CITY OF ALBUQUERQUE

BELL/COMMERCIAL STORM WATER PUMP STATION NO. 37 FORCE MAIN

DESIGN ANALYSIS REPORT

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1.0 EXECUTIVE SUMMARY

The purpose of this Design Analysis Report is to determine the size and alignment of the force main from Storm Water Pump Station No. 37 (Bell & Commercial) to a new discharge point at William Street and Trumbull Avenue. The February 2010 Feasibility Study entitled "Bell/Commercial Pump Station Modifications" determined the design flow to be 135 cubic feet per second (cfs) and recommended that the existing 36-inch force main be increased to 42-inches. It further recommended a preferred alignment that goes from the pump station, east on Bell Avenue one block to William Street, south on William two blocks to Trumbull Avenue, and connecting to the existing 72-inch storm drain at Trumbull.

We investigated the utilities in the area and have determined that the preferred alignment of the force main is achievable. Further utility exploration is required to confirm our findings and to obtain information on utilities that we were unable to verify.

Our analysis of the force main size, however, determined that it is necessary to increase the force main size to 54-inches in order to maintain a reasonable total dynamic head (TDH) and accommodate future pump upgrades that are undetermined at this time. Installing a 54-inch force main will increase the current capacity of the pump station from 80 cfs to 105 cfs, but pump upgrades will need to occur to achieve the desired 135 cfs.

The contractor that performs this work will need to be familiar with utility work and have the capability to construct the new force main within tight utility constrictions and with limited overhead access under the Guadalupe Overpass.

There are no anticipated real estate acquisitions that need to be made since all work will take place within public right-of-way.

The probable cost of this new force main, and associated connections, is estimated to be $1,006,000, inclusive of NMGRT.

2.0 INTRODUCTION

This Design Analysis Report (DAR) describes the existing conditions at the Bell/Commercial Storm Water Pump Station No. 37 and provides recommendations for improvements to the force main. The hydrologic conditions to be used as a basis for this DAR were presented by Smith Engineering Company in their feasibility study entitled "Bell/Commercial Pump Station Modifications", dated February 3, 2010. In that study, it was determined that a design flow of 135 cubic feet per second (cfs) peak flow reaches the pump station, but that only 80 cfs pumping capacity is currently available to drain the station. The study recommended that upgrades to the force main be made along with the replacement of one of the three pumps to increase the pumping capacity to meet the 135 cfs design flow. This recommendation was made with input from and concurrence with personnel from the City of Albuquerque Storm Drainage Design Section (SDDS) and from the Albuquerque Bernalillo County Water Utility Authority (ABCWUA).

Since there is limited funding currently available for improvements, the scope of this report is focused solely on upgrades needed to the force main so that future pump modifications can efficiently deliver the design flow. There is no funding available for pump replacement or electrical upgrades at this time. It is intended, however, that future upgrades will include pump replacement to increase the pumping capacity, so in order to determine the size of the force main, a preliminary analysis of the future pump configurations has been conducted as part of this study. The force main improvements recommended in this Report will increase the capacity of the station using the existing pumps, but will not transmit the design flow until future upgrades to the pump station are completed.

In addition to the feasibility study and field reconnaissance by Molzen Corbin personnel, the City provided the following documents to use as background information:

2.1 Reports

- *South Broadway Sector Drainage Management Plan (DMP), Developed Conditions Report*, September 1990, Bohannan Huston,Inc.
- *Final South Broadway Detention Basin Analysis Phase Report*, July 1991, Resource Technology, Inc.

2.2 As-built Plans

- City of Albuquerque, Highland Storm Sewer, 1939, City Project No. 08-391-39
- Storm Sewer for Paving District No. 73, March 1953, Herkenhoff & Turney, City Project No. 08-541-54
- South William St. Relief Storm Sewer, January 1959, Gordon Herkenhoff & Associates, City Project No. 08-591-59
- Edith Blvd. Trunk Sewer, October 1959, W.F. Turney & Associates, City Project No. 07-016-54
- City of Albuquerque, 1961 Cement Mortar Contract, 24" – 20" Atrisco Trans Line, 1961, City Project No. 09-021-61
- Model Neighborhood Area Drainage Improvements WSNM-20, Commercial at Bell Pump Station, June 1971, Gordon Herkenhoff & Associates, Inc., City Project No. 08-001-77
- Phase I Rehabilitation Storm Water Pumping Stations, May 1987, Bovay Engineers, Inc., City Project No. 26-1647-87
- FY 88-89 Waterline & Sewerline Renewal Program Area 1, Stadium Blvd. & William Street, Holmes & Narver, 1990, City Project No. 26-3502-93
- Trumbull Ave. and William St. Sewer Improvements, February 2000, Holmes and Narver, City Project 6163.91
- Emergency Storm Water Pump Station Improvements Phase I, Bell Station No. 37 Modifications, Relocated Bar Screen Assembly & Installation, May 2009, Molzen-Corbin & Associates, City Project No. 7814.91

- Project No. 07-001-51 – Block to Block Sewer, 1951
- Project No. 03-30-68 – Block to Block Water, Sheet No. 30, 1968

2.3 Other Data

In addition to As-Built Plans, there were several plans not indicated as record drawings, but the work is believed to have been done.

- The City of Albuquerque Grid L-14 GIS data for sanitary sewer, storm, and water lines
- WUA T-Book 2032-4, So. William St. from Bell to Trumbull, March 1951
- Commercial at Bell Pump Station, May 1990, Wilson & Company, City Project No. 3077
- Storm Water Pump Station No. 37 Bell Rehabilitation, July 2002, Molzen-Corbin & Associates, City Project No. 6691.91

3.0 EXISTING CONDITIONS

As shown in **Figure 1**, the Bell/Commercial Pump Station is located at 101 Bell Street S.W., which is on the northeast corner of Bell Avenue and Commercial Street, north of Avenida Cesar Chavez and west of Broadway Boulevard. The pump station was constructed in 1971 and has been upgraded several times, with the most recent upgrade occurring in 2009.

3.1 Original Pump Station and Force Main

When the pump station was built, three vertical line-shaft end-suction centrifugal pumps were installed in a dry pit configuration. Pump No. 1 was a 75-horsepower (HP) pump with an 18-inch suction line. Pumps No. 2 and 3 were 250-HP and 600-HP, respectively, each with 30-inch suction lines. The under-slab suction lines connected to an adjacent wet well outside the building, and the three pumps discharged into a 36-inch manifold force main. This force main exited the station and continued east on Bell Avenue to discharge into a 72-inch storm drain gravity line on Broadway Boulevard. The flow then ran south on Broadway to Trumbull Avenue, then west to William Street and south on William to the San Jose Drain. [1]

In addition to the main pumps, a sump pump was installed in the wet well, which drained low flows through a 4-inch force main and discharged into a storm drain manhole in William Street south of Bell Avenue. There were also two small sump pumps in the dry pit which discharge into the wet well.[1]

According to the 1990 DMP, the theoretical capacity of the three main pumps totaled 167 cfs when considered individually, but when they were tested in 1990, they demonstrated a combined ability to pump only 94 cfs. The report acknowledged, however, that the testing methods may have underestimated the results. Regardless, their analysis of the pumps showed that the existing pump station was undersized for the 100-year storm event. The report recommended replacing the pumps to meet a 185 cfs capacity, and also recommended that flow not be discharged into the

[1] Model Model Neighborhood Area Drainage Improvements WSNM-20, Commercial at Bell Pump Station, June 1971, Gordon Herkenhoff & Associates, Inc., City Project No. 08-001-77

Broadway storm drain system because of inadequate capacity in that line. It recommended installing a 54-inch force main that discharged directly into the Rio Grande.

3.2 Pump Station Upgrades

Molzen Corbin designed the rehabilitation work for the Pump Station in 2002, but the work was not done until 2007.[2] Pump No. 1 remains, but in 2007, the two larger pumps were replaced with used pumps that were removed from the Return Activated Sludge (RAS) Pump Station at the Southside Water Reclamation Plant, where they were originally installed in 1988. The two replacement pumps are Flygt submersible pumps, 134-HP, model CT 3500/860 impeller code 1430, 595 mm diameter. Even though these pumps are submersible pumps, they have always been installed in a dry pit configuration. The benefit of using submersible pumps in this application is that if the dry well is accidentally flooded, there would be no damage to the pumps. The new pumps were able to utilize the existing 30-inch suction lines and the 36-inch discharge manifold pipe.

It was noted from field investigations that the wet well sump pump valves and fittings in the valve vault are now 10-inch, instead of the original 4-inch. We did not find any as-built drawings indicating that this was changed, but we did find "not for construction" drawings that showed the original 4-inch force main upgraded to a 10-inch force main. The drawings also show construction of a new valve vault and the force main discharging into the same storm manhole on William Street that the original 4-inch force main emptied into.[3] This presumably means that a new larger sump pump was installed.

Documentation within the pump station indicates that the pumps are controlled as follows:

Sump On:	1.5 feet
Sump Off:	0.5 feet
Pump No. 1 On:	3.5 feet

[2] Storm Water Pump Station No. 37 Bell Rehabilitation, July 2002, Molzen-Corbin & Associates, City Project No. 6691.91

[3] Commercial at Bell Pump Station, May 1990, Wilson & Company, City Project No. 3077

Pump No. 1 Off:	2.25 feet
Pump No. 2/3 Lead On:	4.0 feet
Pump No. 2/3 Lead Off:	2.25 feet
Pump No. 2/3 Lag On:	5.0 feet
Pump No. 2/3 Lag Off:	2.5 feet

Additional renovation work performed in 2007 included replacing the existing pump control valves with motorized DeZurik plug valves (valve-mounted actuators), replacing all three pump drives with constant-speed 480-volt drives, and installing new controls.[4] In 2009, the existing cable-driven mechanical bar screen located outdoors in the inlet channel of the station was replaced with a used and modified Infilco Degremont climber screen that was removed from the Barelas Stormwater Pump Station No. 32. The replacement bar screen now prevents much of the larger debris from entering the wet well. A new screenings conveyor belt was also installed.[5]

There has been no change to the original 36-inch force main from the station to the 72-inch storm drain in Broadway Boulevard.

