shown on the FIRM map.

The intake basin shall be sized to accommodate the hydraulic requirements of this report. In addition, pipe support structures / bridges shall be built along the entire project to facilitate the two 10' diameter (above ground) pipes, which run from the proposed pump station at the Monticello Avenue Canal to the Mississippi River, See **Plate 11-1, Location Layout.**

The foundation of the pump station shall be supported on composite timber piles (due to the water table fluctuations) while the intake basin and pipe support structures / bridge foundations shall be supported on concrete piles. All foundations shall be designed in accordance with the recommendation of the Geotechnical Report.

Mechanical/Electrical Considerations

- Mechanical

  The pump station will require one (1) 1000 cfs horizontal pump, diesel driven with the motor rated at 2000 HP. Sufficient fuel storage would need to be provided at the site to operate the pump for up to 36 hours.

- Electric Service

  The local electric service is provided by Entergy. The anticipated electrical load at the pump station is including:

  - Two (2) 300 cfs vertical pump, motor rated at 700HP, medium voltage or approximate 1,040 KW
  - Balance of facility loads including power, lighting and auxiliary systems at approximate 300 KW. The electrical system will be stepped down to 480V and 120/208V with transformers and local distribution panels.

  The peak demand in the pumps station is approximate at 1.5 MW. Two service feeders shall be provided by Entergy for redundancy. In case of loss of one feeder the other feeder shall be capable of providing power for the entire pump station demand. Main Substation will consist of MV vacuum type breakers and metering devices to meet Entergy standards. Service availability will be coordinated with Entergy during the design development.

- Standby Power

  Standby power source will be required in case of total black-out on utility grid occurs coincidence with the flood event. There are two options for providing standby power.

  - Option A: Locally installed 1-1.5 MW diesel generator to meet the peak demand. The generator will be specified for continuous duty with sufficient fuel storage to operate the pumps up to 36 hours.
  - Option B: Central Generation Plant. See description on Project 1.

Construction Considerations

Prior to construction of new drainage structures, the contractor shall implement a construction procedure that will not impose on the structural integrity of existing adjacent concrete structures and channels.

A construction sequencing plan would be required to minimize impacts to traffic during construction.

Prior to the construction of the pump station foundation, the Contractor shall implement a construction procedure that will not impose on the integrity of the existing canal and levee. Temporary sheet piling may be used as an alternative to provide stability of the existing levee at the pump station and intake basin.

Where the proposed two 10' diameter pipes cross the New Orleans Public Belt Railroad, it may be imperative to brace the existing railroad embankment while the pipe support bridge is being constructed. Coordination with the Railroad will be required to locate the pipe bridge structure outside of the railroad right-of-way and to facilitate its horizontal and vertical clearance requirements.

The construction of the pipes across Willow Street, River Road, and Oak Street shall be phased so that traffic can be maintained. Construction shall be coordinated with the railroad so that it does not impede rail service.

Environmental Considerations

This project, like all the others, would satisfy the requirements of NEPA through a supplement to EA #433.

For this project, additional consultation with the SHPO is required because a portion of the project area would be constructed in the Uptown NRHP District.

It appears that that a portion of the project area may be an environmental justice area. A determination must be made and actions taken accordingly.

Order of Magnitude Cost Estimate

Cost Estimate - Project 11

Environmental	$10,000
Right-of-Way Acquisition	$2,000,000
Design	$5,701,953
Construction	$65,572,460
Total	**$73,284,413**

Roadmap/Timeline

Design – This would be divided into two phases that would be initiated concurrently, M&E and Civil. The M&E would include a fast-track specification of pumps and other equipment with long lead time deliveries. M&E fast-track should take 2 months and other design should take 4 months.

Environmental Clearance – Concurrent with design

Permits – The permits required concern water quality, and are issued by LDNR, this should be coordinated among the agencies to take no more than one month after final design is completed and be concurrent with the construction bid process.

LERRD – Pipe ROW or easements will have to be coordinated with the Norfolk-Southern Railroad and any owners of land that the pipe crosses. This must be concurrent with Design and could be the critical path of the Civil design.

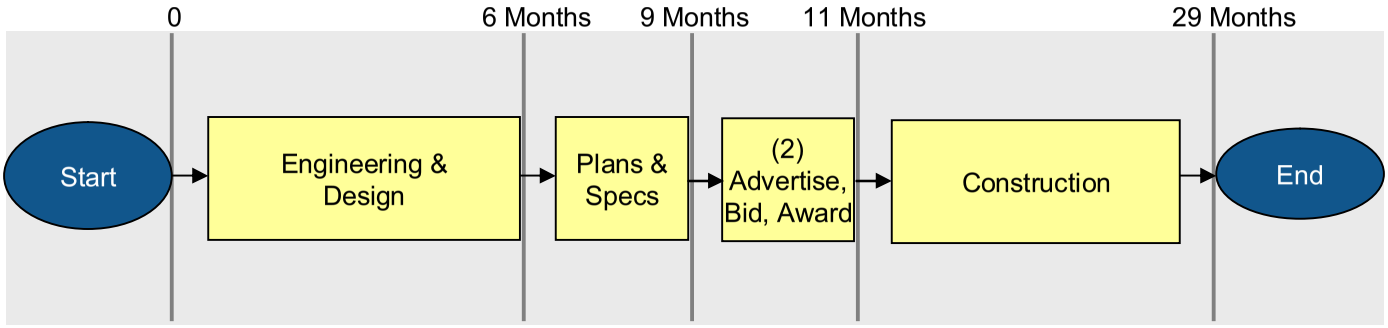
Construction – The pump station proposed would take approximately 18 months to complete.

Conclusion

This project is recommended for further study for the following reasons:

1. It removes 1600 cfs from the 17th Street Canal.
2. It offers another outfall by pumping the water to the Mississippi River.
3. This project implemented in conjunction with Project No. 14 would allow both Orleans and Jefferson Parish to operate separate drainage systems.
4. This project compliments the proposed SELA project, along Claiborne Ave.

Project 11

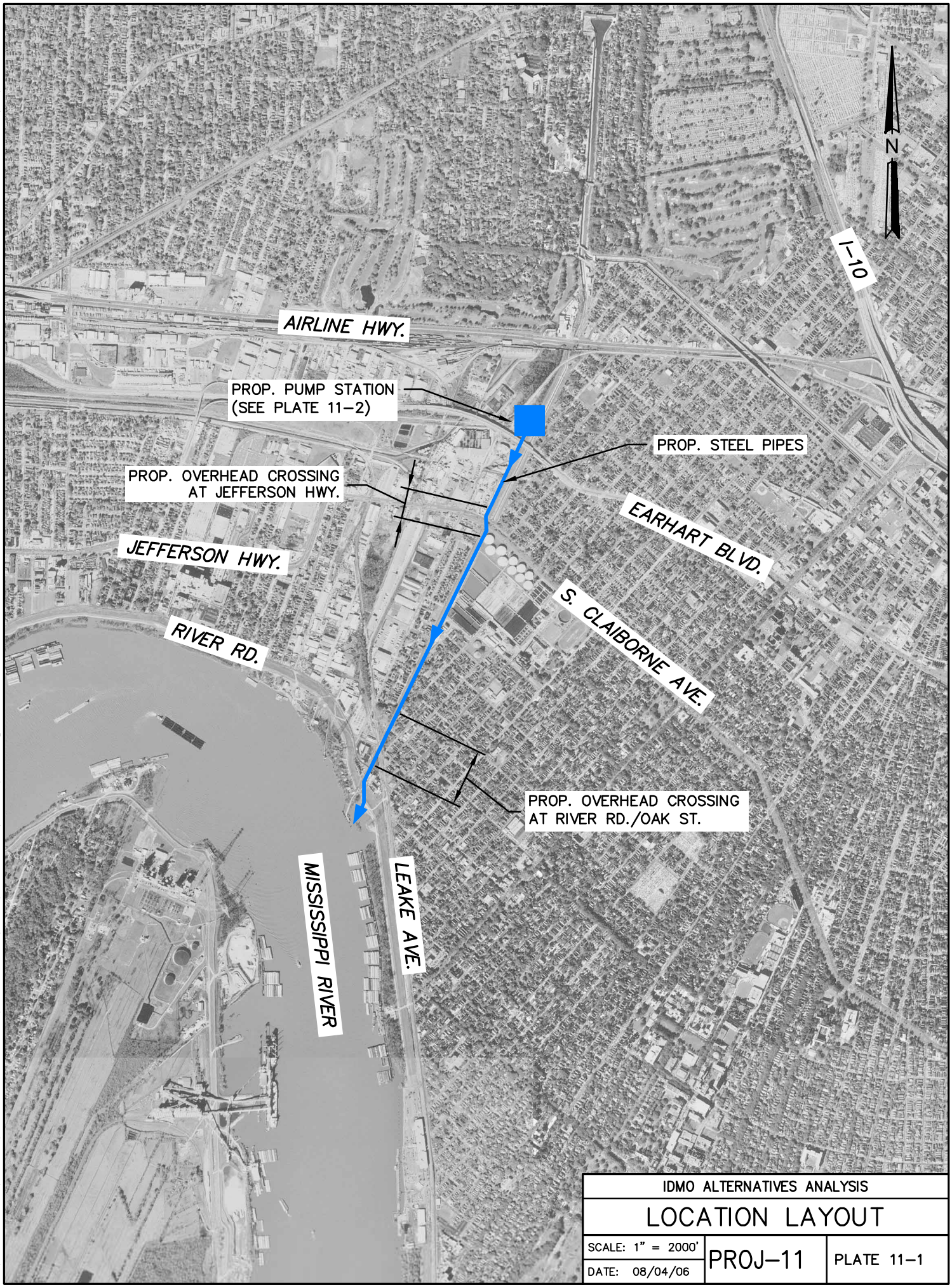


Environmental Compliance – Potential environmental issues, as discussed in the "Environmental Consideration" section, can be addressed during the engineering and design phase in order to keep off the critical path.

LERRD's – Any potential LERRD's , as discussed in the "Proposed Work" section, can be addressed during the engineering and design phase in order to provide for construction without causing delay.

Pump Procurement – Specifics on pumps can be identified early in the engineering and design phase in order to be delivered on-site, when needed, without causing delay. This should be done concurrent with overall schedule. This is not a critical path item in this flow chart. (estimated 12 month lead time required)

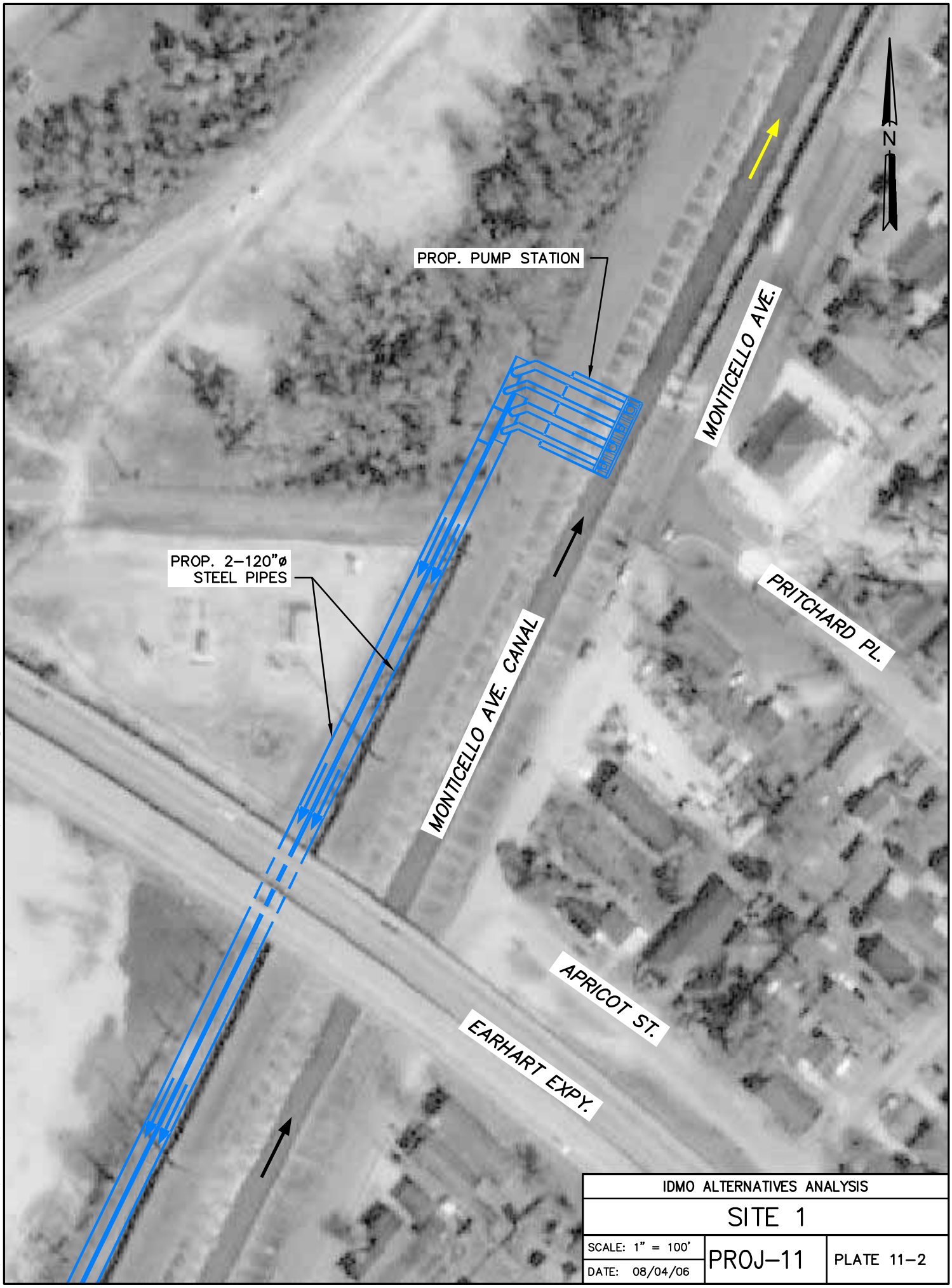
Contract Administration – Construction could be implemented with 2 separate; concurrent contracts for the boxes and pumps in order to expedite the process. Estimated time shown above reflects this approach.



IDMO ALTERNATIVES ANALYSIS

LOCATION LAYOUT

SCALE: 1" = 2000'	PROJ-11	PLATE 11-1
DATE: 08/04/06		



IDMO ALTERNATIVES ANALYSIS		
SITE 1		
SCALE: 1" = 100'	PROJ–11	PLATE 11–2
DATE: 08/04/06		

Monticello Canal (Looking South)

Area along Monticello Canal East Side (Looking South)

Area along Monticello Avenue (Looking North)

Area along Monticello Avenue (Looking South)

Area along Monticello Avenue (Looking South)

Area along Monticello Avenue (Looking South)

Area along Monticello Avenue (Looking North)

Area on the Mississippi River Levee (Looking North)

Area on the Mississippi River Levee Looking North West towards Monticello Avenue

Project No. 15

Redirect flow of DPS 4 from London Avenue Canal to the Inner Harbor Navigation Canal (IHNC) via Prentiss, Peoples, & Dwyer Rights-of-way

Objective

The objective of this project is to divert all of the flow discharged by DPS 4 from the London Ave. Canal and Lake Pontchartrain to the IHNC via the Prentiss Ave., Peoples Ave., and Dwyer rights-of-way (ROW). See **Plate 15-1**, Location Layout.

Existing Conditions

The London Ave. Canal runs through Gentilly from DPS 3 northward to the lake. There are two pumping stations that discharge into the London Ave. Canal, DPS 3 at the southern terminus of the canal at Florida Avenue and N. Broad Street and DPS 4 at Prentiss Ave. on the east bank of the canal.

DPS 4 contains six pumps with a combined capacity of 3,720 CFS. The pumps include one vertical, three horizontal and, two centrifugal pumps that are driven by six 25 Hz electric motors. DPS 4 also contains a 10' and 2' steel siphon over the canal to bring water from the west bank of the canal to the pump station.

The IHNC is a 5.5 mile waterway located within the limits of the City of New Orleans that connects the Mississippi River and Lake Pontchartrain. The channel also connects the river to the Intracoastal Waterway and the Mississippi River Gulf Outlet. Both waterways are optional navigation routes to the Gulf of Mexico. The IHNC is subject to tidal surges. A lock placed near the southern end controls the water surface elevations between the canal and the river. Although it is referred to as the "Industrial Canal" both by commercial mariners and by landside residents, its proper name is the Inner Harbor Navigation Canal (IHNC).

The Prentiss Ave. ROW contains two parallel drainage boxes, a large water force main, and other utilities. Peoples Ave. ROW contains a box culvert parallel to the Norfolk Southern railroad ROW, and the Dwyer ROW contains an open canal from Peoples Ave. to the floodwall at the IHNC.

Proposed Work

Water from the drainage basin that flows to DPS 4 will be redirected using the existing drainage system toward a proposed pump station located at the eastern terminus of the

Dwyer ROW as shown on **Plate 15-3,** Proposed Pump Station. It would have the same capacity as DPS 4 (3,720 CFS). The pumps would discharge the water into five discharge tubes, each 9 feet in diameter, which would be routed over the levee and the railroad track into the Industrial Canal. A discharge basin will be cut on the west bank of the Industrial Canal that will accept the water from the siphon into the canal. See **Plate 15-3**.

To direct the water to the proposed pump station, the Dwyer canal would be replaced with a 12' deep rectangular channel with sheet pile walls and an earthen floor, as seen on **Plate 15-4**. Two 10' x 16' box culverts will be added to cross under the railroad track to connect the People's Ave. Canal and Dwyer Canal. A junction box would be built at the intersection of these two proposed culverts with the Peoples Ave. box culvert.

When the gate at London Ave. Canal and Lake Pontchartrain is closed, DPS 4 would be shut down, and the water would be redirected to the proposed pumping station.

Geotechnical Considerations

- Subsoil Conditions

  Based on borings made in the general area, subsoil conditions at the proposed construction site on the west side of IHNC along Dwyer Canal generally consist of a surface layer of very soft to soft clay to about the 10 to 20 ft. This is expected to be underlain by medium dense to dense sand or silty sand to about the 50 ft. depth. This sand stratum is underlain by medium stiff to stiff clay that extends to the Pleistocene age soils which should be encountered at about the 60 to 70 ft. depth. The Pleistocene age soils consist of preconsolidated stiff clay to at least the 100 ft. depth below ground surface. However, strata of medium dense to dense sand could also be encountered within the Pleistocene age soils.

- Conceptual Foundation System

  Based on the subsoil conditions described above, all important structures including the junction box at Peoples Avenue Canal, the box culvert beneath Norfolk Southern Railroad and the discharge basin extending into the IHNC should be supported on driven piles. For timber piles supporting the pump station and pipe bents, a capacity of at least 15 tons (F.S. = 2.0) in compression should be available. This is based on a 60 to 70 ft. long timber pile (below existing grade). Piles used to support the below ground structures would have a capacity of

several tons less for the same pile tip depth. Higher capacities on the order of 30 to 50 tons would be available if steel "H" or pipe piles or prestressed concrete piles are used for support. These piles may also be desirable in view of the thickness and shallow depth of the sands that would be expected in the area. They should also be considered if a greater design life than typically provided by timber piles is desired.

- Water Diversion and Cofferdam Arrangement

  It is believed that all of the below ground structures including the junction box, culverts beneath the Norfolk Southern Railroad, box culvert to the proposed pump station west of France Road and the discharge basin leading to IHNC should be supported on driven piles. Some specialized form of cofferdam system would be required where the junction box connects to the existing box culvert along Peoples Avenue Canal and where the box culverts underlie the railroad tracks. For cost estimating purposes, a sheet pile penetration of about 60 ft. below ground surface would be expected. The cofferdams should be internally braced at least at one location near the top of the cofferdam walls. Forced dewatering (deep wells, well points, etc.) would be required to dewater the sands that would be expected above the 50 ft. depth below ground surface.

- Additional Geotechnical Investigations

  In general, new soil borings should be made on about 300 ft. spacings starting at the proposed junction box at Peoples Avenue Canal and extending to the IHNC. Geotechnical analyses with regard to the compression, tension and lateral capacities of piles would be needed for support of the various elements of the structures. Analyses would also be needed relative to the temporary retaining structures (structural and dewatering). Geotechnical analyses should also be made for the specialize cofferdams where the junction box connects to the existing box culverts along Peoples Avenue Canal and where the below ground culverts underlie the railroad tracks along the alignment. In addition, analyses should be made to evaluate the stability of the existing levee along France Road relative to the proposed new construction.

Structural Considerations

- Regarding the pump station architectural considerations would be coordinated with local agencies. For the structural integrity of the pump station, all components of the structure would be designed in accordance with the state and local building code requirements and be able to withstand winds in excess of 150 mph.
- The foundations for the pump stations shall be supported on composite timber piles due to water table fluctuations while the box culverts, including junction boxes, will be founded on timber piles.
- All foundations shall be designed in accordance with the Geotechnical Report's recommendations.
- The engine deck for the pump station would be elevated one foot above the base flood elevation as shown on the FIRM map.
- All box culverts and junction boxes have been sized to accommodate the hydraulic requirements.

Mechanical/Electrical Considerations

- Mechanical

  The pump station will require three (3) 1000 cfs horizontal pumps, diesel driven with the motors rated at 2000 HP. Sufficient fuel storage would need to be provided at the site to operate the pumps for up to 36 hours.

- Electric Service

  The local electric service is provided by Entergy. The anticipated electrical load at the pump station is including:

  - Two (2) 300 cfs vertical pump, motor rated at 700HP, medium voltage or approximate 1,040 KW
  - One CD Pump 30x63, 80 cfs, motor rated at 1200HP, medium voltage or approximate 900 KW
  - Balance of facility loads including power, lighting and auxiliary systems at approximate 300 KW. The electrical system will be stepped down to 480V and 120/208V with transformers and local distribution panels.

  The peak demand in the pumps station is approximate at 2.25 MW. Two service feeders shall be provided by Entergy for redundancy. In case of loss of one feeder

the other feeder shall be capable of providing power for the entire pump station demand. Main Substation will consist of MV vacuum type breakers and metering devices to meet Entergy standards. Service availability will be coordinated with Entergy during the design development.

- Standby Power

  Standby power source will be required in case of total black-out on utility grid occurs coincidence with the flood event. There are two options for providing standby power.

  - Option A: Locally installed 2-1.25 MW diesel generators to meet the peak demand. The generators switchgear with synchronizing bus will be provided. The generators will be specified for continuous duty with sufficient fuel storage to operate the pumps up to 36 hours.
  - Option B: Central Generation Plant. See description on Project 1.

Construction Considerations

- All box culverts can be installed using sheet pile braced trenches, a typical construction method in this area due to the poor soil strength characteristics in the New Orleans area. Dewatering will be required since the elevation of the water table is near the ground surface. Prior to the construction of the new culverts and junction boxes, the Contractor shall implement a construction procedure that will not impose on the structural integrity of the existing adjacent box culverts.
- Near the intersection of Peoples Ave. and Dwyer Canal where the proposed culvert runs under Norfolk-Southern Railroad, a temporary detour of the track will need to be constructed, to allow the railroad to operate without impedance while the new culvert is constructed.
- Along the Peoples Ave. ROW, work around the railroad tracks will have to be coordinated with the Norfolk-Southern Railroad.
- A dam will be required to hold back the existing flow with portable pumps to pump the water around the construction area.
- The levee wall will have to be rebuilt around the discharge pipe installation. The contractor will have to provide protection for the levees during construction in the event the water level rises in the Industrial Canal.

- Coordination with the Port of New Orleans, its tenant, and the New Orleans Public Belt Railroad will be necessary to route the discharge tubes from the pump station to the discharge area in the Industrial Canal.

Environmental Considerations

- This project, like all the others, would satisfy the requirements of NEPA through a supplement to EA #433.

It appears that substantial portions of the area in which work would be undertaken may be an environmental justice area. A determination must be made and actions taken accordingly.

Order of Magnitude Cost Estimate

Cost Estimate - Project 15

Environmental	$5,000
Right-of-Way Acquisition	$0
Design	$6,538,541
Construction	$75,193,227
Total	**$81,736,768**

Roadmap/Timeline

Design – This would be divided into two phases that would be initiated concurrently, M&E and Civil. The M&E would include a fast-track specification of pumps and other equipment with long lead time deliveries. M&E fast-track should take 2 months and the civil design should take 4 months.

Environmental Clearance – Concurrent with design. Potential environmental justice considerations could be critical path item.

Permits – The permits required concern water quality, and are issued by LDNR, this should be coordinated among the agencies to take no more than one month after final design is completed and be concurrent with the construction bid process.

LERRD – Land required for the pump station and relocated levee is owned by various owners. ROW to install the improvement would have to be purchased from these owners. This must be concurrent with Design and could be the critical path of the civil design.

Construction – The pump station proposed would take approximately 18 months to complete. Lead time for the pump station would take approximately 12 to 18 month upon placing the order.

Further Considerations

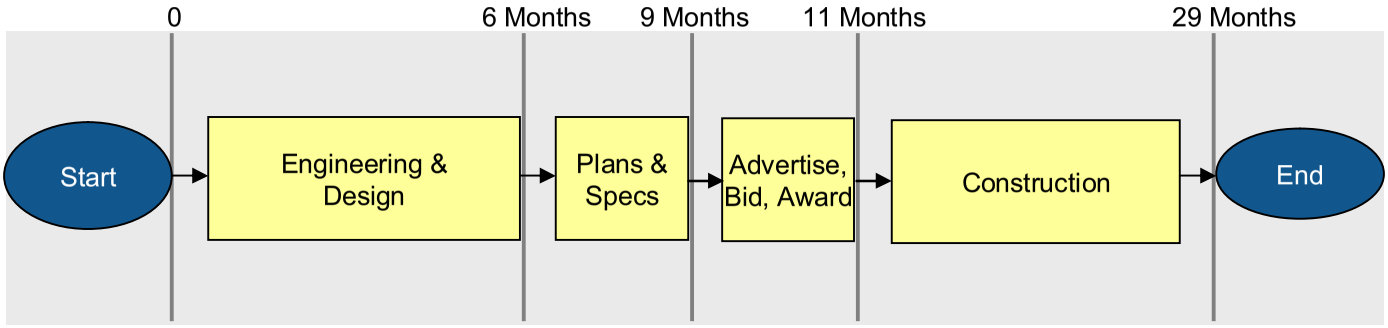
- It is advisable to initiate early coordination with both the Norfolk Southern Railroad and the New Orleans Public Belt Railroad.
- The delivery time for equipment could be the critical path for construction.
- The proposed pump station at the end of the Dwyer Canal and France Rd. could become part of the permanent drainage system. Alternatively, the pumps could be relocated to another location within the system.

Conclusion

This project is recommended for further study for the following reasons:

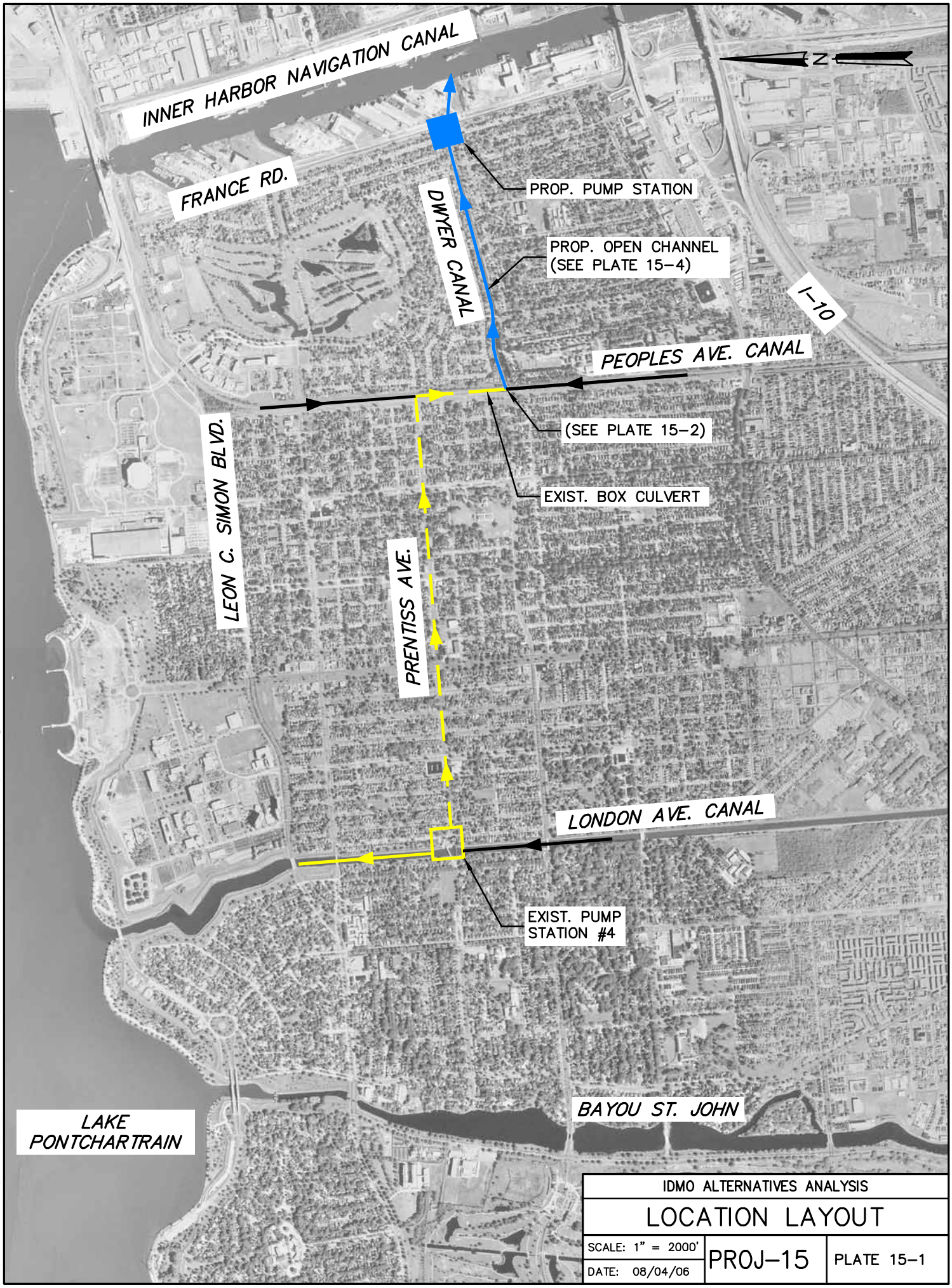
1. The redirection of flow from the London Avenue Canal to the IHNC is significant (3,720 cfs).
2. The proposed pump station would create an alternate outfall for the drainage basin.
3. The pump station could become a permanent part of the drainage system.

Project 15

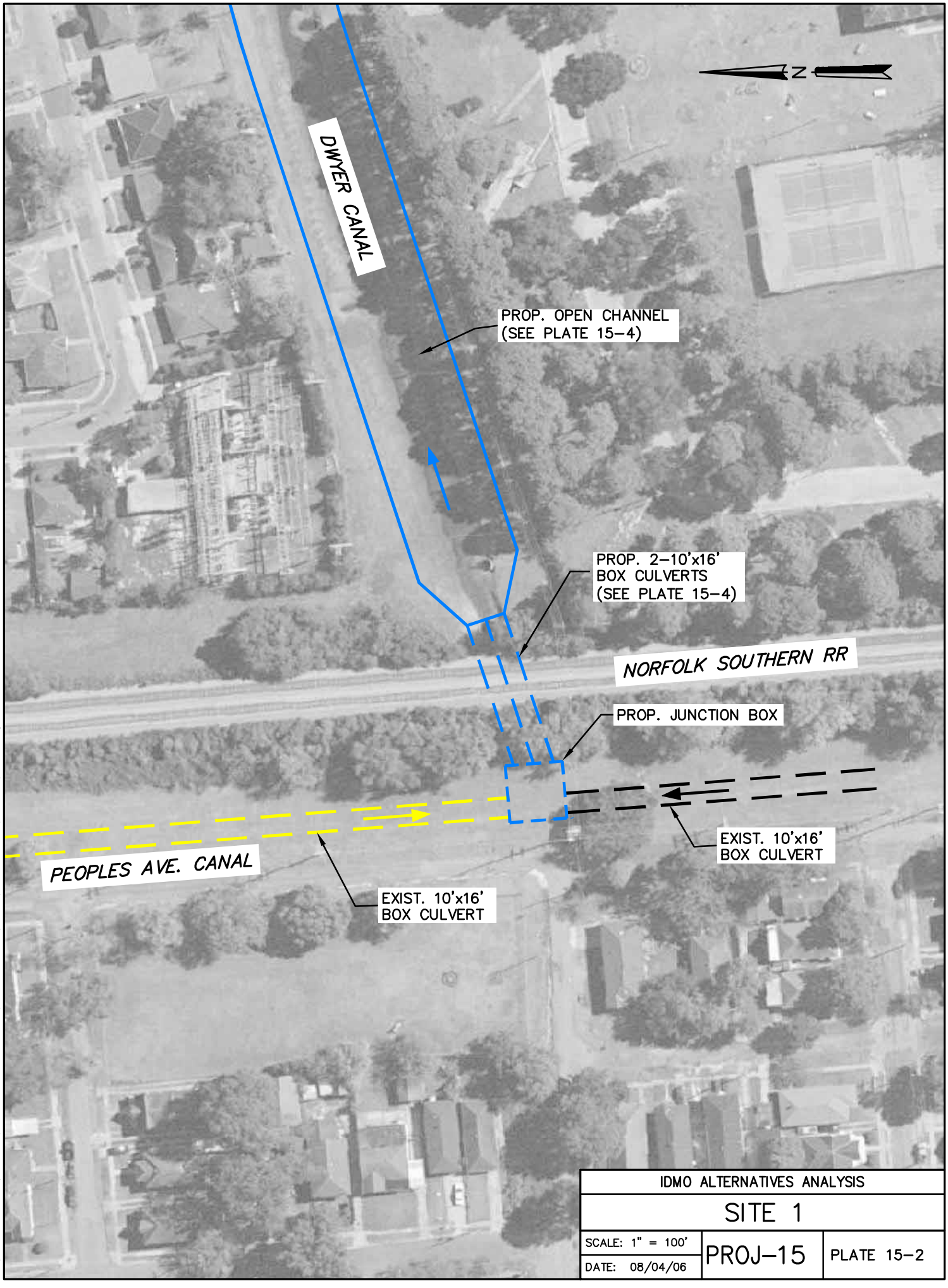


Environmental Compliance – Potential environmental issues, as discussed in the "Environmental Consideration" section, can be addressed during the engineering and design phase in order to keep off the critical path.

LERRD's – Any potential LERRD's , as discussed in the "Proposed Work" section, can be addressed during the engineering and design phase in order to provide for construction without causing delay.



