FINAL ENVIRONMENTAL IMPACT STATEMENT FOR A PROPOSED WATER TREATMENT RESIDUALS MANAGEMENT PROCESS FOR THE WASHINGTON AQUEDUCT, WASHINGTON, D.C.

US Army Corps of Engineers
Baltimore District

VOLUME 4
ENGINEERING FEASIBILITY STUDY COMPENDIUM

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September 2005

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CH2MHILL

In Cooperation with:

NCPC

This Final Environmental Impact Statement (FEIS) describes a proposed project to alter the Washington Aqueduct's current practice of discharging water treatment residuals to the Potomac River to one of instead collecting, treating, then disposing of the residuals at an alternate location. Over 160 alternatives were considered and screened, and four of these, plus the no-action alternative were evaluated in detail to determine the potential for environmental, engineering, and economic impacts. A proposed action, the environmentally preferred alternative, is identified; It involves collection of the residuals at the Dalecarlia Water Treatment Plant and Georgetown Reservoir, treatment of residuals at an East Dalecarlia Processing Site on government property that is located north of Sibley Memorial Hospital in the District of Columbia, and then disposal of residuals by trucking on major streets to licensed land disposal sites likely located in Maryland or Virginia.

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Contents

Appendices

Tables

Figures (Placed following their respective sections.)

Acronyms & Abbreviations

ACM	asbestos-containing materials
ADT	average daily traffic
AHR	American Heritage River
ANC	Advisory Neighborhood Commission
AQCR	Air Quality Control Region
AST	aboveground storage tank
AUES	American University Experiment Station
AWWTP	advanced wastewater treatment plant
bgs	below ground surface
C&O	Chesapeake and Ohio
CAA	Clean Air Act
CCI	Commercial Construction Indicators
CEQ	Council of Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS-NFRAP	Comprehensive Environmental Response, Compensation, and Liability Information System—No Further Remedial Action Planned
CIA	Central Intelligence Agency
CIP	Capital Improvement Plan
CO	carbon monoxide
CSO	combined sewer overflow
CSX	Railway company
CWA	Clean Water Act
dBa	decibels, acoustic
DC	District of Columbia
DC DOH	District of Columbia Department of Health
DC FEMS	District of Columbia Fire and Emergency Medical Services
DC LUST	Leaking UST in DC
DC UST	Registered UST in DC
DC WASA	District of Columbia Water and Sewer Association
DCMR	District of Columbia Municipal Regulations
DCOP	District of Columbia Office of Planning
DCOZ	District of Columbia Office of Zoning
DC DOT	District of Columbia Department of Transportation

DC SHPO	District of Columbia State Historic Preservation Office
DDT	dichloro-diphenyl-trichloroethane
DEIS	Draft Environmental Impact Statement
DO	dissolved oxygen
DOPAA	Description of the Proposed Action and Alternatives
DOT	Department of Transportation
DWM	dwarf wedge mussel
EA	EA Engineering, Science, and Technology
EDR	Environmental Data Resources, Inc.
EFH	essential fish habitat
EFS	Engineering Feasibility Study
EIS	environmental impact statement
EMS	Emergency Medial Service
EO	Executive Order
E-OT	Enviro-Organic Technologies
ERL	effects range—low
ERM	effects range—medium
ERNS	Emergency Response Notification System
ESA	Endangered Species Act
FHWA	Federal Highway Administration
FWA	Fairfax Water Authority
FFCA	Federal Facilities Compliance Agreement
FINDS	Facility Index System
FTE	full-time equivalent
FUDS	Formerly Used Defense Site
GWMP	George Washington Memorial Parkway
HMIRS	Hazardous Materials Information Resource System
HWMP	Hazardous Waste Management Plan
ICIS	Integrated Compliance Information System
kWh	kilowatt hours
LBP	lead-based paint
LCSA	Loudoun County Sanitation Authority
MAIA	Mid-Atlantic Integrated Assessment

MD DOT	Maryland Department of Transportation
MDA	Maryland Department of Agriculture
MDE	Maryland Department of Environment
MDNR	Maryland Department of Natural Resources
mgd	million gallons per day
MHW	mean high water
MLW	mean low water
M-NCPPC	Maryland National Capital Park & Planning Committee
mph	miles per hour
MPN	most probable number
MSA	Metropolitan Statistical Area
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSHA	Maryland State Highway Administration
MSL	mean sea level
MWCOG	Metropolitan Washington Council of Governments
NAAQS	National Ambient Air Quality Standards
NCDB	National Compliance Database
NCPC	National Capital Planning Commission
NEPA	National Environmental Policy Act
NESHAP	National Emission Standard for Hazardous Air Pollutants
NGA	National Geospatial-Intelligence Agency
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NIMA	National Imagery and Mapping Agency
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOx	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O&M	operations and maintenance
OSHA	Occupational Safety and Health Administration
OWRM	Office of Water Resources Management
PACL	polyaluminum chloride
Pb	lead
PCB	polychlorinated biphenyls

PEPCO	Potomac Electric Power Company
PI	Potomac Interceptor
PM	particulate matter
POI	points of interest
RBF	riverbank filtration
RBI	riverbank infiltration
RCRA	Resource Conservation and Recovery Act
RCRAINFO	Resource Conservation and Recovery Act Information System
RCRIS-SQG	Resource Conservation and Recovery Information System—Small Quantity Generator
ROD	Record of Decision
ROI	region of influence
ROW	Right of Way
RTE	rare, threatened, or endangered species
SAV	submerged aquatic vegetation
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SNS	shortnose sturgeon
SO_2	sulfur dioxide
STC	Sound Transmission Class
TC	Toxicity Characteristic
TCLP	Toxicity Characteristics Leaching Procedure
TMDL	Total Maximum Daily Load
TSS	total suspended solids
TTU	trade, transportation, and utilities
USEPA	U.S. Environmental Protection Agency
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDOI	U.S. Department of Interior
USDOT	U.S. Department of Transportation
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
UXO	unexploded ordinance
VDEQ	Virginia Department of Environmental Quality
VDOT	Virginia Department of Transportation

VIMS	Virginia Institute of Marine Science
VOC	volatile organic compound
VPA	Virginia Pollutant Abatement
VPDES	Virginia Pollutant Discharge Elimination System
WFP	water filtration plant
WMATA	Washington Metropolitan Area Transit Authority
WSR	Wild and Scenic River
WSSC	Washington Suburban Sanitary Commission
WTF	water treatment facility
WTP	water treatment plant
WWTP	wastewater treatment plant

BACKGROUND AND HISTORY

SECTION 1

Introduction

1.1 Background and Project History

The Washington Aqueduct, a Division of the U.S. Army Corps of Engineers (USACE), Baltimore District, operates the Dalecarlia and McMillan Water Treatment Plants (WTPs) in Washington, DC, serving over 1 million persons in the DC and northern Virginia area with potable water. The treatment process removes solid particles (e.g., river silt) from the Potomac River supply water, treats and disinfects the water, and distributes the finished water to the metropolitan service area. The solids removed during the treatment process have historically been returned to the Potomac River, but a recently reissued version of the Washington Aqueduct National Pollution Discharge Elimination System (NPDES) permit (Permit No. DC 0000019) effectively precludes the discharge of water treatment solids, or residuals, to the river.

Consequently, Washington Aqueduct is in the process of evaluating water treatment residuals management alternatives that minimize or eliminate the discharge of residuals to the river. The residuals management option that is ultimately selected has a potential to affect the human environment, and thus development of the residuals management plan must comply with the National Environmental Policy Act (NEPA) (passed into law in 1970). This Environmental Impact Statement (EIS) has been prepared in compliance with NEPA and supporting regulations promulgated by the Council on Environmental Quality and the USACE. NEPA requires federal agencies to integrate environmental considerations into their decision-making processes by evaluating the environmental impacts of their proposed actions and feasible alternatives to those actions.

The current water treatment system consists of a series of reservoirs and treatment facilities (Figure 1-1). Raw water diverted from the Potomac River is collected in the Dalecarlia Reservoir. Natural sedimentation of river silt typically occurs in the Forebay of the Dalecarlia Reservoir (Figure 1-2). This silt (Forebay residuals) is periodically dredged, temporarily land applied on Washington Aqueduct property for drying, and then trucked off-site or utilized on-site. The part of this process that involves trucking of dried Forebay solids occurs approximately every seven years.

While some natural sedimentation continues as the river water flows through the Dalecarlia Reservoir, Washington Aqueduct water treatment operations achieve an additional level of sediment removal by adding aluminum sulfate (alum) as a coagulant. Alum is added after the water has passed through the Dalecarlia Reservoir, but prior to reaching the four sedimentation basins at the Dalecarlia WTP (Figure 1-2) and the Georgetown Reservoir (Figure 1-3), where the coagulated sediment (i.e., water treatment residuals) is removed. The settled residuals are periodically flushed from the basins to the Potomac River. This process had been previously permitted through the U.S. Environmental Protection Agency's (USEPA's) NPDES permitting process.

The reissued NPDES permit, which became effective on April 15, 2003, significantly reduced both the allowable total mass and concentration of residuals that may be discharged by the Washington Aqueduct to the Potomac River. The permit also describes numerical limits for parameters such as total suspended solids, total aluminum, and dissolved iron that essentially eliminate residuals discharges from these outfall locations. The NPDES permit covers discharges from the Dalecarlia Sedimentation Basins 1, 2, 3, and 4 through Outfall 002 and discharges from the Georgetown Sedimentation Basins 1 and 2 through Outfalls 003 and 004. Washington Aqueduct and EPA Region 3 entered into a Federal Facilities Compliance Agreement (FFCA), on June 12, 2003, to allow the continued production of drinking water during the development of a new residuals management process to meet the requirements of the new permit. The FFCA includes a strict schedule for delivering documentation and achieving compliance with the NPDES permit, including completion of an alternatives evaluation and a disposal study, a DEIS, and final compliance with the numerical discharge limitations.

1.2 Purpose and Need for Action

The purpose and need for the proposed residuals management process assessment were defined in the Notice of Intent, published in the *Federal Register* on January 12, 2004, as restated below:

> The objectives of the proposed residuals management process are as follows, not necessarily in order of precedence (measurement indicators in parentheses):
>
> - To allow Washington Aqueduct to achieve complete compliance with NPDES Permit DC00000019 and all other federal and local regulations.
> - To design a process that will not impact current or future production of safe drinking water reliably for the Washington Aqueduct customers. (Peak design flow of drinking water).
> - To reduce, if possible, the quantities of solids generated by the water treatment process through optimized coagulation or other means. (Mass or volume of solids generated).
> - To minimize, if possible impacts on various local and regional stakeholders and minimize impacts on the environment. (Traffic, noise, pollutants, etc.).
> - To design a process that is cost-effective in design, implementation, and operation. (Capital, operations, and maintenance costs).

The NPDES permit (DC0000019) was originally issued on March 19, 2003, and amended and reissued on February 27, 2004. It supersedes the previously issued NPDES permits (DC0000019 and DC000329) issued on April 3, 1989 and February 4, 1998 respectively. Because the Clean Water Act does not allow EPA to include a compliance schedule delaying attainment with discharge limits, and it is recognized that the Washington Aqueduct could not immediately comply, EPA and the Washington Aqueduct entered into the FFCA to provide an enforceable compliance schedule for achieving the effluent limitations in NPDES Permit No. DC0000019 as expeditiously as possible. EPA and Washington Aqueduct entered into the FFCA pursuant to the Clean Water Act, 33 U.S.C. §§1251-1387 and Executive Order No. 12088 (Federal Compliance with Pollution Control Standards). The FFCA provides a legally mandated plan for the Washington Aqueduct to achieve and maintain compliance with the NPDES Permit and thus the Clean Water Act.

Washington Aqueduct developed objectives for the proposed residuals management process with the intention of ensuring compliance with all permit and other legal mandates, and preserving or improving upon the safety, reliability, and efficiency of the current water treatment process. In addition, Washington Aqueduct incorporated into the objectives a concern for minimizing impacts to the human and natural environment.

The comments generated from the scoping process for the EIS, have been incorporated into the list of alternatives developed for Section 2 of this report. A detailed evaluation of all alternatives is presented in Section 3. Section 4 discusses various options for sedimentation and residuals collection, and Section 5 presents a summary of the alternatives that will be retained for further evaluation as part of the EIS.

The alternatives screening criteria are linked to the projects purpose and need. Washington Aqueduct developed them subsequent to the issuance of the Notice of Intent. These screening criteria were reviewed by the public during the scoping period and then applied to all of the alternatives – those that were initially developed by the Washington Aqueduct and consultants and those that were suggested by the public. The comments received during the scoping process for the EIS did not result in any modifications to the original objectives as published in the Notice of Intent. The objectives and screening criteria have been incorporated into the analysis of all of the alternatives, as detailed in this volume of the EIS.

Four alternatives met the screening criteria and their effects are evaluated in the EIS. A fifth alternative, the no action alternative is also included. While no action is an alternative that must be evaluated in any environmental documentation accomplished under the National Environmental Policy Act, it cannot be selected in this case. The issuance of NPDES Permit DC 0000019, which itself was evaluated in a public process pursuant to EPA regulations, requires solids collection and disposal processes as an alternative to the current method of flushing them to the Potomac River.

The production of safe drinking water delivered with one hundred percent reliability to Washington Aqueduct's wholesale customers at a reasonable cost must be maintained during the construction and operation of the selected alternative. This is the inherent duty of the Washington Aqueduct management.

Washington Aqueduct is also committed, as indicated in the project objectives, to minimize (if possible) potential impacts on stakeholders and the environment. All of the alternatives under consideration have potential impacts. However, it is anticipated that mitigative measures may be planned and implemented in order to minimize these potential impacts for which ever of the alternatives that is selected.

Washington Aqueduct has selected an alternative among those presented in Section 2 for implementation. The final alternative selected may be contingent on authorization, approvals, or issuance of permits or easements by various public agencies or private entities including, but not limited to, the relevant State Historic Preservation Office (SHPO), the

National Capital Planning Commission (NCPC), the USEPA, the National Park Service (NPS), and the Washington Aqueduct Wholesale Customers (i.e., the District of Columbia Water and Sewer Authority, Arlington County, Virginia, and the City of Falls Church, Virginia).

1.3 Purpose of Document

The purpose of this integrated Engineering Feasibility Study (EFS) and Environmental Impact Statement (EIS) for Washington Aqueduct Water Treatment Residuals is to evaluate alternatives for managing its water treatment residuals. This process, which commenced with development of a Draft Environmental Impact Statement (DEIS), is necessary for the Washington Aqueduct to comply with its National Pollutant Discharge Elimination System (NPDES) NPDES Permit (Permit No. DC0000019) within the Federal Facility Compliance Agreement (FFCA) deadlines.

The Environmental Impact Statement (EIS) was prepared in accordance with the National Environmental Policy Act (NEPA) and supporting regulations promulgated by the Council on Environmental Quality and the United States Army Corps of Engineers. The Draft Environmental Impact Statement (DEIS) was prepared and was issued on April 22, 2005.

Members of the public, regulatory agencies and other stakeholders were encouraged to review and comment on the draft document during the 75-day comment period following its publication. A public hearing was held on May 17, 2005 to formally receive public comment on the DEIS. The 30 day extension to the original 45 day public comment period as well as the tandem informational meeting held prior to and during the public hearing to answer questions were provided to allow for additional public involvement regarding the evaluation of alternatives for managing Washington Aqueduct's water treatment residuals.

The FEIS was prepared at the completion of the DEIS public comment period. Responses to the comments, as well as, a full description of the environmental, social, and economic consequences of implementing the preferred and other feasible alternatives were incorporated into the document.

All public comments received at the public hearing, as well as those submitted during the extended public comment period, are addressed in the EIS Comments and Responses Volumes 3C and 3D. Comments and Responses Volumes 3A and 3B address the public input provided prior to issuance of the DEIS. The Response to Comments table, included in Volume 3 of the EIS was extensively modified to fully address the comments received. These responses include discussions of new sub-topics in the areas of Facility (BH through BM), Pipeline (DK through DM), Schedule (FF through FG), Trucking (GJ through GK), human Health and the Environment (KD), Government (MD), EIS Process (NE through NH), Residuals Handling in Other Metropolitan Areas (PB) and Residuals Alternatives (QB through QD.)

The FEIS is the evidentiary basis for the Record of Decision (ROD) developed by the Baltimore District of the Corps of Engineers that identifies the alternative to implement. Throughout the remainder of this document, although they were developed sequentially in time, their content is similar. Thus, for ease of reference the DEIS and FEIS are called the Environmental Impact Statement (EIS).

W042004001_WDC_WAFS_004_SiteMap_4

FIGURE 1-1
Washington Aqueduct Supply and Treatment System

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The geographic information shown on this map is based on publicly available data from Montgomery County Maryland and the District of Columbia Geographic Information System (GIS) with GIS layers updated at different times. This figure is not intended to be a precise representation of the existing project site. Technical information on land use is evaluated elsewhere in the EIS. The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

Figure 1-2
Dalecarlia Reservoir and Forebay Facilities

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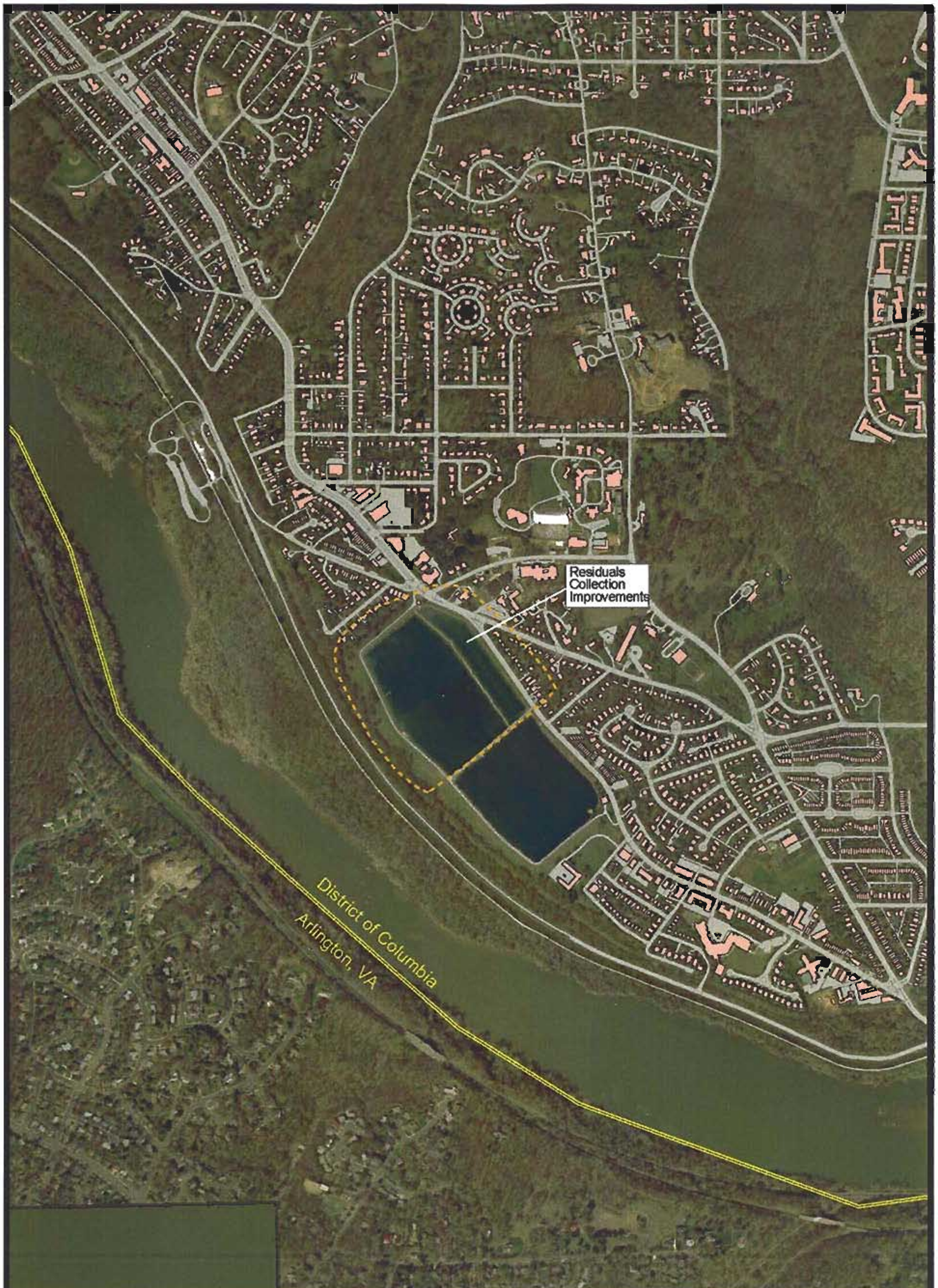

Legend

- Area of Potential Modifications
- County Boundary
- Existing Buildings
- Roads

The geographic information shown on this map is based on publicly available data from Montgomery County Maryland and the District of Columbia Geographic Information System (GIS) with GIS layers updated at different times. This figure is not intended to be a precise representation of the existing project site. Technical information on land use is evaluated elsewhere in the EIS. The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

0 376 750 1,500 Feet

Figure 1-3
Georgetown Reservoir

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Section 2

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

SECTION 2

Description of Proposed Action and Alternatives

2.1 Proposed Action

The proposed action is to develop, design, and construct a permanent residuals management process that will cost-effectively collect, treat, and dispose of the water treatment residuals in conformance with the purpose and need stated in Section 1. The selected action must meet the Federal Facilities Compliance Agreement (FFCA) compliance deadlines. It must also address the management of projected residuals quantities for a period of at least 20 years. Table 2-1 lists the current and future volume of water treatment and Forebay residuals generated daily as estimated for this Engineering Feasibility Study Compendium (EFS) (Volume 4 of DEIS). This table also lists the number of truck trips associated with the residuals quantities, based on a 5-day week. Not all of the alternatives evaluated in detail in the EIS use trucking for final disposal of dewatered residuals. The larger residuals values listed in the design year columns reflect the larger quantity of water demand anticipated 20 years in the future.

TABLE 2-1
Washington Aqueduct Basis for Residuals Quantities

	Daily Generated Volume (Cubic Yards)[a]		Truck Loads/Day [b]			
			22 Cubic Yards/ Truck		11 Cubic Yards/ Truck	
Residuals	**Current Average**	**Design Year Average**	**Current Average**	**Design Year Average**	**Current Average**	**Design Year Average**
Water Treatment	94	120	7	8	13	16
Forebay	22	28	2	2	3	4

[a] Based on 7 days per week production.
[b] Based on hauling to a final disposal site 5 days per week.
c Density of dewatered solids is 67 lbs/cubic foot, thus 1 ton equals 1.1 cubic yards

2.2 Development of Alternatives

Washington Aqueduct has been evaluating residuals management approaches for a number of years due to potential changes to the regulations. During that time many potential alternatives were identified. Some of these alternatives are not consistent with the regulatory requirements defined in the April 2003 National Pollutant Discharge Elimination System (NPDES) permit and associated FFCA.

The first step in the National Environmental Policy Act (NEPA) alternative identification process was to review the project history and compile a full range of possible alternatives that have the potential to meet the stated purpose and need. The following documents were reviewed to develop the historical list:

- Department of the Army, Baltimore District, U.S. Army Corps of Engineers (USACE), Washington Aqueduct. "Dalecarlia Water Treatment Plant and Georgetown Reservoir Residuals Collection and Treatment Engineering Estimate (35 percent Design)." Whitman, Requardt, and Associates. November 1996
- Department of the Army, Baltimore District, Corps of Engineers, Washington Aqueduct. "Dalecarlia Water Treatment Plant and Georgetown Reservoir Residuals Disposal Facilities Residuals Disposal Study." Whitman, Requardt, and Associates in association with Malcolm Pirnie, Inc. September 1995
- Department of the Army, Baltimore District, Corps of Engineers, Washington Aqueduct. "Draft NPDES Permit Review Memorandum on Residual Solids Evaluations." AH Environmental Consultants, Inc., and Greeley and Hansen LLC. May 30, 2003
- Department of the Army, Baltimore District, Corps of Engineers, Washington Aqueduct. "Report on Water Treatment Plant Waste Disposal Alternatives Dalecarlia Water Treatment Plant and Georgetown Reservoir." Camp, Dresser & Mc Kee, Inc. 1977

Additional alternatives and approaches with the potential to improve the historical alternatives were also developed. Suggestions made by the public during the scoping process, such as plasma heat treatment of residuals and consideration of alternate residuals processing sites such as the East Dalecarlia Processing Site adjacent to Little Falls Road, were also considered. This effort culminated in a list of 26 alternatives, which were screened following the Scoping Meeting and discussed in more detail in the Description of Proposed Action, and Alternatives (DOPAA) issued in May 2004.

Subsequent to the issuance of the DOPAA, the public was given two structured opportunities to suggest additional residuals alternatives for consideration, such as consideration of alternate residuals processing sites. These represent the second and third alternative suggestion periods to this Environmental Impact Statement (EIS). These alternative suggestion periods closed on November 15, 2004 and February 14th, 2005, respectively. A total of 142 additional residuals alternatives and options were received from the public during these additional alternative suggestion periods. Two of these alternatives offered during these periods were combined for further consideration of alternative residuals processing sites (i.e., the East Dalecarlia Processing Site adjacent to Little Falls Road).

This section discusses the process and criteria used to screen all of the alternatives, summarizes the results of the screening process.

2.3 Alternative Screening Process and Criteria

Screening of alternatives is an approach commonly used as part of the NEPA process to identify the feasible alternatives and ensure a reasonable range of alternatives for detailed evaluation in the EIS. In this document, each previously or newly identified alternative (or individual component of a residuals management approach) was screened against the established criteria. The draft screening criteria were circulated for public review and comment during the Scoping Process before they were finalized and applied to all alternatives.

The screening criteria used to determine attainment of purpose and need are:

- Is able to meet the FFCA, including schedule.
- Preserves the quality, reliability, and redundancy of the existing water treatment and distribution system.
- Uses proven methods (i.e., proven design water treatment processes, construction equipment and techniques, and operating principles).
- Complies with NPDES permit to reduce or eliminate discharge to the Potomac River.
- Does not produce an undue economic hardship on Washington Aqueduct customers for additional facilities that cost more than 30 percent of the baseline 2004 construction cost budget of $50 million (to increase total project cost beyond $65 million) that are not needed for other feasible alternatives for the five basic project elements of residuals collection, conveyance, thickening, dewatering, and disposal. (Note: All project costs identified were developed in 2004 dollars.)
- Complies with zoning and land use regulations, institutional constraints, and other Federal and local regulations.
- Reduces residual quantities, if possible.

Key schedule milestones included within the FFCA include the following:

- No later than November 2, 2005 (modified from June 3, 2005), "the Corps shall identify in a notice to EPA the engineering/best management practices it will implement in order to achieve compliance with the numeric discharge limitations set forth in the NPDES Permit and a schedule for implementing the identified engineering/best management practices as expeditiously as practicable, including selection of a contractor, preliminary design, and final design, as well as the construction phase..."
- No later than March 1, 2008, "the Corps shall exercise best efforts, consistent with the best engineering judgement, to achieve compliance with the numeric discharge limitations set forth in the NPDES Permit at one or more of the sedimentation basins..."
- No later than December 30, 2009, "achieve full compliance with the numeric discharge limitations at all basins…"

2.4 Alternatives Description

The description of alternatives is split into three separate time periods representing when the alternatives were evaluated. The description of the initial alternatives is presented as May 2004 alternatives. The alternatives which originated from the public comment periods are presented as *November 15, 2004 Alternatives* and *February 14, 2005Alternatives*. Since many of the alternatives are similar, they have been grouped in categories based on similarity of critical components, such as the method of dewatering residuals, transport, or the location of processing facilities. As the public alternatives are introduced subsequent to the May 2004 alternatives, the descriptions of the public alternatives reference the most similar May 2004 Alternative (Alternatives 1 through 26) as appropriate.

2.4.1 May 2004 Alternatives Description

The following 26 alternatives were initially evaluated for this project. Since many of the alternatives are similar, they have been grouped in categories based on similarity of critical components, such as the method of dewatering residuals, transport, or the location of processing facilities. To facilitate the screening process, and to make it easier for the reader to cross-reference this document with the EIS Volume 3: Response to Comments, the alternatives are grouped into categories. These categories of alternatives are as follows:

- No-Action Alternative
- Alternatives that do not require continuous trucking from the Dalecarlia WTP
- Alternatives with a discharge to the Potomac River
- Alternatives involving alternate uses of the Dalecarlia Reservoir
- Alternatives with facilities at the McMillan WTP
- Alternatives with facilities at the Dalecarlia WTP

Alternative 1 is a No-Action alternative that provides no changes to the current practice of discharging residuals to the Potomac River as allowed by the previous NPDES permit. Although this alternative clearly does not meet the purpose and need for the project because it does not comply with the current NPDES permit, it must be examined under NEPA for comparison to other alternatives.

Alternatives 2 through 8 do not require continuous trucking of residuals from the Dalecarlia WTP:

- Alternative 2: Process water treatment residuals at Dalecarlia WTP and dispose of them in the Dalecarlia monofill. Process Forebay residuals by current methods and periodically haul offsite.

- Alternative 3: Coprocess water treatment and Forebay residuals at Dalecarlia WTP and codispose in Dalecarlia monofill.

- Alternative 4: Pump unthickened water treatment residuals via Potomac Interceptor to the District of Columbia Water and Sewer Authority (DC WASA) Blue Plains Advanced Wastewater Treatment Plant (AWWTP). Process Forebay residuals by current methods and periodically haul.

- Alternative 5: Thicken water treatment residuals at Dalecarlia WTP, and then pump via a new pipeline to DC WASA Blue Plains AWWTP. Process Forebay residuals by current methods and periodically haul.

- Alternative 6: Thicken water treatment residuals at Dalecarlia WTP, then transport by barge to the Blue Plains AWWTP. Process Forebay residuals by current methods and periodically haul.

- Alternative 7: Thicken water treatment residuals at Dalecarlia WTP, then pump via pipeline to neighboring water utility. Process Forebay residuals by current methods and periodically haul.
- Alternative 8: Thicken water treatment residuals at Dalecarlia WTP, and then pump via pipeline to a new dewatering location. Process Forebay residuals by current methods and periodically haul.

Alternatives 9 through 11 anticipate discharging some portion of the residuals, or related process streams, back to the Potomac River:

- Alternative 9: Process most water treatment residuals at the Dalecarlia WTP and haul offsite, but dilute some residuals for discharge back to the Potomac River. Process Forebay residuals by current methods and periodically haul.
- Alternative 10: Renegotiate NPDES permit to allow discharge of all residuals to the Potomac River.
- Alternative 11: Process water treatment residuals at Dalecarlia WTP and haul offsite. Process Forebay residuals by current methods and periodically haul. Dilute side streams and discharge to the Potomac River.

Alternatives 12 through 15 would involve some construction of residuals facilities in the Dalecarlia Reservoir:

- Alternative 12: Store all residuals in the Dalecarlia Reservoir prior to processing at the Dalecarlia WTP. Coprocess Forebay and water treatment residuals. Dispose of residuals in Dalecarlia and McMillan monofills.
- Alternative 13: Store all residuals in the Dalecarlia Reservoir prior to processing at the Dalecarlia WTP. Coprocess Forebay and water treatment residuals and haul to offsite disposal.
- Alternative 14: Construct new sedimentation basins at the Dalecarlia Reservoir and process all residuals at the Dalecarlia WTP. Coprocess Forebay and water treatment residuals and haul to offsite disposal.
- Alternate 15: Coagulate all flow in the Dalecarlia Reservoir and process all residuals at the Dalecarlia WTP. Coprocess Forebay and water treatment residuals and haul to offsite disposal.

Alternatives 16 through 23 anticipate constructing residuals facilities at the McMillan WTP:

- Alternative 16: Thicken water treatment residuals at the McMillan WTP and dewater at an existing wholesale customer’s treatment facility. Contract haul dewatered residuals. Process Forebay residuals by current methods and periodically haul.
- Alternative 17: Coprocess Forebay and water treatment residuals at the McMillan WTP. Dispose of residuals via contract hauling from the McMillan WTP.
- Alternative 18: Process water treatment residuals at the McMillan WTP and haul offsite. Process Forebay residuals by current methods and periodically haul.

- Alternative 19: Thicken water treatment residuals at the McMillan WTP and dewater at an existing wholesale customer's dewatering facility. Dispose of residuals via contract hauling from the existing facility. Discharge Forebay residuals to the Potomac River.
- Alternative 20: Thicken water treatment residuals at the Dalecarlia WTP and Georgetown Reservoir and dewater at the McMillan WTP. Dispose of water treatment residuals via contract hauling from the McMillan WTP. Process Forebay residuals via current methods and periodically haul.
- Alternative 21: Store residuals at lagoons at Forebay, Dalecarlia WTP, and McMillan WTP. Thicken and dewater residuals with portable equipment and dispose via contract hauling from all locations.
- Alternative 22: Store water treatment residuals in Dalecarlia and Georgetown Reservoirs prior to thickening and dewatering at Dalecarlia and McMillan WTPs. Dispose of water treatment residuals via contract hauling from the Dalecarlia and McMillan WTPs. Process Forebay residuals via current methods and periodically haul.
- Alternative 23: Store water treatment residuals in the McMillan Reservoir prior to dewatering at the McMillan WTP. Dispose of water treatment residuals via contract hauling from McMillan WTP. Process Forebay residuals via current methods and periodically haul.

Alternatives 24 through 26 involve the construction of residuals facilities at the Dalecarlia WTP, followed by offsite disposal:

- Alternative 24: Coprocess Forebay and water treatment residuals at the Dalecarlia WTP. Dispose of residuals via contract hauling from the Dalecarlia WTP.
- Alternative 25: Process water treatment residuals at the Dalecarlia WTP and dispose via contract hauling. Process Forebay residuals via current methods and periodically haul.
- Alternative 26: Use plasma oven technology to process Forebay and water treatment residuals at the Dalecarlia WTP. Dispose of residuals via contract hauling from the Dalecarlia WTP.

Appendix A briefly describes each alternative evaluated for this project; the locations where residuals are produced and processed; and how each type of residual will be collected, conveyed, processed, and disposed of.

2.4.2 November 2004 Public Alternatives and Option Description

The public alternatives and options received between mid-September 2004 and November 15, 2004 are summarized in Table 2-2. The public contributed a total of 102 public alternatives and options during this time period. These alternatives are numbered P1 through P102 in the text.

Some of this set of alternatives were identified by more than one contributor, or are similar in nature. Consequently, there is some repetition within Table 2-2 in regards to the described alternatives. The public alternatives have been assigned numbers in the approximate order by which they were received by the public and subsequently accumulated into the table (e.g., P23). To facilitate the screening process, and to make it easier for the reader to cross-reference this document with the EIS Volume 3: Response to Comments, the public alternatives were then grouped into categories, using the same category groupings developed to summarize the initial May 2004 alternatives. These categories of alternatives are as follows:

- Alternatives that do not require continuous trucking from the Dalecarlia WTP Complex
- Alternatives with a discharge to the Potomac River
- Alternatives involving alternate uses of the Dalecarlia Reservoir
- Alternatives with facilities at the McMillan WTP
- Alternatives with facilities at the Dalecarlia WTP (without involving trucking from Dalecarlia Complex)

In addition to the categories of alternatives listed above, examination of a number of raw water intake improvement and treatment process optimization options provided by the public are completed in Section 4 of this document.

2.4.3 February 2005 Public Alternatives Description

The public alternatives received between November 16, 2004 and February 14, 2005 are also described within Table 2-2. The public contributed a total of 40 public alternatives during this period. These alternatives are numbered P103 through P142.

All of these alternatives fall under the following category:

Alternatives with facilities at the Dalecarlia WTP (without involving trucking from Dalecarlia Complex)This Engineering Feasibility Study (EFS) provides detailed technical information on the identified alternatives and has been prepared concurrent with the EIS to facilitate residuals management evaluation. The results of the EFS include a determination of feasible alternatives with consideration given to the most environmentally sound, economical, and practical methods. Section 3 presents the screening of all alternatives that produce the results.

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P1	Sludge Stopper - 1	Single 12" Iron Pipe-in-Pipe Potomac	Build a 12" iron pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains	Alternatives 4 and 5
P2	Sludge Stopper - 2	Single 12" Plastic Pipe-in-Pipe Potomac	Build a 12" HDPE (high density polyethylene) piping inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains tc Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains AWWTP.	Alternatives 4 and 5
P3	Sludge Stopper - 3	Single 12" Stainless Pipe-in-Pipe Potomac	Build 12" stainless steel pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains AWWTP.	Alternatives 4 and 5
P4	Sludge Stopper - 4	Single 12" Composite Pipe-in-Pipe Potomac	Build a 12" composite pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is one the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5
P5	Sludge Stopper - 5	Single 6" Iron Pipe-in-Pipe Potomac	Building a 6" iron pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P6	Sludge Stopper - 6	Single 6" Plastic Pipe-in-Pipe Potomac	Build a 6" HDPE (high density polyethylene) piping inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains tc Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P7	Sludge Stopper - 7	Single 6" Stainless Pipe-in-Pipe Potomac	Build a 6" stainless steel pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P8	Sludge Stopper - 8	Single 6" Composite Pipe-in-Pipe Potomac	Build a 6" composite pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5
P9	Sludge Stopper - 9	Trio 6-12-6" Iron Pipe-in-Pipe Potomac	Build a 6-12-6" trio of iron pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5
P10	Sludge Stopper - 10	Trio 6-12-6" Plastic Pipe-in-Pipe Potomac	Build a 6-12-6" trio of HDPE (high density polyethylene) pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5
P11	Sludge Stopper - 11	Trio 6-12-6" Stainless Pipe-in-Pipe Potomac	Build a 6-12-6" trio of stainless steel pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P12	Sludge Stopper - 12	Trio 6-12-6" Composite Pipe-in-Pipe Potomac	Build a 6-12-6" trio of composite pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5
P13	Sludge Stopper - 13	Single 12" Iron Pipe-in-Pipe Rock Creek	Build a 12" iron pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P14	Sludge Stopper - 14	Single 12" Plastic Pipe-in-Pipe Rock Creek	Build a 12" HDPE (high density polyethylene) piping inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P15	Sludge Stopper - 15	Single 12" Stainless Pipe-in-Pipe Rock Creek	Build a 12" stainless steel pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P16	Sludge Stopper - 16	Single 12" Composite Pipe-in-Pipe Rock Creek	Build 1 12" composite pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continued inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5
P17	Sludge Stopper -17	Single 6" Iron Pipe-in-Pipe Rock Creek	Build a 6" iron pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5

Table 2-2

Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P18	Sludge Stopper - 18	Single 6" Plastic Pipe-in-Pipe Rock Creek	Build a 6" HDPE (high density polyethylene) piping inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P19	Sludge Stopper - 19	Single 6" Stainless Pipe-in-Pipe Rock Creek	Build a 6" stainless steel pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P20	Sludge Stopper - 20	Single 6" Composite Pipe-in-Pipe Rock Creek	Build a 12" stainless steel pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P21	Sludge Stopper - 21	Trio 6-12-6" Iron Pipe-in-Pipe Rock Creek	Build a 6-12-6" trio of iron pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P22	Sludge Stopper - 22	Trio 6-12-6" Plastic Pipe-in-Pipe Rock Creek	Build a 6-12-6" HDPE (high density polyethylene) pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P23	Sludge Stopper - 23	Trio 6-12-6" Stainless Pipe-in-Pipe Rock Creek	Build a 6-12-6" trio of stainless steel pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P24	Sludge Stopper - 24	Trio 6-12-6" Composite Pipe-in-Pipe Rock Creek	Build a 6-12-6" trio of composite pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P25	Sludge Stopper - 25	Single 12" Iron Pipe-in-Pipe Potomac via Main	Build a 12" iron pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P26	Sludge Stopper - 26	Single 12" Plastic Pipe-in-Pipe Potomac via Main	Build a 12" HDPE (high density polyethylene) pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P27	Sludge Stopper - 27	Single 12" Stainless Pipe-in-Pipe Potomac via Main	Build a 12" stainless steel pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P28	Sludge Stopper - 28	Single 12" Composite Pipe-in-Pipe Potomac via Main	Build a 12" composite pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5
P29	Sludge Stopper - 29	Single 6" Iron Pipe-in-Pipe Potomac via Main	Build a 6" iron pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P30	Sludge Stopper - 30	Single 6" Plastic Pipe-in-Pipe Potomac via Main	Build a 6" HDPE (high density polyethylene) pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P31	Sludge Stopper - 31	Single 6" Stainless Pipe-in-Pipe Potomac via Main	Build a 6" stainless steel pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P32	Sludge Stopper - 32	Single 6" Composite Pipe-in-Pipe Potomac via Main	Build a 6" composite pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5
P33	Sludge Stopper - 33	Trio 6-12-6" Iron Pipe-in-Pipe Potomac via Main	Build a 6-12-6" trio of pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P34	Sludge Stopper - 34	Trio 6-12-6" Plastic Pipe-in-Pipe Potomac via Main	Build a 6-12-6" trio of HDPE (high density polyethylene) pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5
P35	Sludge Stopper - 35	Trio 6-12-6" Stainless Pipe-in-Pipe Potomac via Main	Build a 6-12-6" trio of stainless steel pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5
P36	Sludge Stopper - 36	Trio 6-12-6" Composite Pipe-in-Pipe Potomac via Main	Build a 6-12-6" trio of composite pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5
P37	Sludge Stopper - 37	Single 12" Iron Pipe-in-Pipe Rock Creek via Main	Build a 12" iron pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P38	Sludge Stopper - 38	Single 12" Plastic Pipe-in-Pipe Rock Creek via Main	Build a 12" HDPE (high density polyethylene) pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P39	Sludge Stopper - 39	Single 12" Stainless Pipe-in-Pipe Rock Creek via Main	Build a 12" stainless steel pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P40	Sludge Stopper - 40	Single 12" Composite Pipe-in-Pipe Rock Creek via Main	Build a 12" composite pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5
P41	Sludge Stopper - 41	Single 6" Iron Pipe-in-Pipe Rock Creek via Main	Build a 6" iron pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residuals to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P42	Sludge Stopper - 42	Single 6" Plastic Pipe-in-Pipe Rock Creek via Main	Build a 6" HDPE (high density polyethylene) pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P43	Sludge Stopper - 43	Single 6" Stainless Pipe-in-Pipe Rock Creek via Main	Build a 6" stainless steel piping inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P44	Sludge Stopper - 44	Single 6" Composite Pipe-in-Pipe Rock Creek via Main	Build a 12" stainless steel pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P45	Sludge Stopper - 45	Trio 6-12-6" Iron Pipe-in-Pipe Rock Creek via Main	Build a 6-12-6" trio of iron pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Truck Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P46	Sludge Stopper - 46	Trio 6-12-6" Plastic Pipe-in-Pipe Rock Creek via Main	Build a 6-12-6" trio of HDPE (high density polyethylene) pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P47	Sludge Stopper - 47	Trio 6-12-6" Stainless Pipe-in-Pipe Rock Creek via Main	Build a 6-12-6" trio of stainless steel pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to the Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P48	Sludge Stopper - 48	Trio 6-12-6" Composite Pipe-in-Pipe Rock Creek via Main	Build a 6-12-6" trio of composite pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains AWWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P49	Sludge Stopper - 49	Dalecarlia to WSSC Potomac Over Interceptor	Build a new single, double, or quad pipeline on top of the Potomac Interceptor to the WSSC Potomac Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P50	Sludge Stopper - 50	Dalecarlia to WSSC Potomac Inside Interceptor	Build a new single, double, or quad pipeline inside the Potomac Interceptor to the WSSC Potomac Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7
P51	Sludge Stopper - 51	Dalecarlia to WSSC Potomac Over Raw Water Conduit	Build a new single, double, or quad pipeline over the Great Falls raw water conduits to the WSSC Potomac Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7
P52	Sludge Stopper - 52	Dalecarlia to WSSC Potomac In Raw Water Conduit	Build a new single, double, or quad pipeline inside one of the Great Falls raw water conduits to the WSSC Potomac Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7
P53	Sludge Stopper - 53	Dalecarlia to WSSC Potomac Via River Road	Build a new single, double, or quad pipeline along River Road, to the WSSC Potomac Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7
P54	Sludge Stopper - 54	Dalecarlia to New Carderock Over Interceptor	Build a new single, double, or quad pipeline on top of the Potomac Interceptor to a new thickening and dewatering plant on the Carderock Naval Research Center grounds, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 8
P55	Sludge Stopper - 55	Dalecarlia to New Carderock Inside Interceptor	Build a new single, double, or quad pipeline inside the Potomac Interceptor to a new thickening and dewatering plant on the Carderock Naval Research Center grounds, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 8
P56	Sludge Stopper - 56	Dalecarlia to New Carderock Over Raw Water Conduit	Build a new single, double, or quad pipeline above the Great Falls raw water conduit to a new thickening and dewatering plan on the Carderock Naval Research Center grounds, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 8
P57	Sludge Stopper - 57	Dalecarlia to New Carderock Inside Raw Water Conduit	Build a new single, double, or quad pipeline inside the Great Falls raw water conduit to a new thickening and dewatering plan on the Carderock Naval Research Center grounds, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 8
P58	Sludge Stopper - 58	Dalecarlia to FCWA Corbalis Via Little Falls	Build a new single, double, or quad pipeline across the Potomac at Little Falls dam, to the FCWA Corbalis Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7
P59	Sludge Stopper - 59	Dalecarlia to FCWA Corbalis Via Chain Bridge	Build a new single, double, or quad pipeline across the Potomac at the Chain Bridge, to the FCWA Corbalis Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P60	Sludge Stopper - 60	Blue Plains Via Potomac Channel	Build a new single, double, or quad pipeline and lay it in the Potomac Channel from Dalecarlia to Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5
P61	Sludge Stopper - 61	Blue Plains Via Virginia Riverbank from Little Falls Dam	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Little Falls dam, then down the Virginia riverbank to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5
P62	Sludge Stopper - 62	Blue Plains Via Virginia Riverbank from Chain Bridge	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Chain Bridge, then down the Virginia riverbank to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5
P63	Sludge Stopper - 63	Blue Plains Via Virginia Riverbank from Key Bridge	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Key Bridge, then down the Virginia riverbank to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5
P64	Sludge Stopper - 64	Blue Plains Via George Washington Parkway form Little Falls Dam	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Little Falls damn, then down the George Washington Parkway to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, stainless steel, and composite, etc.	Alternatives 4 and 5
P65	Sludge Stopper - 65	Blue Plains Via George Washington Parkway from Chain Bridge	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Chain Bridge, then down the George Washington Parkway to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5
P66	Sludge Stopper - 66	Blue plains Via George Washington Parkway from Key Bridge	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Key Bridge, then down the George Washington Parkway to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5
P68	Sludge Stopper - 68	Dalecarlia to Drained Georgetown 2	Implement plate settlers or other high efficiency technologies at Dalecarlia and/or Georgetown basins such that Georgetown 2 can be drained and the new thickening and dewatering plant built on the floor of the basin, below grade and out of site.	Section 4 of EFS

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P70	Sludge Stopper - 70	Georgetown Waterfront CSO Holding Tanks	In conjunction with the DC WASA CIP, utilize or expand upon the current 58 MG Georgetown Waterfront CSO holding tank to store the residual flushes, then dewater the holding tank in a controlled manner via new or existing pumping stations and pipeline to Blue Plains for final processing.	Alternative 5
P73	SCS Engineers-1	Barge to Bioreactor Landfill	Use new of existing outfall piping to transport residuals to the Potomac River without dewatering, and then transport via barge to a bioreactor landfill	Alternative 6
P74	SCS Engineers-2	Transport Unthickened Residuals to Blue Plains via Riverbed Pipeline	Using the existing outfall piping to transport residuals to the Potomac River without dewatering, and transport via new riverbed pipeline to Blue Plains for treatment.	Alternative 5
P75	SCS Engineers-3	Pipe in a Pipe to Blue Plains	Construct new pipeline within existing pipelines.	Alternative 5
P85	S Deschler 11/15/2004 e-mail	Store Residuals and Discharge to Potomac Interceptor During Dry Conditions	Add more storage to alt. 4 so thickened residuals can be discharged to Potomac Interceptor only during dry weather conditions.	Alternatives 4 and 5
P86	S Deschler 11/15/2004 e-mail	Transport Unthickened to Blue Plains via Pipeline, Install in Potomac Interceptor During Dry Conditions	Convey dewatered residuals from Dalecarlia to Blue Plains in a dedicated pipe. Install pipe during dry days when sewer is near empty. Relatively easy to access Potomac Interceptor.	Alternatives 4 and 5
P88	Stuart Ross 11/15/2004 e-mail		Adopt pipeline to Blue Plains alternative.	Alternative 5
P89	Attach B from M Greenwald letter dated 11/15/2004	Residuals Pipeline to Blue Plains via Metro Tunnels	Attachment B: 2. Option B - Route residuals pipeline in Metro ROWs' to Blue Plains	Alternatives 4 and 5
P90	Attach B from M Greenwald letter dated 11/15/2004	Route Residuals Pipeline to Blue Plains via Abandoned Sewer Pipeline	Attachment B: 3. Option B - Use an abandoned sewer line to route residuals pipeline to Blue Plains or WSSC Potomac WFP.	Alternatives 5 and 7
P93	Kent Slowinski 11/5/2004 e-mail	Build Residuals Facilities at Carderock	Build residuals thickening and dewatering at Carderock or move entire WTP upriver.	Alternative 8

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P94	Steve Shapiro 11/15/2004 e-mail	Capital Crescent Pipeline to CSX Railroad	Pipe residuals along Capital Crescent Trail to CSX train line rail cars in Silver Spring, MD	Alternative 8
P95	Steve Shapiro 11/15/2004 e-mail	Capital Crescent Pipeline to Blue Plains	Pipe residuals along Capital Crescent Trail to DC and connect into pipeline to Blue Plains	Alternatives 4 and 5
P96	Steve Shapiro 11/15/2004 e-mail	Tunnel from Dalecarlia WTP to Monofill	If a landfill is built - build an underground tunnel from Dalecarlia WTP to landfill	Alternative 2
P98	Steve Shapiro 11/15/2004 e-mail	Residuals Island on the Potomac	Create an island in the Potomac to store residuals	Alternative 6
P100	Steve Shapiro 11/15/2004 e-mail	Facilities at Carderock or some other Federal facility	Relocate facilities to Carderock or some other Federal facility	Alternative 8
P102	Kent Slowinski 11/5/2004 e-mail	move entire plant	Move the entire water treatment plant upriver	Alternative 8
P103	Sludge Stopper -1 (Feb. 14, 2005)	Carderock East Dewater and Thicken	Purchase or transfer the eastmost tip of the Carderock Navy Research Center form the Navy to the ACE and build the thickening and dewatering facilities there. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit. Contract haul the cake 100 feet to I-495	Alternatives 8, 57
P104	Sludge Stopper -2 (Feb. 14, 2005)	Carderock East Dewater - Thicken Carderock West	Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering faculties there. Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit. Contract haul the cake less than 100 feet to I-495	Alternatives 8, 57
P105	Sludge Stopper -3 (Feb. 14, 2005)	Carderock East Dewater - Thicken MC	Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering faculties there. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract haul the cake 100 feet to I-495	Alternatives 8, 57
P106	Sludge Stopper -4 (Feb. 14, 2005)	Carderock East Dewater - Thicken Sibley	Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract haul the cake 100 feet to I-495	Alternatives 8, 57

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P107	Sludge Stopper -5 (Feb. 14, 2005)	Carderock East Dewater - Thicken Georgetown	Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Upgrade one or more settling basins at Georgetown using plate settling or other high-efficiency process and repurpose at least one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract haul the cake 100 feet to I-495.	Alternatives 8, 57
P108	Sludge Stopper -6 (Feb. 14, 2005)	Carderock West Dewater - Thicken	Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening and dewatering facilities there. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit. Contract haul the cake less then 1 mile to I-495	Alternatives 8, 57
P109	Sludge Stopper -7 (Feb. 14, 2005)	Carderock West Dewater - Thicken MC	Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract haul the cake 1 mile to I-495	Alternatives 8, 57
P110	Sludge Stopper -8 (Feb. 14, 2005)	Carderock West Dewater - Thicken Sibley	Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract Haul the cake 1 mile to I-495	Alternatives 8, 57
P111	Sludge Stopper -9 (Feb. 14, 2005)	Carderock West Dewater - Thicken Georgetown	Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Upgrade one or more settling basins at Georgetown using place settling or other high-efficiency process and repurpose at lease one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract haul the cake 1 mile to I-495	Alternatives 8, 57
P112	Sludge Stopper -10 (Feb. 14, 2005)	Carderock West Dewater & Thicken Carderock East	Purchase of transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit. Contract haul the cake less than 100 feet to I-495	Alternatives 8, 57
P113	Sludge Stopper -11 (Feb. 14, 2005)	Rockville WTP Dewater & Thicken	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the thickening and dewatering facilities there. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 52

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P114	Sludge Stopper -12 (Feb. 14, 2005)	Rockville WTP Dewater & Thicken MC	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the thickening and dewatering facilities there. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 52
P115	Sludge Stopper -13 (Feb. 14, 2005)	Rockville WTP Dewater & Thicken Sibley	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the dewatering facilities there. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 52
P116	Sludge Stopper -14 (Feb. 14, 2005)	Rockville WTP Dewtaer and Thicken Georgetown	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the dewatering facilities there. Upgrade one or more settling basins at Georgetown using plate settling or other high-efficiency process and repurpose at least one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 52
P117	Sludge Stopper -15 (Feb. 14, 2005)	Rockville WTP Dewater & Thicken Carderock East	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the dewatering facilities there. Purchase or transfer the eastmost top of Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Carderock inside a raw water conduit. Pipe the thickened residuals from Carderock inside a raw water conduit as far as possible, the best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 8, 52
P118	Sludge Stopper -16 (Feb. 14, 2005)	Rockville WTP Dewater & Thicken Carderock West	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the dewatering facilities there. Purchase or transfer the westmost top of Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Carderock inside a raw water conduit. Pipe the thickened residuals from Carderock inside a raw water conduit as far as possible, the best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 8, 52
P119	Sludge Stopper -17 (Feb. 14, 2005)	Expand WSSC Potomac - Thicken & Dewater	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to WSSC Potomac. Thicken and dewater at WSSC Potomac. Contract haul the cake to I-495	Alternatives 7, 52
P120	Sludge Stopper -18 (Feb. 14, 2005)	Expand WSSC Potomac - Thicken & Dewater	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property to dewater. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to WSSC. Contract haul the cake to I-495	Alternatives 7, 52

