CITY OF WASHINGTON, ILLINOIS
Public Works Committee Agenda Communication

Meeting Date: 02-03-2020

Prepared By: Kevin Schone – Public Works Director

Agenda Item: Water Treatment Plant #1 Levee - Flood Response Option

Explanation: CMT had prepared a flood protection investigation report in 2018 that outlined several options to provide flood protection at WTP#1. The City elected to proceed with the 100-year protection with 1–foot free board for a construction cost at that time of $120,000. This would not have included engineering, permitting or legal fees.

During surveying it was discovered that the doors and windows are very close to or above the 100-year flood elevation. This elevation was discovered by Christopher B. Burke Engineering's study of Farm Creek. Because of this information other options were considered.

The original report did not consider a flood response such as sand bags because of the response time needed to do so, however there is a small level of protection that is needed to provide protection at the doors and windows. Because of this, the City should consider a flood response option. The flood response option would have a flood sensor at Well #7 to alert plant personnel when a flood was imminent. Plant personnel would be dispatched to the site to install flood panels. The flood panels would be installed at the two entrance doors, garage door and possibly the west windows during the flood event and removed afterwards and stored inside.

There are benefits to this option such as a permit with the IDNR would not be needed, an internal drainage system would not need to be maintained during non-rain events, and there would not be any impact to operations or deliveries. Additional documentation attached.

Fiscal Impact: Estimated cost for the Flood Protection Plan would be approximately $100,000 and includes improvements to Well #7.

Recommendation/
Committee Discussion Summary: There are still unknown risk with the flood response option that needs to be considered, however we should also consider that this type of flooding has not occurred since the plant was built in 1959. Below are some concerns that should be discussed.

1. Can the west wall withstand the hydraulic pressure?
2. Can the floor drains keep up with the seepage?
3. Will the flood water back up through the sanitary sewer which is below the 100-year flood elevation?
4. Will the alarm at well #7 allow adequate time to respond?

Action Requested: Direction on whether to proceed with the flood response option or with the original plan for the limited levee around WTP#1.

CMT

MEMORANDUM

TO: Kevin Schone, City of Washington

FROM: Scott DeSplinter, Crawford, Murphy & Tilly, Inc.

DATE: January 2019

SUBJECT: Water Treatment Plant No. 1 Levee – Flood Response Option

Crawford, Murphy, & Tilly, Inc. (CMT) prepared a Water Treatment Plant No. 1 (WTP #1) Flood Protection Investigation Planning Report dated September 2018. The report outlined several options to provide flood protection for the WTP #1. The City elected to proceed with a limited levee around WTP #1 to provide 100-year protection with 1-foot free board for a budgetary construction cost of $128,000.

During the field surveys for the limited levee project, CMT discovered that the doors and windows are very close to or above the 100-year flood elevation (729.67) that was established by Christopher B. Burke Engineering LTD's study of Farm Creek. Below is a summary of the building elevations:

Description	Elevation (feet)	Height above 100-yr Flood (feet)
Windowsill along the west face of the building.	730.40	+0.73
Front Entrance Door	729.35	-0.32
Center of Garage Door	729.35	-0.32
Rear Entrance Door	729.35	-0.32

The original planning report did not consider a flood response (such as sandbags) as an option of providing flood protection because of the limited response time that would be available for the flash flood event on Farm Creek. However, considering the relatively small level of protection that would need to be assembled to provide 4 inches of additional protection at the entrance doors, we would recommend the City consider flood response as an option while making the final risk based decision on flood protection for WTP #1.

The flood response plan for protection of WTP No. 1 would include the following items:

- A flood sensor at Well #7 to alert staff when a flood event is beginning. The flood sensor would be connected to the existing alarm system. If alerted, the staff would be dispatched to the site to install the flood protection system.
- Installation of flood panel on the 2 entrance doors and garage doors. The panels are removed during normal operations and would be stored in the water plant near the doors.

- Optional – Installation of flood panels over the windows on the west side of the building to provide additional protection.

Photo of a flood panel from floodpanel.com

A budgetary cost to install the above system would be approximately $60,000.