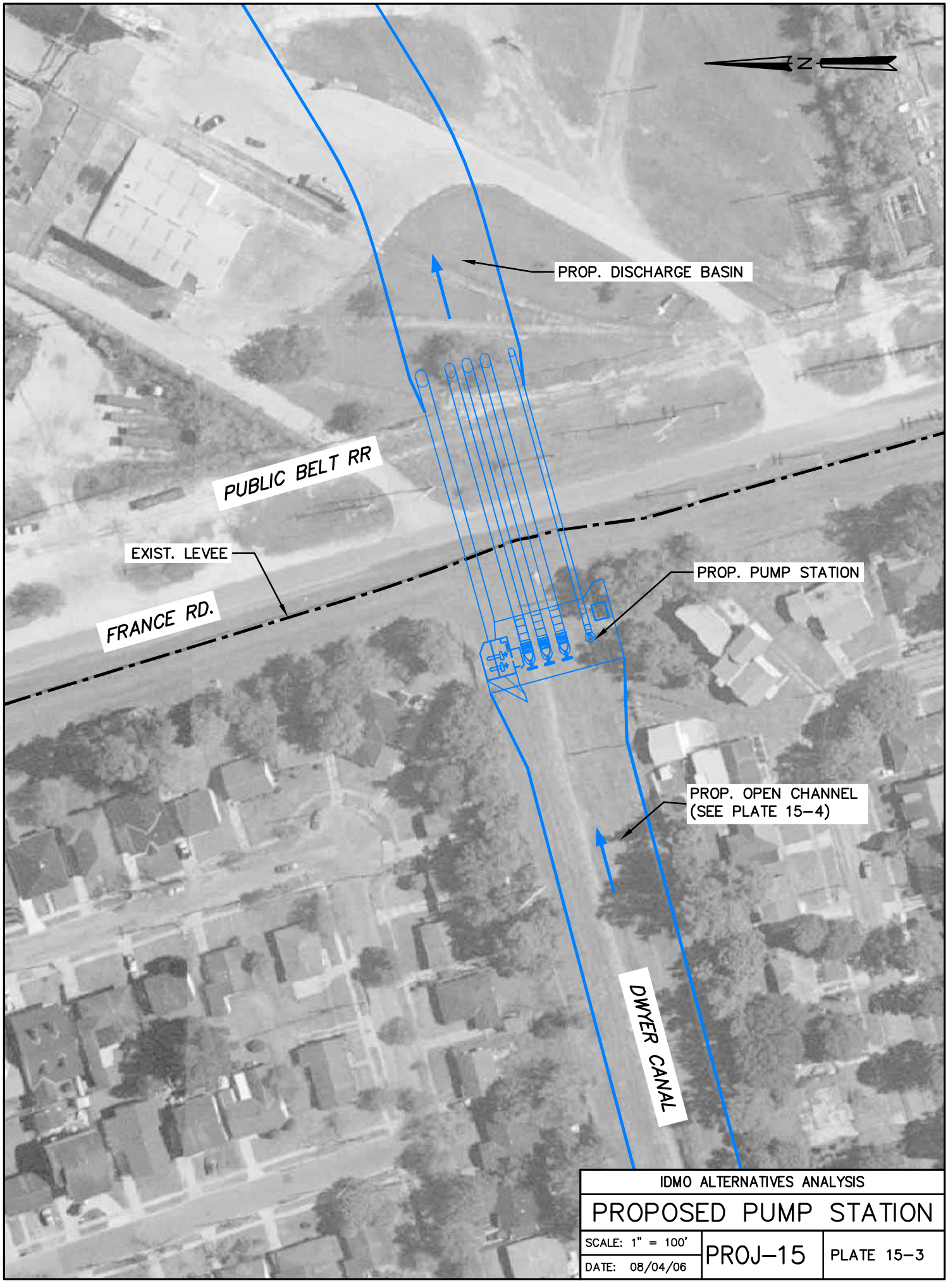
IDMO ALTERNATIVES ANALYSIS		
LOCATION LAYOUT		
SCALE: 1" = 2000'	PROJ-15	PLATE 15-1
DATE: 08/04/06		



IDMO ALTERNATIVES ANALYSIS

SITE 1

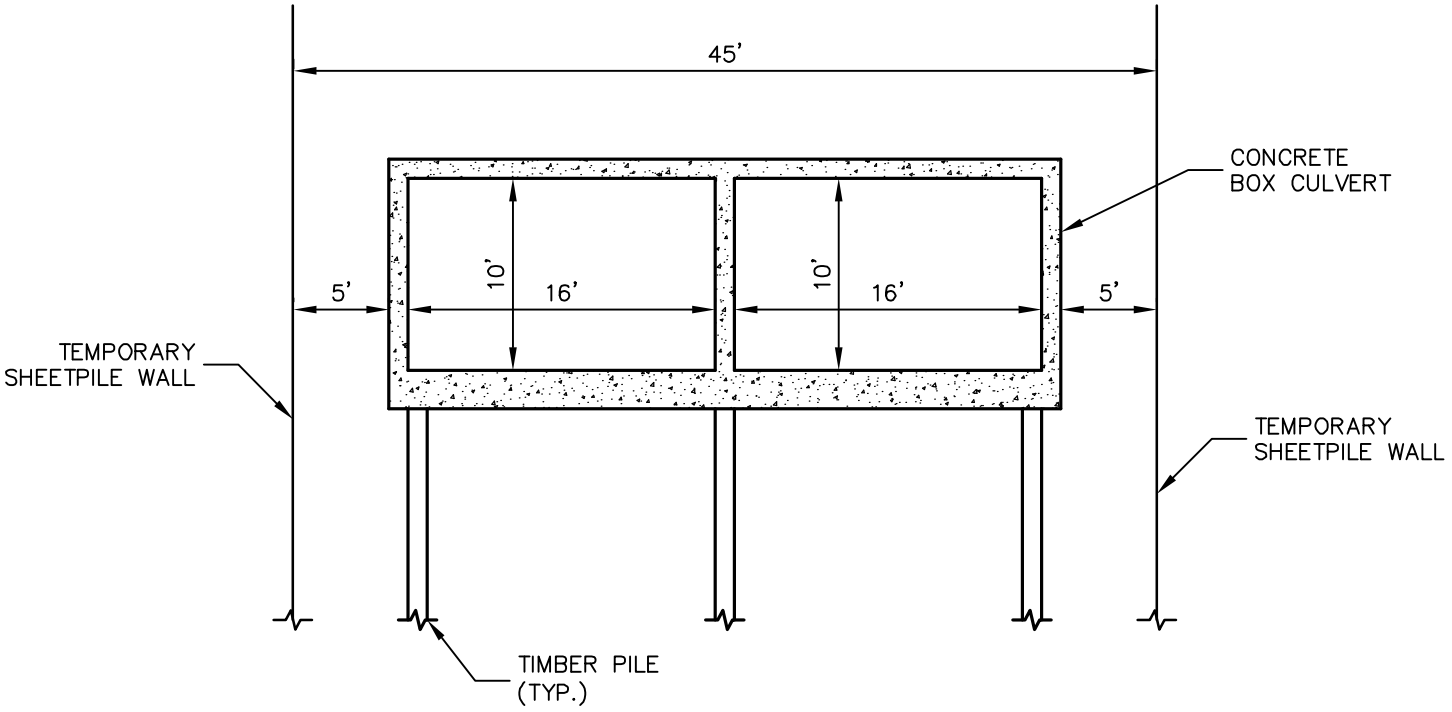
SCALE: 1" = 100'	PROJ-15	PLATE 15-2
DATE: 08/04/06		



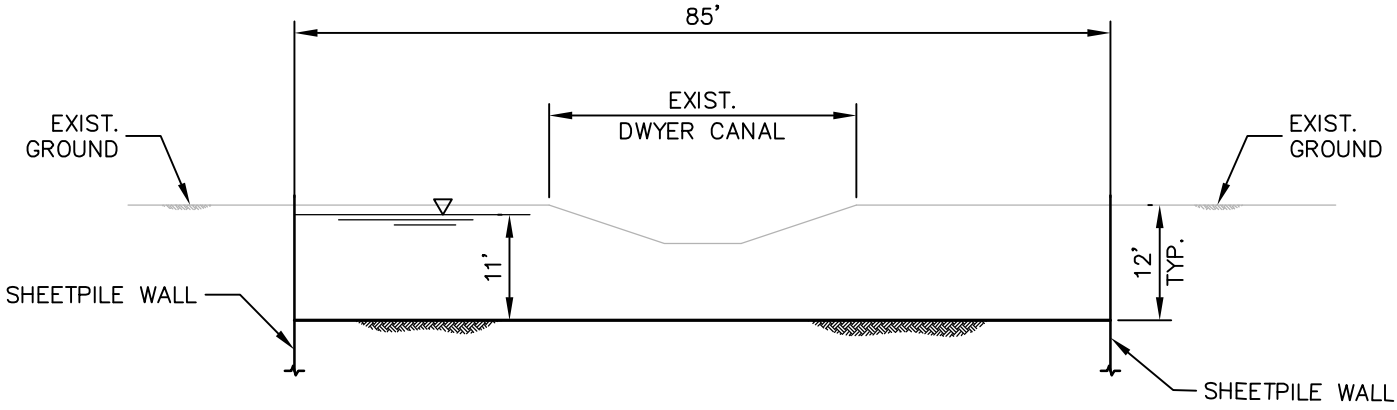
IDMO ALTERNATIVES ANALYSIS

PROPOSED PUMP STATION

SCALE: 1" = 100'	PROJ-15	PLATE 15-3
DATE: 08/04/06		



BOX CULVERT SECTION
N.T.S.



CONCRETE CHANNEL SECTION
N.T.S.

IDMO ALTERNATIVES ANALYSIS		
TYPICAL SECTION		
SCALE: 1" = N.T.S.	PROJ-15	PLATE 15-4
DATE: 08/04/06		

Industrial Canal and Cement Plant (Looking East)

End of Dwyer Canal at west side of the Flood wall (Looking East)

Dwyer Canal (Looking from the railroad on Peoples' Ave to east)

Project No. 16

Redirect Flow from Hoey's Basin to Mississippi River – Jefferson Parish

Objective

The objective of this project is to reduce pumping needs, by 2400cfs, at the 17th Street Canal at the Lake, by redirecting rainwater in the Hoey's Basin to the Hoey's Canal and pumping into the Mississippi.

The concept of this project, and portions of the technical information, are referenced from BCG study report "Rationale for the Hoey's Basin Flood Control Plan For the 2006 Hurricane Season".

Existing Conditions

The 2,500 acres of Hoey's Basin, including the neighborhoods of Oakridge, Metairie Gardens, and South Beverly Knoll, is bounded east and west by the 17th Street Canal and the Severn Avenue-Shrewsbury Road area, and to the north and south by Mississippi River and Metairie Road. And because the River levee and Metairie Road are the highest points in the basin, rain hits the ground and runs to the lowest point, which engineers identified as the Airline-Metairie Country Club golf course area, closely followed by the Pelham, Nassau and the south side of Northline.

Hoey's Canal connects to the 17th St. Canal at Hoey's Cut from up river to help drain the back of the Jefferson Parish communities along the River. Geisenheimer Canal collects water from the entire basin and moves it east from Labarre Road, then north into Hoey's Canal and ultimately into the 17th St. Canal.

The nominal capacity of DPS 6 on the 17th St. Canal is 9,480 CFS. Run off from substantial areas of uptown New Orleans, Metairie, and surrounding neighborhoods drains into the canals and basins on the River side of the pumping station, which pulls the water up into the portion of the 17th St. Canal flowing in to Lake Pontchartrain.

Gates and temporary pumps have been constructed at the lake edge of the 17th St. Canal to facilitate drainage during gate closures associated with the storm. While the floodgate includes some pumps, it is significantly less than the capacity of the canal before Katrina, raising concerns that while the floodgates could protect from Lake Storm surge, heavy

rains could flood portions of the city while the gates are closed because it could not be pumped out.

Proposed Work

The proposed work is to divert 2400 CFS water from Hoey's Canal near Jefferson Highway to the Mississippi River via a pump station, to provide flood reduction levels in the east end of the Geisenheimer Culvert at the Jefferson/Orleans Parish line where the Hoey's Canal joints with the Geisenheimer Culvert to carry rainwater into the 17th St. Canal in Orleans Parish.

A pump station will be located on the south bank of Hoey's Canal. An intake basin would collect water from the pump station that would consist of four pumps (2-1000 cfs and 2-300 cfs) with a total capacity of 2400 cfs. Three 10' diameter pipes, 7000' in length, carrying 800 cfs per pipe, will convey water discharged from the proposed pump station to the Mississippi River. The required total system head is 32 ft. The route of the pipeline would pass under the Kansas City Southern Railroad leads to the river front, be constructed overhead at the crossing of Jefferson Highway and then proceed, above ground, along the east edge of an asphalt parking lot on property leased to Bridgewater Properties. At the south end of this property the force main would be bored under the CN/ICG leads to the river front. The line would come out of the ground and be constructed above ground to Dakin Street where it would turn towards River Road. Dakin Street would be closed. The line would cross River Road on an aerial crossing, cross the Mississippi River levee and discharge into the river. An appropriate discharge basin would be constructed at the river bank and would be designed to achieve siphonic recovery to improve overall efficiency. Total length of this pipe line is approximately 5500 feet.

A box culvert will be added from the east end of Geisenheimer culvert to the north of Hoey's Canal through Airline Dr. From where the box ties into the Hoey's Canal, the canal will be widened toward the proposed pump station to carry 2400 cfs drain water.

Geotechnical Considerations

- Subsoil Conditions

  Based on borings made in the general area, the subsoil conditions at the site of the proposed pump station (north side) generally consist of soft clay or organic clay

to about the 25 ft. depth. The subsoils below this are more granular in character and generally consist of medium dense to dense sand to about the 50 ft. depth. The sands are underlain by medium stiff clay to about the 75 ft. depth where the Pleistocene age soils would be expected to occur. These Pleistocene age soils consist of preconsolidated stiff clay to at least the 100 ft. depth. On the Mississippi River side (south), the subsoils would be expected to consist primarily of soft to medium stiff clay to about the 70 to 80 ft. depth where dense to very dense sand would be expected. This sand should extend to at least the 100 ft. depth below ground surface.

- Conceptual Foundation System

  Based on the subsoil conditions described above, it is believed that the pump station and pipe bents should be supported on driven piles. For timber, or composite, piles, a capacity of about 20 tons (F. S. = 2.0) in compression should be available. This is based on 60 to 65 ft. long timber or composite piles (below existing grade) or piles driven to firm embedment into the medium dense to dense sands. For piles subjected to uplift and lateral loading, a composite timber pile should not be considered. Timber piles used for support of the pump station intake basin would have a capacity of several tons less for the same pile tip depth. Higher capacities on the order of 30 to 50 tons would be available if steel "H" or pipe piles or prestressed concrete piles are used for support. They should also be considered if a greater design life than typically provided by timber piles is desired.

- Water Diversion and Cofferdam Arrangement

  The intake basin for the pump station would have to be constructed within a cofferdam, internally braced at least at one location at the top of the cofferdam walls. For cost estimating purposes, a sheet pile penetration of about 50 ft. below ground surface would be expected. Based on the subsoil conditions, it is believed that some form of forced dewatering (deep wells, well points, etc.) would probably be required to dewater the shallow sands that would be expected between about the 25 and 50 ft. depths below ground surface.

- Additional Geotechnical Investigations

Soil borings for this Project should be made along the project alignment on about 300 ft. spacings, starting at the proposed Pump Station and ending at the Mississippi River. Geotechnical analyses with regard to compression, tension and lateral capacity of piles would be needed for support of the pump station, intake basin and pipe bents. Analyses would also be needed relative to the temporary retaining structure (structural and dewatering) for the intake pump station basin.

Structural Considerations

Due to the location and orientation of the pump station architectural considerations shall be coordinated with local agencies. As for the structural integrity of the pump station, all components of the structure shall be designed in accordance with the state and local building code requirements and be able to withstand winds in excess of 150 mph. The engine deck for the pump stations would be elevated one foot above the base flood elevation as shown on the FIRM map.

The intake basin shall be sized to accommodate the hydraulic requirements of this report. In addition, pipe support structures / bridges shall be built along the entire project to facilitate the two 10' diameter (above ground) pipes, which run from the proposed pump station at the Monticello Avenue Canal to the Mississippi River, See **Plate 11-1, Location Layout.**

The foundation of the pump station shall be supported on composite timber piles (due to the water table fluctuations) while the intake basin and pipe support structures / bridge foundations shall be supported on concrete piles. All foundations shall be designed in accordance with the recommendation of the Geotechnical Report.

Mechanical/Electrical Considerations

- Mechanical

  The pump station will require two (2) 1000 cfs horizontal pumps, diesel driven with the motors rated at 2000 HP. Sufficient fuel storage would need to be provided at the site to operate the pumps for up to 36 hours.

- Electric Service

  The local electric service is provided by Entergy. The anticipated electrical load at pump station is including:

- Two (2) 300 cfs vertical pump, motor rated at 700HP, medium voltage or approximate 1,040 KW
- Balance of facility loads including power, lighting and auxiliary systems at approximate 300 KW. The electrical system will be stepped down to 480V and 120/208V with transformers and local distribution panels.

The peak demand in the pumps station is approximate at 1.5 MW. Two service feeders shall be provided by Entergy for redundancy. In case of loss of one feeder the other feeder shall be capable of providing power for the entire pump station demand. Main Substation will consist of MV vacuum type breakers and metering devices to meet Entergy standards. Service availability will be coordinated with Entergy during the design development.

- Standby Power

Standby power source will be required in case of total black-out on utility grid occurs coincidence with the flood event. There are two options for providing standby power.

- Option A: Locally installed 1-1.5 MW diesel generator to meet the peak demand. The generator will be specified for continuous duty with sufficient fuel storage to operate the pumps up to 36 hours.
- Option B: Central Generation Plant. See description on Project 1.

Construction Considerations

Prior to construction of new drainage structures, the contractor shall implement a construction procedure that will not impose on the structural integrity of existing adjacent concrete structures and channels.

A construction sequencing plan would be required to minimize impacts to traffic during construction.

Prior to the construction of the pump station foundation, the Contractor shall implement a construction procedure that will not impose on the integrity of the existing canal and levee. Temporary sheet piling may be used as an alternative to provide stability of the existing levee at the pump station and intake basin.

Where the proposed two 10’ diameter pipes cross the New Orleans Public Belt Railroad, it may be imperative to brace the existing railroad embankment while the pipe support

bridge is being constructed. Coordination with the Railroad will be required to locate the pipe bridge structure outside of the railroad right-of-way and to facilitate its horizontal and vertical clearance requirements.

The construction of the pipes across Jefferson Highway and River Road shall be phased so that traffic can be maintained. Construction shall be coordinated with the railroad so that it does not impede rail service.

Environmental Considerations

This project, like all the others, would satisfy the requirements of NEPA through a supplement to EA #433.

Order of Magnitude Cost Estimate

Cost Estimate - Project 16

Environmental	$0
Right-of-Way Acquisition	$2,000,000
Design	$8,287,163
Construction	$95,302,371
Total	**$105,589,534**

Road Map/Time line

Design – This would be divided into two phases that would be initiated concurrently, M&E and Civil. The M&E would include a fast-track specification of pumps and other equipment with long lead time deliveries. M&E fast-track should take 2 months and the civil design should take 4 months.

Environmental Clearance – Concurrent with design

Permits – The permits required concern water quality, and are issued by LDNR, this should be coordinated among the agencies to take no more than one month after final design is completed and be concurrent with the construction bid process.

LERRD – Pipe ROW or easements will have to be coordinated with the Norfolk-Southern Railroad and any owners of land that the pipe crosses. This must be concurrent with Design and could be the critical path of the Civil design.

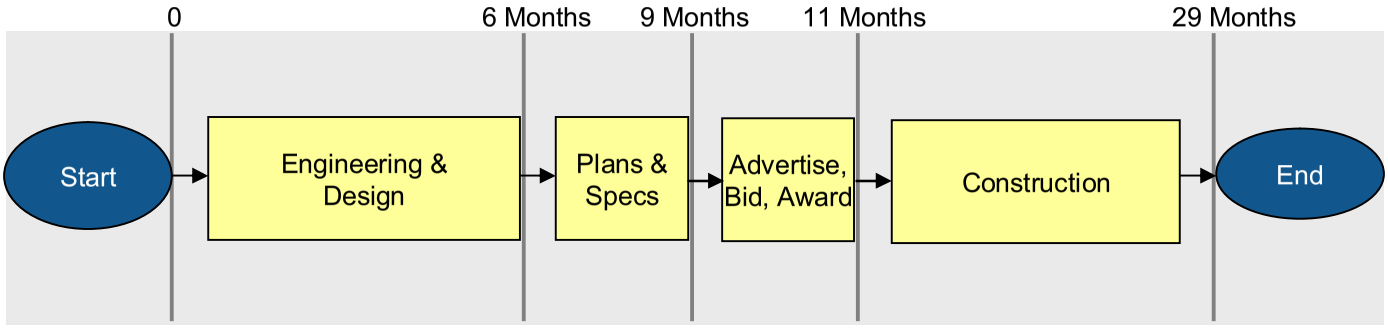
Construction – The pump station proposed would take approximately 18 months to complete.

Conclusion

This project is recommended for further study for the following reasons:

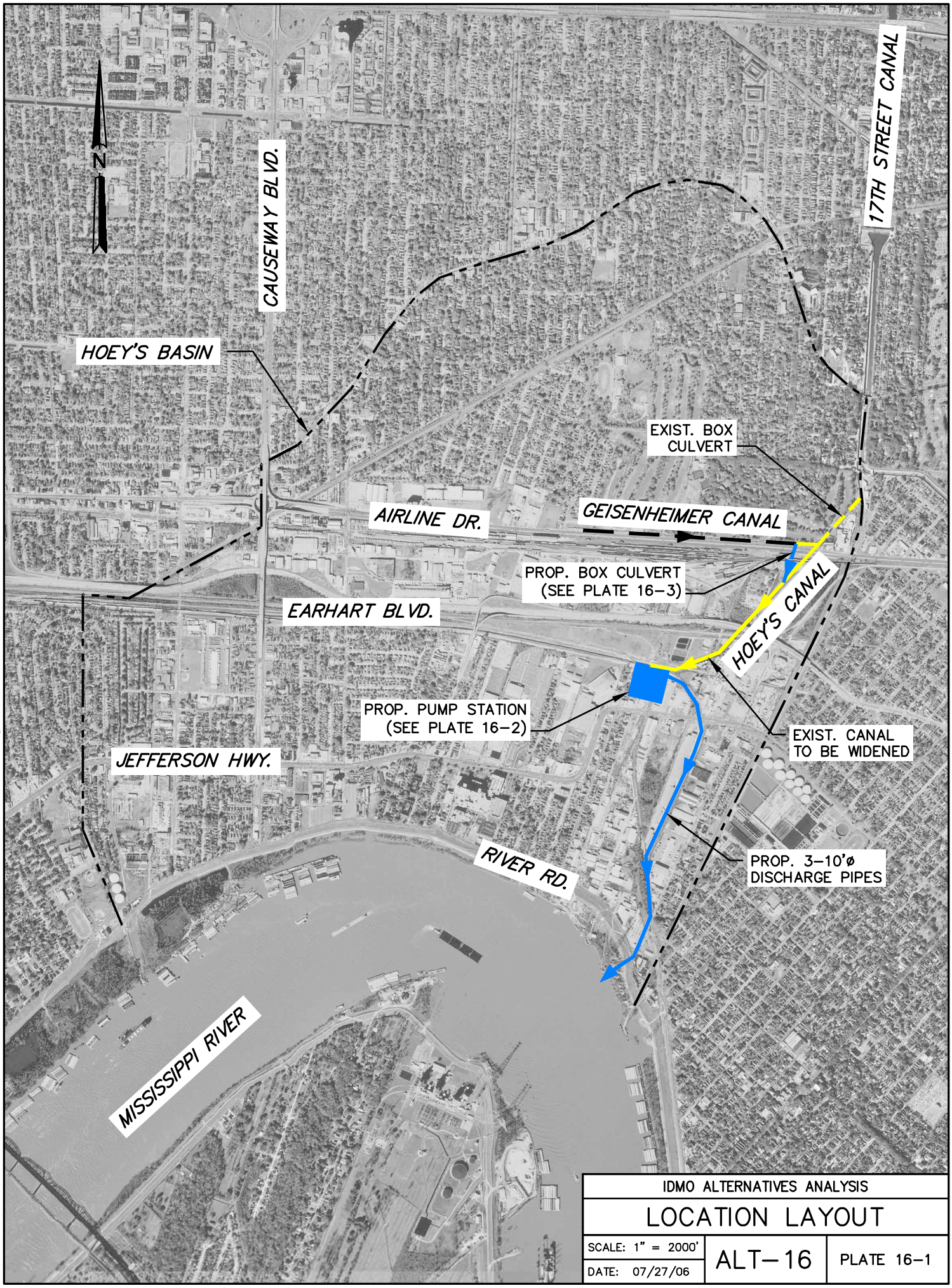
1. It removes 2400 cfs from the 17th Street Canal.
2. It offers another outfall by pumping the water to the Mississippi River.
3. This project implemented in conjunction with Project No. 11 would allow both Orleans and Jefferson Parishes to operate separate drainage systems.

Project 16



Environmental Compliance – Potential environmental issues, as discussed in the "Environmental Consideration" section, can be addressed during the engineering and design phase in order to keep off the critical path.

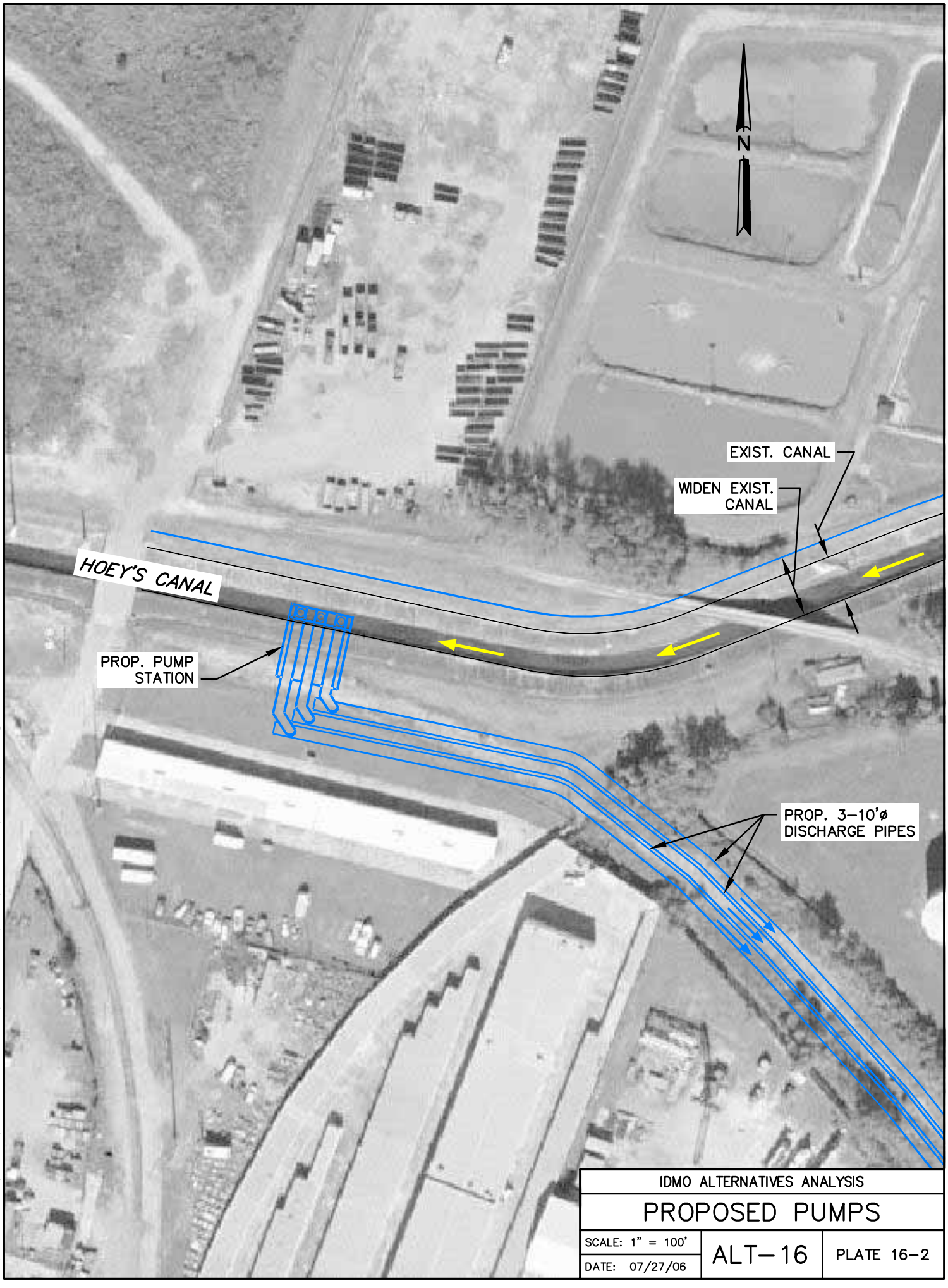
LERRD's – Any potential LERRD's , as discussed in the "Proposed Work" section, can be addressed during the engineering and design phase in order to provide for construction without causing delay.



IDMO ALTERNATIVES ANALYSIS

LOCATION LAYOUT

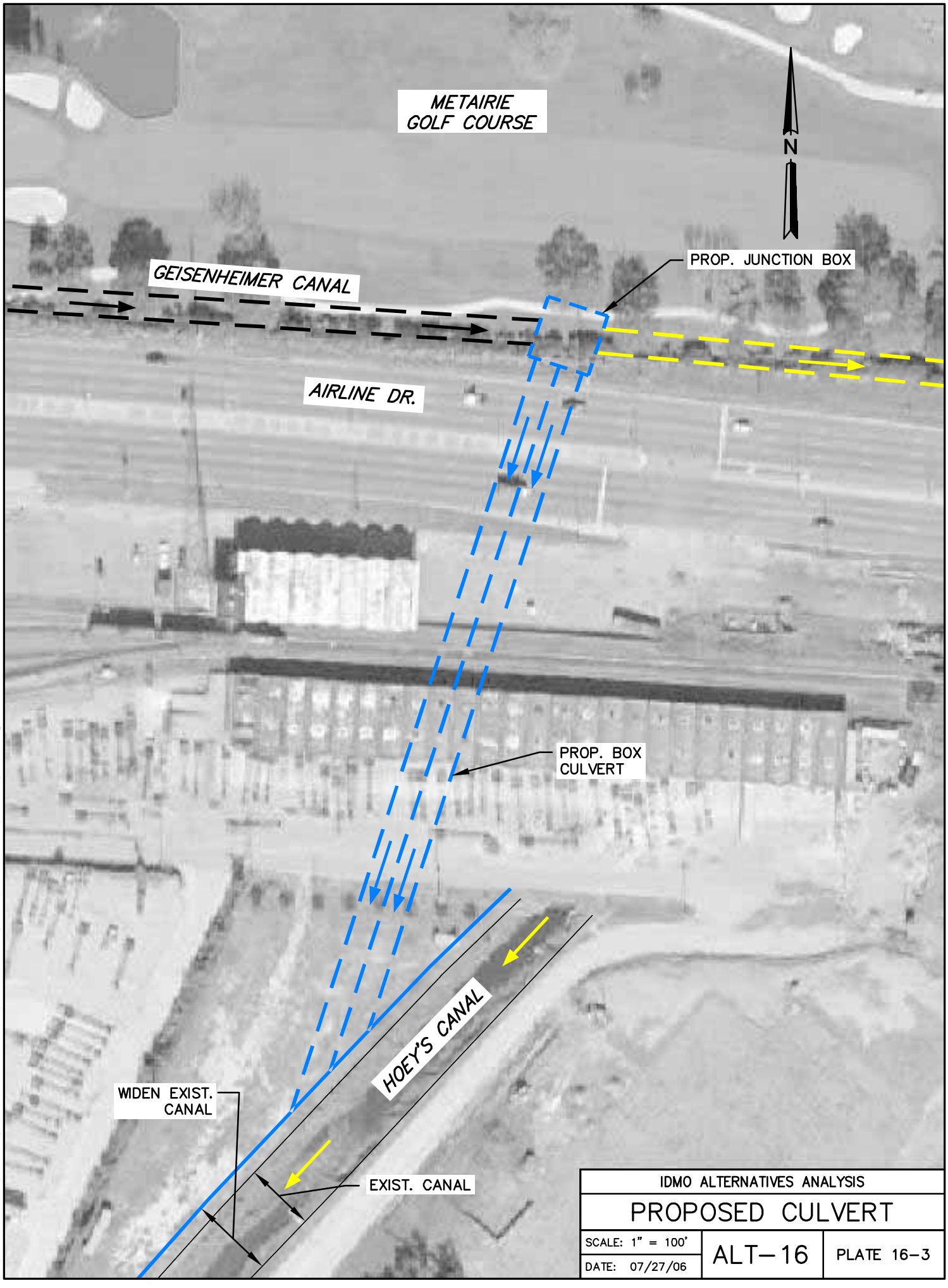
SCALE: 1" = 2000'	ALT-16	PLATE 16-1
DATE: 07/27/06		



IDMO ALTERNATIVES ANALYSIS

PROPOSED PUMPS

SCALE: 1" = 100'	ALT–16	PLATE 16–2
DATE: 07/27/06		



IDMO ALTERNATIVES ANALYSIS

PROPOSED CULVERT

SCALE: 1" = 100'	ALT–16	PLATE 16–3
DATE: 07/27/06		

Building on the south bank of Hoey's Canal (Looking Southeast)

Hoey's Canal and Iris Ave. (Looking Northwest)

Proposed pump station location at Hoey's Canal and railroad track (Looking Southeast)

Railroad track and Jefferson Highway (Looking Northeast)

Railroad track and Jefferson Highway (Looking Southwest)

Railroad track looking southwest toward Dakin Street (Southeast)

Railroad track and Dakin St. (Looking Northwest)

Railroad track and Dakin St. (Looking Southeast)

Dakin St. (Looking Northwest)

Houses Located between the Levee and the River (Looking southeast)

Project No. 19

Redirect flow from DPS 2 to Bayou St. John and pump to the lake

Objective

The objective of this project is to divert a portion of the flow discharged from DPS 2 into Bayou St. John in order to reduce pumping requirements at London Ave. Canal at Lake Pontchartrain. This project would reduce flows at Orleans Ave and London Ave. Canals by a total of 1,200 cfs by using Bayou St. John as a temporary conveyance channel to Lake Pontchartrain. See **Plate 19-1**, Location Layout.

Existing Conditions

DPS 2 is located in the median of N. Broad St. near the intersection of St. Louis St. It contains 6 pumps with a combined capacity of 3,190 cfs. The pumps include four horizontal and two centrifugal pumps, which are driven by six 25 Hz electric motors. The pump station is fed by the Broad St and Lafitte St Canals which collect runoff from the Central Business District and upriver portions of the French Quarter and Treme as well as discharged flow from Pump Station No. 1.

The water discharged from DPS. 2 flows into two conveyance structures:

- An underground box that runs eastward in the median of Broad St. to DPS 3 that is designed to convey 1150 cfs of water into the London Ave. or Florida Ave. Canals, and
- The Lafitte St. Canal, an 11.65' x 25' concrete flume that runs parallel to Lafitte St. to Jefferson Davis Pkwy is designed to convey 2000 cfs of water..

The latter becomes two closed boxes that are routed on the west side of Bayou St. John to Orleans Ave. One of the boxes traverses along Orleans Ave. to DPS 7 at the southern terminus of the Orleans Ave. Canal. The other box is not completed, but it is planned to be constructed as part of the SELA Drainage Improvements program. Typically, the Sewerage and Water Board only pumps 1000 cfs towards DPS 7 because any additional flow would flood neighborhoods that have subsided downstream of DPS 2.

Bayou St. John is a natural waterway that has been manipulated with concrete paved slopes along the channel. The bayou starts at the intersection of Jefferson Davis Pkwy. and Lafitte St and continues toward Lake Pontchartrain along the eastern edge of City Park. A water inlet in the channel, is controlled by two sluice gates located just north of Robert E. Lee Blvd. The elevation water is controlled at the outlet by a 24" diameter

pipe at the start of the bayou and other small outfall pipes that allow overflow into the municipal drainage system. Bayou St. John has no drainage function at the present time. The only major constriction of flow in the Bayou St. John is the 10'x 28' channel at Robert E. Lee Blvd. just downstream of the sluice gates. A large storm surge protection sector gate has been placed near Lake Pontchartrain to prevent intrusion from the lake. The flood protection extends from the lake to the flood gates north of the sluice gates.

Proposed Work

The 1,200 cfs flow from DPS 2 would be diverted into Bayou St. John via the existing Lafitte St. Canal and a 10' x 22' channel that would be added parallel to the existing canal on the north side. Four 300 cfs pumps would be placed at the foot of Bayou St. John to pump the 1,200 cfs of water into the bayou with an intake basin in the median of Jefferson Davis Pkwy. between Lafitte and Conti Sts. The two sluice gates just downstream of Robert E. Lee Blvd. would be removed, and a new 10' x 20' channel, paralleling the existing channel, would be constructed.

A second new pump station, including intake and discharge basins, would be located just east of the existing gate structure at the outlet of the bayou. Each new pump station would house four 300 cfs pumps.

Geotechnical Considerations

- Subsoil Conditions

  Based on the borings made in the general area, subsoil conditions at the site of the proposed construction to the south would be expected to consist of soft clay and organic clay that extend to about the 60 ft. depth where the geologically identified Pleistocene age soils would be expected to occur. However, medium dense to dense sands are interbedded within this clay stratum between about the 40 and 50 ft. depths. The Pleistocene age soils below about the 60 ft. depth generally consist of stiff to very stiff clay to about the 90 ft. depth where dense silty sand would be expected. This silty sand should extend to at least the 100 ft. depth below ground surface. On the north side of Robert E. Lee Boulevard, the subsoils would be expected to consist of alternating layers of soft to medium stiff clay and loose to medium dense sand to about the 25 ft. depth. The subsoils below this are primarily loose to medium dense sand to about the 50 ft. depth. This is typically

followed by medium stiff clay to about the 65 to 70 ft. depth where the geologically identified Pleistocene age soils would be expected. These Pleistocene age soils would consist of either stiff to very stiff clay or medium dense to dense sand to at least the 100 ft. depth below ground surface.

- Conceptual Foundation System

  Based on the subsoil conditions described above, it is believed that all important structures should be supported on driven piles. For timber, or composite, piles supporting the open channel between Drainage Pump Station No. 2 and Bayou St. John and the pump station at the foot of Bayou St. John, a capacity of about 15 tons (F.S. = 2.0) in compression should be available. This is based on 60 to 70 ft. long timber, or composite, piles (below existing grade) or piles driven to firm embedment into sand. Slightly less capacities would be expected for the pump station on the north side of Robert E. Lee Boulevard. For piles subject to uplift and lateral loading, a composite pile should not be considered. Higher capacities on the order of 30 to 50 tons would be available if steel "H" or pile piles or prestressed concrete piles are used for support. They should also be considered if greater design life than typically provided by timber piles is desired.

- Water Diversion and Cofferdam Arrangement

  Construction cofferdams would be required for the open channel between Drainage Pump Station No. 2 and Bayou St. John and the pump station intake and discharge basins. For cost estimating purposes, a sheet pile penetration of about 60 ft. below ground surface would be expected. The cofferdam should be internally braced at least at one location at the top of the cofferdam walls. Forced dewatering (deep wells, well points, etc.) would probably be required to dewater the shallow sands at both pump station locations.

- Additional Geotechnical Investigations

  Soil borings should be made on about 300 ft. spacing between the existing Pump Station No. 2 and the proposed pump station at the foot of Bayou St. John. Borings should also be made where the existing sluice gate at Robert E. Lee Boulevard will be removed and also at the proposed new pump station to the north. Geotechnical analyses with regard to compression, tension and lateral

capacities of piles would be needed of support of the various elements of the structures. Analyses would also be needed relative to the temporary retaining structures (structural and dewatering). Consideration should also be given to the effect of the cofferdam for the channel between Drainage Pump Station No. 2 and Bayou St. John relative to its effect on the adjacent existing channel. If levees are needed along Bayou St. John to contain the flow during maximum operating conditions, then additional analyses and borings along the length of Bayou St. John would also be needed.

Structural Considerations

The architectural elements of the pump stations shall be coordinated with local agencies.

As for the structural integrity of the pump stations, all components of the structure shall be designed in accordance with the state and local building code requirements and be able to withstand winds in excess of 150 mph.

The foundation shall be supported on composite timber piles (due to water table fluctuations) while the open channel (suction and discharge basins) will be founded on concrete piles.

The engine deck for the pump stations would be elevated one foot above the base flood elevation as shown on the FIRM map.

As for the structural integrity of the box culvert and channel their foundations shall be supported on timber piles

All foundations shall be designed in accordance with the Geotechnical Report's recommendations.

The suction and discharge basins (open concrete channel), box culvert and channel shall be sized to accommodate the hydraulic requirements of this report.

Mechanical/Electrical Considerations

- Electric Service

  The local electric service is provided by Entergy. The anticipated electrical load at pump station is including:

  - Four (4) 300 cfs vertical pump, motor rated at 700HP, medium voltage or approximate 2,080 KW

- Balance of facility loads including power, lighting and auxiliary systems at approximate 300 KW. The electrical system will be stepped down to 480V and 120/208V with transformers and local distribution panels.