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P121	Sludge Stopper -19 (Feb. 14, 2005)	Expand WSSC Potomac Dewater & Thicken Sibley	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property to dewater. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to WSSC. Contract haul the cake to I-495	Alternatives 7, 52
P122	Sludge Stopper -20 (Feb. 14, 2005)	Expand WSSC Potomac Dewater & Thick Georgetown	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property to dewater. Upgrade one or more settling basins at Georgetown using plate settling or other high-efficiency process and repurpose at least one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to WSSC. Contract haul the cake to I-495	Alternatives 7, 52
P123	Sludge Stopper -21 (Feb. 14, 2005)	WSSC Potomac Dewater & Thicken Carderock East	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property to dewater. Purchase or transfer the eastmost top of Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Carderock inside a raw water conduit. Pipe the thickened residuals from Carderock inside a raw water conduit as far as possible, the best practice to WSSC Potomac. Contract haul the cake to I-495	Alternatives 7, 8, 52
P124	Sludge Stopper -22 (Feb. 14, 2005)	WSSC Potomac Dewater & Thicken Carderock West	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property to dewater. Purchase or transfer the westmost top of Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Carderock inside a raw water conduit. Pipe the thickened residuals from Carderock inside a raw water conduit as far as possible, the best practice to WSSC Potomac. Contract haul the cake to I-495	Alternatives 7, 8, 52
P125	Sludge Stopper -23 (Feb. 14, 2005)	WSSC Potomac Dewater & Thicken Rockville	Expand the existing facilities or build a redundant facility on the WSSC Potomac property to dewater. Purchase a portion or share facilities at the Rockville WTP and build and/or expand the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Rockville inside a raw water conduit as far as possible, then best practice to Rockville. Pipe the thickened residuals from Rockville to WSSC Potomac using best practice. Contract haul the cake to I-495	Alternatives 7, 52
P126	Sludge Stopper -24 (Feb. 14, 2005)	Rockville Dewater & Thicken WSSC Potomac	Expand the existing facilities or build a redundant facility on the Rockville property to dewater. Purchase a portion or share facilities at the WSSC Potomac WTP and build and/or expand the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Rockville inside a raw water conduit as far as possible, then best practice to Rockville. Pipe the thickened residuals from Rockville to WSSC Potomac using best practice. Contract haul the cake to I-495	Alternatives 7, 52

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P127	Sludge Stopper -25 (Feb. 14, 2005)	CIA Virginia - Thicken & Dewater	Build a thickening and dewatering facility at the secure CIA property by Turkey Run in Virginia. Pipe the unthickened residuals from Dalecarlia to the CIA property across the Potomac using best practices. Thicken and dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58
P128	Sludge Stopper -26 (Feb. 14, 2005)	CIA Virginia Dewater - Thicken MC	Build a thickening and dewatering facility at the secure CIA property by Turkey Run in Virginia. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia to the CIA property across the Potomac using best practices. Dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58
P129	Sludge Stopper -27 (Feb. 14, 2005)	CIA Virginia Dewater - Thicken Sibley	Build a thickening and dewatering facility at the secure CIA property by Turkey Run in Virginia. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia to the CIA property across the Potomac using best practices. Dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58
P130	Sludge Stopper -28 (Feb. 14, 2005)	CIA Virginia Dewater - Thicken Georgetown	Build a thickening and dewatering facility at the secure CIA property by Turkey Run in Virginia. Upgrade one or more settling basins at Georgetown using plate settling or other high-efficiency process and repurpose at least one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Georgetown to the CIA property across the Potomac using best practices. Dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58
P131	Sludge Stopper -29 (Feb. 14, 2005)	CIA Virginia Dewater - Thicken Carderock East	Build a thickening facility at the secure CIA property by Turkey Run in Virginia. Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the thickened residuals from Carderock to the CIA property across the Potomac using best practices. Dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123	Alternatives 8, 57, 58
P132	Sludge Stopper -30 (Feb. 14, 2005)	CIA Virginia - Thicken Carderock West	Build a thickening facility at the secure CIA property by Turkey Run in Virginia. Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the thickened residuals from Carderock to the CIA property across the Potomac using best practices. Dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123	Alternatives 8, 57, 58
P133	Sludge Stopper -31 (Feb. 14, 2005)	FHWA Virginia - Thicken & Dewater	Build a thickening and dewatering facility at the secure FHWA property by Turkey Run in Virginia. Pipe the unthickened residuals from Dalecarlia to the FHWA property across the Potomac using best practices. Thicken and dewater on site at FHWA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58
P134	Sludge Stopper -32 (Feb. 14, 2005)	FHWA Virginia Dewater - Thicken MC	Build a thickening and dewatering facility at the secure FHWA property by Turkey Run in Virginia. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia to the FHWA property across the Potomac using best practices. Dewater on-site at FHWA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58

Table 2-2

Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P135	Sludge Stopper -33 (Feb. 14, 2005)	FHWA Virginia Dewater - Thicken Sibley	Build a thickening and dewatering facility at the secure FHWA property by Turkey Run in Virginia. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia to the FHWA property across the Potomac using best practices. Dewater on-site at FHWA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58
P136	Sludge Stopper -34 (Feb. 14, 2005)	FHWA Virginia Dewater - Thicken Georgetown	Build a thickening and dewatering facility at the secure FHWA property by Turkey Run in Virginia. Upgrade one or more settling basins at Georgetown using plate settling or other high-efficiency process and repurpose at least one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Georgetown to the FHWA property across the Potomac using best practices. Dewater on-site at FHWA. Contract haul the cake to I-495 via 193 or 123	Alternatives 8, 58
P137	Sludge Stopper -35 (Feb. 14, 2005)	FHWA Virginia Dewater - Thicken Carderock East	Build a thickening and dewatering facility at the secure FHWA property by Turkey Run in Virginia. Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the thickened residuals from Carderock to the FHWA property across the Potomac using best practices. Dewater on-site at FHWA. Contract haul the cake to I-495 via 193 or 123	Alternatives 8, 57, 58
P138	Sludge Stopper -36 (Feb. 14, 2005)	FHWA Virginia Dewater - Thicken Carderock West	Build a thickening and dewatering facility at the secure FHWA property by Turkey Run in Virginia. Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the thickened residuals from Carderock to the FHWA property across the Potomac using best practices. Dewater on-site at FHWA. Contract haul the cake to I-495 via 193 or 123	Alternatives 8, 57, 58
P139	Sludge Stopper -37 (Feb. 14, 2005)	Rock Run Treatment Plant	Build a new thickening and dewatering facility in the old Rock Run right-of-way	Alternative 8
P140	Sludge Stopper -38 (Feb. 14, 2005)	Expand Blue Plains AWWTP - Navy Research	Expand the Blue Plains AWWTP through cooperative agreement with the Naval Research Lab to allow use of their southern border. Build thickening and dewatering facilities for the entire region. Pipe either unthickened or thickened residuals from WA to Blue Plains AWWTP via best practices.	Alternatives 4 and 5
P141	Sludge Stopper -39 (Feb. 14, 2005)	Expand Blue Plains AWWTP - Potomac Levy	Expand the Blue Plains AWWTP through cooperative agreement with the Army Corps of Engineers allowing the development of a levy reaching into the Potomac using fill from Blue Plains solids removal processes. Build thickening and dewatering facilities for the entire region on this newly created levy. Pipe either unthickened or thickened residuals from WA to Blue Plains AWWTP via best practices.	Alternatives 4 and 5

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P142	Sludge Stopper -40 (Feb. 14, 2005)	Build on Non-Residentail Government Land	Build the thickening or the dewatering or both of them together, or any combination on any parcel or parcels of government controlled land, be it Federal, State, County, or District. The site must be located in the area that impacts the fewest number of people, both at the operation site, as well as any transit route for the disposal of the resulting residuals.	Alternative 8
Alternatives with a Discharge to the Potomac River				
P101	William Harrop 11/9/04 e-mail	Return to the river	Challenge provisions of NPDES permit and discharge to the river	Alternative 10
Alternatives Involving alternate uses of the Dalecarlia Reservoir				
P82	Steve Luckman 9/30/2004 e-mail	Waste Residuals Lake Alternative	Store water treatment residuals temporarily in a sectioned-off portion of the Dalecarlia Reservoir prior to processing them	Alternatives 12 to 15
Alternatives with Facilities at the McMillan WTP				
None of the public alternatives recommend constructing facilities at the McMillan WTP.				
Alternatives with Facilities at the Dalecarlia WTP				
P71	Sludge Stopper - 71	Dalecarlia Campus Alternate Sites	Only as a last resort, build the thickening and dewatering plant on the Dalecarlia property, but on one of several alternative sites further away from residential property.	Alternative 25
P72	Sludge Stopper - 72	Dalecarlia Campus Underground	Only as the very last resort, build the thickening and dewatering plan on the Dalecarlia property, but underground. Build the equipment "floors" in a shaft dug from the back lot metro fill. Dewatered cake could easily be brought to the surface via a conveyor belt. The shaft fill would be used to build a high berm surrounding the facility which would be heavily planted.	Alternative 25
P79	Alma Gates 9/30/2004 e-mail	Alternate Truck Route to Clara Barton Parkway	Alternative truck route to Clara Barton Parkway or Canal Road	Alternative 25

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P80	Brookmont meeting Request	Relocate Residuals Facilities on Dalecarlia WTP Site	Relocate residuals processing facility on the Dalecarlia WTP site	Alternative 25
P84	Lehigh Cement 9/28/2004 e-mail	Cement Disposal Alternative	Consider alternate disposal locations such as cement manufacturing plants.	Alternative 25
P87	Attach B from M Greenwald letter dated 11/15/2004	Bury Part of Residuals Facilities	Project approach suggestions: bury thickeners in ground and cover with a slab, bury truck entrance/exit from building, answer questions about residuals disposal sites	Alternative 25
P91	Attach B from M Greenwald letter dated 11/15/2004	Relocate Residuals Facilities on Dalecarlia WTP Site or elsewhere	Consider alternate sites for thickening/dewatering facilities (Carderock, Georgetown Reservoir, Unused West Filter Building, On Top of Sedimentation Basins) - Note that P91 will address facilities at Dalecarlia only. Facitlities at Georgetown and Carderock are addressed under other items.	Alternative 25
P97	Steve Shapiro 11/15/2004 e-mail	Heat Drying	Use heat drying as part of the dewatering facilities to reduce the number of trucks required per day	Alternative 25 + 26
P99	Eric Morrison 9/21/2004 e-mail	Alternate Treatment Processes	Switch to new water treatment processes that do not produce alum-associated residuals such as MIEX, GAC, ultrafiltration membranes, etc.	N/A
Raw Water Intake Improvement Options				
P67	Sludge Stopper - 67	Raw Water Intake Relocation	Regardless of the residual processing solution selected, efforts should be made to improve the quality (lower the residual content) of the raw water BEFORE it is sent to Dalecarlia. All solutions researched by FCWA for their intake should be reviewed for the Washington Aqueduct.	N/A
P76	SCS Engineers-4	Redesign Intake to Minimize Residuals Withdrawn from the River	Reduce the volume of residuals requiring management by relocating or redesigning the intake structure(s)	N/A
P77	SCS Engineers-5	Actively Manage Raw Water Intake to Reduce Residuals Withdrawn from the River	Reduce the volume of residuals requiring management through active management of raw water intake	N/A
P81	Leonard Sullivan 9/22/2004 email	Silt Removal at Great Falls	Relocate silt removal facility to Great Falls intake area	N/A

Table 2-2
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
P92	Fred Wright 11/14/2004 e-mail	Riverbank Filtration	Convert surface intake on river to well intake to reduce silt load to the plant and decommission the Little Falls Intake.	N/A
Treatment Process Optimization Options				
P69	Sludge Stopper - 69	Smart Pumping	For any or all piping solutions put forth, investigate the engineering issues associated with "smart pumping", or the co-utilization of existing pipelines for different purposes, i.e.: a pressurized sewer line could be used for primary transport, but when needed, would be temporarily converted to a residual pipeline for a day or portion thereof to drain a residual holding tank/basin with the contents being intelligently redirected at the processing plant to the most appropriate treatment facility for the contents.	N/A
P78	SCS-6	Use Alternate Coagulant to Reduce Residuals Quantities	Use alternative processes for coagulation of sediments to reduce the volume of residuals requiring management	N/A
P83	Eric Morrison 9/22/2004 e-mail	Alternate Coagulant	Switch from aluminum chloride (alum) to an alternate coagulant, such as polyaluminum chloride, to reduce the volume of residuals produced	N/A

SCREENING OF ALTERNATIVES

SECTION 3

Screening of Alternatives

This section of the Engineering Feasibility Study evaluates the alternatives and describes the specific screening process for each alternative. The screening results for the May 2004 alternatives are presented first to follow the chronological manner in which the screening occurred. The public alternatives received in both November 2004 and February 2005 are presented next and incorporate the additional technical information received subsequent to May 2004 that affects the feasibility of an alternative. All public alternatives are compared to the initial 26 alternatives received in May 2004 to assess similarity and achieve consistency in level of screening detail provided.

3.1 May 2004 Alternatives Screening

May 2004 alternatives represent the screening analysis of the initial set of 26 alternatives gathered for consideration as water treatment residuals processing options from historical residuals studies and predesign documents as well as from the public during the scoping process. These alternatives are all screened against the screening criteria presented in Section 2.3. The detailed results from screening each alternative are presented herein.

3.1.1 No Action (Alternative 1)

Alternative 1 is the “No Action” alternative. The alternative would maintain the existing practice of discharging water treatment residuals to the Potomac River. This approach cannot be implemented because an NPDES permit for Washington Aqueduct is now effectively prohibits the discharge of residuals to the river. In addition, the FFCA has been negotiated to identify the steps and time frame for Washington Aqueduct to put the needed facilities in place to come into compliance with the NPDES permit.

Although this alternative does not meet the purpose and need of the project, it represents the “base case” of current environmental conditions, by which other alternatives will be evaluated for their impacts as part of the EIS, in accordance with the requirements of NEPA. Therefore, this alternative shall be retained for further evaluation in the EIS.

3.1.2 Alternatives That Do Not Require Continuous Trucking from Dalecarlia WTP Complex (Alternatives 2–8)

Alternative 2

Process water treatment residuals at Dalecarlia WTP and dispose in Dalecarlia monofill; process Forebay residuals by current methods and periodically haul

Figure 3-1 shows the location of the two sites investigated for this evaluation.

The requirements for Alternative 2 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to Dalecarlia monofill
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to Dalecarlia monofill
Forebay	Collect Forebay residuals using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

To determine whether an onsite monofill is feasible, the amount of dewatered water treatment residuals that would be placed in the monofill over a 20-year period was calculated. The calculation assumed a linear increase in the average amount of water treated from 180 mgd in the first year to 230 mgd in the 20th year with the amount of water treatment residuals being based on 11-year-average concentrations. Using this assumption, the amount of dewatered water treatment residuals produced under average operating conditions during the 20-year period would be 781,964 cubic yards.

The monofill would require enough volume for the total quantity of residuals. Other components of the monofill are expected to include a liner, a leachate collection system, periodic cover material, and a landfill cap (to be installed at the end of the operating period). Dewatered Forebay residuals, if found to be suitable, could potentially be used as periodic cover material. A design summary is presented in Table 3-1.

TABLE 3-1
Monofill Design Summary

Parameter	Description
Area Requirement	30 acres (minimum)
Height	50 to 80 ft
Total Volume (Minimum)	1,470,000 cubic yards
Liner	60 mil HDPE (typical)
Leachate Collection System	Assumed to be required
Periodic Cover Material	Assumed to be required
Landfill Cap	To be installed as it reaches the end of it's useful life

The Washington Aqueduct property was evaluated to determine whether enough land was available for the monofill. A review of zoning and waste disposal regulations, as well as property maps, was undertaken. To prevent regulatory problems in the future, it was decided that the monofill should not straddle the District of Columbia (D.C.)–Maryland border but should be completely within one of the two jurisdictions. Consequently, each jurisdiction was considered separately.

Monofills are permitted in Maryland, pursuant to Title 26, Subtitle 4, Chapter 7, Regulation 4. A review of the property map of the Dalecarlia WTP was conducted to locate a potential site on the Washington Aqueduct property within Maryland. The review indicated that the only available land for monofill use in Maryland would be a space bounded by Mill

Creek, the Dalecarlia Reservoir, and the D.C.–Maryland border. The space was found to occupy approximately 377,121 ft^2 (8.7 acres). The rest of the land in Maryland owned by Washington Aqueduct either is already used or will be used by the existing plant, roads, the proposed thickening and dewatering facilities, Mill Creek, other Federal facilities, and the Dalecarlia Reservoir.

The available site was evaluated further to determine whether this area would be large enough to hold the volume of dewatered water treatment residuals that would be generated over a 20-year period. To approximate the maximum capacity of a proposed monofill area, a slope for the monofill's sides is assumed, and the volume was calculated as if the sides were to converge in an inverted-**V** shape. The actual volume will be slightly less than this estimate because monofills usually are relatively flat on top. The available sub parcel of land suitable for siting the monofill in Maryland is asymmetrical in shape. It was assumed that the slope to the top of the monofill would be 4:1, which is the maximum slope that could be used to control erosion by conventional means. The base of the monofill would have an area of approximately 359,200 ft^2. The sides would be approximately 600 ft long. Using the 4:1 length-to-width ratio, the height would be about 75 ft. A monofill of this size could hold 498,889 cubic yards of material. The assumed monofill footprint does not include allowances for dikes, roads, or anything else needed to build the monofill, which could reduce the amount of material it could hold. Based on this evaluation, the onsite monofill option is not a viable alternative for the Maryland site because the required monofill volume could not be constructed on the available land.

D.C. regulations were also reviewed to determine whether a monofill could be built within the District. The study concluded that D.C. waste disposal regulations (Title 8, Subtitle B, Chapter 10) prohibit, in concept, the operation of a solid waste facility in §8-1052 by private parties or individuals. However, Washington Aqueduct may be excluded from these regulations because it is a governmental entity. No other regulations pertaining to the construction of a monofill in D.C. were found. For the purposes of this evaluation, therefore, it was assumed that D.C. regulations would not prohibit the construction of a monofill by the Washington Aqueduct. Further investigation, and additional interpretation of the regulations, would be needed to verify this conclusion.

The only available land on the D.C. side of the property that is large enough for a monofill is an area just north of East Creek and east of Dalecarlia Reservoir. Dalecarlia Parkway and the D.C.–Maryland line are the other two boundaries of the area. Based on a US Geological Survey (USGS) map of the site, the area is primarily underlain by fractured bedrock, which would be very expensive to excavate. Based on this concern, it was assumed that the monofill would begin at ground elevation.

A 20-acre monofill with a 3.5:1 slope that could hold approximately 1.6 million cubic yards of material could be constructed on this portion of the site. The monofill would be approximately 50 ft above grade on the side facing the Dalecarlia Parkway and 80 ft above grade on the side facing the Dalecarlia Reservoir. The calculated volume assumes 10 percent of the volume in the monofill will be used for the liner, a leachate collection system, and for the periodic placement of cover material.

Screening Evaluation

Existing Washington Aqueduct property was evaluated to determine whether enough space was available to construct a monofill that would hold the 20-year volume of dewatered water treatment residuals. A site on Washington Aqueduct property in Maryland was not large enough to accommodate the required volume of dewatered residuals. A site was located within the District of Columbia that would satisfy the volume requirement, and comply with pertinent regulations governing the construction of monofills within the District of Columbia.

This alternative will be retained for further analysis in the EIS.

Alternative 3

Coprocess water treatment and Forebay residuals at Dalecarlia WTP and codispose in Dalecarlia monofill

If the Forebay residuals were included in the quantity of solids going to an onsite monofill, the amount of residuals would increase from that considered in Alternative 2 to 961,845 cubic yards over a 20-year operating period. This amount of residuals would still fit in the identified monofill site. The monofill would be built in the same location and with the design criteria described previously.

The requirements for Alternative 3 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to Dalecarlia monofill
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals Dalecarlia monofill
Forebay	Collect Forebay residuals using current methods	Pump residuals to Dalecarlia thickening facility along with water treatment residuals	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to Dalecarlia monofill

Screening Evaluation

This alternative involves the coprocessing of water treatment and Forebay residuals. With the exception of Alternative 26, all options involving coprocessing of Forebay residuals and water treatment residuals can be eliminated based on reliability and redundancy concerns. The Forebay residuals contain mostly grit and sand from the Potomac River, which would add a large volume of material to the amount of residuals the thickening and dewatering units that would need to be processed. The total volume of resulting dewatered residuals to be disposed of would also increase because the dewatered material would be limited to about 30 percent dry solids (with the exception of Alternative 26, which uses plasma treatment to reduce the volume of processed residuals). For the other alternatives, much higher dry solids content (with an associated decrease in volume to disposed of) can be achieved by processing the Forebay residuals by the current methods.

The characteristics of the Forebay residuals would result in increased wear on pumping and dewatering equipment, resulting in more frequent repair and replacement needs than those of similar equipment used for the processing of water treatment residuals alone. Concern over increased equipment maintenance requirements may also limit choices for the type of dewatering technology to be used for this application. Centrifuges, for example, might not be the best choice for a coprocessing application due to the potential for more frequent equipment maintenance, since centrifuge maintenance is expensive and usually includes offsite maintenance for machine and balancing work.

For this application, coprocessing of Forebay residuals with water treatment residuals is not recommended, and can be eliminated due to reliability and redundancy concerns. Based on the discussion above, all alternatives that utilize coprocessing (with the exception of Alternative 26) will not be considered further as they are inconsistent with the "Reliability and Redundancy" screening criteria.

Summary

Alternatives utilizing an onsite monofill for the disposal of water treatment residuals alone and for the disposal of coprocessed water treatment and Forebay residuals have been described in the preceding paragraphs. Since the latter involves coprocessing Forebay residuals with water treatment residuals, it has been eliminated from further consideration.

Alternative 4

Pump unthickened water treatment residuals via the Potomac Interceptor to the District of Columbia Water and Sewer Authority (DC WASA) Blue Plains Wastewater Treatment Plant; process Forebay residuals by current methods and periodically haul

This alternative eliminates truck traffic associated with residuals on the roads surrounding the Washington Aqueduct facility by conveying water treatment residuals to the Blue Plains AWWTP for further processing and disposal.

Residuals from the sedimentation basins at the Dalecarlia WTP and the Georgetown Reservoir would be collected at the Dalecarlia WTP before being pumped to the Potomac Interceptor (PI) and conveyed to Blue Plains. Residuals from the Forebay would be processed separately for onsite disposal and periodic hauling offsite, as is currently practiced.

The requirements for Alternative 4 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals into the Potomac Interceptor	Process residuals at Blue Plains with raw sewage	Transport dewatered residuals for disposal per current Blue Plains methods
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals from Dalecarlia to Potomac Interceptor	Process residuals at Blue Plains with raw sewage	Transport dewatered residuals for disposal per current Blue Plains methods
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

Screening Evaluation

For Alternative 4, the water treatment residuals would be discharged directly to the Potomac Interceptor for conveyance to Blue Plains AWWTP. The residuals would be processed with the incoming sewage. The water treatment residuals could be conveyed in either the unthickened or thickened state. Alternative 4 specifically states that unthickened residuals would be conveyed (Alternative 5 considers the thickened residuals option). The unthickened residuals would be conveyed at a dry solids content of approximately 0.5 percent. Table 3-2 summarizes the residuals quantities used for the evaluation.

TABLE 3-2
Residuals Quantities for Alternative—Unthickened Water Treatment Residuals to Blue Plains (230 mgd)

	11-Year Annual Average			Wet Year		
	Annual Average	**Max Month**	**Max Week**	**Annual Average**	**Max Month**	**Max Design**
Dry lbs/day	65,000	110,000	195,000	90,000	148,000	280,000
Dry tons/day	33	55	98	45	74	140
Gallons/day (0.5% dry solids)	1,563,100	2,640,000	4,680,000	2,160,000	3,550,000	6,720,000

Note: Forebay residuals are not included above. All values based on 7 day /week production.

Potomac Interceptor In the vicinity of the Washington Aqueduct, the Potomac Interceptor is a 96-in. diameter pipeline. It conveys sewage from the suburbs in Virginia and Maryland to Blue Plains for treatment. There is only one pipeline (no redundancy). Average flow in the vicinity of the Washington Aqueduct is about 50 mgd. Unthickened Washington Aqueduct residuals would account for 3 to 16 percent of the average Potomac Interceptor flow. Modeling of the interceptor conducted for other purposes has shown that the Potomac Interceptor has the capacity to convey current and future sewage flows, along with their associated peaks. However, peak flows can increase dramatically in wet weather due to rainfall-induced inflow and infiltration. Modeling predicts that in 2025, the Potomac Interceptor will have the capacity to handle peaks associated with the 5-year storm with an acceptable level of surcharging, but will not have the capacity to handle a 10-year storm. The discharge of residuals flows from the Washington Aqueduct to the Potomac Interceptor would need to be carefully managed in the future, especially in times of wet weather to minimize the impact on the interceptor.

At the District of Columbia line, the Potomac Interceptor becomes the Upper Potomac Interceptor Relief Sewer (UPIRS), which flows to the Potomac Pump Station. The pump station is located near the Kennedy Center and is a major DC WASA sewage-pumping station. It collects sewage from the UPIRS, and from several other sewers, and pumps all the collected flow to Blue Plains AWWTP. The pump station cannot pump all of the flow it receives because much of the older part of the District of Columbia has a combined sewer system that conveys large volumes of rainwater runoff to the pump station. The pump station is the site of one of the most active combined sewer overflows (CSOs) in the District. There are also a number of CSOs in the Georgetown area on the UPIRS.

A study of CSOs conducted as part of the DC WASA Combined Sewer System Long-Term Control Plan predicted that 43 overflows into the Potomac River associated with the pump station occurred during a 3-year study period. The estimated total CSO overflow volume associated with these events was 763 million gallons per year.

Blue Plains AWWTP The Blue Plains AWWTP is rated for about 370 mgd, and has a throughput capacity of 740 mgd. However, wet weather peaks can increase the incoming flow to 1.2 billion gallons per day. Walter Bailey, Director of Wastewater Operations at Blue Plains was interviewed for this evaluation, and much of the information below is based on his comments. While his comments do not represent an “official” or “written” response from DC WASA regarding this alternative, his comments are based on a high level of knowledge regarding the capabilities of the Blue Plains facility.

The average quantity of Washington Aqueduct water treatment residuals (33 dry tons/day) is about 10 percent of the amount of residuals generated at Blue Plains AWWTP. In some respects, DC WASA might be able to absorb this load, if it was managed carefully within the confines of daily flow and loading peaks. However, the maximum design quantity of Washington Aqueduct residuals (140 tons/day) would represent 65 to 75 percent of the typical amount of residuals generated by Blue Plains AWWTP. Blue Plains AWWTP could not process this water treatment residual loading. As was noted with a discharge to the interceptor, a large volume of storage would need to be provided (probably at Washington Aqueduct) to equalize the flow coming to Blue Plains AWWTP.

Several issues would affect DC WASA’s capabilities and capacity to handle the water treatment residuals. Presumably, most of the residuals would be settled out in the primary clarifiers. However, performance of the primary clarifiers varies because the clarifiers are subjected to hydraulic shock loads resulting from variations in influent flow rates. Residuals that do not settle in the primary clarifiers would be passed on to the secondary treatment train. The residuals contain a high percentage of inert material that would not be beneficial to biological treatment operations. The inert material is not an energy source for the microorganisms used for biological treatment and would have to be settled out in the secondary clarifiers. Secondary clarification capacity is already a major treatment bottleneck at Blue Plains AWWTP, so the higher loading associated with the water treatment residuals could further contribute to operational problems.

The residuals would ultimately be sent to the digesters for further processing, and then on to dewatering, irrespective of whether they are settled out in the primary or the secondary clarifiers. The inert content of the residuals would also be an issue for digester operation because anaerobic digestion is a biological process. Increased inert material would result in reduced volatile solids destruction—a key indicator of digester performance. DC WASA does not currently have digestion facilities for its own flow (the existing digesters have been taken out of service owing to age and performance problems). DC WASA is currently in the middle of a program to build eight new digesters that will be capable of producing a Class A digested product. However, the new digesters will not be online until about 2008.

Dewatering is the final step of the treatment process. DC WASA currently does not have any excess dewatering capacity that could be used for Washington Aqueduct residuals. However, it is possible that excess capacity will be available when the new digesters are completed in 2008. The schedule for confirming the availability of dewatering capacity at Blue Plains is no sooner than mid-2005.

Reliability and Redundancy. As mentioned above, the unthickened residuals would have a solids concentration of about 0.5 percent, on a dry solids basis. The resulting volume of residuals (in gallons) would be about four times greater than that of the same dry weight of residuals thickened to 2 percent. This volume could have an impact on the reliability and redundancy of the Potomac Interceptor, due to its limited capacity to carry peak flows. There would also be an impact on treatment facilities at both the Washington Aqueduct and the Blue Plains AWWTP.

An onsite thickening facility would be of benefit to Washington Aqueduct as a means of providing control for the solids-collection processes to provide a more consistent residuals product for dewatering. The thickeners would also serve as an important location for temporarily holding solids should there be a downstream problem with the interceptor or at Blue Plains.

Based on the discussion above, it can be concluded that the DC WASA facilities at Blue Plains would have difficulty processing Washington Aqueduct's residuals with the incoming sewage due to the high solids loading of the residuals, the variability in both Washington Aqueduct residuals and DC WASA raw sewage flows, and ongoing process and equipment issues at Blue Plains. These difficulties could impact the ability of the receiving facility to achieve its permit limits.

Economic Considerations. The economic impact of discharging Washington Aqueduct's residuals into the Potomac Interceptor was not calculated. However, the cost would likely be considerable. Additional flow into the Potomac Interceptor would exacerbate the existing DC WASA CSO problem. The Combined Sewer System Long Term Control Plan has identified $250 million in improvements to solve the existing problems in Potomac River portion of the conveyance system, including the rehabilitation of the Potomac Pumping Station, the consolidation of CSOs in the Georgetown waterfront area, and the construction of a 58-million-gallon Potomac Storage Tunnel. While DC WASA is actively working on this program, the Long Term Control Plan is so extensive that the implementation period has been identified as having a duration of 15 to 40 years.

At the Blue Plains facility, impacts were identified for most of the major treatment processes:

- Primary clarification
- Biological treatment and secondary clarification
- Anaerobic digestion
- Dewatering

Because of the number of processes impacted, and the complexities of the programs that are currently underway to address treatment and capacity issues at the plant, a detailed cost estimate for the impact of the discharge of residuals to Blue Plains through the Potomac Interceptor was not developed for this evaluation. Using a conservative estimate of $5 to $10 to construct a gallon of treatment capacity (assuming that biological treatment can be excluded), and assuming that treatment capacity for at least an additional 4 mgd would be required (the approximate difference between Washington Aqueduct average and peak flows), then it could be assumed that an impact of between $20 million to $40 million could be established. This impact would not include the cost of residuals collection and thickening facilities at the Washington Aqueduct. In addition, Washington Aqueduct would need to provide extensive storage and flow equalization facilities to help minimize the impact of residual flows on the existing CSO situation and on treatment processes at Blue Plains. Since these costs are at least equal to the costs of providing processing facilities at the Washington Aqueduct, this option can be eliminated based on economic considerations.

Zoning, Land Use, Institutional Constraints, and other Federal and Local Regulations. The discharge of water treatment residuals to the Blue Plains AWWTP via sewer would have major impacts on the treatment processes at the receiving facility. In many communities, the discharge of water treatment residuals to the sewer system is a common practice. However, the representative of DC WASA that was contacted for this evaluation indicated that operations staff already has difficulties adjusting treatment processes to accommodate the current highly variable flow and load conditions. Therefore, discharge to the sewer system is not feasible at this facility.

Previous work conducted by Whitman Requardt & Associates evaluated this option in detail. As part of the previous effort, the District of Columbia Department of Public Works (the entity that operated Blue Plains before the creation of DC WASA) stated that this alternative was not acceptable to their agency. In response to a more recent request by another jurisdiction for the discharge of biosolids into the Potomac Interceptor, DC WASA cited Section 4, Paragraph 3 of District of Columbia Order No 64-1680 (Regulations for use of the Potomac Interceptor), which prohibits "sludges or other materials from sewage or industrial waste treatment plants or from water treatment plants" from being discharged to the District of Columbia sewer system.

Therefore, Alternative 4 can be eliminated from further consideration as inconsistent with this screening criterion, based on discussions with DC WASA, and on past responses to requests of this nature.

Summary

Alternative 4 was described in detail in the preceding paragraphs. As noted above, this alternative was eliminated from further consideration because it is inconsistent with the screening criteria for "Reliability and Redundancy," "Economic Considerations," and "Zoning, Land Use, Institutional Constraints, and other Federal and Local Regulations."

Alternative 5

Thicken water treatment residuals at Dalecarlia WTP, then pump via a new pipeline to DC WASA Blue Plains Wastewater Treatment Plant; process Forebay residuals by current methods and periodically haul

As Alternative 5 was originally envisioned, Washington Aqueduct residuals would be discharged directly to the Potomac Interceptor for conveyance to Blue Plains. The residuals would be coprocessed with the incoming sewage. Alternative 5 specifically states that thickened residuals would be conveyed to Blue Plains. Alternative 4 is similar, however, unthickened residuals would be sent to Blue Plains for that alternative. The thickened residuals would be conveyed at a dry solids content of approximately 2.0 percent, resulting in much less flow that the unthickened residuals in Alternative 4. Table 3-3 summarizes the residuals quantities used for the evaluation.

TABLE 3-3
Residuals Quantities for Alternative 5

	11-Year Annual Average			Wet Year		
	Annual Average	Max Month	Max Week	Annual Average	Max Month	Max Week
Dry lbs/day	65,000	110,000	195,000	90,000	148,000	280,000
Dry tons/day	33	55	98	45	74	140
Gallons/day (2.0% dry solids)	390,000	660,000	1,170,000	540,000	890,000	1,680,000

Note: Forebay residuals are not included above. All values based on 7 day/week production.

While a much reduced volume of residuals would be discharged to Blue Plains under Alternative 5, this alternative suffers from the same problems as Alternative 4 (impacts on the interceptor system and the Blue Plains AWWTP, potential discharge to the Potomac River through CSOs, etc.). Therefore, this option would also need to be eliminated under the screening criteria used for this evaluation.

An alternative approach that might make conveyance of residuals to Blue Plains acceptable would be to provide a separate pipeline route to completely isolate the water treatment residuals from the sewage. The simplest approach would have a new, dual pipeline following the existing route for the Potomac Interceptor. This approach would eliminate the CSO concerns and allow the residuals to be bypassed around most of the treatment processes at Blue Plains (i.e., primary clarifiers, biological treatment and secondary clarifiers, digesters).

For this alternative, the residuals would likely be blended into the Blue Plains biosolids flow stream after the anaerobic digestion process. Several options for processing the residuals could be envisioned:

- The residuals could be blended with the digested biosolids so that the two residuals streams could be dewatered together
- The residuals could be dewatered separately and then blended with the dewatered biosolids; an evaluation could be conducted to determine whether there was any benefit to blending the two residuals streams (i.e., a beneficial reuse residuals product could possibly be developed for a specialized purpose, such as mine reclamation, etc.)
- The residuals could be dewatered separately and disposed of separately

Because of the volume reduction and level of storage and control provided by thickeners, as well as the resulting decrease in required pipeline diameter, it is recommended that the residuals be thickened at the Dalecarlia WTP before being pumped to DC WASA for dewatering.

As modified per the above, Alternative 5 would now consist of the following major elements:

- Thicken water treatment residuals at the Dalecarlia WTP
- Pump via a new, dual pipeline (for redundancy) to Blue Plains
- Process Forebay residuals by current methods and periodically haul

The requirements for Alternative 5 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening facility Pump thickened residuals to Blue Plains via a new dual pipeline	Thicken collected residuals at Dalecarlia Process thickened residuals at Blue Plains	Transport dewatered residuals for disposal per current Blue Plains methods
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening facility Pump thickened residuals to Blue Plains via a new dual pipeline	Thicken collected residuals at Dalecarlia Process thickened residuals at Blue Plains	Transport dewatered residuals for disposal per current Blue Plains methods
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

Screening Evaluation

The most direct route to Blue Plains from the Washington Aqueduct would be to follow the existing route for the Potomac Interceptor. A second pipeline along this route would be feasible in concept. However, permitting and construction for this pipeline would be a major undertaking. Much of the route passes through government property administered by the National Park Service, and the route passes important monuments and through the

Naval Research Laboratory and Bolling Air Force Base. The National Park Service does not allow unlimited access to the route and has very strict rules about activities on its property.

As noted above, the isolation of Washington Aqueduct's residuals flow stream from the incoming sewage would lessen the impact on treatment operations at Blue Plains, and would allow for greater flexibility and more options for the dewatering of the residuals. The impact of the residuals on dewatering operations at Blue Plains must still be evaluated.

DC WASA currently has seven centrifuges that are each capable of processing 50 dry tons/day. An ongoing project is underway to add seven more units for a total capacity of 500 dry tons/day (10 units in service and four units out of service). When the new digesters are completed in 2008, DC WASA may only need to operate half of it's installed dewatering capacity due to the greatly increased digester performance (i.e., volatile solids destruction) that is expected upon completion of this project.

To compensate for the current shortfall in biosolids processing capacity, DC WASA has contracted with an outside vendor (i.e., KF Environmental) to provide contract dewatering operations at a cost of $85/dry ton. Walt Bailey, of DC WASA, said that the firm is very reliable and cost effective because they are paid only according to the amount of biosolids they can process. They do not get paid if their equipment is out of service. Their operation is located outdoors, and they currently have seven belt filter presses (BFPs) and two centrifuges onsite.

DC WASA is considering construction of a drying facility as part of another major ongoing project—the digester gas utilization project. The drying facility would also be capable of producing a Class A product. This project will be structured, in some manner, as a privatization project (i.e., design-build-operate, etc.), although plans for the project are not yet finalized. Biosolids that would go to the dryer would possibly not be digested in order to preserve the organic solids content of the biosolids. Consequently, DC WASA might not have the excess dewatering capacity mentioned above if a drying facility were added at Blue Plains.

Since DC WASA is in the midst of implementing a major program to reliably produce a Class A biosolids product, a careful evaluation would need to be conducted to determine whether the blending of DC WASA biosolids with the water treatment residuals would cause the dewatered DC WASA biosolids to lose its Class A rating. The Class A rating will be based on the use of an EPA-approved process (Temperature Phased Anaerobic Digestion). If the process were changed by blending with dewatered water treatment residuals, DC WASA might need to implement an extensive testing program to prove that the blended product still meets the Class A standards.

The impact of the water treatment residuals on the rating of the dewatered DC WASA biosolids would depend on the biological activity of the residuals (presumed to be slight) and the metals content of the residuals. There might also be a potential to create a customized product (for mine reclamation, etc.) by blending the residuals and the biosolids.

Summary

Alternative 5, as originally envisioned, would discharge Washington Aqueduct residuals to the Potomac Interceptor for conveyance to Blue Plains. This alternative is similar to

Alternative 4, which was determined to be not feasible. Consequently, Alternative 5, as originally described, is not feasible.

A modification to Alternative 5 that would convey Washington Aqueduct residuals to Blue Plains for processing via a separate pipeline was developed and described above. The advantage of this alternative is that it would have less impact on the treatment operations at Blue Plains. In addition, it would have no impact on operation of the existing conveyance facilities. In principle, this alternative appears to be feasible. However, implementation of this option would involve the largest directional drilling project envisioned to date and major permitting effort, which may ultimately limit the feasibility of this alternative, and be difficult to complete within the FFCA milestone schedule.

In addition, DC WASA's biosolids operations are currently undergoing major change as part of an ongoing improvement program. While various possibilities can be envisioned for the processing of Washington Aqueduct's residuals at Blue Plains, there is an extremely high level of uncertainty associated with any of these ideas due to the complexity of the biosolids improvements program and the current level of uncertainty and change associated with the biosolids operations at Blue Plains. A more detailed evaluation would be required before any conclusion can be reached on the potential for using existing or future facilities at Blue Plains.

For the purposes of this evaluation, it can only be assumed that additional facilities would need to be provided at Blue Plains. These facilities would essentially be the same dewatering facilities that would be provided at the Dalecarlia WTP under several of the other alternatives. Washington Aqueduct would then either need to staff these facilities, or develop a contract operations arrangement with DC WASA or a private contractor.

In summary, Alternative 5 (as modified herein) appears to be feasible, based on the screening criteria used for this evaluation. A more detailed evaluation has been conducted as part of the Environmental Impact Statement to determine whether this alternative can be implemented.

Alternative 6

Thicken water treatment residuals at Dalecarlia WTP, then transport by barge to DC WASA Blue Plains Wastewater Treatment Plant; process Forebay residuals by current methods and periodically haul

This alternative eliminates truck traffic associated with residuals on the roads surrounding the Washington Aqueduct treatment facility by transporting residuals via barge to the Blue Plains AWWTP for further processing and disposal. The use of barges would allow the water treatment residuals to be handled separately from the incoming wastewater. The residuals could either be processed with the Blue Plains biosolids or be processed separately.

A Technical Memorandum that describes the nautical aspects of this alternative in detail is included in Appendix B. This description of the alternative draws heavily on the Technical Memorandum. Nautical maps from the National Oceanic and Atmospheric Administration (NOAA), the U.S. Coast Pilot for the Potomac River, and discussions with representatives of regulatory agencies and marine contractors were consulted to prepare the memorandum.

The approximate distance along the Potomac River from the Washington Aqueduct to Blue Plains is 9.7 nautical miles (nm). There is an existing dock at the Blue Plains AWWTP. It is not currently in regular use, and may require dredging, the construction of unloading facilities, and other improvements before it could be used on a regular basis for this purpose. There are no dock or barge loading facilities near the Washington Aqueduct or at Georgetown. Tourist boats currently travel upriver as far as the Key Bridge (approximately 3.2 nm below the Washington Aqueduct) before returning downstream. Consequently, this alternative would likely require construction of barge facilities at Georgetown. An alternative site would be further upriver near the Washington Aqueduct. To load the barges, pipelines would have to be routed to either Georgetown (along the Capital Crescent Bike Path or the C&O Canal) or directly to the shoreline below the Georgetown Reservoir.

To implement this alternative, residuals from the Dalecarlia sedimentation basins and the Georgetown Reservoir would be collected and thickened at the Dalecarlia WTP before being loaded onto barges on the Potomac River for transport to Blue Plains. To minimize the volume requiring transport, the residuals would be thickened to about 2 percent solids using gravity thickeners (see Table 3-3). Residuals from the Forebay would be processed separately for onsite disposal, as is currently practiced.

Once the residuals arrive at Blue Plains, they could either be pumped to existing solids-handling processes, or they could be handled through a completely separate system. This aspect of the operation would have to be negotiated with DC WASA. The need for the construction of new facilities at Blue Plains has not been determined, but would depend on how Blue Plains wanted to process the materials.

The requirements for Alternative 6 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening facility Transport thickened residuals to Blue Plains by barge	Thicken collected residuals at Dalecarlia Process thickened residuals at Blue Plains	Transport dewatered residuals for disposal per current Blue Plains methods
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening facility Transport thickened residuals from Dalecarlia to Blue Plains by barge	Thicken collected residuals at the Dalecarlia Process thickened residuals at Blue Plains	Transport dewatered residuals for disposal per current Blue Plains methods
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

Two alternate approaches to barging the materials were investigated. The first involved the use of two single hopper barges. Each barge would have a hopper volume of approximately 1,150,700 gallons and would be about 328 ft long, 52 ft wide, and have a 9-ft draft. Each barge would be capable of holding the maximum weekly volume of thickened residuals.

The approach would allow one barge to be filled each day while the second barge was being emptied, based on a 5-day-per-week operating schedule. Discussions with maritime contractors indicated that it was not safe to handle barges of this size and weight in areas such as those along the proposed route, which have limited water depth and bridge clearances.

An alternative approach could use approximately eight smaller barges to transport the material. Each barge would be about 150 ft long, 40 ft wide, and have a 7-ft draft. These barges could carry approximately 295,000 gallons each and a liquid load weight of approximately 2.48 million pounds (1,250 tons). Barges of this type could safely navigate the channel between Marbury Point at Blue Plains and the Key Bridge.

Other significant maritime-related issues that would affect the feasibility of this option include the following:

- Significant manpower and facility requirements would be required for loading, unloading, and transit of six barges in each 24-hour period, 5 days per week, along with the coordination and scheduling of the shipments.
- Locations in the river to safely stand-down one or more barges to allow opposing barge traffic to pass would have to be identified.
- Facilities at each end of the transit route would have to accommodate two to four barges for weekends and periods when environmental conditions or security issues make the river unnavigable for this operation.
- Alternate means of handling or storing the liquid residual would be required during periods when environmental conditions or security issues make the river unnavigable for this operation.

Screening Evaluation

As a result of this Feasibility Study, this alternative has been eliminated from further consideration based on the following screening factors:

- Reliability and redundancy
- Zoning, land use, institutional constraints, and other Federal and local regulations
- Proven methods

Reliability and Redundancy. The Potomac River is part of a large, but narrow watershed, which is subject to floods, swift currents caused by ice and snowmelts, tropical storms, and other phenomena associated with the weather. The channel above the Key Bridge is shallow, rocky, and particularly dangerous. It is currently negotiated only by small craft, such as canoes, kayaks, rowboats, and small fishing boats. Consequently, it would be impossible to bring barges beyond Georgetown without embarking on a significant dredging operation to widen and deepen the channel.

Barges traveling between Blue Plains and Georgetown would have to navigate eight individual bridges (the 14th Street Bridge Complex, the Memorial Bridge, and the Key Bridge). Detailed information on the bridges, as well as other navigational constraints are summarized below:

- Arlington Memorial Bridge: clear width of 80 ft with vertical clearance of 30 ft.
- The 14th St. Bridge Complex: clear width of 104 ft with vertical clearance of 18 ft above Mean High Water (MHW) resulting in maximum air draft of 14 to 16 ft for barge/pushboat operation.
- Obstructions (old stone bridge piers) at 10 ft below Mean Low Water (MLW) just north of Key Bridge.
- Minimum water depth of 10 ft below MLW resulting in maximum water draft of 7 ft for barge/pushboat operation.
- Transit distance of 6.5 nm with maximum speed of 5 knots for 4.1 nm from Key Bridge to Hains Point and 8 knots for 2.4 nm from Hains Point to the Blue Plains plant at Marbury Point.
- One-way transit time estimated to range from 1.5 to 2.5 hours for small barge/push boat operation making only 2.5 knots against the current.
- Average ebb and flood currents of approx. 0.6 knots from Key Bridge to Hains Pt. and up to 1 knot from Hains Point to Marbury Point.
- Transit above Key Bridge to the Washington Aqueduct facility, a distance of 3.2 nm, is currently unsafe for navigation for all but very limited recreational craft such as kayaks and canoes.

A barge operation to transport residuals between the Washington Aqueduct and the Blue Plains AWWTP appears to pose a high and possibly unacceptable level of risk to reliability and redundancy due to navigational difficulties associated with the route. This risk is magnified by the number of barges per day, the volume of liquid that would be loaded on each barge, and the human element associated with operating, loading, unloading, and docking of the barges at two sites.

Zoning and Land Use. The Zoning Map for the District of Columbia (2003) shows all of the riverfront land above 37th Street as being government owned. Presumably, District of Columbia Zoning does not necessarily govern the use for this land. Most of this land is currently part of the Chesapeake & Ohio (C&O) Canal National Historic Park, which runs along the Potomac River for 184 miles from Cumberland, Maryland, to Georgetown. The park is administered by the National Park Service.

The park contains perpetual easements for utilities, and pipelines, conduit, tunnels, etc. However, the existing facilities are relatively unobtrusive in nature. Many, such as the Potomac Interceptor, were in existence before the park was created.

According to the General Plan for the park (1976), one of the purposes of the park is to "enjoy the recreational use of the canal, the parklands, and the Potomac River." The General Plan further states that two of the management objectives for the park are:

- Preserve the atmosphere of past times and enduring beauty and safeguard historic remains and features.

- Impart to visitors an understanding and appreciation of the historic way of life blended into the natural setting of the Potomac Valley.

With the exception of a small piece of land at Georgetown Harbor, which is designated to be for "Mixed Use," all of the land on the Potomac River waterfront is designated on the District of Columbia Generalized Land Use Map as "Parks, Recreation, and Open Space." These uses are fully compatible with the purposes and management objectives of the C&O National Historic Park described above.

More recently, the National Capital Planning Commission (NCPC) published a plan for the Georgetown Waterfront Park (1987). Some of the key features of the plan include the following:

- Create a passive public park along the river
- Create a shoreline promenade
- Maintain river views
- Provide limited docking for transient boats (east of Wisconsin Avenue)
- Establish boating area (nonmotorized)
- Acquire railroad right-of-way (Georgetown spur) for bike path
- Provide floating restaurant
- Preserve and interpret archeological resources
- Preserve the natural scenic values of the Palisades

The plan specifically states that development should end no further than 1,100 ft west of Key Bridge to preserve the natural appearance of the Palisades area of the shoreline.

The vision for the Georgetown Waterfront Park has been largely unrealized due to a lack of funding. However, the plan was recently affirmed by the NCPC in a report entitled *Washington's Waterfronts* (1999). Additional ideas discussed in this report include the establishment of a water taxi service to provide access to Georgetown and improvements to the Kennedy Center to provide a direct pedestrian connection to the river.

The industrial-scale barging operation that would be necessitated by this alternative is not compatible with current and proposed land uses or the purpose and objectives of the C&O National Historic Park, and the vision for future land uses in the area. If the route of the barging operation were to extend beyond the Key Bridge, the barging operation would have major impacts on the park and its operation.

Proven Methods. The barging operation would also violate the "Proven Methods" screening criterion. While there is commercial maritime traffic in Washington Harbor, there is no existing barging operation, per se, in the Georgetown Channel, or in the Washington Harbor. Washington does not have a "modern era" maritime tradition, such as that of other large cities where barging operations can be seen (e.g., Boston, New York, Baltimore, Pittsburgh, or Norfolk).

To initiate such an operation would involve a major commitment of planning, permitting, engineering, and financial resources. In addition, the risks associated with the reliability and redundancy of such an operation are clear. Consequently, the concept is "unproven."

Summary

Alternative 6 (barging residuals to the Blue Plains AWWTP) was described in detail in the preceding paragraphs. As noted above, this alternative can be eliminated from further consideration because it is inconsistent with the screening criteria for "Reliability and Redundancy," "Zoning, Land Use, Institutional Constraints, and Other Federal and Local Regulations," and "Proven Methods."

Alternative 7

Thicken water treatment residuals at Dalecarlia WTP, then pump via pipeline to neighboring water utility; process Forebay residuals by current methods and periodically haul

Residuals from the Dalecarlia sedimentation basins and the Georgetown Reservoir would be collected and thickened at the Dalecarlia WTP before being conveyed to either the Washington Suburban Sanitary Commission (WSSC)'s Potomac Water Filtration Plant (WFP) or to Fairfax Water Authority (FWA)'s Corbalis WTP. As with most other alternatives, the residuals would be thickened to approximately 2 percent dry solids before being conveyed to the offsite facility. Forebay residuals would be processed onsite in accordance with to current methods, and periodically hauled offsite for disposal.

The requirements for Alternative 7 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening facility Pump thickened residuals to WSSC or FWA facility	Thicken collected residuals at Dalecarlia Dewater thickened residuals at WSSC or FWA	Dispose of dewatered residuals with residuals from host facility
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening facility Pump thickened residuals from Dalecarlia to WSSC or FWA facility	Thicken collected residuals at Dalecarlia Dewater thickened residuals at WSSC or FWA	Dispose of dewatered residuals with residuals from host facility
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

Preliminary routes for pipelines to both the WSSC Potomac WFP and the FWA Corbalis WTP were developed for the screening evaluation. The Potomac WFP is located on the Potomac River approximately 12.5 miles upstream from the Dalecarlia WTP. A pipeline could be routed between these two plants by using either (1) existing roadways, or (2) the C&O Canal. An alignment along existing roadways is not desirable due to the extensive number of easements that would be required along the pipeline route. In addition, the only reasonably direct route consists mostly of major roadways, such as River Road.

Construction in major roadways can involve significant permitting issues, would be very expensive, and causes additional inconvenience to businesses and residents.

An alignment along the C&O Canal is also potentially challenging. The property is government owned, but an easement would be required from the National Park Service, which administers the park. Environmental permitting would likely be very complex. The route is not entirely direct, but overall this is expected to be the most feasible route.

The Corbalis WTP is in Herndon, Virginia. A review of pipeline routes leads to a similar conclusion as for the Potomac Plant. The route chosen follows the Canal as described above and crosses the Potomac near the location of the Corbalis Plant's intake. From there the new pipe would be built within the easement for the intake pipe. The route would be approximately 22.5 miles with a 0.6-mile river crossing.

Screening Evaluation

As a result of this Feasibility Study, this alternative has been eliminated from further consideration based on the following screening factors:

- Economic considerations
- Zoning, land use, institutional constraints, and other Federal and local regulations

Economic Considerations. Order-of-magnitude cost estimates for routing the pipelines according to the preliminary pipeline routes along the C&O Canal to each optional destination were developed. The pipelines would be sized for the maximum weekly flow (1.17 mgd). To provide an appropriate level of reliability and redundancy, it was assumed that two pipelines would be provided. High-density polyethylene (HDPE) was assumed for the pipeline material. In an attempt to provide an affordable project, two approaches to sizing the pipelines were evaluated. The first approach would provide 100 percent redundancy (i.e., each pipeline would be sized for the entire maximum weekly flow). An alternate approach would provide two pipelines that were each sized for 50 percent of the maximum weekly flow.

For the route to the WSSC Potomac WFP, two 12-in. pipelines and one booster pump station would be needed for the 100 percent redundancy alternative. The order-of-magnitude cost for this pipeline would be approximately $15.7 million. For the 50 percent redundancy alternative, two 8-in. pipelines and two booster pump stations would be required. The order-of-magnitude cost for this alternative would be approximately $8.5 million. For either design approach, the cost is less than the screening criteria requirement that would eliminate this option based on cost (i.e., 30 percent of the $50 million budget).