There are still unknowns/risks associated with the flood response option that should be considered when reviewing these options. A summary of the unknowns/risks are:

- The existing brick/block wall can withstand the 3.5 feet of hydraulic pressure of flood water against the west side of the building.
- The seepage through the existing walls and foundations will not exceed the capacity of the floor drains or portable trash pumps at the water plant.
- The flood waters will not back up through the existing sanitary sewer system that is below the 100-year flood elevation.
- The alarm system will alert staff with adequate time to install the flood protection devices.

Additional investigations and improvements could be added to the flood response option to limit some of the unknowns/risks noted above but would increase the overall project costs.

There are some additional benefits to the flood response plan besides the cost savings. These benefits are:

- No permitting by IDNR is required
- No internal drainage system to maintain during non-rainfall events
- No impacts to daily operations and deliveries.

If the City chooses to proceed with the Flood Response Option, we would recommend working with National Flood Protection LLC to develop the most effective combination and installation of the Flood Panel products to provide 100-year level protection for the WTP #1.

The City should carefully review the potential impacts of flooding prior to determining how to proceed with flood protection for WTP #1. If the City elects to proceed with the flood response option, they should do so with complete understanding of the unknowns and risks that have been noted above. The final decision on the level of protection to provide for WTP #1 is a risk-based decision based on the City ability to accept the loss of service and financial impacts of the repairs. Only the City can fully weigh the risks and determine how to proceed with flood protection for WTP #1.

City of Washington
Est. 1825

WATER TREATMENT No. 1

Flood Protection Investigation

Planning Report

CMT
Crawford, Murphy & Tilly

FINAL REPORT

September 2018

1.0 Introduction and Background

1.1 Purpose & Impacts of Flooding

Crawford, Murphy & Tilly, Inc. was retained by the City of Washington to investigate flood protection for Water Treatment Plant No. 1 (WTP #1) from Farm Creek. The purpose of the study is to evaluate flood protection options the for water treatment plant.

Determining the level of flood protection is a risk-based decision. With this in mind, the report provides differing levels of flood protection for the City to review and determine which level best fits their tolerance for the flooding risks.

The primary impacts of flooding WTP #1 are included below:

- Loss of potable water production from WTP #1
- Damage to electrical gear within WTP #1
- Loss of records/reports stored at WTP #1

It is anticipated that WTP #1 would remain out-of-service for a minimum of 2 months (depending on the extent of the electrical gear damage), possibly longer. Under 2016 average daily demands, Water Treatment Plant #2 (WTP #2) can support the City's water needs, but water restrictions to limit any peak flow demands may be necessary.

The relatively small Farm Creek watershed allows the flood peak to occur quickly after a rainfall event. This allows for very limited to no response time to set up any flood protection methods. Thus, response-time based methods (such as sand bags) were not considered as a part of this report. The report focused on permanent structural methods to limit flood impacts within the area of WTP #1.

1.2 Previous Reports

Christopher B. Burke Engineering LTD. (CBBEL) completed a study of Farm Creek east of the pedestrian path structure which is located northeast of Jefferson Street. The study was used to develop a FEMA Letter of Map Revision Concurrence. This report was used to determine the limits and depths of potential flooding on the WTP #1 site.

A Report of Soil Exploration was completed by Ramsey Geotechnical Engineering on March 15, 2017. This report was used to review the soil conditions within the area around WTP #1.

1.3 Regulatory Agencies and Requirements

Illinois Department of Natural Resources (IDNR) are responsible for permitting construction in floodways of rivers, lakes and streams. IDNR has issued draft updates to Part 3700 of the Illinois Administrative Code. The draft updates were used when evaluating the permitting requirements. A summary of the primary permit requirements that will impact a proposed improvement within a regulated floodplain is included below:

- A floodway determination would need to be completed. This is required to ensure that any proposed improvements are located outside of the floodway. A floodway determination was not included in the CBBEL report.
- Flood storage would need to be reviewed to ensure at least 90% of the existing floodplain storage volume is preserved (compensatory storage)
- Velocities would need to be determined to verify that any increases are limited to 10% to avoid increased erosion and sedimentation potential.

Federal Emergency Management Agency (FEMA) is responsible for maintaining the floodplain/floodway mapping and administering the flood insurance program. FEMA approval of the proposed improvements would be required to remove a portion of the property from the mapped floodplain.