3.3 Utilities in Project Vicinity

Our field investigations and review of as-builts showed that, in addition to the pump station force mains, there are many utilities in the vicinity of the pump station (see **Figure 1**). We have sent inquiries to New Mexico Gas Company, PNM, Qwest (local and long distance), TW Telecom of NM, Comcast, ATT, MCI Worldcom, Redflex, Citilink, and the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) to verify what we have found. We have received responses from each utility. This is what we know at this time:

3.3.1 Gravity Storm Drain:

- 48-inch running east/west on Bell from William to Commercial
- 24-inch to 36-inch running north/south on William and on Commercial

[4] Storm Water Pump Station No. 37 Bell Rehabilitation, July 2002, Molzen-Corbin & Associates, City Project No. 6691.91

[5] Emergency Storm Water Pump Station Improvements Phase I, Bell Station No. 37 Modifications, Relocated Bar Screen Assembly & Installation, May 2009, Molzen-Corbin & Associates, City Project No. 7814.91

- 72-inch running north/south on Broadway and on William south of Trumbull
- 72-inch running east/west on Trumbull from Broadway to William
- 24-inch running east/west on Trumbull from William to Commercial
- Numerous drop inlet connections at the intersections and roadway along William

3.3.2 Sanitary Sewer:

- 48-inch running east/west on Avenida Cesar Chavez
- 48-inch running north/south on Commercial
- 8-inch running east/west on Bell and on Avenida Cesar Chavez
- 8-inch running north/south on William
- 8-inch running north/south on Commercial, north of Avenida Cesar Chavez
- 8-inch to 36-inch running east/west on Trumbull (parts have been abandoned or removed near the intersection at William according to as-built drawings)

3.3.3 Water:

- 6-inch running north/south on William and on Commercial
- 4-inch to 6-inch running east/west on Bell and on Avenida Cesar Chavez
- 8-inch and 24-inch running east/west on Trumbull

3.3.4 Gas:

- 2-inch high pressure line to 4-inch low pressure line running east/west on Bell
- 2-inch low pressure line running north/south on William
- 2-inch low pressure line running east/west on Trumbull
- 4-inch medium pressure line running east/west on Trumbull
- 14-inch very high pressure line running east/west on Trumbull west of William
- Of note, the 36-inch storm drain going south on William between Trumbull east and Trumbull west has a 400-ft-long inverted siphon that goes underneath the 14-inch very high power gas line.

3.3.5 Electric:

- Overhead poles along all streets

3.3.6 Communications:

- Two telecommunication boxes on William, one just north of the overpass on the west side of the street, and one at Avenida Cesar Chavez on the southeast corner.
- Buried local Qwest cable running east/west on Avenida Cesar Chavez.
- Buried Comcast line running east/west on Avenida Cesar Chavez on both sides of the street.

We believe that most of the utilities are shown correctly in **Figure 1**; however, we do recommend that further utility exploration be completed to verify what we have found. One issue that we found is that the 48" storm drain down Avenida Cesar Chavez and along Commercial is indicated on grid maps to be a sanitary sewer line. Once we removed the manhole cover at William, we thought that it was a storm drain since it was dry and contained some silt. The ABCWUA has confirmed that it is a sanitary sewer line and assumes it is abandoned. They are currently working to confirm this. If it is abandoned, the new 54-inch force main will not need to be constructed below this line. Regardless of whether this line is abandoned, the new force main will need to be constructed approximately 12-feet below grade to the invert of the pipe. For this report, it is assumed this sanitary sewer line is abandoned.

4.0 DESIGN ANALYSIS

4.1 2010 Feasibility Study Findings and Recommendations

The 2010 Feasibility Study determined that the design flow reaching the pump station is now 135 cfs. This is less than that given in the 1990 DMP because system-wide modifications have been implemented since that report was written. The feasibility study did an analysis of the three main pumps and found that only 80 cfs can be pumped out of the station with the three existing pumps and the 36-inch force main, which is below the 135 cfs needed.

The Study recommended replacing the original 75 HP Pump No. 1 with a new submersible pump to augment the capacity of the two Flygt pumps and provide protection against damage in the event the dry pit flooded. The goal of the replacement is to provide a total station capacity of 135 cfs with no redundant pumps. The study also looked at increasing the force main to 42-inch, which would require the new pump to deliver 98 cfs. The Study suggested using a Patterson Type F36B, horizontally mounted, end suction, solids handling, centrifugal pump, but this is not a submersible pump. Also, this pump is very large and efforts to bring the pump into the pump house and install the pump would be very difficult, if not impossible. It would also be very difficult to remove it in the future for maintenance or replacement. The pump is 17.5-feet long, 7-feet wide, and 8.5-feet tall. The roll-up door into the building is 10-feet high by 8-feet wide, and the opening to lower the pump into the dry pit is 9-feet wide. The clear height of the monorail is 8'-11". The weight of this pump is 12,000 pounds, but the monorail is only rated to 5 tons (10,000 pounds). In addition, the existing 18-inch suction line would need to be replaced with a 42-inch suction line. To facilitate not having to take the station out of service for pump replacement, a solution could be to construct a new suction pipe for the new Pump No. 1 through the wall into the wet well, rather than breaking the floor slab to install a larger suction pipe.

The Study also recommended that the discharge point of the 42-inch force main be changed from the existing 72-inch storm drain at Bell and Broadway to the 72-inch storm drain at William and Trumbull. The Study investigated several alignments for the new force main, and upon discussions with City of Albuquerque Storm Drainage Design Section personnel, it was decided

that the preferred alignment of the new force main is: from the pump station, east on Bell one block to William, south on William two blocks to Trumbull, which includes crossing under the Guadalupe Overpass, and connecting to the existing 72-inch line at Trumbull. See **Figure 2**.

While this alignment increases the force main length from approximately 1,000 linear feet to 1,100 linear feet, it diverts flow from the existing Broadway storm drain system and reduces the amount of static lift by approximately 16 vertical feet.

4.2 Additional Analysis of Preliminary Pump Sizing

In order to finalize the sizing of the force main, we also performed a preliminary pump analysis to see if there is a Flygt submersible pump that would work in parallel with the two existing Flygt pumps and achieve a station capacity of 135 cfs. Based on the approximate configuration of the proposed force main, to deliver 135 cfs through a 42-inch force main, we estimate the total dynamic head (TDH), which includes friction losses, would vary from 34 feet (high wet well level) to 56 feet (low wet well level). The challenge is that the shutoff head of the existing Flygt pumps is only 48 feet.

When the level in the wet well is low, this means that only the large pump would be capable of running, when it typically is desirable to have the smallest pumps running to save on power consumption. Also, having such a powerful pump would mean frequent cycling of the pumps. We did not find a Flygt pump that could work with the two existing Flygt pumps to achieve 135 cfs through a 42-inch force main. However, we did find a Flygt 325 HP Flygt model CT 3501/864, impeller code 63-1030, 570 mm, that could, in combination with the two existing Flygt pumps, pump 105 cfs at the mid-range wet well level (see **Figure 3**).

If only a single pump could be added, we found that increasing the size of the force main to 54-inches would lower the TDH to vary between 11 and 33 feet. This would allow the existing Flygt pumps to contribute more. Adding the Flygt CT 3501 would then bring the flow capacity to the desired 135 cfs as illustrated in **Figure 4**. This analysis was done for a Flygt pump, since

that is what is in the pump station now, but the Contractor would be allowed to specify an equivalent manufacturer/model.

The system head curve is based on a 54-inch force main. The existing 134 HP Flygt pumps are shown with one and two pumps running. The new 325 HP Flygt pump is shown running singularly. The solid line shows all three pumps running together, and delivering 135 cfs at the mid-range of the required system head pressure. The new pump would need a 48-inch suction pipe to maintain the good practice of keeping suction velocities below 5 feet per second. Having a larger suction pipe would raise the pump and require a higher wet well level to maintain the required net positive suction head. This decreases the storage available in the wet well. However, the big pump will only be required to turn on during high flows when the wet well level is high. The smaller pumps alone can handle flows below 80 cfs.

The problem with this pump, as with the Patterson pump, is that it is very large and would be very difficult or impossible to install and maintain. The new pump selected in this preliminary investigation is 10'-3" tall, 5'-2" wide and the centerline of the discharge pipe is a minimum of 7'-6" above the floor. It weighs close to 9,500 pounds. Therefore, the needed Flygt pump is too large to install in the dry pit. We have found no other single pump that is smaller that would fit the criteria needed. So, keeping the two existing pumps and adding a third larger pump appears to not be a valid solution, unless at the time of pump replacement, there is another smaller pump available with the same capacity.

There are other alternatives, not discussed in the feasibility study that would be worth further investigation.

1. Use the two existing submersible pumps and add two additional pumps of a reasonable size, placing one in the dry pit and one in the wet well.
2. Change out all pumps with three new slightly larger identical pumps in the dry well. Or, if all three are placed in the wet well, then the existing pumps could be abandoned in place.

3. Put two new pumps in the wet well, and keep all three existing pumps. This would allow for redundancy, having one pump serve as a stand-by pump in case one of the other three pumps needs maintenance.

If pumps are placed in the wet well, the discharge piping may be accomplished by taking off the blind flange on the vertical tee on the existing discharge header and constructing an "upper" discharge pipe. A portable crane would need to be brought on site to install the pumps into the wet well, unless a monorail could be constructed over the wet well. This may not be possible due to the overhang of the building.

Final sizing of the future pump (or pumps) and determining the need for changing the configuration of the suction and discharge piping, is beyond the scope of this study. What we learned from this preliminary review, however, is that it is prudent to install a 54-inch force main to meet the 135 cfs need, since future scenarios may involve only replacing one pump. Having a 54-inch force main would result in lower friction losses, and therefore a lower pressure pump (or pumps) would be needed. We also recommend providing a stub-out in the force main to accommodate placement of pumps in the wet well if that is determined in the future to be the preferred way to proceed. If smaller pumps are chosen, using a smaller force main could be possible, but given that future pump configurations are unknown at this time, it is best to use a 54-inch pipe. Another benefit to installing a 54-inch force main, even without replacing any pumps, is that it would increase the capacity of the pump station. The Feasibility Study reported that with all three existing pumps running and a 36-inch force main, the station can only pump 80 cfs. With a 54-inch force main and all three existing pumps running, the station would be capable of pumping 105 cfs (see **Figure 5)**.