For the route to the FWA Corbalis WTP, two 12-in. pipelines and one booster pump station were be needed for the 100 percent redundancy alternative. The order-of-magnitude cost estimate for this pipeline is $26.1 million. For the 50 percent redundancy option, two 10-in. pipelines and one booster pump station would be required. The order-of-magnitude cost estimate for this pipeline is $18 million. The cost estimates for both options are greater than the screening criteria for cost (i.e., 30 percent of the $50 million budget). Therefore, this option can be eliminated based on cost.

Land Use, Zoning, Institutional Constraints, and Other Federal and Local Regulations. Washington Aqueduct has contacted officials at both WSSC and FCWA. Washington

Aqueduct was told that it's residuals could not be processed at either the WSSC Potomac WFP or at the FCWA Corbalis Plant. In general, it is not part of the "mission" for either facility to process residuals from another jurisdiction, or become a regional facility. Consequently, this alternative must be eliminated as inconsistent with the "Institutional Constraints" screening criteria.

Summary

Alternative 7 was eliminated from further study as inconsistent with the screening criteria for "Economic Considerations" (for the FCWA alternative) and "Land Use, Zoning, Institutional Constraints, and Other Federal and Local Regulations" (both locations).

Alternative 8

Thicken water treatment residuals at Dalecarlia WTP and pump via pipeline to new dewatering location; process Forebay residuals by current methods and periodically haul

Water treatment residuals from the Dalecarlia sedimentation basins and the Georgetown Reservoir would be collected and thickened at the Dalecarlia WTP before being conveyed by a pipeline to a new residuals treatment facility in the D.C. Metro area. To minimize the volume of residuals requiring conveyance, the residuals would be thickened to a concentration of about 2 percent dry solids before conveyance. Forebay residuals would continue to be processed according to current methods.

The requirements for Alternative 8 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from the existing sedimentation basins	Pump residuals to Dalecarlia thickening facility Pump thickened residuals to new offsite dewatering facility	Thicken the collected residuals at Dalecarlia Dewater the thickened residuals at offsite facility	Contract haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening facility Pump thickened residuals from Dalecarlia to a new dewatering facility	Thicken collected residuals at Dalecarlia facility Dewater the thickened residuals at offsite facility	Contract haul dewatered residuals to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

Approximately 10 acres will be required for the offsite facility, although it may be possible to configure the facility into a smaller space. The location for the new facility would attempt to minimize the distance of the pipeline as well as the need for hauling by truck on local roads. A location close to Dalecarlia would accomplish the former, and a location near a major highway would accomplish the latter.

One important factor in the development of this alternative is that a pipeline alignment within existing rights of way may not be desirable due to the extensive number of easements that would be required along the pipeline route. In addition, the only reasonably direct routes consist mostly of major roadways. Construction within major roadways requires significant additional permitting efforts, is more expensive, is an inconvenience to residents and businesses, and would take more time to permit, design, and construct.

Therefore, cross-country routes were considered. Two options include the C&O Canal and the Capital Crescent Trail. These alignments also pose difficulties. Easements would be required from the National Park Service and other entities. In the case of the C&O Canal, environmental permitting would likely be more complex. Despite these potential difficulties, these were considered to be two of the more feasible routes.

Available land suitable for construction of a new dewatering facility is extremely scarce in the area. A review of nonresidential (commercial and industrial) land values in the Bethesda and Silver Spring areas along the Capital Crescent Trail indicates current values of at least $1 million per acre. Industrial land is available in more distant locations, such as Chantilly, Springfield, or Woodbridge, Virginia. However, these communities are at least 20 miles from the Dalecarlia WTP, and the cost to construct a pipeline to these areas would be prohibitive, as was found in the evaluation of the cost for a pipeline to the Corbalis WTP, as described above for Alternative 7.

Alternatives to industrial land acquisition are also possibilities. The David Taylor Model Basin (U.S. Naval Reservation) is located approximately five miles upstream on the C&O Canal. However, due to ongoing projects at that site, acreage is likely not available for this project.

Screening Evaluation

As a result of this Feasibility Study, this alternative has been eliminated from further consideration based on the following screening factors:

- FFCA schedule requirements
- Economic considerations

FFCA. This alternative would violate the FFCA screening criteria because of the additional time required to identify and obtain a site for the new residuals treatment facility and a route for the pipeline to convey the residuals to the new facility. To initiate such an effort would involve a major commitment of planning, permitting, engineering, and financial resources. The project would be unable to meet the FFCA schedule, which is summarized below

- May 28, 2004: The Corps shall complete an alternatives evaluation and a disposal study. The purpose of the alternatives evaluation and disposal study shall be to identify a range of engineering and/or best management practices to achieve compliance with the numeric discharge limitations set forth in the NPDES permit.

- December 20, 2004: The Corps shall complete and submit to EPA an analysis of engineering and/or best management practices. This may be a draft EA or a draft EIS.
- June 3, 2005: The Corps shall identify in a notice to EPA the engineering/BMPs it will implement to achieve compliance with the NPDES Permit and a schedule for implementing the identified engineering/BMPs as expeditiously as practicable, consistent with best engineering judgement.
- March 1, 2008: The Corps shall exercise best efforts, consistent with best engineering judgement, to achieve compliance with the numeric discharge limitations set forth in the NPDES permit at one or more of the sedimentation basins.
- December 30, 2009: Achieve full compliance with the numeric discharge limitations at all basins.

The elements of this alternative which jeopardize the ability to meet the FFCA schedule are identifying and obtaining a site for the new residuals treatment facility, as well as the pipeline route from Dalecarlia to the new facility. The evaluation process would involve the steps outlined in Table 3-4:

TABLE 3-4
Site and Route Evaluation for Alternative 8

Action	Time Required
1. Develop investigation process, including methods of public input	1 month
2. Determine site search area	1 month
3. Develop initial screening criteria for site selection, such as: – Size – Proximity to highways – Pipeline routes – Ownership issues – Permittability – Zoning	1 month
4. Collect baseline information on sites and routes within the site search area	2 months
5. Identify potential sites and routes	1 month
6. Develop detailed screening criteria	1 month
7. Screen potential sites based on detailed screening criteria to obtain a reasonable range of alternatives	1 month
8. Develop conceptual designs, impact evaluation, force main routing, and cost estimates for the alternatives.	2 months
9. Select site and force main route	1 month
10. Incorporate into overall alternatives evaluation and draft EIS	1 month
Total time required	**12 months**

Because of the nature and content of the EIS, it would not be possible to conduct the site and route evaluation process concurrently with the preparation of the EIS. Even if the offsite evaluation outlined in Table 3-4 were fast-tracked and completed in 8 months instead of 12. The current schedule calls for the overall alternatives analysis to be submitted to EPA in October 2004, while an 8-month offsite evaluation cannot be completed before the end of November. This would preclude the ability of the Corps to meet the December 20, 2004, deadline. The implementation schedule for this alternative would also jeopardize the goal of reaching the March 1, 2008, deadline.

Obtaining the selected site (whether by purchase or by lease) and confirming approvals and easements for the selected force main route could easily add three to twelve months to the implementation process, during which additional planning, permitting, and design work could be advanced only with increased risk.

Economic Considerations. Cost estimates for routing a pipeline to the offsite location were developed using the same approach as that used for Alternative 7. The pipeline would be sized for the maximum weekly flow (1.17 mgd). To provide an appropriate level of reliability and redundancy, it was assumed that two pipelines would be provided. HDPE was assumed to be the pipeline material. In an attempt to provide an affordable project, two approaches to sizing the pipelines were evaluated. The first approach would provide 100 percent redundancy (i.e., each pipeline would be sized for the entire maximum weekly flow). An alternate approach would provide two pipelines that were each sized for 50 percent of the maximum weekly flow.

For the route to the offsite location, a 10-mile distance was assumed. As mentioned above, this would allow the pipeline to be built either along the C&O Canal or along the Capital Crescent Trail. A particular location for the offsite dewatering facility was not identified for this evaluation, but these two routes would allow the pipeline to end near the beltway to the west and to the north. Two 12-in. pipelines and one booster pump station would be needed for the 100 percent redundancy alternative. The order-of-magnitude cost for this pipeline would be approximately $29.5 million, including $10 million for land purchase costs. For the 50 percent redundancy alternative, two 8-in. pipelines and two booster pump stations would be required. The order-of-magnitude cost for this alternative would be approximately $25.5 million, including the cost to purchase the land.

For either design approach, the cost is inconsistent with the screening criteria requirement that would eliminate this option based on cost (i.e., 30 percent of the $50 million budget for additional facilities beyond residuals collection, thickening, and dewatering).

Summary

Alternative 8 was described in the preceding paragraphs. As noted above, this alternative can be eliminated from further consideration because it is inconsistent with the screening criteria for the "FFCA" and "Economic Considerations."

3.1.3 Alternatives with a Discharge to the Potomac River (Alternatives 9–11)

Alternative 9

Process most WTP residuals at Dalecarlia WTP and haul offsite, but dilute some residuals for discharge back to Potomac River; process Forebay residuals by current methods and periodically haul

In order to discharge in accordance with the NPDES permit, dilution water will need to be added to the water treatment residuals collected from the sedimentation basins since the water treatment residuals total suspended solids (TSS) concentration will be much greater than the 30 mg/L TSS concentration allowed in the permit. Only discharge water from the Dalecarlia Reservoir can be used for dilution water because the TSS concentration in the raw water from the river frequently exceeds the concentration of TSS allowed by the permit. The concentration of the Dalecarlia Reservoir discharge water ranges from about 16 mg/L to 316 mg/L, depending upon the weather conditions, with an annual concentration average of 16 to 25 mg/L. Thus, even the water from the reservoir cannot be used for dilution under many situations.

The requirements for Alternative 9 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump portion of residuals to Dalecarlia thickening facility Pump portion of residuals to Dalecarlia storage and dilution facility (10% assumed)	Thicken and dewater portion of collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location Discharge diluted residuals to Potomac River
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals from Dalecarlia to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir	Pump residuals to Dalecarlia WTP thickening facility	Thicken and dewater collected residuals at Dalecarlia thickening facility	Haul dewatered residuals to offsite disposal facility every 7 years

To determine whether this alternative is feasible, the amount of dilution water potentially needed was calculated, assuming that the average concentration of TSS in water at the discharge end of Dalecarlia Reservoir was approximately 16 mg/L. It is important to note that the concentration is greater than 16 mg/L most of the time, and much greater during the maximum week, month, or day for the year.

For purposes of this calculation, it is assumed that only 10 percent of the total volume of residuals will be diluted and discharged to the Potomac River. The remainder of the residuals would be processed onsite and hauled offsite for disposal. With this assumption, the minimum amount of water that would need to be added to dilute 10 percent of the solids generated on an average day is 53 million gallons per day, or approximately 23 percent of the 230-mgd annual average design-year production capacity of the plant.

Screening Evaluation

As a result of this Feasibility Study, this alternative has been eliminated from further consideration as inconsistent with the following screening factors:

- Reliability and redundancy
- NPDES permit

Reliability and Redundancy. Because the TSS concentration of the reservoir discharge water is too high to use as dilution water for much of the time, this approach could not be used on a daily basis. A potentially significant volume of residuals storage (i.e., several days worth) would need to be provided to make this approach feasible.

Essentially, the use of Dalecarlia Reservoir water for the dilution of water treatment residuals reduces the potential production capacity of the facilities. Water that is used for dilution cannot be used to produce potable water. In addition, Washington Aqueduct would eventually need to remove the additional accumulation of silt that would occur in the Forebay and reservoir as a result of this operation.

NPDES Permit. The purpose of this project is to reduce or eliminate the discharge of water treatment residuals from Washington Aqueduct to the Potomac River, and that purpose will not be met by discharging residuals to the river, even if it is only a portion of the residuals and they are diluted.

Summary

Alternative 9, river discharge per permit, can be eliminated because the dilution approach is inconsistent with the reliability and redundancy screening criteria due to the variable water quality in the river and the reservoir. This approach is also not in accordance with the purpose and need of the project, as embodied in the NPDES permit.

Alternative 10

Renegotiate NPDES Permit to allow discharge of all residuals to Potomac River

Alternative 10 involves the renegotiation of the NPDES permit limits, to allow constituents such as TSS and aluminum to be discharged at higher discharge concentrations than are allowable by the current permit. The result could potentially reduce the amount of residuals Washington Aqueduct has to process. The permit, however, is final, and an agreement has been reached (the FFCA) defining an implementation period. Several years of negotiation were involved in finalizing the permit and developing the FFCA. It is not possible to negotiate the permit again. Thus, Alternative 10 is not viable. Even if Washington Aqueduct attempted to negotiate a new permit, the project would most likely not meet the agreed-upon FFCA schedule.

The requirements for Alternative 10 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Renegotiate NPDES Permit to discharge all water treatment residuals to the Potomac River			
Georgetown Reservoir	Renegotiate NPDES Permit to discharge all water treatment residuals to the Potomac River			
Forebay	Collect Forebay residuals from reservoir	Pump residuals to Dalecarlia WTP thickening facility	Thicken and dewater collected residuals at Dalecarlia thickening facility	Haul dewatered residuals to offsite disposal facility every 7 years

Alternative 11

Process water treatment residuals at Dalecarlia WTP and haul offsite; process Forebay residuals by current methods and periodically haul; dilute treatment side streams and discharge to the Potomac River

This alternative includes the same residuals processing facilities that are included in many of the alternatives discussed in this Feasibility Study (i.e., thickening, dewatering, etc.), with the exception that the liquid waste stream from the dewatering processes would be discharged to the Potomac River.

As with Alternative 9, the TSS concentration of the discharge stream must be compared to the NPDES permit to determine whether the liquid waste can be directly discharged. Centrifuges or belt filter presses will likely be used to dewater the residuals. Based on a mass balance for the residuals flows, developed using typical solids capture design criteria, the TSS concentration in the liquid waste from the thickeners and centrifuges is predicted to be at or below approximately 260 mg/L and 860 mg/L, respectively. Both concentrations are well above the 30-mg/L limit allowed in the permit. Therefore, dilution is required to make this alternative feasible.

As with Alternative 9, only discharge water from the Dalecarlia Reservoir can be used as dilution water because the river water has a highly variable TSS concentration. If the residuals from the thickeners and centrifuges were combined into one waste stream, a minimum 40 mgd of reservoir water would need to be added as dilution water to allow the residuals to be discharged to the river under the best-case reservoir discharge conditions. This flow would be equivalent to 18 percent of the annual average design-year production capacity of the plant. Higher dilution water flow rates would be required during peak residual production periods. As with Alternative 9, clean reservoir water would need to be stored to provide dilution water during maximum-day, -month, or -week (i.e., high-TSS) events.

The requirements for Alternative 11 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening facility Pump Thickener overflow and centrate to onsite storage and dilution facility	Thicken and dewater portion of collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location Discharge diluted thickener overflow and centrate to Potomac River
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals from Dalecarlia to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

Screening Evaluation

As a result of this Feasibility Study, this alternative has been eliminated from further consideration based on the following screening factors:

- Reliability and Redundancy
- NPDES Permit

Reliability and Redundancy. The TSS concentration of the reservoir is highly variable, and cannot be reliably used as dilution water. Consequently, this option is not feasible, and inconsistent with the reliability and redundancy criteria. The Washington Aqueduct would need to use a significant portion of its potential production capacity for the dilution operation, reducing the overall reliability of its drinking water production capability.

NPDES Permit. The purpose of this project is to reduce or eliminate the discharge of water treatment residuals from Washington Aqueduct to the Potomac River, and that purpose would not be met by discharging residuals to the river, even if it is only a portion of the residuals.

Summary

Alternative 11, processing of residuals at the Dalecarlia WTP with a liquid discharge of residuals sidestreams to the Potomac River is inconsistent with the "Reliability and Redundancy" and "NPDES Permit" screening criteria. This alternative can be eliminated as unreliable due to the variable quality of the river water. In addition, Dalecarlia Reservoir water that used for the dilution of residuals would reduce Washington Aqueduct's overall reliability by reducing its potential to produce water.

In addition, this approach would not meet the purpose and need of the project and the intent of the NPDES Permit, which is to eliminate discharges to the Potomac River.

3.1.4 Alternatives Involving Alternate Uses of the Dalecarlia Reservoir (Alternatives 12–15)

The four alternatives discussed in this section all use the Dalecarlia Reservoir in some manner, either as a location for the storage of WTP residuals, a location for treatment facilities, or as part of a treatment process.

Alternative 12

Store all residuals in the Dalecarlia Reservoir prior to processing at the Dalecarlia WTP; coprocess Forebay and water treatment residuals; dispose in Dalecarlia and McMillan monofills

This alternative converts Dalecarlia Reservoir into a storage basin for residuals. The stored residuals, including those from the Forebay, would then be thickened and dewatered at the Dalecarlia WTP, and disposed of at monofills on Washington Aqueduct property at the Dalecarlia and McMillan WTPs.

The requirements for Alternative 12 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia Reservoir	Thicken and dewater collected residuals at Dalecarlia facility	Haul dewatered residuals to monofills on Dalecarlia and McMillan sites
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia Reservoir	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to monofills on Dalecarlia and McMillan sites
McMillan WTP				Haul dewatered residuals to monofill on the McMillan site
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia facility	Haul dewatered residuals to Dalecarlia and McMillan monofills

Alternative 13

Store all residuals in the Dalecarlia Reservoir prior to processing at the Dalecarlia WTP; coprocess Forebay and water treatment residuals and haul to offsite disposal

As with Alternative 12, Alternative 13 involves the storage of residuals in the Dalecarlia Reservoir and the coprocessing of Forebay and water treatment residuals at the Dalecarlia WTP. However, disposal of residuals in this alternative is done via contract hauling from Dalecarlia WTP. In Alternative 12, the processed residuals would be disposed of in monofills at both the Dalecarlia and McMillan WTPs.

The requirements for Alternative 13 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia Reservoir	Thicken and dewater collected residuals at Dalecarlia facility	Haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia Reservoir	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to a permitted offsite location

Alternative 14

Construct new sedimentation basins at the Dalecarlia Reservoir and process all residuals at Dalecarlia WTP; coprocess Forebay and water treatment residuals and haul to offsite disposal

Alternative 14 involves the construction of new sedimentation basins within the Dalecarlia Reservoir and the coprocessing of Forebay and water treatment residuals at the Dalecarlia WTP. This would allow the Georgetown Reservoir to be abandoned, or used strictly as a backup facility. The residuals would then be disposed of via contract hauling.

The requirements for Alternative 14 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from new sedimentation basins	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Abandon Georgetown Reservoir; all coagulation to occur at Dalecarlia			
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to a permitted offsite location

Alternative 15

Coagulate all flow in the Dalecarlia Reservoir and process all residuals at the Dalecarlia WTP; coprocess Forebay and water treatment residuals and haul to offsite disposal

For this alternative, coagulation chemicals would be added directly to the Dalecarlia Reservoir. The reservoir would be dredged on a regular basis and the residuals would be coprocessed with the Forebay residuals at the Dalecarlia WTP. The residuals would then be disposed of via contract hauling to an offsite location.

The requirements for Alternative 15 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Add Coagulant at Dalecarlia Booster Station; Coagulate in the Dalecarlia Reservoir Dredge the Dalecarlia Reservoir	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Abandon Georgetown Reservoir; all coagulation to occur at Dalecarlia			
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location

Screening Evaluation of Alternatives 12–15

Each of these alternatives includes the coprocessing of Forebay residuals with water treatment residuals. This approach has been eliminated from further consideration as inconsistent with the “Reliability and Redundancy” screening criteria.

In addition, these alternatives all make some use of the Dalecarlia Reservoir, resulting in an additional loss of reliability in terms of storage volume and potentially in terms of water quality. The Dalecarlia Reservoir acts as a sedimentation basin to dampen the large swings in turbidity that occur in the Potomac River, stabilizing the quality of the water to be treated by the Dalecarlia and McMillan WTPs. Without the reservoir to serve this purpose, more sediment will need to be removed by the sedimentation basins within the plant. Chemical doses and treatment requirements will also be much more irregular, resulting in significant impacts to the operations and maintenance costs of the plant.

Alternative 15 will impact maintenance costs more than the other three alternatives as the addition of coagulant at the beginning of the reservoir will require additional dredging of the reservoir. This will stir up settled material in the reservoir, degrade water quality, and impact downstream treatment processes within the plant.

3.1.5 Alternatives with Facilities at the McMillan WTP (Alternatives 16–23)

Eight identified alternatives with residuals processing facilities at the McMillan WTP were evaluated. The specifics of the alternatives differ widely. However, they all share a common element—a residuals pipeline would need to be installed within the Washington City Tunnel to convey residuals from the Dalecarlia WTP and Georgetown Reservoir sites to the McMillan WTP.

Since the residuals pipeline would have a critical bearing on the feasibility of these alternatives, the feasibility evaluation was based primarily on the feasibility of the pipeline. Each of the eight alternatives is described briefly in the paragraphs below. The feasibility evaluation for the pipeline follows the alternatives description.

Alternative 16

Thicken water treatment residuals at the McMillan WTP and dewater at an existing wholesale customer's treatment facility; contract haul dewatered residuals; process Forebay residuals by current methods and periodically haul

This alternative eliminates truck traffic associated with residuals on the roads surrounding the Washington Aqueduct facility by conveying water treatment residuals by pipeline to an existing facility for further processing and disposal.

Residuals from the Dalecarlia Sedimentation Basins and the Georgetown Reservoir would be collected and thickened at the McMillan WTP before being conveyed to an existing facility for further processing. Presumably, the existing facility would be owned and operated by an existing wholesale customer, such as the Blue Plains AWWTP (owned by DC WASA) or the Arlington County Water Pollution Control Plant. The City of Falls Church, another Washington Aqueduct customer, does not have any existing facilities. Residuals from the Forebay would be processed separately for onsite disposal followed by periodic hauling offsite, as is currently practiced.

The requirements for Alternative 16 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to McMillan thickening facility Pump thickened residuals to Blue Plains, Arlington, or Falls Church dewatering facility	Thicken collected residuals at McMillan facility Dewater thickened residuals at Blue Plains, Arlington, or Falls Church facility	Contract haul dewatered residuals from host facility to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to McMillan thickening facility Pump thickened residuals to Blue Plains, Arlington, or Falls Church dewatering facility	Thicken collected residuals at McMillan facility Dewater thickened residuals at Blue Plains, Arlington, or Falls Church facility	Contract haul dewatered residuals from host facility to a permitted offsite location
McMillan WTP	Collect combined Dalecarlia and Georgetown Reservoir water treatment residuals	Pump residuals to McMillan thickening facility Pump thickened residuals to Blue Plains, Arlington, or Falls Church dewatering facility	Thicken collected residuals at McMillan Dewater thickened residuals at Blue Plains, Arlington, or Falls Church facility	Contract haul the dewatered residuals from host facility to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Contract haul dewatered residuals to offsite disposal facility every 7 years.

Alternative 17

Coprocess Forebay and water treatment residuals at the McMillan WTP and dispose of residuals via contract hauling from McMillan WTP

This alternative eliminates truck traffic associated with residuals on the roads surrounding the Washington Aqueduct facility by conveying all residuals by pipeline to an existing facility for further processing and disposal. Residuals from the Dalecarlia Sedimentation Basins, Georgetown Reservoir, and Forebay would be collected and conveyed to the McMillan WTP for thickening and dewatering. The dewatered residuals would then be hauled to an offsite location for disposal.

As described previously, coprocessing of Forebay residuals with water treatment residuals is not consistent with the screening criteria for reliability and redundancy and is not recommended. Therefore, Alternative 17 can be removed from further consideration.

The requirements for Alternative 17 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to McMillan thickening facility	Thicken and dewater collected residuals at McMillan	Contract haul dewatered residuals from McMillan to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to McMillan	Thicken and dewater collected residuals at McMillan	Contract haul dewatered residuals from McMillan to a permitted offsite location
McMillan WTP	N/A	Pump water treatment residuals from Dalecarlia WTP and Georgetown Reservoir to McMillan thickening facility	Thicken and dewater collected residuals at McMillan	Contract haul dewatered residuals to a permitted offsite location
Forebay	Collect water treatment residuals from reservoir using current methods	Pump Forebay residuals to McMillan thickening facility	Thicken and dewater collected residuals at McMillan	Contract haul dewatered residuals to a permitted offsite location

Note: Alternative 17 is the same as Alternative 18 with coprocessing.

Alternative 18

Process water treatment residuals at the McMillan WTP and haul offsite; process Forebay residuals by current methods and periodically haul

This alternative eliminates truck traffic associated with residuals on the roads surrounding Dalecarlia by conveying water treatment residuals by pipeline to the McMillan WTP thickening, dewatering, and disposal. Residuals from the Dalecarlia Sedimentation Basins and the Georgetown Reservoir would be collected and thickened and dewatered at the McMillan WTP. Residuals from the Forebay would be processed separately for onsite disposal and periodic hauling to an offsite location, as is currently practiced.

The requirements for Alternative 18 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to McMillan thickening facility	Thicken and dewater collected residuals at McMillan	Contract haul dewatered residuals from McMillan to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to McMillan	Thicken and dewater collected residuals at McMillan	Contract haul dewatered residuals from McMillan to a permitted offsite location
McMillan WTP	Collect Dalecarlia and Georgetown Reservoir water treatment residuals	Pump residuals to McMillan	Thicken and dewater collected residuals at McMillan	Contract haul dewatered residuals to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years.

Alternative 19

Thicken water treatment residuals at the McMillan WTP and dewater at an existing wholesale customer's treatment facility; dispose of residuals via contract hauling from the existing facility; discharge Forebay residuals to the Potomac River

This option is similar to Alternative 16 because water treatment residuals would be conveyed to the McMillan WTP for thickening. The thickened residuals would then be conveyed to an existing wholesale customer's facility (i.e., Blue Plains, Arlington, or Falls Church) for further processing. This alternative differs from Alternative 16 in the way by which the Forebay residuals are handled. Residuals from the Forebay would be discharged to the Potomac River for this alternative.

Because of the discharge to the Potomac River, this alternative can be eliminated from further consideration because it is inconsistent with the screening criteria for the "NPDES Permit," which does not authorize residuals discharges to the river.

The requirements for Alternative 19 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to McMillan Pump thickened residuals to Blue Plains, Arlington, or Falls Church dewatering facility	Thicken collected residuals at McMillan Dewater thickened residuals at Blue Plains, Arlington, or Falls Church facility	Contract haul dewatered residuals from host facility to a permitted offsite location

Location	Collection	Conveyance	Processing	Disposal
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to McMillan Pump thickened residuals to Blue Plains, Arlington, or Falls Church dewatering facility	Thicken collected residuals at McMillan Dewater thickened residuals at Blue Plains, Arlington, or Falls Church facility	Contract haul dewatered residuals from host facility to a permitted offsite location
McMillan WTP	Collect Dalecarlia and Georgetown Reservoir water treatment residuals	Pump residuals to McMillan Pump thickened residuals to Blue Plains, Arlington, or Falls Church dewatering facility	Thicken collected residuals at McMillan Dewater thickened residuals at Blue Plains, Arlington, or Falls Church facility	Contract haul dewatered residuals from host facility to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to Potomac River	None	None

Alternative 20

Thicken water treatment residuals at the Dalecarlia WTP and the Georgetown Reservoir and dewater at the McMillan WTP; dispose of water treatment residuals via contract hauling from McMillan WTP; process Forebay residuals by current methods and periodically haul

This alternative would provide thickening facilities at both the Dalecarlia WTP and the Georgetown Reservoir. The thickened residuals would then be pumped to the McMillan WTP for additional processing. Compared to the previously discussed McMillan alternatives, this alternative has the advantage of providing a "wide spot" to equalize residuals flow in the thickeners. It also reduces the volume of flow that would need to be pumped to the McMillan WTP, resulting in a corresponding decrease in pipeline diameter and cost.

The requirements for Alternative 20 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening facility Pump thickened residuals to McMillan dewatering facility	Thicken collected residuals at Dalecarlia facility Dewater thickened residuals at McMillan	Contract haul dewatered residuals from McMillan to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Georgetown thickening facility Pump thickened residuals to McMillan	Thicken collected residuals at Georgetown Dewater thickened residuals at McMillan	Contract haul dewatered residuals from McMillan to a permitted offsite location

Location	Collection	Conveyance	Processing	Disposal
McMillan WTP	Collect thickened Dalecarlia and Georgetown Reservoir water treatment residuals	Pump residuals to McMillan	Dewater residuals at McMillan	Contract haul dewatered residuals to offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

Alternative 21

Store residuals in lagoons at the Forebay, Dalecarlia WTP, and McMillan WTP; thicken and dewater residuals with portable equipment and dispose via contract hauling from all locations

This alternative would provide storing, thickening and dewatering residuals simultaneously at three separate locations: Forebay, Dalecarlia WTP, and McMillan WTP. The dewatering operations would be accomplished through the use of portable equipment (i.e. via contract dewatering services with standard dewatering equipment).

The requirements for Alternative 21 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia storage lagoon	Thicken and dewater collected residuals at Dalecarlia with portable equipment	Contract haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to McMillan storage lagoon	Thicken and dewater collected residuals at McMillan with portable equipment	Contract haul dewatered residuals to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to Dalecarlia storage lagoon	Thicken and dewater collected residuals at Dalecarlia with portable equipment	Contract haul dewatered residuals to a permitted offsite location

Alternative 22

Store water treatment residuals in Dalecarlia and Georgetown Reservoirs, prior to thickening and dewatering at the Dalecarlia and McMillan WTPs; dispose of water treatment residuals via contract hauling from the Dalecarlia and McMillan WTPs; process Forebay residuals by current methods and periodically haul

This alternative would provide storing of residuals in both the Dalecarlia and Georgetown Reservoirs. Thickening and dewatering of residuals will be provided at two separate locations, Dalecarlia and McMillan WTPs. Contract hauling operations are used for disposing of residuals from both locations.

The requirements for Alternative 22 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Add coagulant at Dalecarlia Lift Station Collect water treatment residuals from existing sedimentation basins Dredge Dalecarlia Reservoir	Pump collected residuals to the Dalecarlia Reservoir Pump dredged residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to McMillan Reservoir	Thicken and dewater dredged residuals at McMillan facility	Contract haul dewatered residuals to a permitted offsite location
McMillan WTP	Dredge the McMillan Reservoir	Pump dredged residuals to the McMillan thickening facility	Thicken and dewater dredged residuals at McMillan	Contract haul dewatered residuals to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years.

Alternative 23

Store water treatment residuals in McMillan Reservoir prior to dewatering at the McMillan WTP; dispose of water treatment residuals via contract hauling from the McMillan WTP; process Forebay residuals by current methods and periodically haul

This alternative would include conveying residuals from Dalecarlia and Georgetown Reservoir to McMIllan WTP through City Tunnel. Prior to dewatering residuals will be temporarily stored in the McMillan Reservoir prior to dewatering at McMillan WTP. Contract hauling operations are used for disposing of residuals.

The requirements for Alternative 23 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to McMillan Reservoir	Thicken and dewater dredged residuals at McMillan facility	Contract haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to McMillan Reservoir	Thicken and dewater dredged residuals at McMillan	Contract haul dewatered residuals to a permitted offsite location
McMillan WTP	Dredge the McMillan Reservoir	Pump dredged residuals to the McMillan thickening facility	Thicken and dewater dredged residuals at McMillan	Contract haul dewatered residuals to a permitted offsite location

Location	Collection	Conveyance	Processing	Disposal
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

Washington City Tunnel and Alternatives 16–23

All of the alternatives that would locate thickening and/or dewatering facilities to be constructed at the McMillan WTP would require a pipeline to be installed within the Washington City Tunnel. Figure 3-2 provides an overview of the construction details for the tunnel. The installation of this pipeline would be a major project, and as such, warrants some serious consideration. The feasibility of each proposed alternative with a portion of residuals processing at McMillan WTP, depends, in part, on the feasibility of the installation of a residuals pipeline with the Washington City Tunnel. As with other alternatives involving the construction of offsite pipelines, surface construction is not feasible due to the cost and time needed to obtain easements and the cost and difficulty of construction in major urban streets.

The Washington City Tunnel conveys water from the Georgetown Reservoir to the McMillan WTP. The tunnel is approximately 21,000 ft long, and was built between the years of 1883 and 1901. The 12-ft-diameter entrance shaft at the west end is 65 ft deep, and the 12-ft-diameter shaft at the McMillan end is 165 ft deep. A booster pump is installed at the McMillan end of the tunnel. The pump propeller is located at a depth of about 100 ft.

The lowest elevation of the tunnel is 29.45 ft below the Washington Aqueduct datum, at the point where the tunnel passes below Rock Creek. A 48-in.-diameter tunnel blow off is installed at Rock Creek at Elevation 14.0.

At the center, the tunnel is approximately 9 ft tall. The volume of the tunnel, not considering the shafts, is approximately 11.4 million gallons. There are several airshafts along the length of the tunnel. Four of the airshafts have pipe diameters of about 6 in. However, the shafts at Rock Creek and Champlain Avenue are about 6 ft in diameter.

Generally, the tunnel is built in an inverted-**U** shape and is lined with three rings of brick on the sides and top, backed by rubble masonry fill. Some of the lower walls have rock lining. The section under Rock Creek is lined with iron. In 1908, cracks and bulges were found in one section of the tunnel that had been constructed with a lowered bottom invert. About 1,600 ft of this section were reinforced with steel jacks, placed from side to side in the tunnel. The jacks were later replaced with concrete jacks in 1928. Other sections may have been lined with concrete in the years following completion of the tunnel. According to Mays (1992), the tunnel was dewatered in 1910, 1927, 1945, and 1967. It may not have been dewatered for at least 25 years, according to Washington Aqueduct staff. The tunnel is dewatered infrequently due to the difficulty of dewatering the tunnel and the desire to keep the McMillan plant in operation.

Installation of a Residuals Pipeline within the City Tunnel

As noted above, the installation of a pipeline within the City Tunnel to convey WTP residuals to the McMillan WTP for processing would be a major project. The specifics of the pipeline installation are described in the paragraphs below.

To minimize the risk of pipe failure and the resulting negative outcomes, dual double-walled pipelines, consisting of a carrier pipe within a containment pipe are recommended for this installation. The dual pipelines would provide redundancy, and the containment piping would provide an additional measure of reliability. Several pre-engineered dual containment piping systems are available in the marketplace. HDPE dual-containment piping would likely be recommended for this application due to its durability, reliability, flexibility, and chemical resistance. Pipe joints are connected by butt fusion welding techniques. Welded joints are inherently more reliable than mechanical joints because the joints are as strong as the pipe itself. Mechanical joints have a higher probability of leaking due to installation failures, or pipe settlement.

To determine the feasibility of this application, representatives from two major HDPE piping manufacturers were contacted. The information provided below is largely based on discussions with these manufacturer's representatives. Both the internal pressure of the fluid being conveyed and the outside pressure of the material surrounding the pipe must be taken into consideration to properly design the pipeline. For the purposes of this evaluation, it was assumed that a carrier pipe dimensional ratio of 11 would be sufficient. This piping would be rated for a working pressure of approximately 160 psi.

Two advantages of HDPE piping are that it is relatively flexible and that it has a high tensile strength. To install HDPE piping in the field, individual sections of piping are often welded together in a staging area, or on the ground above a trench. The connected sections can then be pulled into place using a cable and winch assembly. This installation approach is generally much faster than installation by conventional methods. The approach could be adapted to install the pipelines in the tunnel, as described below.

Staging areas would likely be installed at each end of the tunnel. Individual sections of piping, in 20-, 40-, or 50-ft lengths would be lowered to the bottom of the shafts, where they would be butt-fusion welded to each other and pulled into the tunnel. If 20-ft lengths were used, approximately 1,050 welds would be needed for each pipeline over the 21,000-ft length of the tunnel. For piping of this size, approximately 2,000 to 3,000 ft of piping could be welded together and dragged as one unit. The butt-fusion-welding equipment would then have to be moved into the tunnel to connect the long sections into one continuous pipeline.

Self-propelled, gasoline powered fusion welding machines are normally used to connect the individual sections of HDPE piping. Because the tunnel would be a confined space, with little natural ventilation, the machines would need to be converted to electric power. Generators (located at the surface of the shafts and electric cabling would then be used to power the machines). The machines are relatively compact, and could be partially disassembled to move around obstructions, such as the concrete braces that were installed within the tunnel, if required.

Once the pipeline is installed, it will have to be held down to prevent flotation in the tunnel. Three methods are typically used: **U**-bolt pipe brackets, concrete collars or weights, and continuous concrete encasement of the piping. Due to the age and unknown condition of the tunnel, concrete collars or encasements would probably be recommended to fix the pipelines to the bottom of the tunnel.

Careful planning and logistics are the keys to success on projects of this sort. Specialty contractors who have experience with tunnels and the installation of HDPE piping have the highest probability of completing a project of this sort successfully. The exact schedule for completing the work would depend on the type, quality, and quantity of equipment and the methods used by the contractor. Contractor preselection, performance specifications, or design-build might be appropriate approaches to consider for this type of project.

One manufacturer's representative estimated that the entire project might take 9 to 12 months, depending factors such as the setup time required, the difficulty and amount of dewatering required, the logistics of working onsite and gaining access to the tunnel, the condition of the tunnel, the environmental conditions within the tunnel, and the time needed to complete the concrete work. A conservative estimate for the duration of the project is 24 months, about twice as long as the maximum duration estimated by the vendor. The actual duration is dependent on the factors described above and the number of resources (i.e., crews and shifts) that can be put to work at any one time.

Screening Evaluation

As a result of this Feasibility Study, all alternatives involving the installation of a pipeline in the City Tunnel have been eliminated from further consideration as inconsistent with the following screening factors:

- FFCA
- Reliability and Redundancy
- Economic Considerations
- Proven Methods

FFCA. The FFCA requires that one or more sedimentation basins must be in compliance with NPDES permit No. DC 0000019 by March 1, 2008, and full compliance must be achieved by December 30, 2009. The compliance schedule associated with the FFCA anticipates that a 3-year construction period will be needed to build the facilities required to fully comply with the NPDES permit, commencing in January, 2007.

Construction in the Washington City Tunnel would add a significant level of complexity, and a number of interdependencies, to the overall construction project because it would require that the Georgetown Reservoir and the McMillan WTP be out of service for the entire period of time that construction was occurring in the City Tunnel. During this time, all production would need to occur at the Dalecarlia WTP, and work on the four Dalecarlia sedimentation basins would likely need to be deferred (or be completed before the work in the tunnel could be started).

With a maximum total finished water capacity of 320 mgd (220 mgd for the Dalecarlia WTP and 100 mgd for the McMillan WTP), and a peak historical demand of 260 mgd during the summer months, capacity reduction during the peak season must be limited to 60 mgd to ensure that demand for finished water can be met. Since the estimated duration of construction for the pipeline in the tunnel is 12 to 24 months, then all production needs for the Washington Aqueduct system would need to be met at the Dalecarlia WTP for one to two thirds of the total 3-year construction schedule, and for one or two periods of heavy seasonal demand.

There may also be impacts on the distribution system from taking the McMillan WTP out of service for such a long period of time.

Reliability and Redundancy. Since the City Tunnel carries coagulated water to the McMillan WTP for filtration and disinfection, reliability and redundancy of the residuals pipeline installation are important considerations. Washington Aqueduct operations and maintenance staff place a high priority on ensuring that the tunnel remains in operation. The tunnel is the only means of providing the McMillan WTP with coagulated water. As the only such conduit, it is already somewhat of a risk to reliability. A failure of the residuals pipeline could result in both the contamination of a major portion of the water supply (i.e., 100 mgd of the system's filtration capacity is located at the McMillan WTP) and the inability to operate the residuals processing facilities located at the McMillan WTP.

While the use of double-walled pipe minimizes the potential for pipeline failure, and the installation of dual pipelines would allow one pipeline to be taken out of service, neither measure would minimize the impact of a pipeline (or tunnel) failure. Since the tunnel is rarely taken out of service, it would be extremely difficult to regularly inspect the residuals pipeline. Both manufacturers noted that instrumentation to monitor the annular space in the containment piping was notoriously unreliable.

Economic Considerations. As described above, the installation of a pipeline within the City Tunnel would be a major undertaking. Eight alternatives were identified that would convey residuals to the McMillan WTP for processing. The pipe diameter of the pipeline would vary, depending on the materials to be conveyed under each alternative. The most conservative approach would be to provide a completely redundant pipeline, so that one line could be taken out of service without also taking the residuals processing facilities out of service. This approach would result in somewhat larger pipeline diameter requirements and corresponding higher costs. Because residuals flows can vary significantly, pipelines sized for peak flow could suffer from problems due to low velocity during times of low flow.

A less conservative, but still acceptable approach would be to size the pipelines for 50 percent redundancy. That is, two pipelines would be provided, but each would be optimally sized for only 50 percent of the peak flow. This approach will result in some cost savings and will minimize the potential problem of low velocity at low flows. Because of the 21,000-ft length of the tunnel, an aboveground installation would likely include a booster pump station to minimize the pumping pressure requirements. A booster pump station cannot be provided for this installation because of the inaccessibility of the pipeline.

Table 3-5 summarizes the estimated pipeline diameter for each of the McMillan alternatives and for each of the two design approaches.

TABLE 3-5
Preliminary Pipe Diameters for Carrier Pipe to Convey Water Treatment Residuals to the McMillan WTP

No.	Material Pumped	Max Flow (gpm)	100% Redundancy Diameter (in.)	50% Redundancy Diameter (in.)
16, 18, 19, 23	Unthickened Water Treatment Residuals Only	4,700	16	14
17	Water Treatment Residuals plus Forebay Residuals	NA	NA	NA
20	Thickened Water Treatment Residuals Only	1,170	12	10
21, 22	Unthickened Water Treatment Residuals from Georgetown Reservoir Only	700	8	6

Notes: Alternative 17 was eliminated from consideration as inconsistent with reliability and redundancy screening criteria. The coprocessing of Forebay residuals with water treatment residuals is not recommended.

For the purposes of this evaluation, cost estimates were developed for the two pipeline options for Alternative 20, which appears to be the most practical alternative of all those involving the McMillan WTP . For Alternative 20, the water treatment residuals would be thickened at the Dalecarlia WTP and Georgetown Reservoir sites before being pumped to the McMillan WTP for dewatering. The estimated carrier pipe diameters were 12 in. for the 100 percent redundant installation and 10 in. for the 50 percent redundant installation. The estimated cost for the dual containment pipelines were $22,208,000 and $18,761,000, respectively. The cost for both options is greater than 30 percent of the estimated project budget used in this evaluation as the economic screening criteria.

Due to the large financial investment that would be required to build a residuals pipeline in the City Tunnel, all alternatives involving the McMillan WTP can be eliminated based on economic considerations.

Proven Methods. The two HDPE piping manufacturers contacted felt that construction of a residuals pipeline within the City Tunnel was feasible. Given the fact, however, that the tunnel has not been dewatered for inspection in many years, the actual condition of the tunnel is currently unknown. Consequently, the feasibility of building such a pipeline is in question.

For this reason, and until a thorough inspection and evaluation of the condition of the tunnel is undertaken, all alternatives involving the construction of a pipeline within the City Tunnel should also be eliminated as inconsistent with the “proven methods” criteria. The risks associated with the reliability and redundancies of such an operation are clear, and the concept is “unproven.”

Summary

Alternatives 16 to 23 (Alternatives Involving the Construction of Facilities at the McMillan WTP) were described in detail in the preceding paragraphs. As noted above, each of these alternatives can be eliminated from further consideration because construction of a residuals pipeline within the City Tunnel are inconsistent with the screening criteria for Reliability and Redundancy, the FFCA, Economic Considerations, and Proven Methods.

In addition, Alternative 12 can be eliminated because there is no available space at the McMillan WTP to build a residuals monofill. Alternative 17 can also be eliminated because it involves the coprocessing of Forebay residuals with the water treatment residuals. This approach is not recommended due to reliability and redundancy concerns. Alternative 19 is also inconsistent with the screening criteria for the NPDES Permit.

3.1.6 Alternatives with Facilities at the Dalecarlia WTP without involving trucking from the Dalecarlia Complex (Alternatives 24–26)

Alternative 24

Coprocess Forebay and water treatment residuals at Dalecarlia WTP; dispose of residuals via contract hauling from the Dalecarlia WTP

For this alternative, water treatment residuals would be collected from the Dalecarlia sedimentation basins and the Georgetown Reservoir. The residuals would be coprocessed with Forebay residuals at the Dalecarlia WTP. Residuals processing would consist of thickening and dewatering. The dewatered residuals would be hauled offsite for disposal.

The requirements for Alternative 24 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir	Pump residuals to Dalecarlia	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location

Note: Alternative 24 is the same as Alternative 25 with coprocessing.

Screening Evaluation

As noted for all other alternatives involving the coprocessing of Forebay residuals with water treatment residuals, this approach is not consistent with the screening criteria for reliability and redundancy. Coprocessing would greatly increase the residuals flow that would need to be processed, and would increase wear on residuals processing equipment due to the high concentration of grit and granular material that is characteristic of the Forebay residuals.

This approach is not recommended and will not be considered for further evaluation.

Alternative 25

Process water treatment residuals at the Dalecarlia WTP and dispose via contract hauling; process Forebay residuals by current methods and periodically haul

Residuals processing would consist of residuals collection from the Dalecarlia sedimentation basins and the Georgetown Reservoir, followed by thickening and dewatering. Contract hauling would be used to remove the dewatered residuals from the site for offsite disposal. Forebay residuals would be processed by current methods and periodically hauled from the site.

The requirements for Alternative 25 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

Table 3-6 summarizes the dewatered residuals quantities and the resulting number of trucks required to remove the residuals from the site for this alternative.

TABLE 3-6
Residuals Quantities for Alternative 25

	11-Year Annual Average		Wet Year	
	Annual Average	**Max Week**	**Annual Average**	**Max Design**
Dry lbs/day	65,000	195,000	90,000	280,000
Dry tons/day	33	98	45	140
Wet tons/day[a]	152	455	210	653
Number of truck loads/day[b]	8 truck loads/day	23 truck loads/day	11 truck loads/day	33 truck loads/day

[a]30 percent dry solids at 67 lbs/ft^3; 5 days/week; 16 hours/day operation.

[b]One-way trips.

Note: Forebay residuals are included above. Processing of Forebay residuals would result in approximately 2 truck loads per day (5 days/week) on an average annual basis. Number of truck loads is based upon 20-ton trucks transporting 22 cubic yards/truck; if smaller, 11-cubic-yard trucks are used, then number of trucks per day would be doubled.

Screening Evaluation

Alternative 25 is consistent with the screening criteria and will be retained for further evaluation in the EIS.

Alternative 26

Use plasma oven technology to process Forebay and water treatment residuals at the Dalecarlia WTP; dispose of residuals via contract hauling from the Dalecarlia WTP

This alternative was added in response to a public comment received at the Scoping Meeting held by Washington Aqueduct on January 28, 2004. A suggestion was made to consider plasma arc technologies as a means of reducing the amount of material that needs to be disposed of. The feasibility of using this process was evaluated as a result of those comments.

The requirements for Alternative 26 are summarized below (see Appendix A for a summary of all alternatives):

Location	Collection	Conveyance	Processing	Disposal
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening/dewatering/ plasma oven facility	Use plasma oven process following thickening and dewatering on collected residuals at Dalecarlia	Contract haul processed residuals to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening/dewatering/ plasma oven facility	Use plasma oven process following thickening and dewatering on collected residuals at Dalecarlia	Contract haul processed residuals to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir	Pump residuals to Dalecarlia thickening/dewatering/ plasma oven facility	Use plasma oven process following thickening and dewatering on collected residuals at Dalecarlia	Contract haul processed residuals to a permitted offsite location

Plasma arc technologies are also referred to as “plasma treatment,” “plasma-assisted sludge oxidation,” and “plasma gasification and vitrification.” These technologies have been used for selected waste applications for the past 20 years and collectively are still considered a relatively new and unproven method for waste treatment. Thickening and dewatering facilities would still need to be built for this alternative because plasma arc technology must be used with a material that is fairly dry to work effectively.

A plasma arc system generally consists of a plasma reactor, environmental controls, and a power generation unit or power supply. Dried waste is fed to the plasma reactor, an enclosed chamber where organic material is converted to a combustible gas and inorganic material is converted to a glasslike slag or very fine ash at temperatures ranging from 600°C to 15,000°C, depending upon the type of plasma system. The combustible gas must be cleaned of contaminants, and may either be burned off as waste or used for power generation.

The glasslike slag may be reused as road fill, bricks, etc., or be disposed of at a waste disposal facility. Uses for the fly ash are still being researched, but some that are being studied include agricultural fertilizer, cement aggregate, and geotechnical construction material. The potential usage, though, depends on the waste source since different sources have different chemical components in their waste. Like the slag, the ash can also be sent to a waste disposal facility.

Plasma arc technologies require environmental controls to prevent pollution of water, air, and/or soil. Emission control devices used to treat the combustible gas produced in the plasma arc processes include scrubbers, filter, and sorbent systems. Regular air monitoring and EPA Toxicity Characteristic Leaching Procedure (TCLP) testing of waste materials will be required for permitting and disposal. For the systems that produce fly ash, measures need to be taken to prevent the dust from blowing into the air.

Screening Evaluation

As a result of this Feasibility Study, this alternative has been eliminated from further consideration since it is inconsistent with the following screening factors:

- Reliability and redundancy
- Economic considerations
- Proven methods

Reliability and Redundancy. The process embodies a high degree of technology. It is still considered to be an innovative approach to residuals disposal, even though it has been used in select waste industries for several years. It can only be concluded that the use of this technology involves some degree of risk to reliability and redundancy for Washington Aqueduct, simply because it has not been adopted by the water and wastewater industry.

Economic Considerations. A cost for installing this technology cannot be precisely determined because the application has not been used with drinking water treatment residuals. Costs are very dependent on the type and characteristics of the material to be processed. Because the plasma arc system would be in addition to all of the previously identified components of the residuals processing system (i.e., thickening, dewatering, etc.), it would represent a large additional expense that would not be incurred by the other alternatives. Through discussions with various vendors, it is estimated that it would cost a minimum of $20 million to install a plasma arc system for the Washington Aqueduct (in addition to all other costs for residuals collection, conveyance, and processing). Therefore, this alternative can be eliminated as inconsistent with the screening criteria for economic considerations because these additional costs are greater than 30 percent of the budget of $50 million for the baseline project.

Proven Methods. Fabgroups, a company that is testing plasma-assisted sludge oxidation on wastewater sludge, requires the waste to have 20 percent organic content. If solids do not have that amount of organic matter, the energy input required to sustain the system is very high and the process becomes more costly. Since Washington Aqueduct's water treatment residuals have very little organic content, the process would likely require large amounts of energy (i.e., approximately 100 MW/ton) and be very expensive to operate.

Our research findings indicate that, to date, plasma arc technology has been used with materials such as municipal solid waste, hazardous waste, medical waste, and incinerator ash. This process has not been used on water treatment residuals. Thus, this technology does not meet the proven methods criterion.

Summary

Alternative 26 was described in the preceding paragraphs. This alternative is not a viable option for Washington Aqueduct because the technology is new and unproven, particularly with regards to its use with water treatment residuals, and the process is not reliable. Other disposal options offer more established, reliable, cost-effective processing of water treatment residuals. Thus, Alternative 26 will not be studied in the DEIS.

3.2 Public Alternatives Screening Results (November 2004 and February 2005)

This section of the report evaluates alternatives that were provided by the public during the time period from May 2004 through to the second cutoff date for the submission of alternatives by members of the public through the extended public involvement process (February 14, 2005).

The public alternatives were evaluated using the same screening criteria to evaluate the 26 initial alternatives screened during May 2004. The results of the screening process for the public alternatives are presented herein. Many of the public alternatives are similar to the May 2004 alternatives and where applicable the appropriate May 2004 alternative is referenced in the screening summary for the public alternative.

3.2.1 Public Alternatives and Option Screening Results

Table 3-7 describes each of the 134 public alternatives and 8 options considered in this analysis, and summarize the results of the screening process.

Three of the alternatives were found to be consistent with the screening criteria and 131 were found to be inconsistent with the screening criteria. One of the three feasible alternatives (P84) represents a new disposal option for an existing alternative and will, therefore, not be evaluated in detail in the EIS. The other consistent alternatives (P71 and P80) have been evaluated in detail in the EIS and are discussed in more detail.

Of the 8 public options, 6 were found to be inconsistent with the screening criteria and 2 were found to be consistent.