The peak demand in the pumps station is approximate at 2.4 MW. Two service feeders shall be provided by Entergy for redundancy. In case of loss of one feeder the other feeder shall be capable of providing power for the entire pump station demand. Main Substation will consist of MV vacuum type breakers and metering devices to meet Entergy standards. Service availability will be coordinated with Entergy during the design development.

- Standby Power

Standby power source will be required in case of total black-out on utility grid occurs coincidence with the flood event. There are two options for providing standby power.

- Option A: Locally installed 2-1.25 MW diesel generators to meet the peak demand. The generators switchgear with synchronizing bus will be provided. The generators will be specified for continuous duty with sufficient fuel storage to operate the pumps up to 36 hours.
- Option B: Central Generation Plant. See description on Project 1.

Construction Considerations

A construction sequencing plan would be required to minimize impacts to traffic during construction of the required box culvert at Robert E. Lee Blvd.

Installation of the pump station, and its intake and discharge basins adjacent to the closure gate, requires relocation of the levee on the east bank of the bayou north of Robert E. Lee.

Prior to the construction of the new drainage structures, the Contractor shall implement a construction procedure that will not impose on the structural integrity of the existing adjacent channels at Lafitte St and Robert E. Lee Blvd.

Temporary sheet piling may be used as an alternative at several locations for providing stability of the existing levee at the junction points:

1) of the existing levee and intake and discharge basins and

2) at the pump station and levee interface.

In addition, sheet piling may be used as an alternative for providing stability of the existing culvert along Lafitte St. See Plates 19-2, Site 1 and 19-5, Conc. Channel Section and the existing channel at Robert E. Lee Blvd. See Plates 19-3, Site 2, and 19-6, Conc. Box Culvert Section.

Remove existing Lafitte St. roadway between Hagen and Moss Sts. and construct new pump station. Also, remove any abandoned railroad tracks in the construction area.

Permanent traffic operation would be addressed by relocating the movements now provided on Lafitte Street to Conti Street, one block away.

Environmental Considerations

This project, like all the others, would satisfy the requirements of NEPA through a supplement to EA #433.

For this project, additional consultation with the SHPO is required because the new pump station in the Jefferson Davis Pkwy. median is within one block of 2 districts and must be reviewed for viewshed concerns, and the new pump station at the lake is in an area that may be eligible for the NRHP.

A Scenic River permit must be obtained from LDWF because Bayou St. John is listed as a Scenic River.

It appears that that the area along Lafitte St. between N. Broad St. and Jefferson Davis Pkwy. may be an environmental justice area. A determination must be made and actions taken accordingly.

Order of Magnitude Cost Estimate

Cost Estimate - Project 19

Environmental	$30,000
Right-of-Way Acquisition	$0
Design	$2,375,745
Construction	$27,321,062
Total	**$29,726,807**

Roadmap / Timeline

Design – This would be divided into two phases that would be initiated concurrently, M&E and Civil. The M&E would include a fast-track specification of pumps and other equipment with long lead time deliveries. M&E fast-track should take 2 months and other design should take 4 months.

Environmental Clearance – Concurrent with design. Compliance with the Scenic River Permit may be a critical path item.

Permits – The permits required concern water quality, and are issued by LDNR, this should be coordinated among the agencies to take no more than one month after final design is completed and be concurrent with the construction bid process.

LERRD – Land required for the concrete flume is within an abandoned railroad ROW. Coordination with the railroad company could be a critical path item.

Construction – The pump station proposed at the lake would take approximately 18 months to complete. Lead time for the pumps would be approximately 12 months from the placement of the order.

Further Considerations

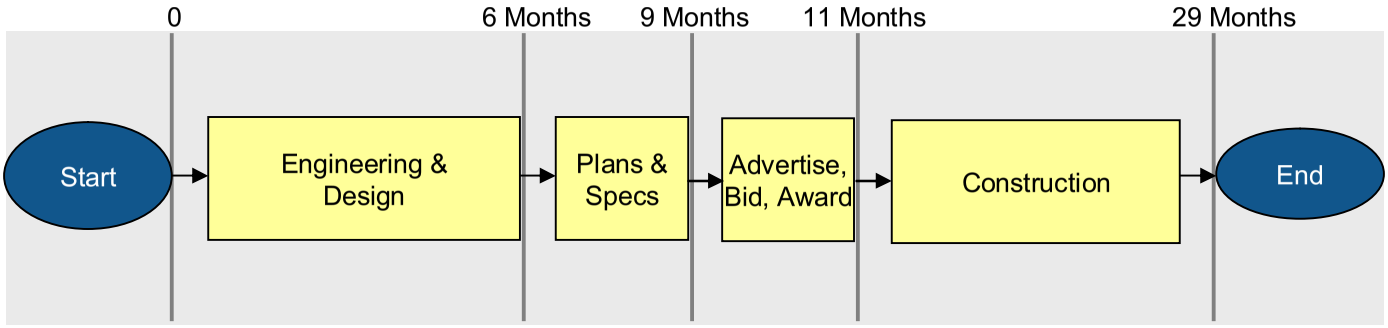
- Bayou St. John can be converted to a new outfall within the drainage system at a cost considerably lower than any other possible project.
- A ROW preservation plan for the additional canal proposed in the Lafitte St. ROW is essential because, although the land is currently vacant, the Norfolk Southern Railroad is actively marketing the property.
- Early coordination with the LDWF concerning the Scenic River permit and with the SHPO regarding the Section 106 process is advised because the design elements concerned here overlap, and because these activities are frequently time-consuming.
- The visual concerns relative to both Section 106 and the Scenic River permit could be avoided or mitigated through context sensitive architectural design.
- The delivery time for the pumps and other equipment are probably the critical path of construction.
- There are conveyance limitations between DPS 1 and DPS 2 that may reduce the potential contribution of this project to system capacity improvements.

- Additional flow can be pumped out of DPS 2 towards the new pump station at the southern end of Bayou St. John without the risk of flooding neighborhoods downstream that have subsided. This condition currently exists pending completion of the SELA project for additional conveyance capacity between the site of the proposed station at Jefferson Davis Pkwy. and DPS 7.
- The additional capacity in the Lafitte St. ROW would be a permanent improvement to the drainage system. Given various proposed improvements in the conveyance network, could provide an option to increase or decrease flow to DPS 7, and, to relieve both DPS 1 and DPS 3.
- Construction of the canal and intake basin in the median of Jefferson Davis can take place in the dry without disturbing the existing system until it is necessary to tie into the system.
- If an Environmental Justice area is identified, a public involvement process must be undertaken, as appropriate.

Conclusion

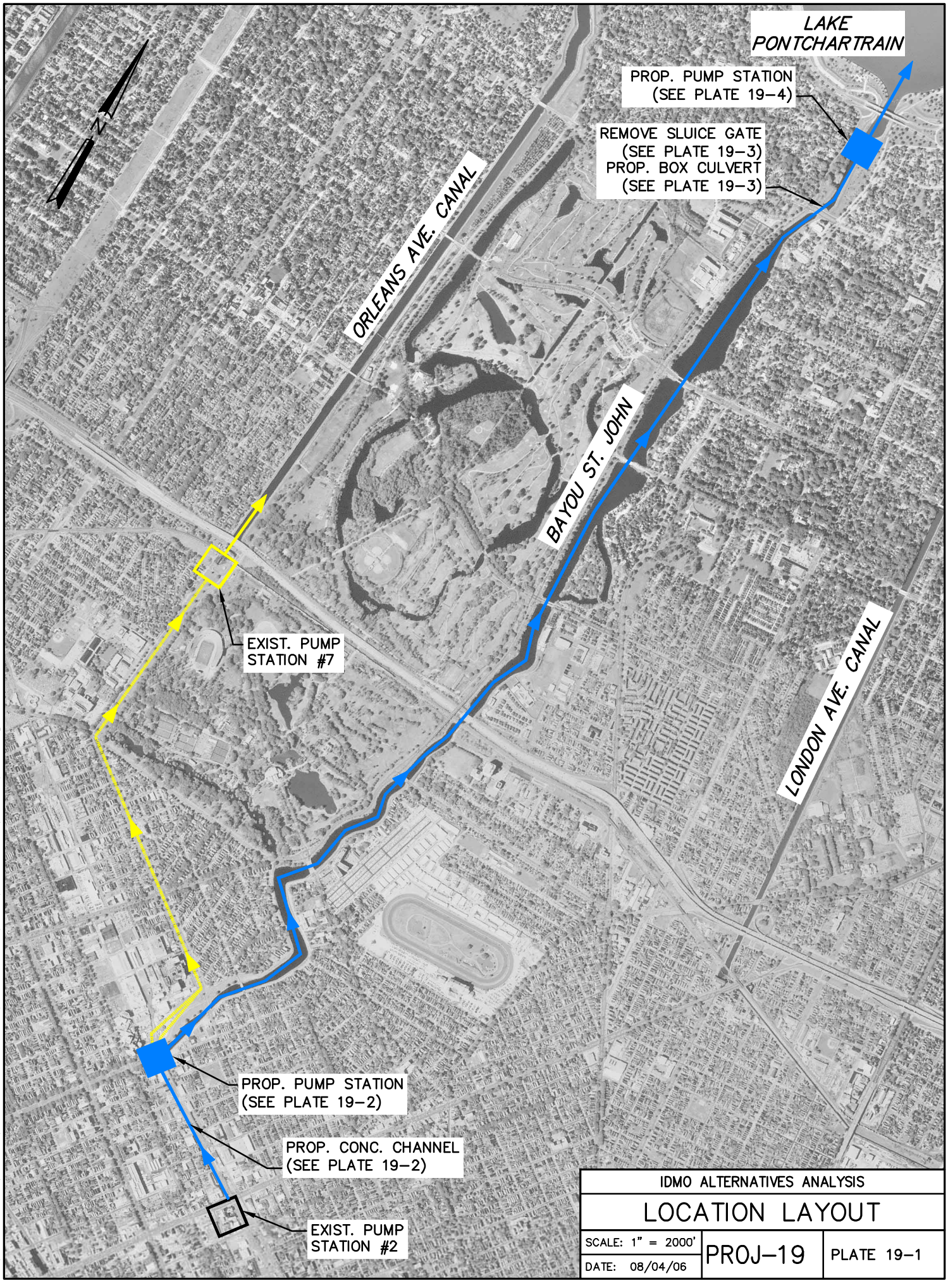
This project has been recommended for further study. The construction of the parallel channel along Lafitte Street from DPS 2 to Bayou St. John and the adjacent pump station can offer significant relief to the London Avenue Canal. This project also can be combined with Project No. 15 to redirect a total of 4800 cfs away from the London Ave, Canal.

Project 19



Environmental Compliance – Potential environmental issues, as discussed in the "Environmental Consideration" section, can be addressed during the engineering and design phase in order to keep off the critical path.

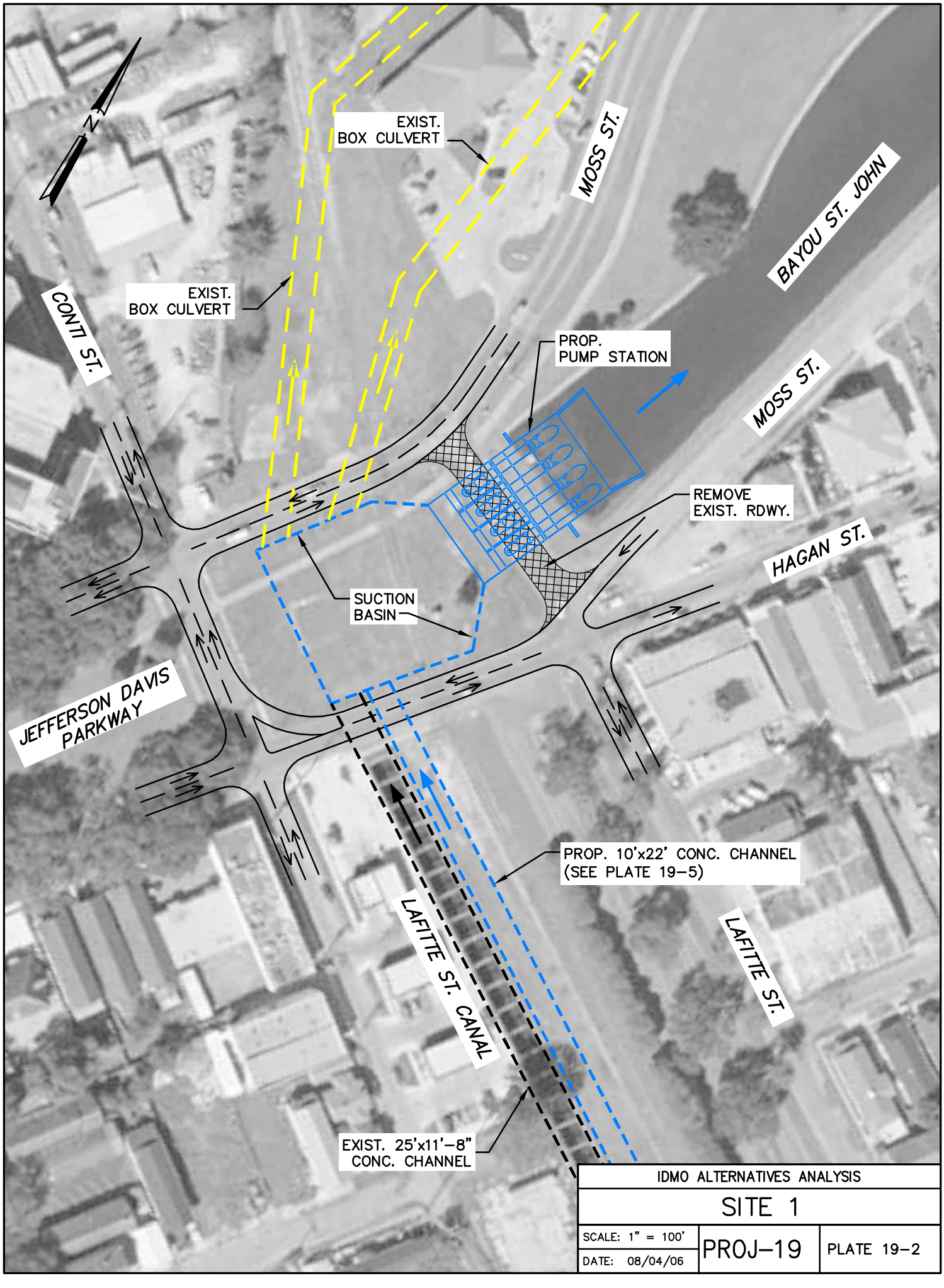
LERRD's – Any potential LERRD's , as discussed in the "Proposed Work" section, can be addressed during the engineering and design phase in order to provide for construction without causing delay.



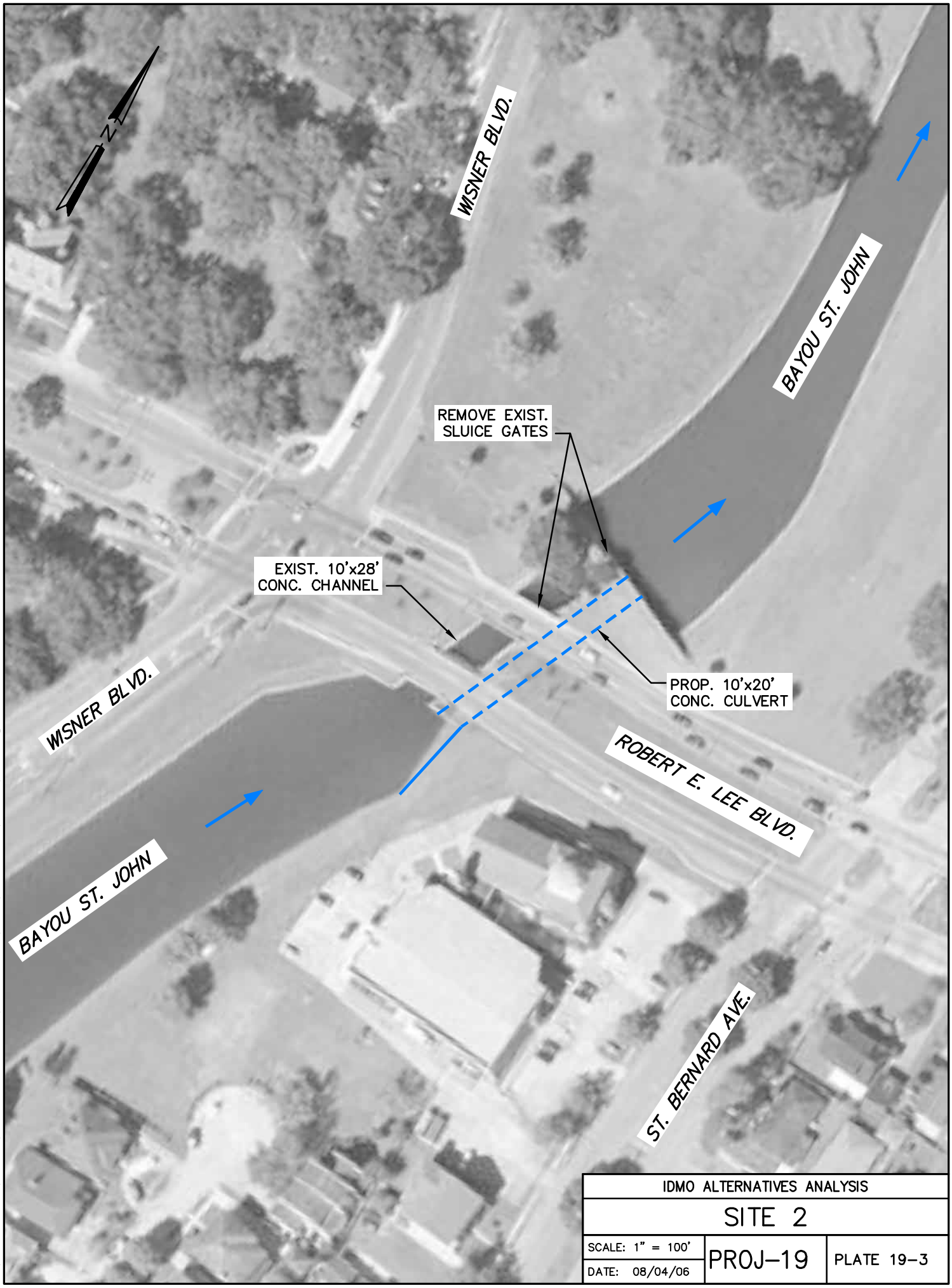
IDMO ALTERNATIVES ANALYSIS

LOCATION LAYOUT

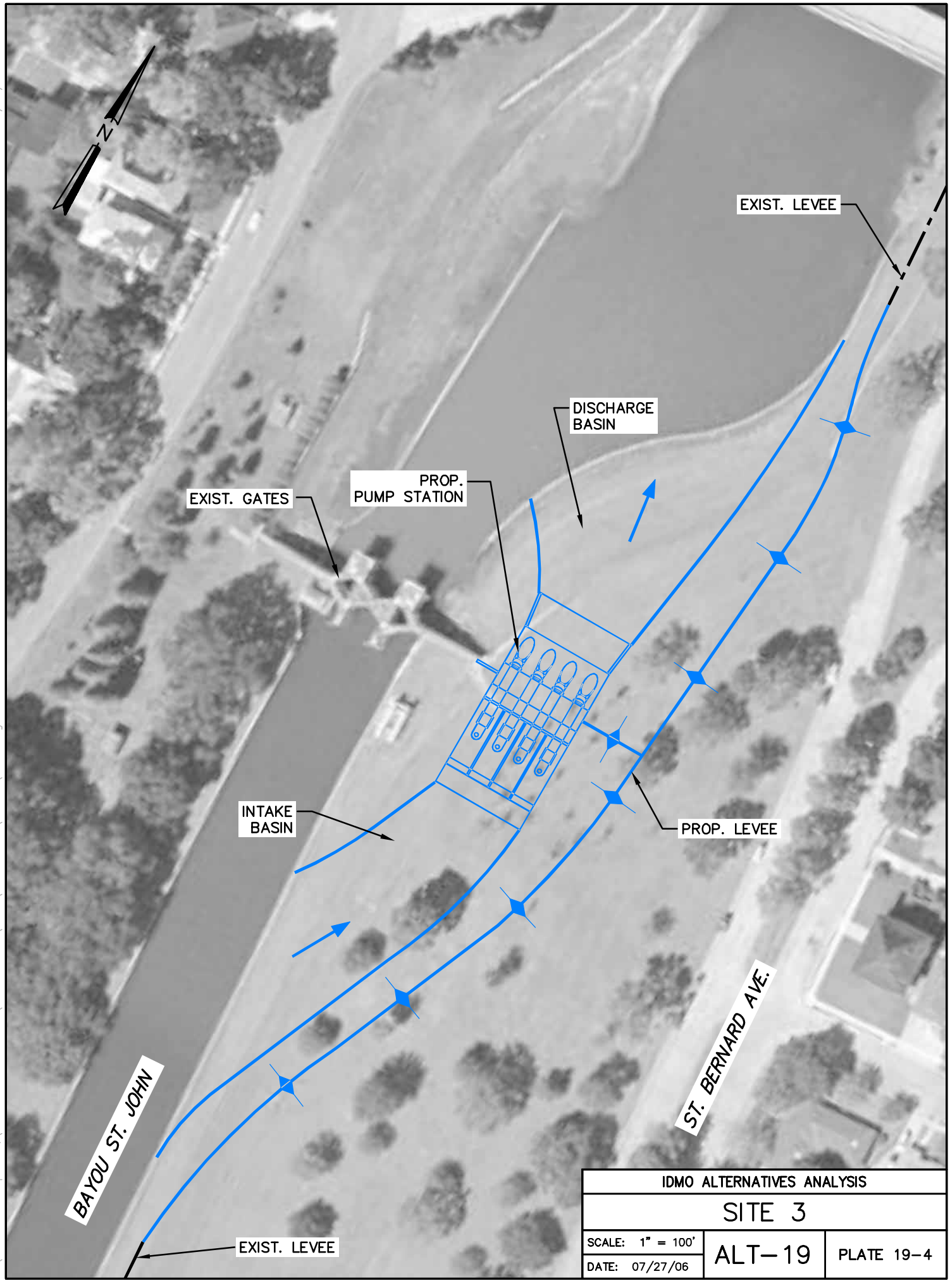
SCALE: 1" = 2000'	PROJ-19	PLATE 19-1
DATE: 08/04/06		



IDMO ALTERNATIVES ANALYSIS		
SITE 1		
SCALE: 1" = 100'	PROJ-19	PLATE 19-2
DATE: 08/04/06		



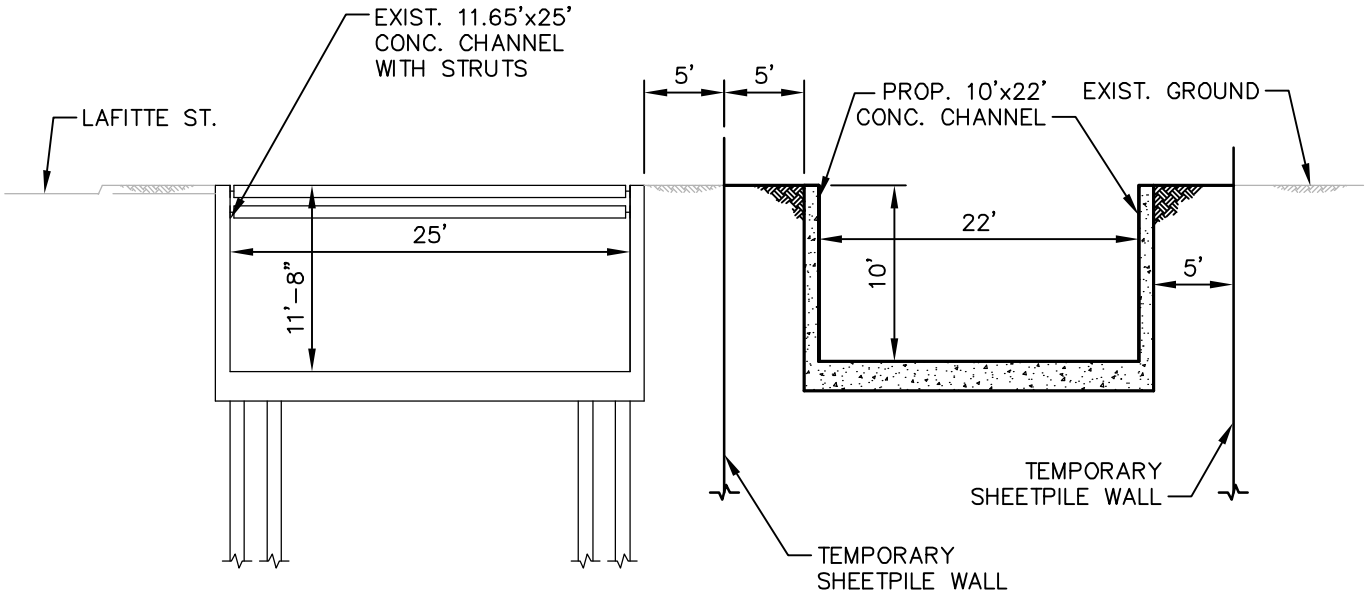
IDMO ALTERNATIVES ANALYSIS		
SITE 2		
SCALE: 1" = 100'	PROJ-19	PLATE 19-3
DATE: 08/04/06		



IDMO ALTERNATIVES ANALYSIS

SITE 3

SCALE: 1" = 100'	ALT-19	PLATE 19-4
DATE: 07/27/06		



LAFITTE ST. CANAL TYPICAL SECTION

N.T.S.

IDMO ALTERNATIVES ANALYSIS		
TYPICAL SECTION		
SCALE: 1" = N.T.S.	PROJ-19	PLATE 19-5
DATE: 08/04/06		

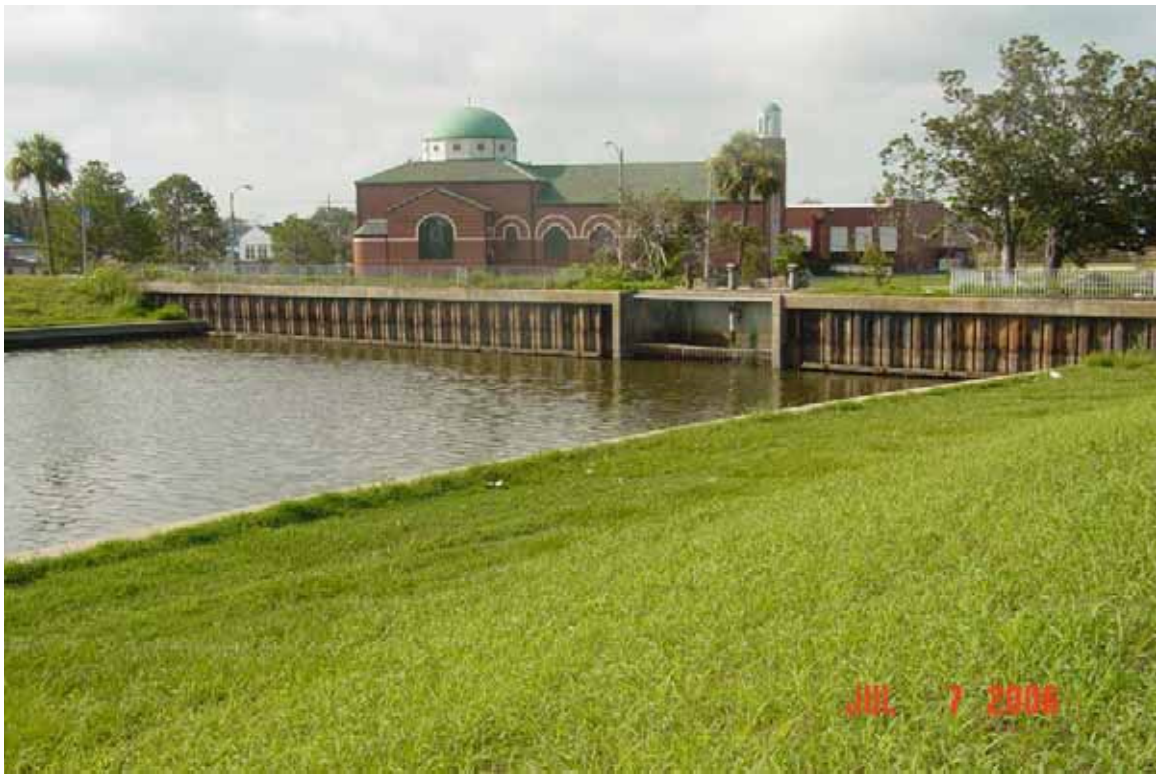
Pump Station No. 2 (Looking at the Northeast corner)

Beginning of Bayou St. John (Looking Southwest)

Beginning of Bayou St. John (Looking Northeast)

Lafitte St. Box (Looking toward DPS No. 2)

Weir on Bayou St. John (Looking North)



Sluice Gates on Bayou St. John (Looking South)

Sector Gate on Bayou St. John (Looking South)

REFERENCES

Brown, Cunningham, Gannuch. 2006. Hoey's Basin Interim Protection Conceptual Plan Map. Jefferson Parish, LA.

Brown, Cunningham, Gannuch. 2006. Hydrologic and Hydraulic Analysis of Orleans Canal Temporary Pumps and Gated Structure. New Orleans, LA.

Council on Environmental Quality. 2005. Memorandum: Emergency Actions and NEPA. http://ceq.eh.doe.gov/nepa/nepanet.htm.

Department of the Army; New Orleans District, Corps of Engineers. 2006. Damage Survey Report. Orleans Parish Drainage Pumping Stations Katrina Damage Repair. New Orleans, LA.

Department of the Army, New Orleans District, Corps of Engineers. 2006. Draft Environmental Assessment No. 433. U.S. Army Corps of Engineers Response to Hurricanes Katrina and Rita in Louisiana. New Orleans, LA.

Department of the Army, New Orleans District, Corps of Engineers. 2006. Electrical, Mechanical, and Structural Specifications and Site Plans. Lake Pontchartrain and Vicinity Interim Drainage Pump Stations. New Orleans, LA.

Department of the Army, New Orleans District, Corps of Engineers. 2006. Hydrologic and Hydraulic Analyses of 17th Street Canal Temporary Pumps and Gated Structures. New Orleans, LA.

Department of the Army, New Orleans District, Corps of Engineers. 2006. Hydrologic and Hydraulic Analyses of Additional Pumping Capacity at the Three Outfall Canals (17th Street, London Avenue, and Orleans Avenue). New Orleans, LA.

Department of the Army, New Orleans District, Corps of Engineers. 2006. Memorandum: Imminent Threat of Flooding Due to Damaged Hurricane Protection Works. Richard P. Wagenaar, District Engineer, signatory.

Department of the Army, New Orleans District, Corps of Engineers. 2006. Performance Evaluation of the New Orleans and Southeast Louisiana Hurricane Protection System. Draft Final Report of the Interagency Performance Evaluation Task Force. New Orleans, LA.

Department of the Army, New Orleans District, Corps of Engineers. 2006. Project Information Report. Damaged Flood Control Works: Federal and Non-Federal Pump Stations, Flood Control. Orleans Parish, LA.

Department of the Army, New Orleans District, Corps of Engineers. 2006. Unwatering the New Orleans Metropolitan Area Following Hurricanes Katrina and Rita and Repair of the Flood Protection System in Southeast Louisiana. Clean Water Act Section 404 Public Notice. New Orleans, LA.

Department of the Interior; Fish and Wildlife Service. 2005. Memorandum: Environmental Compliance Associated with Hurricane Response and Clean-up Activities. Atlanta, Georgia.

Louisiana Department of Environmental Quality. 2005. Draft Water Discharge Permit Municipal Separate Storm Sewer Systems (MS4s) within Jefferson Parish – AI 95365. Public Notice. Baton Rouge, LA.

Louisiana Department of Environmental Quality. 2005a. Louisiana Administrative Code Title 73 Chapter 1 Administration of the Natural and Scenic Rivers and Historic and Scenic Rivers. Baton Rouge, LA.

Louisiana Department of Environmental Quality. 2002. Water Quality Management Plan Water Quality Inventory Section 305(b) Report. Appendix B Descriptions of Louisiana's Natural and Scenic Rivers. Baton Rouge, LA.

Louisiana Department of Environmental Quality. June 29, 2006. Sixth Amended Declaration of Emergency and Administrative Order. In the Matter of Hurricane Katrina and Its Aftermath, Agency No. 130534. Baton Rouge, LA.

Luther, L. 2005. NEPA and Hurricane Response, Recovery, and Rebuilding Effort. Congressional Research Service Report for Congress. CRS Report RL33104

Maygarden, B.D., J-K. Yakubik, E. Weiss, C. Peyronnin, and K.R. Jones. 1999. National Register Evaluation of New Orleans Drainage System, Orleans Parish, Louisiana. New Orleans, LA.

Piehler, C. 2006. Hurricane Response Team Contact for Water and Wastewater Issues. Personal communications with Anne Compson, DMJM Harris – AECOM. July 2006.

Sewerage and Water Board of New Orleans. Diagrams, Plot Plans, and Drawings of Drainage Pump Stations. New Orleans, LA.

Sewerage and Water Board of New Orleans. 2003. Sewerage System Evaluation and Rehabilitation Program. Systemwide Elevation Relief Map. New Orleans, LA.

Sewerage and Water Board of New Orleans. 2003. Sewerage System Evaluation and Rehabilitation Program. Systemwide Drainage System (30" and Larger) Map. New Orleans, LA.

APPENDIX A

PUMP INFORMATION

PROVIDED BY HEALY ENGINEERING, INC.

PUMP CONSULTANT

Schumann, Ronald, Jr.

From: Jim Healy [jimhealy@healyengineering.net]
Sent: Tuesday, July 18, 2006 4:51 AM
To: Schumann, Ronald, Jr.
Subject: FW: City of New Orleans / 17th Street Canal

Ron,

This is part of the submittal I will complete this morning.

My server has been down since yesterday afternoon. I am faxing additional input this morning.

If you have any questions, please call.