Further study is also needed to determine what modifications of the electrical service would be needed to provide power for the entire station load. The Feasibility Study also recommended replacement of the existing electric valve actuators on the discharge pump control plug valves with actuators not susceptible to flooding of the dry pit.

4.3 Additional Analysis of Recommended Force Main Alignment

To determine if the alignment selected in the Feasibility Study is reasonable, we studied the existing utilities in the area. The route east on Bell to William and south on William to Trumbull is very congested with buried utilities, but it will still be achievable. Extra care during construction will need to be taken to ensure none of the existing utilities are damaged. Most of the existing utilities are shallow, and going with a 54-inch force main will mean that it needs to go beneath all of the existing utilities. We estimate that the 54-inch would need to be approximately 12-feet deep to the bottom of the pipe.

Figure 2 shows where we believe the new pipe can be placed. This would need to be verified by conducting a subsurface utility engineering (SUE) investigation along the proposed alignment to both locate and designate the existing utilities. From this investigation, it will be determined where potholing needs to be performed to determine the depths of the utilities. On Bell, the new force main will need to be installed in the same trench where the existing force main is located. The existing force main to Broadway east of William will be abandoned in place. Along William, there is a corridor on the west side of the street, between the water line and the sanitary sewer line that appears to be wide enough to install the force main. See **Figure 6** for section cuts through William.

During construction, it will be necessary to temporarily remove the 10-inch sump pump force main, because it is within the available corridor. After the 54-inch pipe is installed, the 10-inch pipe can be replaced in the same alignment. It will still discharge into the manhole just north of the overpass.

The 54-inch force main will connect to the 72-inch gravity storm sewer at the intersection of Trumbull and William. There is currently no manhole in this location, but we propose tying into the 72-inch line by constructing a junction box. The invert elevation of the 72-inch pipe at this location is approximately 9-feet deep. The 54-inch line will match the invert. (See **Figures 8 and 9**.) This intersection is congested with utilities, and some utilities may need to be relocated.

The flow from the 54-inch force main will discharge into the existing 72-inch storm drain at the new junction box and flow by gravity down William. Flow from the existing 72-inch on Trumbull will add to the flow from the pump station at the junction box. The capacity of the 72-inch lines on Trumbull and William is not certain. The grid maps show that the 72-inch line on Trumbull west of Broadway has a slope of 0.0081 and that the slope is 0.001 on William near Trumbull. Further south of Trumbull on William, it lists the slope as "no record". The capacity of a 72-inch pipe running full at a 0.0081 slope is 380.5 cfs. The capacity of a 72-inch pipe running full at 0.001 slope is 133.7 cfs. This means that the pipe coming down Trumbull has adequate capacity. It appears, however, that the flow at the junction box will likely back up in the 72-inch on Trumbull. Storm Drainage Design Section (SDDS) personnel indicate that the flow in the 72-inch in Trumbull typically runs at ¼ full, so it should not present a problem if it does back up.

Even though the City does not have an updated in-depth analysis of the hydrology in the project area, according to SDDS personnel, several projects have been completed since the time of the 1990 South Broadway DMP that have improved drainage problems in the area and freed capacity in the 72-inch storm drain downstream of the pump station. Currently, only the area between Trumbull and Garfield, which is two blocks north of the pump station, will contribute flow to the 72-inch storm drain at the new junction box.

As far as the type of pipe to use, we propose using concrete cylinder pipe because, for 54-inch pipe, it costs much less than ductile iron pipe. We received quotes from suppliers of both types of pipe and found that 54-inch concrete cylinder pipe costs approximately $180 per linear foot overall, including the fittings that are needed for this project. Ductile iron pipe, on the other hand, costs approximately $225 per linear foot without considering the fittings. For the fittings, as an example, a 54-inch 45 or 90 degree bend costs $12,000, and a reducer fitting from a 54-inch to a 36-inch is $13,000. A wye needs to be specially made and would cost $84,000. Instead of using a wye, a tee could be used for $45,000. By using concrete cylinder pipe instead of ductile iron for this project, we estimate that there would be a savings of over $150,000.

Installation costs would be added to these pipe material costs, which would be around $200 additional per foot for both ductile iron and concrete cylinder pipe.

Ductile iron pipe is considered to be more durable than concrete cylinder pipe and could conceivably have a longer life. Ductile iron should be easier to maintain if there is a problem in the future. Even so, many miles of concrete cylinder pipe were used on the San Juan Chama project because of the cost savings realized over ductile iron pipe. Personnel in the City Storm Drainage Design Section indicated they preferred to use concrete cylinder pipe.

Another issue is that water will stand in the 54-inch force main once the pumps shut off. This is true also of water in the existing 36-inch force main, and no problems have been noted with regard to stagnant water, so this should not present a problem with the 54-inch as well. If so desired, the existing plug valves at the pumps could be programmed to open after the pumps shut off to drain the water back into the wet well.

4.4 Constructability Issues

There are several constructability issues that need to be considered during construction:

- Constructability of the 54-inch force main beneath the existing utilities will require the use of trench boxes since there is no room to lay back an excavated slope.
- Since William goes below the Guadalupe Overpass, which has a clear height of 15-feet, construction methods will need to be used to accommodate limited overhead access. In discussions with local contractors, this could be achieved by having the excavator enter the trench so that it has more overhead reach. The operator would use the excavator bucked to pull the trench box down into the trench and then reach up to lower the pipe in. Installing the pipe underneath the overpass would cost one-and-a-half to two times more than typical installation.
- During the installation of the force main and junction box, the roadways will likely need to be closed for portions of that time or have limited access. A traffic control plan will need to be implemented.

- The construction will need to be phased in order to keep the existing force main in operation for as long as possible. The contractor may need to construct the portion of the new force main along William Street first so that when the work on Bell is completed, it can immediately be put into service. There will be some time, however, when the pump station will not be able to operate. This is when the existing force main on Bell is being replaced with the new force main. This portion is approximately 200-feet long and the contractor will need to finish this portion within a short timeframe and coordinate it such that it occurs during a month when less rain is expected. In addition, the 10-inch sump force main will not be able to be used during its removal and replacement.
- The contractor may encounter groundwater during trenching operations and would need to dewater if this is the case. There is an 11-foot deep unnamed pond located north of the Pump Station where Commercial Street meets John Street. The top of pond elevation is at 4951, and the bottom elevation is at 4940. There is no evidence of groundwater in this pond. According to Storm Drainage Design Section personnel, at the Tingley Park/Pond located near 8th Street and Atlantic groundwater was found at elevation 4939. This pond is northwest of the Pump Station and is closer to the river. The elevation of William Street near Trumbull is at 4949, and the excavation for the pipe will be approximately at elevation 4936. So, while we think it is unlikely, there may be the possibility of encountering groundwater during construction of this force main.

5.0 RECOMMENDATIONS

5.1 Existing Site

- Perform SUE and potholing investigations to verify our preliminary utility findings.
- Test for the depth of groundwater in the vicinity of the project.

5.2 New Force Main

- Increase the existing 36-inch force main from the station to a 54-inch force main.
- Use concrete cylinder pipe for the new force main
- Remove the existing 36-inch force main in Bell Avenue west of William Street. Abandon the remaining portion from Williams Street to Broadway Boulevard.
- Change the alignment of the new force main to run from the station east to William, then south on William to Trumbull.
- Tie into the existing 72-inch gravity storm drain at Trumbull by constructing a new junction box.
- Provide a stub-out in the new 54-inch force main to accommodate future pump additions in the wet well if that proves to be feasible.

5.3 Future Pump Upgrades

- Continue evaluating pump replacement options once funding becomes available. Also evaluate valve and electrical upgrades.

6.0 OTHER CONSIDERATIONS

6.1 Design Criteria

Design of the force main will adhere to the City of Albuquerque's Development Process Manual (DPM), Volume II. City standard specifications and standard drawings will be referenced wherever they are applicable.

6.2 Outline of Specifications Content

In addition to using the Standard City of Albuquerque Boiler Plate and General Conditions, these are the technical sections from the City of Albuquerque Standard Specifications for Public Works Construction that we anticipate will be needed:

Spec. No.	Spec. Title
101	Portland Cement Concrete
102	Steel Reinforcement
103	Epoxy-Coated Steel Reinforcement
105	Concrete Curing Compound
107	Joint Filler and Sealant Material
112	Paving Asphalt
113	Emulsified Asphalts
114	Asphalt Paving Hot Recycling
116	Asphalt Concrete
128	Concrete Cylinder Pipe
129	Ductile Iron Pipe
207	Lean Fill Construction
301	Subgrade Preparation
302	Aggregate Base Course Construction
306	Bituminous Stabilized Base and Surfacing
307	Plant Mixed Bituminous Treated Base Construction
334	Seal Coats
336	Asphalt Concrete Pavement
340	Portland Cement Concrete Curbs, Gutters, Walks, Driveways, Alley Intersections, Slope Paving and Median Paving
343	Removal and Disposal of Existing Pavements, Curb and Gutter, Sidewalk, Drivepads, and Slope Pavement
349	Concrete Curing
401	Concrete Wall and Metal Barriers

Spec. No.	Spec. Title
410	Fences
440	Reflectorized Painted Pavement Markings
501	Excavation and Backfill for Structures
510	Concrete Structures
701	Trenching, Excavation and Backfill
801	Installation of Water Transmission, Collector and Distribution Lines
910	Storm Sewer Pipe Installations
915	Storm Sewer Drainage Appurtenances
1200	Barricading and Temporary Traffic Control
1502	Submittals

Additional Supplemental Technical Specifications to be provided by the City of Albuquerque or Molzen Corbin:

621	Mobilization/Demobilization
630	NPDES Compliance
01 11 00	Summary of Work and Scheduling Constraints
01 31 19.05	Project Meetings
01 32 13.05	Construction Schedules
01 45 16.14	Digital Video Recording
01 45 23.05	Testing Laboratory Services
01 71 23	Field Engineering

6.3 Preliminary List of Plan Sheets

Following are the sheets that we anticipate will be in the final design plans:

G37-001	Title Sheet & Index
G37-002	Traffic Control Plan
G37-003	Traffic Control Details
C37-100	Survey Control
C37-501	Pavement Removal and Replacement
W37-101	Existing Site Plan
W37-102	Proposed Alignment of New Force Main
W37-103	Force Main Plan & Profile Sht 1
W37-104	Force Main Plan & Profile Sht 2
W37-105	Force Main Plan & Profile Sht 3
W37-106	Existing Force Main Connection to Discharge Header Details
W37-107	Demolition Sheet
W37-108	New Force Main Connection to Discharge Header Details
W37-501	Storm Sewer Connection & Junction Box Details
W37-502	Miscellaneous Details of City of Albuquerque Standard Drawings for roadway asphalt placement, sidewalks, curb & gutter, and driveways

6.4 Real Estate Acquisition Needs

All construction will be within the City roadway right-of-way and therefore will not require any real estate acquisitions.