Table 3-7 provides a brief list of the screening criteria that were not satisfied for each of the inconsistent alternatives or options. The justifications for considering these alternatives or options infeasible are also described in more detail following Table 3-7

Table 3-7
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.	Screening Result (Consistent/ Inconsistent with Screening Criteria)	Unsatisfied Screening Criteria	Primary Screening Issue	Secondary Screening Issues
Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP								
P1	Sludge Stopper - 1	Single 12" Iron Pipe-in-Pipe Potomac	Build a 12" iron pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P2	Sludge Stopper - 2	Single 12" Plastic Pipe-in-Pipe Potomac	Build a 12" HDPE (high density polyethylene) piping inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P3	Sludge Stopper - 3	Single 12" Stainless Pipe-in-Pipe Potomac	Build 12" stainless steel pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P4	Sludge Stopper - 4	Single 12" Composite Pipe-in-Pipe Potomac	Build a 12" composite pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is one the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P5	Sludge Stopper - 5	Single 6" Iron Pipe-in-Pipe Potomac	Building a 6" iron pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P6	Sludge Stopper - 6	Single 6" Plastic Pipe-in-Pipe Potomac	Build a 6" HDPE (high density polyethylene) piping inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P7	Sludge Stopper - 7	Single 6" Stainless Pipe-in-Pipe Potomac	Build a 6" stainless steel pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities Economic, FFCA
P8	Sludge Stopper - 8	Single 6" Composite Pipe-in-Pipe Potomac	Build a 6" composite pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P9	Sludge Stopper - 9	Trio 6-12-6" Iron Pipe-in-Pipe Potomac	Build a 6-12-6" trio of iron pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	DC WASA would require SST pipe; two 6" diameter pipes do not carry equivalent flow to one 12"; three suggested pipes are not sufficiently sized to transport unthickened residuals flow - total pipe diameter must be equivalent to 18" - 24"; more land required at Blue Plains for thickening facilities. Economic, FFCA
P10	Sludge Stopper - 10	Trio 6-12-6" Plastic Pipe-in-Pipe Potomac	Build a 6-12-6" trio of HDPE (high density polyethylene) pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	DC WASA would require SST pipe; three suggested pipes are not sufficiently sized to transport unthickened residuals flow - total pipe diameter must be equivalent to 18" - 24"; more land required at Blue Plains for thickening facilities. Economic, FFCA

Table 3-7
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.	Screening Result (Consistent/ Inconsistent with Screening Criteria)	Unsatisfied Screening Criteria	Primary Screening Issue	Secondary Screening Issues
P11	Sludge Stopper - 11	Trio 6-12-6" Stainless Pipe-in-Pipe Potomac	Build a 6-12-6" trio of stainless steel pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Two 6" diameter pipes do not carry equivalent flow to 12"; three suggested pipes are not sufficiently sized to transport unthickened residuals flow - total pipe diameter must be equivalent to 18" - 24";more land required at Blue Plains for thickening facilities. Economic, FFCA
P12	Sludge Stopper - 12	Trio 6-12-6" Composite Pipe-in-Pipe Potomac	Build a 6-12-6" trio of composite pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	DC WASA would require SST pipe; two 6" diameter pipes do not carry equivalent flow to 12"; three suggested pipes are not sufficiently sized to transport unthickened residuals flow - total pipe diameter must be equivalent to 18" - 24"; more land required at Blue Plains for thickening facilities. Economic, FFCA
P13	Sludge Stopper - 13	Single 12" Iron Pipe-in-Pipe Rock Creek	Build a 12" iron pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P14	Sludge Stopper - 14	Single 12" Plastic Pipe-in-Pipe Rock Creek	Build a 12" HDPE (high density polyethylene) piping inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P15	Sludge Stopper - 15	Single 12" Stainless Pipe-in-Pipe Rock Creek	Build a 12" stainless steel pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P16	Sludge Stopper - 16	Single 12" Composite Pipe-in-Pipe Rock Creek	Build 1 12" composite pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continued inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P17	Sludge Stopper -17	Single 6" Iron Pipe-in-Pipe Rock Creek	Build a 6" iron pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P18	Sludge Stopper - 18	Single 6" Plastic Pipe-in-Pipe Rock Creek	Build a 6" HDPE (high density polyethylene) piping inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P19	Sludge Stopper - 19	Single 6" Stainless Pipe-in-Pipe Rock Creek	Build a 6" stainless steel pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities Economic, FFCA
P20	Sludge Stopper - 20	Single 6" Composite Pipe-in-Pipe Rock Creek	Build a 12" stainless steel pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P21	Sludge Stopper - 21	Trio 6-12-6" Iron Pipe-in-Pipe Rock Creek	Build a 6-12-6" trio of iron pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	DC WASA would require SST pipe; two 6" diameter pipes do not carry equivalent flow to one 12"; three suggested pipes are not sufficiently sized to transport unthickened residuals flow - total pipe diameter must be equivalent to 18" - 24"; more land required at Blue Plains for thickening facilities. Economic, FFCA

Table 3-7
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.	Screening Result (Consistent/ Inconsistent with Screening Criteria)	Unsatisfied Screening Criteria	Primary Screening Issue	Secondary Screening Issues
P22	Sludge Stopper - 22	Trio 6-12-6" Plastic Pipe-in-Pipe Rock Creek	Build a 6-12-6" HDPE (high density polyethylene) pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	DC WASA would require SST pipe; two 6" diameter pipes do not carry equivalent flow to one 12"; three suggested pipes are not sufficiently sized to transport unthickened residuals flow - total pipe diameter must be equivalent to 18" - 24"; more land required at Blue Plains for thickening facilities. Economic, FFCA
P23	Sludge Stopper - 23	Trio 6-12-6" Stainless Pipe-in-Pipe Rock Creek	Build a 6-12-6" trio of stainless steel pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Two 6" diameter pipes do not carry equivalent flow to 12"; three suggested pipes are not sufficiently sized to transport unthickened residuals flow - total pipe diameter must be equivalent to 18" - 24";more land required at Blue Plains for thickening facilities. Economic, FFCA
P24	Sludge Stopper - 24	Trio 6-12-6" Composite Pipe-in-Pipe Rock Creek	Build a 6-12-6" trio of composite pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	DC WASA would require SST pipe; two 6" diameter pipes do not carry equivalent flow to 12"; three suggested pipes are not sufficiently sized to transport unthickened residuals flow - total pipe diameter must be equivalent to 18" - 24"; more land required at Blue Plains for thickening facilities. Economic, FFCA
P25	Sludge Stopper - 25	Single 12" Iron Pipe-in-Pipe Potomac via Main	Build a 12" iron pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P26	Sludge Stopper - 26	Single 12" Plastic Pipe-in-Pipe Potomac via Main	Build a 12" HDPE (high density polyethylene) pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P27	Sludge Stopper - 27	Single 12" Stainless Pipe-in-Pipe Potomac via Main	Build a 12" stainless steel pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P28	Sludge Stopper - 28	Single 12" Composite Pipe-in-Pipe Potomac via Main	Build a 12" composite pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P29	Sludge Stopper - 29	Single 6" Iron Pipe-in-Pipe Potomac via Main	Build a 6" iron pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P30	Sludge Stopper - 30	Single 6" Plastic Pipe-in-Pipe Potomac via Main	Build a 6" HDPE (high density polyethylene) pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P31	Sludge Stopper - 31	Single 6" Stainless Pipe-in-Pipe Potomac via Main	Build a 6" stainless steel pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities Economic, FFCA
P32	Sludge Stopper - 32	Single 6" Composite Pipe-in-Pipe Potomac via Main	Build a 6" composite pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA

Table 3-7
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.	Screening Result (Consistent/ Inconsistent with Screening Criteria)	Unsatisfied Screening Criteria	Primary Screening Issue	Secondary Screening Issues
P33	Sludge Stopper - 33	Trio 6-12-6" Iron Pipe-in-Pipe Potomac via Main	Build a 6-12-6" trio of pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	DC WASA would require SST pipe; two 6" diameter pipes do not carry equivalent flow to one 12"; three suggested pipes are not sufficiently sized to transport unthickened residuals flow - total pipe diameter must be equivalent to 18" - 24"; more land required at Blue Plains for thickening facilities. Economic, FFCA
P34	Sludge Stopper - 34	Trio 6-12-6" Plastic Pipe-in-Pipe Potomac via Main	Build a 6-12-6" trio of HDPE (high density polyethylene) pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	DC WASA would require SST pipe; two 6" diameter pipes do not carry equivalent flow to one 12"; three suggested pipes are not sufficiently sized to transport unthickened residuals flow - total pipe diameter must be equivalent to 18" - 24"; more land required at Blue Plains for thickening facilities. Economic, FFCA
P35	Sludge Stopper - 35	Trio 6-12-6" Stainless Pipe-in-Pipe Potomac via Main	Build a 6-12-6" trio of stainless steel pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Two 6" diameter pipes do not carry equivalent flow to 12"; three suggested pipes are not sufficiently sized to transport unthickened residuals flow - total pipe diameter must be equivalent to 18" - 24";more land required at Blue Plains for thickening facilities. Economic, FFCA
P36	Sludge Stopper - 36	Trio 6-12-6" Composite Pipe-in-Pipe Potomac via Main	Build a 6-12-6" trio of composite pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	DC WASA would require SST pipe; two 6" diameter pipes do not carry equivalent flow to 12"; three suggested pipes are not sufficiently sized to transport unthickened residuals flow - total pipe diameter must be equivalent to 18" - 24"; more land required at Blue Plains for thickening facilities. Economic, FFCA
P37	Sludge Stopper - 37	Single 12" Iron Pipe-in-Pipe Rock Creek via Main	Build a 12" iron pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P38	Sludge Stopper - 38	Single 12" Plastic Pipe-in-Pipe Rock Creek via Main	Build a 12" HDPE (high density polyethylene) pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P39	Sludge Stopper - 39	Single 12" Stainless Pipe-in-Pipe Rock Creek via Main	Build a 12" stainless steel pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P40	Sludge Stopper - 40	Single 12" Composite Pipe-in-Pipe Rock Creek via Main	Build a 12" composite pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P41	Sludge Stopper - 41	Single 6" Iron Pipe-in-Pipe Rock Creek via Main	Build a 6" iron pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residuals to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P42	Sludge Stopper - 42	Single 6" Plastic Pipe-in-Pipe Rock Creek via Main	Build a 6" HDPE (high density polyethylene) pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P43	Sludge Stopper - 43	Single 6" Stainless Pipe-in-Pipe Rock Creek via Main	Build a 6" stainless steel piping inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities Economic, FFCA

Table 3-7
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.	Screening Result (Consistent/ Inconsistent with Screening Criteria)	Unsatisfied Screening Criteria	Primary Screening Issue	Secondary Screening Issues
P44	Sludge Stopper - 44	Single 6" Composite Pipe-in-Pipe Rock Creek via Main	Build a 12" stainless steel pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Proposal does not include redundancy; DC WASA would require SST pipe; 18" to 24" diameter required for unthickened flow; more land required at Blue Plains for thickening facilities. Economic, FFCA
P45	Sludge Stopper - 45	Trio 6-12-6" Iron Pipe-in-Pipe Rock Creek via Main	Build a 6-12-6" trio of iron pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Truck Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	DC WASA would require SST pipe; two 6" diameter pipes do not carry equivalent flow to one 12"; three suggested pipes are not sufficiently sized to transport unthickened residuals flow - total pipe diameter must be equivalent to 18" - 24"; more land required at Blue Plains for thickening facilities. Economic, FFCA
P46	Sludge Stopper - 46	Trio 6-12-6" Plastic Pipe-in-Pipe Rock Creek via Main	Build a 6-12-6" trio of HDPE (high density polyethylene) pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	DC WASA would require SST pipe; taking longer to install; two 6" diameter pipes do not carry equivalent flow to one 12"; three suggested pipes are not sufficiently sized to transport unthickened residuals flow - total pipe diameter must be equivalent to 18" - 24"; more land required at Blue Plains for thickening facilities. Economic, FFCA
P47	Sludge Stopper - 47	Trio 6-12-6" Stainless Pipe-in-Pipe Rock Creek via Main	Build a 6-12-6" trio of stainless steel pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to the Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Two 6" diameter pipes do not carry equivalent flow to 12"; three suggested pipes are not sufficiently sized to transport unthickened residuals flow - total pipe diameter must be equivalent to 18" - 24";more land required at Blue Plains for thickening facilities. Economic, FFCA
P48	Sludge Stopper - 48	Trio 6-12-6" Composite Pipe-in-Pipe Rock Creek via Main	Build a 6-12-6" trio of composite pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	DC WASA would require SST pipe; two 6" diameter pipes do not carry equivalent flow to 12"; three suggested pipes are not sufficiently sized to transport unthickened residuals flow - total pipe diameter must be equivalent to 18" - 24"; more land required at Blue Plains for thickening facilities. Economic, FFCA
P49	Sludge Stopper - 49	Dalecarlia to WSSC Potomac Over Interceptor	Build a new single, double, or quad pipeline on top of the Potomac Interceptor to the WSSC Potomac Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7	Inconsistent	Institutional Constraints (WSSC)	WSSC will not accept Washington Aqueduct residuals	Economic, FFCA, Zoning, Landuse, and Local Regulations
P50	Sludge Stopper - 50	Dalecarlia to WSSC Potomac Inside Interceptor	Build a new single, double, or quad pipeline inside the Potomac Interceptor to the WSSC Potomac Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7	Inconsistent	Institutional Constraints (WSSC)	WSSC will not accept Washington Aqueduct residuals	Economic, FFCA, Zoning, Landuse, and Local Regulations
P51	Sludge Stopper - 51	Dalecarlia to WSSC Potomac Over Raw Water Conduit	Build a new single, double, or quad pipeline over the Great Falls raw water conduits to the WSSC Potomac Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7	Inconsistent	Institutional Constraints (WSSC)	WSSC will not accept Washington Aqueduct residuals	Economic, FFCA
P52	Sludge Stopper - 52	Dalecarlia to WSSC Potomac In Raw Water Conduit	Build a new single, double, or quad pipeline inside one of the Great Falls raw water conduits to the WSSC Potomac Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7	Inconsistent	Institutional Constraints (WSSC)	WSSC will not accept Washington Aqueduct residuals	Economic
P53	Sludge Stopper - 53	Dalecarlia to WSSC Potomac Via River Road	Build a new single, double, or quad pipeline along River Road, to the WSSC Potomac Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7	Inconsistent	Institutional Constraints (WSSC)	WSSC will not accept Washington Aqueduct residuals	Economic, FFCA
P54	Sludge Stopper - 54	Dalecarlia to New Carderock Over Interceptor	Build a new single, double, or quad pipeline on top of the Potomac Interceptor to a new thickening and dewatering plant on the Carderock Naval Research Center grounds, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 8	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Based on preliminary conversations, Carderock is not anticipated to be able to commit to accepting residuals processing facilities on their site within the timeline of the FFCA. Economic, FFCA
P55	Sludge Stopper - 55	Dalecarlia to New Carderock Inside Interceptor	Build a new single, double, or quad pipeline inside the Potomac Interceptor to a new thickening and dewatering plant on the Carderock Naval Research Center grounds, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 8	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Based on preliminary conversations, Carderock is not anticipated to be able to commit to accepting residuals processing facilities on their site within the timeline of the FFCA. Economic, FFCA
P56	Sludge Stopper - 56	Dalecarlia to New Carderock Over Raw Water Conduit	Build a new single, double, or quad pipeline above the Great Falls raw water conduit to a new thickening and dewatering plan on the Carderock Naval Research Center grounds, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 8	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Based on preliminary conversations, Carderock is not anticipated to be able to commit to accepting residuals processing facilities on their site within the timeline of the FFCA. Economic, FFCA

Table 3-7
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.	Screening Result (Consistent/ Inconsistent with Screening Criteria)	Unsatisfied Screening Criteria	Primary Screening Issue	Secondary Screening Issues
P57	Sludge Stopper - 57	Dalecarlia to New Carderock Inside Raw Water Conduit	Build a new single, double, or quad pipeline inside the Great Falls raw water conduit to a new thickening and dewatering plan on the Carderock Naval Research Center grounds, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 8	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Economic, FFCA
P58	Sludge Stopper - 58	Dalecarlia to FCWA Corbalis Via Little Falls	Build a new single, double, or quad pipeline across the Potomac at Little Falls dam, to the FCWA Corbalis Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7	Inconsistent	Institutional Constraints (FCWA)	FCWA will not accept Washington Aqueduct residuals	Economic, FFCA
P59	Sludge Stopper - 59	Dalecarlia to FCWA Corbalis Via Chain Bridge	Build a new single, double, or quad pipeline across the Potomac at the Chain Bridge, to the FCWA Corbalis Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7	Inconsistent	Institutional Constraints (FCWA)	FCWA will not accept Washington Aqueduct residuals	Economic, FFCA
P60	Sludge Stopper - 60	Blue Plains Via Potomac Channel	Build a new single, double, or quad pipeline and lay it in the Potomac Channel from Dalecarlia to Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Economic, FFCA, Zoning, Landuse, and Local Regulations
P61	Sludge Stopper - 61	Blue Plains Via Virginia Riverbank from Little Falls Dam	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Little Falls dam, then down the Virginia riverbank to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Economic, FFCA, Zoning, Landuse, and Local Regulations
P62	Sludge Stopper - 62	Blue Plains Via Virginia Riverbank from Chain Bridge	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Chain Bridge, then down the Virginia riverbank to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Economic, FFCA, Zoning, Landuse, and Local Regulations
P63	Sludge Stopper - 63	Blue Plains Via Virginia Riverbank from Key Bridge	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Key Bridge, then down the Virginia riverbank to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Economic, FFCA, Zoning, Landuse, and Local Regulations
P64	Sludge Stopper - 64	Blue Plains Via George Washington Parkway form Little Falls Dam	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Little Falls damn, then down the George Washington Parkway to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, stainless steel, and composite, etc.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Economic, FFCA, Zoning, Landuse, and Local Regulations
P65	Sludge Stopper - 65	Blue Plains Via George Washington Parkway from Chain Bridge	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Chain Bridge, then down the George Washington Parkway to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Economic, FFCA, Zoning, Landuse, and Local Regulations
P66	Sludge Stopper - 66	Blue plains Via George Washington Parkway from Key Bridge	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Key Bridge, then down the George Washington Parkway to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Economic, FFCA, Zoning, Landuse, and Local Regulations
P68	Sludge Stopper - 68	Dalecarlia to Drained Georgetown 2	Implement plate settlers or other high efficiency technologies at Dalecarlia and/or Georgetown basins such that Georgetown 2 can be drained and the new thickening and dewatering plant built on the floor of the basin, below grade and out of site.	Section 4 of EFS	Inconsistent	Economic Considerations	Cost of facility at Georgetown	
P70	Sludge Stopper - 70	Georgetown Waterfront CSO Holding Tanks	In conjunction with the DC WASA CIP, utilize or expand upon the current 58 MG Georgetown Waterfront CSO holding tank to store the residual flushes, then dewater the holding tank in a controlled manner via new or existing pumping stations and pipeline to Blue Plains for final processing.	Alternative 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Economic, FFCA
P73	SCS Engineers-1	Barge to Bioreactor Landfill	Use new of existing outfall piping to transport residuals to the Potomac River without dewatering, and then transport via barge to a bioreactor landfill	Alternative 6	Inconsistent	Reliability and Redundancy; Zoning, land use, and local regulations	Proven methods	See barge discussion in Feasibility Study
P74	SCS Engineers-2	Transport Unthickened Residuals to Blue Plains via Riverbed Pipeline	Using the existing outfall piping to transport residuals to the Potomac River without dewatering, and transport via new riverbed pipeline to Blue Plains for treatment.	Alternative 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Economic, FFCA, Zoning, Landuse, and Local Regulations
P75	SCS Engineers-3	Pipe in a Pipe to Blue Plains	Construct new pipeline within existing pipelines.	Alternative 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Economic
P85	S Deschler 11/15/2004 e-mail	Store Residuals and Discharge to Potomac Interceptor During Dry Conditions	Add more storage to alt. 4 so thickened residuals can be discharged to Potomac Interceptor only during dry weather conditions.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Economic, FFCA
P86	S Deschler 11/15/2004 e-mail	Transport Unthickened to Blue Plains via Pipeline, Install in Potomac Interceptor During Dry Conditions	Convey dewatered residuals from Dalecarlia to Blue Plains in a dedicated pipe. Install pipe during dry days when sewer is near empty. Relatively easy to access Potomac Interceptor.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Economic, FFCA
P88	Stuart Ross 11/15/2004 e-mail		Adopt pipeline to Blue Plains alternative.	Alternative 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Economic, FFCA, Zoning, Landuse, and Local Regulations

Table 3-7
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.	Screening Result (Consistent/ Inconsistent with Screening Criteria)	Unsatisfied Screening Criteria	Primary Screening Issue	Secondary Screening Issues
P89	Attach B from M Greenwald letter dated 11/15/2004	Residuals Pipeline to Blue Plains via Metro Tunnels	Attachment B: 2. Option B - Route residuals pipeline in Metro ROWs' to Blue Plains	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Economic, FFCA
P90	Attach B from M Greenwald letter dated 11/15/2004	Route Residuals Pipeline to Blue Plains via Abandoned Sewer Pipeline	Attachment B: 3. Option B - Use an abandoned sewer line to route residuals pipeline to Blue Plains or WSSC Potomac WFP.	Alternatives 5 and 7	Inconsistent	Institutional Constraints (DC WASA)	DC WASA and WSSC will not accept Washington Aqueduct residuals	Economic, FFCA
P93	Kent Slowinski 11/5/2004 e-mail	Build Residuals Facilities at Carderock	Build residuals thickening and dewatering at Carderock or move entire WTP upriver.	Alternative 8	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Economic, FFCA
P94	Steve Shapiro 11/15/2004 e-mail	Capital Crescent Pipeline to CSX Railroad	Pipe residuals along Capital Crescent Trail to CSX train line rail cars in Silver Spring, MD	Alternative 8	Inconsistent	Economic considerations; FFCA, Institutional Constraints	Unthickened residuals are not suitable form for land application. A thickening and dewatering plant would be necessary in another location within access of the CSX train line.	It is anticipated that extensive and time-consuming negotiations would be required to procure the rights to an easement along the Capital Crescent Trail and also to arrange for use of rail cars on the CSX train line. It is unlikely that these issues could be addressed within the context of the FFCA schedule.
P95	Steve Shapiro 11/15/2004 e-mail	Capital Crescent Pipeline to Blue Plains	Pipe residuals along Capital Crescent Trail to DC and connect into pipeline to Blue Plains	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Economic, FFCA, Zoning, Landuse, and Local Regulations
P96	Steve Shapiro 11/15/2004 e-mail	Tunnel from Dalecarlia WTP to Monofill	If a landfill is built - build an underground tunnel from Dalecarlia WTP to landfill	Alternative 2	Inconsistent	Economic Considerations plus FFCA relative to monofill option	Relative to the monofill option, a portion of the monofill footprint occupies an area that is targeted for further investigation by the Spring Valley American University Experiment Station (AUES) Formerly Used Defense Site (FUDS) project. Investigations can not be completed in sufficient time to design, permit, construct and have a monofill operational by the FFCA 2009 deadline.	It is anticipated that it would be difficult to construct a new truck access tunnel under MacArthur Boulevard in the vicinity of the front entrance to the Dalecarlia WTP because the tunnel would need to be installed beneath both the road and the Georgetown Tunnel, which transports raw water from the Dalecarlia Reservoir to the Georgetown Reservoirs. Option is anticipated to exceed the cost screening criteria.
P98	Steve Shapiro 11/15/2004 e-mail	Residuals Island on the Potomac	Create an island in the Potomac to store residuals	Alternative 6	Inconsistent	Reliability and Redundancy		See barge discussion in Feasibility Study Economic, FFCA, Zoning, Landuse, and Local Regulations
P100	Steve Shapiro 11/15/2004 e-mail	Facilities at Carderock or some other Federal facility	Relocate facilities to Carderock or some other Federal facility	Alternative 8	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Economic, FFCA
P102	Kent Slowinski 11/5/2004 e-mail	move entire plant	Move the entire water treatment plant upriver	Alternative 8	Inconsistent	NPDES	Does not meet requirements of NPDES permit	FFCA
P103	Sludge Stopper -1	Carderock East Dewater and Thicken	Purchase or transfer the eastmost tip of the Carderock Navy Research Center form the Navy to the ACE and build the thickening and dewatering facilities there. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit. Contract haul the cake 100 feet to I-495	Alternatives 8, 57	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Economic, FFCA
P104	Sludge Stopper -2	Carderock East Dewater - Thicken Carderock West	Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering faculties there. Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit. Contract haul the cake less than 100 feet to I-495	Alternatives 8, 57	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Economic, FFCA
P105	Sludge Stopper -3	Carderock East Dewater - Thicken MC	Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering faculties there. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract haul the cake 100 feet to I-495	Alternatives 8, 57	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Economic, FFCA
P106	Sludge Stopper -4	Carderock East Dewater - Thicken Sibley	Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract haul the cake 100 feet to I-495	Alternatives 8, 57	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Economic, FFCA
P107	Sludge Stopper -5	Carderock East Dewater - Thicken Georgetown	Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Upgrade one or more settling basins at Georgetown using plate settling or other high-efficiency process and repurpose at least one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract haul the cake 100 feet to I-495.	Alternatives 8, 57	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Economic, FFCA
P108	Sludge Stopper -6	Carderock West Dewater - Thicken	Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening and dewatering facilities there. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit. Contract haul the cake less then 1 mile to I-495	Alternatives 8, 57	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Economic, FFCA
P109	Sludge Stopper -7	Carderock West Dewater - Thicken MC	Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract haul the cake 1 mile to I-495	Alternatives 8, 57	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Economic, FFCA

Table 3-7
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.	Screening Result (Consistent/ Inconsistent with Screening Criteria)	Unsatisfied Screening Criteria	Primary Screening Issue	Secondary Screening Issues
P110	Sludge Stopper -8	Carderock West Dewater - Thicken Sibley	Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract Haul the cake 1 mile to I-495	Alternatives 8, 57	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Economic, FFCA
P111	Sludge Stopper -9	Carderock West Dewater - Thicken Georgetown	Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Upgrade one or more settling basins at Georgetown using place settling or other high-efficiency process and repurpose at lease one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract haul the cake 1 mile to I-495	Alternatives 8, 57	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Economic, FFCA
P112	Sludge Stopper -10	Carderock West Dewater & Thicken Carderock East	Purchase of transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit. Contract haul the cake less than 100 feet to I-495	Alternatives 8, 57	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Economic, FFCA
P113	Sludge Stopper -11	Rockville WTP Dewater & Thicken	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the thickening and dewatering facilities there. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 52	Inconsistent	Institutional Constraints (Rockville)	Rockville will not accept Washington Aqueduct residuals	Economic, FFCA
P114	Sludge Stopper -12	Rockville WTP Dewater & Thicken MC	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the thickening and dewatering facilities there. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 52	Inconsistent	Institutional Constraints (Rockville)	Rockville will not accept Washington Aqueduct residuals	Economic, FFCA
P115	Sludge Stopper -13	Rockville WTP Dewater & Thicken Sibley	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the dewatering facilities there. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 52	Inconsistent	Institutional Constraints (Rockville)	Rockville will not accept Washington Aqueduct residuals	Economic, FFCA
P116	Sludge Stopper -14	Rockville WTP Dewtaer and Thicken Georgetown	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the dewatering facilities there. Upgrade one or more settling basins at Georgetown using plate settling or other high-efficiency process and repurpose at least one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 52	Inconsistent	Institutional Constraints (Rockville)	Rockville will not accept Washington Aqueduct residuals	Economic, FFCA
P117	Sludge Stopper -15	Rockville WTP Dewater & Thicken Carderock East	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the dewatering facilities there. Purchase or transfer the eastmost top of Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Carderock inside a raw water conduit. Pipe the thickened residuals from Carderock inside a raw water conduit as far as possible, the best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 8, 52	Inconsistent	Institutional Constraints (Rockville)	Rockville will not accept Washington Aqueduct residuals	Economic, FFCA
P118	Sludge Stopper -16	Rockville WTP Dewater & Thicken Carderock West	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the dewatering facilities there. Purchase or transfer the westmost top of Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Carderock inside a raw water conduit. Pipe the thickened residuals from Carderock inside a raw water conduit as far as possible, the best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 8, 52	Inconsistent	Institutional Constraints (Rockville)	Rockville will not accept Washington Aqueduct residuals	Economic, FFCA
P119	Sludge Stopper -17	Expand WSSC Potomac - Thicken & Dewater	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to WSSC Potomac. Thicken and dewater at WSSC Potomac. Contract haul the cake to I-495	Alternatives 7, 52	Inconsistent	Institutional Constraints (WSSC)	WSSC will not accept Washington Aqueduct residuals	Economic, FFCA
P120	Sludge Stopper -18	Expand WSSC Potomac - Thicken & Dewater	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property to dewater. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to WSSC. Contract haul the cake to I-495	Alternatives 7, 52	Inconsistent	Institutional Constraints (WSSC)	WSSC will not accept Washington Aqueduct residuals	Economic, FFCA
P121	Sludge Stopper -19	Expand WSSC Potomac Dewater & Thicken Sibley	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property to dewater. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to WSSC. Contract haul the cake to I-495	Alternatives 7, 52	Inconsistent	Institutional Constraints (WSSC)	WSSC will not accept Washington Aqueduct residuals	Economic, FFCA
P122	Sludge Stopper -20	Expand WSSC Potomac Dewater & Thick Georgetown	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property to dewater. Upgrade one or more settling basins at Georgetown using plate settling or other high-efficiency process and repurpose at least one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to WSSC. Contract haul the cake to I-495	Alternatives 7, 52	Inconsistent	Institutional Constraints (WSSC)	WSSC will not accept Washington Aqueduct residuals	Economic, FFCA
P123	Sludge Stopper -21	WSSC Potomac Dewater & Thicken Carderock East	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property to dewater. Purchase or transfer the eastmost top of Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Carderock inside a raw water conduit. Pipe the thickened residuals from Carderock inside a raw water conduit as far as possible, the best practice to WSSC Potomac. Contract haul the cake to I-495	Alternatives 7, 8, 52	Inconsistent	Institutional Constraints (WSSC and Navy)	WSSC and Navy will not accept Washington Aqueduct residuals	Economic, FFCA

Table 3-7
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Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.	Screening Result (Consistent/ Inconsistent with Screening Criteria)	Unsatisfied Screening Criteria	Primary Screening Issue	Secondary Screening Issues
P124	Sludge Stopper -22	WSSC Potomac Dewater & Thicken Carderock West	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property to dewater. Purchase or transfer the westmost top of Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Carderock inside a raw water conduit. Pipe the thickened residuals from Carderock inside a raw water conduit as far as possible, the best practice to WSSC Potomac. Contract haul the cake to I-495	Alternatives 7, 8, 52	Inconsistent	Institutional Constraints (WSSC and Navy)	WSSC and Navy will not accept Washington Aqueduct residuals	Economic, FFCA
P125	Sludge Stopper -23	WSSC Potomac Dewater & Thicken Rockville	Expand the existing facilities or build a redundant facility on the WSSC Potomac property to dewater. Purchase a portion or share facilities at the Rockville WTP and build and/or expand the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Rockville inside a raw water conduit as far as possible, then best practice to Rockville. Pipe the thickened residuals from Rockville to WSSC Potomac using best practice. Contract haul the cake to I-495	Alternatives 7, 52	Inconsistent	Institutional Constraints (WSSC and Rockville)	WSSC and Rockville will not accept Washington Aqueduct residuals	Economic, FFCA
P126	Sludge Stopper -24	Rockville Dewater & Thicken WSSC Potomac	Expand the existing facilities or build a redundant facility on the Rockville property to dewater. Purchase a portion or share facilities at the WSSC Potomac WTP and build and/or expand the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Rockville inside a raw water conduit as far as possible, then best practice to Rockville. Pipe the thickened residuals from Rockville to WSSC Potomac using best practice. Contract haul the cake to I-495	Alternatives 7, 52	Inconsistent	Institutional Constraints (WSSC and Rockville)	WSSC and Rockville will not accept Washington Aqueduct residuals	Economic, FFCA
P127	Sludge Stopper -25	CIA Virginia - Thicken & Dewater	Build a thickening and dewatering facility at the secure CIA property by Turkey Run in Virginia. Pipe the unthickened residuals from Dalecarlia to the CIA property across the Potomac using best practices. Thicken and dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58	Inconsistent	Institutional Constraints (CIA)	CIA will not accept Washington Aqueduct residuals	Economic, FFCA
P128	Sludge Stopper -26	CIA Virginia Dewater - Thicken MC	Build a thickening and dewatering facility at the secure CIA property by Turkey Run in Virginia. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia to the CIA property across the Potomac using best practices. Dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58	Inconsistent	Institutional Constraints (CIA)	CIA will not accept Washington Aqueduct residuals	Economic, FFCA
P129	Sludge Stopper -27	CIA Virginia Dewater - Thicken Sibley	Build a thickening and dewatering facility at the secure CIA property by Turkey Run in Virginia. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia to the CIA property across the Potomac using best practices. Dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58	Inconsistent	Institutional Constraints (CIA)	CIA will not accept Washington Aqueduct residuals	Economic, FFCA
P130	Sludge Stopper -28	CIA Virginia Dewater - Thicken Georgetown	Build a thickening and dewatering facility at the secure CIA property by Turkey Run in Virginia. Upgrade one or more settling basins at Georgetown using plate settling or other high-efficiency process and repurpose at least one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Georgetown to the CIA property across the Potomac using best practices. Dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58	Inconsistent	Institutional Constraints (CIA)	CIA will not accept Washington Aqueduct residuals	Economic, FFCA
P131	Sludge Stopper -29	CIA Virginia Dewater - Thicken Carderock East	Build a thickening facility at the secure CIA property by Turkey Run in Virginia. Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the thickened residuals from Carderock to the CIA property across the Potomac using best practices. Dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123	Alternatives 8, 57, 58	Inconsistent	Institutional Constraints (CIA and Navy)	CIA and Navy will not accept Washington Aqueduct residuals	Economic, FFCA
P132	Sludge Stopper -30	CIA Virginia - Thicken Carderock West	Build a thickening facility at the secure CIA property by Turkey Run in Virginia. Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the thickened residuals from Carderock to the CIA property across the Potomac using best practices. Dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123	Alternatives 8, 57, 58	Inconsistent	Institutional Constraints (CIA and Navy)	CIA and Navy will not accept Washington Aqueduct residuals	Economic, FFCA
P133	Sludge Stopper -31	FHWA Virginia - Thicken & Dewater	Build a thickening and dewatering facility at the secure FHWA property by Turkey Run in Virginia. Pipe the unthickened residuals from Dalecarlia to the FHWA property across the Potomac using best practices. Thicken and dewater on site at FHWA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58	Inconsistent	FFCA	Economic	Uncertainty about instutional constraints
P134	Sludge Stopper -32	FHWA Virginia Dewater - Thicken MC	Build a thickening and dewatering facility at the secure FHWA property by Turkey Run in Virginia. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia to the FHWA property across the Potomac using best practices. Dewater on-site at FHWA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58	Inconsistent	FFCA	Economic	Uncertainty about instutional constraints
P135	Sludge Stopper -33	FHWA Virginia Dewater - Thicken Sibley	Build a thickening and dewatering facility at the secure FHWA property by Turkey Run in Virginia. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia to the FHWA property across the Potomac using best practices. Dewater on-site at FHWA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58	Inconsistent	FFCA	Economic	Uncertainty about instutional constraints
P136	Sludge Stopper -34	FHWA Virginia Dewater - Thicken Georgetown	Build a thickening and dewatering facility at the secure FHWA property by Turkey Run in Virginia. Upgrade one or more settling basins at Georgetown using plate settling or other high-efficiency process and repurpose at least one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Georgetown to the FHWA property across the Potomac using best practices. Dewater on-site at FHWA. Contract haul the cake to I-495 via 193 or 123	Alternatives 8, 58	Inconsistent	FFCA	Economic	Uncertainty about instutional constraints
P137	Sludge Stopper -35	FHWA Virginia Dewater - Thicken Carderock East	Build a thickening and dewatering facility at the secure FHWA property by Turkey Run in Virginia. Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the thickened residuals from Carderock to the FHWA property across the Potomac using best practices. Dewater on-site at FHWA. Contract haul the cake to I-495 via 193 or 123	Alternatives 8, 57, 58	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Economic, FFCA

Table 3-7
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Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.	Screening Result (Consistent/ Inconsistent with Screening Criteria)	Unsatisfied Screening Criteria	Primary Screening Issue	Secondary Screening Issues
P138	Sludge Stopper -36	FHWA Virginia Dewater - Thicken Carderock West	Build a thickening and dewatering facility at the secure FHWA property by Turkey Run in Virginia. Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the thickened residuals from Carderock to the FHWA property across the Potomac using best practices. Dewater on-site at FHWA. Contract haul the cake to I-495 via 193 or 123	Alternatives 8, 57, 58	Inconsistent	Institutional Constraints (Navy)	Navy will not accept Washington Aqueduct residuals	Economic, FFCA
P139	Sludge Stopper -37	Rock Run Treatment Plant	Build a new thickening and dewatering facility in the old Rock Run right-of-way	Alternative 8	Inconsistent	FFCA	Time required to gain approval for use of the site	Economic
P140	Sludge Stopper -38	Expand Blue Plains WWTP - Navy Research	Expand the Blue Plains WWTP through cooperative agreement with the Naval Research Lab to allow use of their southern border. Build thickening and dewatering facilities for the entire region. Pipe either unthickened or thickened residuals from WAD to Blue Plains via best practices.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Economic, FFCA
P141	Sludge Stopper -39	Expand Blue Plains WWTP - Potomac Levy	Expand the Blue Plains WWTP through cooperative agreement with the Army Corps of Engineers allowing the development of a levy reaching into the Potomac using fill from Blue Plains solids removal processes. Build thickening and dewatering facilities for the entire region on this newly created levy. Pipe either unthickened or thickened residuals from WAD to Blue Plains via best practices.	Alternatives 4 and 5	Inconsistent	Institutional Constraints (DC WASA)	DC WASA will not accept Washington Aqueduct residuals	Economic, FFCA, Zoning, Landuse, and Local Regulations
P142	Sludge Stopper -40	Build on Non-Residentail Government Land	Build the thickening or the dewatering or both of them together, or any combination on any parcel or parcels of government controlled land, be it Federal, State, County, or District. The site must be located in the area that impacts the fewest number of people, both at the operation site, as well as any transit route for the disposal of the resulting residuals.	Alternative 8	Inconsistent	FFCA	A siting study would be required to define a suitable parcel. The study can not be completed in compliance with FFCA schedule	Economic
Alternatives with a Discharge to the Potomac River								
P101	William Harrop 11/9/04 e-mail	Return to the river	Challenge provisions of NPDES permit and discharge to the river	Alternative 10	Inconsistent	NPDES	Permit was finalized after years of negotiation. Permit authority is from the Clean Water Act.	
Alternatives Involving alternate uses of the Dalecarlia Reservoir								
P82	Steve Luckman 9/30/2004 e-mail	Waste Residuals Lake Alternative	Store water treatment residuals temporarily in a sectioned-off portion of the Dalecarlia Reservoir prior to processing them	Alternatives 12 to 15	Inconsistent	Reliability and Redundancy	Silt removal function provided by reservoir cannot be compromised.	
Alternatives with Facilities at the McMillan WTP								
None of the public alternatives recommend constructing facilities at the McMillan WTP.								
Alternatives with Facilities at the Dalecarlia WTP								
P71	Sludge Stopper - 71	Dalecarlia Campus Alternate Sites	Only as a last resort, build the thickening and dewatering plant on the Dalecarlia property, but on one of several alternative sites further away from residential property.	Alternative 25	Consistent			
P72	Sludge Stopper - 72	Dalecarlia Campus Underground	Only as the very last resort, build the thickening and dewatering plan on the Dalecarlia property, but underground. Build the equipment "floors" in a shaft dug from the back lot metro fill. Dewatered cake could easily be brought to the surface via a conveyor belt. The shaft fill would be used to build a high berm surrounding the facility which would be heavily planted.	Alternative 25	Inconsistent	Economic, Reliabilty and Redundancy	Costs associated with burying thickeners and a portion of the buildingwill be evaluated, along with equipment maintenance impacts associated with covering thickeners and transporting residuals via conveyor belt	
P79	Alma Gates 9/30/2004 e-mail	Alternate Truck Route to Clara Barton Parkway	Alternative truck route to Clara Barton Parkway or Canal Road	Alternative 25	Inconsistent	Institutional Constraints (NPS)	The NPS will not allow construction of a new access road through park land or the truck transport of residuals on the Clara Barton Parkway.	
P80	Brookmont meeting Request	Relocate Residuals Facilities on Dalecarlia WTP Site	Relocate residuals processing facility on the Dalecarlia WTP site	Alternative 25	Consistent			
P84	Lehigh Cement 9/28/2004 e-mail	Cement Disposal Alternative	Consider alternate disposal locations such as cement manufacturing plants.	Alternative 25	Consistent/Option, potential disposal option for Alternative 25			
P87	Attach B from M Greenwald letter dated 11/15/2004	Bury Part of Residuals Facilities	Project approach suggestions: bury thickeners in ground and cover with a slab, bury truck entrance/exit from building, answer questions about residuals disposal sites	Alternative 25	Inconsistent	Economic, Reliabilty and Redundancy	Costs associated with burying thickeners and a portion of the buildingwill be evaluated, along with equipment maintenance impacts associated with covering thickeners.	Feasibility of burying building is impacted by size and topography of site and allowable road grades.
P91	Attach B from M Greenwald letter dated 11/15/2004	Relocate Residuals Facilities on Dalecarlia WTP Site or elsewhere	Consider alternate sites for thickening/dewatering facilities (Carderock, Georgetown Reservoir, Unused West Filter Building, On Top of Sedimentation Basins) - Note that P91 will address facilities at Dalecarlia only. Facitilities at Georgetown and Carderock are addressed under other items.	Alternative 25	Inconsistent	Reliability and Redundancy	Alternate residuals processing location that conflict with current or anticipated water treatment facilities will not be evaluated in detail.	
P97	Steve Shapiro 11/15/2004 e-mail	Heat Drying	Use heat drying as part of the dewatering facilities to reduce the number of trucks required per day	Alternative 25 + 26	Inconsistent	Economic Considerations	Alternative would require construction of all residuals facilities required for other trucking alternatives plus new drying facility. Construction cost of this alternative does not meet screening criteria.	

Table 3-7
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.	Screening Result (Consistent/ Inconsistent with Screening Criteria)	Unsatisfied Screening Criteria	Primary Screening Issue	Secondary Screening Issues
P99	Eric Morrison 9/21/2004 e-mail	Alternate Treatment Processes	Switch to new water treatment processes that do not produce alum-associated residuals, such as MIEX, GAC, ultrafiltration membranes, etc.	N/A	Inconsistent	FFCA, Economic Considerations, Unproven technologies	This would involve an overhaul of the water treatment processes with this newly emerging technology. The technology is unproven for large scale water treatment processes. Time required for pilot testing would be is not possible within the FFCA schedule. The cost associated with this alternative exceeds the screening threshold.	
Raw Water Intake Improvement Options								
P67	Sludge Stopper - 67	Raw Water Intake Relocation	Regardless of the residual processing solution selected, efforts should be made to improve the quality (lower the residual content) of the raw water BEFORE it is sent to Dalecarlia. All solutions researched by FCWA for their intake should be reviewed for the Washington Aqueduct.	N/A	Inconsistent	FFCA, Institutional Constraints, Economic Considerations, Reliability and Redundancy	Land is not currently available to construct new intake facilities. The NPS would need to grant permission to construction of a new intake facility on their property. It is not anticipated that this permission could be obtained within the limitations of the FFCA schedule. Intake improvements would be required at both the Great Falls and Little Falls locations to take full advantage of the suggested improvements. The cost of these improvements is anticipated to exceed the cost screening criteria for the project.	Because of the nature of the exiting intakes, it is not anticipated that significant improvement will be achieved by relocating intakes, which would come at considerable cost.
P76	SCS Engineers-4	Redesign Intake to Minimize Residuals Withdrawn from the River	Reduce the volume of residuals requiring management by relocating or redesigning the intake structure(s)	N/A	Inconsistent	FFCA, Institutional Constraints, Economic Considerations, Reliability and Redundancy	See P67	See P67
P77	SCS Engineers-5	Actively Manage Raw Water Intake to Reduce Residuals Withdrawn from the River	Reduce the volume of residuals requiring management through active management of raw water intake	N/A	Inconsistent		See P67	See P67
P81	Leonard Sullivan 9/22/2004 email	Silt Removal at Great Falls	Relocate silt removal facility to Great Falls intake area	N/A	Inconsistent	FFCA	In addition to the need for further study to confirm feasibility, the silt removal system would require a significant amount of land to construct. This land is owned by the National Park Service and is not readily available.	
P92	Fred Wright 11/14/2004 e-mail	Riverbank Filtration	Convert surface intake on river to well intake to reduce silt load to the plant and decommission the Little Falls Intake.	N/A	Inconsistent	FFCA	Feasibility of such a process would take considerable study and is uncertain at the scale of the Washington Aqueduct operation. It would not eliminate the generation of water treatment residuals, and it could only be implemented as part of a long-term plan.	
Treatment Process Optimization Options								
P69	Sludge Stopper - 69	Smart Pumping	For any or all piping solutions put forth, investigate the engineering issues associated with "smart pumping", or the co-utilization of existing pipelines for different purposes, i.e.: a pressurized sewer line could be used for primary transport, but when needed, would be temporarily converted to a residual pipeline for a day or portion thereof to drain a residual holding tank/basin with the contents being intelligently redirected at the processing plant to the most appropriate treatment facility for the contents.	N/A	Inconsistent	Institutional Constraints	Implementation of this option would require a system-wide, region-wide change in approach for the conveyance, treatment, and processing of sewage and residuals. Because multiple jurisdictions would be involved (i.e., Washington Aqueduct, DC WASA, WSSC, FCWA, etc.), this option would be very difficult to implement	
P78	SCS-6	Use Alternate Coagulant to Reduce Residuals Quantities	Use alternative processes for coagulation of sediments to reduce the volume of residuals requiring management	N/A	Consistant/Requires further evaluation		Washington Aqueduct is considering alternate coagulants but they must ensure that they do not negatively impact other water treatment goals, such as corrosion control or disinfection by-product formation. Pilot and full scale testing will be required to confirm these goals can be achieved. This testing cannot be completed in time to meet the FFCA deadlines. However, the proposed facilities will be designed to allow the use of alternate coagulants in the future if proven feasible and reliable.	
P83	Eric Morrison 9/22/2004 e-mail	Alternate Coagulant	Switch from aluminum chloride (alum) to an alternate coagulant, such as polyaluminum chloride, to reduce the volume of residuals produced	N/A	Consistant/Requires further evaluation		see P78 discussion above.	

3.2.2 Description of Public Alternatives Inconsistent with Screening Criteria

The 142 public alternatives are either consistent or inconsistent with screening criteria. This section evaluates the 131 public alternatives by categories which are not inconsistent with screening criteria.

No Action Alternative

None of the public alternatives directly pertained to this alternative.

Alternatives That Do Not Require Continuous Trucking from Dalecarlia WTP Complex

Many of the public alternatives were placed into this category. Table 3-8 summarizes the ultimate processing destination for these alternatives.

TABLE 3-8
Proposed Processing Locations for Alternatives That Do Not Require Continuous Trucking from Dalecarlia WTP Complex

Processing Location	Alternative(s)
Blue Plains AWWTP (DCWASA)	P1 – P48, P60 – P66, P70, P74, P75, P85, P86, P88, P89, P90, P95 , P140, P141
Potomac WFP (WSSC)	P49 – P53, P90, P101, P119 – P126
Naval Surface Warfare Center at Carderock	P54 – P57, P93, P100, P103 – P112
Corbalis WTP (FCWA)	P58 – P59
Barge to a Bioreactor Landfill or an Island	P73, P98
Georgetown Reservoir	P68
Capital Crescent Trail to CSX Railroad	P94
Construct Tunnel to Dalecarlia Reservoir Monofill	P96
Rockville WTP	P113 – P118
Central Intelligence Agency (CIA)	P127 – P132
Federal Highway Administration (FHWA)	P133 – P138
Rock Run Advanced Wastewater Treatment Plant right of way (ROW)	P139
Relocate entire water treatment plant (WA) or residuals processes	P102, P142

As shown on Table 3-7 the majority of these alternatives involve the transport of water treatment residuals from the Washington Aqueduct via pipeline to the Blue Plains AWWTP for processing. These alternatives are similar to (or variations of) Alternatives 4 and 5. The public alternatives typically engage the use of different construction methods, pipe materials, or pipe routes to address the issues associated with these alternatives.

As noted previously in Section 3.1, Alternative 4 involved the use of the Potomac Interceptor, and downstream forcemains, for conveying *unthickened* water treatment residuals to Blue Plains AWWTP. This alternative was screened out of consideration due to reliability and redundancy issues, economic considerations, and institutional constraints, based on conversations with operations staff at Blue Plains AWWTP regarding the potential impact of the water treatment residuals on operations at Blue Plains AWWTP.

As described in Section 3-1 and as a result of the evaluation of Alternative 4, Alternative 5 was developed for the conveyance of *thickened* water treatment residuals to Blue Plains AWWTP via the existing Potomac Interceptor piping, and the downstream forcemains. By thickening residuals before conveying them to Blue Plains AWWTP, the total volume of residuals that would be conveyed to Blue Plains AWWTP for processing could be greatly reduced. Because a large number of issues related to the use of the Potomac Interceptor and the processing of water treatment residuals along with sewage at Blue Plains AWWTP were identified, Alternative 5 was modified to include a separate pipeline that would be dedicated to water treatment residuals only. This alternative was carried forward into the EIS for further evaluation.

Alternatives Designating Blue Plains AWWTP as the Processing Destination.

Public Alternatives P1 through P48 and P75 are variations to Alternatives 4 and 5. They each would use segments of the DC WASA gravity and pressure collection system to convey water treatment residuals to Blue Plains AWWTP for processing. This approach would separate the water treatment residuals from the sewage to avoid impacts on treatment processes at Blue Plains AWWTP by literally constructing a “pipe-in-a-pipe” within the existing gravity sewer lines of forcemains. The large number of alternatives in this category reflects various choices of either piping material or pipeline route. This approach could, in principle, eliminate many of the construction, pipeline routing, and permitting issues associated with the construction of a new pipeline between the Dalecarlia WTP Complex and the Blue Plains AWWTP.

The “pipe-in-a pipe” concept was not evaluated during May 2004 with regard to the existing sewage delivery system. It was, however, discussed in detail with regard to the existing Georgetown and Washington City Tunnels. For alternatives involving the Washington City Tunnel, the approach was found to be inconsistent with screening factors related to the FFCA schedule, reliability and redundancy, economic considerations, and proven methods. For alternatives involving the Georgetown Conduit (any alternative that would require water treatment residuals to be pumped from the Georgetown Reservoir to the Dalecarlia WTP) this alternative was considered to be feasible.

Several of the public alternatives apply the “pipe-in-a pipe” concept. A preliminary evaluation indicates that implementation of the “pipe-in-a pipe” concept within an active pipeline, such as the Potomac Interceptor, or by any of the alternative interceptor routes, would be challenging. Currently, the following issues associated with the construction of these 48 public “pipe-in-a pipe “ alternatives have been identified:

- Construction of medium to large diameter (12-inch) piping within an operational interceptor will be difficult. Pipe typically comes in standard 20-foot lengths, so getting straight pipe lengths into the interceptor through the manhole openings will be a challenge. Consequently, construction would likely require the temporary removal of manholes to obtain access to the interceptor system, and the subsequent bypass pumping of sewage around the segment of piping under construction. These activities at a minimum would create disturbances to the local environment and facility operations.

- Several different choices of pipe materials are suggested in the list of public alternatives. These include ductile iron, high-density polyethylene (HDPE), stainless steel, and composite materials. Preliminary conversations with DC WASA have indicated that they would only be willing to accept stainless steel pipe. Therefore, alternatives using materials other than stainless steel should be eliminated from consideration.
- Many public alternatives in this category generally anticipate that *unthickened* residuals would be conveyed to Blue Plains AWWTP. The flow rate for unthickened residuals would be about four times as great as the flow rate for thickened residuals. The pipe diameters proposed in the public alternatives (i.e., 6-inch, 12-inch, or a trio of one 12-inch and two 6-inch pipes) would not be large enough to convey the unthickened residuals flow. Minimum pipe diameters of approximately 24 – 30 inches would be required to convey unthickened residuals to Blue Plains AWWTP. In the vicinity of the Darlecarlia WTP, one 30-inch pipe would use approximately 15 percent of the total area in the 96-inch Potomac Interceptor.
- Access to the piping for inspection or maintenance will be limited due to the active nature of interceptor piping.
- Access to pressurized, downstream forcemains is impossible due to the nature of a pressurized pipe system.

Screening Evaluation. Public alternatives P1 through P48, P75, P86, and P88 use the pipe-in-a-pipe concept to route a dedicated residuals pipeline to Blue Plains AWWTP. Other alternatives that use Blue Plains AWWTP for the processing of water treatment residuals include the following:

- Alternatives P60 through P66, and P74 would use alternate routes to reach Blue Plains AWWTP (i.e., through Virginia, within the riverbed, etc.).
- Alternatives P70 and P85 would utilize existing or future CSO holding facilities, or other storage facilities, to regulate the flow of residuals to Blue Plains AWWTP in an effort to minimize the impact on treatment processes.
- Alternative P89 would use existing Washington Metropolitan Area Transit Authority (WMATA) tunnels to route pipelines to Blue Plains AWWTP.
- Alternative P90 would use abandoned sewer lines to route a residuals pipeline to either Blue Plains AWWTP or the Potomac WFP.
- Public Alternative P95 would involve piping the residuals along the Capital Crescent Trail to a pipeline that would convey the residuals on to Blue Plains AWWTP.
- Public Alternative P140 would involved acquiring land at the Naval Research Land and constructing a regional thickening and dewatering facility.

- Public Alternative P141 would involve expansion of the Blue Plains AWWTP through construction of a levy in the Potomac to house the regional thickening and dewatering facility.

In the time since the initial screening of alternatives (May 2004), and in response to the evaluation of Alternative 5 for the EIS, DC WASA has indicated to Washington Aqueduct (John Dunn correspondence date October 28, 2004), that it is not willing to accept water treatment residuals from the Washington Aqueduct. The reasons cited relate to the potential need to provide additional facilities at Blue Plains AWWTP for future treatment needs related to Blue Plains' Biosolids management program objectives to protect the water quality of the Chesapeake Bay and the handling of wet weather flows.

Additionally, the Blue Plains Regional Committee of the Metropolitan Washington Council of Governments (BPRC) indicated (Jimmie Jenkins correspondence dated March 3, 2005) that as part of their study on regional long-term wastewater capacity needs through 2030 and their involvement in DC WASA's current study evaluating Blue Plains' process requirements in light of the projected 2030 capacity needs and pending regulations it is appropriate for them to comment on the alternatives that would effect future operational constraints at Blue Plains AWWTP. BPRC states that given the many critical site constraints and permit demands facing Blue Plains AWWTP, it would not be appropriate to consider setting aside acreage on their property to accommodate facilities associated with WA residuals management.Consequently, all public alternatives which use Blue Plains AWWTP as the processing location for water treatment residuals are inconsistent with the screening criterion for Institutional Constraints.

Alternative 5, which was carried through the previous screening exercise to the DEIS, will also need to be eliminated from consideration as a result of this new information from DC WASA and BPRC. A copy of the letters from DC WASA and BPRC are included in Volume 2 of the EIS.

Alternatives Designating the Potomac WFP as the Processing Destination.

Alternative 7 identified the Potomac Water Filtration Plant (WFP), operated by WSSC, as a potential location for a dewatering facility. WSSC operates the plant. This alternative is eliminated from consideration as inconsistent with the Institutional Constraints criterion because WSSC will not accept water treatment residuals for processing. A copy of the letter from WSSC is included in Volume 2 of the EIS.