US Army Corp of Engineers (USACE) are responsible for permitting/regulating improvements within the waters of the US. USACE permitting is not anticipated, since the potential improvements are not anticipated to occur within the natural water level of Farm Creek or a wetland.

City of Washington Zoning Code (Special Flood Hazard Area Regulations) regulate development within a flood hazard area. The primary function of the code is to prevent development/improvements from increasing flood heights and ensuring that the proper permits are received from IDNR.

2.0 Discussion of Protection Options

2.1 500-Year Level Protection

Industry standards for a new water treatment plant would be to provide 500-year level flood protection. The two primary options to provide this level of protection are discussed below.

2.1.1 Sheet Pile Levee

A sheet pile levee would allow for 500-year protection (with 1-foot freeboard) while maintaining deliveries to the water treatment plant (chemicals and salt) and the internal circulation of 911 Drive. See Exhibit A1 and A2 for the alignment and details of the proposed sheet pile levee. This alignment would provide the following benefits:

- Provides 500-year protection for the Water Treatment Plant, Well #7, and the Public Works Facilities
- Maintains access to WTP #1 and Public Works Facilities
- Limited impacts on day to day operations and storage

The alignment does have some negative impacts:

- Large impact to the floodplain. The alignment removes a significant amount of storage that will need to be replaced with compensatory storage within the floodplain
- Major visual impacts to the area. The levee could raise concerns with residential buildings within the floodplain on the north side of Farm Creek. If flooding of these structure were to occur after the installation of the levee, it is likely the residents will fault the levee for the flooding.

A permit from IDNR will be required to construct the sheet pile levee. IDNR will require a floodway determination be completed to confirm that the proposed levee alignment is outside of the floodway boundary. This determination and the proposed project would need to be submitted to IDNR for review and approval.

An opinion of probable construction costs was completed for the proposed sheet pile levee. A summary of these costs is included below:

Construction Item	Cost ($)
Sheet Pile Wall	$515,000
Earthwork (Detention / Compensatory Storage)	$180,000
Misc. Items (Levee Penetrations)	$50,000
20% Planning Contingency	$155,000
TOTAL	**$900,000**

*Construction costs do not include engineering, permitting or legal costs.
**Opinion of Probable Construction Costs based on 2018 project costs.

2.1.2 Earthen Levee

An earthen levee was eliminated from consideration due to the impacts of the overall footprint of the levee. The average width of the earthen levee (with 3:1 side-slopes and an average height of 11 feet) would be 71 feet. This width created too large of an impact on the area and did not allow for detention and compensatory storage areas. The earthen levee is not a preferred option to provide 500-year protection for WTP #1.

2.2 Limited 100-Year Level Protection

Since the City can maintain potable water service with WTP #2 in the event of flooding at WTP #1, the City could consider providing less than the 500-year level protection. A limited 100-year level protection improvements are discussed below.

2.2.1 WTP #1 Protection

The City could consider a combination of an earthen levee and a retaining wall to provide 100-year limited level protection (with 1-foot of freeboard) for the WTP #1 only. See Exhibit B1 and B2 for the details and location of the proposed improvement. This improvement would have the following benefits:

- Provides 100-year level protection for the WTP #1
- Limited impacts on the watershed. Minimal amount of compensatory storage would be required because it will only protect the WTP #1
- Minimal visual impact on the watershed because it is considerable shorter and will only remove the WTP #1 building from the 100-year floodplain.
- Limited impacts on day to day operations and storage

The alignment does have some negative impacts:

- Does not provide 500-year protection for the WTP #1
- Does not provide any flood protection of the public works facilities or Well #7

A preliminary discussion with IDNR was conducted to determine potential permitting requirements. IDNR indicated (based on the preliminary information they were provided) that the project would need an IDNR permit. However, they would not need a floodway determination if compensatory storage was provided for any lost storage volume within the floodplain. This determination was based on the improvement being located within an area that does not contribute to the conveyance of the flow and the lost storage volume being replaced with compensatory storage.