6.5 Special Materials and Labor

There are no special materials required for the construction of this force main. As previously mentioned, special construction methods will need to be used to construct the force main within a very tight corridor of utilities and limited overhead access at the overpass, so the chosen contractor must be familiar with this type of construction and have the proper equipment; i.e., trench boxes, cranes, etc. to construct this force main. This may require that the two apparent lowest bidders submit a Bidder's Qualification Statement to ensure that an experienced contractor and superintendent are selected for this project.

7.0 ESTIMATED PROJECT CONSTRUCTION COST

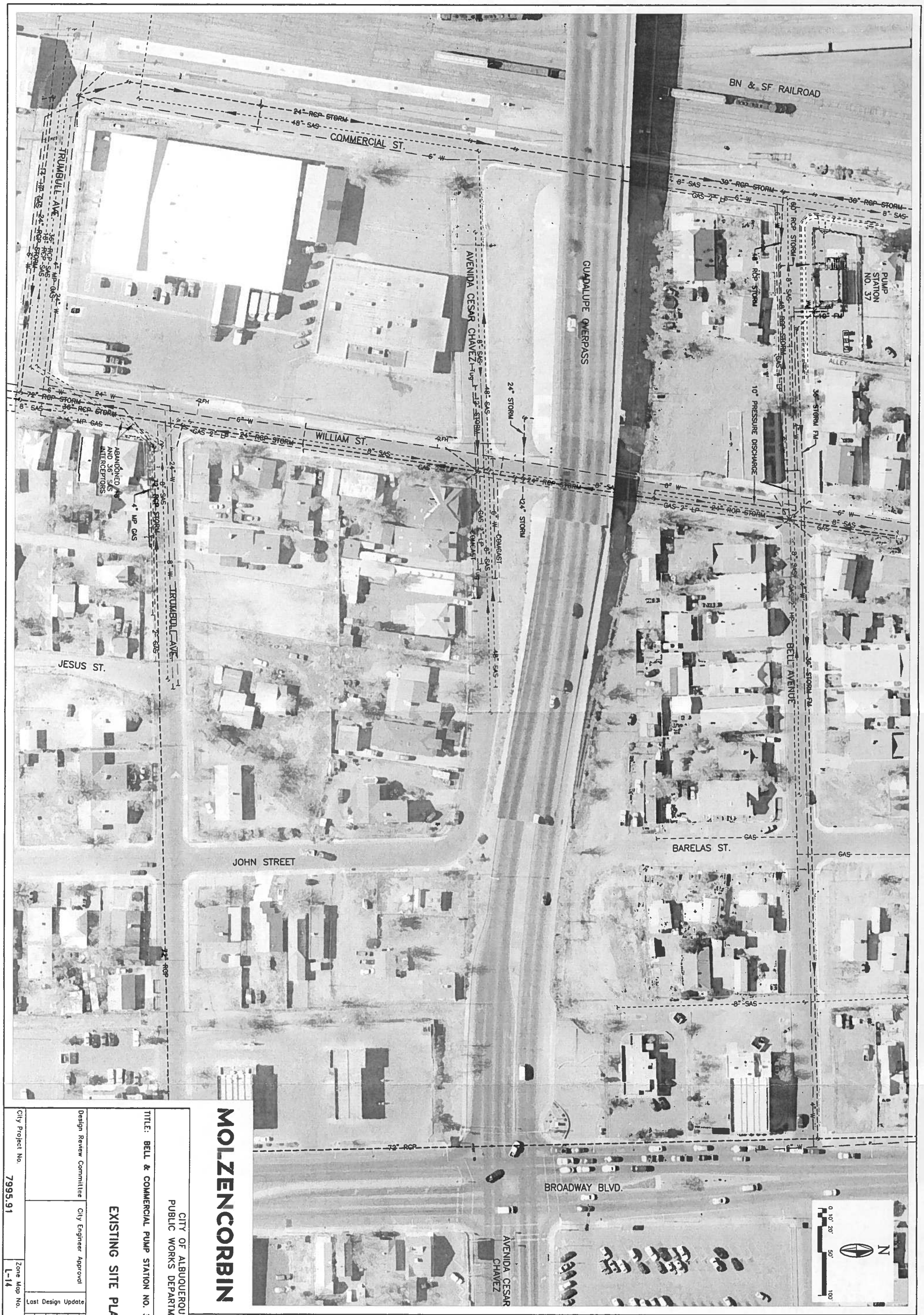
We have prepared an Engineer's Opinion of Probable Cost for the construction of this force main and junction box by using the latest City Engineer's Estimated Unit Prices for Contract Items 2009 (see **Figure 9**). We have added a 30% percent contingency factor to compensate for undefined elements at this time. Our estimate includes:

- Removal of the existing force main in Bell to William
- Removal and replacement of the 10-inch sump pump force main to facilitate the construction of the 54-inch force main
- Removal and replacement of a 10-foot wide section of asphalt
- Installation of a concrete cylinder pipe 54-inch force main
- Trenching and backfilling
- Removal and replacement of sidewalk, curb and gutter, and driveway
- Construction of the junction box at the 72-inch connection point
- Mobilization, demobilization, surveying, construction staking, traffic control, flood protection, and NPDES compliance

We understand that the City may prefer to repave an entire lane rather than just the width of the trenching, but for the purposes of this estimate, we have included only quantities for the width of the trenching. Also, we did not include costs for dewatering the site, but if groundwater is found in the area, we anticipate that the cost to dewater could be around $100,000. As far as the pipe material is concerned, if the City prefers to use ductile iron pipe, we estimate that it would cost an additional $150,000.

The total estimated cost of replacing the force main is $1,006,000.

FIGURES



MOLZENCORBIN

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT

TITLE: BELL & COMMERCIAL PUMP STATION NO. 37 FORCEMAIN

EXISTING SITE PLAN

NO.	DATE	REMARKS	BY

REVISIONS

DESIGN

DESIGNED BY	M.S	DATE	11/10
DRAWN BY	A.L.	DATE	11/10
CHECKED BY	K.M.	DATE	11/10

ENGINEER'S SEAL

SURVEY INFORMATION

FIELD NOTES

NO.	BY	DATE

BENCH MARKS

AS BUILT INFORMATION

CONTRACTOR
WORK STAKED BY DATE
INSPECTOR'S ACCEPTANCE BY DATE
FIELD VERIFICATION BY DATE
DRAWINGS CORRECTED BY DATE

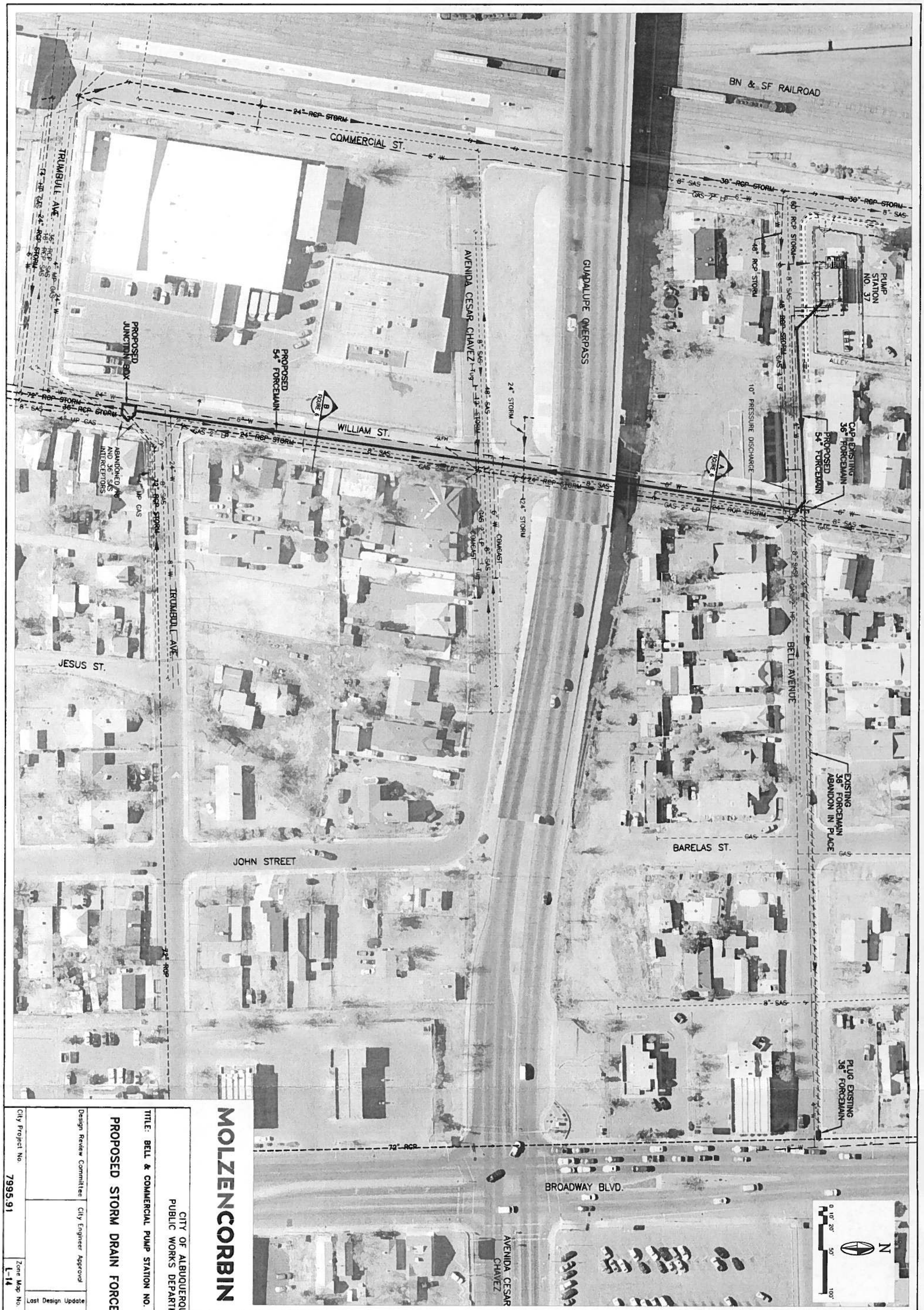
MICRO-FILM INFORMATION

RECORDED BY DATE
NO.