Public Alternatives P49 through P53 would route piping to the WSSC by a variety of alternative routes:

- Public Alternative P49 would route pipelines on top of the Potomac Interceptor
- Public Alternative P50 would route pipelines inside the Potomac Interceptor
- Public Alternative P51 would route pipelines over the raw water conduit
- Public Alternative P52, P119 –P126 would route pipelines inside the raw water conduit
- Public Alternative P53 would route pipelines via River Road

- Public Alternative P90 would use abandoned sewer lines to route a residuals pipeline to either Blue Plains AWWTP or the Potomac WFP.

These alternatives have varying levels of viability, construct ability, and reliability. For example, construction of a major pipeline on top of another major pipeline (Public Alternatives P49 and P51) creates reliability and maintenance concerns. In addition, the routing of pipelines within the Potomac Interceptor (Public Alternative P50) would not be recommended due to accessibility concerns and capacity issues associated with the interceptor, as described in Section 3-1. Consequently, Public Alternatives P49 through P51 are all eliminated due to reliability and redundancy concerns.

Public Alternatives P119 through P126 would route unthickened residuals through the raw water conduit to a variety of residuals thickening locations. The thickened residuals are then routed to WSSC for dewatering and hauling.

The routing of pipelines within the raw water conduit (Public Alternative P52) would also be of concern, but is more feasible, due to the existing raw water supply redundancy between the two gravity conduits and Little Falls Pumping Station.

Construction along major roads (Alternative P53), such as River Road, was previously determined to be potentially costly and time consuming.

Using existing abandoned sewer lines, such as suggested in Public Alternative P90 could potentially be a beneficial use of previously obsolete infrastructure. However, no abandoned sewer lines have been identified at the time of this writing.

None of these alternatives are feasible because WSSC is not willing to accept the water treatment residuals for processing and are therefore they are eliminated based on institutional constraints.

Alternatives Designating Carderock as the Processing Destination.

Several of the public alternatives identified the Naval Surface Warfare Center (NSWF) at Carderock as a potential site for a water treatment residuals processing facility. Public Alternatives P54 through P57 would route piping to Carderock by the following methods and routes:

- Public Alternative P54 would route pipelines on top of the Potomac Interceptor
- Public Alternative P55 would route pipelines inside the Potomac Interceptor
- Public Alternative P56 would route pipelines over the raw water conduit
- Public Alternative P57 would route pipelines inside the raw water conduit
- Public Alternative P93 would build the thickening and dewatering facility at Carderock
- Public Alternative P100 would build the facilities at Carderock or some other federal facility

- Public Alternatives P103 through P112 would involve either thickening and dewatering at Carderock or just thickening at Carderock.

The feasibility associated with the construction of these pipeline alternatives is similar to that described for the Potomac WFP alternatives. Therefore, Public Alternatives P54 through P56 are eliminated based on reliability and redundancy concerns.

Officials at Carderock have been contacted by the Washington Aqueduct and have indicated it would not be possible to obtain land at the Carderock site, due to the large number of competing needs for this parcel, the classified nature of some of the government work at this site, the need to protect historic resources, and the location of the site between a residential area and National Park Service property. Based on this information, these alternatives are eliminated based on institutional constraints. A copy of the letter from Department of Navy (Naval District Washington) is included in Volume 2 of the EIS.

Alternatives Designating the Corbalis WTP as the Processing Destination.

Public Alternatives P58 and P59 describe alternate routes to the Corbalis WTP in Herndon, Virginia, which is operated by the FCWA. In the EFS, one pipeline route to the Corbalis WTP was evaluated. However, it was eliminated due to the Economic Considerations criterion. It is unlikely that an alternate route would be considerably less expensive, given that the distance between the two plants is approximately 22 miles.

Moreover, FCWA has indicated that it will not accept Washington Aqueduct's water treatment residuals (see Volume 2 of the EIS). Therefore, all alternatives to the Corbalis WTP are eliminated because they are inconsistent with the Institutional Constraints criterion.

Alternatives that Barge Residuals to either a Bioreactor Landfill or an Island in the Potomac River or Chesapeake Bay.

Public Alternative P73 would use barges to transfer thickened residuals to a bioreactor landfill for disposal. This alternative would eliminate the need for siting a processing facility at Blue Plains AWWTP.

Bioreactor landfills represent an emerging concept in the field of solid-waste management. A bioreactor landfill accepts controlled quantities of liquid wastes, whereas traditional landfills generally limit the amount of "liquid wastes" that can be placed in the landfill. Liquid (i.e., leachate) is recirculated through the waste to accelerate the rate of biodegradation within the landfill compared to a traditional landfill. This approach should result in decreased landfill gas emissions, improved leachate quality, and increased landfill capacity. The concept is currently undergoing demonstration testing at two landfills in Virginia (Maplewood Recycling and Waste Disposal Facility in Amelia County, and King George County Landfill and Recycling Center). The demonstration testing program is supported by EPA.

Bioreactor landfills do not appear to be a "Proven Method," for managing water treatment residuals. Therefore, this alternative is eliminated from further consideration.

Section 3.1 addressed the issue of barge transfer under the discussion of Alternative 6. This alternative was eliminated from consideration as inconsistent with the screening criteria for Reliability and Redundancy, Zoning, Land Use, Institutional Constraints, and Proven Methods. Public Alternative P73 would eliminate navigational hazards near Marbury Point and Blue Plains AWWTP, but would not eliminate the hazards in the channel to the Georgetown area.

Issues associated with increasing the navigability of the Potomac above the Key Bridge would not be addressed by barging the residuals to another location. Facility siting and permitting for the facility would likely be the most difficult issue to address for the barging operation. It is unlikely that these issues could be addressed within the context of the FFCA schedule. For example, Georgetown University is currently working on a project to build a boathouse for its rowing teams just upstream of the Key Bridge. The University has been working on resolving land use issues associated with this project for approximately 10 years, despite that fact that several important agencies, such as the National Park Service, have generally been supportive of the project. Based on the experience of Georgetown University, it can be assumed that it might take as long to site and permit a barge-loading facility on the Potomac River. Therefore, all barge alternatives are inconsistent with the FFCA screening criteria.

Public Alternative P98 involves creating an island in the Potomac, or some other water body such as the Chesapeake Bay, and barging residuals to this island. As with Alternative 6 this alternative was eliminated from consideration as inconsistent with the screening criteria for Reliability and Redundancy, Zoning, Land Use, Institutional Constraints, and Proven Methods. Because of the constraints associated with barging, Alternative P98 is screened out.

Alternatives Designating the Georgetown Reservoir as the Processing Destination. Alternative P68 proposed to install plate settlers at the Georgetown Reservoir and build a thickening and dewatering complex in one of the existing basins. According to the proposal, the building would be constructed below grade, within Basin No. 2, so that it would not be visible from the street.

The order-of-magnitude estimate for a plate settler system (evaluated in Section 5) at the Georgetown Reservoir is approximately $59,800,000, approximately $10,000,000 more than the base case estimate of $50,000,000 for the project.

A preliminary estimate of the cost to locate the thickening and dewatering building at the Georgetown Reservoir indicates that excavation costs for this proposal would approximately double the cost of the dewatering building (i.e., from approximately $20,0000,000 to approximately $40,000,000). Therefore, the total cost of the alternative would sum to approximately $79,800,000.

This estimate did not take into account the extensive roadway improvements that would be necessary to allow large residuals trucks to access both the site and the building. This alternative does not reduce the number of trucks in the Palisades community; it simply relocates them. These cost estimates are currently being defined further. However, based on this information, Public Alternative P68 is screened from consideration as inconsistent with the criteria for Economic Considerations. The total cost of the project would be more than 30 percent greater than the base cost estimate of $50,000,000.

Alternatives that Transport Residuals via the Capital Crescent Trail to the CSX Railroad. Public Alternative P94 involves piping residuals along the Capital Crescent Trail to the CSX train line in Silver Spring, Maryland. The residuals would then be transported by rail to a land application or disposal site somewhere along the rail line. This alternative has logistical limitations due to the need to pipe and transport by tank cars a high volume of liquid residuals. For this alternative, it is assumed that the volume of residuals to be transported is approximately 1.5 million gallons per day and that no thickening or dewatering facilities are built/utilized prior to utilizing the rail line. Assuming that each tank car can transport 20,000 gallons of unthickened residuals, this option requires approximately 75 tank cars per day, on average. In addition to this transport limitation, it is anticipated that extensive and time-consuming negotiations would be required to procure the rights to an easement along the Capital Crescent Trail and to arrange for use of rail cars on the CSX train line. To make this alternative plausible, some type of transfer system would need to developed to convey the residuals using the railroad. In addition to the development of a transfer system, if a disposal location that can take unthickened residuals cannot be identified, a thickening and dewatering facility, accessible to the rail line, would be necessary. It is unlikely that these issues could be addressed within the context of the FFCA schedule. Therefore, this alternative is inconsistent with the FFCA schedule.

Alternatives that Transport Dewatered Residuals to the Monofill via a Tunnel Under MacArthur Boulevard.

Public Alternative P96 is no longer under consideration because it is dependent upon Alternative 2 (Monofill alternative), which makes it inconsistent with the FFCA. It is also anticipated that it would be difficult to construct a new truck access tunnel under MacArthur Boulevard, in the vicinity of the front entrance to the Dalecarlia WTP, because the tunnel would need to be installed beneath both the road and the Georgetown Conduit, which transports raw water from the Dalecarlia Reservoir to the Georgetown Reservoirs.

Rockville WTP

Several of the public alternatives identified the Rockville WTP as a potential site for a water treatment residuals processing facility. Public Alternatives P113 through P118 would involve either thickening and dewatering at Rockville or just thickening at a variety of sites and dewatering at the Rockville WTP.

The Rockville WTP has indicated that it will not accept Washington Aqueduct’s water treatment residuals (see Volume 2 of the EIS) as it is inconsistent with their mission as local water treatment purveyor and their permitted treatment capacity is much smaller then the WA. Therefore, all alternatives to the Rockville WTP are eliminated because they are inconsistent with the Institutional Constraints criterion.

Central Intelligence Agency (CIA)

Several of the public alternatives identified the Central Intelligence Agency (CIA) as a potential site for a water treatment residuals processing facility. Public Alternatives P127 through P132 would involve either thickening and dewatering at CIA or just thickening at a variety of sites and dewatering at the CIA.

The CIA has indicated that it will not accept Washington Aqueduct’s water treatment residuals (see Volume 2 of the EIS) as it is inconsistent with their mission. Therefore, all alternatives to the CIA are eliminated because they are inconsistent with the Institutional Constraints criterion.

Federal Highway Administration (FHWA)

Several of the public alternatives identified the Federal Highway Administration (FHWA) as a potential site for water treatment residuals processing facilities. Public Alternatives P133 through P138 would involve either thickening and dewatering at FHWA or just thickening at a variety of sites and dewatering at the FHWA.

As with the other local Federally controlled sites suggested by the public as alternate thickening or thickening and dewatering sites, Washington Aqueduct has contacted FHWA in writing to determine if they would be willing to allow Washington Aqueduct to construct residuals processing facilities on their site. As of this writing, no response has been received from FHWA. Regardless of this lack of response, this alternative can be eliminated from further evaluation for several reasons that are similar to the issues identified with Alternative 8 –another alternative involving piping residuals to a remote processing facility. As with Alternative 8, this alternative would be unable to carry forward into the EIS for several reasons, including cost, compliance with the FFCA schedule, and uncertainty regarding the willingness of the FHWA to allocate a portion of their site to Washington Aqueduct.

As with Alternate 8, this alternative include a pipeline to transport either unthickened or thickened residuals to a remote processing site plus all of the other project components required for each of the alternatives. Depending pond the final pipeline route selection, this pipeline is anticipated to be approximately 4.5 miles long. Dual 8-inch pipelines are envisioned for this alternative as described in Alternative 8. This pipe size is sufficient to provide 50-pecent redundancy based on maximum anticipated residuals flows. It is assumed that thickened residuals will be pumped through the pipeline rather than unthickened because it allows a smaller diameter and more cost-effective pipeline to be utilized. The approximate construction cost for the twin 8-inch pipelines plus a $10,000,000.00 allowance for purchasing 10-acres of land on the FCWA site is anticipated to be $18,000,000.00. This cost exceeds the alternative screening criteria for cost, which requires that any additional costs associated with an alternative not exceed 30-percent of the $50,000,000.00 budget.

In addition to issues related to its cost, it is unlikely that this alternative could be implemented within the timeframe required by the FFCA schedule. Issues that would need to be addressed would include the following:

- It is anticipated that FHWA would require a separate NEPA investigation be completed for the area impacted by the proposed pipeline and FHWA site before the alternative could be considered feasible. This study would be expected to take approximately 12 months to complete.
- In parallel with the NEPA study, it I anticipated that the NPS would require alternate pipeline routes to be studied to confirm that there isn't any other pipeline route that could be used. That would have fewer impacts on parkland. It is anticipated that archeological issues would be one area of concern for the NPS.
- Easements would need to be obtained from the NPS on both the Virginia and District of Columbia sides of the Potomac River before the project could be constructed. This activity would be expected to take approximately 12 months and could not be started until the NEPA evaluation and pipeline route studies were completed and approved.

Based on the high cost, lengthy implementation schedule, and uncertainty concerning whether the FCWA would be willing to allow Washington Aqueduct to construct a residuals processing facility on their property, this alternative cannot be recommended for further study in the EIS.

Relocate entire water treatment plant (WA) or residuals processes

Public Alternative P102 proposes moving the entire Dalecarlia WTP to an alternate, upriver location. The economic impact of this alternative was not calculated. However, the cost would be considerable and would not meet the economic considerations screening criteria. In addition, this alternative would require additional time to identify, evaluate, and obtain a parcel of land suitable for a new facility.

Public Alternative P142 anticipates constructing the proposed residuals thickening and dewatering facilities on remote non-residential government owned land. A separate site selection study would be required to implement this alternative. It is anticipated that such a study could take several months to complete, after which an Engineering Feasibility Study evaluation and an environmental impacts evaluation would need to be completed. Assuming that Washington Aqueduct could identify a federally controlled site that is willing to allow the construction of new residuals processing facilities is not anticipated that this series of studies and evaluations could be completed within the FFCA schedule. Based upon knowledge of the federal facilities located in the immediate vicinity of the Dalecarlia WTP, it is anticipated that a potential federally controlled site would likely be located at least 10 miles away from the WTP. A pipeline would, therefore, be required to transport residuals to this site. The extra cost associated with this pipeline is anticipated to violate the economic screening criteria for the project.

The public alternatives involving construction of a new water treatment facilities resemble Alternative 8, which is considered inconsistent with screening criteria due to economic constraints, that proposes construction of a new dewatering facility. The additional effort to site and construct a new water treatment plant would prevent Washington Aqueduct from meeting the FFCA schedule

Rock Run Advanced Wastewater Treatment Plant right of way (ROW)

Public Alternative P139 proposes constructing a thickening and dewatering facility in the old Rock Run right of way. The economic impact of this alternative was not calculated. However, this alternative would require significant time to permit construction of residuals facilities on the public right of way.

The Rock Run Advanced Wastewater Treatment project is still listed in the 2004 Capital Improvement Plan (CIP) for WSSC, despite the fact that is was conceived over 20 years ago. At the present time, it appears unlikely that the project will ever be built, because the capacity of the Blue Plains AWWTP has been expanded, making the need for an additional wastewater plant questionable. Growth controls and water conservation efforts have also led to a decrease in wastewater flow projections over the years.

> "…actual project costs will be heavily dependent upon whether agreement can be reached with the National Park Service concerning the location and construction of the effluent conveyance system within the George Washington Memorial Parkway corridor and on whether it is deemed environmentally acceptable to place the effluent pipe within the Rock Run Stream Valley Park, managed by the MNCPPC (Maryland-National Capital Park & Planning Commission). Negotiations with the United States Department of the Navy for rights-of-way for the influent and effluent conveyance system would also be necessary. Upon successful completion of negotiations, construction could begin. The currently planned discharge pipe would be approximately seven miles long and would run along MacArthur Boulevard for approximately three miles. The planned route would require the removal of

> roadside and streamside trees for most of its length." (Montgomery County Government Website, http://www.montgomerycountymd.gov/content/omb/fy05/pdf/804537.pdf)

A right of way to construct a pipe in the rock run stream has not been obtained. This effort would entail getting National Park Service approval which can be a lengthy process. Additionally, there would be a large number of environmental mitigation issues and archaeological concerns to address associated with construction in Rock Run Stream. This alternative is screened out as it is inconsistent with the FFCA.

Alternatives with a Discharge to the Potomac River

One of the Public Alternatives (P101) involves challenging the provisions of the existing NPDES permit and returning water treatment residuals to the Potomac River. This alternative is the same as alternative number 10 of the original 26 alternatives. This alternative is screened out as it is inconsistent with the NPDES permit.

Alternatives Involving alternate uses of the Dalecarlia Reservoir

Public Alternative P82 proposes that water treatment residuals be stored temporarily in a sectioned-off portion of the Dalecarlia Reservoir prior to processing them. This option is inconsistent with reliability and redundancy criteria because it would use reservoir capacity that can best be used to dampen fluctuations in influent raw water quality. As with all Dalecarlia Reservoir alternatives in the EFS, this alternative is screened from further consideration.

Alternatives with Facilities at the McMillan WTP

None of the Public Alternatives involved the siting of facilities at the McMillan WTP.

Alternatives with Facilities at the Dalecarlia WTP (involving trucking from Dalecarlia WTP Complex)

Public Alternatives P72, P79, P87, P91, P97, and P99 generally involve facilities that would be located at the Dalecarlia WTP:

- Public Alternative P72 would provide an underground thickening and dewatering facility at the Dalecarlia site. In this proposal, the facility would be built into the hillside created when fill was piled onsite during the construction of the WMATA transit system.
- Public Alternative P79 would build a dedicated roadway from the Dalecarlia site to the Clara Barton Parkway to minimize the impact of truck traffic on the neighborhoods north of the Dalecarlia WTP.
- Public Alternative P87 provided some suggestions about burying the thickeners in the ground or burying the truck entrance/exit to the processing building in the ground.
- Public Alternative P91 also made suggestions about the location and configuration of the thickening and dewatering facilities. Carderock, the Georgetown Reservoir (both discussed elsewhere in this document), the currently unused portion of the Dalecarlia

WTP West Filter Building, and the top of the sedimentation basins were specifically mentioned.

- Public Alternative P99 would involve substantially replacing water treatment process components in order to minimize or eliminate the generation of coagulant-associated water treatment residuals.

For the purposes of this evaluation, Public Alternatives P72, P80, P87, and P91 will be combined and considered as one group. The overall purpose of all of these alternatives is to select a location and configuration for the thickening and dewatering facilities on the Dalecarlia WTP complex that will address the concerns residents in the surrounding neighborhoods. The following locations were considered:

- The currently proposed site (described in the EFS) on the western side of Dalecarlia WTP property. The site is south of MacArthur Boulevard, and between the Capital Crescent Trail and the property line. This site was reserved for residuals-handling facilities on the 1971 Master Plan for the site, and will be referred to in this document as the “Master Plan site”.

- The Master Plan site, with the facilities partially buried into the ground to provide an underground entrance/exit to the dewatering facility. Much of the site consists of fill that was placed at this location during the construction of the WMATA transit system.

- A site to the west of the West Filter Building, which is currently reserved for a potential future ozone/carbon treatment facility. This site is not considered consistent with the screening criteria because it is reserved for future treatment facilities, which would need to be constructed in close proximity to the existing liquid treatment facilities.

- The West Filter Building. The unequipped filters in this building are reserved for future flows and/or changes in filtration technology. This alternative is not considered consistent with the screening criteria for the project. These existing filters must be reserved for future liquid treatment facilities or the installation of new treatment processes associated with changing water treatment regulations. Modifying the existing filters to function as residuals processing facilities is not considered a wise use of this existing infrastructure.

- The top of the sedimentation basins. This alternative is not considered consistent with the screening criteria for the project. The new residuals removal equipment planned for installation in the existing sedimentation basins will require open access for routine maintenance as well as safe and reliable operation of the treatment facilities.

Public Alternative P79 would require the approval of the National Park Service, which controls the parkland, located on the west side of the proposed Northwest Dalecarlia Processing Site as well as the Clara Barton Parkway itself. The Washington Aqueduct has contacted the NPS to inquire about whether the NPS would permit a new access road to be constructed from the proposed Northwest Dalecarlia Processing Site to the Clara Barton Parkway and permit residuals trucks to use the Clara Barton Parkway to access the Beltway. Preliminary feedback from the NPS indicates that this request would not be approved (see April 9, 2005 Memorandum for the Record prepared by Thomas P. Jacobus, General Manager of the Washington Aqueduct provided in the appendix). A written response to

Washington Aqueducts' inquiry is anticipated soon. However, at the time of this writing no written response has not been received from the NPS.

Public Alternative P97 is similar to Alternative 25 in that it includes processing water treatment residuals at the Dalecarlia WTP and disposal via contract hauling. However, this alternative proposes using a combination of thickening and dewatering followed by heat drying technology to further reduce the volume of residuals to be hauled, thereby reducing the number of trucks required per day. Heat drying is a technology that is not typically used for water treatment residuals, mainly because of high moisture content and low fuel value of the residuals. This translates into relatively high capital and operating costs for the dryer. Dewatered residuals are dried at very high temperatures to further reduce the water content of the material. Heat drying is used at wastewater treatment facilities to produce very high quality stabilized biosolids that can be sold as fertilizer, thereby providing a vehicle for recovering some of the operating costs. Wastewater solids can be dried by this method and used as a fertilizer because of their relatively high organic content. Water treatment residuals generally contain little to no organic content and would therefore not be attractive as a fertilizer product. It is anticipated, based on experience with heat drying applications at wastewater treatment plants producing similar solids volumes, that the cost of a heat drying facility would be greater than $15 million. Therefore, Public Alternative P97 is screened from consideration as inconsistent with the criteria for Economic Considerations.

Public Alternative P99 involves the utilization of a combination of MIEX ® water treatment technology, followed by microfiltration and granular activated carbon (GAC) for processing all of the water treated at the Dalecarlia and McMillan WTPs. This combination of proposed treatment processes can be contrasted with the conventional rapid mix, flocculation, sedimentation, and filtration treatment processes currently used by the Washington Aqueduct. MIEX ® water treatment technology is a relatively new water treatment technology that uses a magnetically charged ion exchange resin to remove naturally occurring organic compounds, including disinfection byproduct precursors. This treatment function is currently being performed at the Dalecarlia and McMillan WTPs by adding alum to the raw water, flocculating the water (which forms larger, settle able particles containing the alum, river silt, and organic compounds), and then allowing the larger particles to deposit out in the sedimentation basins. The use of MIEX ® treatment technology in lieu of the existing Dalecarlia and McMillan treatment processes would eliminate the formation of an alum residual byproduct. However, the MIEX ® treatment process requires periodic regeneration with a brine solution. This recycle stream is unsuitable to recycle back to the Washington Aqueduct treatment process. MIEX ® would not eliminate the production of water treatment residuals. Instead, it would substitute a new liquid brine form of residuals for the solid form of alum residuals currently produced at the Washington Aqueduct treatment facilities.

The second treatment process recommended by the public in this alternative, microfiltration membranes, is similar to MIEX ® in that it also doesn't produce a solid waste by-product. However, microfiltration membranes do require periodic cleaning with a strong solution of sodium hypochlorite and citric acid to maintain stable operation of the membranes. The liquid waste stream produced during each cleaning would need to be neutralized and discharged offsite because it is not suitable for recycling to the head end of the WTPs. This adds to the implementation complexity of this alternative and confirms that this option substitutes one waste stream for another, rather than truly eliminating all water treatment residuals.

The combination of the proposed treatment technologies is quite complex and innovative when compared with the existing technology currently being used by the Washington Aqueduct. While it is likely that the proposed new technologies would produce higher quality finished water than the existing plants, if they were retrofitted with the proposed technologies, they would be among a very small number of plants in the world to use this combination of treatment technologies. The modified plants would also be among a relatively small number of MIEX ® water treatment plants in the world. The relative newness of the MIEX ® water treatment process and the lack of "large" water treatment plant experience raises questions about the reliability of both MIEX ® and the proposed combination of treatment technologies for this application.

In addition to the other uncertainties associated with the MIEX ® water treatment process, it is uncertain whether the proposed microfiltration membranes would be capable of reliably and cost effectively treating Potomac River water without requiring frequent cleaning. Membrane cleaning frequency is typically assessed by performing a pilot scale demonstration test of the proposed treatment processes on the actual water to be treated. Cleaning cycle intervals more frequent than every 30-days could render this combination of treatment technologies infeasible and unreliable. Given the variability of the Potomac River water supply, a 12-month pilot test would be appropriate to assess the feasibility of the proposed combination of water treatment technologies. This piloting duration would allow the performance of this innovative combination of treatment technologies to be assessed throughout one complete set of seasonal variations. Given the uncertainties about the potential performance of this combination of treatment technologies when applied to Potomac River water and the significant cost associated with this alternative, it would also be appropriate to delay start of design until the pilot testing is successfully completed. This delay would negatively impact the Washington Aqueduct's ability to meet the project FFCA schedule.

The proposed combination of treatment technologies would require a much more significant capital investment at both existing Washington Aqueduct water treatment plants than the proposed residuals processing facilities. New treatment facilities, with a total treatment capacity of 320 mgd, would be required for this option. While a detailed cost estimate was not prepared for this alternative, costs for similar water treatment retrofit projects indicate that this treatment alternative would cost between $1.00/gallon and $3.00/gallon of treatment capacity. This translates into an anticipated project capital cost of between $320,000,000.00 and $960,000,000.00. This cost range violates the cost screening criteria used for this project.

This alternative is considered unproven and inconsistent with the screening criterion because only a limited number of water treatment plants currently use the combination of treatment technologies proposed in this alternative. A modified Washington Aqueduct water treatment facility, equipped with the proposed combination of water treatment technologies, would also have a significantly larger capacity than typical installations currently using the proposed technology.

This alternative, therefore, is inconsistent with the screening criteria, due to concerns with complying with the FFCA, cost considerations, and the fact that it is a technology unproven with the Washington Aqueduct scale of water production, as well as with the source water.

3.2.3 Description of Public Alternatives Consistent with Screening Criteria

Public Alternative P71 and P80 are consistent with screening criteria. These alternatives both propose the siting of the dewatering and thickening facilities at an alternative location on the Dalecarlia WTP Complex. A new site further from residential housing at the Dalecarlia WTP Complex, located adjacent to the Little Falls Road, is being evaluated for the residuals thickening and dewatering facilities. Siting the dewatering facility on the east side of the Dalecarlia WTP Complex is consistent with the screening criteria for the project.

Public Alternative P84 would evaluate alternative disposal locations, such as cement plants. This alternative identifies a potential beneficial reuse for dewatered water treatment residuals. It would not necessarily change the form of processing or the method of transport (i.e., trucks), or reduce the number of trucks when compared with other trucking alternatives. This alternative is consistent with the screening criteria for the project but is not carried forward for further evaluation in the EIS.

3.3 Alternative Screening Summary

This section summarize the screening results presented individually in the preceding text for both the original 26 alternatives (May 2004) and the subsequent public alternatives (November 2004 and February 2005).

3.3.1 May 2004 Screening Summary

Table 3-9 concisely describes each of the 26 alternatives considered in this analysis and summarizes the results of the screening process. Three of the alternatives were found to be feasible based upon the screening analysis. In addition, the no-action alternative will be carried forward into the EIS, as required by the NEPA process. The three feasible alternatives are described in more detail in Section 5.

The remaining 22 alternatives did not meet one or more of the screening criteria. Table 3-7 provides a brief list of the screening criteria that were not satisfied for each of these 22 alternatives.

TABLE 3-9
Screening Results Summary

No.	Description	Screening Result (Consistent/ Inconsistent with Screening Criteria)	Unsatisfied Screening Criteria
1	No Action	Analyzed in detail in the EIS per NEPA requirements	• N/A
Alternatives 2–8: Alternatives That Do Not Include Continuous Trucking from the Dalecarlia WTP			
2	Process water treatment residuals at Dalecarlia WTP and dispose in Dalecarlia monofill. Process Forebay residuals by current methods and periodically haul.	Consistent	• None
3	Coprocess water treatment and Forebay residuals at Dalecarlia WTP and codispose in Dalecarlia monofill.	Inconsistent	• Reliability and redundancy
4	Pump unthickened water treatment residuals via Potomac Interceptor to DC WASA Blue Plains AWWTP. Process Forebay residuals by current methods and periodically haul.	Inconsistent	• Reliability and redundancy • Economic • Zoning, land use, and Federal and local regulations
5	Thicken water treatment residuals at Dalecarlia WTP, and then pump via a new pipeline to DC WASA Blue Plains AWWTP. Process Forebay residuals by current methods and periodically haul.	Consistent	• None
6	Thicken water treatment residuals at Dalecarlia WTP, then transport by barge to DC WASA Blue Plains AWWTP. Process Forebay residuals by current methods and periodically haul.	Inconsistent	• Reliability and redundancy • Zoning, land use, and local regulations • Proven methods
7	Thicken water treatment residuals at Dalecarlia WTP, then pump via pipeline to neighboring water utility. Process Forebay residuals by current methods and periodically haul.	Inconsistent	• Economic (FCWA) • Institutional constraints (FCWA, WSSC)
8	Thicken water treatment residuals at Dalecarlia WTP and pump via pipeline to new dewatering location. Process Forebay residuals by current methods and periodically haul.	Inconsistent	• FFCA • Economic
Alternatives 9–11: Alternatives with a Discharge to the Potomac River			
9	Process most water treatment residuals at Dalecarlia WTP and haul offsite, but dilute some residuals for discharge back to Potomac River. Process Forebay residuals by current methods and periodically haul.	Inconsistent	• Reliability and redundancy • NPDES

TABLE 3-9
Screening Results Summary

No.	Description	Screening Result (Consistent/ Inconsistent with Screening Criteria)	Unsatisfied Screening Criteria
10	Renegotiate NPDES Permit to allow discharge of all residuals to Potomac River.	Inconsistent	• NPDES
11	Process water treatment residuals at Dalecarlia WTP and haul offsite. Process Forebay residuals by current methods and periodically haul. Dilute treatment side streams and discharge to the Potomac River.	Inconsistent	• Reliability and redundancy • NPDES
Alternatives 12–15: Alternatives Involving the Dalecarlia Reservoir			
12	Store all residuals in the Dalecarlia Reservoir prior to processing at the Dalecarlia WTP. Coprocess Forebay and water treatment residuals. Dispose in Dalecarlia & McMillan monofills.	Inconsistent	• Reliability and redundancy
13	Store all residuals in the Dalecarlia Reservoir prior to processing at the Dalecarlia WTP. Coprocess Forebay and water treatment residuals and haul to offsite disposal.	Inconsistent	• Reliability and redundancy
14	Construct new sedimentation basins at the Dalecarlia Reservoir and process all residuals at Dalecarlia WTP. Coprocess Forebay and water treatment residuals and haul to offsite disposal.	Inconsistent	• Reliability and redundancy
15	Coagulate all flow in the Dalecarlia Reservoir and process all residuals at the Dalecarlia WTP. Coprocess Forebay and water treatment residuals and haul to offsite disposal.	Inconsistent	• Reliability and redundancy
Alternatives 16–23: Alternatives with Facilities at the McMillan WTP			
16	Thicken water treatment residuals at the McMillan WTP and dewater at an existing wholesale customer's treatment facility. Contract haul dewatered residuals. Process Forebay residuals by current methods and periodically haul.	Inconsistent	• FFCA • Reliability and redundancy • Economic • Proven methods
17	Coprocess Forebay and water treatment residuals at the McMillan WTP. Disposal of residuals via contract hauling from McMillan WTP. *(Same as Alternative 18 w/ coprocessing)*	Inconsistent	• Reliability and redundancy • FFCA • Economic and proven methods
18	Process water treatment residuals at the McMillan WTP and haul offsite. Process Forebay residuals by current methods and periodically haul.	Inconsistent	• FFCA • Reliability and redundancy • Economic • Proven methods

TABLE 3-9
Screening Results Summary

No.	Description	Screening Result (Consistent/ Inconsistent with Screening Criteria)	Unsatisfied Screening Criteria
19	Thicken water treatment residuals at the McMillan WTP and dewater at an existing wholesale customer's treatment facility. Dispose of residuals via contract hauling from the existing facility. Discharge Forebay residuals to the Potomac River.	Inconsistent	• FFCA • Reliability and redundancy • Economic • Proven methods • NPDES
20	Thicken water treatment residuals at the Dalecarlia WTP and the Georgetown Reservoir and dewater at the McMillan WTP. Dispose of water treatment residuals via contract hauling from McMillan WTP. Process Forebay residuals by current methods and periodically haul.	Inconsistent	• FFCA • Reliability and redundancy • Economic • Proven methods
21	Store residuals in lagoons at Forebay, Dalecarlia WTP, and McMillan WTP. Thicken and dewater residuals with portable equipment and dispose via contract hauling from all locations.	Inconsistent	• FFCA • Reliability and redundancy • Economic • Proven methods
22	Store water treatment residuals in Dalecarlia and Georgetown Reservoirs, prior to thickening and dewatering at the Dalecarlia and McMillan WTPs. Dispose of water treatment residuals via contract hauling from the Dalecarlia and McMillan WTPs. Process Forebay residuals by current methods and periodically haul.	Inconsistent	• FFCA • Reliability and redundancy • Economic • Proven methods
23	Store water treatment residuals in McMillan Reservoir prior to dewatering at the McMillan WTP. Dispose of water treatment residuals via contract hauling from the McMillan WTP. Process Forebay residuals by current methods and periodically haul.	Inconsistent	• FFCA • Reliability and redundancy • Economic • Proven methods
Alternatives 24–26: Alternatives with Facilities at the Dalecarlia WTP			
24	Coprocess Forebay and water treatment residuals at Dalecarlia WTP. Dispose of residuals via contract hauling from the Dalecarlia WTP. *(Same as Alternative 25 w/ coprocessing)*	Inconsistent	• Reliability and redundancy
25	Process water treatment residuals at the Dalecarlia WTP; and dispose via contract hauling. Process Forebay residuals by current methods and periodically haul.	Consistent	• None

TABLE 3-9
Screening Results Summary

No.	Description	Screening Result (Consistent/ Inconsistent with Screening Criteria)	Unsatisfied Screening Criteria
26	Use plasma oven technology to process Forebay and water treatment residuals at the Dalecarlia WTP. Dispose of residuals via contract hauling from the Dalecarlia WTP. *(Same as Alternative 25 with coprocessing and plasma oven step)*	Inconsistent	• Reliability and redundancy • Economic • Proven methods

3.3.2 November 2004 and February 2005 Screening Summary

Table 3-7 presented earlier describes and screens each of the 142 public alternatives and options considered in this analysis of water treatment residuals processing. The column "screening result (Consistent/Inconsistent with Screening Criteria)" demonstrates the public alternatives and options that are carried forward into the EIS for further evaluation. Two of the alternatives were found to be feasible based upon the screening analysis. The two feasible alternatives, P71 and P80, are essentially the same alternative and combined as one to be described in more detail in Section 5. There are 6 public options that are defined in more detail in Section 5.

The remaining 131 alternatives and 2 options did not meet one or more of the screening criteria. Table 3-7 provides a brief list of the screening criteria that were not satisfied for each of these alternatives in options in the last three columns, "unsatisfied screening criteria", "Primary Screening issue" and "secondary screening issue".

The five (5) alternatives that are consistent with screening criteria are concisely defined in Section 5. The four alternatives (3 original and the combined public alternative) that are consistent with the screening criteria are concisely defined in Section 5 of this document. These alternatives and the No Action Alternative represent the alternatives that are evaluated in the EIS for consideration as a proposed action to the for residuals management at the Washington Aqueduct. The following section, Section 4, presents an evaluation of potential residuals collection, processing and disposal options that are applicable to all alternatives.

Legend

- Approximate Location of New/Modified
- County Boundary
- Existing Buildings
- Roads

The geographic information shown on this map is based on publicly available data from Montgomery County Maryland and the District of Columbia Geographic Information System (GIS) with GIS layers updated at different times. This figure is not intended to be a precise representation of the existing project site. Technical information on land use is evaluated elsewhere in the EIS. The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

0 375 750 Feet

Figure 3-1
Site Plan - Potential Monofill Sites

CH2MHILL

W0420040001WDC_WAFS_002_CityTunnel_v2

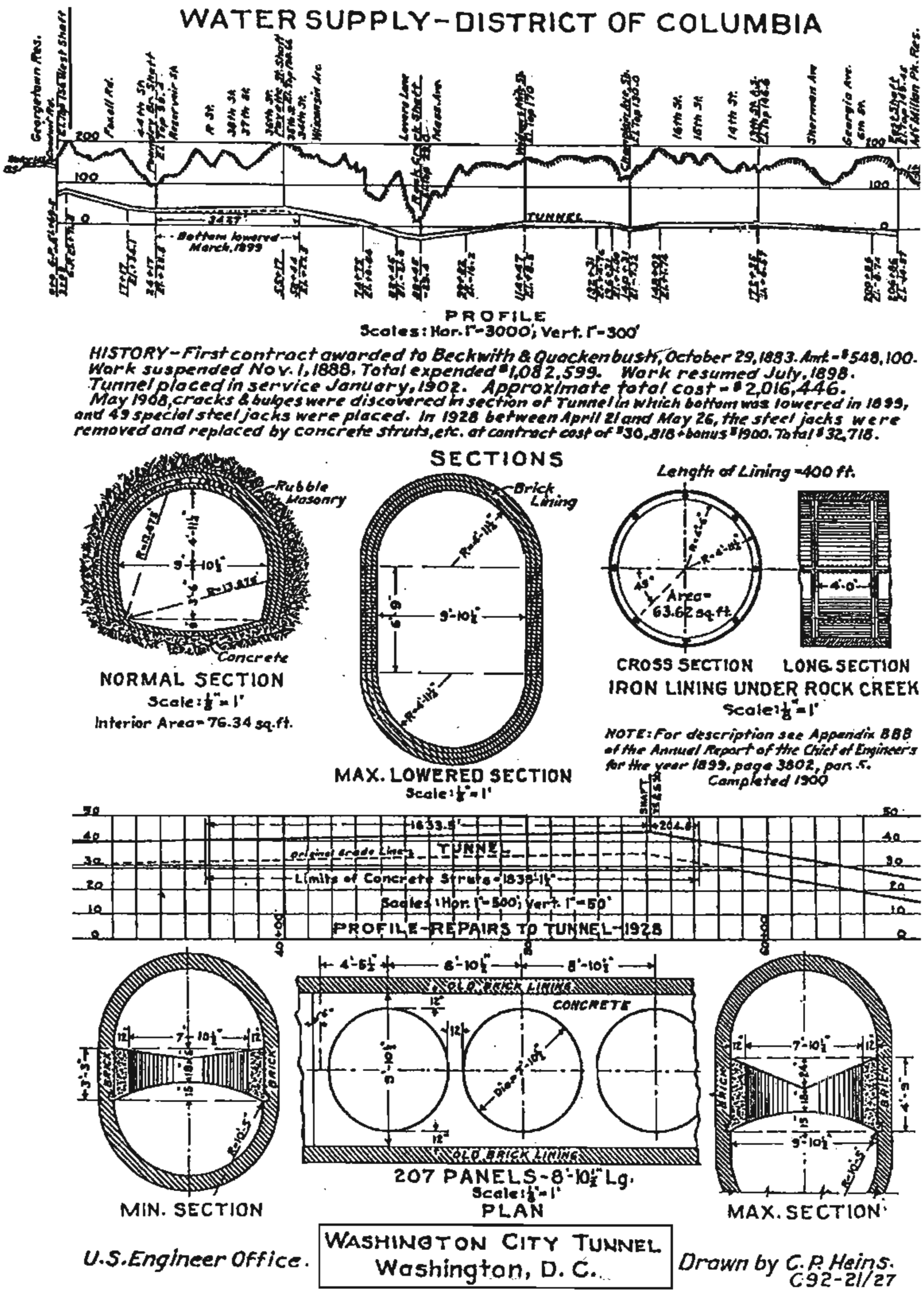


FIGURE 3-2

Profile and Sections of the Washington City Tunnel from "Washington Aqueduct Cultural Resource Management Plan" June 1998

RESIDUALS COLLECTION, PROCESSING, AND PUBLIC OPTIONS

SECTION 4

Residuals Collection, Processing, and Public Options

4.1 Introduction

Previous sections of this Engineering Feasibility Study (EFS) discussed numerous alternatives for the collection, conveyance, and processing of water treatment and Forebay residuals generated by the Washington Aqueduct treatment operations at the Dalecarlia WTP and the Georgetown Reservoir. The alternatives were evaluated with respect to a number of screening criteria to determine whether they were consistent with the purpose and need of the Washington Aqueduct Water Treatment Residuals Management Project.

For the purposes of this evaluation, it was assumed that residuals from the Forebay would be collected and processed onsite by current methods (dredging, pumping, and gravity thickening and dewatering) and periodically hauled to an offsite location. Co-processing of the Forebay and water treatment residuals (i.e., using the same thickening and dewatering equipment to process a combined flow of blended residuals) is not recommended because the Forebay residuals have a high grit content, which will result in excessive wear on pumps, centrifuges, pipes, and other mechanical equipment. All alternatives that were based on this approach were eliminated as inconsistent with screening criteria for reliability and redundancy reasons. Other options for the processing of Forebay residuals also exist and are considered within this section.

Four alternatives for the processing of water treatment residuals were selected as being consistent with the purpose and need of the project. These alternatives can be briefly described as:

- Monofill disposal of dewatered water treatment residuals (alternative 2)
- Conveyance of thickened water treatment residuals to Blue Plains via a dedicated pipeline for further processing (alternative 5)
- Onsite thickening and dewatering of water treatment residuals at the northwest Dalecarlia WTP site with contract hauling for off-site disposal (alternative 25)
- Onsite thickening and dewatering of water treatment residuals at the east Dalecarlia WTP site with contract hauling for off-site disposal (alternative P71 and P80)

The selected alternatives each represent a generalized approach for residuals collection, conveyance, processing, and disposal. Within the context of each alternative, a number of options are available for implementing that alternative. The options might involve the choice of a particular residuals collection and processing technology, the manner in which a particular technology is used, or the location of a particular treatment process. The issues surrounding the use of alternate coagulants are also examined.

This section of the Engineering Feasibility Report discusses several specific options that are under consideration for the collection and processing of Washington Aqueduct's Forebay and water treatment residuals. The new residuals collection and processing options were developed with the location and configuration of the existing treatment basins and reservoirs in mind. Numerous residuals collection and processing options have been explored in an attempt to identify the optimum method of collecting and processing residuals within the existing plant infrastructure.

In addition to new residuals collection and processing options identified by the technical staff responsible for preparing the Engineering Feasibility Study, several residuals options suggested by the public are also examined in this section.

4.2 Residuals Collection Options Applicable to Alternatives 2,5,25, and P71/P80

In order to enhance performance, reduce cost, and mitigate environmental impacts, numerous residuals collection options applicable to May 2004 Alternatives 2, 25, and 5 and public Alternative P71 and P80 have been evaluated. The options considered include options associated with the collection of Forebay residuals and options related to the sedimentation process that currently takes place in the Dalecarlia WTP sedimentation basins and the Georgetown Reservoir.

4.2.1 Forebay Residuals Collection and Processing Options

Existing Forebay Residuals Collection and Processing Practice

For the purposes of evaluating the alternatives presented in the previous sections of this report, it was assumed that Forebay residuals would continue to be processed by current methods. They are currently dredged from the Forebay on a seasonal basis, pumped to the Forebay spoils area and periodically transferred to a residuals drying area located north of Little Falls Road. Here, the residuals are allowed to gravity dewater over a period of several years. Once dried to a consistency similar to soil, they are hauled offsite to a final disposal site. This occurs approximately every 7 or 8 years.

Alternate Forebay Residuals Collection and Processing Options

Two Forebay residuals collection and processing options are explored below. The first option uses a new solids/liquid separation technology (HEADCELL™ mechanical silt removal system) to perform the same silt sedimentation function as the existing Forebay. Once separated from the raw water flow stream, the collected silt would be dewatered using new equipment to be installed in the new Residuals Dewatering Building proposed for processing water treatment residuals.

The second option assumes that the Forebay will continue to be used to settle grit present in the raw water flow stream out of solution. An upgraded dredge system would be used to periodically remove the settled silt from the Forebay. Silt dewatering would be accomplished with new equipment installed in the new Residuals Dewatering Building proposed for processing water treatment residuals, similar to the HEADCELL™ option.

HEADCELL™ Collection with Cyclone/ GRIT SNAIL™ Dewatering

New grit removal technologies are available that might simplify the processing effort, increase dryness of the processed residuals (resulting in slightly fewer truck loads), and result in better reservoir water quality. One manufacturer of such technology (i.e., Eutec) manufacturers a grit removal system that effectively removes grit particles as small as 50 microns in diameter. Conventional wastewater treatment grit removal systems, by comparison, are designed to remove particles in the 300-micron diameter range.

The Eutec system, known by the trade name HEADCELL™, uses a modular multiple-tray solids concentrator. A high efficiency flow distribution header is used to divide the flow evenly between the trays. Tangential feed is used to establish a vortex flow pattern within the unit to force particles to settle into a boundary layer on each tray, from which they are swept through the center of vortex to a collection chamber. From the collection point, the solids are continuously pumped to grit separation and classification devices (known by the trade names SLURRYCUP™ and GRIT SNAIL™) for further processing. Figure 4-1 provides a cutaway view of a HEADCELL™ solids separator unit.

This new technology could be used for Forebay residuals processing by installing a grit collection facility at the entrance to the Forebay (i.e., a headworks facility). Incoming water from the Potomac River would pass through the grit removal system before entering the Forebay portion of the Dalecarlia Reservoir. The collected grit flow would be pumped from the new headworks facility to the residuals processing complex for separation and classification. Trucks could be loaded from the same location.

By removing grit and other settleable solids before the water enters the Forebay, the total suspended solids and turbidity of the reservoir effluent water transferred to the treatment plants would be reduced, resulting in higher quality raw water. The current quality of incoming raw water varies significantly, depending on conditions in the river, and the residuals processing facility would dampen these fluctuations in water quality. A conceptual design of the new headworks facility was developed as part of this Feasibility Study to determine if both the headworks and water treatment residuals collection, conveyance, processing and disposal facilities could be constructed within the residuals project budget. The proposed headworks facilities have not been defined to a high degree of detail at this time because this facility is not the major focus of the water treatment residuals project. However, it is being considered as part of the overall Washington Aqueduct residuals processing system for the future. For this reason, the environmental impacts associated with the proposed headworks facility have been evaluated in the EIS. This analysis includes a visual simulation of the proposed headworks facilities that could be installed within the upstream end of the existing Forebay.

Conceptual design sketches of the proposed headworks structure are included in Appendix D of this report. The proposed headworks structure would include a new poured concrete divider wall installed on the north end of the headworks facility, which would span from the east to west shores of the Forebay. This wall would effectively divide the existing Forebay into a north section and a south section. All raw water flow from the Great Falls Aqueducts would enter the north section of the Forebay, pass through the proposed headworks structure, and discharge into the south section of the Forebay. The south section of the Forebay would continue to serve as a wetwell for the Forebay to Reservoir Booster Pump Station. A total of 18 individual HEADCELL™ units would be installed in the proposed headworks facility, as well as, associated grit pumps and piping. The proposed headworks facility would be designed to process a maximum flow of 320 mgd and measure approximately 130 feet wide by 155 feet long by approximately 25 feet deep, plus width allowances for the wing walls that extend to the east and west shores of the Forebay. The grit pumps will pump the collected grit slurry discharged from the bottom of the HEADCELL™ units to a transfer pipeline that carries the grit to the residuals proposed processing building.

Appendix D includes a conceptual design construction cost estimate for the headworks facility. The anticipated order of magnitude construction cost for the proposed headworks facility is $18,360,000.00. This cost is not currently included in the construction cost for any of the residuals alternatives planned for evaluation in the EIS. The feasibility of this option is dependent upon the construction cost of one of the residuals alternatives being low enough to allow the additional cost of this Forebay option being included without exceeding the budget for the residuals project as a whole. This is not anticipated to be the case. However, the environmental impacts of this option will be evaluated in detail in the EIS to confirm its feasibility for construction in a subsequent project, should additional funds become available.

Dredge Residuals Collection with Cyclone/GRIT SNAIL™ Dewatering

Another potential variation on the existing Forebay dredge collection and processing practice could involve combining Forebay residuals dredging with Eutec SLURRYCUP™ and GRIT SNAIL™ grit dewatering technology. A site plan of associated dredge and pumping facilities is provided in Figure 4-2. The dredge could pump residuals to a new booster pump station, which would then transfer the residuals to the residuals processing building via a buried pipeline (if the northwest residuals processing site is selected) or via a new HDPE pipeline routed through the Dalecarlia Reservoir (if the east residuals processing site is selected). Once inside the residuals processing building, the pumped Forebay residuals could be dewatered using the Eutec SLURRYCUP™ and GRIT SNAIL™ equipment, similar to that proposed for the HEADCELL™ option described above.

This option offers a cost advantage over the HEADCELL™ option because the cost of a new dredge is significantly less than the headworks facility required to house the HEADCELL™ equipment. All other Forebay residuals conveyance and processing equipment would be similar between the two Forebay residuals alternatives. An order of magnitude construction cost estimate for the Forebay dredging with cyclone/ GRIT SNAIL™ dewatering option was prepared as a part of this Engineering Feasibility Study effort. The order of magnitude construction cost estimate for these facilities are anticipated to be $3,900,000.00. As with the HEADCELL™ Forebay residuals option, this option could only be implemented if sufficient excess funds exist within the overall residuals project budget, above and beyond those required to collect residuals within the Georgetown Reservoir and the Dalecarlia sedimentation basins, convey the residuals to the process site, and process the residuals for ultimate disposal. The implementation of an improved Forebay residuals collection and processing system has a second priority to this water treatment residuals goal.

Forebay Residuals Collection Conclusions

Based upon the significantly higher cost of the HEADCELL™ Forebay residuals collection and processing option and its limited benefit over the option that provides a new dredge, pump station, pipeline, and cyclone/ GRIT SNAIL™ dewatering system, this option is eliminated from consideration and will not be considered further in the EIS. The two remaining dredge-based residuals collection and processing options (continue current practices or provide a new dredge, pump station, pipeline, and cyclone/ GRIT SNAIL™ dewatering) are both technically feasible. The selection of the final Forebay residuals collection and processing option will be made during the design phase of the project, when more defined costs become available. The environmental impacts associated with the Forebay residuals collection and processing option that incorporates a new Forebay dredge, pipeline, pump station, and cyclone/ GRIT SNAIL™ dewatering are fully evaluated in the EIS to allow this option to be implemented if sufficient funds become available to do so.

4.2.2 Potential Sedimentation Process Residuals Collection Modifications

The sedimentation treatment function currently occurs at two locations: the Dalecarlia sedimentation basins and the Georgetown Reservoir. This section describes the potential modifications that could be performed at each of these sites in anticipation of defining combined sedimentation process options for detailed evaluation in the EIS.

Dalecarlia WTP Site

The existing sedimentation basins at the Dalecarlia WTP consist of two conventional units and two double-decker units. The conventional units (Basins 1 and 2) were constructed in 1992 to replace two older units. Each basin is approximately 407 ft long and 135 ft wide. The side water depth is approximately 16 ft deep. They have an average treatment capacity of approximately 30 mgd, each. The two double-decker units (Basins 3 and 4) were constructed in 1947 and 1964. The settling area of each lower level is approximately 316 ft long and 138 ft wide. The lower and upper level depths are approximately 16 and 14 ft deep, respectively. Each of these basins has an average rated capacity of approximately 50 mgd.

Residuals from the basins are currently discharged to the Potomac River. The purpose and need of the project requires that this practice be discontinued. The following alternatives were developed to address the need to collect the residuals from these basins and perform the sedimentation function at the Dalecarlia WTP:

- Install continuous residuals collection equipment in all four basins
- Install plate settling equipment and residuals collection equipment in Basins 1 and 2. This would enable Basins 1 and 2 to process the maximum day, design year flow of 320 mgd. No modifications would then be needed in Dalecarlia Sedimentation Basins 3 and 4, or in the Georgetown Reservoir, unless there was a desire to keep these facilities in service
- Provide a new, double-decker flocculation/sedimentation basin (using plate-settling technology) at the Dalecarlia WTP for the Georgetown flow. The addition of this basin would centralize all sedimentation functions at the Dalecarlia WTP site. No modifications would then be required for the Georgetown Reservoir, unless there was a desire to keep this facility in service

Conventional Sedimentation with Continuous Residuals Collection Equipment

The most "straightforward" approach to collecting the residuals in the existing sedimentation basins would be to simply install equipment in the existing four basins to allow the water treatment residuals to be collected on a continuous basis. Several technologies and systems could be used for this purpose. Options for the continuous collection of residuals include chain and flight collection systems and vacuum-type, or suction header-type collection systems.

Chain and Flight Residuals Collection Mechanisms

Chain and flight-type collector mechanisms are suitable for this application and are widely used in the industry. They are subject to wear and require regular maintenance; however, existing Basins 1 and 2 were originally designed with a future chain and flight retrofit in mind. These basins are each divided into four large, uniformly sloped areas that drain into full width trenches sized to contain a future residuals screw collector. The existing basin arrangement favors installing a series of new chain and flight collectors, arranged in a north/south orientation. Chain and flight collection system manufacturers include USFilter, Polychem, and Walker Process Equipment.

Figures 4-3 through 4-5 shows how chain and flight residuals collectors could be installed inside Basins 1 and 2. A total of 32 chain and flight mechanisms would be required in these two basins. A three-point chain and flight arrangement is assumed in these figures. Two new 14-feet wide poured concrete walkways would need to be installed at the ¼ and ¾ points along the length of the basins to support the drive mechanisms for the chain and flight mechanisms. The new walkway would be installed level with the top elevation of the sedimentation basins. The remainder of the mechanisms would be installed beneath the water surface. Residuals could be removed from Basins 1 and 2 by two potential means. Submersible pumps could be installed in the center of the basins at the mid-point of the existing transverse trenches. These pumps would transfer residuals to the gravity thickeners after being deposited in the trench by the chain and flight mechanism and screw conveyed to the center of each basin. Alternatively, residuals could be pumped to the thickeners with new progressive cavity pumps installed in the existing dry-well located between Basins 1 and 2. New residuals suction pipes would be installed in each basin to serve as suction headers for these pumps. In both cases, the construction of a new separate pump station structure could be avoided.