An opinion of probable construction costs was completed for the proposed 100-year limited levee. A summary of these costs is included below:

Construction Item	Cost ($)
Earthwork (Detention / Compensatory Storage)	$18,000
Retaining Wall	$30,000
Concrete Sidewalk (ADA Accessibility)	$7,000
Loading Dock Revision	$15,000
Interior Drainage	$20,000
Misc. (Pavement removal, seeding, fertilization, etc.)	$10,000
20% Planning Contingency	$20,000
TOTAL	**$120,000**

*Construction costs do not include engineering, permitting or legal costs.
** Opinion of Probable Construction Costs based on 2018 project costs.

2.2.2 Well #7 Protection

The City has three (3) wells which can currently serve WTP #1. Well #6 and Well #8 are located outside of the 100-year floodplain. During a flood event, the City could turn off Well #7 and continue to operate WTP #1 using Well #6 or Well #8. Thus, under the 100-year limited levee option, no protection was proposed for Well #7.

Minor improvements to Well #7 should be completed to eliminate the potential of floodwaters entering the well during a flood event. These improvements include raising the well casing vent pipe above the 100-year flood elevation.

More significant improvements would be required to protect Well #7 from being damaged during the 100-year flood event. If additional protection for Well #7 is desired, the City should consider raising the electrical gear above the 100-year flood elevation. An opinion of probable construction costs was completed for the Well #7 protection options. A summary of these costs is included below:

Construction Item	Cost ($)
Well casing vent piping	$2,000
Raise existing electrical gear above the 100-year flood elevation	$30,000
20% Planning Contingency	$6,000
TOTAL	**$38,000**

*Construction costs do not include engineering, permitting or legal costs.
** Opinion of Probable Construction Costs based on 2018 project costs.

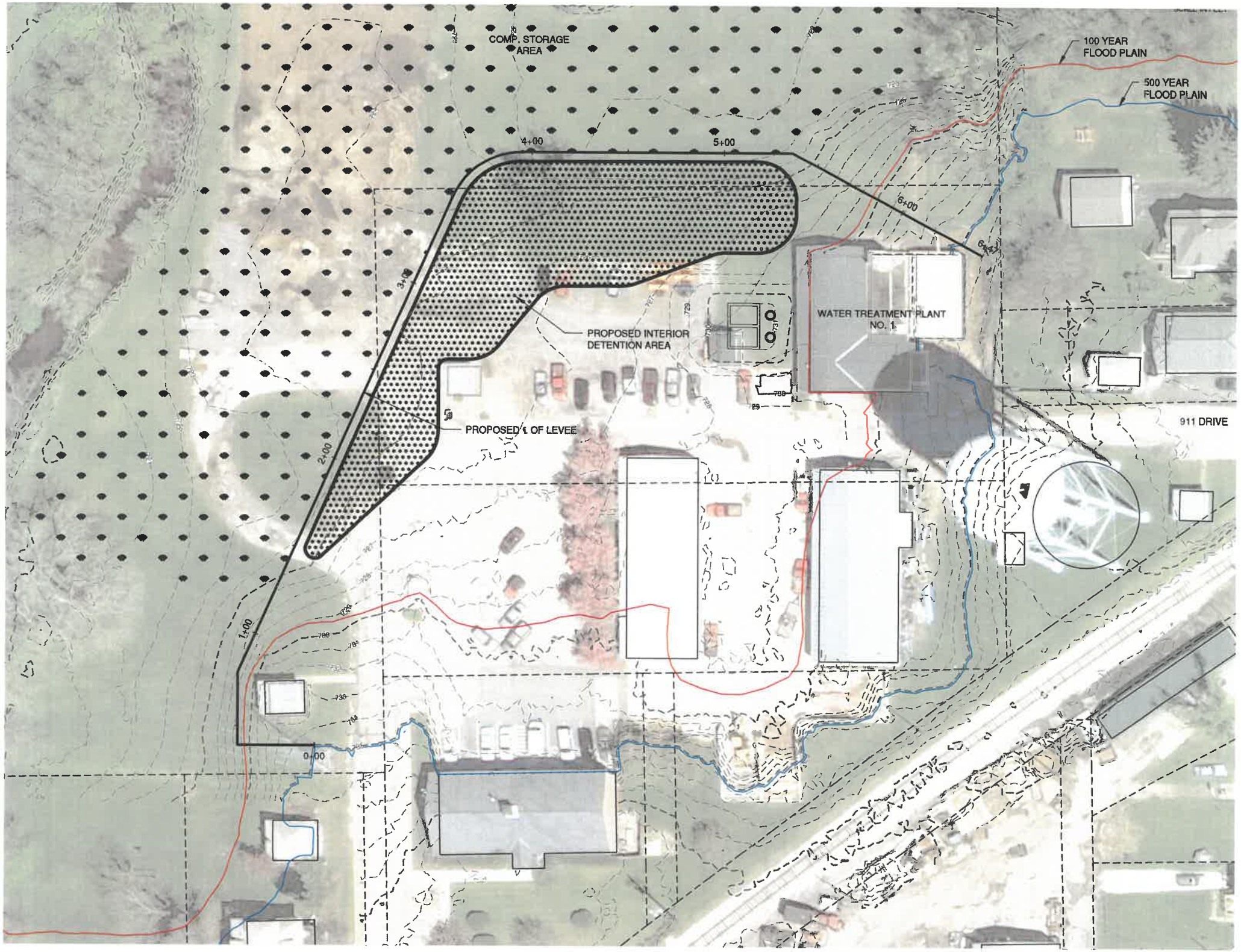
At a minimum, of any of the existing electrical gear for Well #7 is replaced (or improved) it should be installed at an elevation above the 100-year floodplain.