Design Review Committee
City Engineer Approval
Last Design Update
Mo/Day/Yr
Mo/Day/Yr

City Project No. 7995.91
Zone Map No. L-14
Sheet FIGURE 1 Of

FIGURE-II 1/19/11 1:1



MOLZENCORBIN

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT

TITLE: BELL & COMMERCIAL PUMP STATION NO. 37 FORCEMAIN

PROPOSED STORM DRAIN FORCEMAIN ALIGNMENT

City Project No. 7995.91	Zone Map No. L-14	Sheet FIGURE 2	Of

Design Review Committee

City Engineer Approval

Last Design Update

Mo./Day/Yr.

Mo./Day/Yr.

NO.	DATE	REMARKS	BY
		REVISIONS	
		DESIGN	
		DESIGNED BY M.S DATE 11/10	
		DRAWN BY A.L. DATE 11/10	
		CHECKED BY K.M. DATE 11/10	

ENGINEER'S SEAL

SURVEY INFORMATION

FIELD NOTES

NO.	BY	DATE

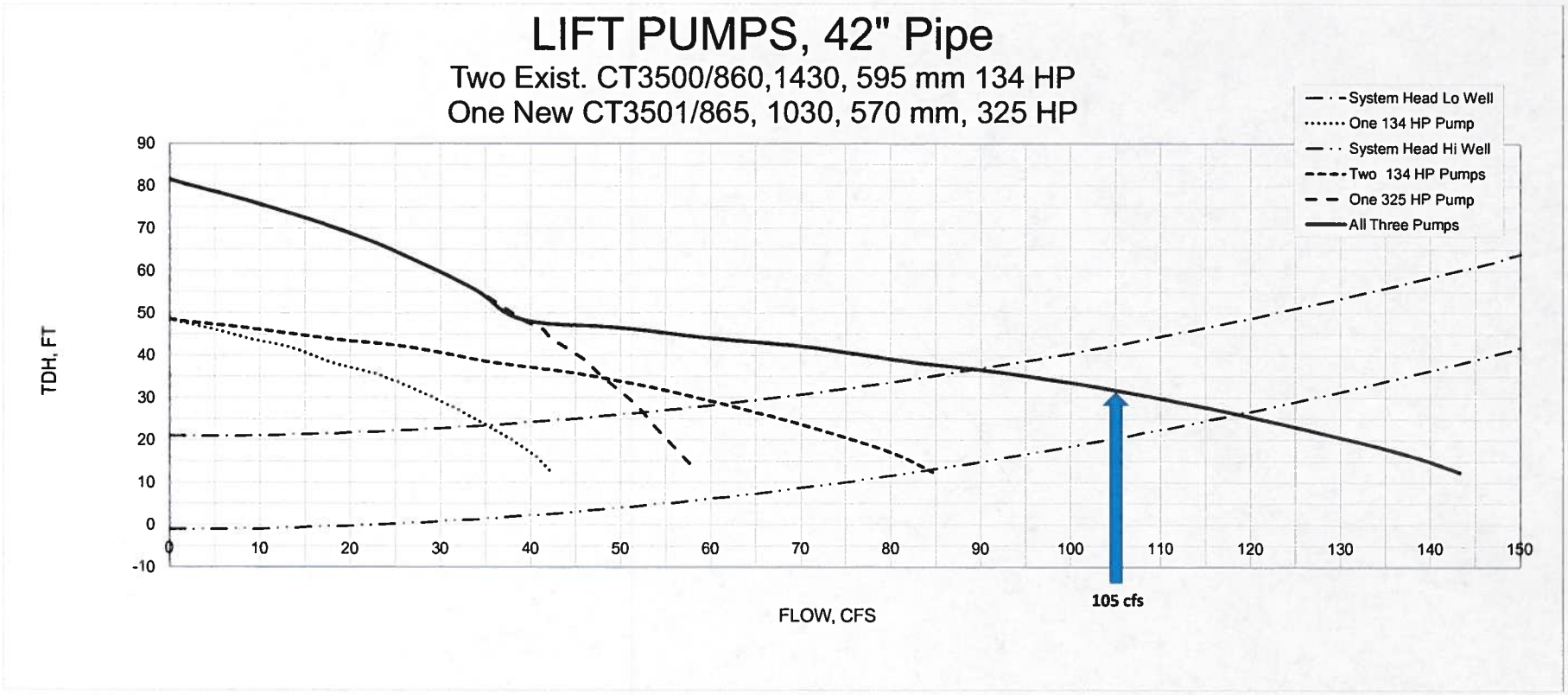
BENCH MARKS

AS BUILT INFORMATION

CONTRACTOR
WORK STAKED BY DATE
INSPECTOR'S ACCEPTANCE BY DATE
FIELD VERIFICATION BY DATE
DRAWINGS CORRECTED BY DATE

MICRO-FILM INFORMATION

RECORDED BY DATE
NO.



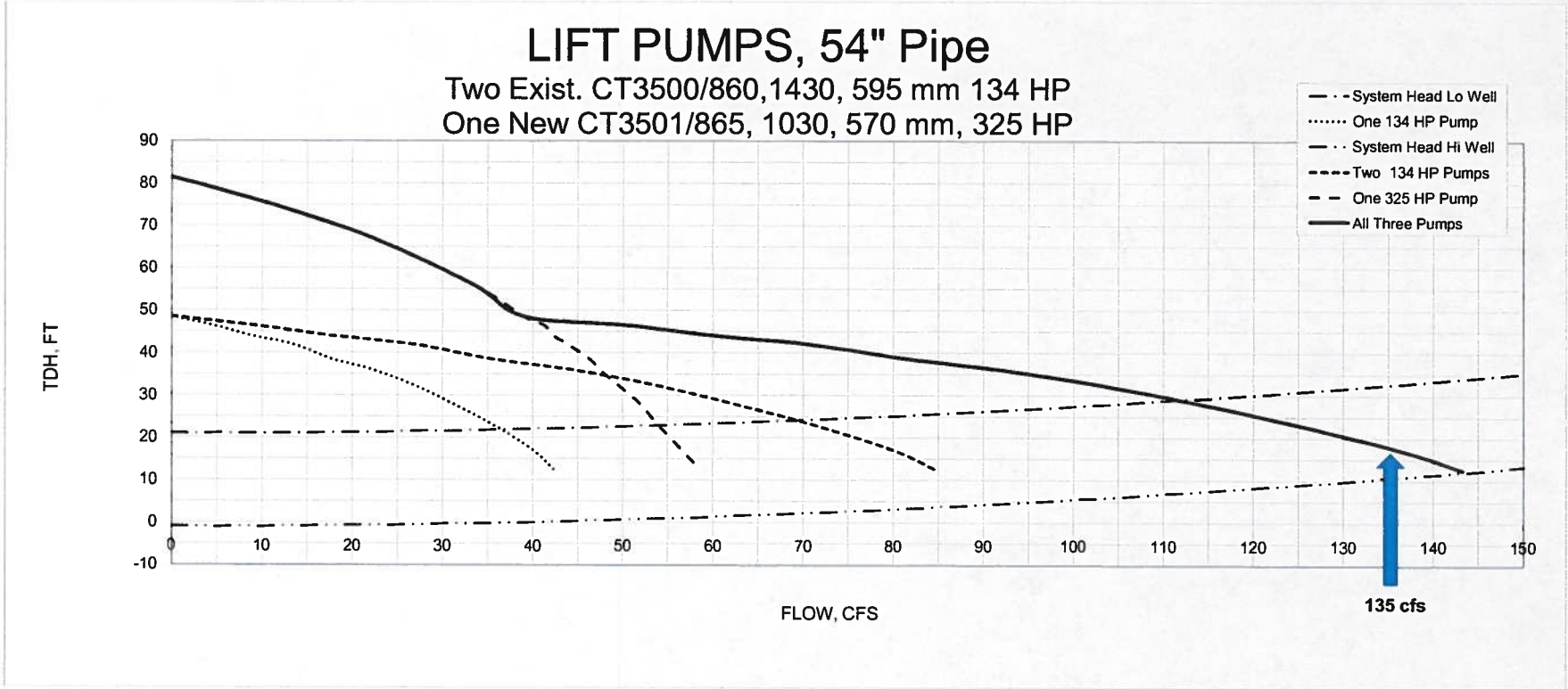
At the mid-range wet well level, the two existing Flygt pumps and one new Flygt pump will be able to deliver 105 cf with a 42-inch force main. The new pump is very large, however, and is not a viable solution.