Separate submersible basin drain pumps would be installed in the drain trench that runs the entire length of the lower floor of the gallery located between Basins 1 and 2 to drain the basins when required. The pumps would return drain flow back to either the head end of the plant or the gravity thickeners.

Figure 4-7 shows how chain and flight residuals collectors could be installed in existing Basins 3 and 4. These basins are less suited to chain and flight mechanism retrofit because the lower basin floor slab slopes towards the center channel the runs the length of the basin. The most cost effective way to install chain and flight mechanisms in existing Basins 3 and 4 is to "pull" the residuals from one end of the basin to the other (north to south). However, this requires concrete fill to be installed on the bottom slab to provide a level surface for the flights to ride on as they travel in the north/south direction. A four-point chain and flight mechanism arrangement is envisioned for Basins 3 and 4 to allow easy access to the chain and flight mechanism for maintenance activities. A new drive unit support platform would also need to be installed on the south end of Basins 3 and 4 with this option. The platform would be level with the top of the existing basin.

As with Basins 1 and 2, residuals collection at the end of the chain and flights would be accomplished with a combination of transverse mounted screw conveyors and submersible pumps installed at the end of each basin. Separate submersible basin drain pumps would also be installed inside the existing basin drain trench to facilitate basin draining when required. The pumps would return drain flow back to either the head end of the plant or the gravity thickeners.

Suction Header Residuals Collection Mechanisms

A previous evaluation of residuals collection for the sedimentation basins at the Dalecarlia WTP resulted in a recommendation for a suction header-type system. This type of technology is commonly used in the industry. Typical manufacturers for suction header-type collection systems include Meurer Research Inc. (Hoseless CABLE-VAC™ Sludge Collector), Leopold (CT2 and Clari-Trac), and General Filter (Sludge Sucker). The pressure differential between the water in the tank and the discharge trough is used to withdraw the residuals from the basin. Alternatively, the suction header collection system can be directly connected to residuals pump suction piping. The withdrawal principle can be used with submerged, floating, or traveling bridge collection units. Some submerged systems have had operational problems if the sludge blankets are heavy, if thickening occurs in the basins, or if the residuals contain high grit content. This concern is relevant because approximately half of the grit load contained in the Potomac River raw water passes through the Dalecarlia Reservoir to the sedimentation basins, historically.

The design of the Meurer Research Inc. unit includes features that help minimize problems associated with high grit content residuals. These include a cable drive system that positively moves each “traveling sludge collector” along the length of the basin, traveling sludge collectors that include both horizontal and vertical oriented guide wheels to prevent misalignment under heavy sludge conditions, and a telescoping pipe within a pipe collection system that is less likely to hang-up than the flexible hose collector used in other similar mechanism designs. The sedimentation basin residuals collection layouts shown in Figures 4-6 and 4-8 through 4-10 are based on the “traveling sludge collector” manufactured by Meurer Research Inc.

Figure 4-6 shows one orientation for installing this type of mechanism within Basins 1 and 2. As with the chain and flight mechanisms, new drive mechanism support and access walkways would need to be installed with this orientation to support the residuals mechanism drive units. These walkways would be installed at the ¼ and ¾ points along the length of the basins. The new walkway would be installed level with the top elevation of the sedimentation basins. As an alternate to the parallel arrangement described above, the residuals suction header collection mechanisms could be installed perpendicular to the length of the basins. New access walkways would not be required with this orientation because the drive units could be installed on the existing divider walkway between Basins 1 and 2. Fewer mechanism drive units would also be required with this orientation.

Residuals collection could be accomplished by two potential means. Submersible pumps could be installed in the center of the basins at the mid-point of the existing transverse trenches. These pumps would transfer residuals to the gravity thickeners. Alternatively, residuals could be pumped to the thickeners or head end of the plant with new progressive cavity pumps installed in the existing dry-well located between Basins 1 and 2. New residuals suction pipes would be installed in each basin to serve as suction headers for these pumps. In both cases, the construction of a new separate pump station structure could be avoided. Separate submersible basin drain pumps would be installed in the drain trench that runs the entire length of the lower floor of the gallery located between Basins 1 and 2 to drain the basins when required. The pumps would return drain flow back to either the head end of the plant or the gravity thickeners.

Figures 4-8 through 4-10 show how a "traveling sludge collector" mechanism could be installed within Basins 3 and 4. A total of twenty four mechanisms would be required for both layers of the two double-decker basins. The mechanisms installed in the north/south direction between the existing support columns on the lower level and between new guidance ribs installed on the upper levels of these basins. A new drive mechanism support/access walkway would be required at the south end of the basin. This walkway would be level with the top of the basins. Residuals collection could be accomplished by two potential means. Submersible pumps could be installed at the south end of each basin. These pumps would be connected to a suction header piping system capable of withdrawing residuals from numerous "traveling sludge collector" mechanisms. In this case, the construction of a new separate pump station structure could be avoided. Alternatively, residuals could be pumped to the thickeners or head end of the plant with new self-priming pumps installed in a new single story, below ground pump station, located north of Basin 3 and west of the Basin 2 flocculation zone. New residuals suction pipes would be installed in each basin to serve as suction headers for these pumps. Separate submersible basin drain pumps would be installed in the drain trench that runs the entire length of the lower floor pass of Basins 3 and 4 to drain the basins when required. The pumps would return drain flow back to either the head end of the plant or the gravity thickeners.

As shown on Figure 4-7, "traveling sludge collector" mechanisms would be recommended for the upper levels of Basins 3 and 4 even if chain and flight mechanisms were installed on the lower levels of these basins. The relatively flat floor surface provided on the upper level lends itself to this type of mechanism versus the chain and flight mechanism.

The selection of the preferred residuals collection equipment will be influenced by the relative construction cost of each collection and pumping option, their relative ease of operation, and the ease and timeframe for construction within the existing basins. This decision will be made during the design phase of the project. The costs shown in Table 5-1 currently assume that a suction header residuals collection mechanism will be installed in Basins 1 through 4.

Enhanced Sedimentation with and Continuous Residuals Collection - All Flow Processed through Sedimentation Basins 1 and 2

Sedimentation capacity is currently distributed between the Dalecarlia WTP and the Georgetown Reservoir. This approach requires water treatment residuals to be collected at both locations and transported to a central location for processing. An alternative approach would be to centralize all sedimentation capacity at the Dalecarlia WTP to simplify the logistics of residuals collection. The Georgetown Reservoir could then be removed from production completely or be used strictly as a backup facility. Residuals collection equipment would still need to be provided if the Georgetown Reservoir were to be used as a backup facility.

Sedimentation capacity could be centralized at the Dalecarlia WTP through either of two mechanisms:

- Maximize the production capacity of the existing sedimentation basins
- Provide additional sedimentation capacity at Dalecarlia through the construction of additional sedimentation basins

To produce 320 mgd, the Dalecarlia WTP would typically process 220 mgd and the Georgetown Reservoir would process 100 mgd. Through the use of inclined plate sedimentation, all 320 mgd of sedimentation capacity could be provided at the Dalecarlia WTP. The main advantage of inclined plate sedimentation is that increased surface loading rates can be used to provide settling using a smaller basin.

Plates (provided in pre-engineered modules, or "plate packs") could be retrofitted into existing basins to increase their sedimentation capacity. The plates are designed to be vertically inclined at an angle of 55 to 60 degrees from the horizontal. The distance between the plates (usually from 2 to 4 in.) is designed to provide an uplift velocity lower than the settling velocity of the particles, allowing them to settle to the surface of the plates to be directed to the collection area below. Most plate settlers use a combination of cross- and counter-current flow by introducing water into the plate packs at the side of the plates, near the bottom. Water flows across the plates as it rises to effluent troughs, or overflow weirs, at the top of the plates. Residuals are collected from the area below the plates.

Both chain and flight and suction header–type residual collection systems could be used with plate settlers. One objection to plate settlers is the perception that access to the residuals collection equipment is reduced because the equipment is located beneath the plate packs. In reality, access to residuals collection equipment is about equal for both conventional and plate settler sedimentation basin, provided that sufficient headroom is provided beneath the plate packs.

Manufacturers for plate settling equipment include Parkson, EIMCO, Meurer, and USFilter (i.e., Zimpro). While all plate settlers are based on the same principles, the equipment provided by each manufacturer differs considerably, especially with regard to influent flow distribution, equipment proportions and dimensions, effluent collection, etc. Consequently, the designer must work with the manufacturers to establish an appropriate design for any particular installation. Appendix C contains manufacturer's information for typical plate settlers.

The main design criterion for plate settlers is the projected surface loading for each plate, where the projected surface area is calculated as the active surface area of the plate (usually 80 percent of the actual plate area), multiplied by the cosine of the inclination angle. Typical loading rates range from 0.30 to 0.50 gpm/ft^2, depending on the settling characteristics of the residuals, the water temperature, and the desired effluent quality. The hydraulic loading rate for a basin equipped with plate settlers is 4 to 7 gpm/ft^2, compared to 0.25 to 0.38 gpm/ft^2 for conventional sedimentation processes.

A preliminary analysis of the existing sedimentation basins has indicated that the entire required treatment capacity of 320 mgd could be supplied by Basins 1 and 2. This would potentially eliminate or defer the need to retrofit Basins 3 and 4 for residuals collection (if desired), and would potentially eliminate the need to retrofit the Georgetown Reservoir for residuals collection and for conveying residuals from the Georgetown Reservoir site to a centralized location for processing.

For this option, flocculation would occur in Basin 2 (the basin would be divided into seven parallel flocculation channels for redundancy purposes), and Basin 1 would hold the plate packs. Basin 1 would be divided into seven trains for redundancy. Each train would hold five modular plate packs of nine plates each, for a total of 315 plates. In addition to the compartmentalization of the basins, the influent and effluent channel arrangement would need to be extensively modified as part of the retrofit arrangement.

As part of the effluent channel modifications, a portion of the flow would need to be diverted to the McMillan WTP for filtration and disinfection via the existing Georgetown Conduit. This would require the construction of a large diameter pipeline between the basins and the tunnel, since such a connection does not currently exist.

Chain and flight or suction header residuals collection mechanisms could be used with this approach. Residuals collection pumps could possibly be installed in the existing gallery between the two basins. Alternately, an external pump station could be provided adjacent to the existing basins.

Figure 4-11 is a plan view showing the modifications to Basins 1 and 2. Figure 4-12 is a sectional view of the basins.

A preliminary construction estimate was prepared for this option to allow it to be compared with the other modification alternatives. The modifications to Basins 1 and 2 are anticipated to cost approximately $36,700,000.00. This cost is more than double the cost for adding mechanical residuals removal equipment and residuals pumping facilities to Basins 1 through 4. However, this option provides significantly more treatment capacity than the option that renovates Basins 1 through 4.

New Georgetown Flocculation/Sedimentation at the Dalecarlia WTP

A new flocculation/sedimentation basin for the flow currently processed by the Georgetown Reservoir could be provided as an alternate means of centralizing sedimentation capacity at the Dalecarlia WTP. To conserve space, a double-decker basin, equipped with plate settlers was considered. Residual collection equipment would still need to be retrofitted into Basins 1 through 4 to take advantage of the existing sedimentation capacity at the Dalecarlia WTP.

The double-decker basin would be configured with the flocculation section on the lower level and the sedimentation section on the upper level. Three flocculation trains and five sedimentation trains are recommended. The basin would have a peak flow capacity of 120 mgd at a flocculation detention time of 20 minutes and a sedimentation rate of 0.38 gpm/ft^2.

Issues that would need to be addressed as part of the design of this facility include the depth of the basin (extensive rock excavation would likely be required), the routing of effluent flow to the Georgetown Conduit, and the location of the residuals pump station.

Figure 4-13 depicts a plan view of the Georgetown Sedimentation Basin at Dalecarlia. Figure 4-14 is a sectional view of the basin.

A preliminary construction estimate was prepared for this option to allow it to be compared with the other modification alternatives. The modifications associated with adding a new sedimentation basin at the Dalecarlia WTP site to treat the current Georgetown Reservoir flow are anticipated to cost approximately $23,800,000.00. This cost must be added to the cost for adding mechanical residuals removal equipment and residuals pumping facilities to Basins 1 through 4 to create a complete residuals treatment alternative equivalent to the previous option that renovates only Basins 1 and 2.

Georgetown Reservoir Site

The Georgetown Reservoir consists of three large basins. The basins are irregular in shape, and were originally of bermed, earthen construction. They have been lined with concrete in recent years. Because of the large surface area of the basins (Basin 1 is 5.8 acres and Basin 2 is 19.5 acres) and the basin configuration, previous studies have concluded that it would be difficult to retrofit the basins with conventional residuals collection equipment. At least two previous studies recommended a dredging operation for the collection of water treatment residuals from the Georgetown Reservoir. Basin 3 is mainly used for the storage of clarified water. Therefore, residuals collection is not required for this basin.

Conventional Sedimentation with Dredge Residuals Collection

Figure 4-15 provides a dredging plan for the Georgetown Reservoir. The plan anticipates that two new small electrically powered dredges will be provided (one in Basin 1 and one in Basin 2), each equipped with a flexible submerged discharge hose and power supply cable, equipped with floatation balls approximately 8-feet along their length, and automatic dredge positioning cable system. It is anticipated that the dredges will operate approximately 16 hours per day, 5 days per week over 9 months of the year. The dredge will have a relatively small footprint (approximately 20 feet long by 8 feet wide and be relatively low in profile, with a maximum height of approximately 4 feet above the water surface at their tallest point). Sample dredge equipment cut-sheet information is provided in Appendix C (Selected Manufacturer's Literature). The submersible pumps supplied with each dredge will pump the dredged residuals through the flexible hoses to a single booster pump station located northwest of Basins 1 and 2. This pump station will discharge the dredged residuals into a dedicated residuals pipeline installed inside the Georgetown Conduit which will transport the residuals to the thickening and dewatering facilities. The proposed pump station will consist of a buried concrete wet well equipped with multiple submersible pumps and top slab installed approximately at existing grade elevation. A small electrical equipment building will also be required adjacent to the booster pump station to house electrical equipment associated with the electrical dredges and the booster pumps. This building is anticipated to measure approximately 14 feet wide by 22 feet long and 12 feet high. It will be positioned adjacent to the booster pump station at an elevation below the access road surrounding the reservoirs to minimize visual impacts associated with the facility.

The existing bottom contour of Basin 2 is undulating. Previous Georgetown Reservoir dredging preliminary designs have assumed that these undulations would need to be flattened to facilitate successful dredge operations. Recent conversations with dredge manufacturers indicate that this modification may not be required. Based on recent information, the articulating dredge mechanisms would be capable of following the bottom profile of the existing basins. This assumption will be confirmed during the preliminary design of the Georgetown Reservoir improvement project.

A preliminary construction estimate was prepared for this option to allow it to be compared with the other modification alternatives. The modifications associated with adding a pair of new residuals removal dredges to the Georgetown Reservoir and the associated pipelines and booster pump station is anticipated to be approximately $2,400,000.00. This cost must be added to the cost for adding mechanical residuals removal equipment and residuals pumping facilities to Basins 1 through 4 to create a complete residuals treatment alternative equivalent to the previous option that renovates only Basins 1 and 2.

New Sedimentation Basin within the Georgetown Reservoir

An alternative to dredging would be to construct a new, compact sedimentation basin within a portion of the Georgetown Reservoir. Due to the limited available space at the Georgetown Reservoir site, the basin could actually be constructed within one of the existing reservoir basins. The existing reservoir basins could be taken out of service, be used as backup facilities, or be used strictly as a community "water feature." A new basin, equipped with plate settlers, would need only a small fraction of the area currently used by the reservoir basins. A flocculation section would not be required because flocculation occurs as the water flows to the reservoir through the Georgetown Conduit.

Issues to be resolved during the design of this facility include the details of the interface between the new basin and Basin 2 (i.e., influent flow routing, coordination of the basin foundation design with the existing facility, etc.).

Figure 4-16 provides a plan view of a new sedimentation basin for the Georgetown Reservoir site. The basin would potentially be located within Basin 2. This location was chosen because it is well within the interior of the Georgetown Reservoir site and distant from MacArthur Boulevard to limit the visual impact of the basin. Figure 4-17 provides a section view of the basin.

A preliminary construction estimate was prepared for this option to allow it to be compared with the other modification alternatives. The modifications associated with adding a new sedimentation basin at the Georgetown Reservoir site to treat the current Georgetown Reservoir flow are anticipated to cost approximately $14,600,000.00. This cost must be added to the cost for adding mechanical residuals removal equipment and residuals pumping facilities to Basins 1 through 4 to create a complete residuals treatment alternative equivalent to the previous option that renovates only Basins 1 and 2.

4.2.3 Combined Sedimentation Improvement Options

Several location specific options for collecting and processing water treatment residuals are discussed in the paragraphs above. Not including the mechanical processing of Forebay residuals, which may be more appropriately considered as part of a second phase project, the sedimentation options for this project include the following:

Option 1

Option 1 is the "base case," and consists of installing new mechanical residuals collection equipment in the Dalecarlia sedimentation basins and the two new electric powered dredges and associated dredged residuals booster pump station and pipelines at the Georgetown Reservoir site, followed by thickening and dewatering. Figure 4-18 provides a general site plan, which shows the locations of the sedimentation facilities required for this option.

Option 2

Option 2 would centralize all sedimentation capacity at the Dalecarlia WTP through the modifications of Basins 1 and 2, followed by thickening and dewatering. Figure 4-19 provides a site plan showing the location of the sedimentation facilities required for this option.

Option 3

Option 3 would also centralize all sedimentation capacity at the Dalecarlia WTP through the addition of a new sedimentation basin, dedicated to treating the Georgetown flow. The new basin would be located adjacent to the existing Dalecarlia basins. Figure 4-20 provides a site plan showing the location of the facilities for this option.

Option 4

Option 4 would involve the construction of a new sedimentation basin at the Georgetown Reservoir site. The new basin would likely be located within existing Basin 2. Figure 4-21 provides a site plan showing the location of the sedimentation facilities for this option.

4.2.4 Combined Sedimentation Improvement Costs

Cost Estimating Approach

“Order of magnitude” or “Class 4” costs, as defined by the Association for the Advancement of Cost Engineering, were developed to compare the four sedimentation and residuals collection processing options discussed above. Actual construction costs can be expected to range from 50 percent above to 30 percent below the estimate presented. This level of accuracy is consistent with costs prepared to compare the relative merits of several alternatives using sketches, general assumptions, and historical costs from similar projects before an exact project definition and specific preliminary design drawings are available. Because of the accuracy of this type of estimate and the variable nature of a number of factors, including the final scope of the project, this level of estimate is not a prediction of final construction costs. Final construction costs are expected to vary from those presented.

As part of a previous study and preliminary design, Whitman Requardt & Associates (WR&A) developed a 35 percent-complete design and cost estimate for a project that would be similar in scope to the “base case” described above. This estimate was completed in 1995. Because of the similarities between the two projects, and the early state of design associated with this Engineering Feasibility Study, the costs developed for the WR&A estimate for several facilities were updated to 2004 and used as the basis for the development of some of the costs presented here. Adjustments to the costs were made for known differences in scope and design details.

Specifically, elements of the WR&A costs for the gravity thickeners, the dewatering building, and for ancillary facilities were used to develop the cost estimates presented in this document. In addition, the WR&A costs were used to develop unit costs for the estimates presented here. Entirely new cost estimates (based on quantity takeoffs from preliminary sketches and using appropriate unit costs from the WR&A estimate) were developed for the three new sedimentation basin options and the dredge/pump station improvements at the Georgetown Reservoir.

Results and Conclusions

Table 4-1 summarizes the order-of-magnitude cost estimates for the four sedimentation and residuals collection options described above. The construction costs listed in Table 4-1 are presented in both 2004 dollars, and in dollars escalated to the midpoint of construction (July 2008).

Based on the information presented in Table 4-1, the “base case” option has the lowest estimated construction cost ($16,600,000.00), followed by Option 4, which includes a new sedimentation basin at the Georgetown Reservoir ($28,800,000.00). The additional cost associated with Option 4 does not appear to be justified when compared with its limited additional benefit over Option 1. Therefore, Option 4 is eliminated from further consideration based upon cost.

Options 2 and 3 centralize sedimentation capacity at the Dalecarlia WTP. These two options are approximately equal in cost ($36,700,000.00 and $38,000,000.00 respectively). However, they are significantly higher in cost than Options 1 and 4. Both Options 2 and 3 would be eliminated from consideration if the alternative screening criteria were applied to them because of their additional cost, above the Option 1 cost, is greater than 30-pecent of the $50,000,000.00 budget set for the project by Washington Aqueduct. Options 2 and 3 are therefore eliminated from further consideration based upon cost.

Options 1 will be used as the basis of estimating costs for the project as a whole. The environmental impacts associated with this option will also be evaluated in detail in the EIS.

4.3 Alternate Coagulants

The use of alternate coagulants, such as polyaluminum chloride, has been suggested by the public and considered by Washington Aqueduct as one method of decreasing the volume of water residuals produced at the Dalecarlia WTP and the Georgetown Reservoir. Consideration of such a proposal required a thorough evaluation of both the potential for reducing residuals quantities and any possible water treatment and finished water quality impacts associated with such a change.

The use of an alternate coagulant could only reduce that fraction of the residuals associated with the addition of a coagulant to the raw water. Residuals quantities associated with the Forebay would not be impacted by the use of an alternate coagulant because these residuals are associated with the silt that enters the reservoirs and the treatment plant from the river. Likewise, the fraction of water treatment residuals associated with silt from the river would also not be reduced if an alternate coagulant were used. The fraction of total residuals that consists of coagulant residue when alum is used ranges from 50-percent on an average annual basis to 20-30 percent during high silt load rainy periods. If polyaluminum chloride were used instead, this may mean that only 10 to 25 percent of the average residual load and only 40 to 45 percent of peak residual load would consist of coagulant residuals.

While the potential average residuals quantity reductions noted above are significant, additional study of the other potential water treatment and finished water quality impacts associated with switching to polyaluminum chloride would need to be better defined before such a switch is recommended. Impact areas of potential concern for the Washington Aqueduct system include the following:

- Residuals Dewaterability: Polyaluminum chloride use can negatively impact the dewaterability of the residuals, effectively lowering the percent solids achievable in the dewatering process, partially offsetting the residuals formation benefits noted in the sedimentation process. Confirmation of these impacts via pilot testing would be recommended for this facility.
- Decreased Organic Removal: Polyaluminum chloride typically removes fewer naturally organic compounds than alum. This can result in higher disinfection by-product concentrations (compounds known to have a negative health effect) in the finished water following disinfection with chlorine. Confirmation of these potential impacts via a year long pilot test would be recommended for this facility.
- Reduced Particle Removal Effectiveness during High Turbidity Events: Polyaluminum chloride can be less effective at removing particles from the raw water under high turbidity (rainy) events in some waters. Confirmation of these potential impacts via a year long pilot test would be recommended for this facility.
- Potential Lead Impacts: Switching to an alternate coagulant could increase the corrosivity of the finished water, acerbating the current drinking water lead problem. Confirmation of these potential impacts via a year long pilot and lead pipe loop test would be recommended for this facility.

In conclusion, switching to an alternate coagulant offers potential advantages from a residuals formation perspective. However, additional water quality studies are appropriate to confirm that other potential negative impacts will not also occur if such a switch were implemented. Washington Aqueduct is committed to continue to evaluate this issue in the future.

4.4 Residuals Thickening and Dewatering Options Applicable to Alternatives 25 and P71/P80

Two potential residuals thickening and dewatering locations on the Dalecarlia WTP site are proposed in Alternatives 25 and P71/P80. They include the Northwest Dalecarlia Processing Site, located north of the Capital Crescent Trail, and the East Dalecarlia Processing Site, located north of Little Falls Road and Sibley Hospital.

4.4.1 Northwest Dalecarlia Processing Site

A site for the proposed thickening and dewatering complex was identified in previous work. The site is located to the north of the existing Maintenance Yard, and is bordered by a fence-line to the west and the Capital Crescent Trail to the east. A total of about 5 acres is available at this location.

Figures 4-22 through 4-30 provide some preliminary views of the thickening and dewatering complex planned for this site. Figure 4-22 provides a site plan of the complex on the proposed site and Figure 4-23 provides an overall plan for the residuals processing complex. The design concept was based on the idea of combining the thickeners and the thickened residuals pump station with the dewatering building into a single complex. This concept will minimize the percentage of site area devoted to the processing facilities, making them appear smaller and allowing more site area to be preserved as buffer space.

Four 105-ft-diameter thickeners are proposed. Figure 4-24 provides a sectional view of a typical gravity thickener. The thickeners could be raised out of the ground to the maximum extent possible to minimize excavation depth and eliminate the need for a deep, thickened residuals pump station or they could be lowered into the ground to reduce their profile, requiring a deeper thickened residuals pumping facility. A three-floor dewatering building is envisioned. Preliminary sizing indicates that the building would be approximately 128 ft long by 76 ft wide by 70 feet tall (measured from the first floor slab to the mid-point of the sloped roof). The space between the thickeners and the building would be enclosed to provide a location for the thickened residuals pumps.

Figures 4-25 and 4-26 are preliminary elevations of the dewatering building. To the greatest extent possible, the building will be designed to honor the architecture of the existing site buildings. Likely features of the building will include brick construction, multi-pane windows, slate (or slate-look) roof, etc. Figure 4-26 also shows the space provided for the thickened residuals pump station.

Figures 4-27, 4-28, and 4-29 show the preliminary layout of the first, second, and third floors of the dewatering building portion of the residuals processing complex. The third floor would house the dewatering equipment and the polymer feed equipment, the second floor would house the dewatered residuals storage bins and polymer storage tanks, and the first floor would include three drive-through bays for loading trucks.

A total of six dewatering devices will be required. The dewatering devices would be arranged in pairs, so that each pair would discharge into one of three storage and discharge bins. For the purposes of this evaluation, it was assumed that centrifuge dewatering equipment would be provided. However, belt filter press dewatering equipment would also fit in the same space and be appropriate for this application. Both technologies are expected to produce dewatered cake with a dry solids content of approximately 30 percent. Plate-and-frame dewatering equipment could also be used. However, the capital and operations and maintenance cost for this equipment would be significantly higher than that of either centrifuges or belt filter presses. A larger dewatering building might also be required.

Figure 4-30 is a section view of the residuals processing complex, which shows the vertical relationship of the equipment to the building structure.

4.4.2 East Dalecarlia Processing Site

An alternate thickening and dewatering facility location, on the east side of the Dalecarlia WTP site was suggested by the public in Alternative P71/P80. Figure 4-31 provides a site plan of the East Dalecarlia Processing Site, including one potential arrangement of the proposed thickening and dewatering facilities. It is anticipated that the arrangement of residuals facilities on this site could be modified slightly during the design phase as additional subsurface and general site information is obtained and incorporated into the site layout decision making process. In general, these modifications are anticipated to be relatively minor.

Figures 4-32 and 4-33 illustrate the potential elevation views of the proposed residuals thickening and dewatering facility envisioned for this site. A flat roof structure is recommended for this site to allow the facility to blend in with the existing architectural theme of Sibley Hospital, located just south of Little Falls Road. The other features of the proposed thickening and dewatering facility are very similar to the facility proposed for the northwest site, as discussed above.

4.5 Additional Treatment and Residuals Processing Options Introduced by the Public

Public Alternatives P67, P69, P76, P77, P78, P81, P83, and P92 relate directly to water treatment processes employed by the Washington Aqueduct at the Dalecarlia WTP.

Public Alternatives P67, P76, P77, P81, and P92 refer to improvements to the location, configuration, or operation of the intake structure at Great Falls. For the purposes of this evaluation, these alternatives will be categorized into “raw water intake improvement options.”

Public Alternative P69 refers to a residuals management concept described as “smart pumping.” Public Alternatives P78 and P83 would seek to reduce and minimize the quantity of water treatment residuals through the selection of water treatment processes or chemical coagulants to treat the raw water. The alternatives will be grouped together into “water treatment optimization options.”

4.5.1 Raw Water Intake Improvement Options Identified by the Public

The common objective of all of the raw water intake improvement options is to substantially improve the quality of the raw water being conveyed to the Dalecarlia WTP for treatment. This could potentially be accomplished through a variety of means, by relocating, reconfiguring, or modifying the operation of the intake facilities.

The Washington Aqueduct raw water intakes on the Potomac River are located in Maryland at Great Falls, approximately 9 miles from the Dalecarlia WTP; and at Little Falls, approximately one-half mile from the Dalecarlia WTP. At Great Falls, the intake structure consists of a stone dam that extends from the Maryland shore to the Virginia shore. The dam does not create a large impoundment, but is designed to divert water to the two intake conduits that convey water to the Dalecarlia WTP. Likewise, at Little Falls, the pumping station intake is upstream of the Little Falls Dam. Downstream of the intakes, the raw water is stored in the Dalecarlia Reservoir prior to treatment. The function of the reservoir is to settle out suspended material.

Public Alternative P67 proposes that Washington Aqueduct evaluate a relocation of the intake. The FCWA has recently relocated its intake from the Virginia shoreline to the middle of the river, at a cost of approximately $15,000,000, and the WSSC is considering doing the same for its intake. Without a major evaluation it cannot be determined whether relocation of the intake would result in substantial benefits for the Washington Aqueduct; however, based on knowledge of the nature of the intakes and the river, and on sound engineering judgment, it is unlikely that there would be a substantial benefit. The FCWA intake is a "run-of-the-river" configuration, and the WSSC Potomac intake is highly influenced by the discharge from Watts Branch under storm conditions, whereas both of the Washington Aqueduct intakes are a river diversion upstream of a dam. The dam creates a "pooling" effect, much different from the run-of-the-river configuration. Unlike the focused areas of high turbidity noted under storm conditions at the FCWA and WSSC Potomac intake locations, the river near the Washington Aqueduct intakes has a much more uniform turbidity across its cross section. This minimizes the potential water quality benefits of relocating the Washington Aqueduct intake.

Public Alternative P76 is similar to Public Alternatives P67 and P77, proposing that the Washington Aqueduct actively manage the intake to optimize the quality of the water being conveyed to the Dalecarlia WTP. Public Alternative P81 proposed that the silt removal system discussed in paragraph 4.2.1.2 of this report be sited at the raw water intake.

All of these options are worthy of consideration as part of a long-term strategy for improving raw water quality, optimizing treatment and operations, providing better finished-water quality, and minimizing residuals quantities, and Washington Aqueduct should consider them in that light. However, none of them would actually eliminate water treatment residuals. Therefore, they are not consistent with the purpose and need of this project and the EIS. In addition, they could not be implemented with the schedule set by the FFCA, because of the location of the current intake facilities (adjacent to National Park Service property) and the historic nature of the current facilities. The silt removal system, in particular, would require a significant amount of land to construct, and this land is not readily available.

Public Alternative P92 proposes that the intake system be redesigned as a well intake to reduce the silt load to the plant. This option described by various names, including riverbank filtration (RBF), riverbank infiltration (RBI), or riverbed filtration or infiltration, is used extensively in Europe and often in the Midwest of the U.S. However, this method of collecting water is typically used in areas underlain with large expanses of alluvial sands, through which water will readily travel. Due to limitations of local geology, etc., these systems are generally designed to produce less than 50 million gallons per day (mgd), although a few larger systems exist.

RBF systems are typically constructed by building a concrete caisson into a large-diameter hole that is drilled or augured into unconsolidated sediments. Once the caisson is installed, perforated collector piping (well casing) is drilled horizontally into the surrounding sediment layers. These collector wells can extend under the riverbed. The collected water drains into the caisson, and from there it is pumped to the surface for treatment or distribution. A series of vertical wells, drilled adjacent to the river, can also sometimes be used.

RBF systems are of increasing interest in the U.S. because they can result in substantial increases in raw water quality, compared to a typical intake system. RBF offers several possible advantages:

- Total organic carbon (TOC) concentrations are generally less than those of the main river
- Some protection from microorganisms is provided
- Water quality fluctuations are generally dampened
- RBF systems may be less susceptible to security threats

While RBF systems offer many potential benefits, they require extensive and time-consuming hydrologic and geologic evaluations before they can be properly implemented, to ensure that the potential benefits can truly be attained for a particular site/river system. Consequently, permitting for these systems may also be time-consuming.

The RBF concept was recently evaluated for the Loudoun County Sanitation Authority (LCSA). LCSA is planning for a future intake on the Potomac River near Leesburg, Virginia, several miles upstream from the Washington Aqueduct intake. The evaluation determined that much of the area surrounding LCSA's property is underlain by various shallow formations of sandstone. Consequently, a conventional RBF system would not be practical (i.e., could not yield the 30 mgd of water desired by LCSA) for this installation.

In place of a conventional RBF system, LCSA considered the use of riverbed infiltration system. To install this system, a cofferdam would be built, allowing the riverbed to be completely excavated to a depth of approximately eight feet below the existing river bottom. A network of well screens would then be installed within the excavated area and a bed of fine sand would be placed over and around the piping. A one-foot thick rock blanket would then be placed over the sand to protect it from erosion.

For the 30-mgd LCSA system, it was estimated that an area approximately 100-feet wide and 150-feet long would need to be excavated (a total of 15,000 square feet of area). The estimated cost of the system was $1,700,000 (2003 dollars). Geologic conditions at Great Falls are likely to be similar to those further upstream (i.e., it appears that there is a lot of rock at the intake area). A 200-mgd intake system, then, would require at least 100,000 square feet of area, or approximately 2.3 acres.

The RBF alternative has many potential advantages; however, the feasibility of such a process would take considerable study and is uncertain at the scale of Washington Aqueduct operation given the local geology of the river intake. It would not eliminate the generation of water treatment residuals, and it could only be implemented as part of a long-term plan. Therefore, this alternative is screened from consideration as inconsistent with the purpose and need and with FFCA screening criteria.

4.5.2 Water Treatment Optimization Options Identified by the Public

Public Alternative P69 refers to a residuals management concept described as "smart pumping." This option would regulate the use of existing pipelines and facilities in a manner allowing them to be used for multiple purposes. For example, a pipeline might be used as a sewer pipeline for part of the day, and used as a residuals pipeline for the remainder of a day. Regulation of the system would be accomplished through the use of instrumentation and computers that would direct flows to the most appropriate facility for treatment or processing.

The existing conveyance systems are generally being utilized according to their design intent. Conveyance systems are at their approximate design capacity during peak hours and have some extra capacity during night hours. Implementation of this option would require a system-wide, region-wide change in approach for the conveyance, treatment, and processing of sewage and residuals. For example, large volumes of storage for both residuals and raw sewage would need to be constructed to implement this option.

Because multiple jurisdictions would be involved (i.e., Washington Aqueduct, DC WASA, WSSC, FCWA, etc.), this option would be very difficult to implement. None of these jurisdictions currently have facilities available for the conveyance or processing of the residuals. Therefore, multiple options do not currently exist. DC WASA, WSSC, and FCWA have all indicated that they will not accept Washington Aqueduct residuals. This option has some intriguing and thought-provoking components; however, it is screened from consideration as inconsistent with the Institutional Constraints criterion.

Public Alternatives 78 and 83 would seek to reduce and minimize the quantity of water treatment residuals through the selection of water treatment processes or of chemical coagulants to be used for the treatment of the raw water. Washington Aqueduct is currently evaluating alternative coagulants, such as polyaluminum chloride (PACL), and similar compounds as discussed above. Other regional producers (e.g., FCWA, WSSC) have found that PACL can provide superior water quality at lower cost, while producing less residuals. As with other options evaluated in the EFS, a change in coagulants, or even a change in treatment technology, will not eliminate or reduce residuals to a point that would allow the Washington Aqueduct to successfully discharge the remaining residuals to the Potomac River with the current NPDES permit standards.

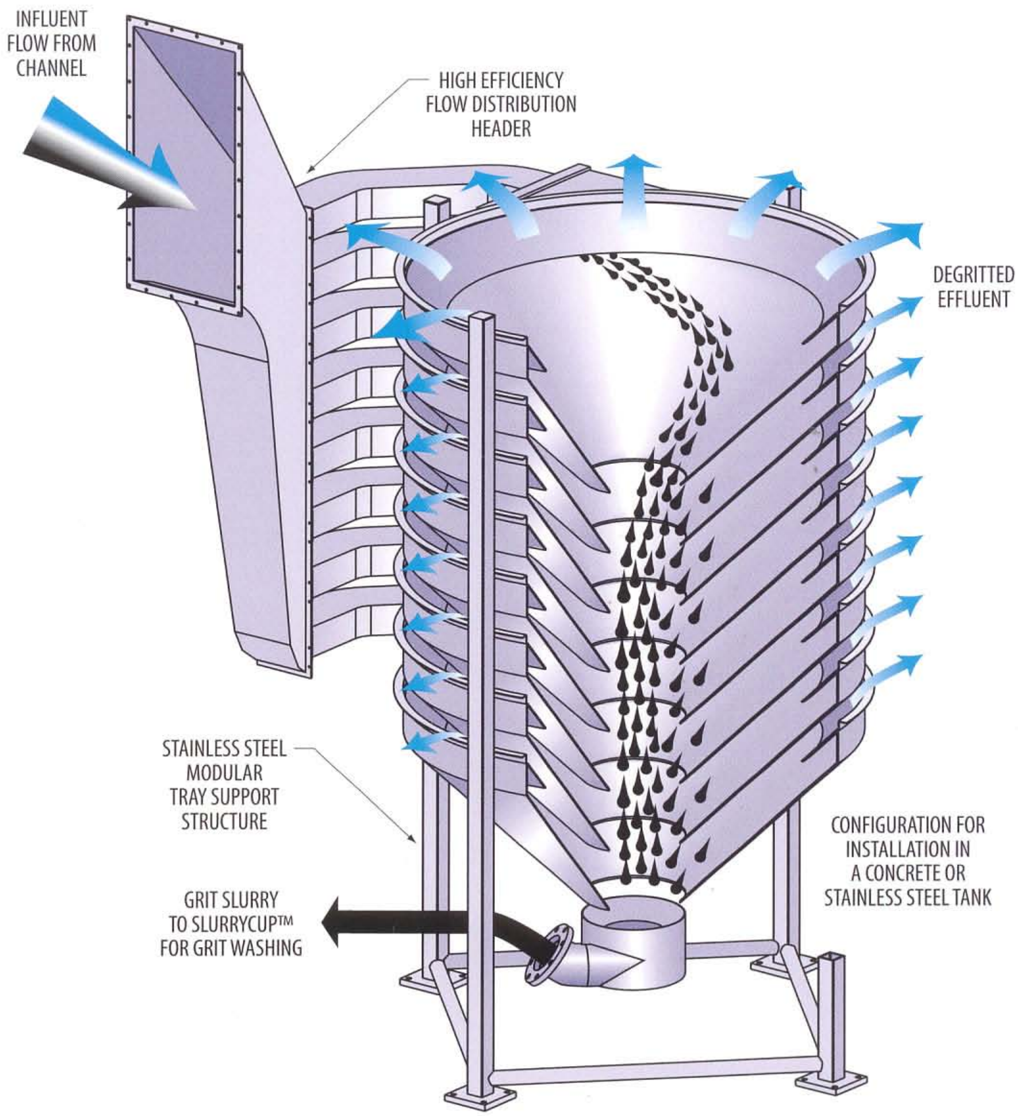
TABLE 4-1
Order-of-Magnitude Cost Summary for Sedimentation and Residuals Collection Alternatives

Residuals Process	Option 1 "Base Case"	Option 2 Modifications to Basins 1 & 2	Option 3 New Sedimentation Basin at Dalecarlia WTP	Option 4 New Sedimentation Basin at Georgetown
Sedimentation Alternatives at the Dalecarlia WTP				
Retrofit of Existing Basins with Residuals Collection Equipment	$14,200,000		$14,200,000	$14,200,000
Modifications to Basins 1 & 2 Only		$36,700,000		
New Basin Sedimentation Basin at Dalecarlia WTP (for Georgetown Flow)			$23,800,000	
Sedimentation Alternatives for the Georgetown Reservoir				
Dredging System	$2,400,000			
New Sedimentation Basin at the Georgetown Reservoir				$14,600,000
Total ($2004)	**$16,600,000**	**$36,700,000**	**$38,000,000**	**$28,800,000**

W042004002WDC

EUTEK® SYSTEMS™

HEADCELL™
Settleable Solids Separator



FEATURES	BENEFITS
✦ Large surface area with short settling distances	✦ Protects equipment and processes from abrasive wear and sedimentation
✦ Compact, yet expandable design	✦ Effective use of valuable space
✦ All-hydraulic design with no moving parts	✦ Long component life with minimal wear
✦ Structured flow configuration	✦ Eliminates short circuiting, enhancing grit capture
✦ Continuous boundary layer flow over hydrophobic surfaces	✦ Minimal grease build-up
✦ Clean, dry grit when washed and dewatered by the EUTEK® SYSTEMS™ SLRRYCUP™ and GRIT SNAIL™	✦ Meets stringent environmental requirements with less odors

Figure 4-17
Settleable Solids Separator

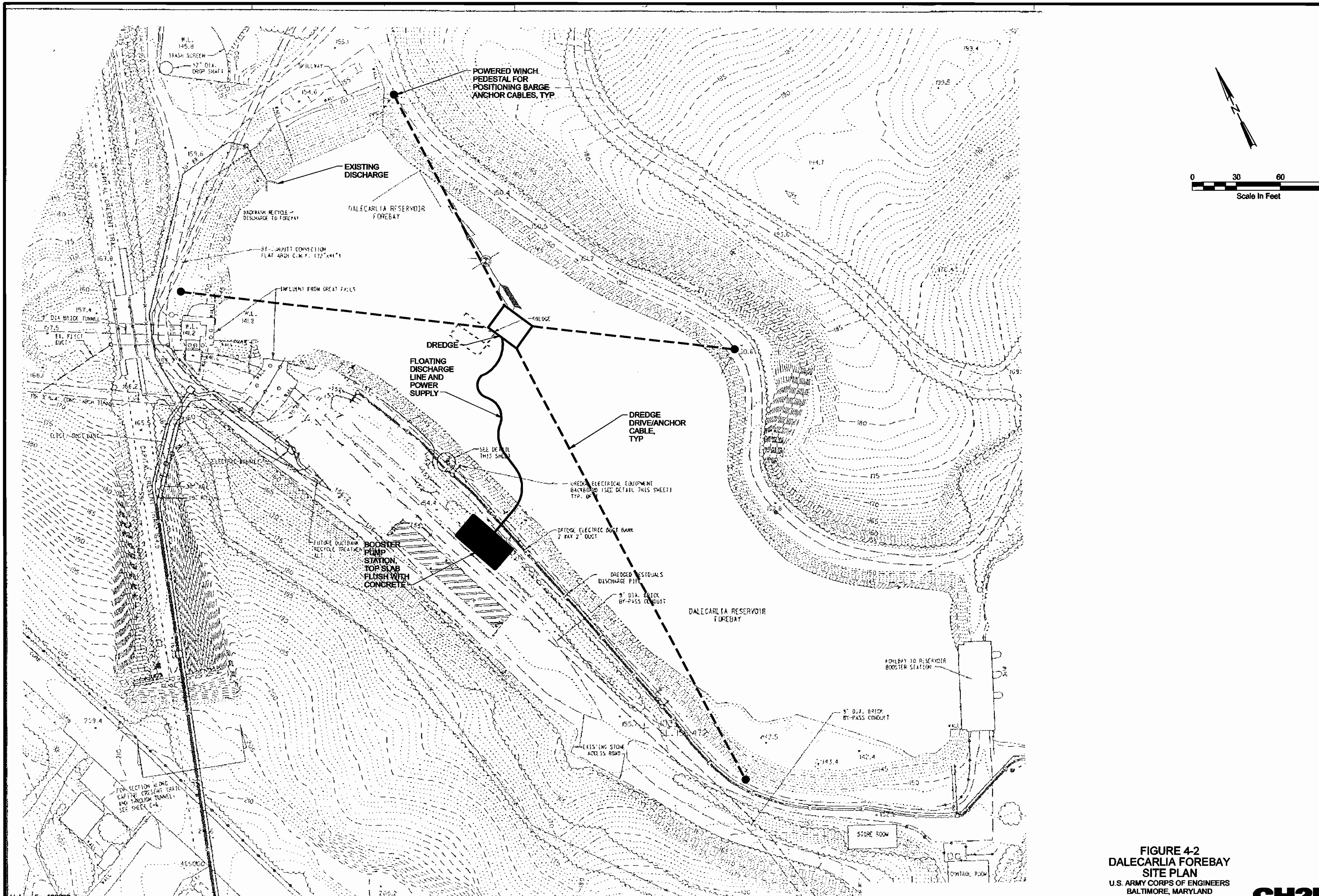


FIGURE 4-2
DALECARLIA FOREBAY
SITE PLAN
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE, MARYLAND

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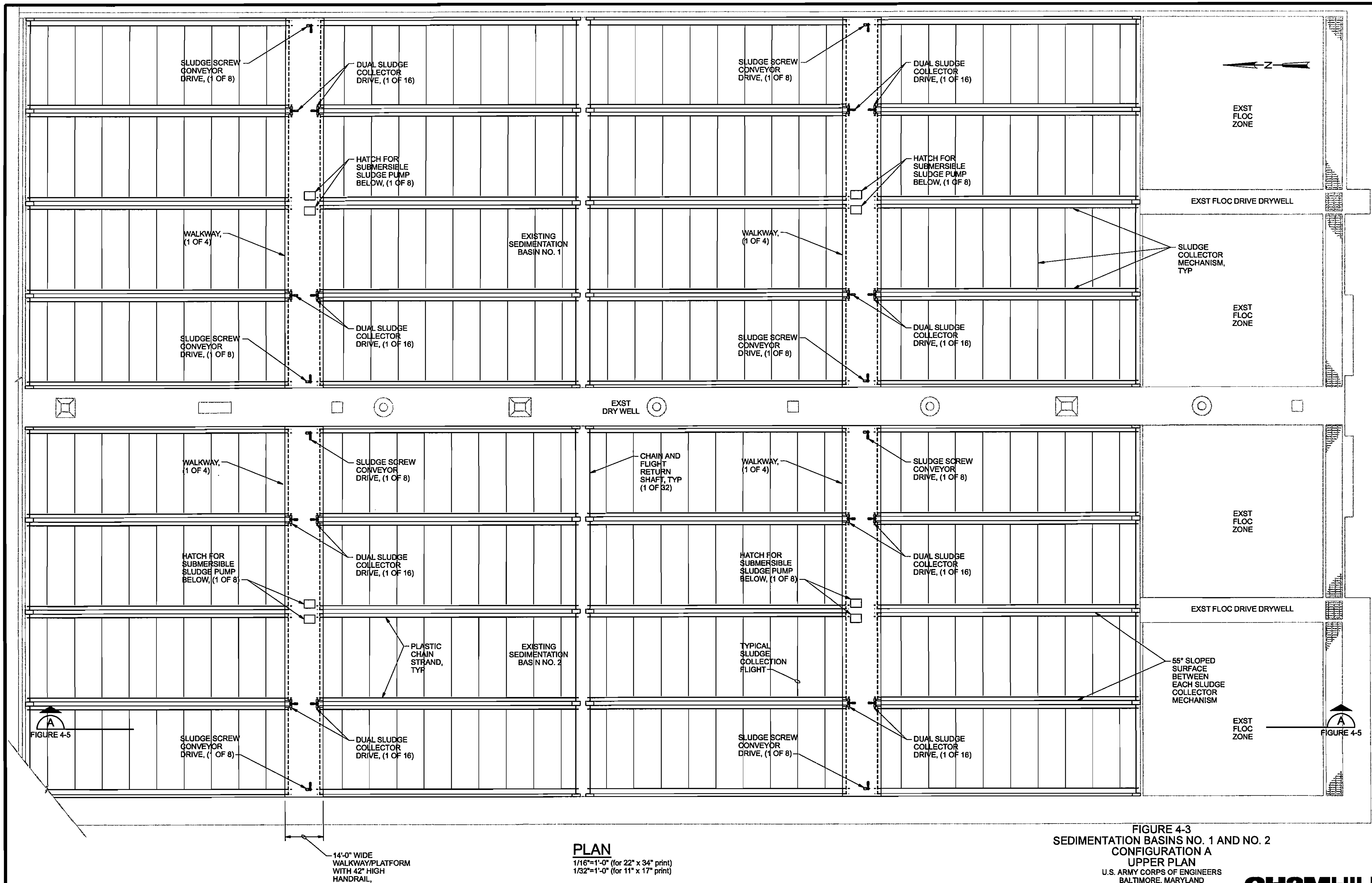

PLAN

1/16"=1'-0" (for 22" x 34" print)
1/32"=1'-0" (for 11" x 17" print)

FIGURE 4-3
SEDIMENTATION BASINS NO. 1 AND NO. 2
CONFIGURATION A
UPPER PLAN

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE, MARYLAND

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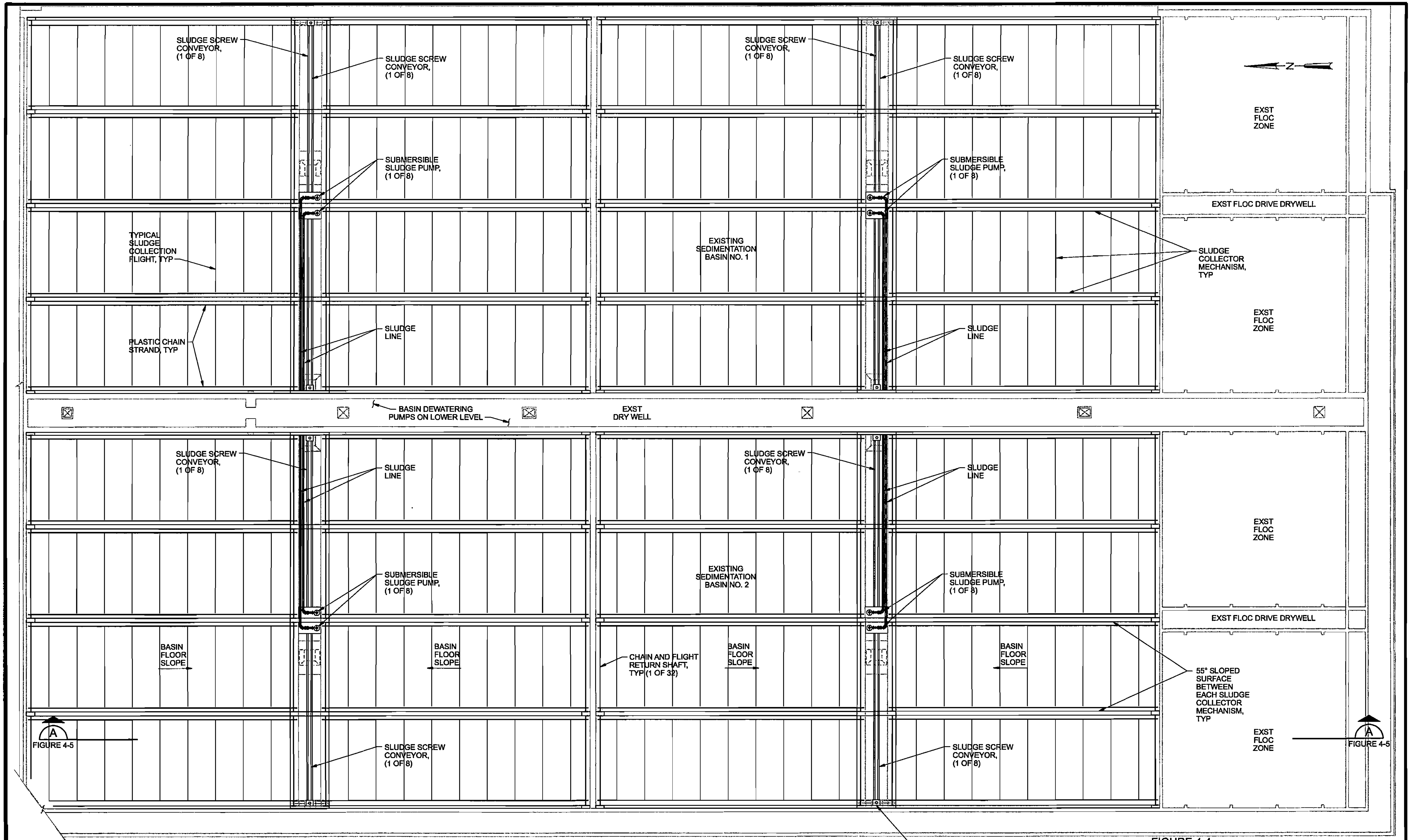

PLAN

1/16"=1'-0" (for 22" x 34" print)
1/32"=1'-0" (for 11" x 17" print)