3.0 Recommendations

The City should careful review the potential impacts of flooding prior to determining how to proceed with flood protection within the watershed. If the City elects to proceed with the 500-year level protection, we would recommend contacting USACE to review potential funding alternates under the CAP – 205 Small Flood Risk Management Projects. The program could provide up to 50% of the funding and allow the USACE to complete the engineering, floodway modeling and permitting as a part of the project. A project funded through this program is anticipated to take 3-5 years to go from acceptance through completion.

It is anticipated that the limited 100-year level protection would be completed with local funding. This project could be completed within 1-2 years, depending on the final IDNR permitting requirements.

The final decision on the level of protection to provide for WTP #1 is a risk-based decision based on the City ability to accept the loss of service and financial impacts of the repairs. Only the City can fully weigh the risks and determine how to proceed with flood protection for WTP #1.


COMP. STORAGE AREA
100 YEAR FLOOD PLAIN
500 YEAR FLOOD PLAIN
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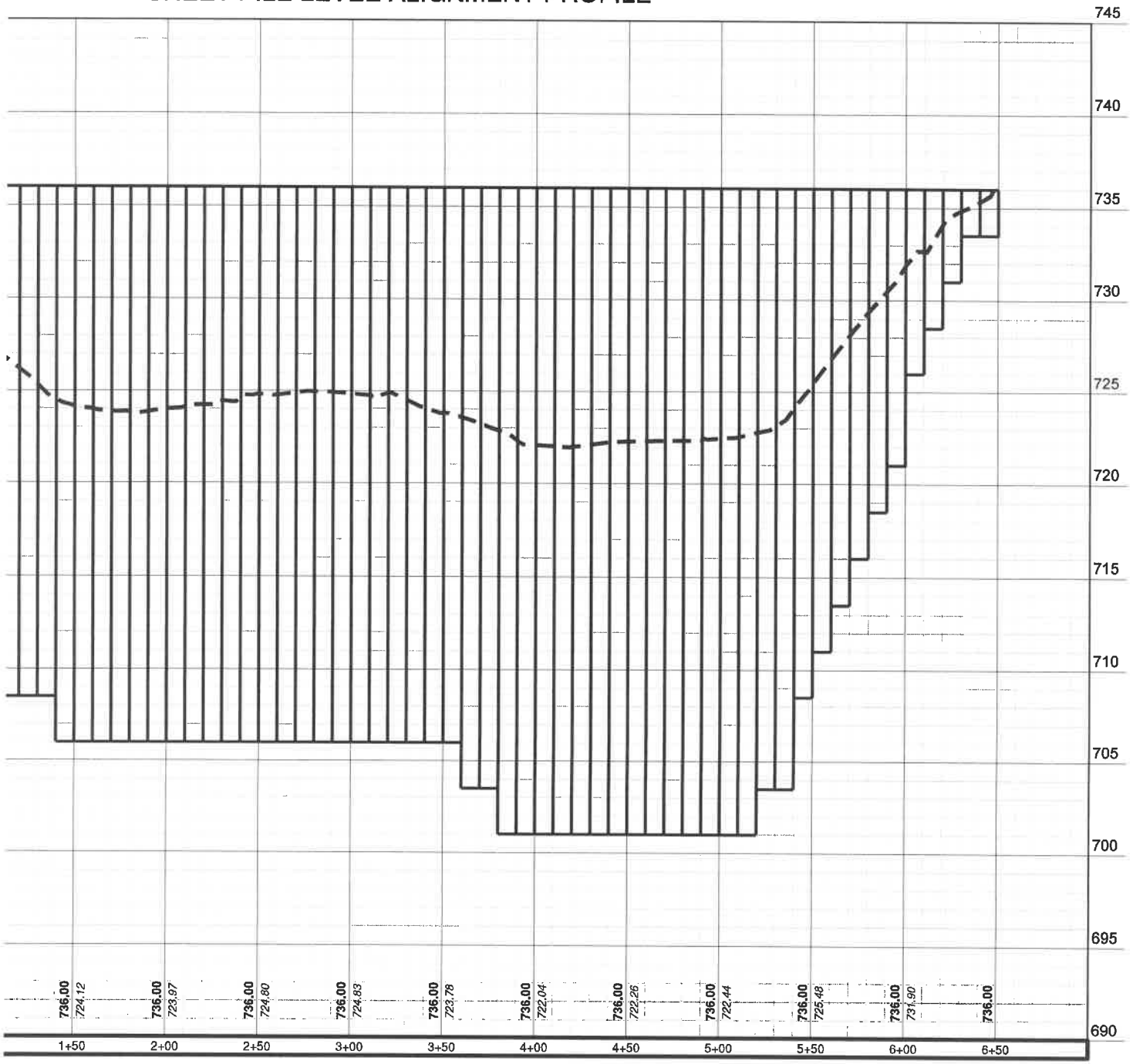
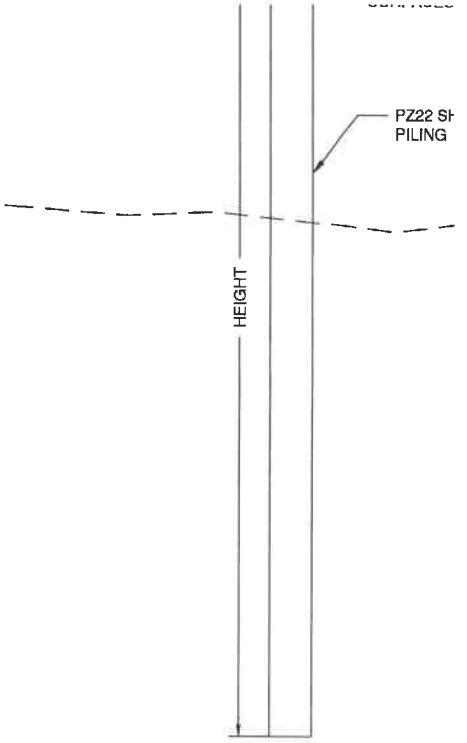
5+00
6+00
3+00
2+00
1+00
0+00
PROPOSED INTERIOR DETENTION AREA
PROPOSED ℄ OF LEVEE
WATER TREATMENT PLANT NO. 1
911 DRIVE