MOLZENCORBIN

Bell and Commercial Pump Station No. 37 Force Main

Two Existing Pumps and One New Pump - 42" Force Main

Figure 3



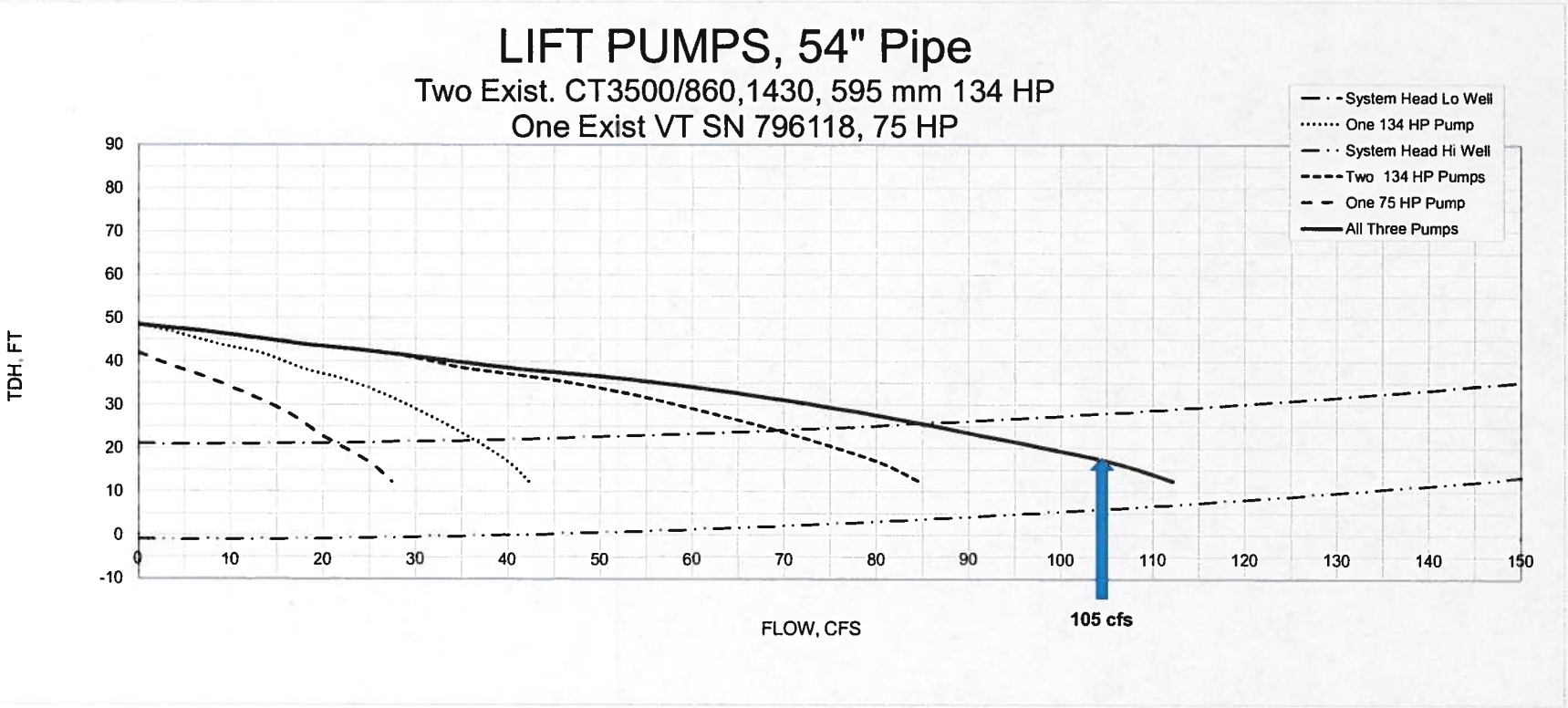
At the mid-range wet well level, the two existing Flygt pumps and one new Flygt pump will be able to deliver 135 cfs with a 54-inch force main. The new pump is very large, however, and is not a viable solution.

MOLZENCORBIN

Bell and Commercial Pump Station No. 37 Force Main

Two Existing Pumps and One New Pump - 54" Force Main

Figure 4



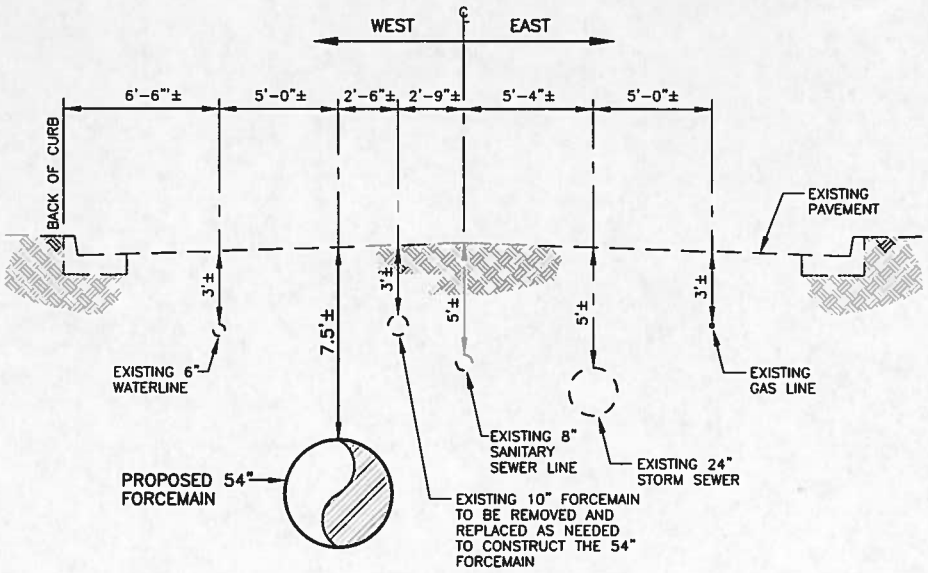
At the mid-range wet well level, all three existing pumps will be able to deliver 105 cfs with a 54-inch force main.

MOLZENCORBIN

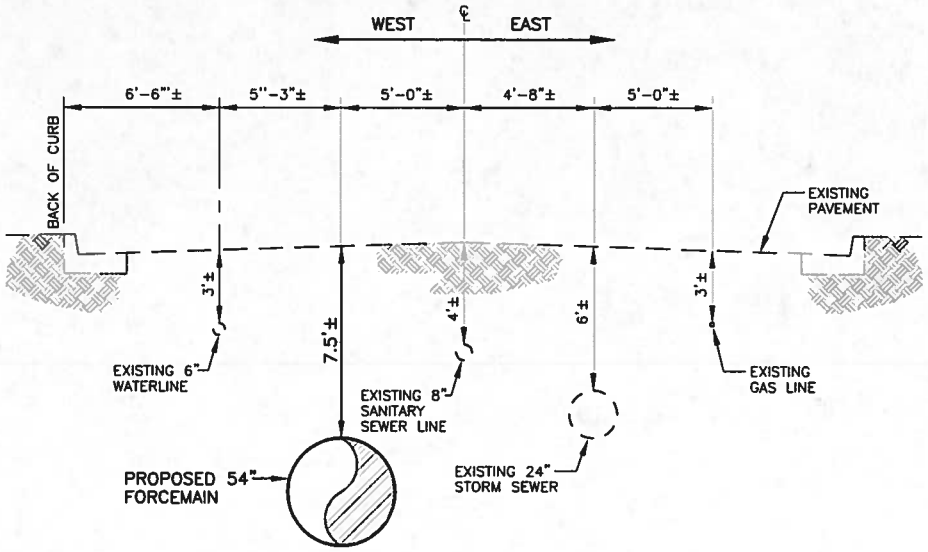
Bell and Commercial Pump Station No. 37 Force Main

Three Existing Pumps - 54" Force Main

Figure 5



A SECTION–WILLIAM STREET
FIGURE 2 1/8"=1'



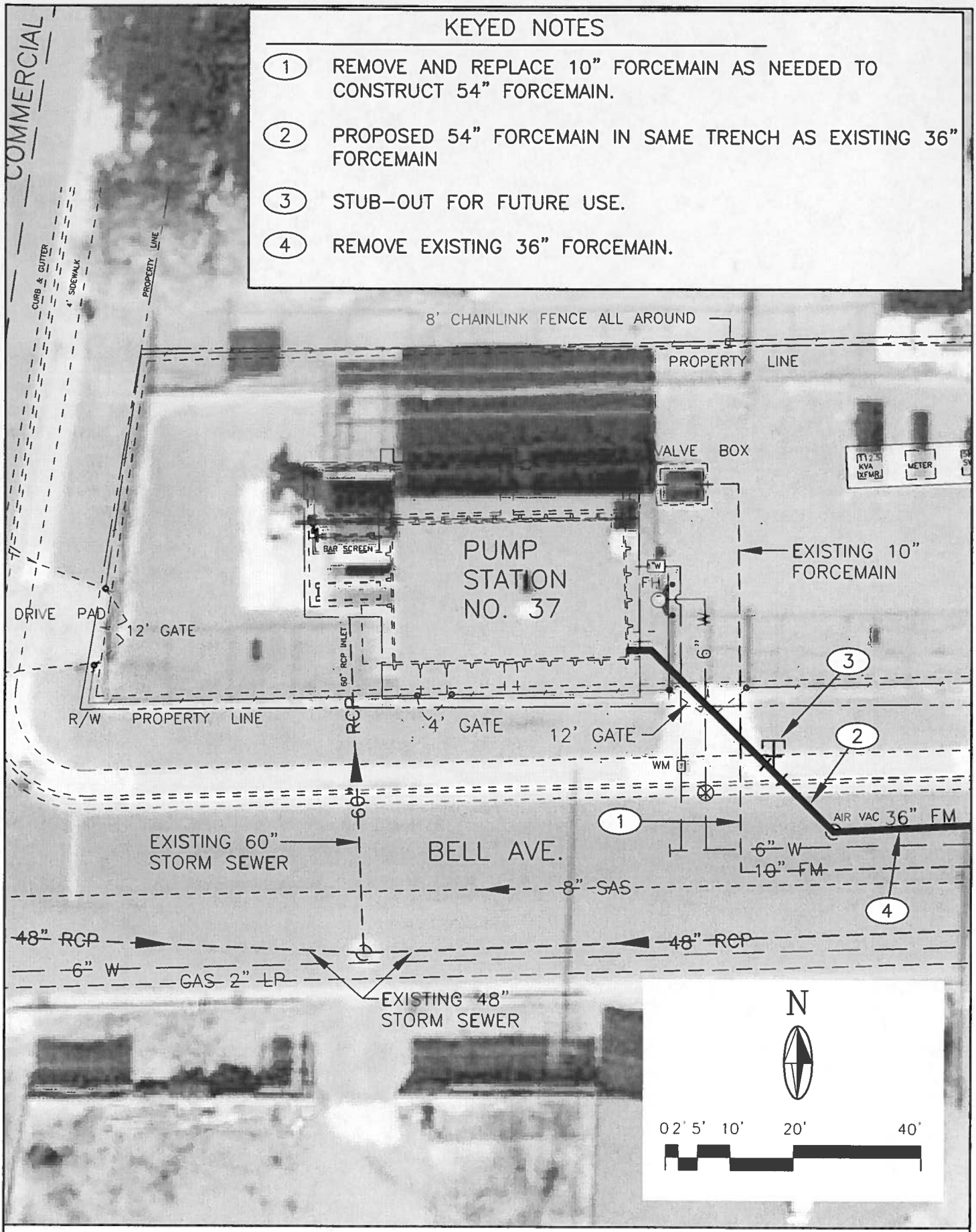
B SECTION–WILLIAM STREET
FIGURE 2 1/8"=1'