Regards,

Jim Healy
Healy Engineering, Inc.
617-698-5960 (phone)
617-687-5624 (e-fax)
617-312-9697 (cell)

jimhealy@healyengineering.net

From: Bob Cornman [mailto:BCornman@flowserve.com]
Sent: Monday, July 17, 2006 8:15 AM
To: jimhealy@healyengineering.net
Subject: City of New Orleans / 17th Street Canal

Jim,

See info below:

1. 375 CFS Curve

2. 1000 CFS Curve

3. !000 CFS Drawings

4. I am also going to forward to you an email I sent to B&V regarding the New Orleans Canal.

Regards,

Bob Cornman
Director, Technical Services NA & LA
Flowserve Pump Division
942 Memorial Parkway
Phillipsburg, NJ USA

Tel: 908-859-7256
Fax: 908-859-7482

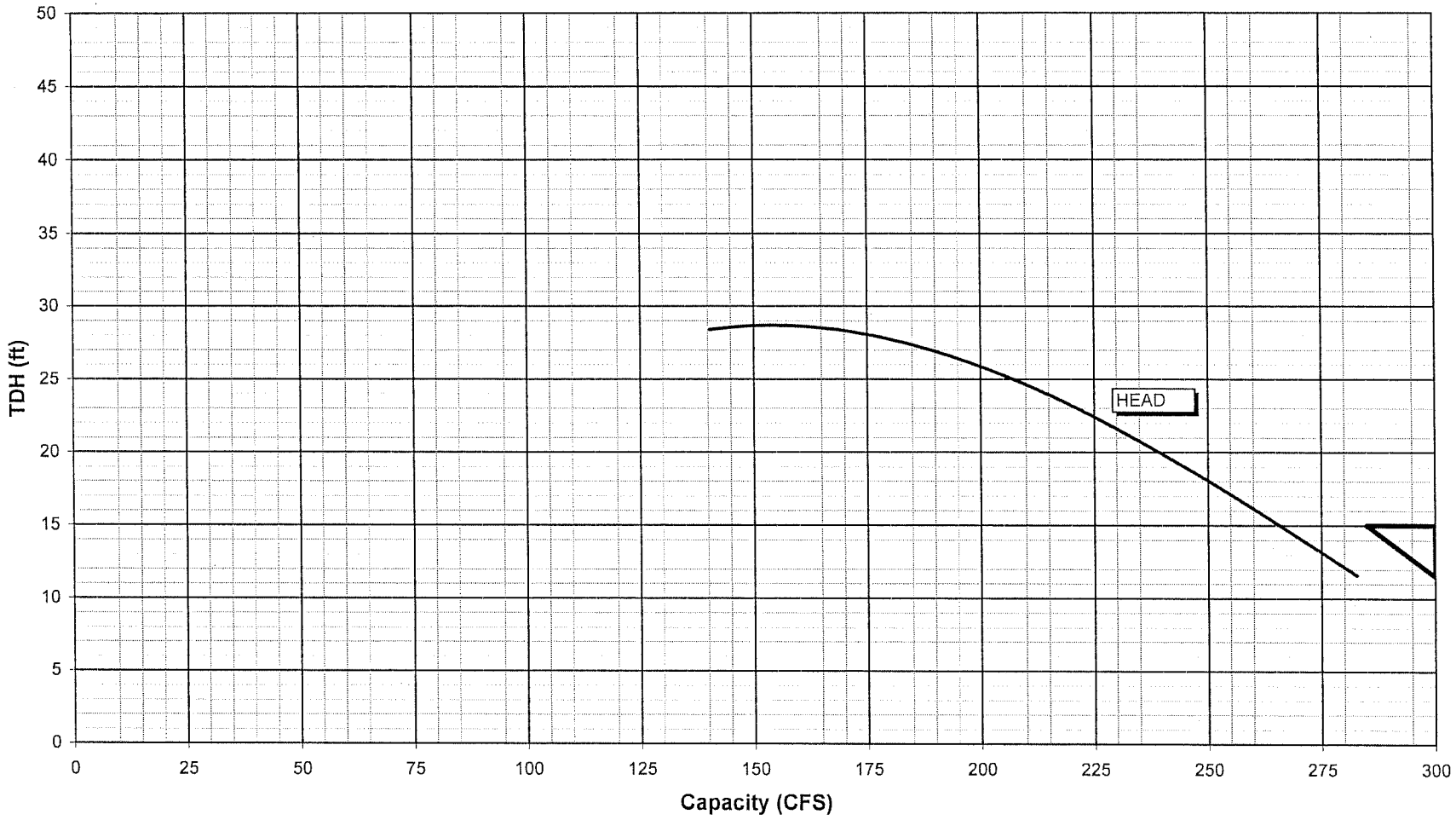
FLOWSERVE

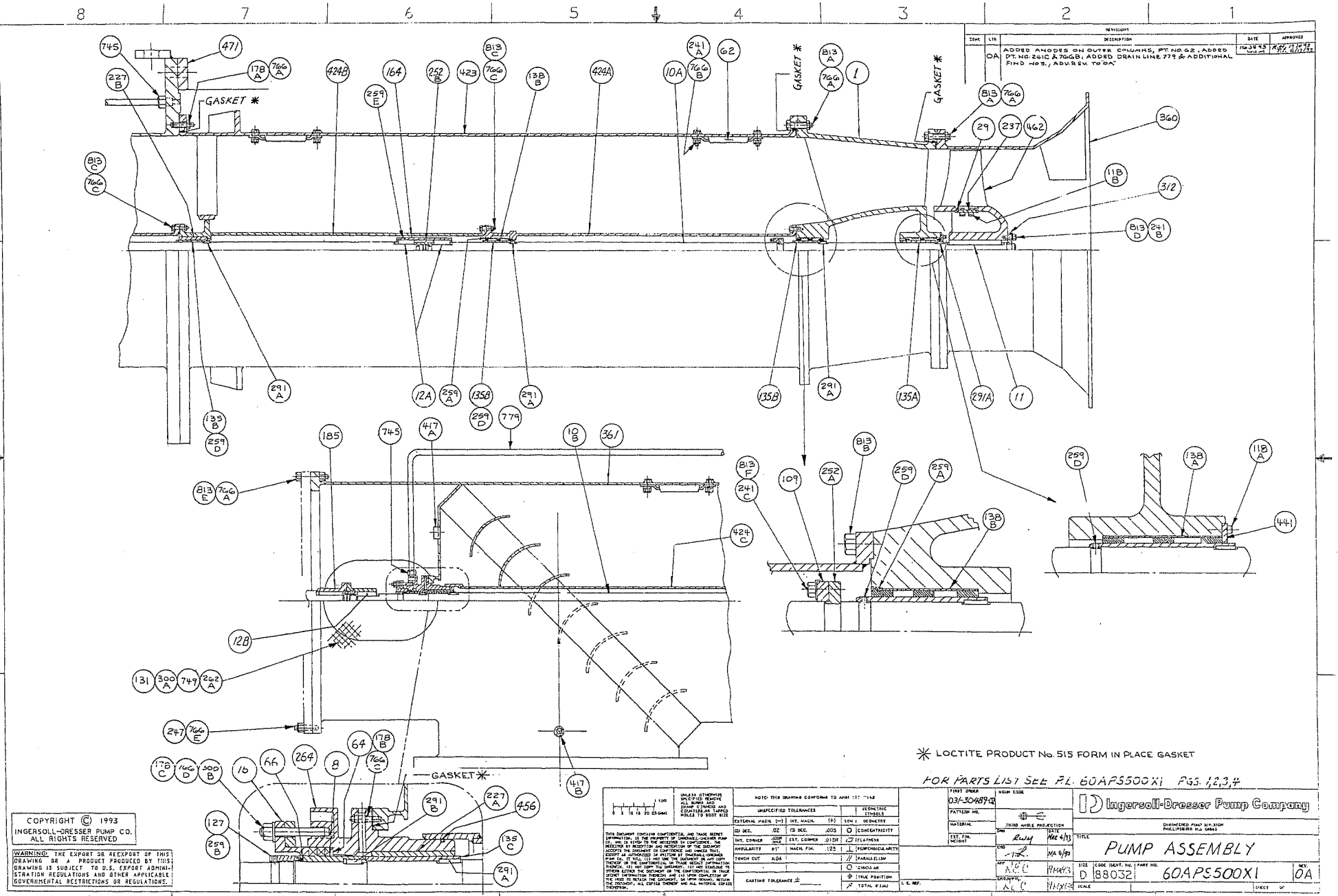
Proposed Performance

Order Number		**Liquid**	Water	**Speed (RPM)**	375	**Capacity (CFS)**	300
Customer	COE/17th Street Canal	**Temperature (°F)**		**Pump type**	60APS	**TDH (ft)**	15
Service	Drainage	**Viscosity (Cp)**		**Pump Serial No.**		**Efficiency**	
Date	5/10/2006	**Specific Gravity**				**NPSHR (ft)**	

Rev. A

Curves are approximate. Pump is guaranteed for one set of conditions. Capacity, head, and efficiency guarantees are based on shop test and when handling clear, cold, fresh water at a temperature of not over 85 degrees.





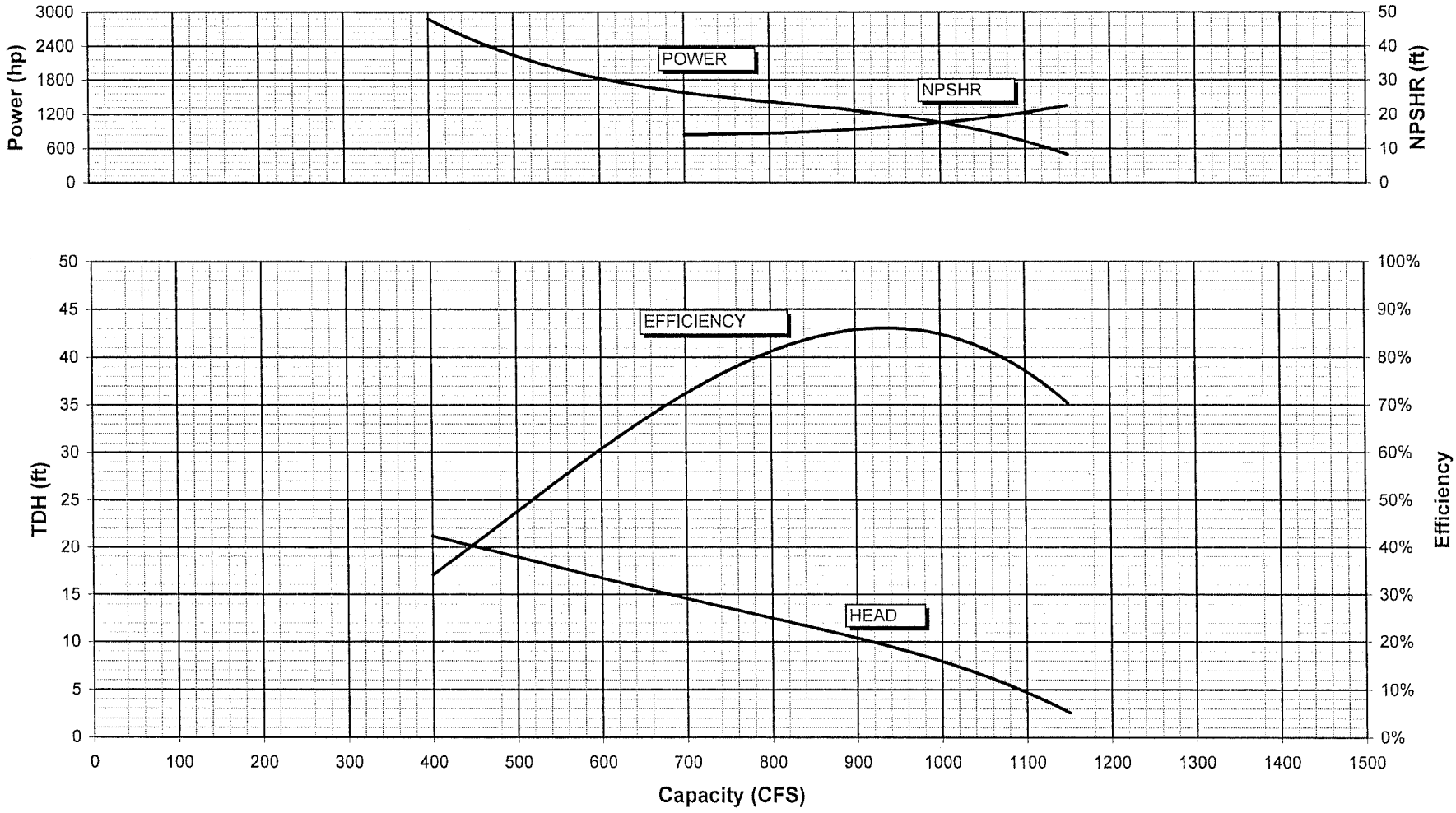
FLOWSERVE

Proposed Performance

Order Number	WFLT-20334	**Liquid**	Water	**Speed (RPM)**	123	**Capacity (CFS)**	1000
Customer	B&V	**Temperature (°F)**		**Pump type**	127APS	**TDH (ft)**	
Service		**Viscosity (Cp)**		**Pump Serial No.**		**Efficiency**	
Date	7/10/2006	**Specific Gravity**	1			**NPSHR (ft)**	
	1000CFS Option #1						

Rev. A

Curves are approximate. Pump is guaranteed for one set of conditions. Capacity, head, and efficiency guarantees are based on shop test and when handling clear, cold, fresh water at a temperature of not over 85 degrees.



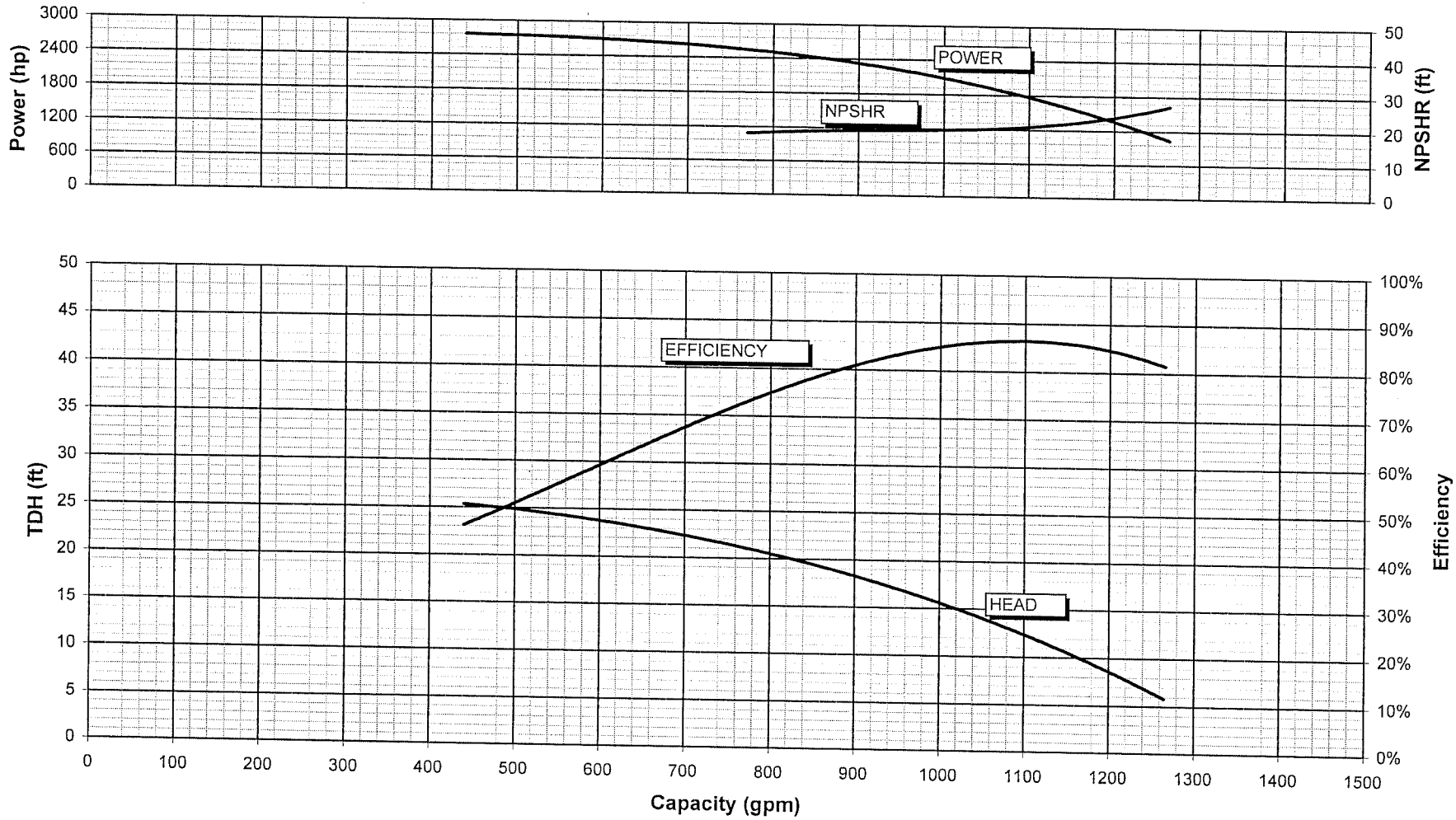
FLOWSERVE

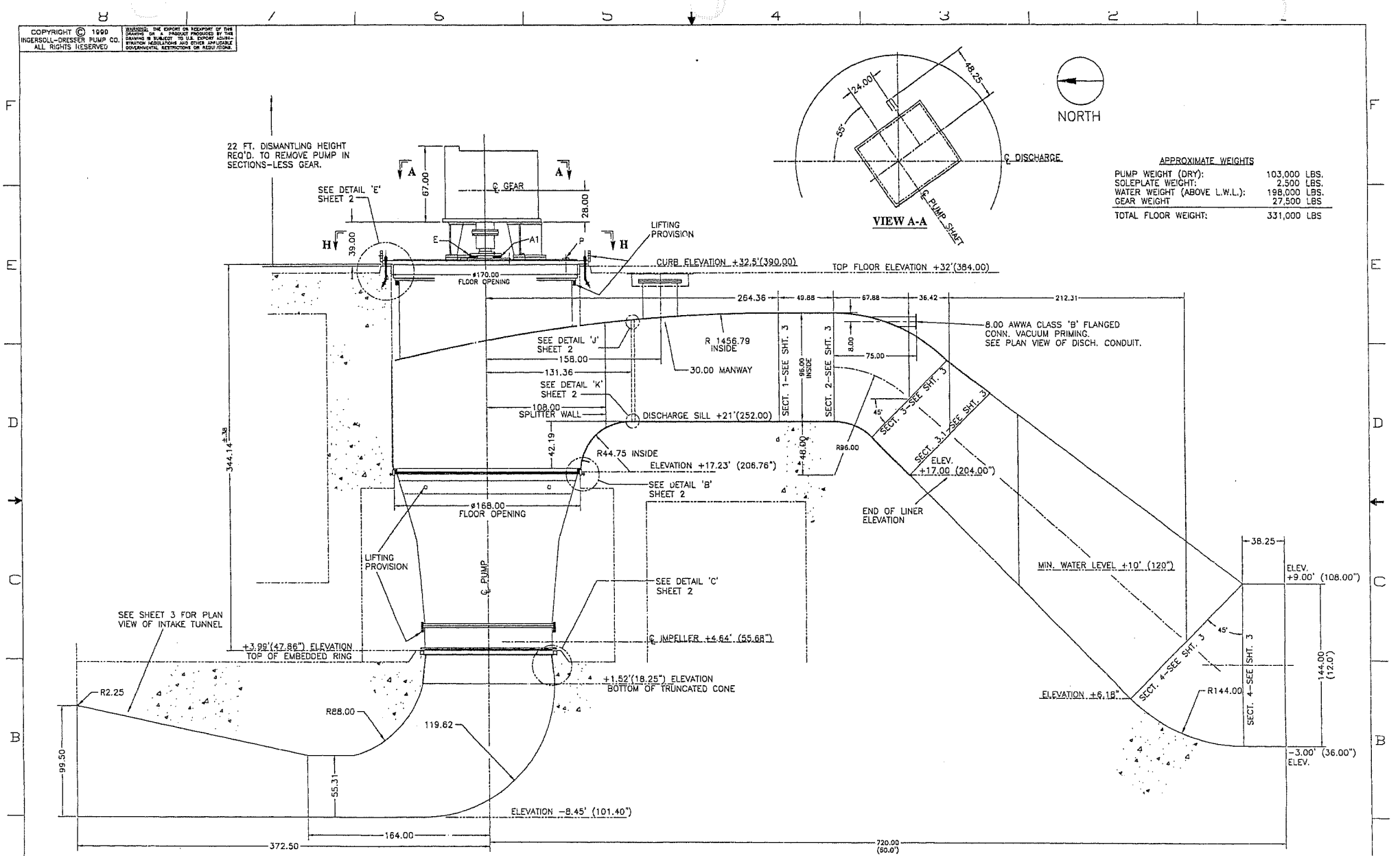
Proposed Performance

Order Number	WFLT-20334	Liquid	Water	Speed (RPM)	138	Capacity (CFS)	1000
Customer	B&V	Temperature (°F)		Pump type	127APS	TDH (ft)	
Service		Viscosity (Cp)		Pump Serial No.		Efficiency	
Date	7/10/2006	Specific Gravity	1			NPSHR (ft)	
	1000CFS Option 2						

Rev. A

Curves are approximate. Pump is guaranteed for one set of conditions. Capacity, head, and efficiency guarantees are based on shop test and when handling clear, cold, fresh water at a temperature of not over 85 degrees.





APPROXIMATE WEIGHTS

PUMP WEIGHT (DRY):	103,000 LBS.
SOLEPLATE WEIGHT:	2,500 LBS.
WATER WEIGHT (ABOVE L.W.L.):	198,000 LBS.
GEAR WEIGHT	27,500 LBS
TOTAL FLOOR WEIGHT:	331,000 LBS

REV	DRN	CKD	APP
D	DJS	WP	
DATE	1NV99		
① REV'D. GEAR SUPP. HEAD MOUNTING WAS 35			
ECR# 5030.			

REV	DRN	CKD	APP
C	D.C.	P.F.	J.R.
DATE	28OC98		
MODIFIED PER CUST. TRANSM. NO. 20027			

REV	DRN	CKD	APP
B	D.C.	P.F	J.R.
DATE	30JL98		
GENERAL REV. AND MODIFIED PER CUSTOMER M/U PRINT			

REV	DRN	CKD	APP
A	D.C.	J.R.	M.P.
DATE	28FE98		
INITIAL ISSUE			

GEAR MFG.	PHIL. GEAR CORP.
SERVICE	DRAINAGE PUMP
CUSTOMER	SOUTH FLORIDA WATER MANAGEMENT DISTRICT
ORD. NO.	047-82043
TYPE	1.8 MVBX-2PD
LIQUID	FRESH WATER
ORD. NO.	RFP NO. C-E203
ITEM NO.	01
FRAME	
ROTATION	CCW (H.I.)
ITEM NO.	
DATE	26FE98
H.P.	
BEARINGS	
DRAWN	D.C.
R.P.M.	720 INPUT 125 OUTPUT
	ECP PUMPING STATION EQUIPMENT FOR STORMWATER TREATMENT AREA 1W AND STORMWATER TREATMENT AREA 2
CHECKED	J.R.
PURCH. NO.	03152*0539
CERTIFIED	M.P.

REFERENCE NOTES

SEE SHEET 3 FOR GENERAL NOTES

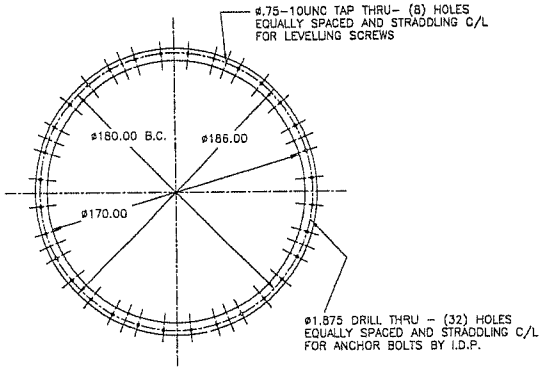
Ingersoll-Dresser Pump Company

GENERAL ARRANGEMENT

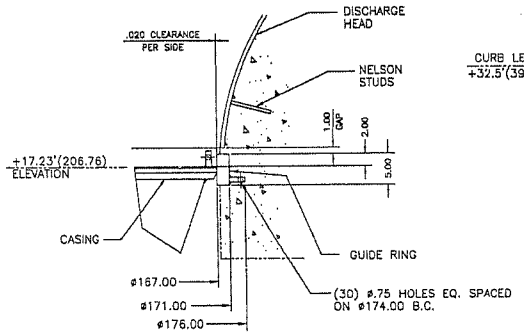
950 CFS-STATION 310 (127 APS)

SIZE	DESIGN IDENT. NO.	DWG. NO.	REV.
F	88032	127APS86X1	D

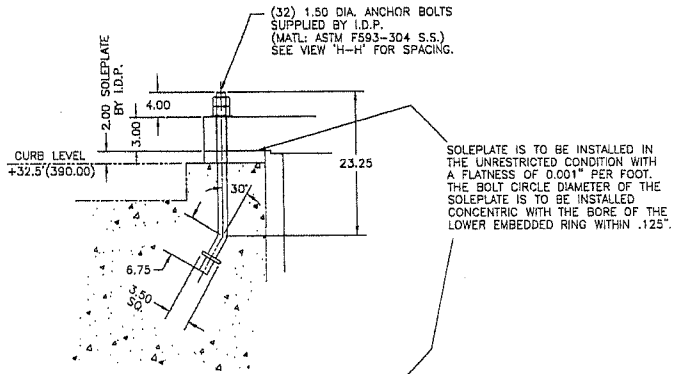
THIRD ANGLE PROJECTION | SCALE NONE | G:\0086\980724 | SHEET 1 OF 3 | A.CAD



VIEW 'H–H'
SHOWING CURB RING



DETAIL 'B'



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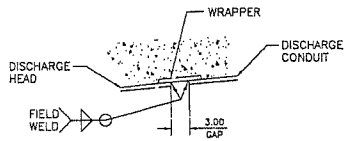
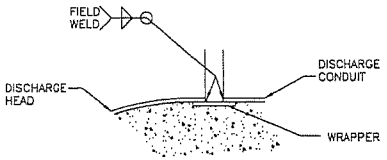
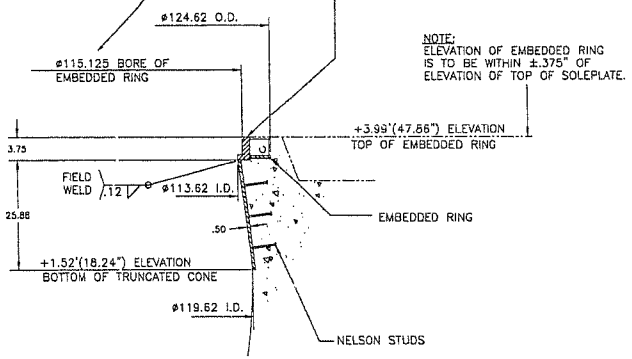


DETAIL 'J'



DETAIL 'K'



DETAIL 'C'

MATERIALS & DETAILS OF CONSTRUCTION

COMPONENT	MATERIAL	DETAIL OF CONSTRUCTION
Diffusor	ASTM A-36	Fabricated carbon steel with thermal stress relieving
Impeller	ASTM A-351, Gr CF3M	Single piece sand casting supplied in the solution annealed condition
Shaft-pump end	ASTM A-276, Type 410	Solid, fully machined barstock
Shaft-upper	ASTM A-276, Type 410	Solid, fully machined barstock
Key-impeller	AISI Type 410	Machined keystock
Key-shaft coupling	AISI Type 410	Machined keystock
Key-journal sleeves	AISI Type 410	Machined keystock
Key-drive coupling	Carbon steel	Machined keystock
Gland	ASTM A-36	Fabricated carbon steel
Packing	Braided cotton yarn impregnated with mineral oil	---
Journal sleeve	ASTM A-276, Type 420	Fully machined, thermally hardened
Bearing	Thordon SXL	Metal backed, Thordon
Shaft coupling	ASTM A-276, Type 420	Fully machined
Fasteners-submerged	ASTM A-593, Gr 304	---
Fasteners-nonsubmerged	ASTM A-307, Gr B	---
Anchor bolting	ASTM A-593, Gr 304	---
Drive Coupling	AISI 1045	Precision machined component
Gear support	ASTM A-36	Fabricated carbon steel with thermal stress relieving
Stuffing box extension	ASTM A-36	Fabricated carbon steel with thermal stress relieving
Discharge head	ASTM A-516	Fabricated carbon steel
Inner column	ASTM A-36	Fabricated carbon steel with thermal stress relieving
Mounting plate	ASTM A-36	Machined plate
Discharge head liner	ASTM A-36	Fabricated carbon steel with thermal stress relieving
Impeller housing	ASTM A-240, Ty 316L	Fabricated austenitic stainless steel
Embedded ring	ASTM A-240, Ty 316L	Fabricated austenitic stainless steel
Guide ring	ASTM A-36	Fabricated carbon steel
Soleplate	ASTM A-36	Fabricated carbon steel
'O' Rings	Buna 'N'	---
Discharge conduit	ASTM A-516	Fabricated carbon steel
Intake cone	ASTM A-516	Fabricated carbon steel

REV	DRN	CKD	APP	DESCRIPTION	DATE
D	DJS			REV'D. GEAR SUPP. HEAD MOUNTING WAS .35" ECR# 5030.	1NV98
C	D.C.	P.F.	J.R.	MODIFIED PER CUST. TRANSM. NO. 20027	28OC98
B	D.C.	P.F.	J.R.	GENERAL REV. AND MODIFIED PER CUSTOMER M/U PRINT	30JL98
A	D.C.	J.R.	M.P.	INITIAL ISSUE	26FE98

GEAR MFG.	PHIL. GEAR CORP.
SERVICE	DRAINAGE PUMP
CUSTOMER	SOUTH FLORIDA WATER MANAGEMENT DISTRICT
ORD. NO.	047–82043
TYPE	1.8 MVBX–2PD
LIQUID	FRESH WATER
ORD. NO.	RFP NO. C–E203
ITEM NO.	01
FRAME	
ROTATION	CCW (H.L)
ITEM NO.	
DATE	26FE98
HP.	
SCHEDULE	
ECP PUMPING STATION EQUIPMENT FOR STORMWATER TREATMENT AREA 1W AND STORMWATER TREATMENT AREA 2	
DRAWN	D.C.
RPM. 720 INPUT 125 OUTPUT	
CHECKED	J.R.
SYS. NO. 03152*0539	
CERTIFIED	M.P.

REFERENCE NOTES
SEE SHEET 3 FOR GENERAL NOTES

Ingersoll-Dresser Pump Company

GENERAL ARRANGEMENT
950 CFS–STATION 310 (127 APS)

SIZE	DISC. IDENT. NO.	SYS. NO.	REV.
F	88032	127APS86X1	D

THIRD ANGLE PROJECTION | SCALE NONE | GA\0086\080724 | SHEET 2 OF 3 | A_CAD

INSTALLATION REQUIREMENTS AND DETAILS

PLEASE REFER TO THE IDP OPERATING AND MAINTENANCE MANUAL FOR THE COMPLETE INSTALLATION PROCEDURE

REFER TO IDP CROSS SECTIONAL DRAWING 127APS50GX1 FOR COMPONENT PART NUMBERS.

1. The pump design incorporates six components that must be permanently embedded in concrete. Those components are:
   a. Part #498 (Support Ring) b. Part #15 (Suction Cone)
   c. Part #103 (Guide Ring) d. Part #361 (Discharge Head)
   e. Part #471 (Sole Plate) f. Discharge conduit liners

   The above embedments will be shipped to the site prior to the shipment of the main pump components.

2. The main pump components will be shipped in multiple pieces and will require field assembly due to the size of the components. At the present time it is anticipated that the pump will be shipped with an assembled pump element that will weigh about 55,000 lbs. The pump element consists of the following major components:
   Part #89 (Shroud)– Part #1 (Casing)– Part #10A (Pump End Shaft)–Part #3 (Impellar)

   All other of the pump components will be shipped as loose pieces.

3. The discharge conduit liners will be shipped in two segments which require field assembly and welding by the General Contractor.

4. The pump Discharge Head (Part #361) will be shipped in two segments which require field assembly and welding by the General Contractor.

5. It will be necessary to install,align,and grout Part #498 (Support Ring) at the elevation as shown on IDP drawing 127APS86X1. Part #103 (Guide Ring) must also be installed, all ned, and grouted as shown on the referenced drawing.

   Part #498 must be installed flat within 0.001" per foot of diameter. This is shown in Figure "D" on IDP drawing 127APS86X1. Since the 115.130" diam. bore forms the seal with the pump, this surface must be protected during the installation process. The 115.130" diameter must be held round within 0.020" during the complete installation process.

   The concentricity, roundness, and flatness of this component must be checked prior to and after grouting to assure that the above requirements are achieved.

   Part #103 must be installed concentric with Part #498 within 0.040" and the bore diameter of 167.000" must be held round during the installation process within 0.030". This is shown in Detail "B" on IDP drawing 127APS86X1.

   The concentricity and roundness of this component must be checked prior to and after grouting to assure that the above requirements are achieved.

6. At the curb elevation there are (32)1.5" diameter anchor bolts supplied by IDP that are equally spaced on a 180" diameter bolt circle. The soleplate is to be used as a template to set the anchor bolts. This is shown in Detail "E" on IDP drawing 127APS86X1.

   The bolt circle of the Soleplate (Part #471) must be installed concentric with the 115.125" bore of Support Ring (Part #498) within 0.125".

7. It is necessary to field weld the upper end of the Suction Cone (Part #15) to the bottom of the Support Ring (Part #498) once the Support Ring has been positioned in place.

   Part # 498 is 316 stainless steel and Part #15 is carbon steel. The contractor is responsible for selecting a suitable weld procedure for these different materials and submitting the procedure to IDP prior to conducting the required field weld. The welding process is to utilize a process to prevent any distortion of the finish machined Embedded Ring during the welding process. The weld is to be a small fillet weld to seal between the two components.

   After completion of the welding operation, the concentricity, roundness, and flatness of the embedded ring are to be checked to confirm that they are within the limits of this procedure.

8. The Discharge Head (Part #361) must be positioned so that it can be aligned to the discharge conduit liners. The Discharge Head is not mechanically connected to the Guide Ring (Part #103) as shown in Detail "B" on IDP drawing 127APS86X1.

9. The contractor is responsible for field welding the discharge head to the discharge conduit as shown in Details "J" and "K" on IDP drawing 127APS86X1. IDP is supplying the steel plate for the "wrapper" as shown in the above details. The contractor will be required to cut and bend the wrapper prior to making the field welds. The wrapper is to be field welded on the inside and outside surfaces.

10. The following process is used to install the main pump components:
    a. Install pump element by lifting the assembly by the upper end of Pump End Shaft (Part #10A). This assembly will be lowered down through the Discharge Head, Guide Ring, and will be allowed to rest on the bottom of the Support Ring (Part #498).

    b. Install the Upper Shaft (Part #108) and the Shaft Coupling (Part #'s164,252C,&2520). The fit between the shafting and the shaft coupling is a precision fit.

    c. Install the Pump Support (Part #176) and Discharge Head Liner (Part #421) as an assembly over the top of the assembled shafting. The Pump Support is then placed on top of the Soleplate (Part #471).

    d. Install the Inner Column (Part #424) over the shafting onto the top of the Casing (Part #1).It is necessary to attach fasteners that are located on the upper portion of the casing (Part #1788) which is below the large support plate from the inside of the pump. In order to accomplish this, it is necessary to temporarily lift the pump element/rotor assembly.

    e. Align the rotor with the inner column alignment fit.

    f. Install the Stuffing Box Extension (Part #264), Packing (Part #34),Split Gland (Part #16), Drive Coupling (Part #33) and other small associated components on the upper end of the pump.

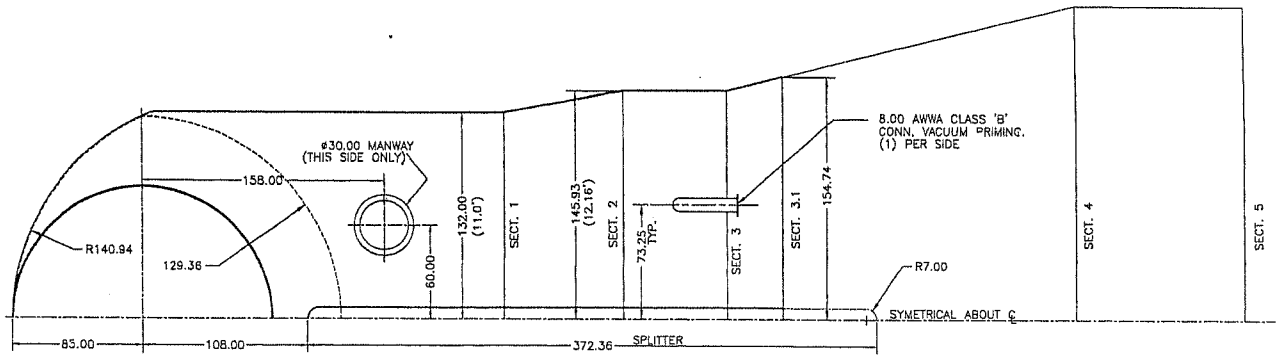
    g. Install the Gear Support (Part #172)

11. The anchor bolts are then tightened and the gear is placed on the Gear Support.

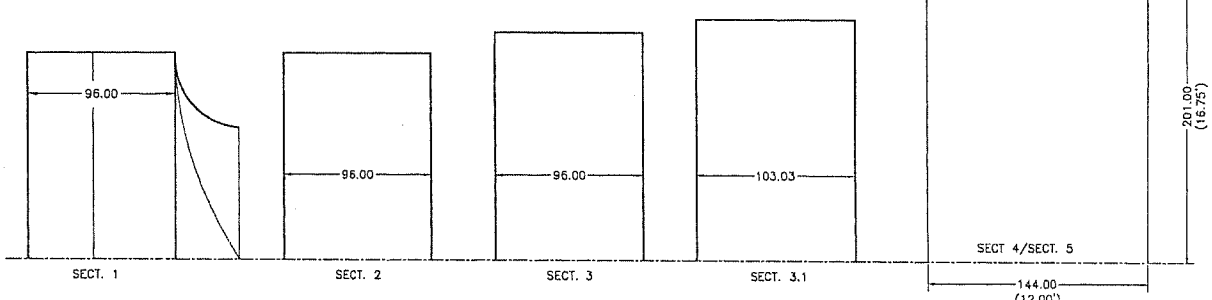
12. The gear must be moved around on the pump gear pedestal until the low speed gear shaft is concentric with the pump shaft within 0.001" as shown by sweeping the pump shaft with a dial indicator attached to the gear shaft. Once this is completed, the gear is then bolted solid to the pump and the feet are then field drilled and dowaled.

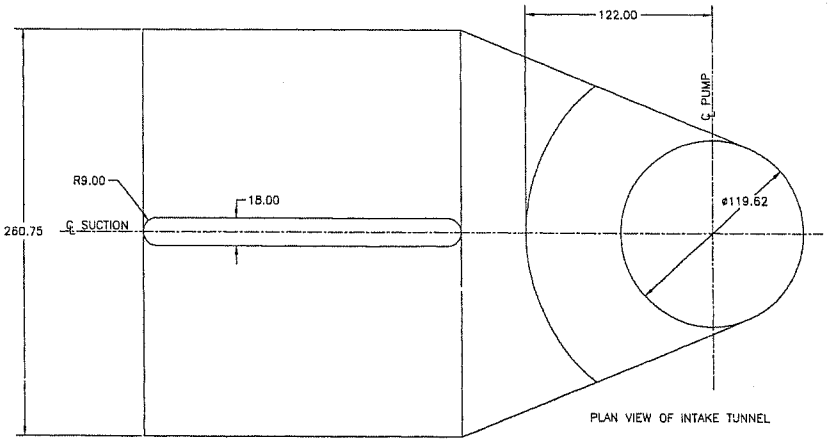
13. The Pump Half Coupling Hub (Part #33) and the gear low speed shaft coupling hub (Part #34) are connected.

14. The high speed gear shaft is then aligned to the drive shaft and engine that are supplied by the District.



PLAN VIEW OF DISCHARGE CONDUIT
(HALF SECTION SHOWN)





PLAN VIEW OF INTAKE TUNNEL

GENERAL NOTES

THIS DRAWING IS NOT TO SCALE. WORK FROM DIMENSIONS SHOWN. READ INSTRUCTION BOOK BEFORE STARTING EQUIPMENT.

FOR GEAR INSTRUCTIONS, REFER TO LATEST GEAR OUTLINE DRAWINGS AND GEAR PROCEDURES.

TOLERANCES:
(1) ALLOW PLUS OR MINUS .25" FOR VARIATION OF FOUNDATION BOLT HOLES. SOLEPLATE IS TO BE USED AS A TEMPLATE TO LOCATE ANCHOR BOLTS.
(2) ALLOW PLUS OR MINUS .38" FOR ALL NOZZLE AND PIPING CONNECTION LOCATIONS.
(3) PLUS OR MINUS 1% FOR ALL NOMINAL LINEAR DIMENSIONS.
(4) PLUS OR MINUS 2 DEGREES FOR ALL NOMINAL ANGLES.

ALL HOLES IN FLANGES STRADDLE CENTERLINE UNLESS OTHERWISE INDICATED.

PIPING AND FITTINGS NOT SHOWN ARE TO BE FURNISHED BY CUSTOMER. DO NOT CONNECT TO PIPE TAPS UNLESS SPECIFIED ON DRAWING.

CONNECTIONS

(A1) 1.00 NPT– LUBRICATION WATER INJECTION–CUSTOMER TO INJECT 15–17 USGPM OF CLEAN WATER AT 10–15 PSI BEFORE STARTING, DURING NORMAL OPERATION, AND DURING SHUTDOWN OF PUMP. I–DP TO PROVIDE A 1.00" SOLENOID VALVE (NORMALLY CLOSED) AND A SIGHT–FLOW INDICATOR. PIPING TO BE DONE BY CUSTOMER.