FIGURE 4-4
SEDIMENTATION BASINS NO. 1 AND NO. 2
CONFIGURATION A
LOWER PLAN

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE, MARYLAND

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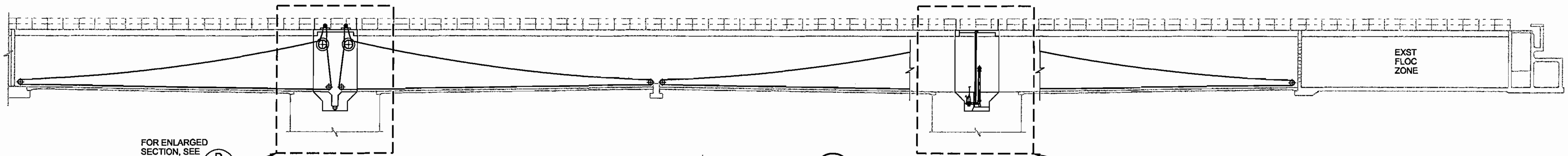
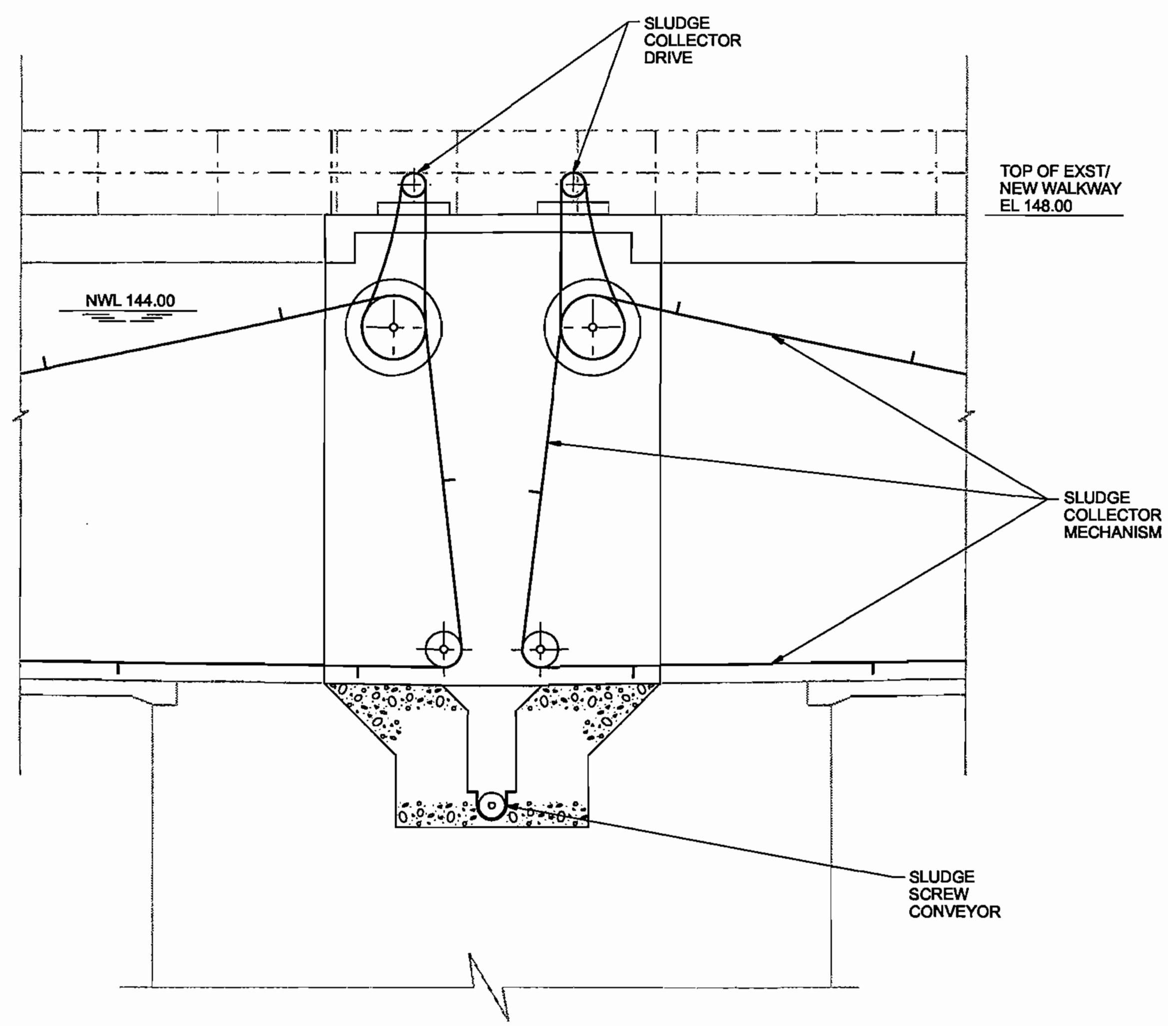
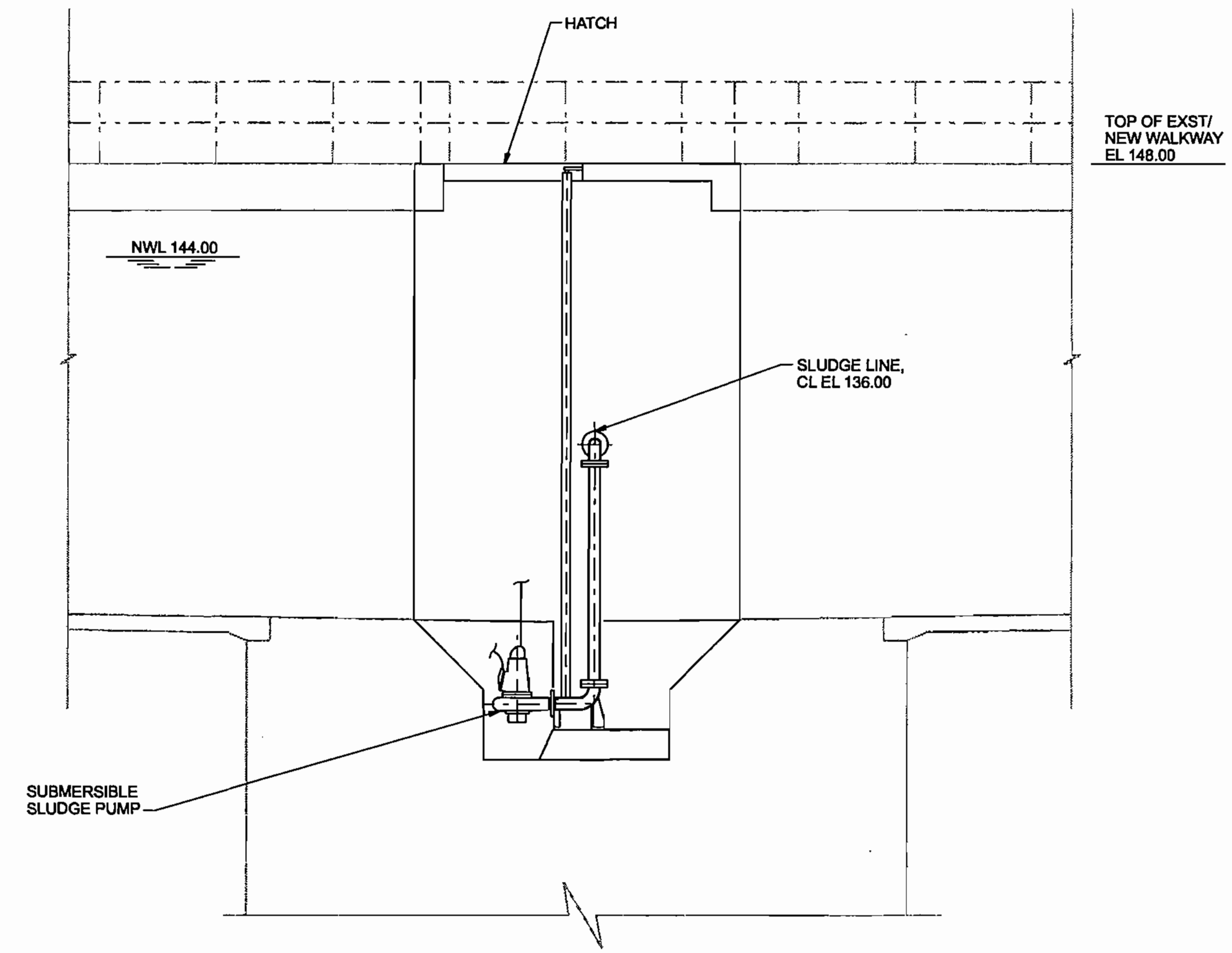


SECTION A
1/16"=1'-0" (for 22" x 34" print) FIGURE 4-3
1/32"=1'-0" (for 11" x 17" print) FIGURE 4-4



SECTION B
1/4"=1'-0" (for 22" x 34" print) FIGURE 4-5
1/8"=1'-0" (for 11" x 17" print)



SECTION C
1/4"=1'-0" (for 22" x 34" print) FIGURE 4-5
1/8"=1'-0" (for 11" x 17" print)

FIGURE 4-5
SEDIMENTATION BASINS NO. 1 AND NO. 2
CONFIGURATION A
SECTIONS
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE, MARYLAND

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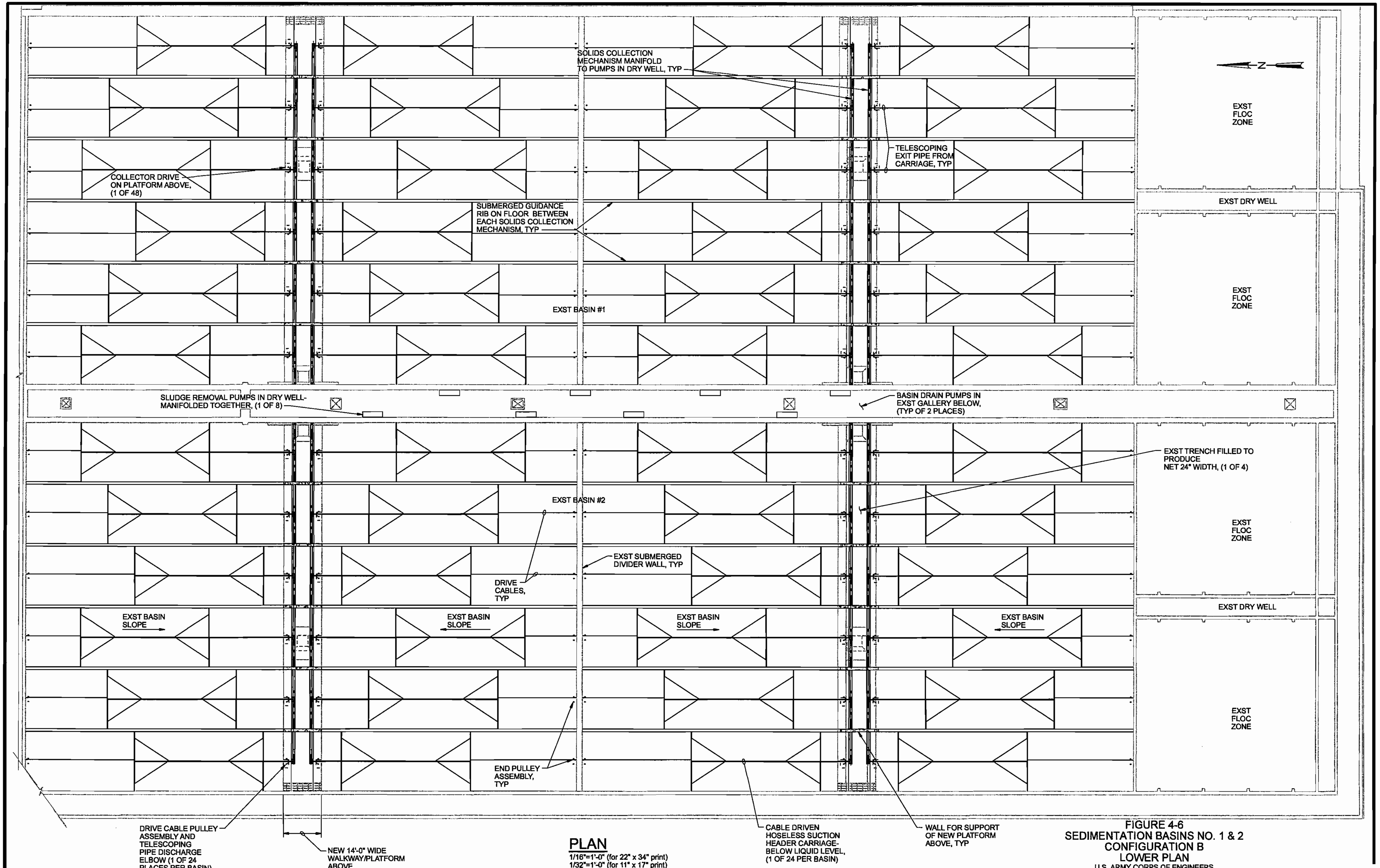

PLAN
1/16"=1'-0" (for 22" x 34" print)
1/32"=1'-0" (for 11" x 17" print)

FIGURE 4-6
SEDIMENTATION BASINS NO. 1 & 2
CONFIGURATION B
LOWER PLAN
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE, MARYLAND

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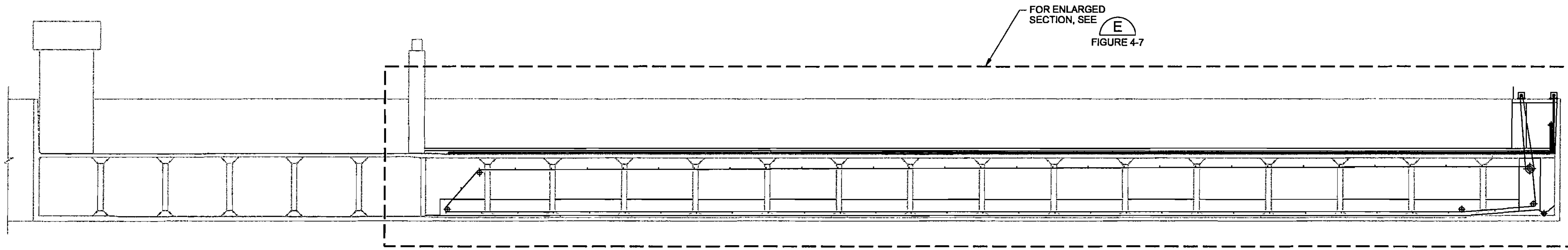
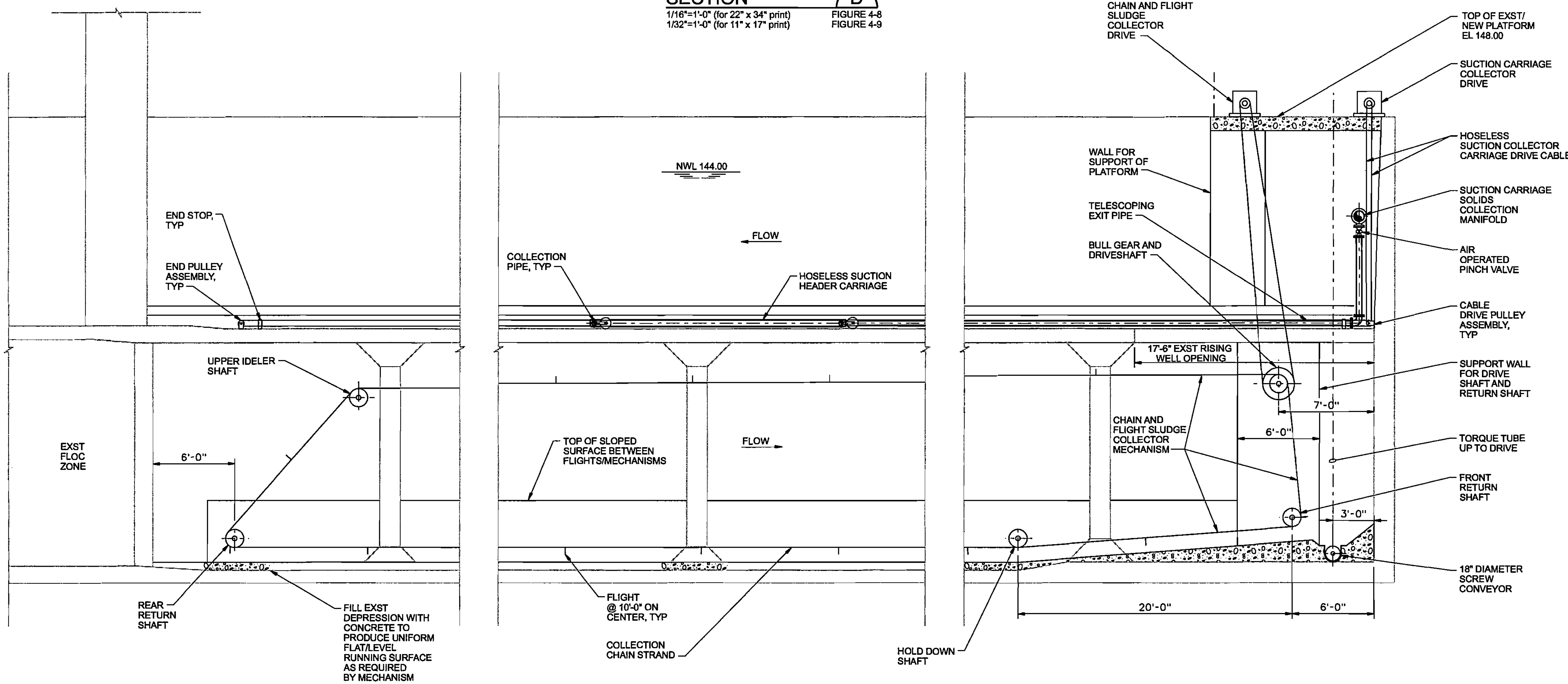


SECTION D
1/16"=1'-0" (for 22" x 34" print) FIGURE 4-8
1/32"=1'-0" (for 11" x 17" print) FIGURE 4-9



SECTION E
1/4"=1'-0" (for 22" x 34" print) FIGURE 4-7
1/8"=1'-0" (for 11" x 17" print)

FIGURE 4-7
SEDIMENTATION BASINS NO. 3 AND NO. 4
CONFIGURATION A
SECTIONS
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE, MARYLAND

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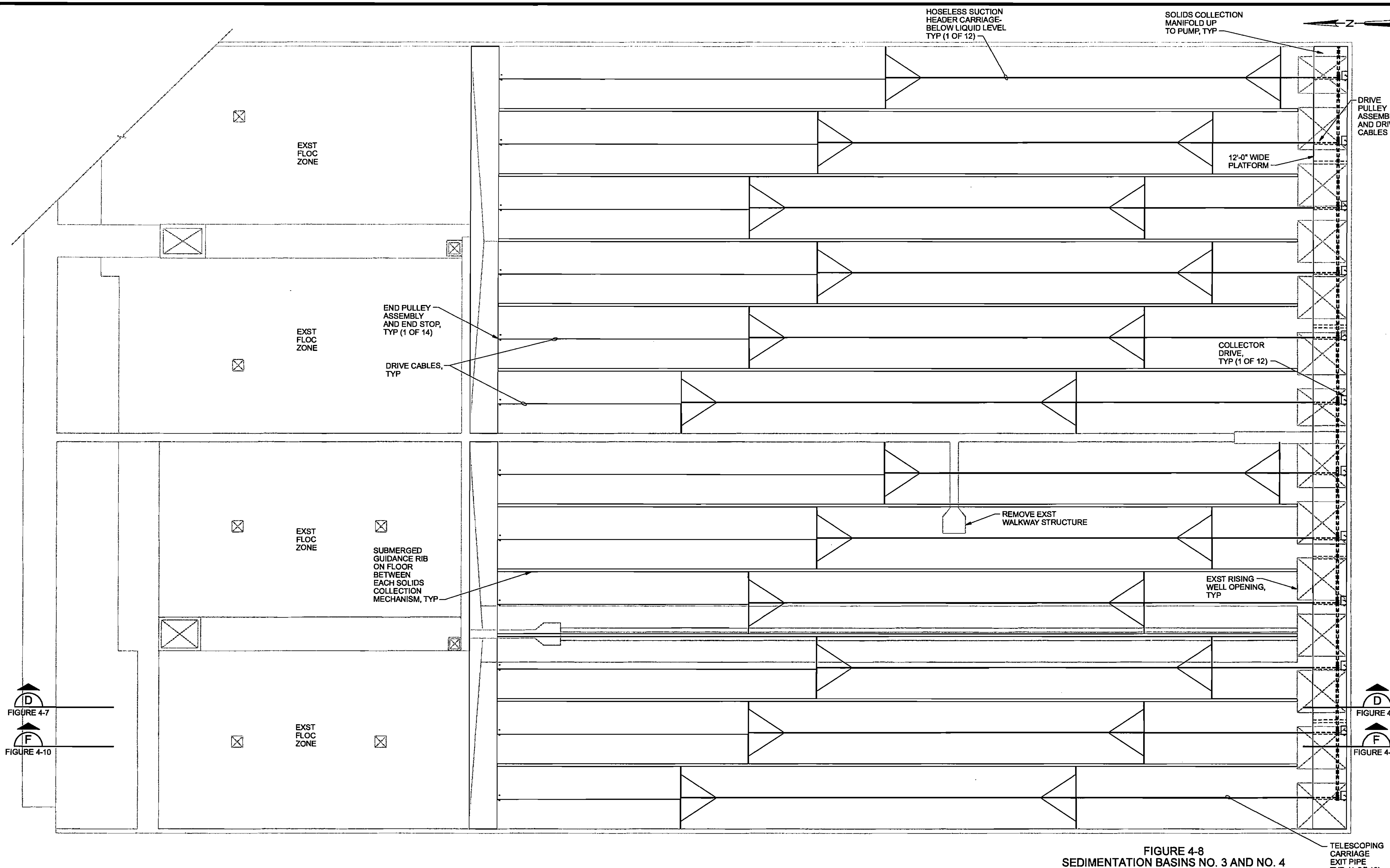

FIGURE 4-8
SEDIMENTATION BASINS NO. 3 AND NO. 4
CONFIGURATION B
UPPER PLAN
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE, MARYLAND

PLAN
1/16"=1'-0" (for 22" x 34" print)
1/32"=1'-0" (for 11" x 17" print)

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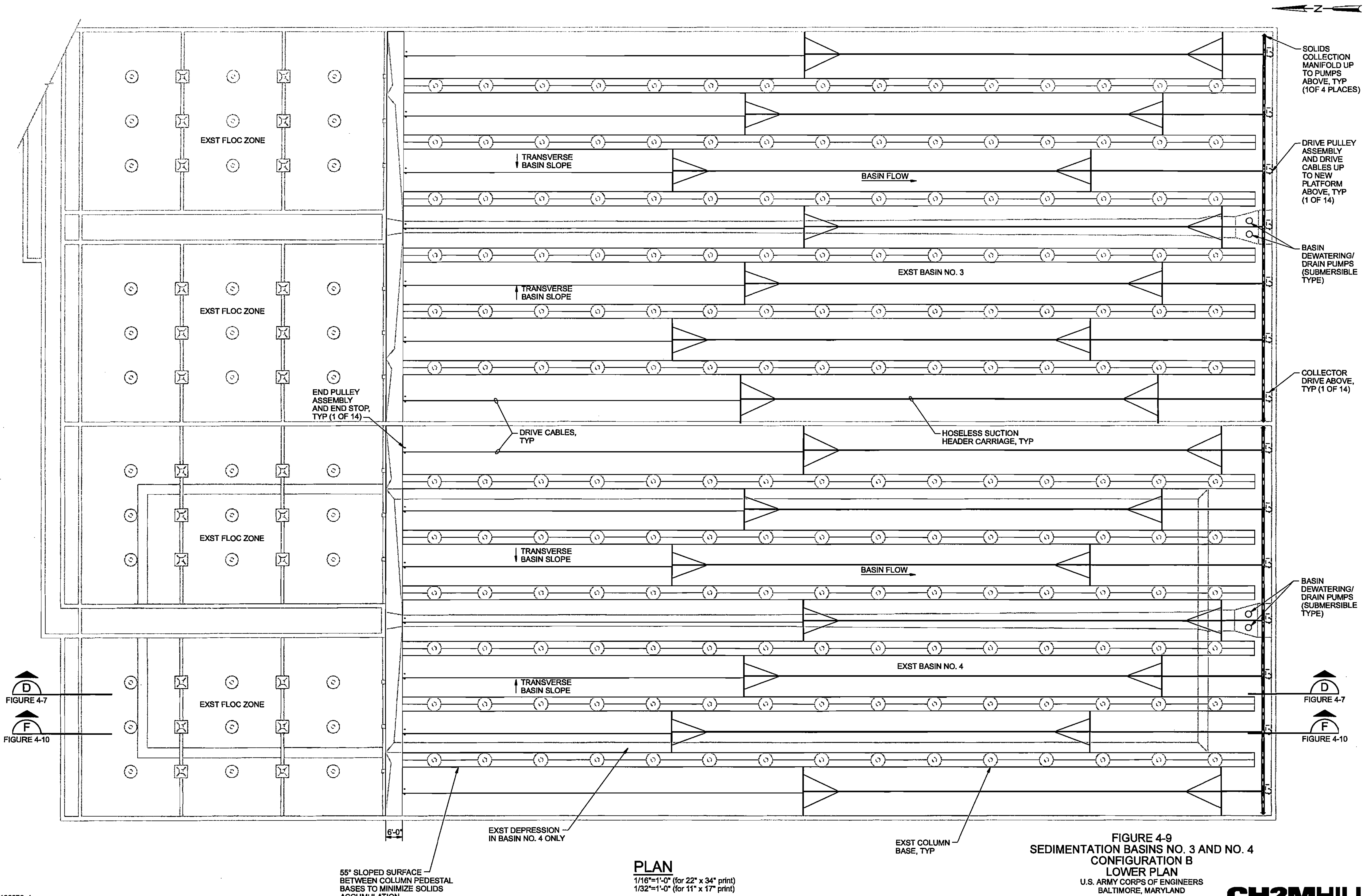

PLAN

1/16"=1'-0" (for 22" x 34" print)
1/32"=1'-0" (for 11" x 17" print)

FIGURE 4-9
SEDIMENTATION BASINS NO. 3 AND NO. 4
CONFIGURATION B
LOWER PLAN

U.S. ARMY CORPS OF ENGINEERS
BALTIMORE, MARYLAND

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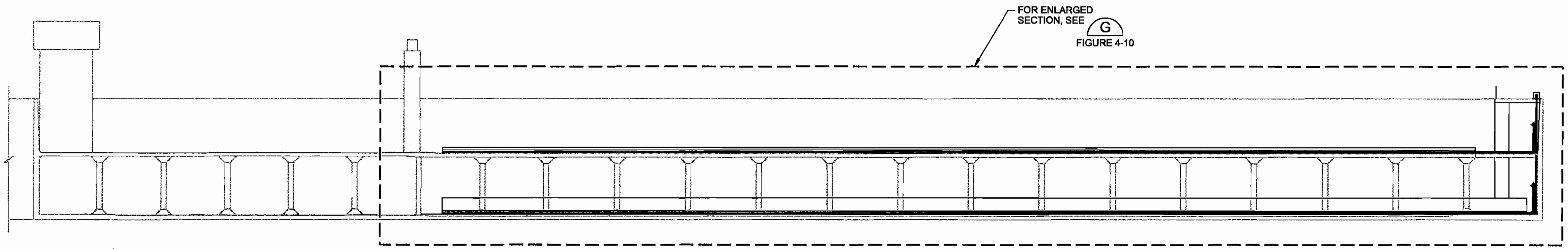
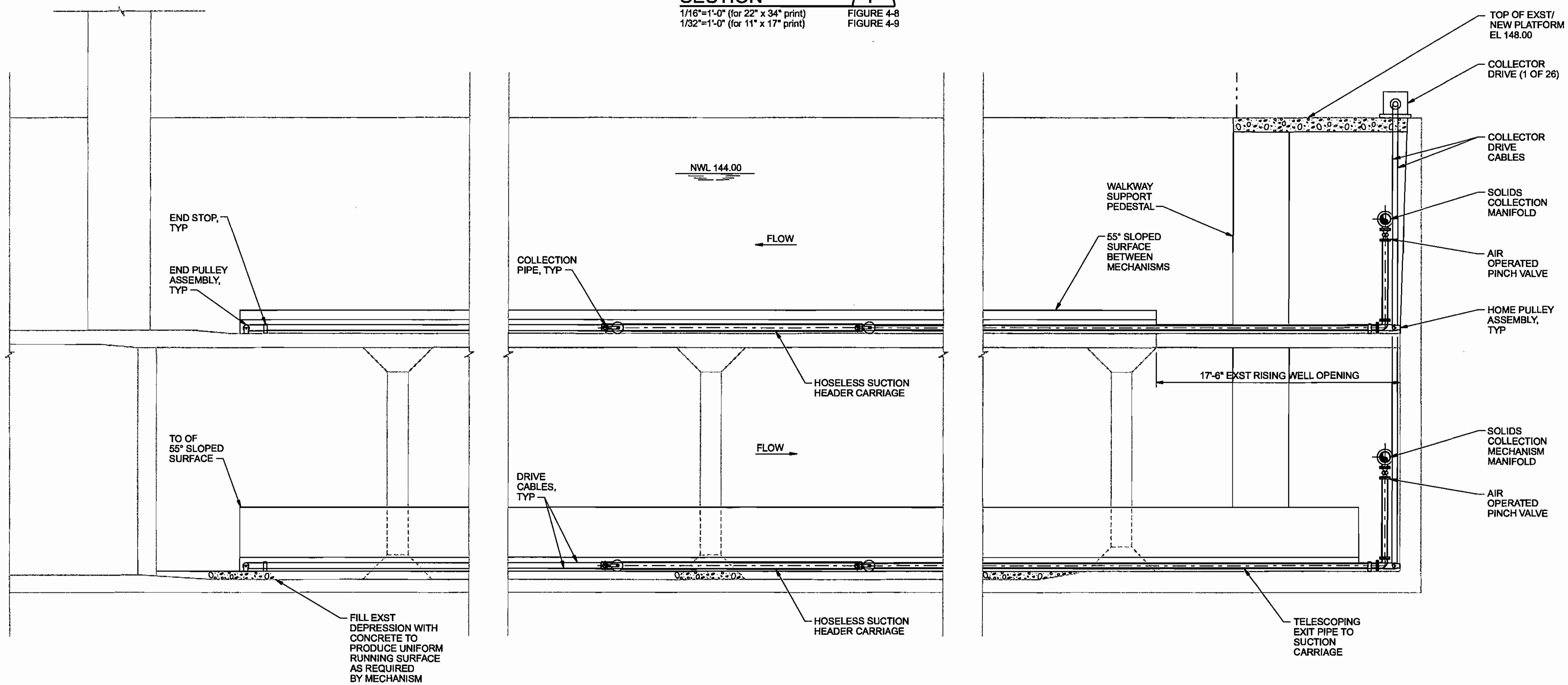


SECTION F
1/16"=1'-0" (for 22" x 34" print)
1/32"=1'-0" (for 11" x 17" print)
FIGURE 4-8
FIGURE 4-9



SECTION G
1/4"=1'-0" (for 22" x 34" print)
1/8"=1'-0" (for 11" x 17" print)
FIGURE 4-10

FIGURE 4-10
SEDIMENTATION BASINS NO. 3 AND NO. 4
CONFIGURATION B
SECTIONS
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE, MARYLAND

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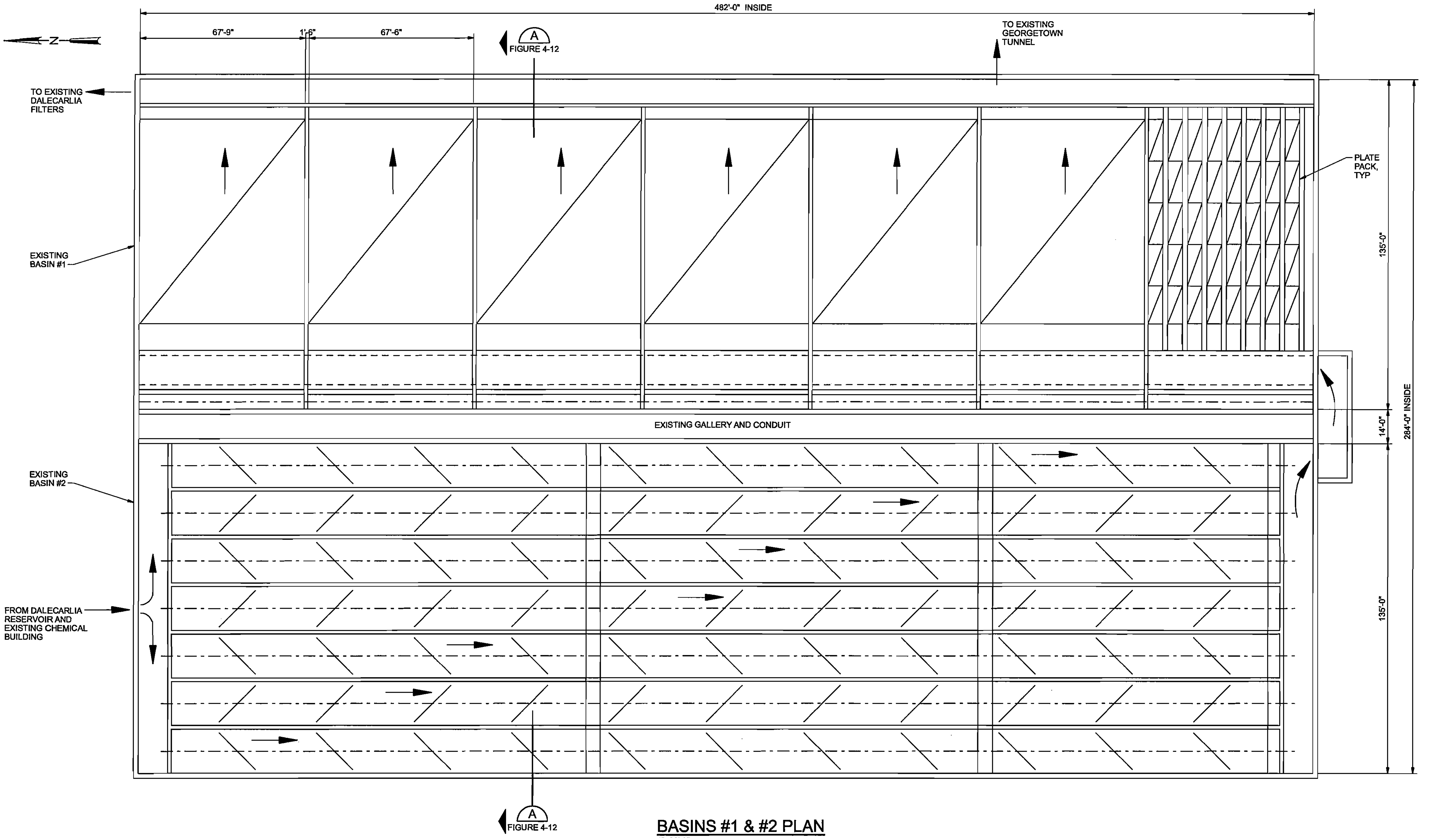

BASINS #1 & #2 PLAN

1"=20'-0"

0 20 40 60
Scale In Feet

FIGURE 4-11
MODIFICATIONS TO
BASINS 1 & 2 PLAN

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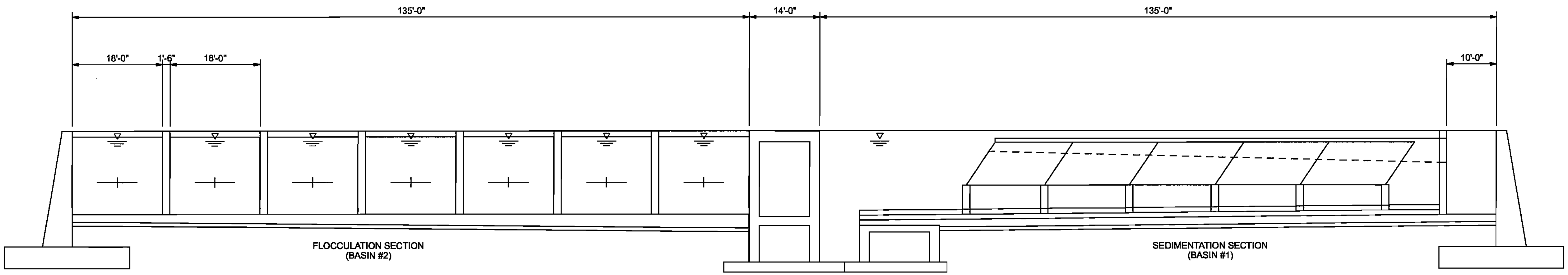

BASINS #1 & #2 SECTION (A)
3/32"=1'-0" FIGURE 4-11

FIGURE 4-12
MODIFICATIONS TO
BASINS 1 & 2 SECTION

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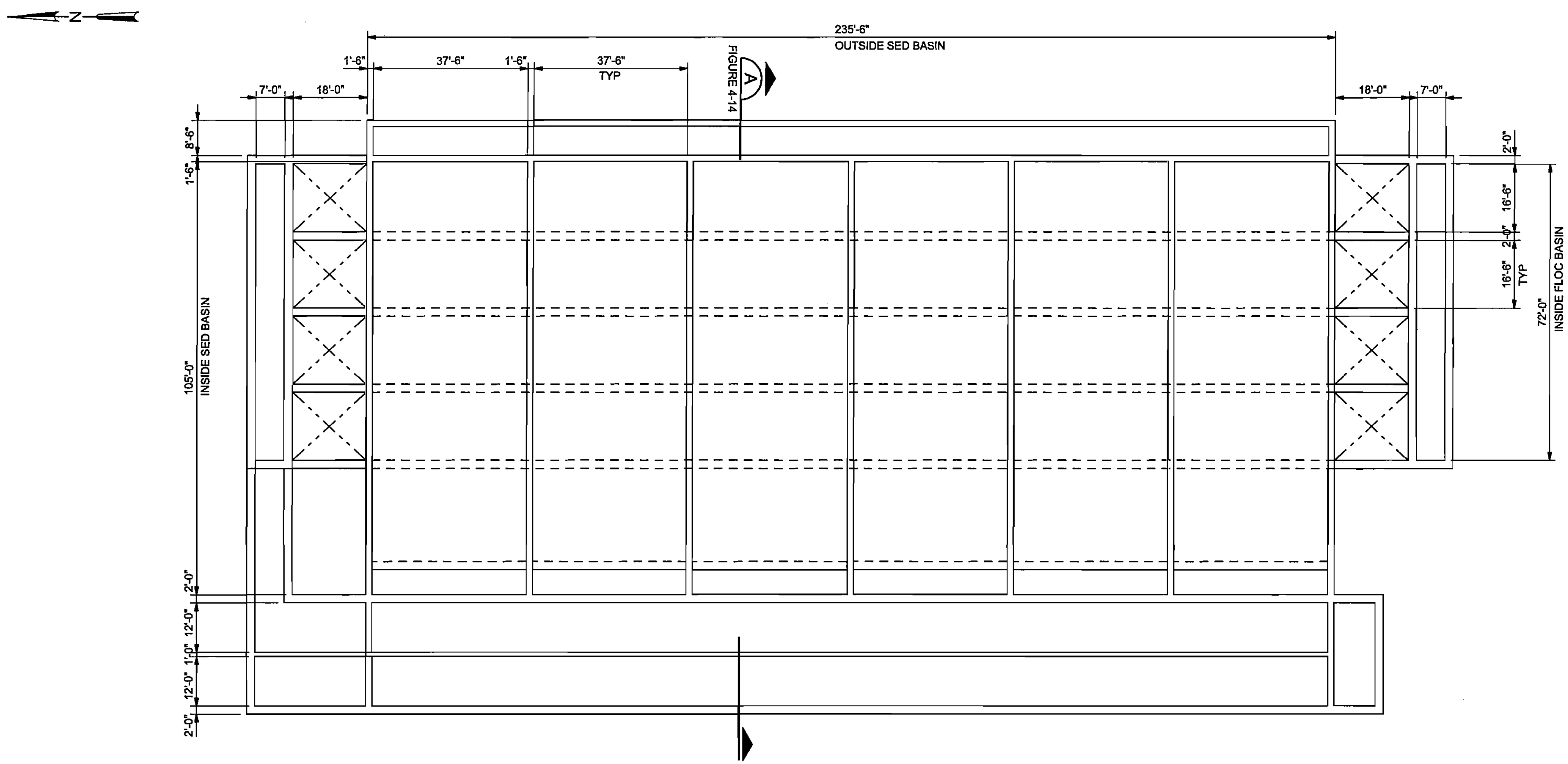

SEDIMENTATION BASIN PLAN

1/16"=1'-0"

0 16 32 48

Scale In Feet

FIGURE 4-13
GEORGETOWN SEDIMENTATION
BASIN AT DALECARLIA
PLAN

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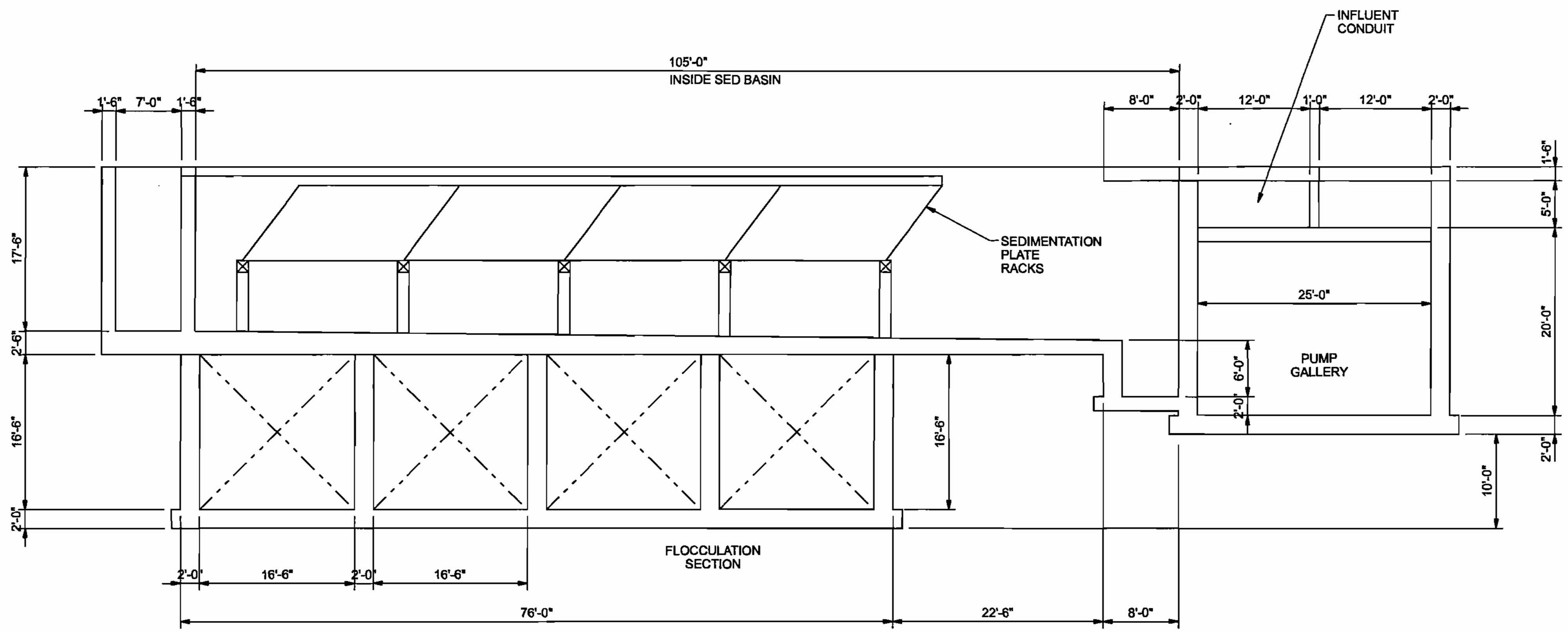

BASIN SECTION (A)
1/8"=1'-0" FIGURE 4-13

FIGURE 4-14
GEORGETOWN SEDIMENTATION
BASIN AT DALECARLIA
SECTION

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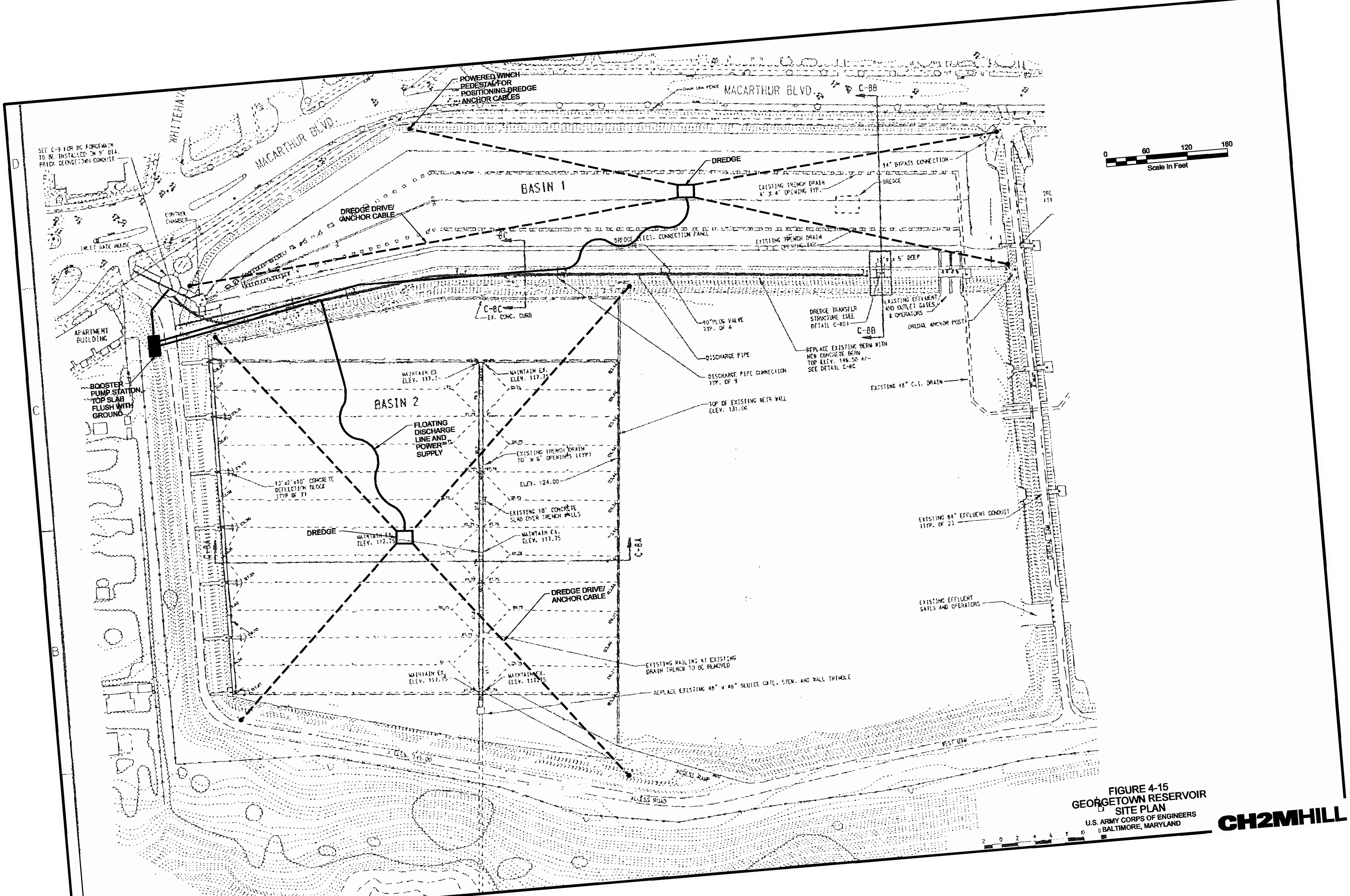

FIGURE 4-15
GEORGETOWN RESERVOIR
SITE PLAN
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE, MARYLAND

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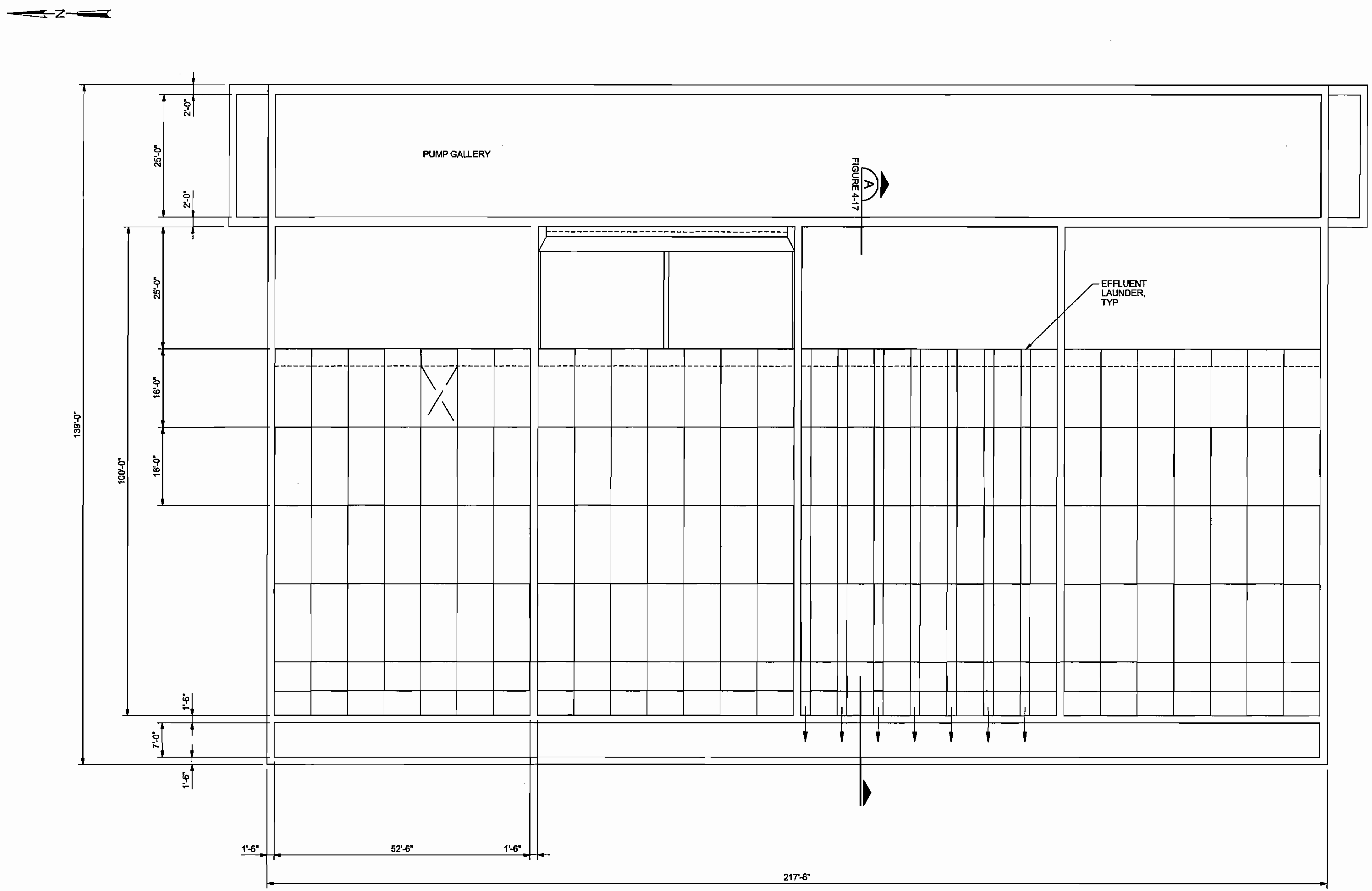

BASIN PLAN
3/32"=1'-0"

FIGURE 4-16
GEORGETOWN SEDIMENTATION BASIN
PLAN

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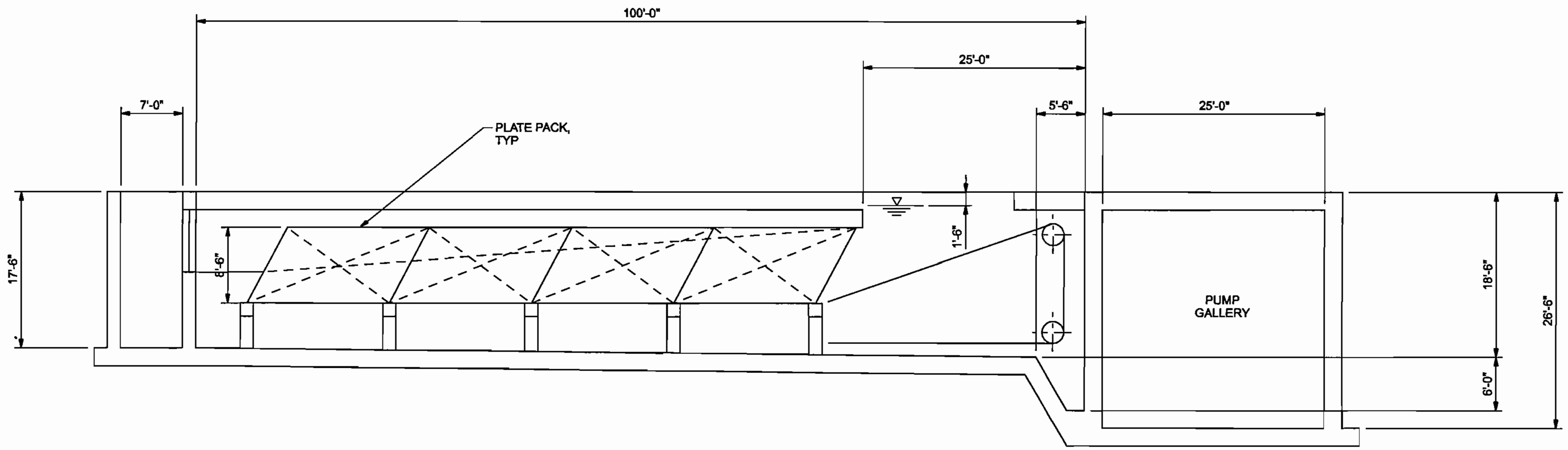