Bell and Commercial Pump Station No. 37 Forcemain

MOLZENCORBIN

Section Cuts on William Street

Figure 6

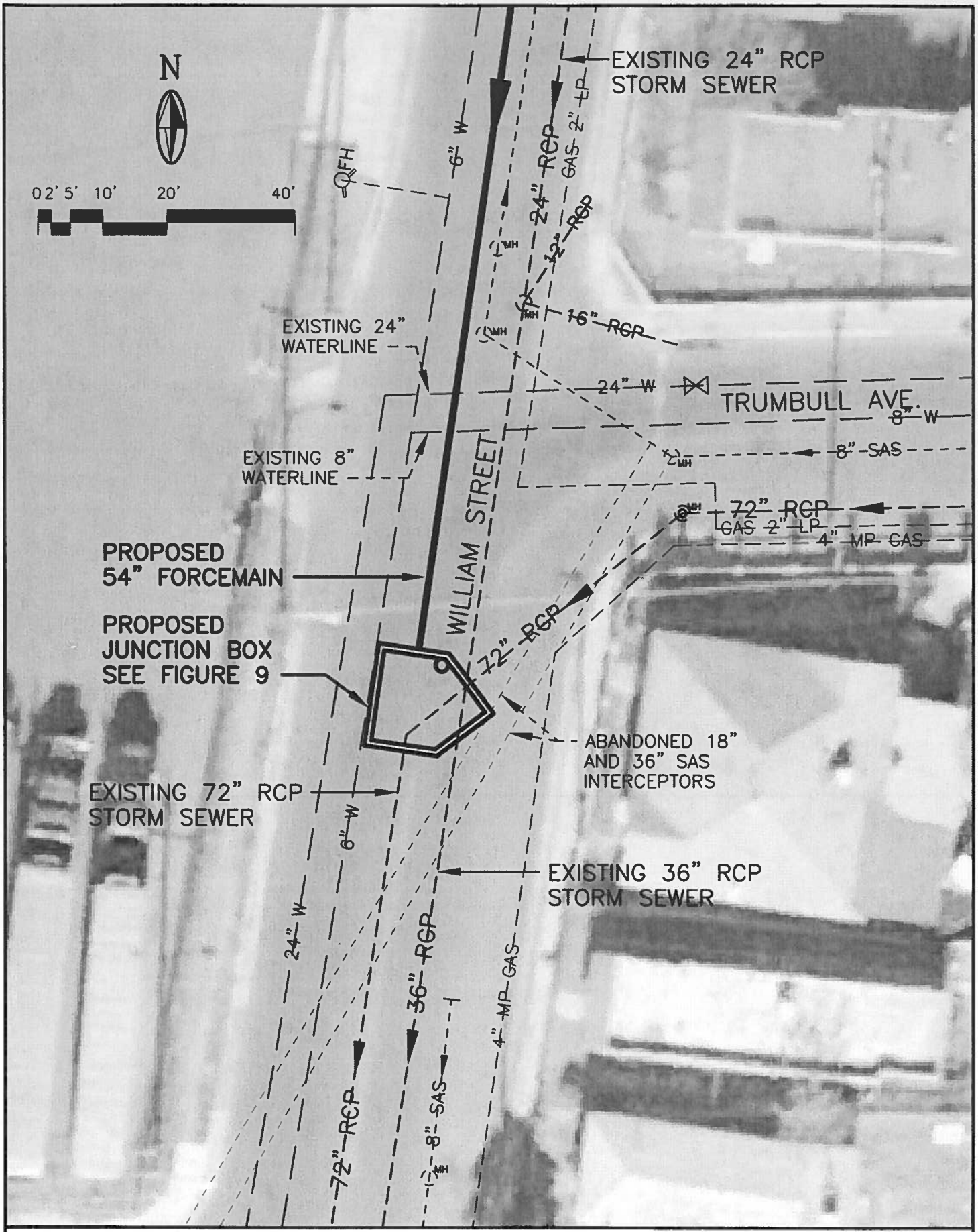


Bell and Commercial Pump Station No. 37 Forcemain

MOLZENCORBIN

Proposed Tie-in at Pump Station

Figure 7

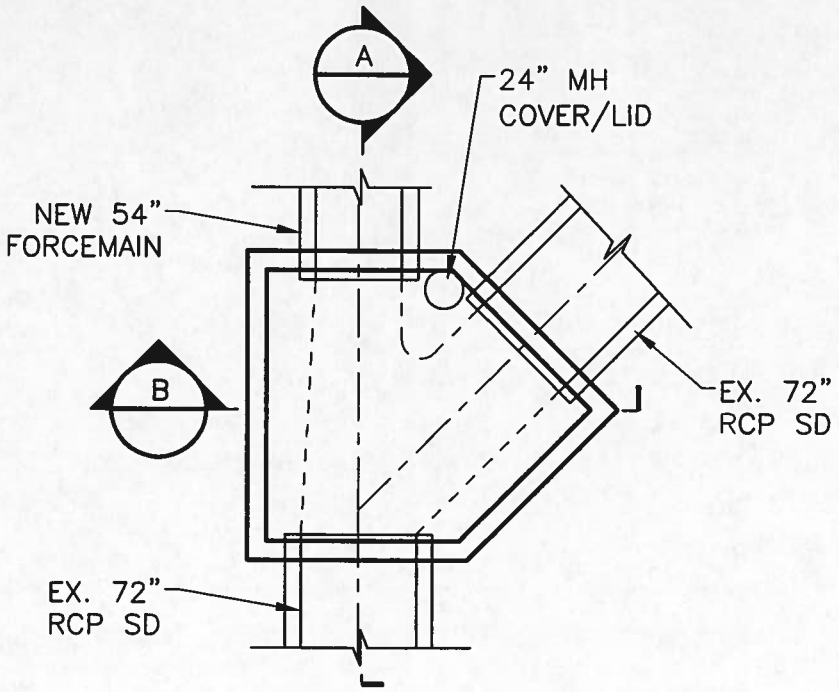


Bell and Commercial Pump Station No. 37 Forcemain

MOLZENCORBIN

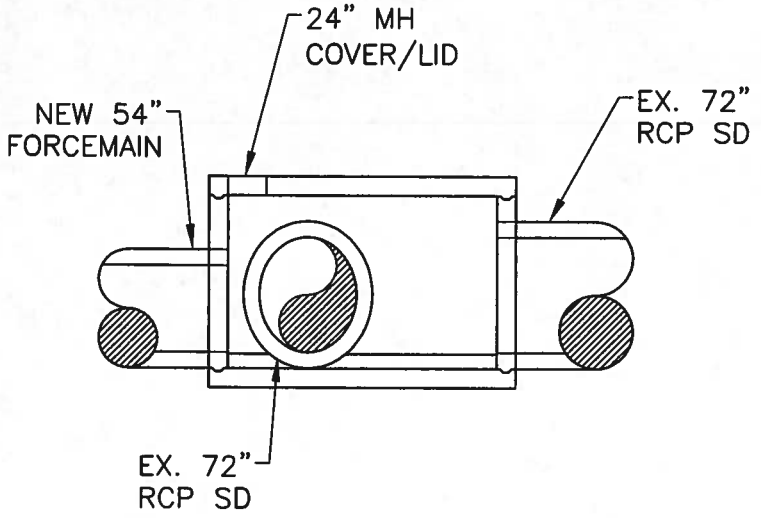
Proposed Tie-in to 72" Line

Figure 8

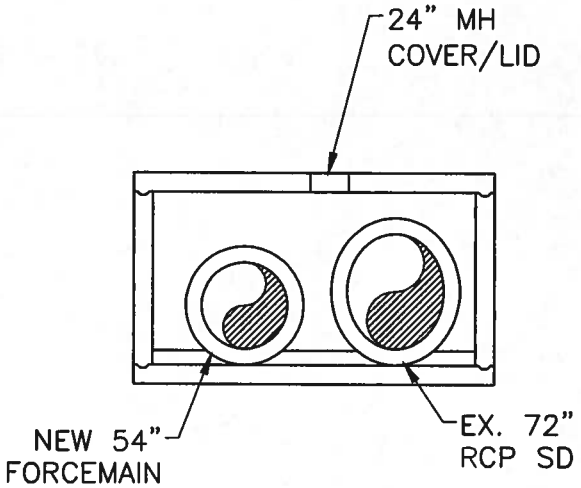


PLAN

JUNCTION BOX
SCALE: 1"=10'



A SECTION
SCALE: 1"=10'



B SECTION
SCALE: 1"=10'