(E) .75 NPT– GLAND LEAKAGE DRAIN–S.B.E. CATCH BASIN CUSTOMER TO PROVIDE PIPING TO REMOVE LEAKAGE FROM STUFFING BOX PACKING TO INTAKE OF DRAINAGE PUMP.

(P) 3.00 NPT– COLUMN VENT – PLUGGED FOR SHIPMENT/ STORAGE ONLY. CUSTOMER TO PIPE TO THIS VENT. CLOSE VALE AFTER STARTING PUMP AND VENTING PUMP CAVITY.

NOTE:
ALL PIPE CONNECTIONS ARE NATIONAL PIPE TAPERED PIPE THREADS.

REV	DRN	CKD	APP
D	DJS	P.F.	M.P.
C	D.C.	P.F.	J.R.
B	D.C.	P.F.	J.R.
A	D.C.	J.R.	M.P.

DATE	REV'D. GEAR SUPP. HEAD MOUNTING WAS 36"	ECR# 5030.
1NV99		
28OC98	MODIFIED PER CUST. TRANSM. NO. 20027	
30JA98	GENERAL REV. AND MODIFIED PER CUSTOMER M/U PRINT	
28FE98	INITIAL ISSUE	

GEAR MFG.	PHIL. GEAR CORP.
TYPE	1.8 MVBX–2PD
FRAME	
H.P.	
R.P.M.	720 INPUT 125 OUTPUT
SVG. NO.	03152*0539
SERVICE	DRAINAGE PUMP
LIQUID	FRESH WATER
ROTATION	CCW (H.L.)
REMARKS	

CUSTOMER	SOUTH FLORIDA WATER MANAGEMENT DISTRICT
ORD. NO.	047–62043
ORD. NO.	RFP NO. C–E203
ITEM NO.	01
DATE	28FE98
DRAWN	D.C.
CHECKED	J.R.
CERTIFIED	M.P.

ECP PUMPING STATION EQUIPMENT FOR STORMWATER TREATMENT AREA 1W AND STORMWATER TREATMENT AREA 2

REFERENCE NOTES

SEE SHEET 3 FOR GENERAL NOTES

Ingersoll-Dresser Pump Company

ENGINEERED PUMP DIVISION
PHILLIPSBURG, NJ 08865

GENERAL ARRANGEMENT

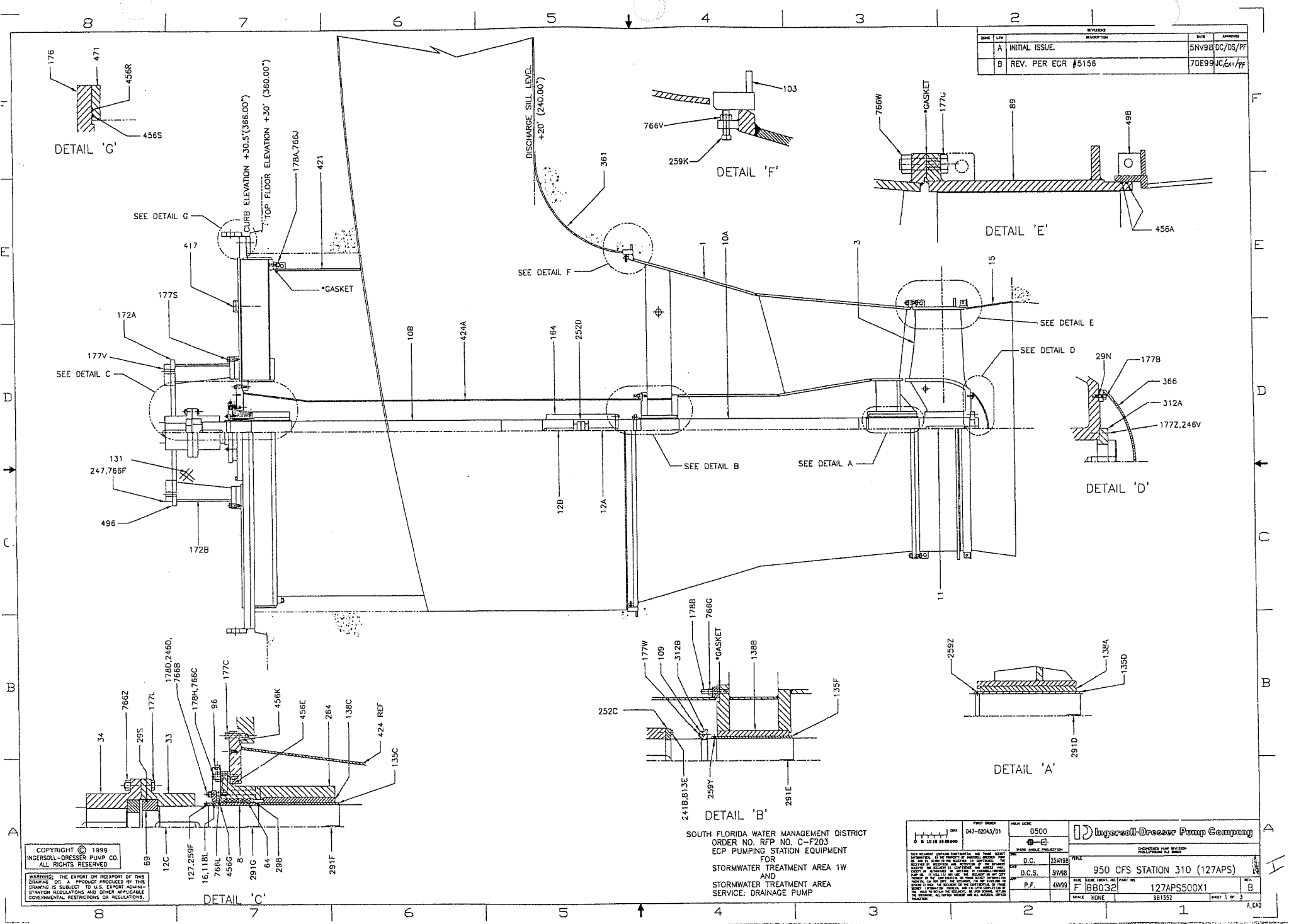
PUMP SIZE: 950 CFS–STATION 310 (127 APS)

SIZE F | CODE IDENT. NO. 88032 | DWG. NO. 127APS86X1 | REV. D

SCALE NONE | WEIGHT GA\0086\980724 | SHEET 3 OF 3

THIRD ANGLE PROJECTION

A_CAD



ZONE	LTR	REVISIONS DESCRIPTION	DATE	APPROVED
	A	INITIAL ISSUE.	5NV98	DC/DS/PF
	B	REV. PER ECR #5156	7DE99	JC/GH/PF

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
ORDER NO. RFP NO. C-F203
ECP PUMPING STATION EQUIPMENT
FOR
STORMWATER TREATMENT AREA 1W
AND
STORMWATER TREATMENT AREA
SERVICE: DRAINAGE PUMP

FIRST ORDER	047-82043/01	MFG# DOC#	0500
THIRD ANGLE PROJECTION			
DRN	D.C.	25NV98	
DES	D.C.S.	5NV98	
CHK	P.F.	4NV99	

Ingersoll-Dresser Pump Company
ENGINEERED PUMP DIVISION PHILLIPSBURG, N.J. 08865

TITLE: 950 CFS STATION 310 (127APS)

SIZE	CAGE CODE NO.	PART NO.	REV.
F	88032	127APS500X1	B
SCALE NONE		981552	SHEET 1 OF 3

A_CAD

FIND NO.	DESCRIPTION
1	CASING
3	IMPELLER
8	SLEEVE - SHAFT
10A	SHAFT - PUMP END
10B	SHAFT - UPPER
11	KEY - IMPELLER
12A	KEY - SHAFT COUPLING - PUMP SHAFT
12B	KEY - SHAFT COUPLING - UPPER SHAFT
12C	KEY - PUMP HALF CPLG.
15	SUCTION CONE
16	GLAND
29S	PIN - CPLG ADJ. NUT
29N	PIN - GUIDE CONE TO IMP.
33	COUPLING - PUMP HALF
34	COUPLING - GEAR HALF
64	PACKING - STUFF. BOX EXTN.
69	SHAFT ADJUSTING NUT
89	SHROUD
96	CATCH BASIN (STUFF. BOX EXTN.)
103	GUIDE RING
109	RETAINING RING
118L	CAPSCREW SOCKET HD - GLAND ASSEMBLY
127	NUT - SHAFT SLEEVE
131	GUARD - COUPLING
135C	JOURNAL SLEEVE - STUFF. BOX EXTN.
135D	JOURNAL SLEEVE - LOWER CASING
135F	JOURNAL SLEEVE - UPPER CASING
138A	BEARING - LOWER CASING
138B	BEARING - UPPER CASING
138C	BEARING - STUFF. BOX EXTN.
164	SHAFT COUPLING
172A	GEAR SUPPORT
172B	GEAR SUPPORT
176	PUMP SUPPORT
177B	CAPSCREW – GUIDE CONE TO IMPELLER
177C	CAPSCREW - INNER COL. TO PUMP SUPPORT
177G	CAPSCREW - CASING TO SHROUD
177L	CAPSCREW - COUPLING
177S	CAPSCREW - DISCH. HD. TO GEAR SUPPORT
177V	CAPSCREW - GEAR MTG. FLANGE TO GEAR SUPPORT
177W	CAPSCREW - LOCKCOLLAR TO RETNG. RING
177Z	CAPSCREW - LOCK COLLAR TO IMPELLER
178A	STUD – DISCH. HD. LINER TO PUMP SUPPORT
178B	STUD - CASING TO INNER COLUMN
178D	STUD - GLAND
178H	STUD - STUFFING BOX EXT. TO PUMP SUPPORT

FIND NO.	DESCRIPTION
241B	WASHER - SPLIT RING TO SHAFT CPLG
246D	WASHER - GLAND STUDS
246V	WASHER - LOCK COLLAR TO IMPELLER
247	TAPER DOWEL PIN - GEAR
252C	SPLIT RING - SHAFT COUPLING
252D	SPLIT RING - SHAFT COUPLING - INNER
259F	SET SCREW - SHAFT SLEEVE NUT
259K	SET SCREW – CASING TO GUIDE RING
259Y	SET SCREW - JOURNAL SLV., UPPER CAS.
259Z	SET SCREW - JOURNAL SLV., LOWER CAS.
264	STUFFING BOX EXTENSION
291D	KEY - JOURNAL SLV., LOWER CASING
291E	KEY - JOURNAL SLV., UPPER CASING
291F	KEY - JOURNAL SLV., STUFF. BOX EXTN.
291G	KEY - SHAFT SLEEVE
298	WASHER - PACKING
312A	LOCK COLLAR (IMP.)
312B	LOCK COLLAR
361	DISCHARGE HEAD
366	GUIDE CONE – IMPELLER
417	PIPE PLUG
421	DISCHARGE HEAD LINER
424	INNER COLUMN
456A	O-RING - SHROUD TO SUPPORT RING
456E	O-RING - STUFF. BOX EXT. TO INNER COLUMN
456G	O-RING - SHAFT SLEEVE NUT TO UPPER SHAFT
456K	O-RING - INNER COLUMN TO PUMP SUPPORT
456R	O-RING - SOLEPLATE TO PUMP SUPPORT
456S	O-RING - SOLEPLATE TO PUMP SUPPORT
471	SOLE PLATE
496	ALIGNMENT FIXTURE
498	EMBEDDED SUPPORT RING
766B	HEX NUT - GLAND STUDS
766C	HEX NUT - STUFF. BOX EXTN. TO INNER COLUMN
766F	HEX NUT - GEAR DOWEL PINS
766G	HEX NUT - INNER COL. TO CASING
766J	HEX NUT - DISCH. HD. LINER TO PUMP SUPPORT
766L	JAM NUT - CATCH BASIN TO STUFF. BOX EXTN.
766V	JAM NUT – CASING TO GUIDE RING
766W	HEX NUT - CASING TO SHROUD
766Z	HEX NUT - COUPLING
813E	HEX HD CAP SCREW - SPLIT RING TO SHAFT CPLG
*	GASKET ELIMINATOR — LOCTITE PRODUCT #515

Schumann, Ronald, Jr.

From: Jim Healy [jimhealy@healyengineering.net]
Sent: Tuesday, July 18, 2006 4:54 AM
To: Schumann, Ronald, Jr.
Subject: FW: WFLT-20334 / New Orleans Canal Pumping Stations / Selection information

Ron,

Additional input from FS.

Regards,

Jim Healy
Healy Engineering, Inc.
617-698-5960 (phone)
617-687-5624 (e-fax)
617-312-9697 (cell)

jimhealy@healyengineering.net

From: Bob Cornman [mailto:BCornman@flowserve.com]
Sent: Monday, July 17, 2006 8:18 AM
To: jimhealy@healyengineering.net
Subject: Fw: WFLT-20334 / New Orleans Canal Pumping Stations / Selection information

Bob Cornman
Director, Technical Services NA & LA
Flowserve Pump Division
942 Memorial Parkway
Phillipsburg, NJ USA

Tel: 908-859-7256
Fax: 908-859-7482

----- Forwarded by Bob Cornman/North America/Flowserve on 07/17/2006 08:17 AM -----

Bob Cornman/North America/Flowserve

07/10/2006 07:41 AM

To "Stolinski, Theodore J. \(Ted\)" <StolinskiTJ@bv.com>
cc John Ondrejack/North America/Flowserve@Flowserve, Greg Poska/North America/Flowserve@Flowserve
Subject WFLT-20334 / New Orleans Canal Pumping Stations / Selection information Link

Ted,

Below are curves for my selections. I have assumed that all these pumps will be engine drive and that is why they are running at or all speeds. Let me know if any are motor drive so that I can adjust the speed accordingly. I have based all my selections off of the pumps that we have previously supplied to SFWMD.
[attachment "250CFS_Opt 2.pdf" deleted by Bob Cornman/North America/Flowserve] [attachment "500CFS_Opt 1.pdf" deleted by Bob Cornman/North America/Flowserve] [attachment "500CFS_OPt 2.pdf" deleted by Bob Cornman/North America/Flowserve] [attachment "1000CFS_Opt 1.pdf" deleted by Bob Cornman/North America/Flowserve] [attachment "1000CFS_Opt 2.pdf" deleted by Bob Cornman/North America/Flowserve] [attachment "250CFS_Opt 1.pdf" deleted by Bob Cornman/North America/Flowserve]

With regard to manufacturing lead time:

a) 10 - 15 weeks to prepare and submit job documentation (including GA drawing, cross sectional drawing, driver information, torsional/lateral analysis)

b) 18 - 24 weeks for model pump test depending on scope of testing required

c) 40 - 45 weeks for pump manufacturing after release

Rough budgetary pricing for pumps only:

1000CFS pumps: $600 - 800,000 each

500CFS pumps: $475 - 650,000 each

250CFS pumps: $300 - 450,000 each

Regards,

Bob Cornman
Director, Technical Services NA & LA
Flowserve Pump Division
942 Memorial Parkway
Phillipsburg, NJ USA

Tel: 908-859-7256
Fax: 908-859-7482

"Stolinski, Theodore J. \(Ted\)" <StolinskiTJ@bv.com>

07/06/2006 09:30 AM

To "Bob Cornman" <BCornman@flowserve.com>

cc

Subject FW: New Orleans Canal Pumping Stations

Have you had a chance to look at this?

From: Stolinski, Theodore J. (Ted)
Sent: Wednesday, June 21, 2006 12:19 PM
To: 'Bob Cornman'
Subject: RE: New Orleans Canal Pumping Stations

8/2/2006

I forgot to include the table. Sorry. The table is attached at the bottom of this memo.

Fr Stolinski, Theodore J. (Ted)
Sent: Wednesday, June 21, 2006 12:15 PM
To: 'Bob Cornman'
Subject: New Orleans Canal Pumping Stations

We are currently evaluating for the City of New Orleans and the Corps of Engineers, three pumping stations at the mouths of the 17th Ave Canal (12,500 cfs), Orleans Canal (3400 cfs), and the New London Canal (9000 cfs).

As this is part of the New Orleans Hurricane Protection System it has a high priority and is in "rush" mode. The concept report will need to be completed by July 10. To comply with this target date I will need the requested information below by June 28 th.

First some background information

We are evaluating whether the pumping stations are best designed as Hurricane Protection Pumping Stations (Option 1) in which the pump stations only operate when there is a surge in Lake Pontchartrain retaining all existing interior drainage pumping stations or new Primary Duty Drainage and Hurricane Protection Pumping Stations (Option 2) in which 7 old existing stations are abandoned.

In Option 1 the pumping station will only operate rarely say once every three years. Normally all flow will pass through a flood gate in the pumping station.

In Option 2, the pumping station would operate year round as they would become the primary drainage pumps for the City. There would be no flood gate on the canal and all drainage will be pumped year round.

I've set up a table that shows the bowl requirements. This is a Corps of Engineers project in the conceptual phase, so the bowl heads indicated are preliminary only and will most likely change some change. But I am confident the numbers are good enough for a start. I have purposely including the screen, FSI, discharge elbow, and station losses in the rated bowl head so that I can make adjustments as the concept design for the pump station evolves.

I would really appreciate if you could provide bowl curves for each of the conditions indicated. Also please include the "d" for the FSI Type 10 Intake layout and if possible an elevation sketch that will provide sufficient pump dimensions to allow laying out the pumping stations.

New Orleans uses a combination of horizontal and vertical axial flow. As the type of pump won't impact the this concept report, I am going to base the evaluation on all vertical pumps. This will be re-visited in the next phase of the work. Also, this station will include motor driven pumps for all pumps smaller than 1000 cfs. The 1000 cfs pumps will be a mixture of direct drive engines and motors probably in a 40/60 split.

Additionally since you know I will eventually ask, can you provide a "report level" budget estimate and an estimated delivery time for the pump only? If you have anything on motor dimensions or cost I would appreciate that as well. Engine dimension and cost would also be appreciated. If you don't have any information on either motor or engine, if you let me know early, I will have our electrical and mechanical engineers pursue this separately.

Schumann, Ronald, Jr.

m: Jim Healy [jimhealy@healyengineering.net]
Sent: Tuesday, July 18, 2006 5:07 AM
To: Schumann, Ronald, Jr.
Subject: IDMO-Alternative Options

Ron,

Attached is the submittal received from ITT\GOULDS.

The others received were sent by fax or forwarded by e-mail.

I will submit a summary this morning of all the material I have received.

If you have any questions, please call.

Regards,

Jim Healy
Healy Engineering, Inc.
-698-5960 (phone)
617-687-5624 (e-fax)
617-312-9697 (cell)

jimhealy@healyengineering.net

Jim Healy

From: Japs, Gregory - FLYGT [Gregory.Japs@itt.com]
Sent: Tuesday, July 11, 2006 12:14 PM
To: jimhealy@healyengineering.net
Cc: Peterson, Jim - FLYGT; Deisher, Mark - IBG
Subject: New Orleans - WCXH Pump Drawing and Curve
Attachments: Order List - WCXH.doc; Flood Control Brochure.pdf; 08-502-679-405.TIF; _0711110844_001.pdf

Jim,

Per our phone conversation, attached is the pump drawing and a sample curve for the 144x132 WCXH pump. I have also attached our brochure and a users list for these pumps. If you have any questions, or would like a job specific curve, please let me know.

Greg Japs
Applications Engineer
ITT Flygt
Ph. 262-548-8178
Fax 262-548-8170
gregory.japs@itt.com

7/18/06
DATE TO: R. SCHUMANN
FROM: J. HEALY
8 sheets

Axial Flow, Horizontally-Split Casing Pumps

Type WCXH
Partial Order List

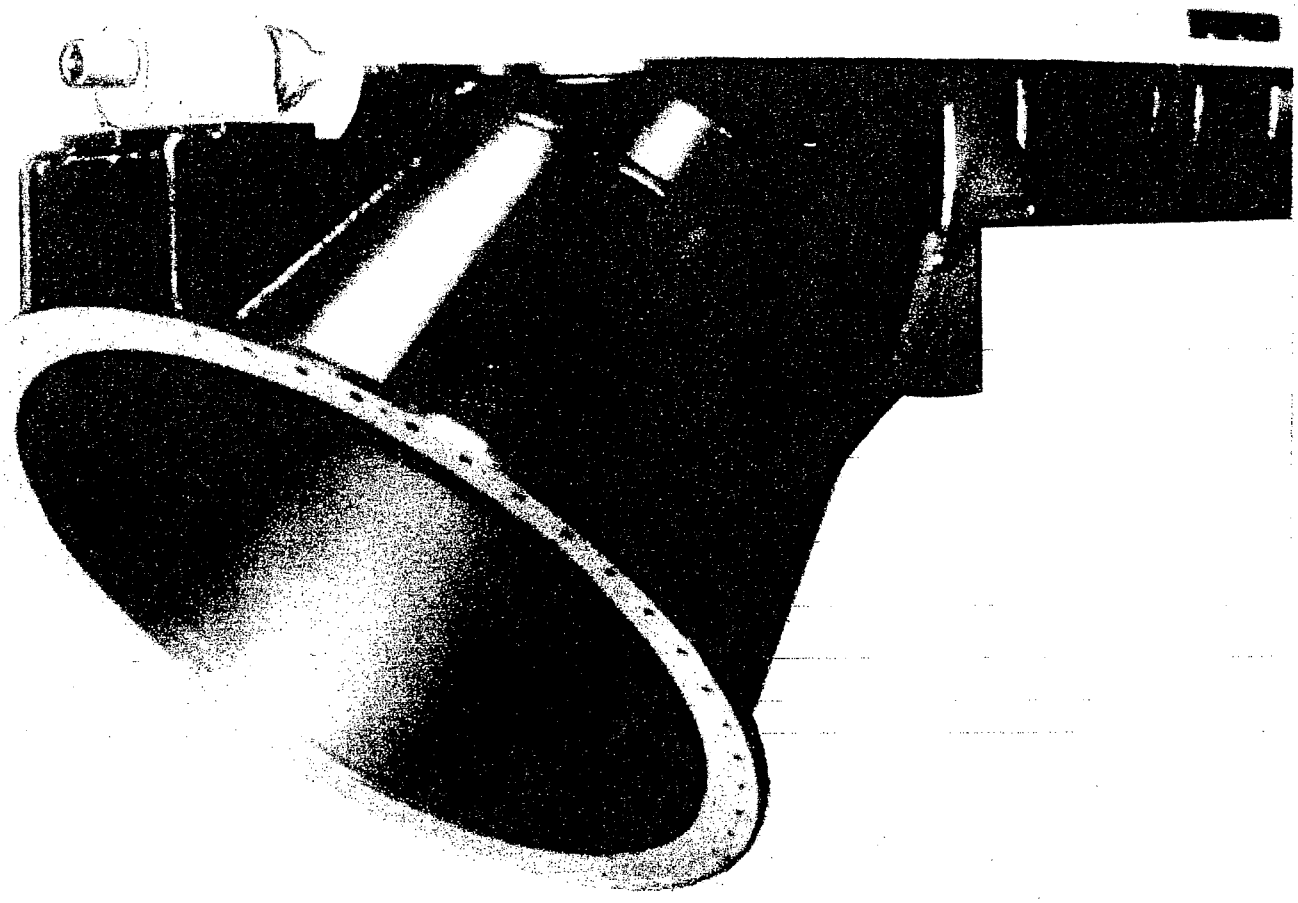
Supersedes all previous issues

CUSTOMER	YEAR	NO.	SIZE, TYPE	GPM	FT/ HEAD	RPM	HP
Jefferson Parish, Louisiana Station 2	1982	1	144 x 132 WCXH	448,831	14	100	3070
Jefferson Parish, Louisiana Hero Station	1982	4	72 x 60 WCXH	83,926	15	226.5	500
Jefferson Parish, Louisiana Stations 1 & 4	1982	7	144 x 132 WCXH	448,831	14	100	3070
Jefferson Parish, Louisiana Ames Station	1982	1	144 x 132 WCXH	516,120	9.5	100	2305
Jefferson Parish, Louisiana Cousins Station	1982	2	144 x 132 WCXH	516,120	9.5	100	2305
New Orleans Sewerage & Water Board Algiers Station	1983	2	144 x 132 WCXH	460,020	12	100	2500
New Orleans Sewerage & Water Board Station 6	1984	2	144 x 132 WCXH	493,713	12	105	3000
New Orleans Sewerage & Water Board Station 19	1988	3	144 x 132 WCXH	493,713	12.8	105	3000
New Oreleans Sewerage & Water Board Station 11	1993	2	108 x 96 WCXH	280,518	9	135	1250
New Orleans Sewerage & Water Board Station 1	1993	2	144 x 132 WCXH	538,596	8	100	2500
New York City – Gowanus Canal	1996	1	86 x 86 WCXH	209,310	8	134	600
Jefferson Parish, Louisisna New Estelle Station	1996	2	108 x 96 WCXH	255,834	10	138	800
Jefferson Parish, Louisiana USCOE - SELA	1998	9	144 x 132 WCXH	471,271	11	100	1700
Jefferson Parish, Louisisna New Bayou Signette	1999	2	108 x 96 WCXH	273,800	8.5	138	800

A-C Pump

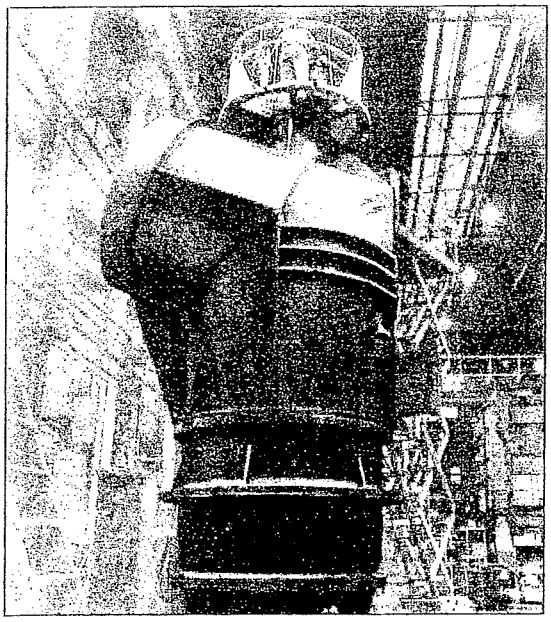
ITT Fluid Technology Corporation

PUMPS FOR FLOOD CONTROL

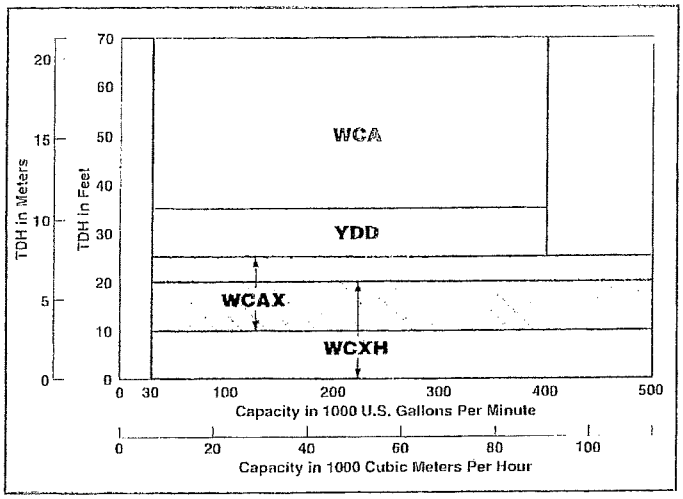


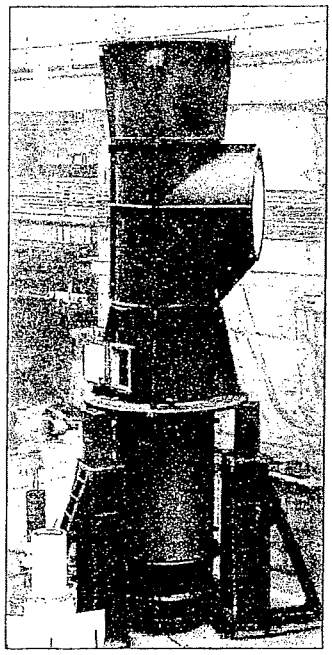
VERTICAL WET PIT COLUMN PUMP

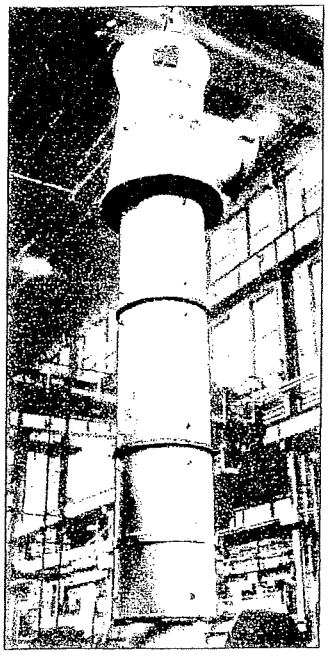
Types WCAX, YDD and WCA



Capacity and Head Range





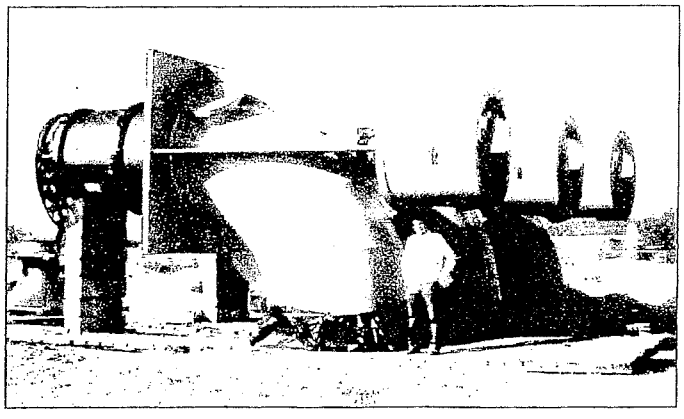


Vertical Wet Pit Pumps Offer Maximum Flexibility

The vertical wet pit column pump is the backbone of flood control applications. It has the capability of operating over a wide range of heads, varying suction water levels, and takes a minimum of floor space.

ITT A-C Pump offers several specific speed designs in the axial and mixed flow range to meet a broad range of customer requirements. Mechanical designs are HEAVY-DUTY for long life and reliability.

ITT A-C Pump offers a full range of pump materials of construction including either cast or fabricated bowls to handle fresh, brackish or sea water. Typically the discharge elbow and column are constructed of fabricated steel and the bowl components are cast for maximum hydraulic performance. Our computer finite element stress analysis programs are used to determine required wall thickness and rib location for maximum rigidity on fabricated components. Bearings are available in water lubricated fluted rubber or grease lubricated bronze designs. When the design requires intermediate bearings, they are rigidly supported by spiders fitted to the column pipe. Bearing lengths and spans are optimized through computerized lateral and torsional critical speed analysis. Shaft protecting sleeves are located along the pump shaft at the bearings and the stuffing box for ease of maintenance and long pump life.



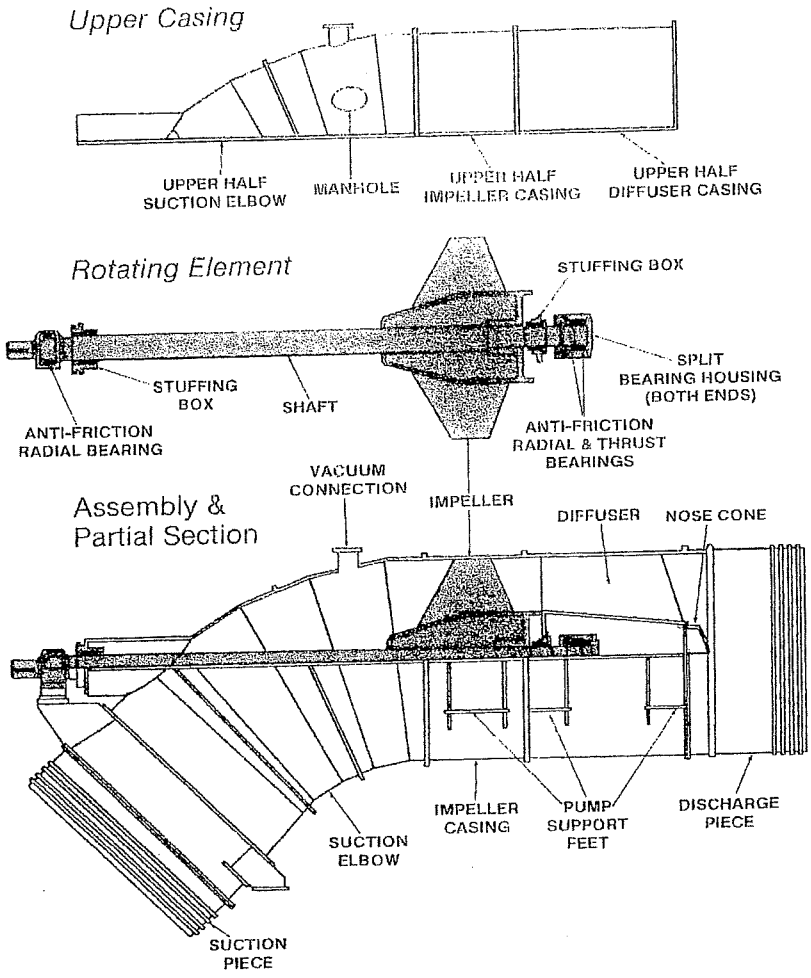
Horizontal Pump

Type WCXH

The original design of this pump has been proven over many years of service. The horizontal arrangement has been used extensively in New Orleans, Louisiana, where flood control is a way of life.

Advantages of the WCXH Pump

The major advantage of this type of pump is the rotating element sits "high and dry" when the pump is not in use. In addition, the casing is split horizontally for easy access to the removable rotating assembly. In contrast the vertical wet pit bowl assembly is submerged, being subject to the corrosive effects of the pumped water while sitting idle in the standby condition. Thus the horizontal design offers maximum life and reliability as well as ease of maintenance. Because the horizontal pump sits out of the water, sump excavation is reduced. With the horizontal arrangement a vacuum system is used to prime the pump during start-up.



HI A-C Pump WCXH Construction Features

The **top casing half** is removable exposing complete rotating assembly for ease of maintenance and removal.

The **impeller** is single suction, open type, offering excellent suction lift characteristics, and is available in a variety of cast alloys.

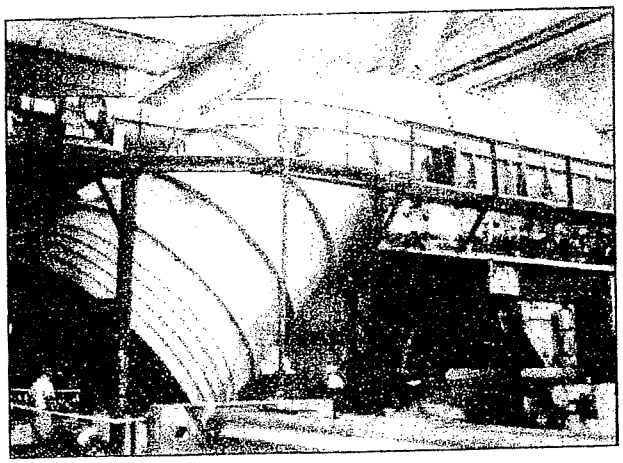
The **casing** is heavy-walled fabricated steel. Suction elbow, impeller casing and diffuser section are all flanged horizontally and vertically.

The **bearings** are self oil lubricated anti-friction type for maximum life. Bearing housings are horizontally split for bearing inspection and maintenance. The nose cone of the diffuser is removable to provide access to the inboard bearing assembly. The outboard radial bearing housing is supported at the suction elbow.

The **shaft** is precisely machined from alloy steel to receive the impeller, bearings, sleeves and coupling. It is conservatively sized to transmit the maximum required power exhibiting lateral and torsional critical speeds safely above the maximum rotating speed of the machine.

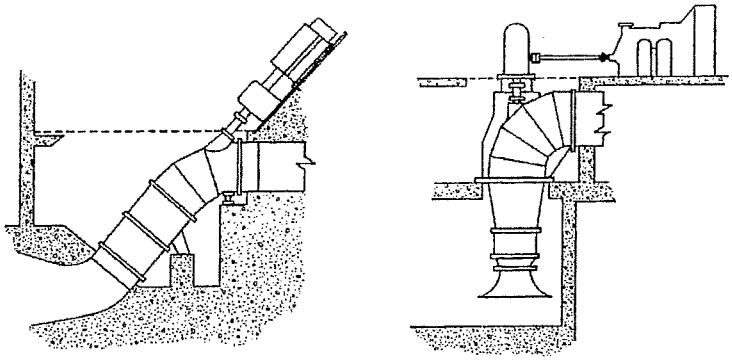
Shaft sleeves protect the shaft where it passes through the stuffing boxes (or at fluted rubber bearings when applied). 400 series stainless steel, hardened to 500 BHN minimum is used for extended life.

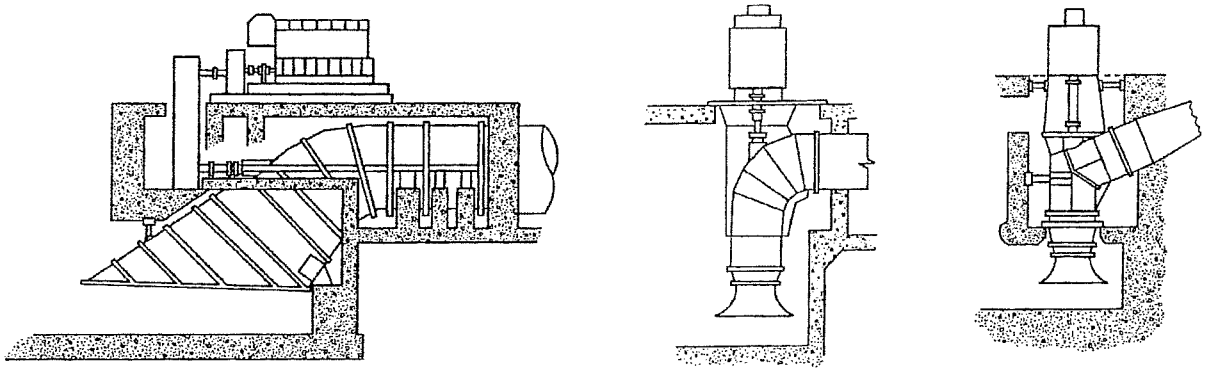
Stuffing boxes are located at the inboard bearing housing to seal the inboard bearing chamber from process water and at the shaft exit through the suction elbow to control leakage.