SHEET PILE LEVEE ALIGNMENT PROFILE





SHEET PILING LOCATION	LENGTH (LF)	HEIGHT (FT)
STA. 0+00 TO STA. 0+10	10	5
STA. 0+10 TO STA. 0+20	10	7.5
STA. 0+20 TO STA. 0+30	10	12.5
STA. 0+30 TO STA. 0+40	10	17.5
STA. 0+40 TO STA. 0+70	30	20
STA. 0+70 TO STA. 1+10	40	22.5
STA. 1+10TO STA. 1+30	20	27.5
STA. 1+30 TO STA. 1+40	10	27.5
STA. 1+40 TO STA. 2+40	100	30
STA. 2+40 TO STA. 3+30	90	30
STA. 3+30 TO STA. 3+60	30	30
STA. 3+60 TO STA. 3+80	20	32.5
STA. 3+80 TO STA. 5+20	140	35
STA. 5+20 TO STA. 5+40	20	32.5
STA. 5+40 TO STA. 5+50	10	27.5
STA. 5+50 TO STA. 5+60	10	25
STA. 5+60 TO STA. 5+70	10	22.5
STA. 5+70 TO STA. 5+80	10	20
STA. 5+80 TO STA. 5+90	10	17.5
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STA. 6+00 TO STA. 6+10	10	10
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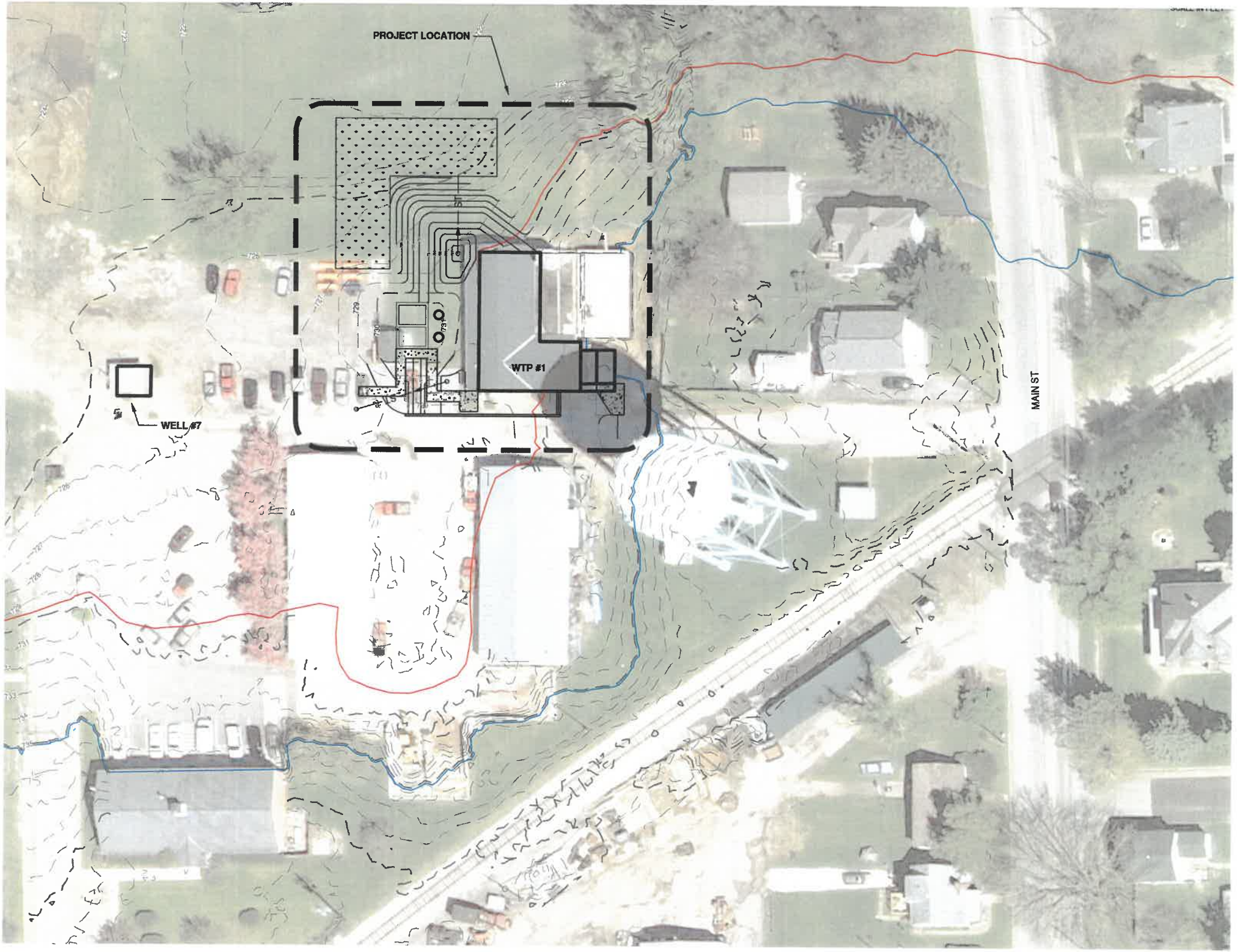
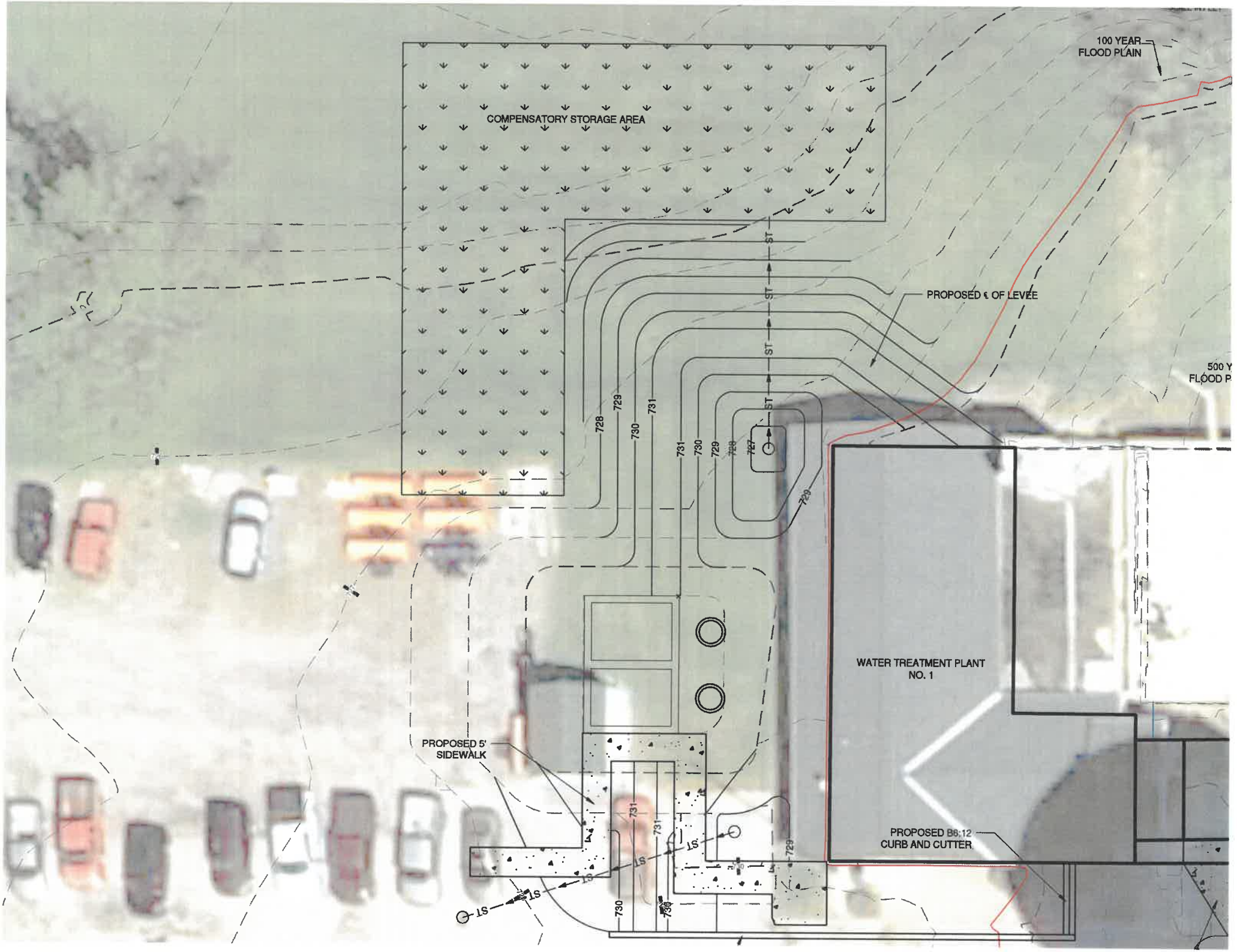

PROJECT LOCATION
WTP #1
WELL #7
MAIN ST


100 YEAR
FLOOD PLAIN
COMPENSATORY STORAGE AREA
PROPOSED ℄ OF LEVEE
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WATER TREATMENT PLANT
NO. 1
PROPOSED 5'
SIDEWALK
PROPOSED B6:12
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