Bell and Commercial Pump Station No. 37 Forcemain

MOLZENCORBIN

Junction Box Plan and Section

Figure 9

Bell & Commercial Pump Station No. 37 Force Main, City Project 7955.91

Bid Item Number	Spec. Item Number	Description	Unit	Estimated Quantity	Estimated Unit Price	Estimated Amount
1	6.010	Construction Project Sign, per Contract Special Provisions, cip.	EA	2	$700.00	$1,400.00
2	207.01	Lean Fill, cip	CY	250	$120.00	$30,000.00
3	301.020	Subgrade Prep. 12" at 95% compaction, cip.	SY	1300	$2.00	$2,600.00
4	302.010	Aggregate Base Course, crushed 6" at 95% compaction, cip. SD 2408	SY	1300	$9.00	$11,700.00
5	336.010	Prime Coat, emulsified asphalt, cip.	SY	1300	$0.50	$650.00
6	336.024	Asphalt Concrete Pavement, 3 inch thick, superpave	SY	2600	$15.00	$39,000.00
7	336.120	Tack Coat, cationic emulsified asphalt, cip.	SY	1300	$0.40	$520.00
8	340.010	Sidewalk, 4" thick, Portland Cement Concrete, incl. subrade compaction, cip. SD 2430	SY	40	$40.00	$1,600.00
9	340.020	Drivepad, 6" thick, Portland Cement Concrete, incl. subgrade compaction, cip. SD 2425	SY	70	$55.00	$3,850.00
10	340.050	Curb & Gutter, Standard, Portland Cement Concrete, incl. subgrade preparation, cip. SD 2415	LF	150	$20.00	$3,000.00
11	343,03	Existing Pavement, Asphalt Concrete, remove and dispose, more than 4" thick, sawcut, remove & dispose, compl.	SY	1300	$10.00	$13,000.00
12	343.080	Existing Curb & Gutter or Valley Gutter, PC Concrete, remove & dispose, compl.	LF	150	$7.00	$1,050.00
13	343.085	Existing Sidewalk, 4" PC Concrete, remove & disopose, compl.	SY	70	$10.00	$700.00
14	501.01	Excavation, Backfill, and Compaction, related to construction of structures such as box culverts, wing walls, etc. cip.	CY	625	$15.00	$9,375.00
15	510.110	Structural Reinforced PC Concrete, 4,000 psi, incl. formwork, cip.	CY	40	$650.00	$26,000.00
16	701.17	Trenching, Backfilling, & Compaction, 42" to 60" sewer pipe, over 8' to 12' in depth, pipe not incl., compl.	LF	1030	$45.00	$46,350.00
17	701.32	Backfill Material, Select, incl. compaction, cip.	CY	3800	$12.00	$45,600.00
18	910.XXX	54" Concrete Cylinder Pipe, incl. fittings, furnish and place in open trench, cip.	LF	1030	$380.00	$391,400.00
						$627,795.00
19	4.010	Construction Staking including staking of project, quantity verification, and as-built information, compl.	%	2% of Subtotal Base Bid	$12,555.90	$12,555.90
20	4.02	Construction Surveying, compl.	%	1.5% of Subtotal Base Bid	$9,416.93	$9,416.93
21	6.050	Construction Mobilization, compl.	%	5% of Subtotal Base Bid	$31,389.75	$31,389.75
22	6.060	Construction Demobilization, compl.	%	0.5% of Subtotal Base Bid	$3,138.98	$3,138.98
23	19.010	Construction Traffic Control & Barricading, compl.	%	2% of Subtotal Base Bid	$12,555.90	$12,555.90
24	30.010	Flood Protection, compl.	%	0.5% of Subtotal Base Bid	$3,138.98	$3,138.98
25	30.020	NPDES Permitting, compl.	%	0.6% of Subtotal Base Bid	$3,766.77	$3,766.77
					TOTAL BASE BID:	$703,758.20
					CONTINGENCIES @ 30%:	$211,127.46
					ALLOWANCES:	
					Utility Relocation Allowance	$10,000.00
					Geotechnical Materials Testing	$15,000.00
					TOTAL ALLOWANCES:	$25,000.00
					BASE BID + CONTINGENCIES + ALLOWANCES:	$939,885.65
					NEW MEXICO GROSS RECEIPTS TAX (NMGRT) @ 7.000%:	$65,792.00
					ESTIMATED PROJECT TOTAL:	**$1,005,677.65**
					ROUNDED ESTIMATED PROJECT TOTAL:	**$1,006,000.00**

APPENDIX A

Email from City
directing use of hydrologic results from
Smith Engineering Feasibility Study dated Feb. 3, 2010

Michelle Salas

From: Eisenberg, Jame J. [jeisenberg@cabq.gov]
Sent: Monday, January 03, 2011 4:28 PM
To: Michelle Salas
Cc: Curtin, John P.; Penttila, Roland V.
Subject: Hydrology for Project 7955.91. Bell/Commercial Pump Station No. 37 Force Main

Good afternoon Michelle

Regarding our recent discussions concerning hydrology:

The City of Albuquerque does not have an updated study of mid-valley hydrology that would provide comprehensive flow data for our project area. As discussed, several projects have been constructed since the time of Bohannan-Huston's 1990 South Broadway DMP that have improved downstream drainage and freed capacity in the 72" storm drain downstream of PS 37. Most notable are the South Broadway, Kathryn, and Mechem Detention Basins.

The City's intent for this project, Bell/Commercial Pump Station No. 37 Force Main, was that the force main design use the hydrologic information developed by Smith Engineering in their February 3, 2010 feasibility report entitled "Bell/Commercial Pump Station Modifications, 100% Submittal". The project scope does not include a re-analysis of hydrology between the Bell/Commercial Pump Station and the San Jose Drain. The Smith report estimated that 135 cfs would reach PS 37, 110 cfs from Basin SJ-2 and 25 cfs from the Santa Fe [South Broadway] Detention Basin.

Please contact me if you have further questions about the intended project scope. Thank you

Jame Eisenberg, PE
City of Albuquerque
Department of Municipal Development
Engineering Division
Ph: 768-2654 Fax: 768-2765
jeisenberg@cabq.gov

APPENDIX B

Meeting Minutes
From
Draft DAR Review Meeting

MOLZENCORBIN
ENGINEERS | ARCHITECTS | PLANNERS
2701 Miles Road SE, Albuquerque, NM 87106 505 242 5700 Tel 505 242 0673 Fax MolzenCorbin.com

MEETING MINUTES

City of Albuquerque
Bell/Commercial Storm Water
Pump Station No. 37 Force Main

Date and Time: Wednesday, December 8, 2010 at 3:30 p.m.

In Attendance: Melissa Lazoya, P.E., City of Albuquerque
Roland Penttila, P.E., City of Albuquerque
John Curtin, P.E., City of Albuquerque
Jame Eisenberg, P.E., City of Albuquerque
Michelle Salas, P.E., Molzen Corbin

Purpose of Meeting: To discuss the review comments that the City had on the draft Design Analysis Report (DAR) that was submitted on Wednesday, November 24, 2010.

Discussion Items:

1. To size the force main, Molzen Corbin was instructed to use the results from the hydrologic analysis conducted by Smith and presented in their feasibility study, dated February 3, 2010. The desired capacity to be pumped from the pump station was given as 135 cfs. Molzen Corbin used 135 cfs to size the force main and recommended that a 54-inch pipe be used.

   At the meeting, it was discussed that Smith's analysis was not in-depth and may not be accurate. The actual flow could be higher or lower. Due to this uncertainty, Michelle indicated that it may be appropriate to increase the pipe size. The City would like Molzen Corbin to continue with the assumption that 135 cfs is correct, and thus stay with the recommendation of a 54-inch force main. Further in-depth hydrologic analysis is desired, but is not feasible at this time. However, it is important to move forward with force main improvements.

2. Add a statement in the Executive Summary comparing the estimated station capacity with the new force main to the desired design flow with the future pump station improvements.

3. Concern: There may be the possibility of water backing up into the 72" on Trumbull east of William. John stated that this pipe is typically flowing at one-quarter full and that if the water backs up, it should not be a problem.

4. In the draft DAR, it was stated that the 48-inch sanitary sewer line on Avenida Cesar Chavez is thought to be a storm line, based on field studies that Molzen Corbin conducted. This may not be true. The City will investigate to see what kind of line this is and if it is abandoned. If this line is abandoned and can be removed, then the new force main may not need to be 12.5-feet deep.

5. Concern: Water will remain in the new force main once the pumps drain the wet well. This is currently true of the existing force main that ties into the gravity line on Broadway. If the new force main needs to be constructed at 12.5-feet deep, then water will remain for the entire length. If the force main can be constructed at less than 9-feet, which is the depth of the 72-inch gravity line on William and Trumbull, then most of the water will drain. This is dependent upon the 48-inch line in Avenida Cesar Chavez.

6. Concern: The 10-inch force main from the sump pumps is believed to tie into a manhole on William, which is in the corridor where the new 54-inch force main will be placed. Molzen Corbin could not locate that manhole and assumed it was covered over with asphalt. The City will investigate and see if they can find the manhole. (NOTE: The City located this manhole and uncovered it on 12-14-10 so the DAR can be revised accordingly). The draft DAR recommended that this 10-inch line tie into the new 54-inch force main so that there is room to build the force main on William. This may present a problem for the sump pumps if they have to pump against a long pipeline of water. Molzen Corbin will investigate this.

7. Concurrence: The City agreed with the draft DAR that concrete cylinder pipe should be used for the force main instead of ductile iron pipe.

8. Concern: Will the cost to install the new force main be higher at the Overpass? Molzen Corbin will investigate this.

9. The "Hydrology Division" should be referred to as the "Storm Drainage Design Section".

10. Use "Guadalupe Overpass" when referring to the bridge.

11. Footnotes should be added to indicate where information was obtained. Where appropriate, the City Project Numbers should be included in the narratives describing previous work.

12. City project numbers should be added to the plans listed as reference drawings.

13. Question: Where do the two small sump pumps discharge that are in the dry pit? They discharge into the wet well.

14. Question: How was the junction box modeled? As a pressure manhole or with free discharge of the force main? It was assumed to be a free discharge. Molzen Corbin will investigate this.

15. Molzen Corbin has submitted a fee proposal for Subsurface Utility Engineering (SUE). The City has in the past contracted out for this work, but would prefer that it be handled by Molzen Corbin this time so that it is not the City's responsibility. The City is reviewing this fee.

16. The City cannot specify a pump manufacturer, so our report should indicate an "or equivalent" option.

17. There is an existing 36-inch storm drain that has an inverted siphon. At first it was thought that this siphon was to take it under the 72-inch storm drain and that perhaps the 36-inch could be joined to the junction box constructed for the force main. From as-builts, this siphon is actually 400-feet long and appears to go under the 72-inch and a high pressured gas line. So, it is recommended to not modify this siphon.

18. Question: What utilities were contacted and which have submitted responses? As indicated in the draft DAR, the following utilities were contacted: New Mexico Gas Company, PNM, QWEST, TW Telecom of NM, and Comcast. QWEST (local) responded and there are no conflicts. (NOTE: After the meeting, I contacted QWEST (long distance) and they indicated there are no conflicts.) No other utilities have responded.

19. Add a cross section view of the proposed junction box at Trumbull.