A 144" x 132" WCXH Pump rated 516,000 GPM at 9.5 Ft. TDH.

[illegible]

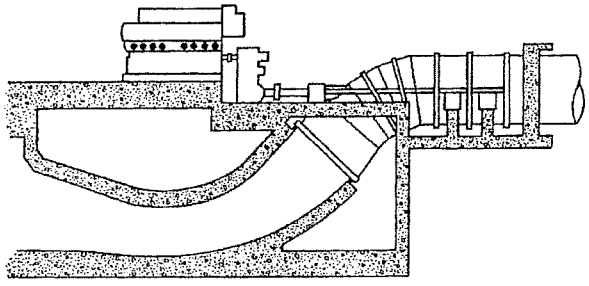




Experienced Custom Designs

Topography, variable suction and discharge water levels, available space...all vary so widely from one site to another that each flood control application is a unique engineering proposition.

Vertical, horizontal or angle flow type pumps; we have them all. Turnkey equipment packaging with drivers, pumps and valves; we have the experience. Applications, Engineering and Project Management; we have the talent. All backed by 120 years of pump experience, and a users list that gets longer every year.



A-C Pump

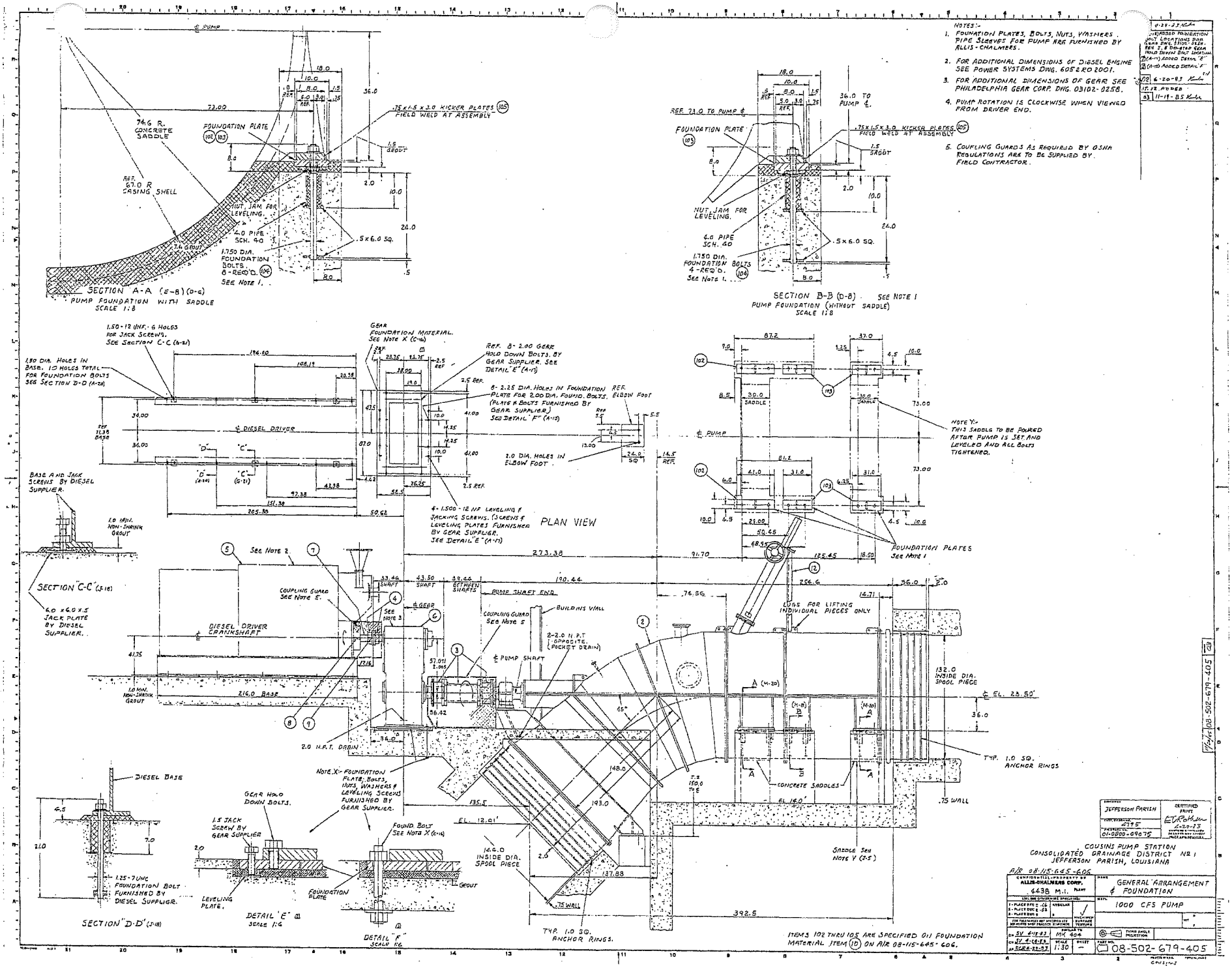
A unit of ITT Corporation

[illegible] A-C Custom Pump
N27 W23293 Roundy Drive
Pewaukee, WI 53072 USA
Telephone: 414/548-8181
Fax: 414/548-8170

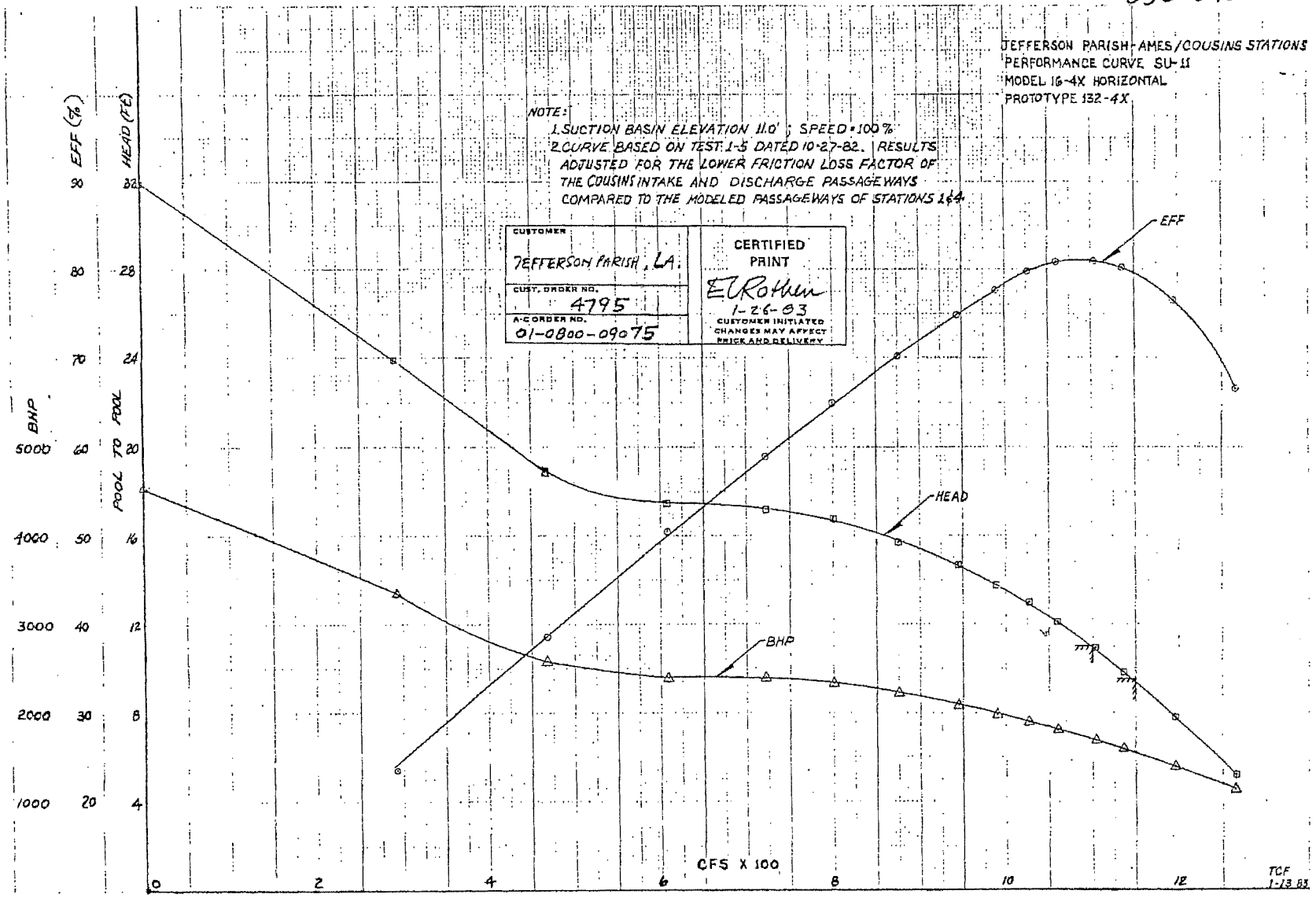
INTERNATIONAL SALES
445 Godwin Avenue
Midland Park, NJ 07432 USA
Telephone: 201/444-6030
Fax: 201/444-0124

[illegible]
1150 Tennessee Avenue
Cincinnati, OH 45229 USA
Telephone: 513/482-2500
Fax: 513/482-2569

08B3000


SECTION A-A (E-8)(D-6)
PUMP FOUNDATION WITH SADDLE
SCALE 1:8
SECTION B-B (D-8) SEE NOTE 1
PUMP FOUNDATION (WITHOUT SADDLE)
SCALE 1:8
PLAN VIEW
SECTION "C-C" (J-18)
SECTION "D-D" (J-18)
DETAIL "E"
SCALE 1:4
DETAIL "F"
SCALE 1:4
NOTES:-
1. FOUNDATION PLATES, BOLTS, NUTS, WASHERS, PIPE SLEEVES FOR PUMP ARE FURNISHED BY ALLIS-CHALMERS.
2. FOR ADDITIONAL DIMENSIONS OF DIESEL ENGINE SEE POWER SYSTEMS DWG. 605 2R0 2001.
3. FOR ADDITIONAL DIMENSIONS OF GEAR SEE PHILADELPHIA GEAR CORP. DWG. 03102-0258.
4. PUMP ROTATION IS CLOCKWISE WHEN VIEWED FROM DRIVER END.
5. COUPLING GUARDS AS REQUIRED BY OSHA REGULATIONS ARE TO BE SUPPLIED BY FIELD CONTRACTOR.
Note Y:- THIS SADDLE TO BE POURED AFTER PUMP IS SET AND LEVELED AND ALL BOLTS TIGHTENED.
ITEMS 102 THRU 105 ARE SPECIFIED ON FOUNDATION MATERIAL ITEM (10) ON AIR 08-115-645-606.
COUSINS PUMP STATION
CONSOLIDATED DRAINAGE DISTRICT NO. 1
JEFFERSON PARISH, LOUISIANA
AIR 08-115-645-606
GENERAL ARRANGEMENT & FOUNDATION
1000 CFS PUMP
08-502-679-405

850-09076


JEFFERSON PARISH - AMES/COUSINS STATIONS
PERFORMANCE CURVE SU-11
MODEL 16-4X HORIZONTAL
PROTOTYPE 132-4X
NOTE:
1. SUCTION BASIN ELEVATION 11.0' ; SPEED = 100 %
2. CURVE BASED ON TEST 1-5 DATED 10-27-82. RESULTS ADJUSTED FOR THE LOWER FRICTION LOSS FACTOR OF THE COUSINS INTAKE AND DISCHARGE PASSAGEWAYS COMPARED TO THE MODELED PASSAGEWAYS OF STATIONS 1&4
CUSTOMER
JEFFERSON PARISH, LA.
CUST. ORDER NO.
4795
A-C ORDER NO.
01-0800-09075
CERTIFIED PRINT
E.C. Rothen
1-26-83
CUSTOMER INITIATED CHANGES MAY AFFECT PRICE AND DELIVERY
EFF (%)
HEAD (FT)
BHP
POOL TO POOL
90
80
70
60
50
40
30
20
32
28
24
20
16
12
8
4
5000
4000
3000
2000
1000
EFF
HEAD
BHP
0
2
4
6
8
10
12
CFS X 100
TCF
1-13-83

Schumann, Ronald, Jr.

m: Jim Healy [jimhealy@healyengineering.net]
Sent: Tuesday, July 18, 2006 9:21 AM
To: Schumann, Ronald, Jr.
Subject: FW: New Orleans Pumps

Ron,

Attached is the input from SULZER\Johnston.

Regards,

Jim Healy
Healy Engineering, Inc.
617-698-5960 (phone)
617-687-5624 (e-fax)
617-312-9697 (cell)

jimhealy@healyengineering.net

Fr...n: McHale, Sean [mailto:Sean.McHale@sulzer.com]
Sent: Monday, July 17, 2006 12:58 PM
To: Jim Healy
Subject: FW: New Orleans Pumps

Jim,

See attached curves for the New Orleans pumps. This is all I have been able to get so far from Houston. Feel free to contact me or even Bob Davis if you have any questions.

Thanks, Sean

From: Davis, Robert
Sent: Monday, July 17, 2006 11:58 AM
To: McHale, Sean
Cc: Trevillian, John; Cugal, Mike

Attached is a book curve for the 72PO running at 270 rpm and then I made a curve for a 110PO running at 188 rpm. The 110PO was modeled from the 72PO. I have show the 110PO at min, max, and Neutral pitch.

<<...10PO-1_EPD-3831_Corp of Engineers.pdf>> <<72PO_BOOK_270 rpm.pdf>>

Best Regards,

Bob Davis
Sr. Engineer, Engineered Pump Group
Sulzer Pump Houston Inc.
800 Koomey Rd, Brookshire, TX77423 USA
T 1 (218)934-6380
F (218)934-6056
E-mail mailto:robert.davis@sulzer.com
Internet http://www.sulzerpumps.com

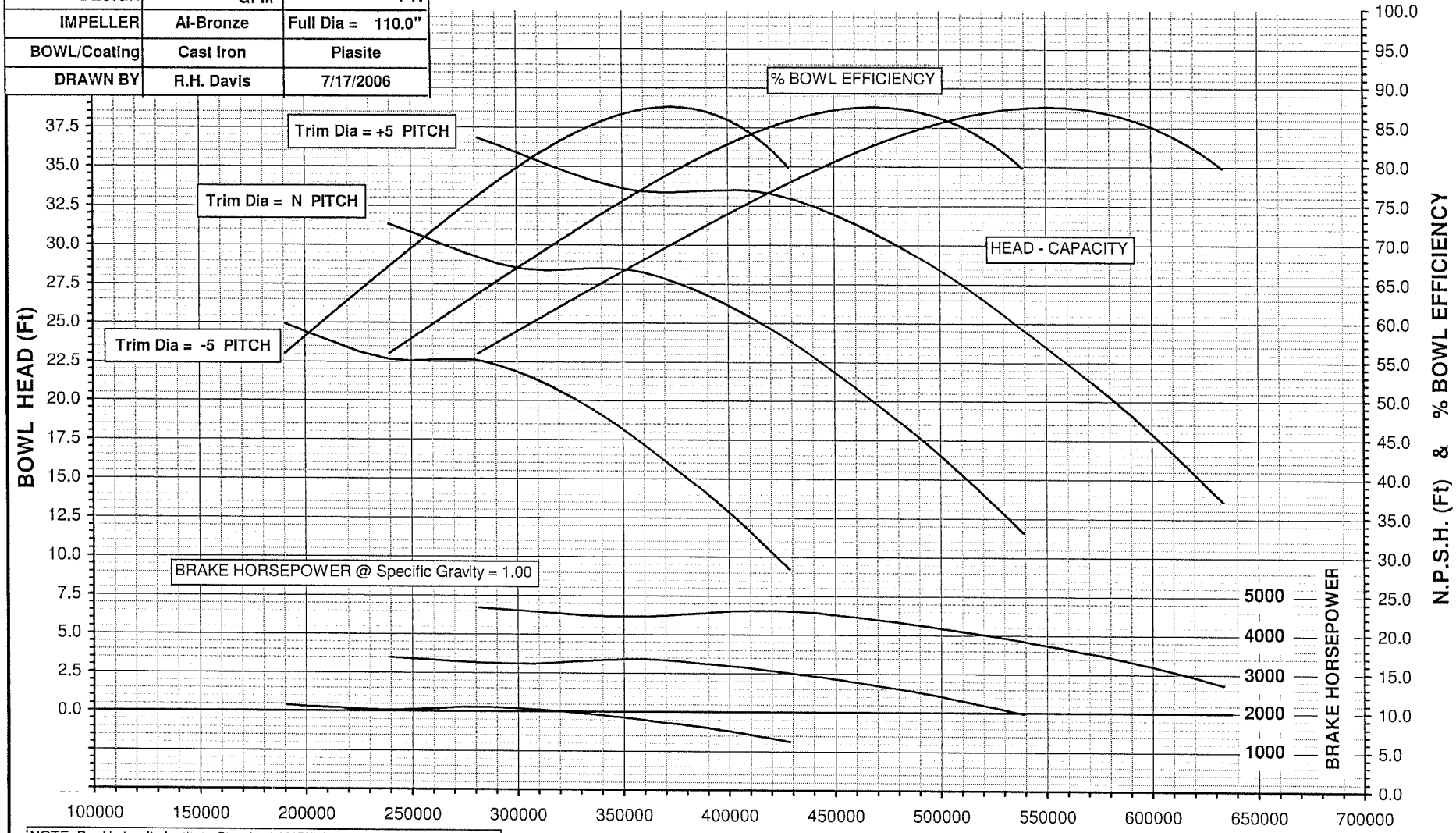
MODEL:	110 PO	STAGES: 1
CUSTOMER:	Corp of Engineers	
SITE:		
QUOTE No:		
CURVE No:	EPD - 3831	Rev. #: 0
SPEED:	188 RPM	
DESIGN:	GPM	FT.
IMPELLER	Al-Bronze	Full Dia = 110.0"
BOWL/Coating	Cast Iron	Plasite
DRAWN BY	R.H. Davis	7/17/2006

Sulzer Pumps Houston Inc.

Brookshire, Texas

PREDICTED PERFORMANCE CURVE

SULZER



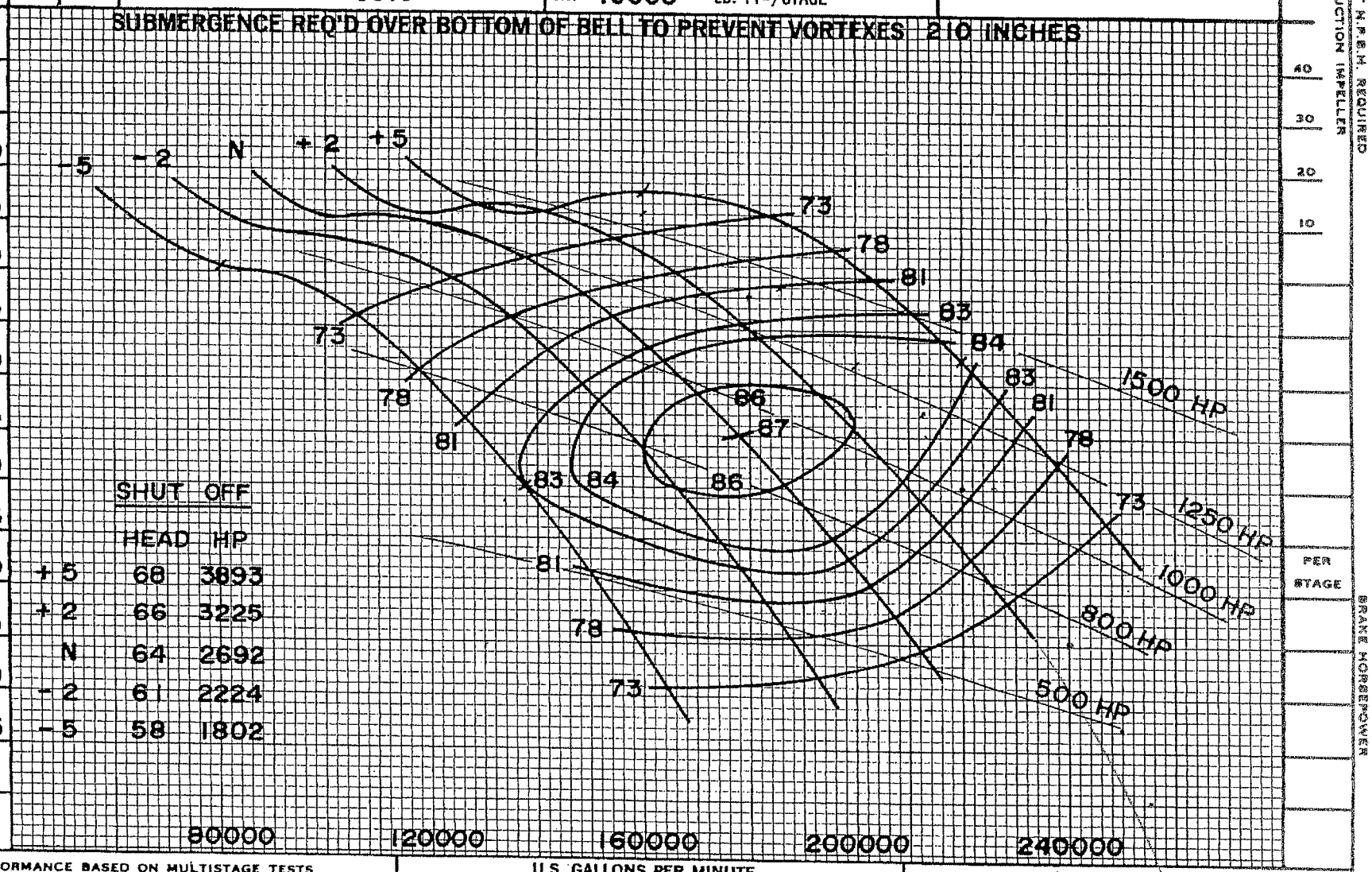
U.S. GALLONS PER MINUTE

NOTE: Per Hydraulic Institute Standard ANSI/HI 2.6-2000, paragraph 2.6.5, "acceptance test tolerances apply to a specified condition point only, not to the entire performance curve". All other points shown for reference only and shall not be used as an acceptance criteria.

TC-
TC-

PER STAGE	IMP. DIA.	IMP. EXIT	IMPELLER PART NO. 22180	THRUST CONSTANT 1757	PUMP SHAFT DIAM. 4
			IMPELLER PATTERN NO. 8919	WR^2 10000 LB. FT^2/STAGE	

SUBMERGENCE REQ'D OVER BOTTOM OF BELL TO PREVENT VORTEXES 210 INCHES



PERFORMANCE BASED ON MULTISTAGE TESTS
PUMPING CLEAR COLD WATER SP. GR. 1.0

FOR 1 STAGE MULTIPLY HEAD & EFF. BY 1.0

FOR 2 STAGES MULTIPLY HD. & EFF. BY 1.0

DATE 5-23-73

Johnston Pump Company
Brookshire, Texas 77423
ESTABLISHED 1909

72 PO PROPELLER PUMP 270 R.P.M

IMPELLER — BRONZE BOWL — CAST IRON

CURVE SHEET NO. EC-0788

JP-1017

Schumann, Ronald, Jr.

From: Jim Healy [jimhealy@healyengineering.net]
Sent: Tuesday, July 18, 2006 9:46 AM
To: Schumann, Ronald, Jr.
Subject: FW: 500 CFS Pump Station

Ron,

As with a number of other OEM's , Fairbanks has had discussions with 4-5 other firms for a while addressing the same issues we have been charged.

There appears to be no direction or decision.

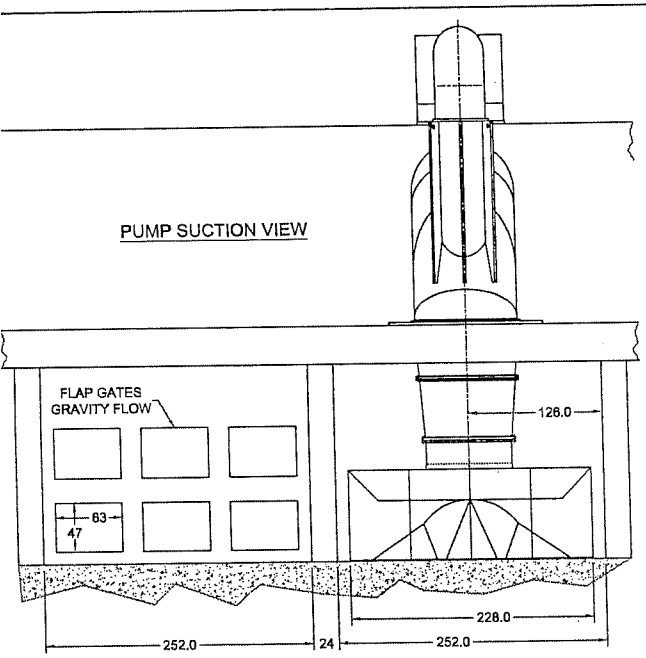
Regards,

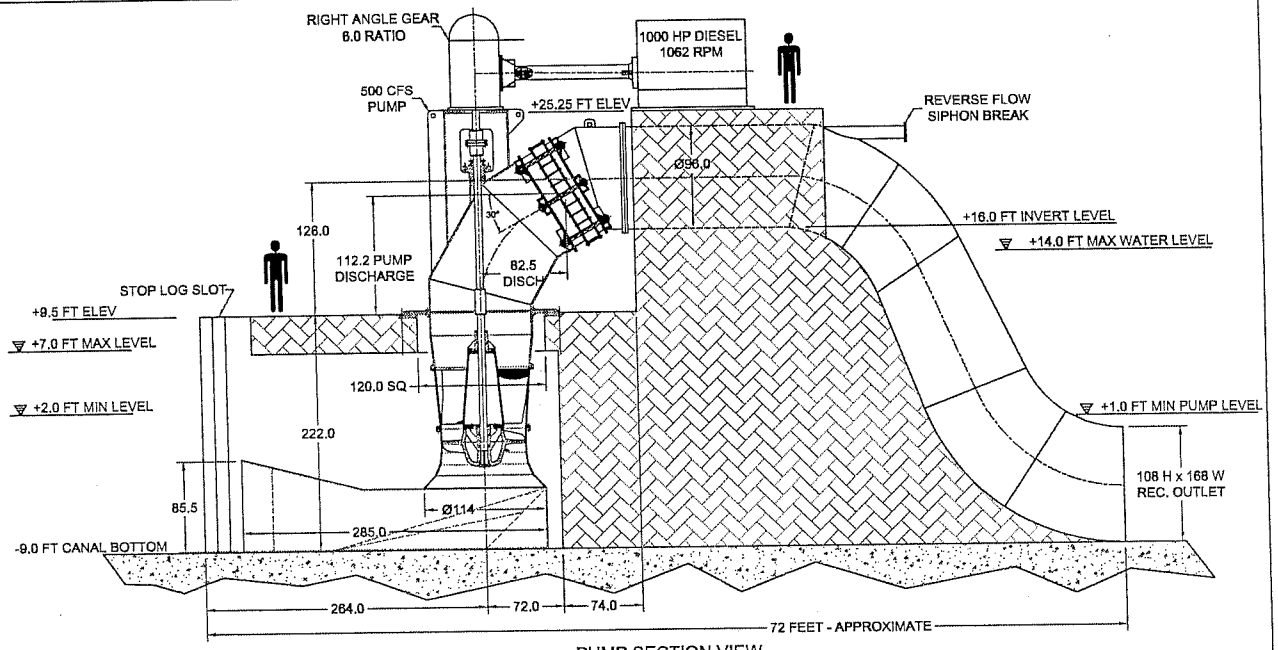
Jim Healy
Healy Engineering, Inc.
617-698-5960 (phone)
617-687-5624 (e-fax)
617-312-9697 (cell)

jimhealy@healyengineering.net

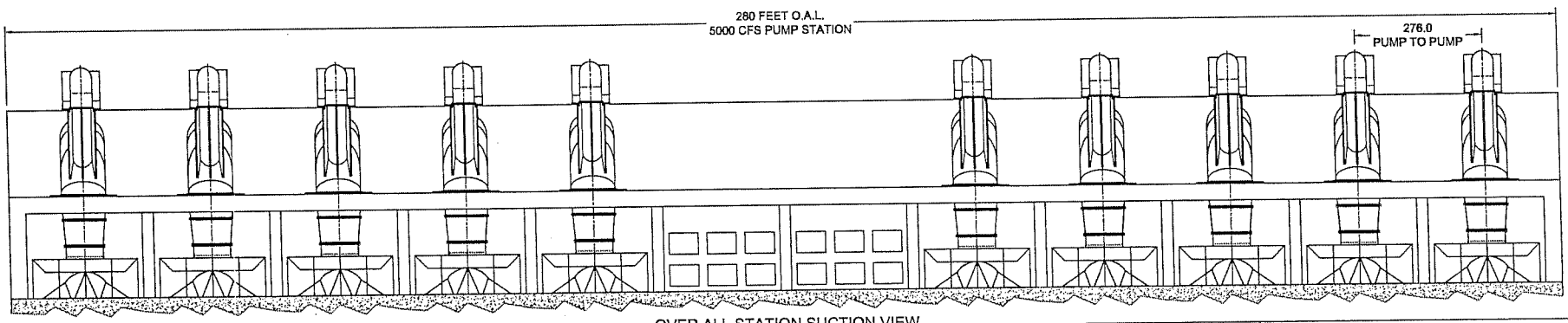
From: arnie.sdano@PentairWater.com [mailto:arnie.sdano@PentairWater.com]
Sent: Tuesday, July 18, 2006 10:41 AM
To: jimhealy@healyengineering.net
Subject: 500 CFS Pump Station

Jim,
Attached is a solution showing pumps with an FSI inlet to reduce the suction submergence and the depth of the station. When I did this several months ago, the thinking was that they were going to use gravity flow during non-storm events and keep the canal at a +2.0' elevation. I doubt that this will be implemented. More likely, the depth of the water level in the canal will be lowered to about -5.0' elevation and there will be no gravity flow. Ball park cost of the FSI, 90" Pump, RAG and 1000 HP driver will be about one million dollars each.
Arnie





PUMP SECTION VIEW



OVER ALL STATION SUCTION VIEW
(REDUCED SCALE)

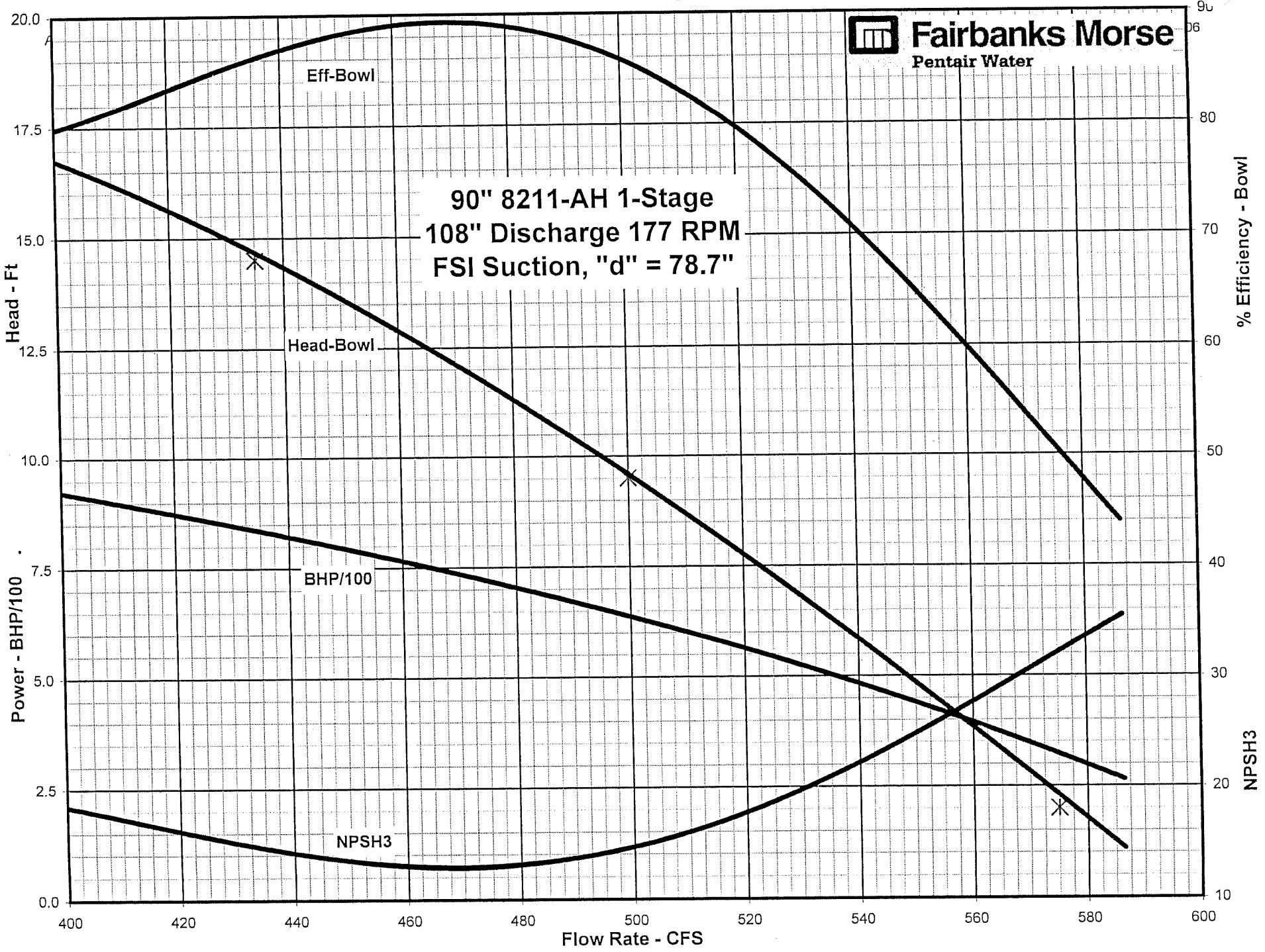
NOTE:
1- All dimensions are in inches unless otherwise stated
2- Discharge pipe sized for automatic siphonic recovery
3- Anti-reverse flow siphon breaker required
4- See quotation for extent of supply
5- Dimensions may vary due to manufacturing tolerances
6- Preliminary - not for construction purposes

Designed under the supervision of
Arnold R. Sdano-PE

FAIRBANKS MORSE PUMP
PENTAIR WATER

500 CFS 90" 8211-AH
PROPOSED PUMP STATION DESIGN

SIZE	DWG NO.	REVISION DATE	REV
B	ARS042606		
SCALE N.A.	ISSUED 4/26/06	SHEET 1 OF 1	


Fairbanks Morse
Pentair Water
90" 8211-AH 1-Stage
108" Discharge 177 RPM
FSI Suction, "d" = 78.7"
Eff-Bowl
Head-Bowl
BHP/100
NPSH3
Head - Ft
Power - BHP/100
% Efficiency - Bowl
NPSH3
Flow Rate - CFS
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
90
80
70
60
50
40
30
20
10
400
420
440
460
480
500
520
540
560
580
600

humann, Ronald, Jr.

From: Jim Healy [jimhealy@healyengineering.net]
Sent: Tuesday, July 18, 2006 11:42 AM
To: Schumann, Ronald, Jr.
Subject: New Orleans - Pump OEM Input

Ron,

I have addressed the data you requested last week for a number of OEM's.

Representative data for a range of pump sizes and OEM's has been sent separately.

I hope I have provided the overview, recommendations and supporting details for your evaluation.

If additional detail\input is required, please call.

Regards,

Jim Healy
Healy Engineering, Inc.
617-698-5960 (phone)
617-687-5624 (e-fax)
617-312-9697 (cell)

jimhealy@healyengineering.net

Healy Engineering, Inc.

JO: 20748.00
July 18, 2006
Memo #2

SUBJECT: IDMO Alternative Options

As a follow-up to a site walk down and discussions on July 10-11, 2006 additional pump data has been requested to determine the availability, lead-time and costs for pumping equipment to be considered for various pump sites at sites serving New Orleans.

To collect available data for 300 cfs and 1000 cfs pump ratings, a number of OEM's have been identified.

Based upon the data requested and supplied the following information is provided:

#1

OEM:	**MWI**	**Deerfield Beach, FL**
Contact Info:	**Jim Endres**	**954-426-1505**
300 cfs Option	**Cost: $ 750K (P+D)** **Delivery: 8-12 weeks**	**Arrangement: H or V** **Drives: Hydraulic/E-Motor/Engine** **Curves:**
1000 cfs Option	**Cost:** **Delivery:**	**Arrangement:** **Drives:** **Curves:**

Notes:

1. Curves and GA's were requested on July 14, 2006. No data has been sent at this time.
2. There is no option for the 1000 cfs rating.

#2

OEM:	**ITT-AC**	**Pewaukee, WI**
Contact Info:	**Greg Japps**	**262-548-8178**
300 cfs Option	**Cost: $ 600K (P+D)** **Delivery: 48 weeks**	**Arrangement: V** **Drives: Hydraulic/E-Motor/Engine** **Curves: *provided***
1000 cfs Option	**Cost: $ 2000 K (P+D)** **Delivery: 72 weeks**	**Arrangement: H** **Drives: E-Motor/Engine** **Curves: *provided***

Notes:

1. Curve and GA for 1000 cfs rating received on July 11 and forwarded on July 18.
2. Curve and GA for 300 cfs rating not received.

#3

OEM:	SULZER\Johnston	Brookshire, TX
Contact Info:	Bob Davis	218-934-6380
300 cfs Option	Cost: $ 600K (P+D) Delivery: 48 weeks	Arrangement: V Drives: Hydraulic/E-Motor/Engine Curves: *provided*
1000 cfs Option	Cost: Delivery:	Arrangement: V Drives: Hydraulic/E-Motor Curves: *provided*

Notes:

1. 300 cfs rating is estimated. No value provided for 1000 csf option.

#4

OEM:	Fairbanks-Morse	Kansas City, KS
Contact Info:	Arnie Sdano	913-371-5000
300 cfs Option	Cost: Delivery:	Arrangement:V Drives: Hydraulic/E-Motor/Engine Curves: *provided*
500 cfs Option	Cost: Delivery:	Arrangement: CV\FSI Drives: Hydraulic/E-Motor/Engine Curves: : *provided*

Notes:

1. No cost estimates provided for either option.

#5

OEM:	Peerless	Indianapolis, IN
Contact Info:	Harvey Campbell	985-612-2033
300 cfs Option	NA	
1000 cfs Option	NA	

Notes:

1. Does not have offering for either rating.

#6

OEM:	WEIR	Cathcart, Scotland
Contact Info:	Derek Stewart	44-141-308-2282
300 cfs Option	Cost: ~$ 1000K (P+D) Delivery: 48 weeks	Arrangement: V Drives: Hydraulic/E-Motor/Engine Curves:
1000 cfs Option	Cost: Delivery:	Arrangement: CV Drives: E-Motor/Engine Curves:

Notes:

1. GA for 1000 cfs offering provided.

#7

OEM:	**FLOWSERVE**	**Phillipsburg, NJ**
Contact Info:	**Bob Cornman**	**908-859-7256**
300 cfs Option	**Cost: $ 600K (P+D)** **Delivery: 48 weeks**	**Arrangement: V or CV** **Drives: E-Motor/Engine** **Curves: *provided***
1000 cfs Option	**Cost: $ 2000 K (P+D)** **Delivery: 72 weeks**	**Arrangement: H or CV** **Drives: E-Motor/Engine** **Curves: *provided***

Notes:

1. **Full set of details provided to other studies provided.**

#8

OEM:	**KSB**	**Frankenthal, Germany**
Contact Info:	**Douglas Pereira**	**804-565-8349**
300 cfs Option		
1000 cfs Option		

Notes:

1. **Both S and V models are available but no data has been submitted.**

#9

OEM:	**NIJHUIS**	**Winterswijk, Netherlands**
Contact Info:	**Luke Vrielink**	**31-543-54 74 31**
300 cfs Option	**Cost:** **Delivery:**	**Arrangement: V** **Drives: E-Motor/Engine** **Curves:**
1000 cfs Option	**Cost:** **Delivery:**	**Arrangement: S or CV** **Drives: E-Motor** **Curves:**

Notes:

1. **Both S and CV models are designed for only the very-high capacity.**

#10

OEM:	**ITT-FLYGT**	**Pewaukee, WI**
Contact Info:	**Dennis Murray**	**781-935-6516**
200 cfs Option	**Cost: 250K (P+M)** **Delivery: 16-20 weeks**	**Arrangement: S** **Drives: E-Motor/Engine** **Curves: : *provided***
1000 cfs Option	**NA**	

Notes:

1. Although the pump rating is only ~ 200 cfs, the availability and reliability of the pump should offset the number of pumps needed for a particular application.

#11

OEM:	TORISHIMA	Osaka, Japan
Contact Info:	Ron Hayes	866-374-1130
300 cfs Option		
1000 cfs Option		

Notes related to pump OEM's:

1. Couch Pump is a part of MWI.
2. Worthington Pump is a part of FLOWSERVE.

Collection of the above data coupled with forwarding the available GA, curve and cost estimates yielded the following observations:

1. Studies have been conducted by a number of firms over the past few months.

2. Pump ratings have varied amongst OEM's depending upon the values provided.

3. There appears to be no single focus of:
   - Pump type- Horizontal, Submersible or Vertical.
   - Pump size- 300-500-1000 cfs.
   - Drive option-E-motor, hydraulic drive or direct engine with gearing.
   - Pump location- with respect to position within the canals and setting.

4. Lead times required for the manufacturing of pump and drive components are being estimated at:
   - 11-12 months for the smaller vertical pump 300 cfs option. *Bottlenecks will be demand for time and space imposed by other industries.*
   - 12-18 months for the 1000 and larger options.
     The largest pump option lead-time appears to be universally > 1 year.

5. MWI's lead time appears to be the shortest for 'conventional' pumpsets with hydraulic drives.
   - There appears to be little equivalent experience amongst other OEM's for such drives.
   - The most conventional approach will be to use E-motors or an engine drive with a gear box for speed change and shaft change.

Based upon the input received with a range of response from *very poor to very good*, the objectives of the review and assessment will be influenced by:

- No single conceptual design approach to reliably support the capacity demands of the various canals and reservoirs.

- There is no mention of the need for and impact of a model review or study that would significantly enhance the likelihood of success of the pumping response in an emergency.

  A simple review of the arrangements being used could anticipate and prevent performance issues now and in the future.

- With a target date of June, 2007 the sole options that could meet the capacity requirements are the pumps being supplied by MWI and the submersible pumps that can be furnished by ITT-FLYGT.

- There should be model calculations that address priming and constant-capacity operation with various combinations of pumps responding.

The unavailability of input from MWI may reflect their reluctance to admit or reveal any of the issues related to design, manufacturing and performance of the pumpsets being installed.

In conclusion, I believe that there are no technical difficulties for the selection of one or two optional sizes and arrangements that can be furnished by a number of qualified OEM's.

A model evaluation *must* be conducted in support of any design decision.

Practical lead-times are within a range of 10-16 months ARO depending upon size and drive selection.

Pumps can be furnished but time must be provided to execute the civil and mechanical prerequisites correctly at the outset.

If there are questions about any of the above, please call.

James J. Healy
Consultant-Pumps

Schumann, Ronald, Jr.

From: Jim Healy [jimhealy@healyengineering.net]
Sent: Friday, July 21, 2006 11:39 AM
To: Schumann, Ronald, Jr.
Subject: FW: Flygt propeller pump installations

Ron,

As promised, this is FLYGT's response.

Please call if you have any questions.

Regards,

Jim Healy
Healy Engineering, Inc.
617-698-5960 (phone)
617-687-5624 (e-fax)
617-312-9697 (cell)

jimhealy@healyengineering.net

From: McCARTHY, PATRICIA - FLYGT [mailto:PATRICIA.McCARTHY@itt.com]
Sent: Friday, July 21, 2006 11:51 AM
To: jimhealy@healyengineering.net
Subject: Flygt propeller pump installations

Hi Jim,

Attached please find a sampling of some of the installations we have either sold or proposed in the past. All of these installations include the same size pump as that which we are proposing for your use.

If you require any additional information, please don't hesitate to contact me.

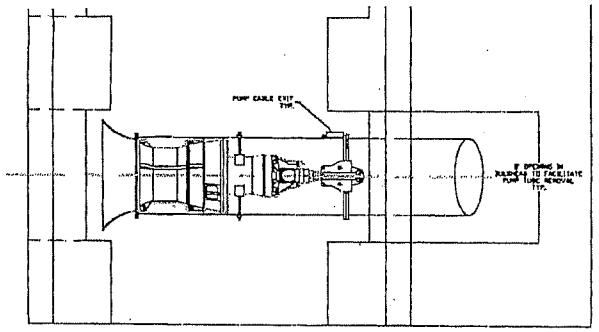
Regards,

Patty

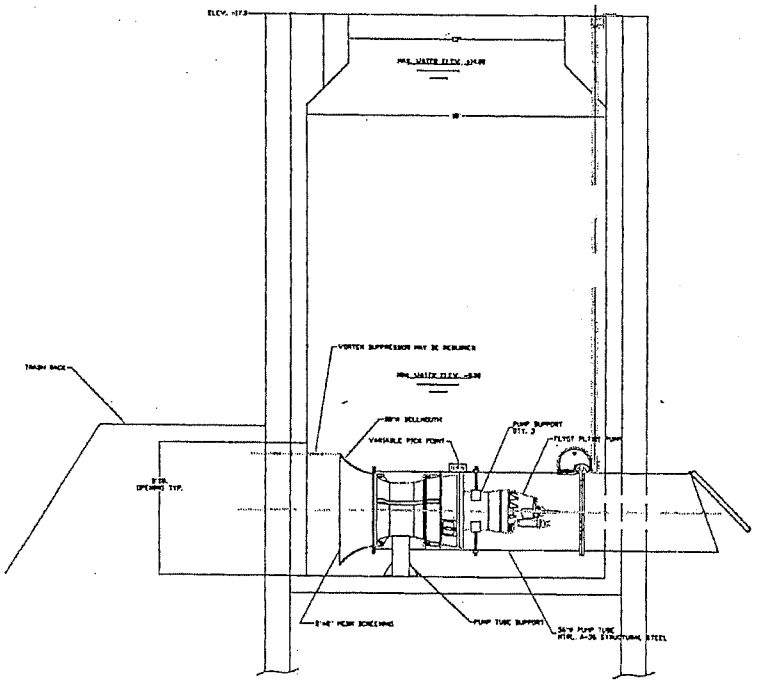
Patricia McCarthy
Systems & Applications Engineer

ITT Flygt Corporation
P.O. Box 1004
35 Nutmeg Drive
Trumbull, CT 06611
Phone: 203-380-4827
Fax: 203-380-4711

E-mail: patricia.mccarthy@itt.com



TOP VIEW
HORIZONTAL INSTALLATION



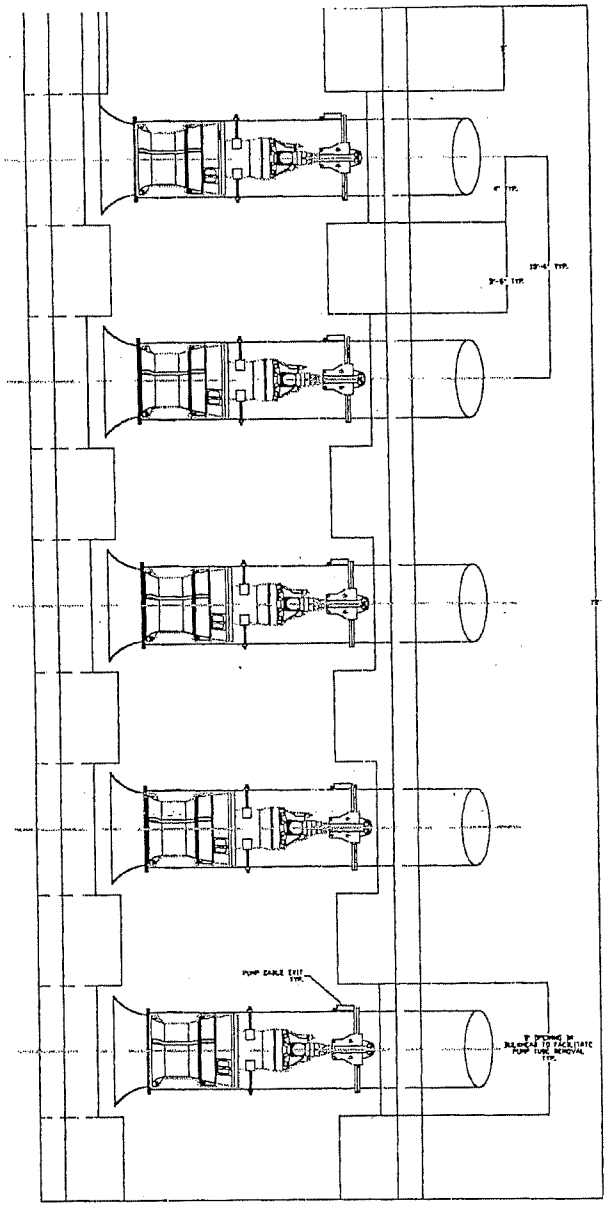
SIDE VIEW
HORIZONTAL INSTALLATION

FLYGT

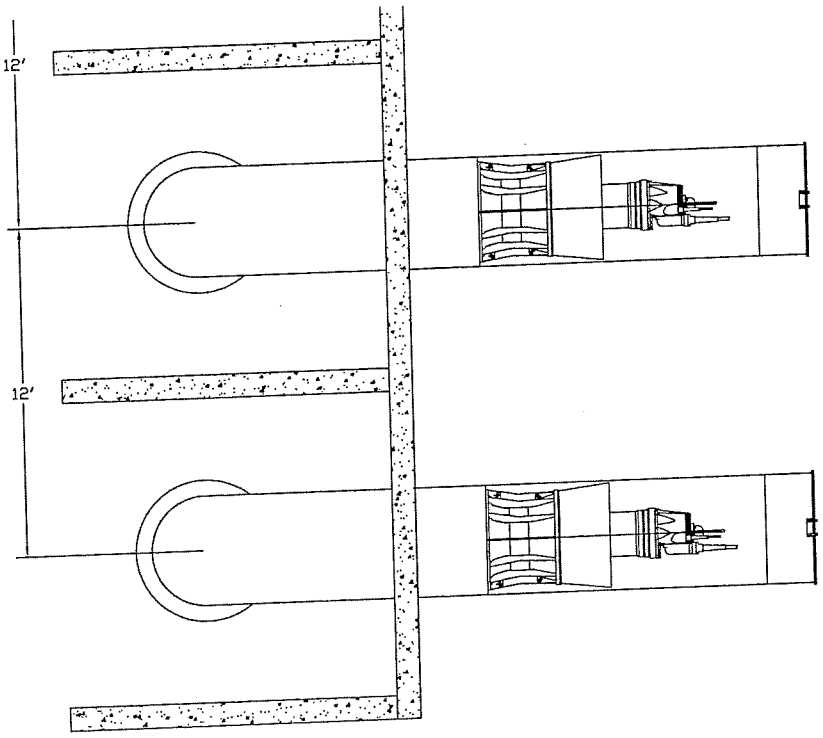
ITT FLYGT CORPORATION, TRUMBULL, CONNECTICUT 06611

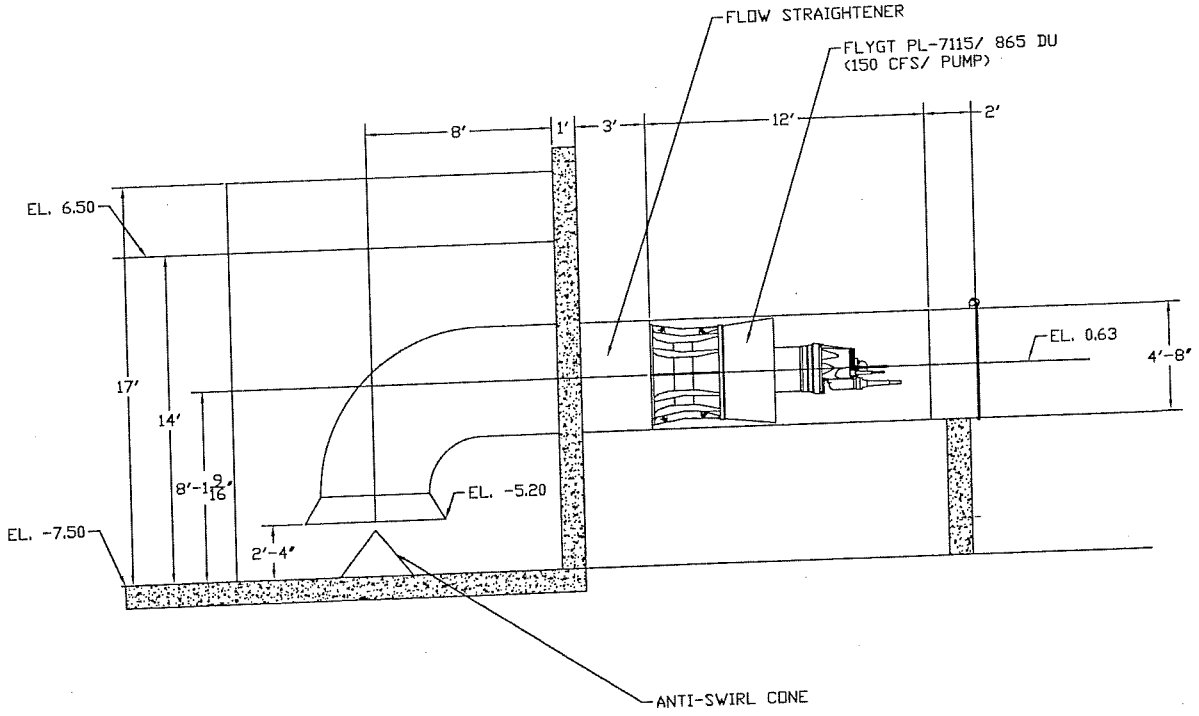
6/13/00 MCCARTHY

SOUTH RIVER



TOP VIEW
HORIZONTAL INSTALLATION


12'
12'


FLOW STRAIGHTENER
FLYGT PL-7115/ 865 DU
(150 CFS/ PUMP)
8'
1'
3'
12'
2'
EL. 6.50
EL. 0.63
4'-8"
17'
14'
8'-1 9/16"
EL. -5.20
EL. -7.50
2'-4"
ANTI-SWIRL CONE

FLYGT

LIQUID HANDLING WORLDWIDE

SUBJECT Lake Okeechobee PL7115

CUSTOMER

PROJECT NO. BY P.M.McCarthy

Sheet ___ of ___

Date 7/20/06

Revision ___

Date ___

Wastewater Pumps
- non-clog
- fibrous waste
- vortex impeller
- explosion proof
- stainless steel
- bronze
- warm liquid
- agriwaste

Portable Pumps
- dewatering
- contractor
- mine permissible
- sump
- slurry
- non-clog trash
- explosion proof
- direct current

Raw Water Pumps
- mixers
- industrial
- wastewater
- agriwaste
- stainless steel
- explosion proof
- warm liquid

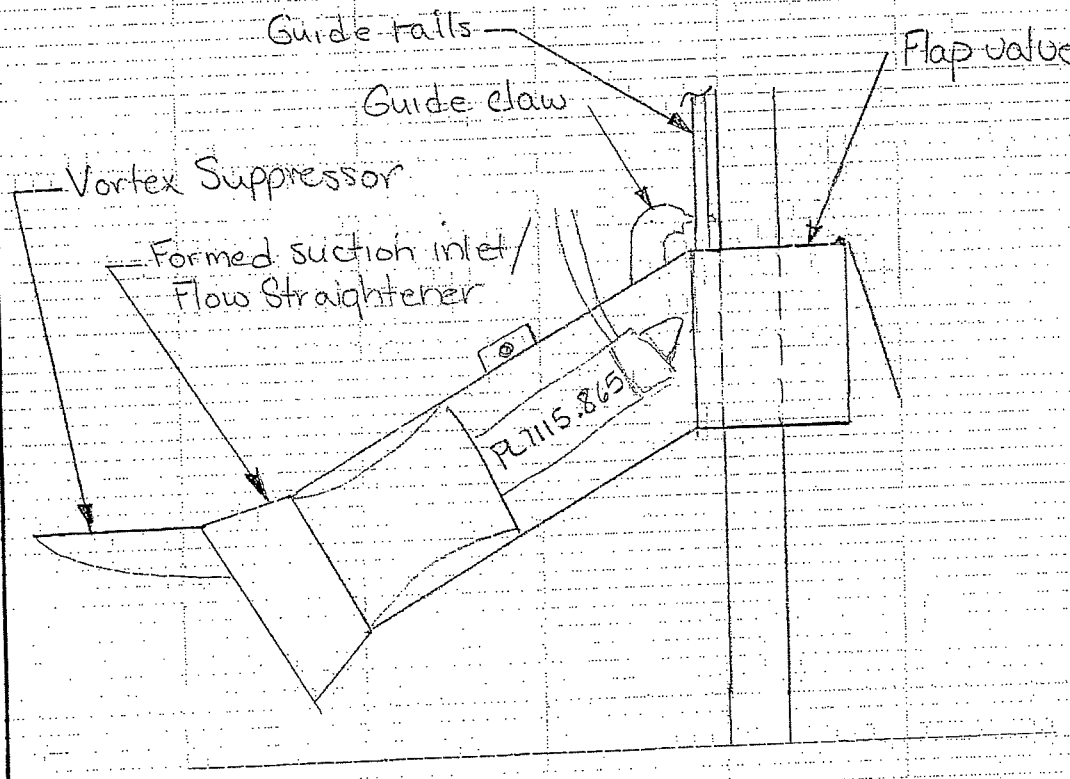
Irrigation Pumps

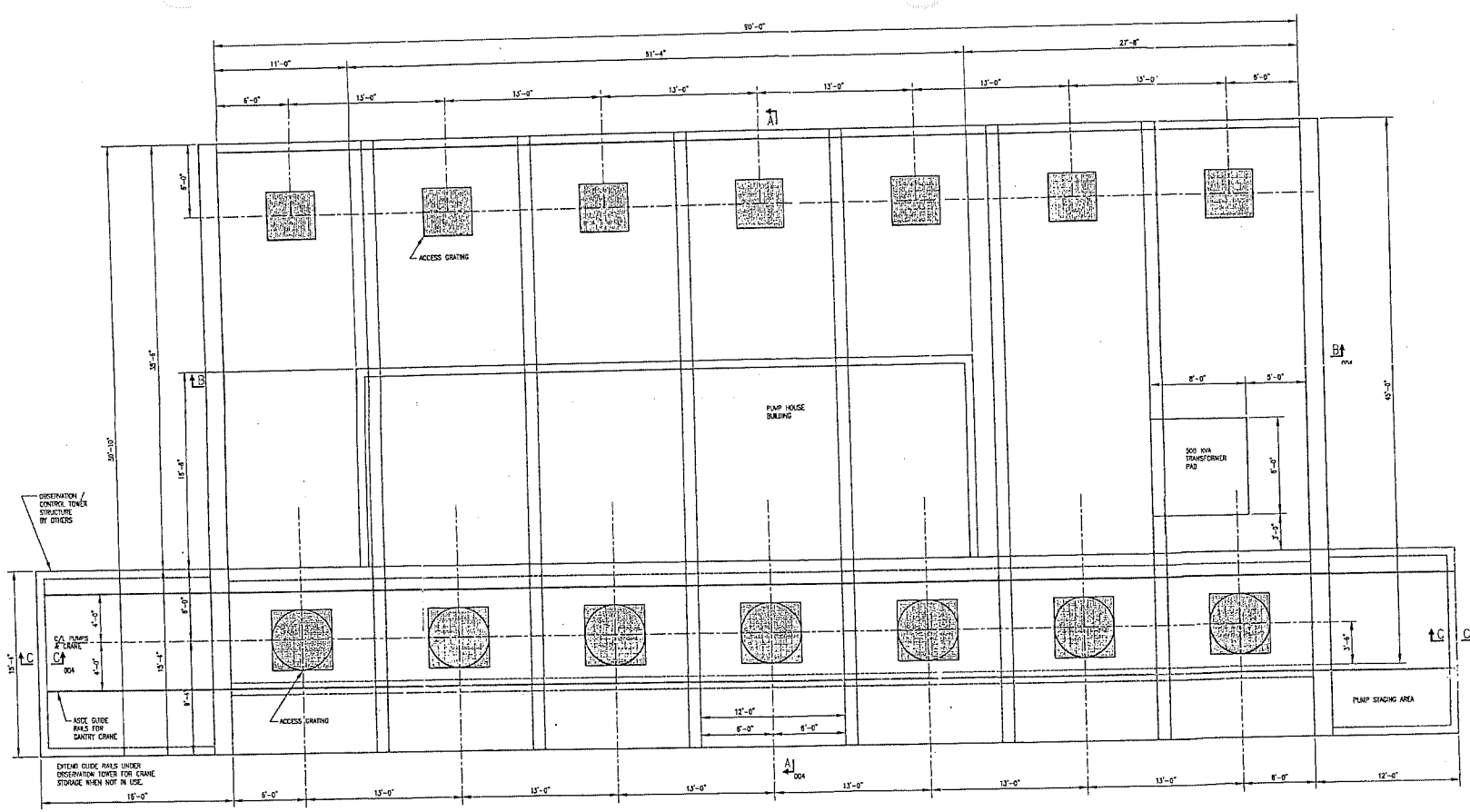
Land Drainage Pumps

Industrial Pumps
- slurry
- warm liquid
- corrosive

Propeller Pumps

Turbine Generators





OVERALL PLAN
INTAKE STRUCTURE
SCALE: 1/4" = 1'-0"

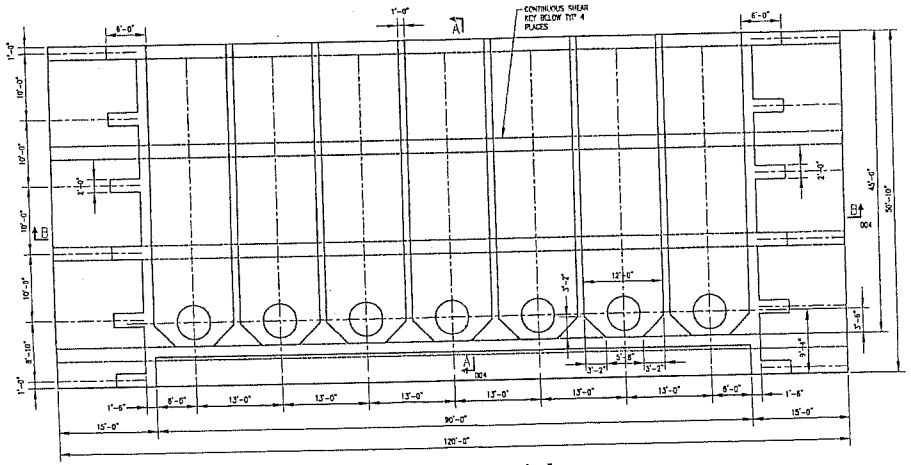
NORTH

A CONCRETE MIX DESIGN SHALL BE SUBMITTED TO THE ENGINEER FOR HIS APPROVAL PRIOR TO ANY POURS. MIX SPECIFICATIONS ARE AS FOLLOWS:

28 DAY COMPRESSIVE STRENGTH	4000 PSI
MAXIMUM WATER/CEMENT RATIO	0.45
AIR CONTENT (AIR ENTRAINED)	5+/-1 1/2% CONFORM TO ASTM 260
SLUMP	3" MAX FOR FOOTINGS, 4" MAX FOR WALLS AND SLABS
CEMENT	ASTM C150, TYPE II
AGGREGATE	3/4" MAX, CONFORM TO ASTM C33
FLYASH *	ASTM C618 (CLASS F)
WATER-REDUCING ADMIXTURES	ASTM C494

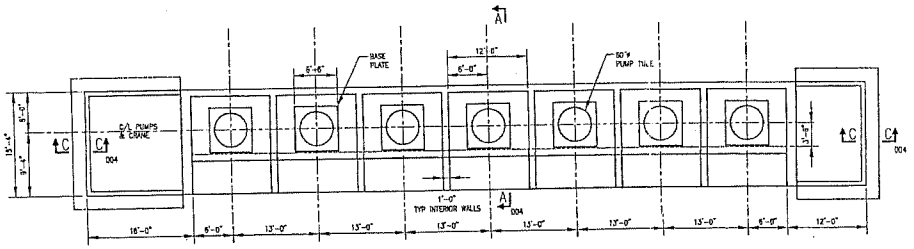
* FLYASH SHALL BE USED ONLY WITH THE APPROVAL OF THE ENGINEER.

ISSUED FOR 100% DD PROGRESS

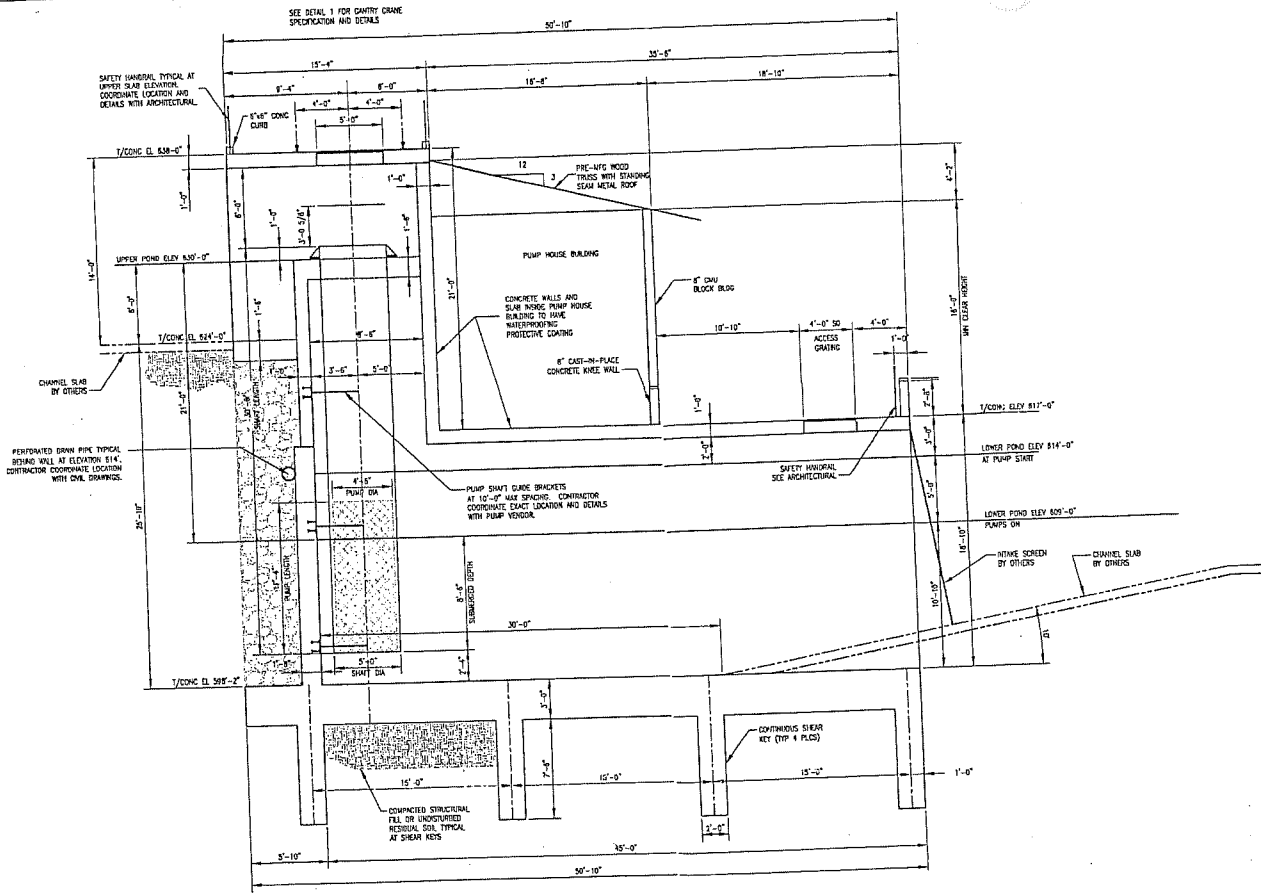


LOWER PLAN @ ELEV 596'-2"
INTAKE STRUCTURE
SCALE: 1/8" = 1'-0"

NOTE TO INSTALLER
ALL STATE SAFETY GUIDELINES, AS WELL AS MANUFACTURER SPECIFICATIONS, ALL APPLICABLE SAFETY CODES, REGULATIONS, AND STANDARDS, INCLUDING, BUT NOT LIMITED TO, OSHA AND OSHA, MUST BE FOLLOWED AS MINIMUM SAFETY PRECAUTIONS DURING CONSTRUCTION.



UPPER PLAN @ ELEV 624'-0" & 630'-0"
INTAKE STRUCTURE
SCALE: 1/8" = 1'-0"



GANTRY CRANE SPECIFICATION:

MODEL: SPANCO / ST1515S or ST1518S OR EQUAL AS REQUIRED TO PROVIDE MINIMUM HOOK HEIGHT AND OVER ALL HEIGHT REQUIREMENTS SHOWN.

USE: EXTERIOR APPLICATION FOR REMOVAL OF SUBMERSIBLE PUMPS FOR MAINTENANCE

CAPACITY: 8 TON

PUMP DATA:
11'-4" LENGTH
4'-8" DIAMETER
WEIGHT = 13000#

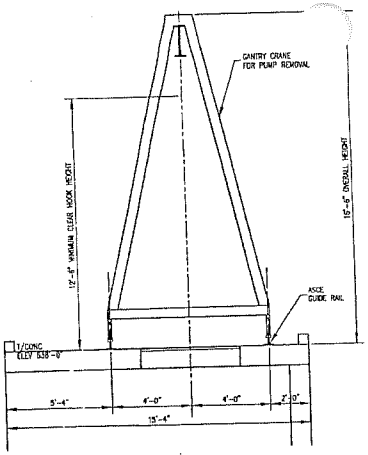
HOIST: ELECTRIC HOIST WITH ±40'-0" TRAVEL

CRANE DIMENSIONS:
8'-0" FRAME SPREAD
12'-0" MINIMUM SPAN
±8'-0" CLEAR SPAN FOR PUMP REMOVAL
±16'-6" OVERALL HEIGHT

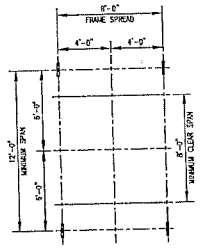
NOTE: ALTERNATE DIMENSIONS FOR STANDARD MODELS WILL BE CONSIDERED.

CRANE TRAVEL:
ELECTRIC DRIVE
RAIL GUIDED
± 118'-0" FROM STORAGE AREA TO PUMP STAGING AREA

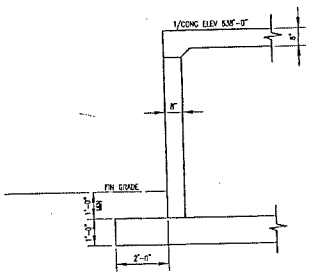
CONTACT:
JEREMY ROBINSON
SUN HOIST AND CRANE
EASTONVAL, NC
704-824-8505 PHONE
704-824-7101 FAX
704-718-1973 CELL



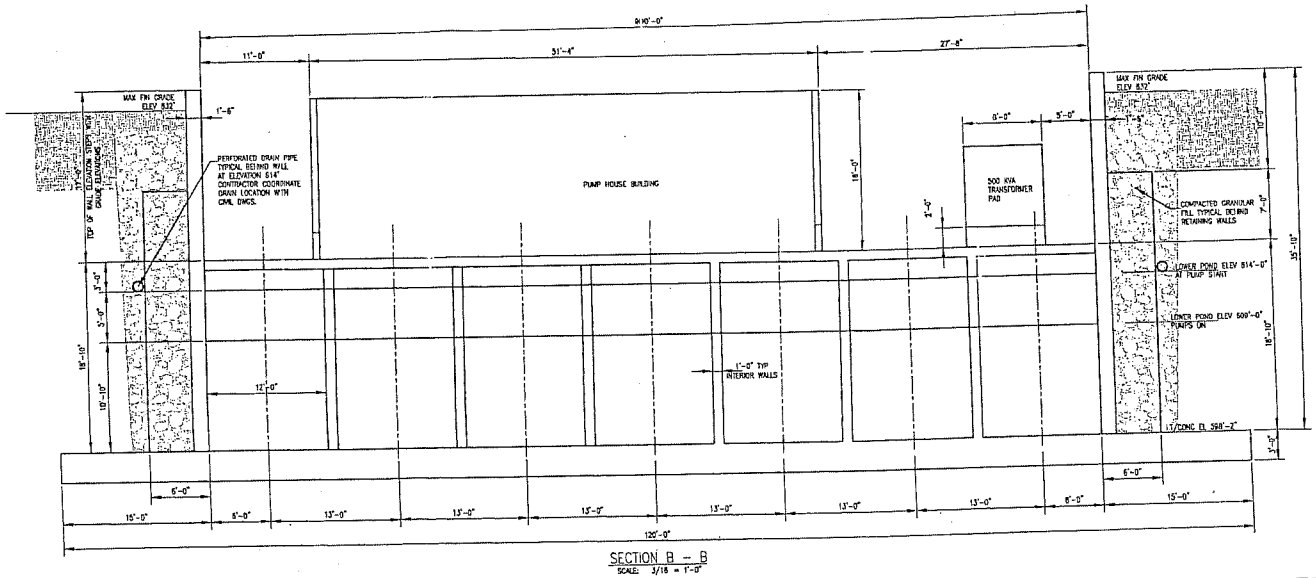
DETAIL 1
SCALE: 3/8" = 1'-0"



PLAN
SCALE: 1/4" = 1'-0"



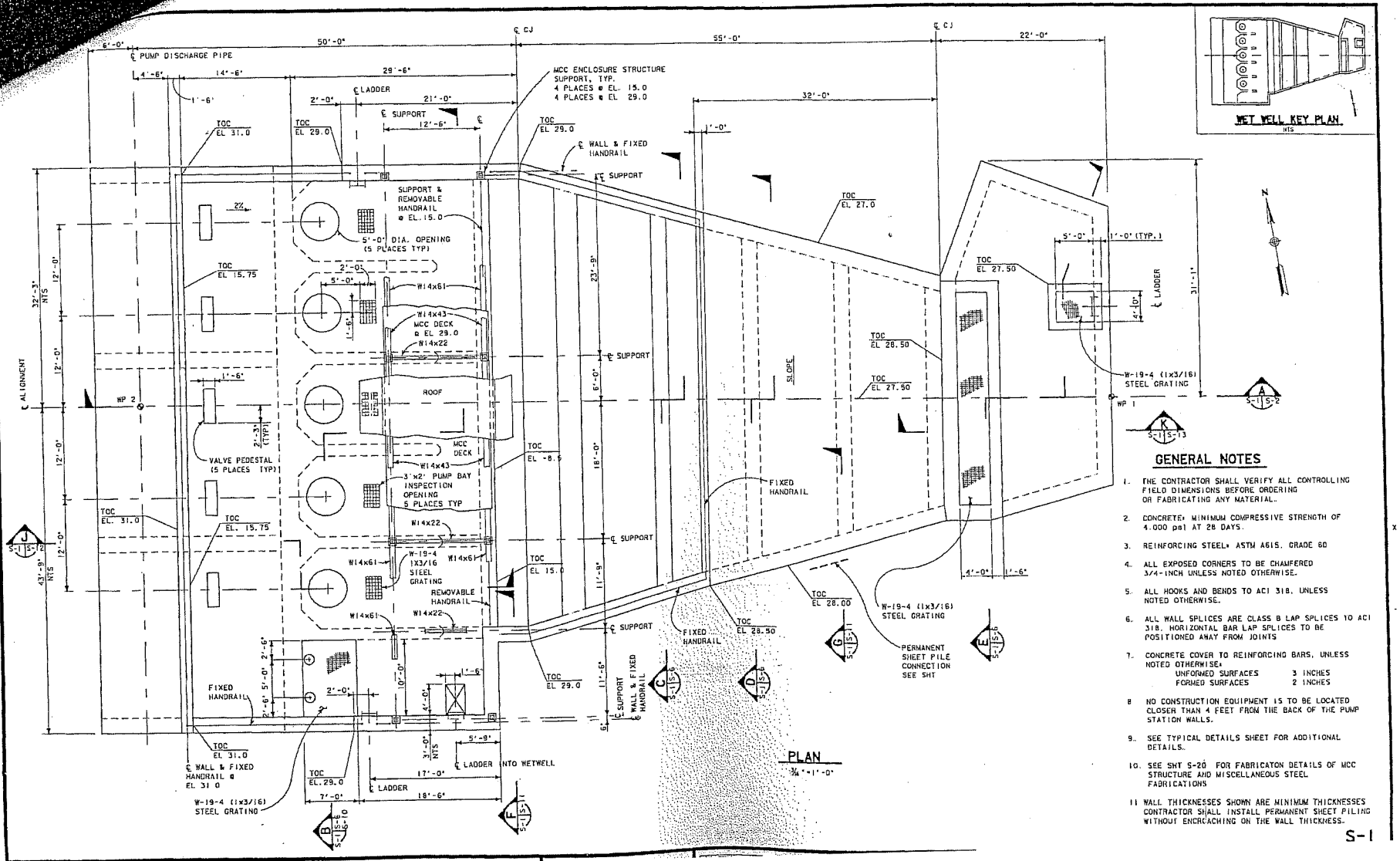
SECTION C – C
SCALE: 1/2" = 1'-0"



SECTION B – B
SCALE: 3/16" = 1'-0"

ISSUED FOR 100% DD PROGRESS

NOTE TO INSTALLER
ALL WORK SHALL CONFORM TO, AS WELL AS MANUFACTURER SPECIFICATIONS AND GUIDELINES, ALL APPLICABLE SAFETY CODES, REGULATIONS, AND STANDARDS, INCLUDING, BUT NOT LIMITED TO, NFPA AND OSHA. SAFETY AS REQUIRED BY MINIMUM SAFETY PRECAUTIONS DURING CONSTRUCTION.

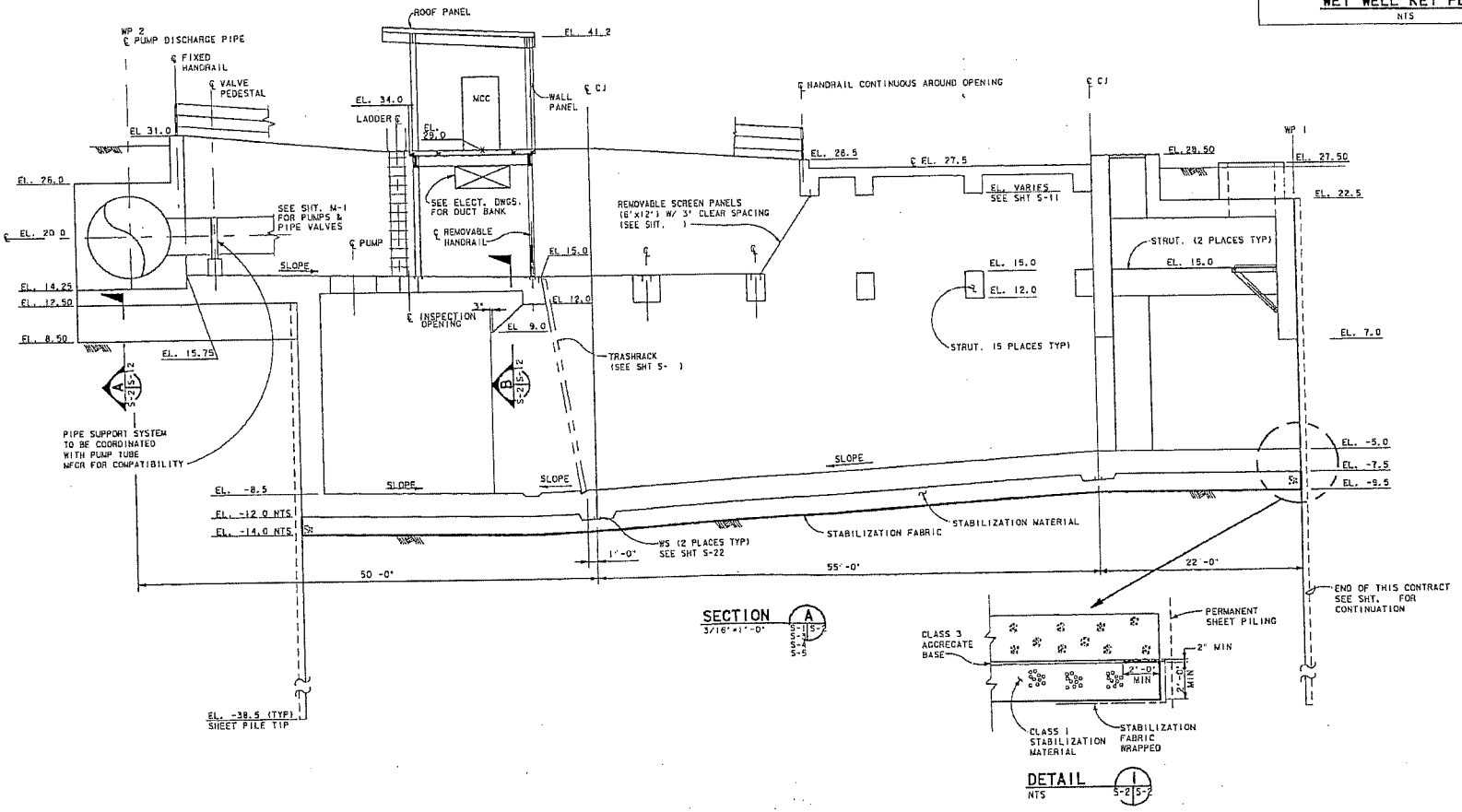


PLAN

3/16" = 1'-0"

GENERAL NOTES

1. THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.
2. CONCRETE: MINIMUM COMPRESSIVE STRENGTH OF 4,000 psi AT 28 DAYS.
3. REINFORCING STEEL: ASTM A615, GRADE 60
4. ALL EXPOSED CORNERS TO BE CHAMFERED 3/4-INCH UNLESS NOTED OTHERWISE.
5. ALL HOOKS AND BENDS TO ACI 318, UNLESS NOTED OTHERWISE.
6. ALL WALL SPLICES ARE CLASS B LAP SPLICES TO ACI 318. HORIZONTAL BAR LAP SPLICES TO BE POSITIONED AWAY FROM JOINTS
7. CONCRETE COVER TO REINFORCING BARS, UNLESS NOTED OTHERWISE:
   - UNFORMED SURFACES — 3 INCHES
   - FORMED SURFACES — 2 INCHES
8. NO CONSTRUCTION EQUIPMENT IS TO BE LOCATED CLOSER THAN 4 FEET FROM THE BACK OF THE PUMP STATION WALLS.
9. SEE TYPICAL DETAILS SHEET FOR ADDITIONAL DETAILS.
10. SEE SHT S-20 FOR FABRICATON DETAILS OF MCC STRUCTURE AND MISCELLANEOUS STEEL FABRICATIONS
11. WALL THICKNESSES SHOWN ARE MINIMUM THICKNESSES CONTRACTOR SHALL INSTALL PERMANENT SHEET PILING WITHOUT ENCROACHING ON THE WALL THICKNESS.


WET WELL KEY PLAN
NTS
WP 2
℄ PUMP DISCHARGE PIPE
℄ FIXED HANDRAIL
℄ VALVE PEDESTAL
ROOF PANEL
EL. 41.2
EL. 34.0
LADDER ℄
MCC
EL. 29.0
WALL PANEL
℄ CJ
℄ HANDRAIL CONTINUOUS AROUND OPENING
EL. 31.0
EL. 28.5
℄ EL. 27.5
EL. 28.50
WP 1
EL. 27.50
EL. 26.0
EL. VARIES SEE SHT S-11
EL. 22.5
SEE SHT. M-1 FOR PUMPS & PIPE VALVES
SEE ELECT. DWGS. FOR DUCT BANK
REMOVABLE SCREEN PANELS (6'x12') W/ 3" CLEAR SPACING (SEE SHT.)
℄ EL. 20.0
℄ PUMP
℄ REMOVABLE HANDRAIL
EL. 15.0
STRUT. (2 PLACES TYP)
EL. 15.0
SLOPE
EL. 15.0
EL. 14.25
EL. 12.50
EL. 12.0
℄ INSPECTION OPENING
3"
EL. 9.0
EL. 8.50
EL. 15.75
STRUT. (5 PLACES TYP)
EL. 7.0
TRASHRACK (SEE SHT S-)
A S-2 S-2
B S-2 S-2
PIPE SUPPORT SYSTEM TO BE COORDINATED WITH PUMP TUBE MFGR FOR COMPATIBILITY
EL. -5.0
EL. -7.5
EL. -9.5
SLOPE
SLOPE
SLOPE
EL. -8.5
EL. -12.0 NTS
EL. -14.0 NTS
WS (2 PLACES TYP) SEE SHT S-22
STABILIZATION FABRIC
STABILIZATION MATERIAL
1'-0"
50'-0"
55'-0"
22'-0"
END OF THIS CONTRACT SEE SHT. FOR CONTINUATION
EL. -38.5 (TYP) SHEET PILE TIP
SECTION A
3/16"=1'-0"
S-1 S-2 S-3 S-4 S-5
PERMANENT SHEET PILING
CLASS 3 AGGREGATE BASE
2" MIN
2'-0" MIN
2'-0" MIN
CLASS 1 STABILIZATION MATERIAL
STABILIZATION FABRIC WRAPPED
DETAIL 1
NTS
S-2 S-2

Schumann, Ronald, Jr.

From: Jim Healy [jimhealy@healyengineering.net]
Sent: Wednesday, August 02, 2006 12:13 PM
To: Schumann, Ronald, Jr.
Subject: FW: Louisiana Pumps

Ronnie,

As requested, curves reflecting pump characteristics for 300 cfs @ 15 feet, 1000 cfs @ 15 feet and 1000 cfs @ 50 feet have been submitted by ITT\AC.

If you need additional details\input, please call.

Regards,

Jim Healy
Healy Engineering, Inc.
617-698-5960 (phone)
617-687-5624 (e-fax)
617-312-9697 (cell)

jimhealy@healyengineering.net

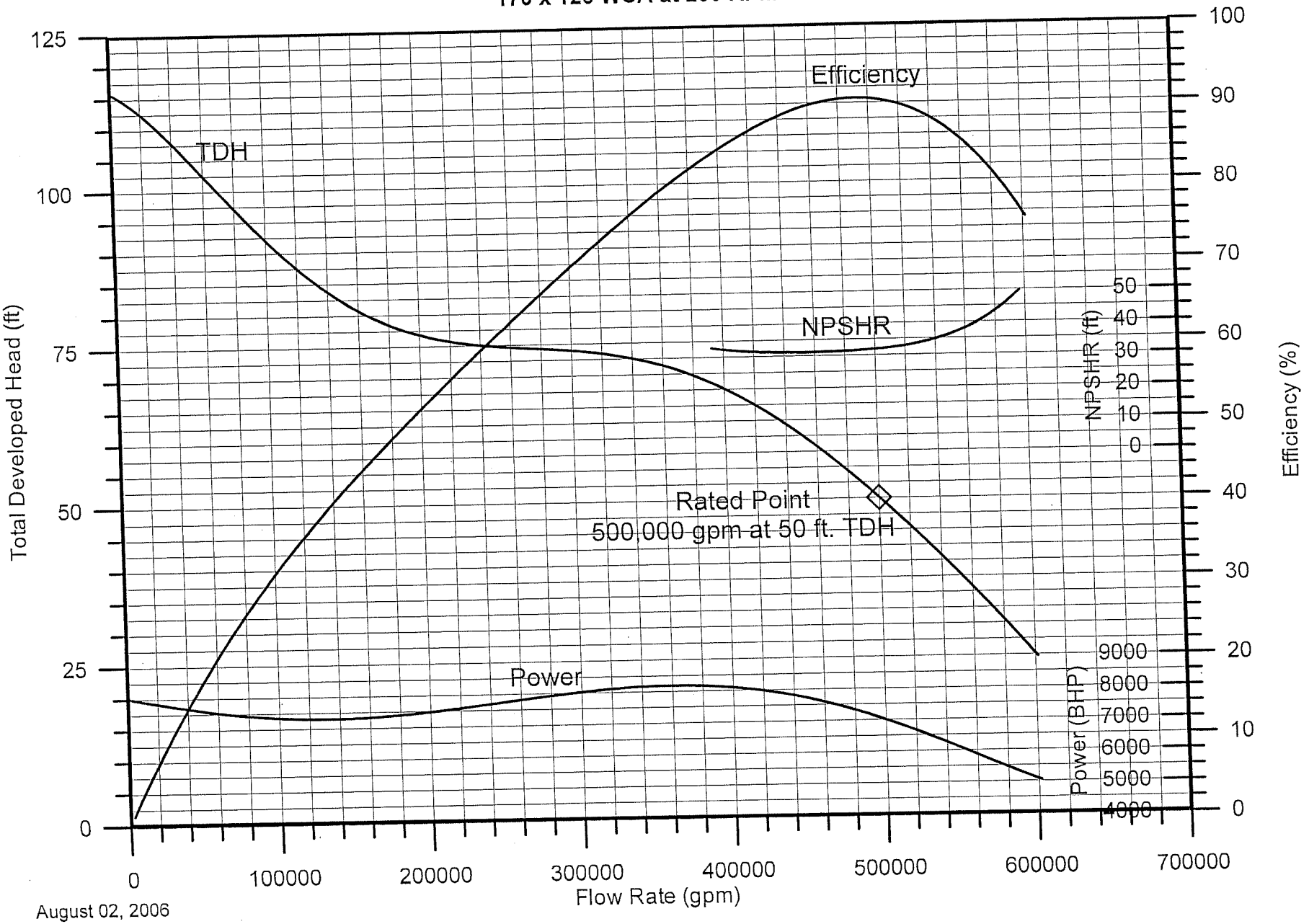
From: Japs, Gregory - FLYGT [mailto:Gregory.Japs@itt.com]
Sent: Wednesday, August 02, 2006 11:01 AM
To: jimhealy@healyengineering.net
Cc: Deisher, Mark - IBG
Subject: Louisiana Pumps

Jim,

Attached are the requested curves. If you have any questions, please let me know.

Greg Japs
Applications Engineer
ITT Flygt
Ph. 262-548-8178
Fax 262-548-8170
gregory.japs@itt.com

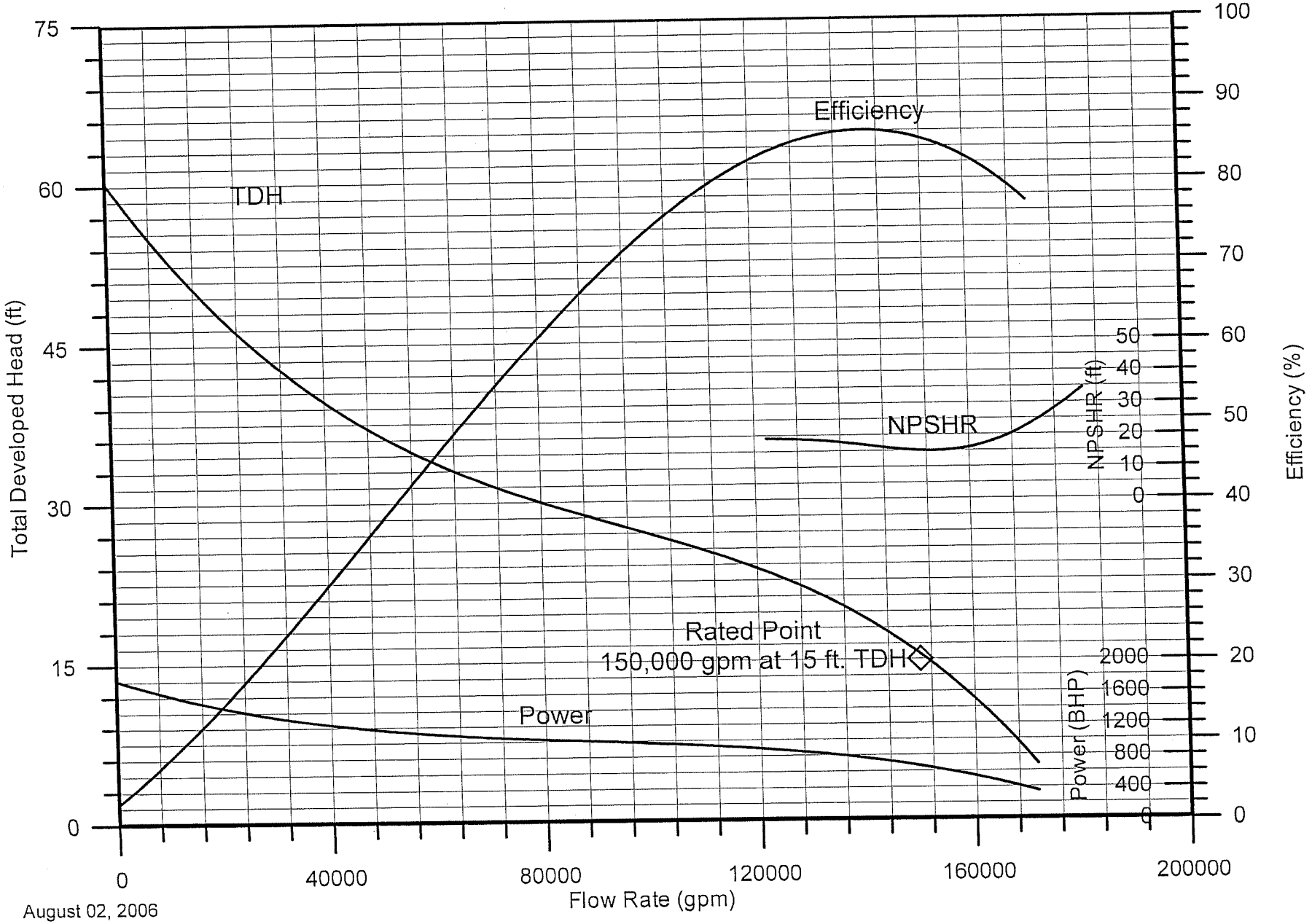
Louisiana
ITT Flygt Curve Number 71159
170 x 126 WCA at 200 RPM



August 02, 2006

Louisiana
ITT Flygt Curve Number 71160
114 x 72 WCAX 271 RPM

ITT



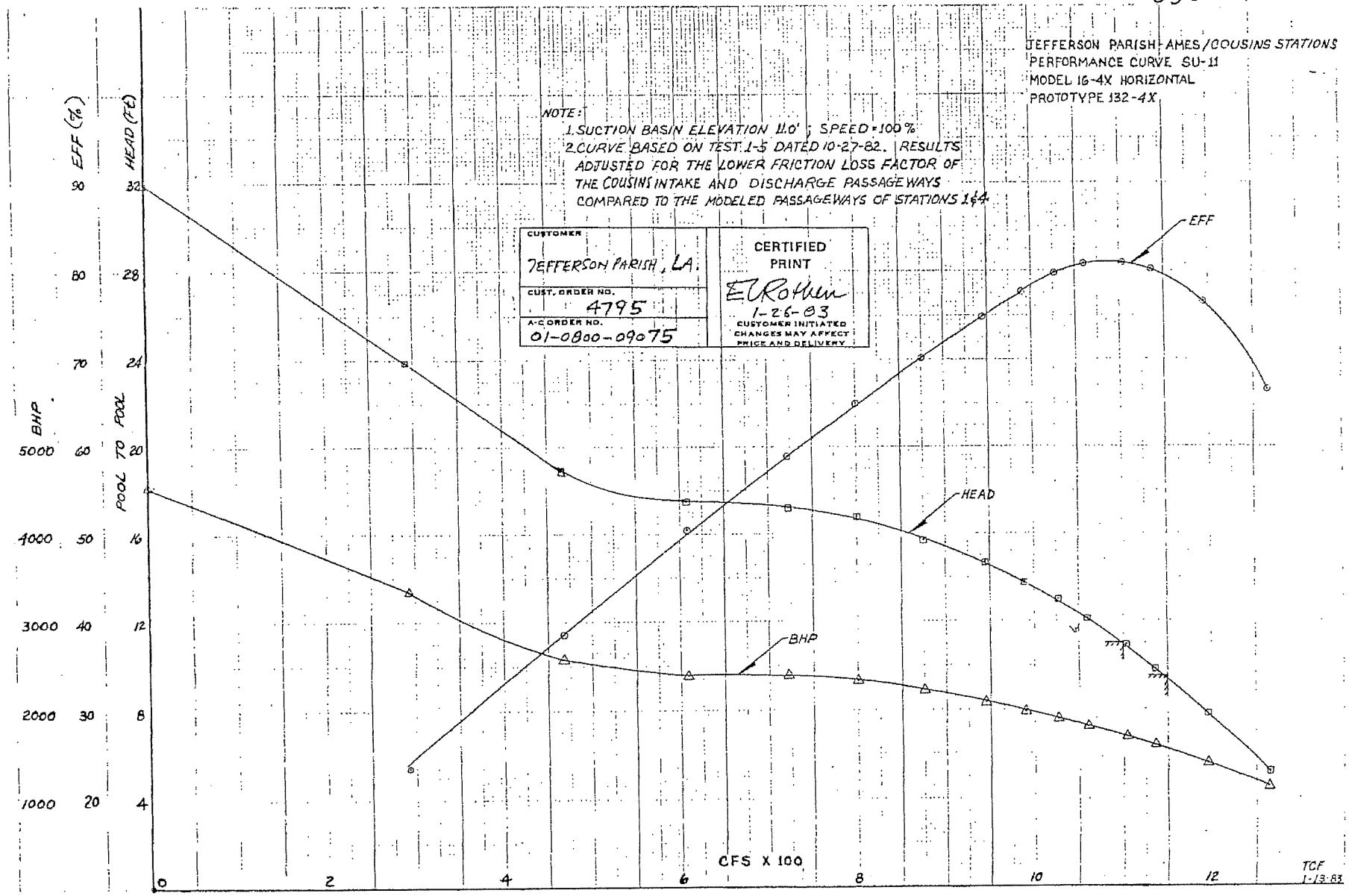
August 02, 2006

850-09076

JEFFERSON PARISH-AMES/COUSINS STATIONS
PERFORMANCE CURVE SU-11
MODEL 16-4X HORIZONTAL
PROTOTYPE 132-4X

NOTE:
1. SUCTION BASIN ELEVATION 11.0' ; SPEED = 100%
2. CURVE BASED ON TEST 1-5 DATED 10-27-82. RESULTS ADJUSTED FOR THE LOWER FRICTION LOSS FACTOR OF THE COUSINS INTAKE AND DISCHARGE PASSAGEWAYS COMPARED TO THE MODELED PASSAGEWAYS OF STATIONS 1&4

CUSTOMER	CERTIFIED PRINT
JEFFERSON PARISH, LA.	E.C. Rotten 1-26-83
CUST. ORDER NO. 4795	CUSTOMER INITIATED CHANGES MAY AFFECT PRICE AND DELIVERY
A-C ORDER NO. 01-0800-09075	



TCF
1-13-83

humann, Ronald, Jr.

From: Jim Healy [jimhealy@healyengineering.net]
Sent: Thursday, August 03, 2006 9:25 AM
To: Schumann, Ronald, Jr.
Subject: FW: DJMJ Harris

Ronnie,

Attached is the proposed ITT curve for 300 cfs @ 50 feet.

In discussing the estimated delivery times for the pumpsets, the best projections would be ~ 48 weeks for the 300 cfs size with ~ 60 weeks for the 1000 cfs size. Both values are dependent upon drive selections, QA imposed by the Corps and the level of business at the time of award for the pump and motor OEM's.

I've requested input from PENTAIR-Fairbanks for today.

If you need additional details, please call.

Regards,

Jim Healy
Healy Engineering, Inc.
617-698-5960 (phone)
617-687-5624 (e-fax)
617-312-9697 (cell)

jimhealy@healyengineering.net

From: Japs, Gregory - FLYGT [mailto:Gregory.Japs@itt.com]
Sent: Thursday, August 03, 2006 10:18 AM
To: jimhealy@healyengineering.net
Cc: Deisher, Mark - IBG
Subject: DJMJ Harris

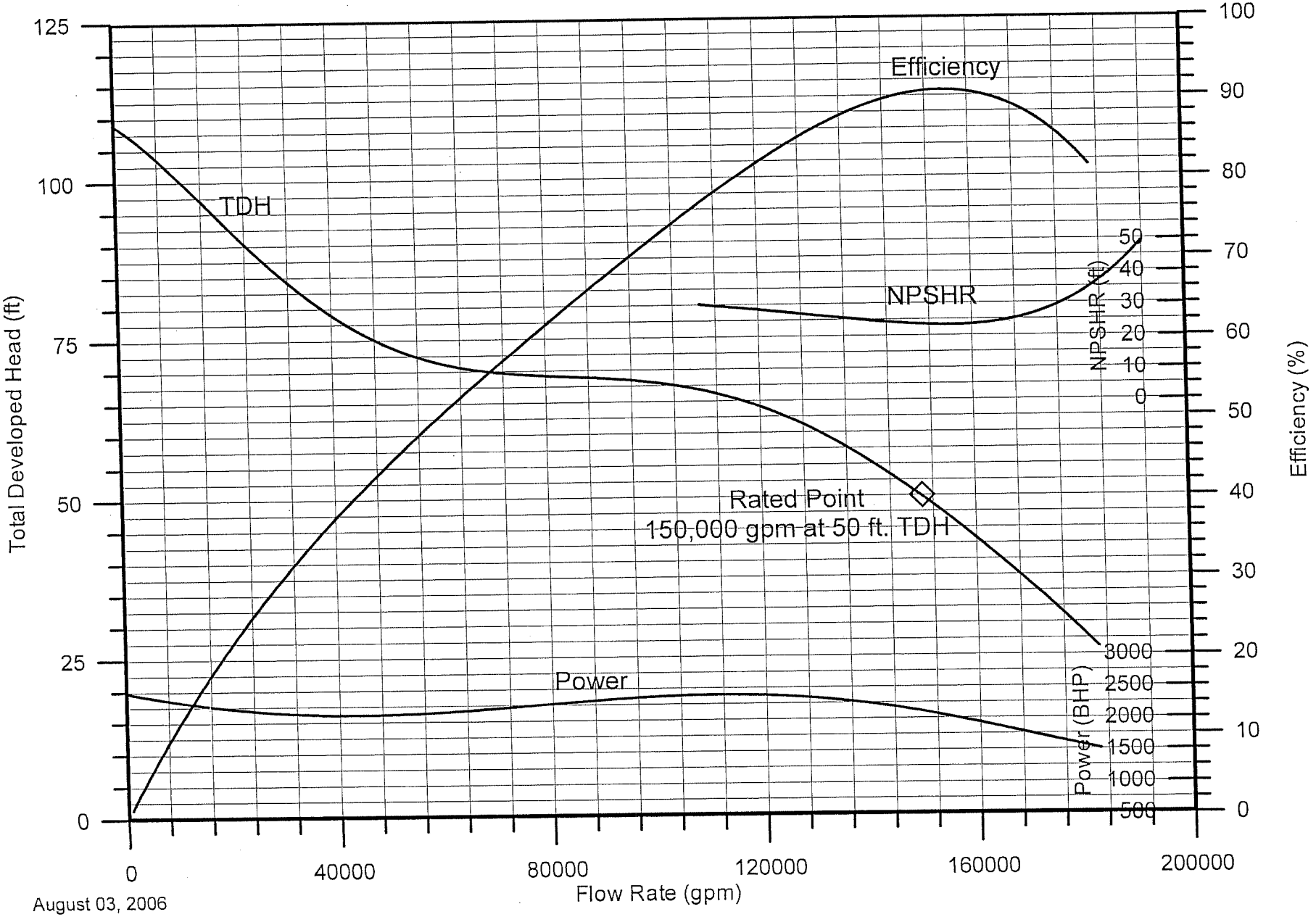
Jim,

Attached is the pump curve for 150,000 gpm at 50 ft.

Greg Japs
Applications Engineer
ITT Flygt
Ph. 262-548-8178
Fax 262-548-8170
gregory.japs@itt.com

DJ MJ Harris
ITT Flygt Curve Number 71162
108 x 78 WCA at 320 RPM

ITT



August 03, 2006

Schumann, Ronald, Jr.

From: Jim Healy [jimhealy@healyengineering.net]
Sent: Thursday, August 03, 2006 1:57 PM
To: Schumann, Ronald, Jr.
Subject: FW: 300 CFS Flood Control Pump Selection and Setting Plan

Ronnie,

As requested, the submittal from Fairbanks for the 300 cfs low-head service is attached.

If more is needed, please call.

Regards,

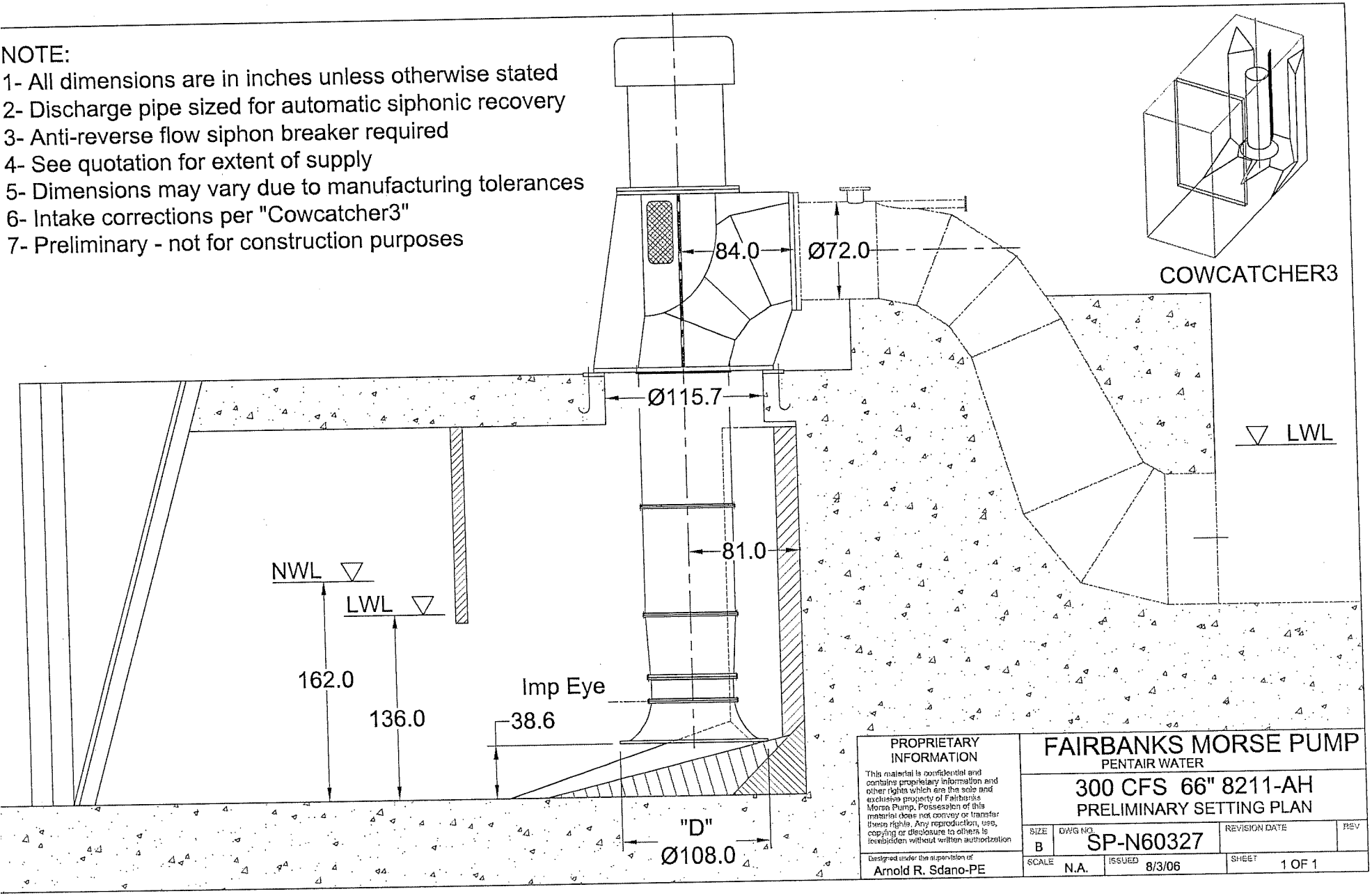
Jim Healy
Healy Engineering, Inc.
617-698-5960 (phone)
617-687-5624 (e-fax)
617-312-9697 (cell)

jimhealy@healyengineering.net

From: arnie.sdano@PentairWater.com [mailto:arnie.sdano@PentairWater.com]
Sent: Thursday, August 03, 2006 2:40 PM
To: jimhealy@healyengineering.net
Cc: jim.miller@PentairWater.com; joe.maloney@PentairWater.com
Subject: 300 CFS Flood Control Pump Selection and Setting Plan

Jim, Curve and setting plan for a 66" prop pump is attached. Should consider a Cowcatcher3 intake or a FSI. - Arnie

NOTE:
1- All dimensions are in inches unless otherwise stated
2- Discharge pipe sized for automatic siphonic recovery
3- Anti-reverse flow siphon breaker required
4- See quotation for extent of supply
5- Dimensions may vary due to manufacturing tolerances
6- Intake corrections per "Cowcatcher3"
7- Preliminary - not for construction purposes



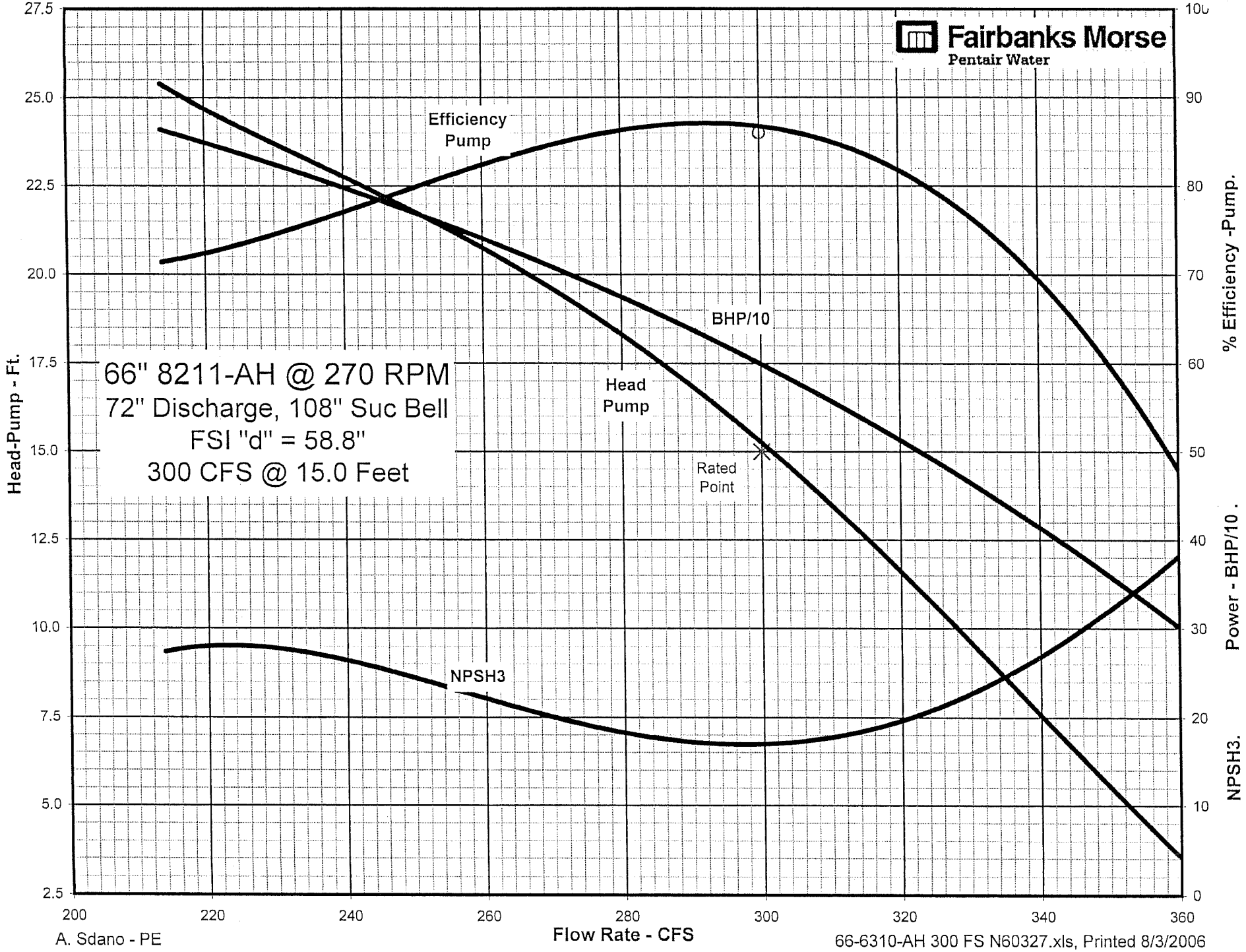
COWCATCHER3

Designed under the supervision of
Arnold R. Sdano-PE

FAIRBANKS MORSE PUMP
PENTAIR WATER

300 CFS 66" 8211-AH
PRELIMINARY SETTING PLAN

SIZE	DWG NO.	REVISION DATE	REV
B	SP-N60327		
SCALE N.A.	ISSUED 8/3/06	SHEET 1 OF 1	



A. Sdano - PE

66-6310-AH 300 FS N60327.xls, Printed 8/3/2006

ANSI/HI 9.8, Appendix A, Remedial Corrections
Figure A-11, Combinations A, E, F, G, & H