BASIN SECTION (A)
1/8"=1'-0" FIGURE 4-16

FIGURE 4-17
GEORGETOWN SEDIMENTATION BASIN
SECTION

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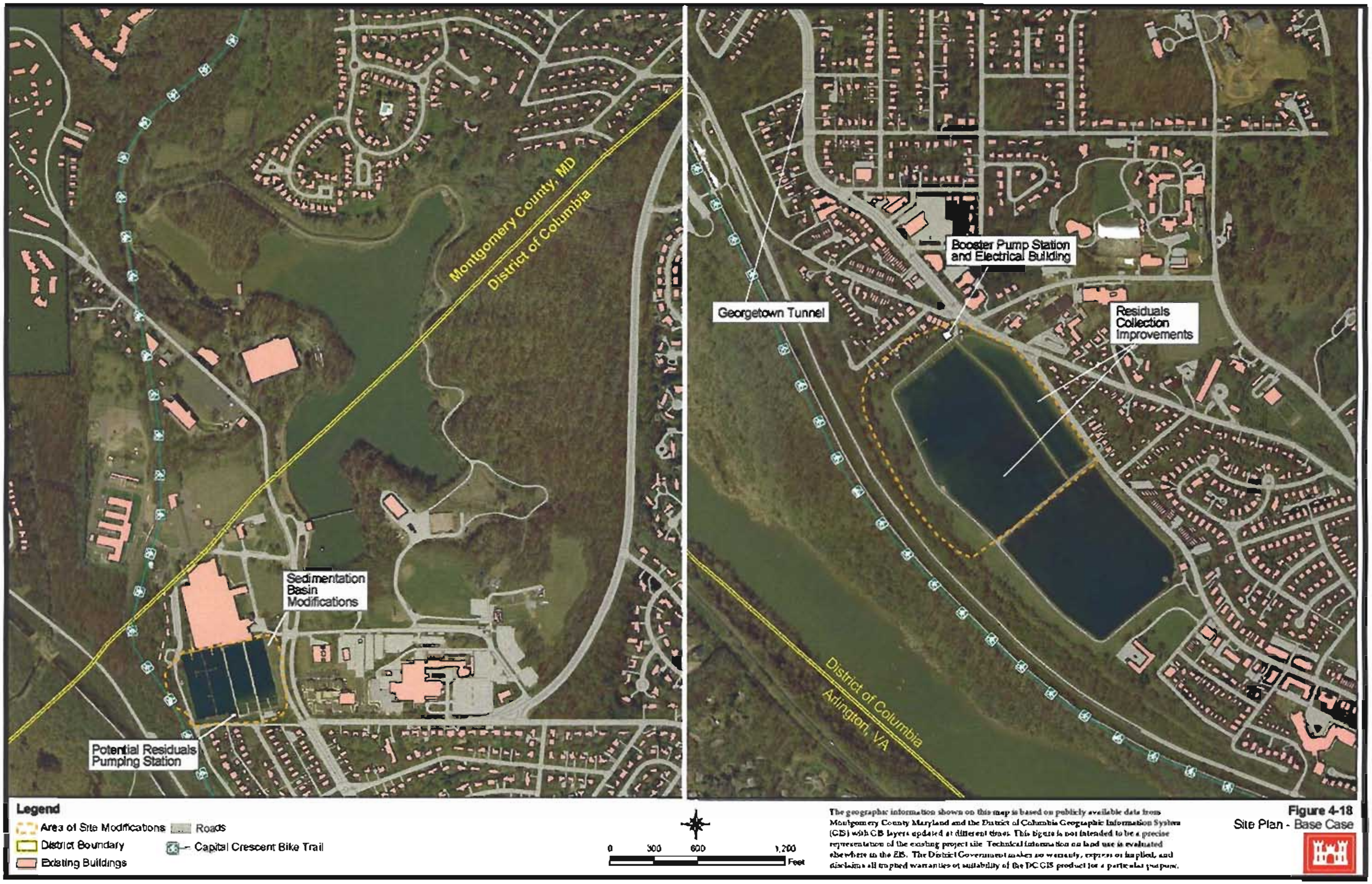

The geographic information shown on this map is based on publicly available data from Montgomery County Maryland and the District of Columbia Geographic Information System (GIS) with GIS layers updated at different times. This figure is not intended to be a precise representation of the existing project site. Technical information on land use is evaluated elsewhere in the EIS. The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

Figure 4-18
Site Plan - Base Case

Legend

- Area of Potential Modifications
- County Boundary
- Existing Buildings
- Roads

The geographic information shown on this map is based on publicly available data from Montgomery County Maryland and the District of Columbia Geographic Information System (GIS) with GIS layers updated at different times. This figure is not intended to be a precise representation of the existing project site. Technical information on land use is evaluated elsewhere in the EIS. The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

0 100 200 400 600 800 Feet

Figure 4-19
Site Plan - Modifications to Basins 1 and 2

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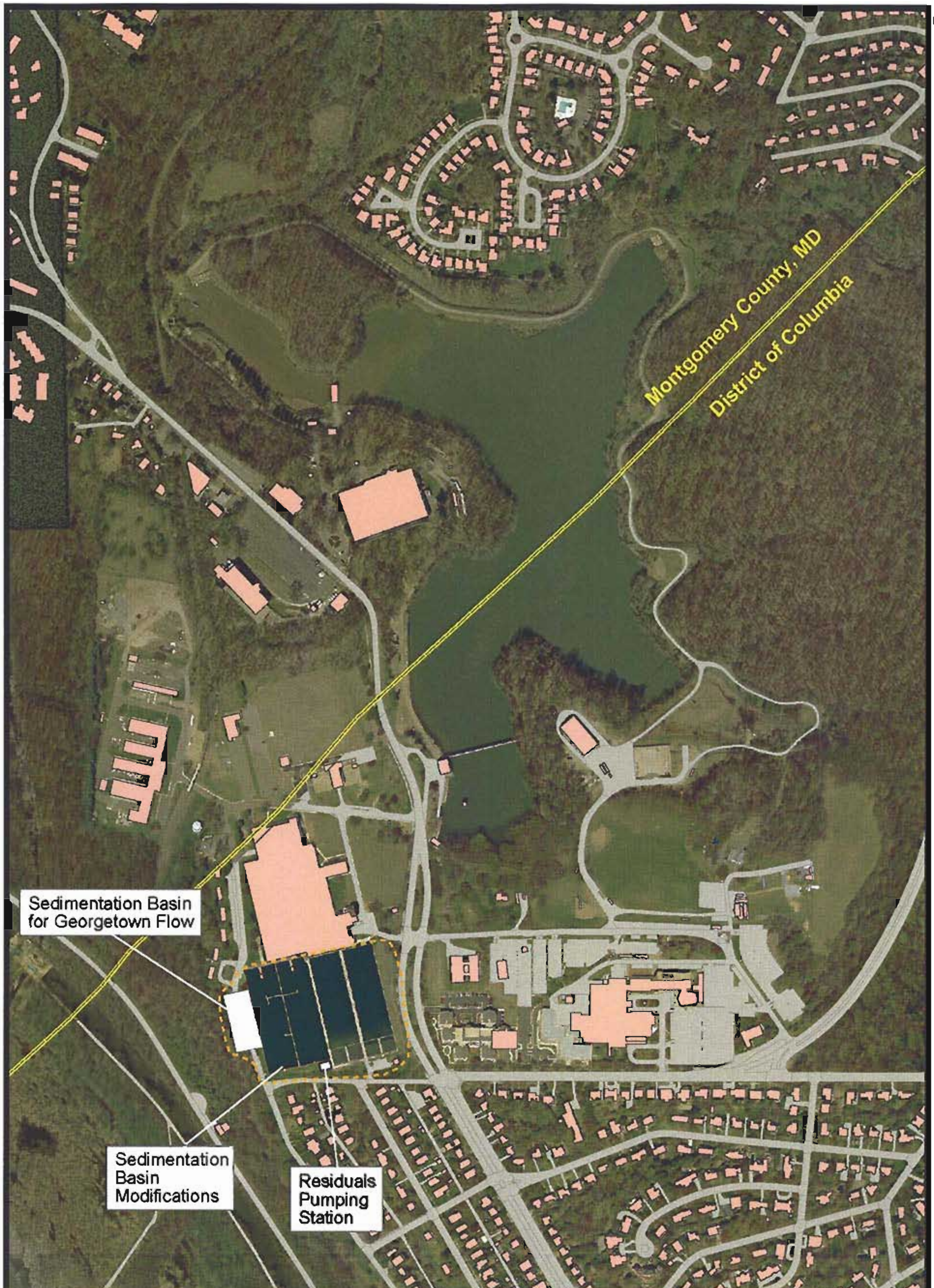

Legend

- Area of Potential Modifications
- County Boundary
- Existing Buildings
- Roads

The geographic information shown on this map is based on publicly available data from Montgomery County Maryland and the District of Columbia Geographic Information System (GIS) with GIS layers updated at different times. This figure is not intended to be a precise representation of the existing project site. Technical information on land use is evaluated elsewhere in the EIS. The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

0 100 200 400 600 800 Feet

Figure 4-20
Site Plan - Georgetown Sedimentation Basin at Dalecarlia

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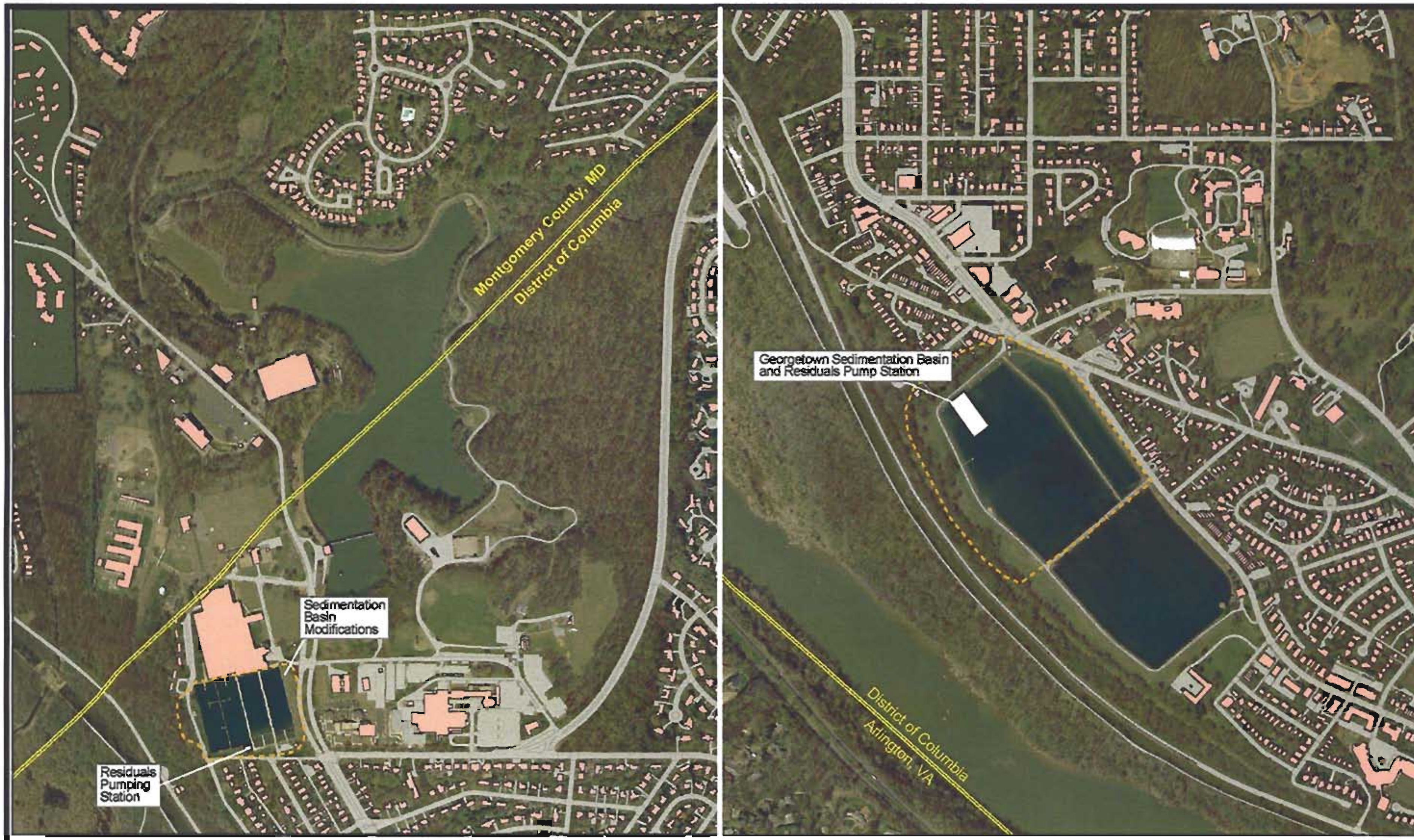

Legend

- Area of Potential Modifications
- Roads
- County Boundary
- Existing Buildings

The geographic information shown on this map is based on publicly available data from Montgomery County Maryland and the District of Columbia Geographic Information System (GIS) with GIS layers updated at different times. This figure is not intended to be a precise representation of the existing project site. Technical information on land use is evaluated elsewhere in the EIS. The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

0 Feet

Figure 4-21
Site Plan - New Georgetown Sedimentation Basin

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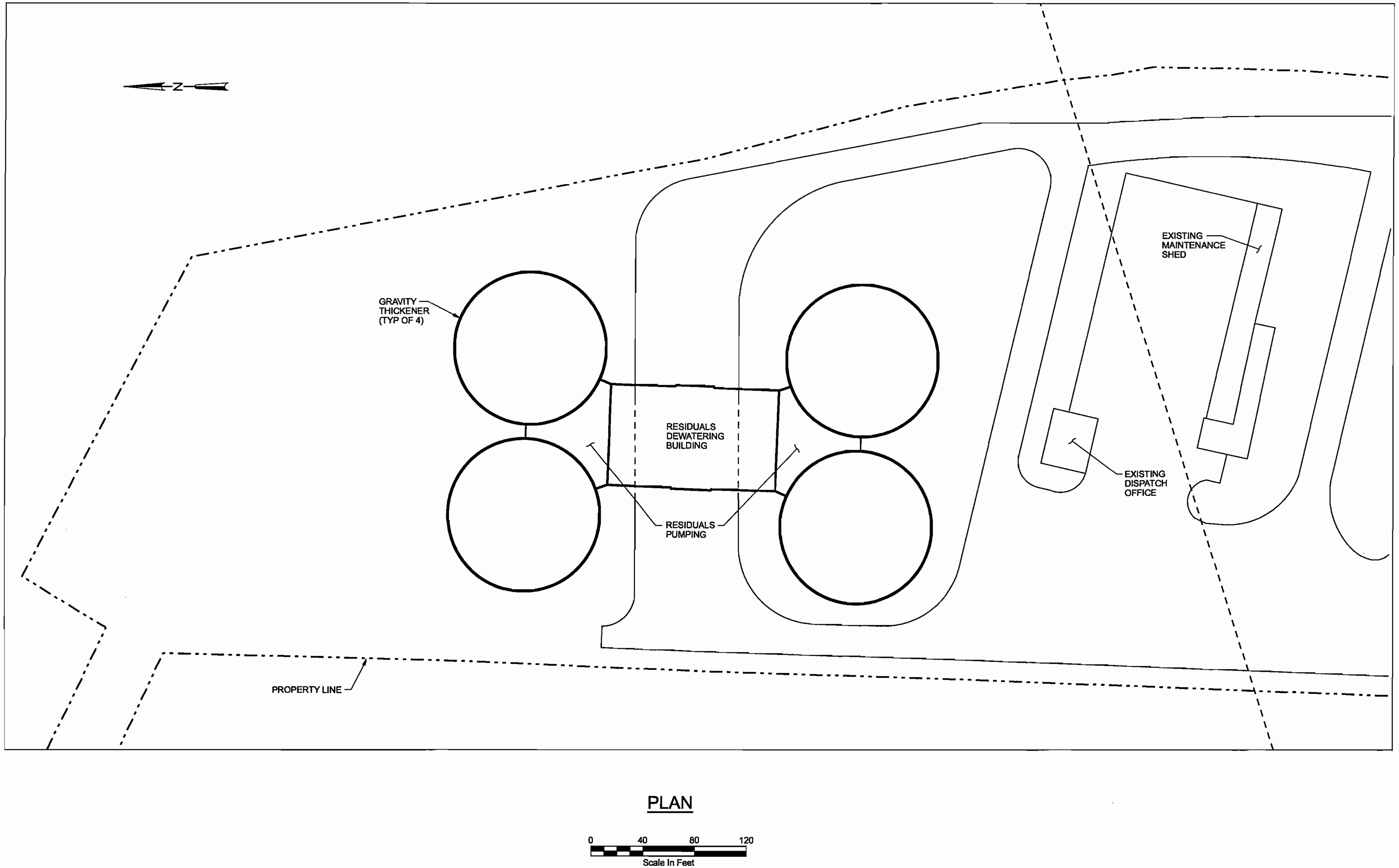

Figure 4-22
RESIDUALS PROCESSING COMPLEX
SITE PLAN

CH2MHILL

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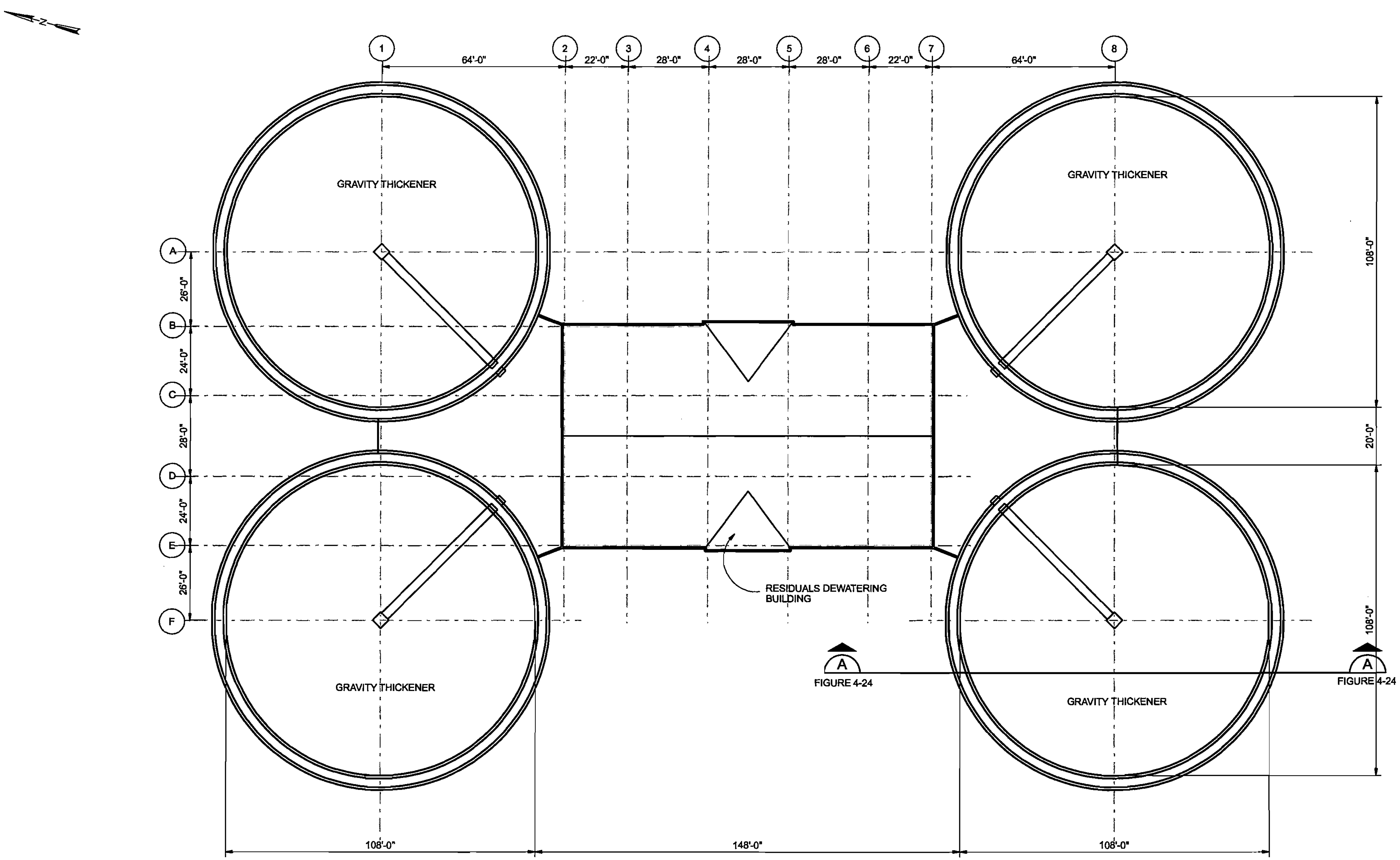
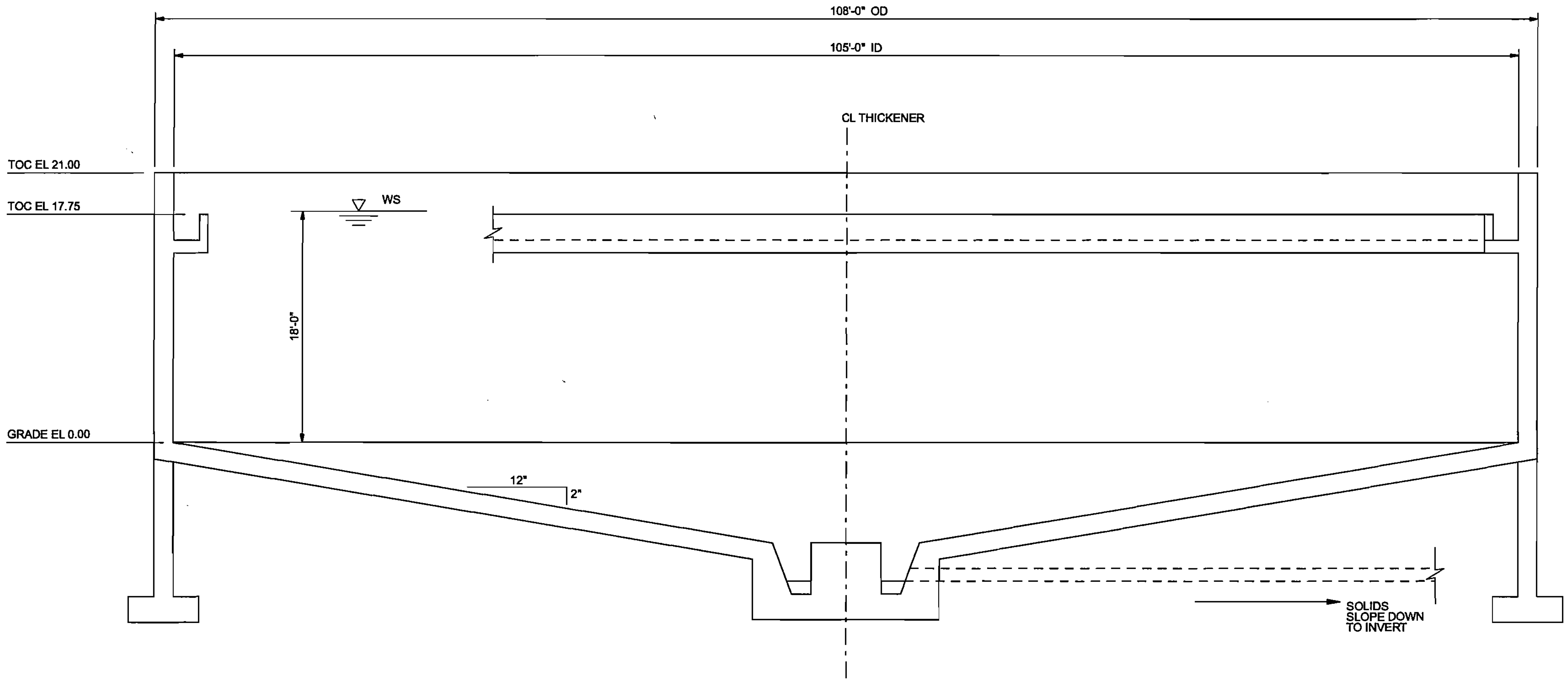


FIGURE 4-23
RESIDUALS PROCESSING COMPLEX
OVERALL PLAN SCALE 1"=20'

0 20 40 60
Scale In Feet

CH2MHILL



THICKENER SECTION (A)
3/16"=1'-0" FIGURE 4-23

FIGURE 4-24
GRAVITY THICKENERS
SECTION

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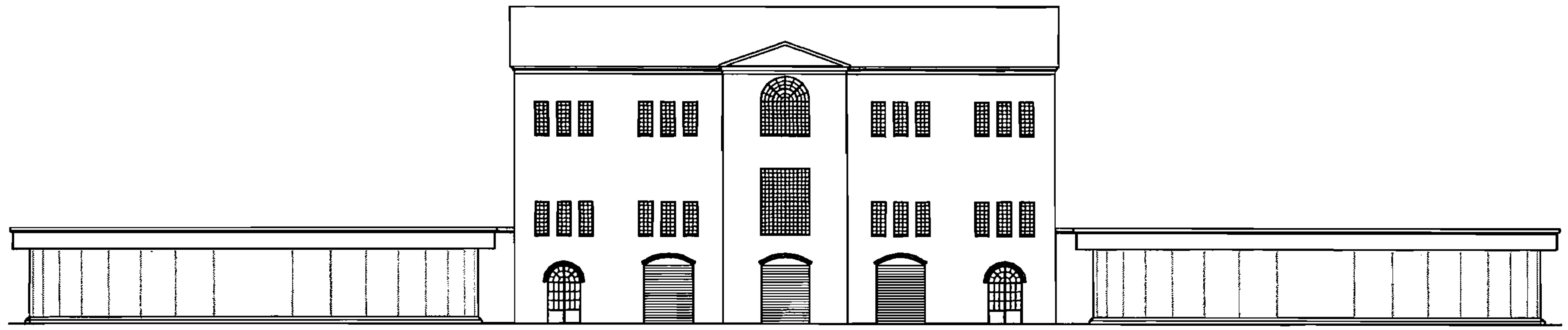
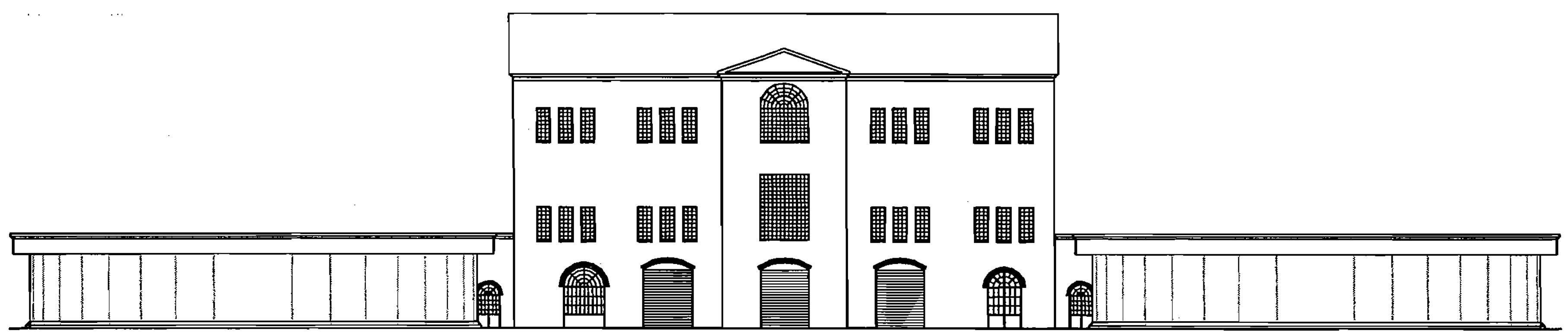


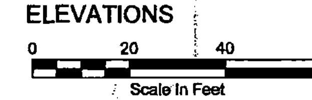
EAST ELEVATION
SCALE 1" = 20'-0"



WEST ELEVATION
SCALE 1" = 20'-0"

FIGURE 4-25
RESIDUALS PROCESSING COMPLEX
ELEVATIONS

SCALE 1" = 20'-0"



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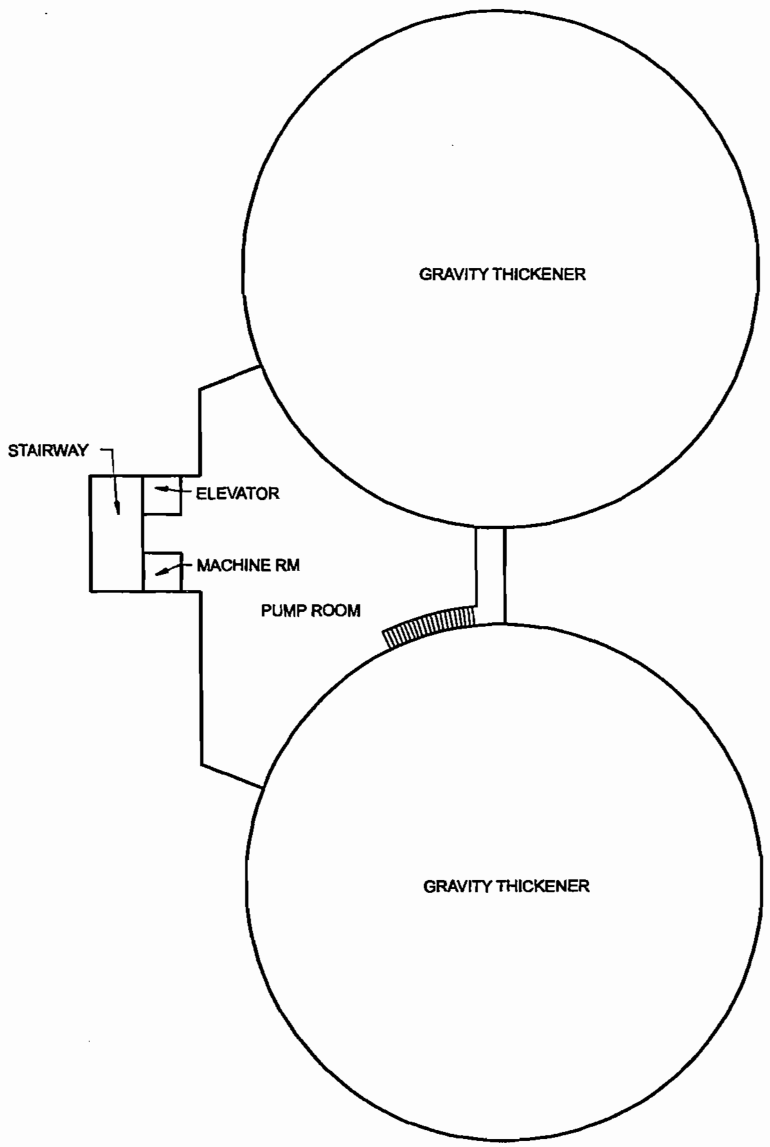
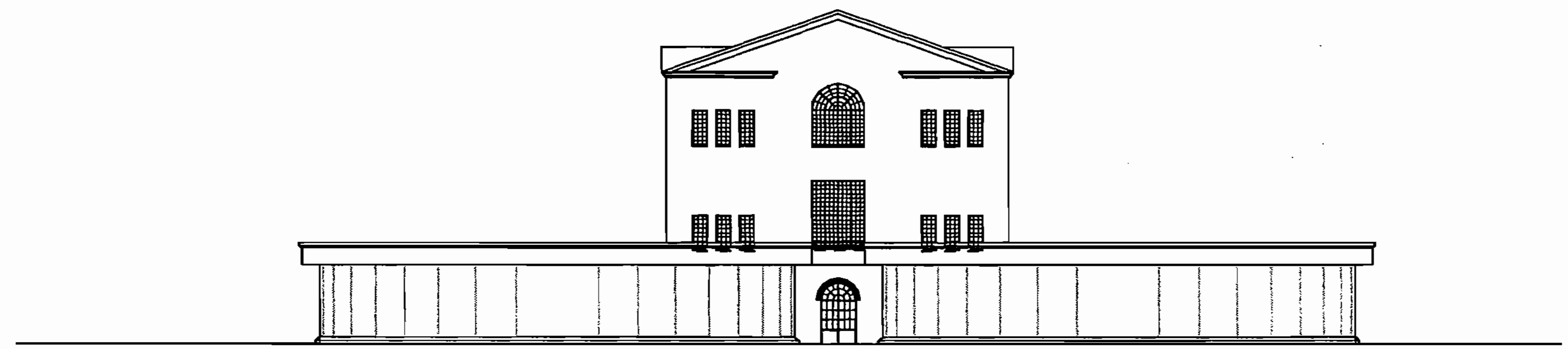


BASEMENT PLAN

SCALE 1" = 20'-0"



NORTH ELEVATION (SOUTH SIMILAR)

SCALE 1" = 20'-0"

FIGURE 4-26
RESIDUALS PROCESSING COMPLEX
ELEVATIONS AND BASEMENT PLAN SCALE 1" = 20'-0"

0 20 40 60
Scale In Feet

CH2MHILL

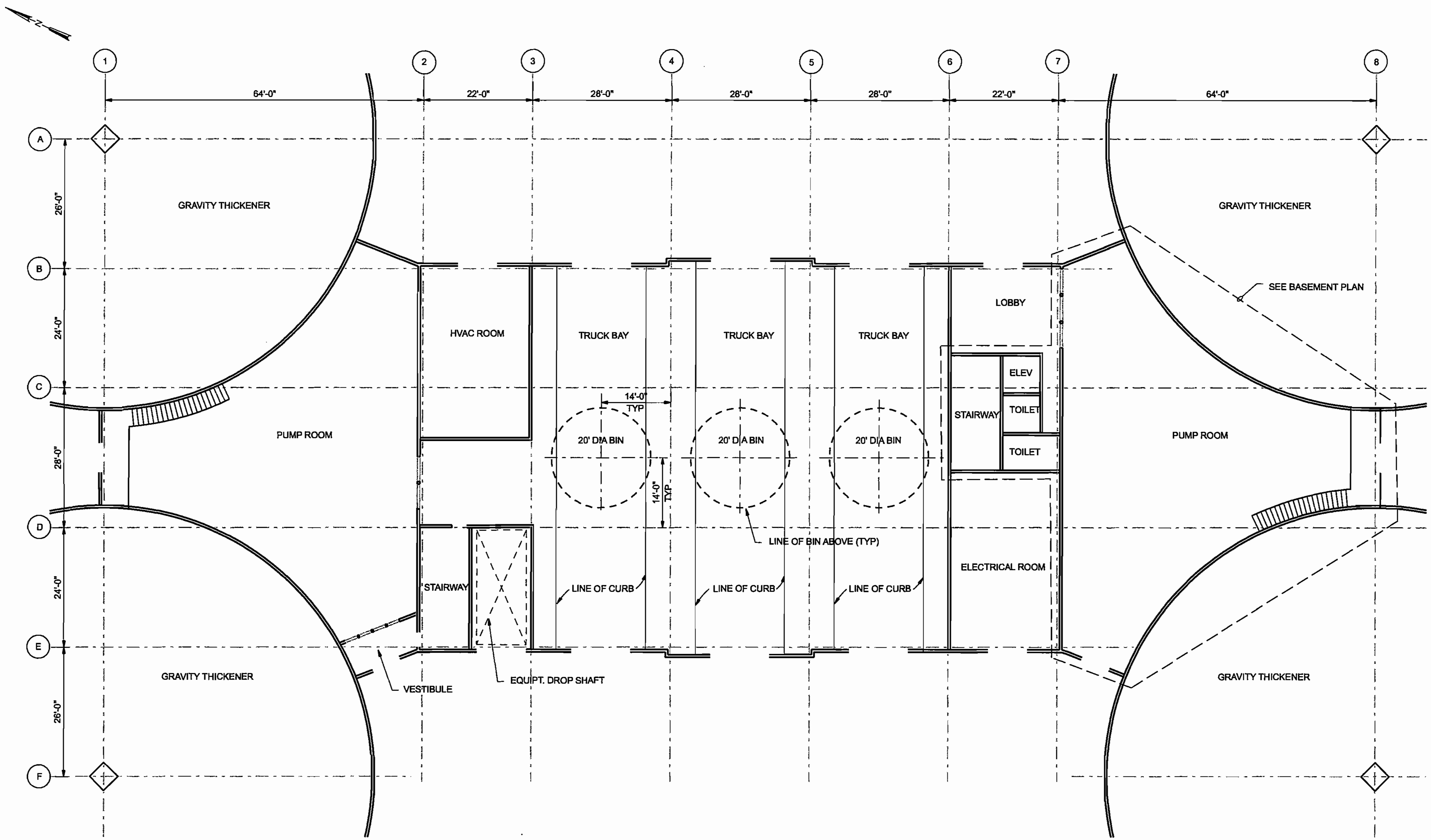


FIGURE 4-27
RESIDUALS PROCESSING COMPLEX
FIRST FLOOR PLAN SCALE 3/32" = 1'-0"

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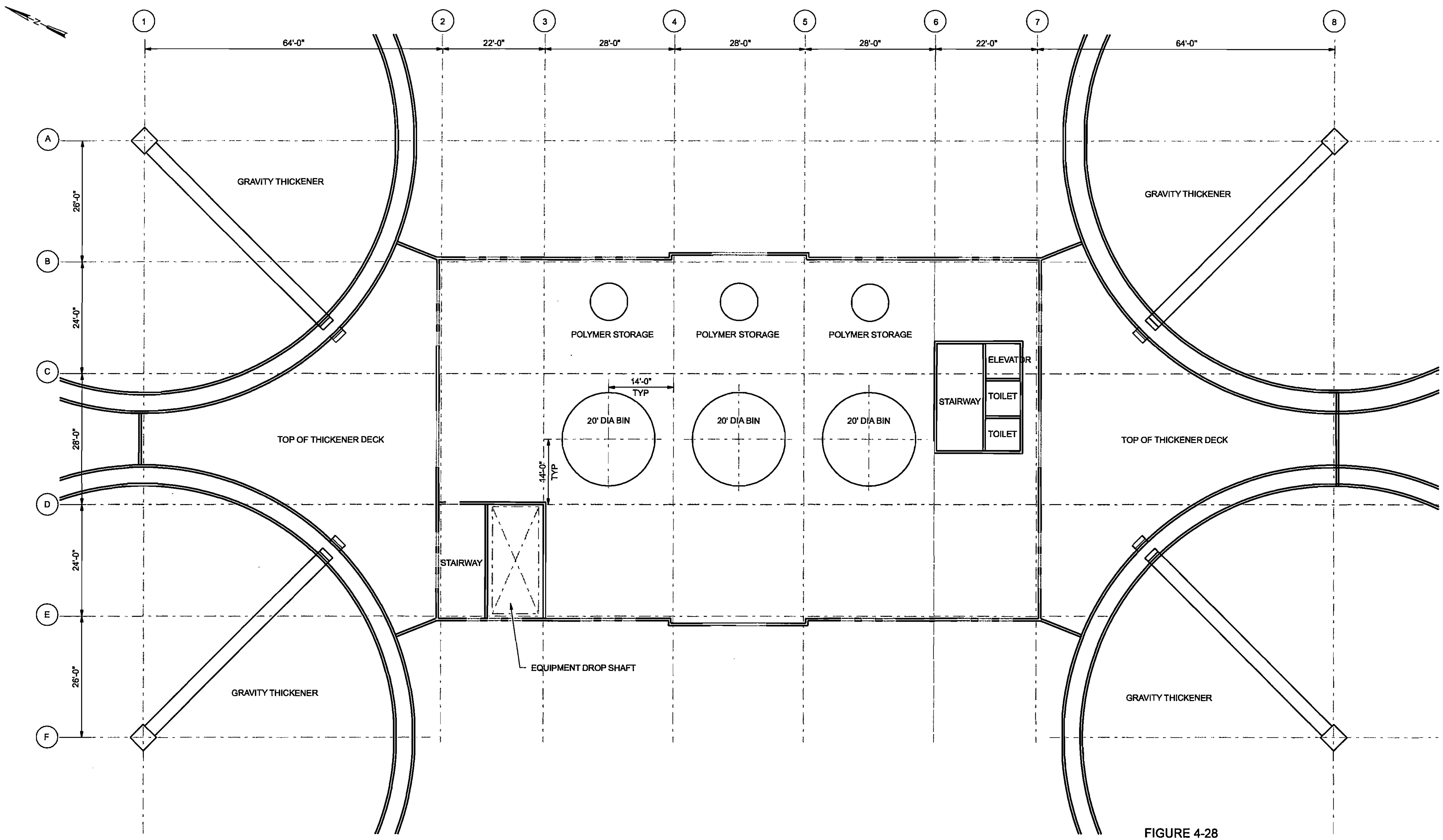

FIGURE 4-28
RESIDUALS PROCESSING COMPLEX
SECOND FLOOR PLAN SCALE 3/32" = 1'-0"

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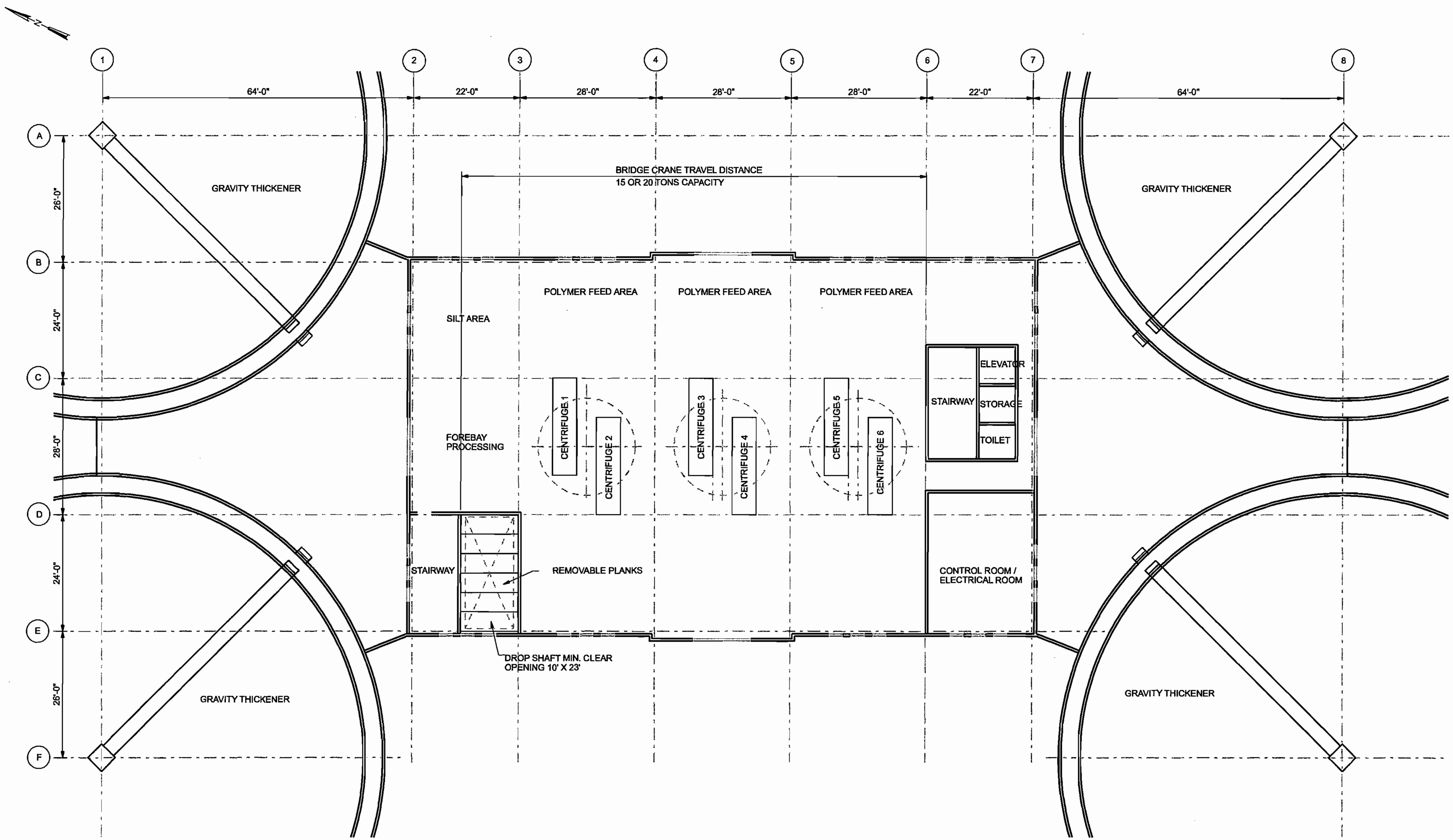
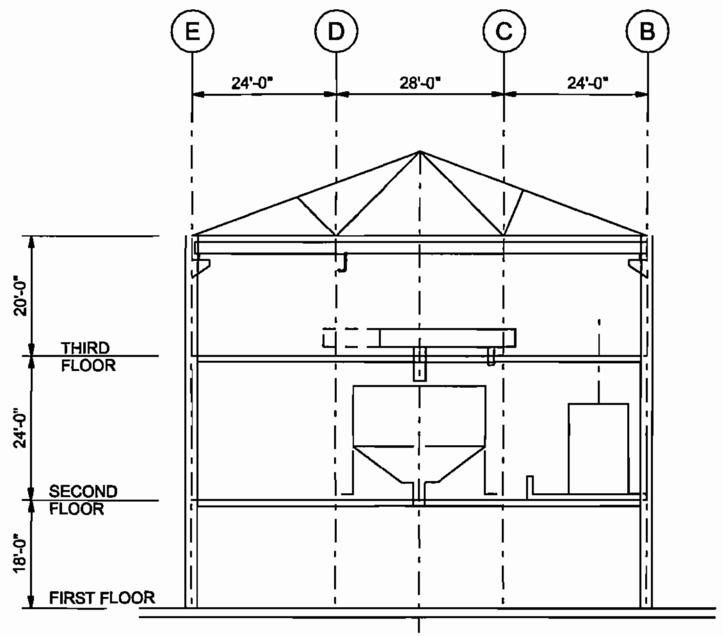
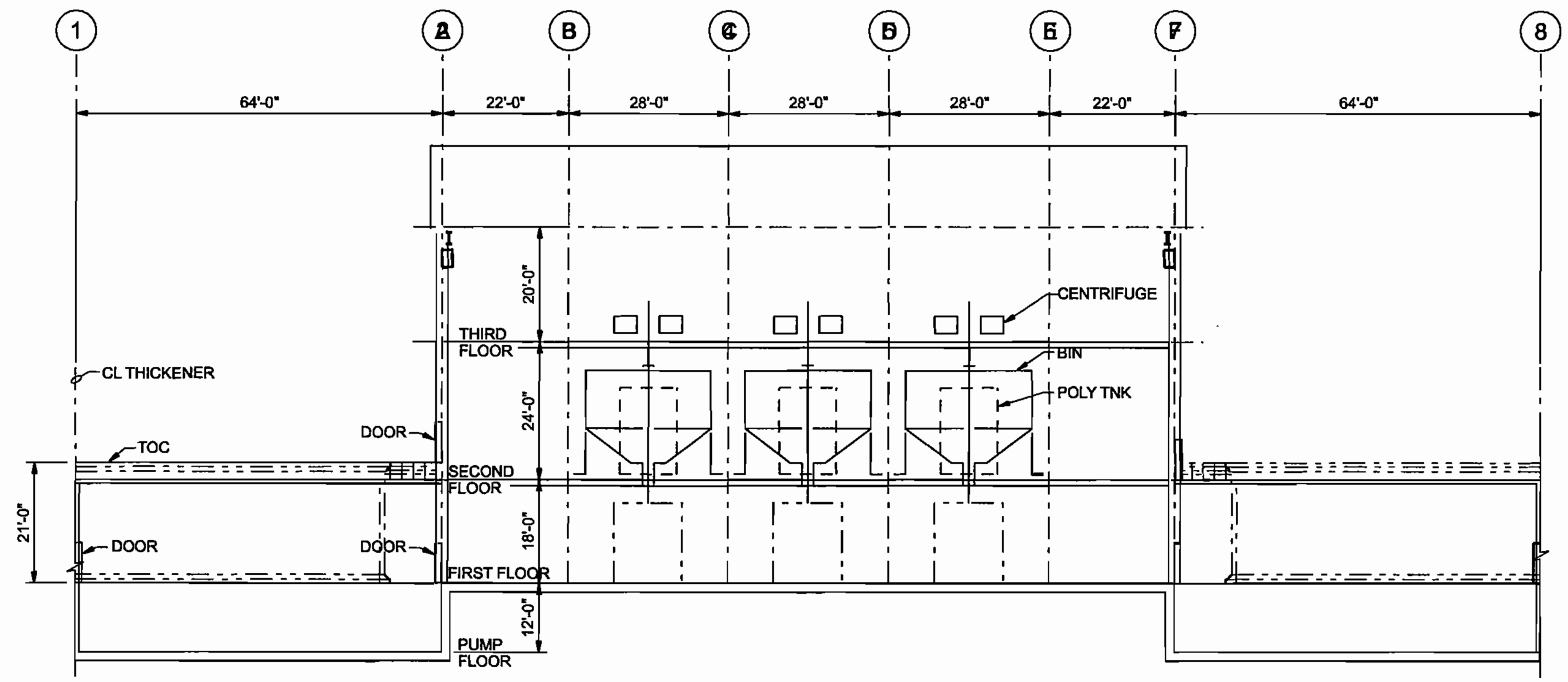


FIGURE 4-29
RESIDUALS PROCESSING COMPLEX
THIRD FLOOR PLAN SCALE 3/32" = 1'-0"

CH2MHILL



SECTION A
1/16"=1'-0"



SECTION B
1/16"=1'-0"

0 16 32 48
Scale In Feet

FIGURE 4-30
RESIDUALS PROCESSING COMPLEX
SECTION

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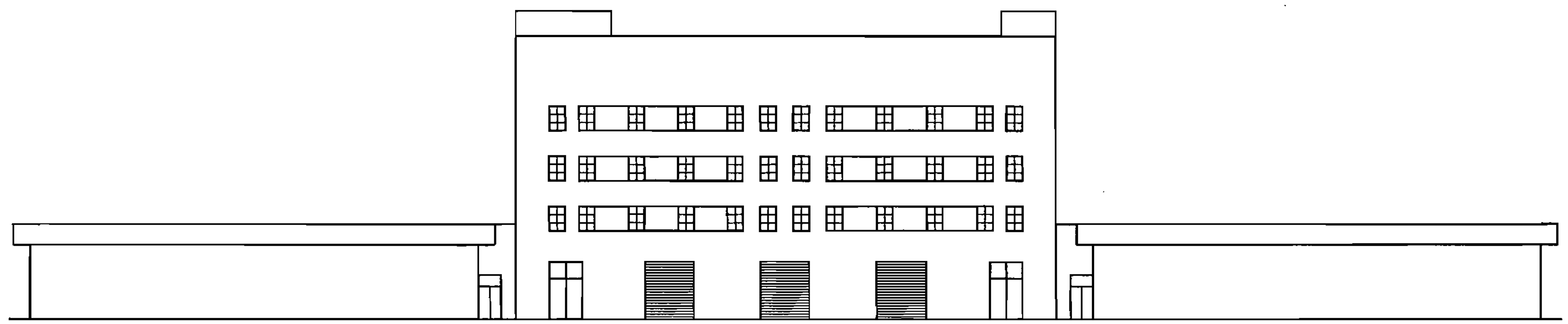
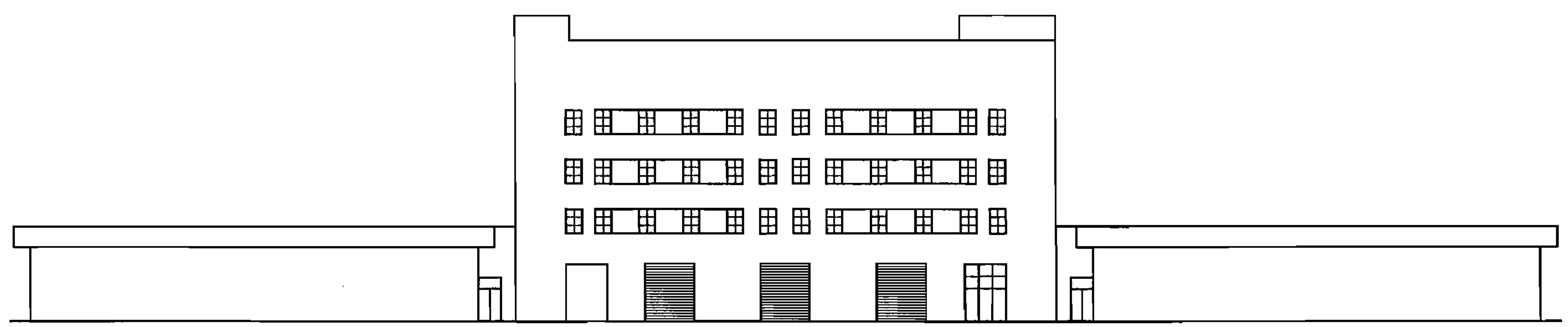
Figure 4-31
Potential Arrangement of the Proposed Thickening and Dewatering Facilities at East Site



EAST ELEVATION

SCALE 1" = 20'-0"



WEST ELEVATION

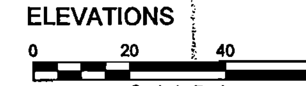
SCALE 1" = 20'-0"

FIGURE 4-32

RESIDUALS PROCESSING COMPLEX

ELEVATIONS

SCALE 1" = 20'-0"



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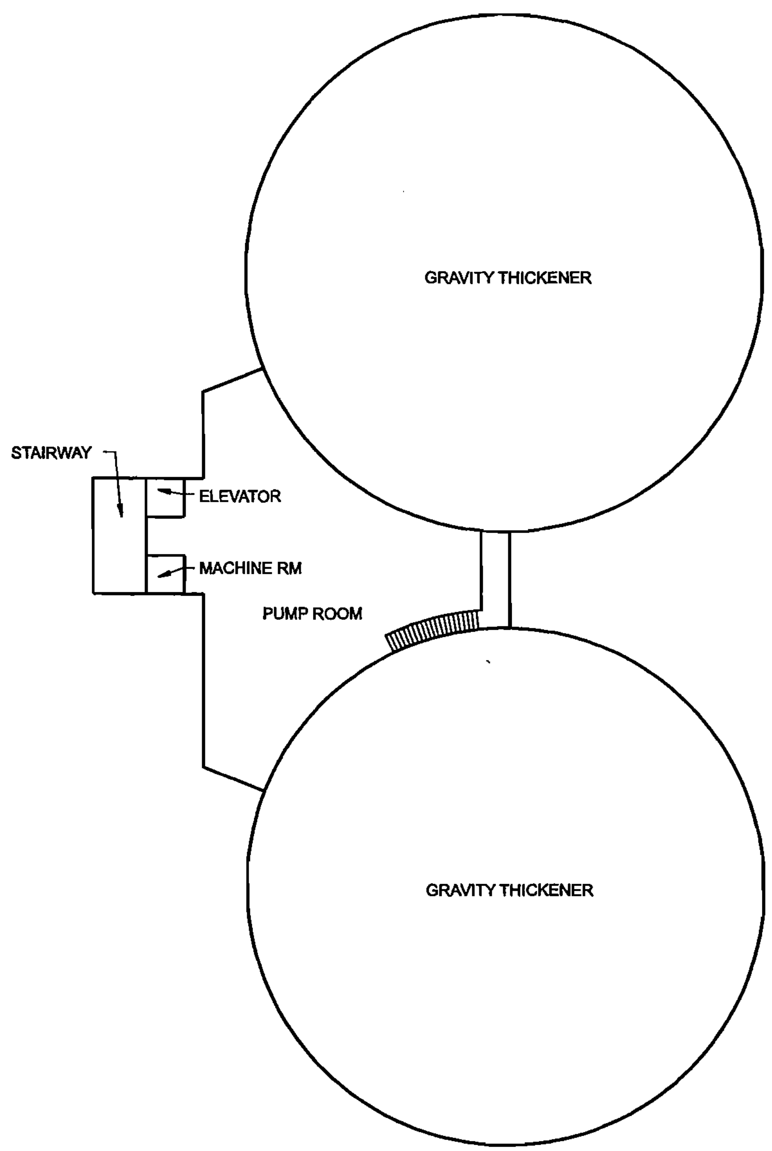
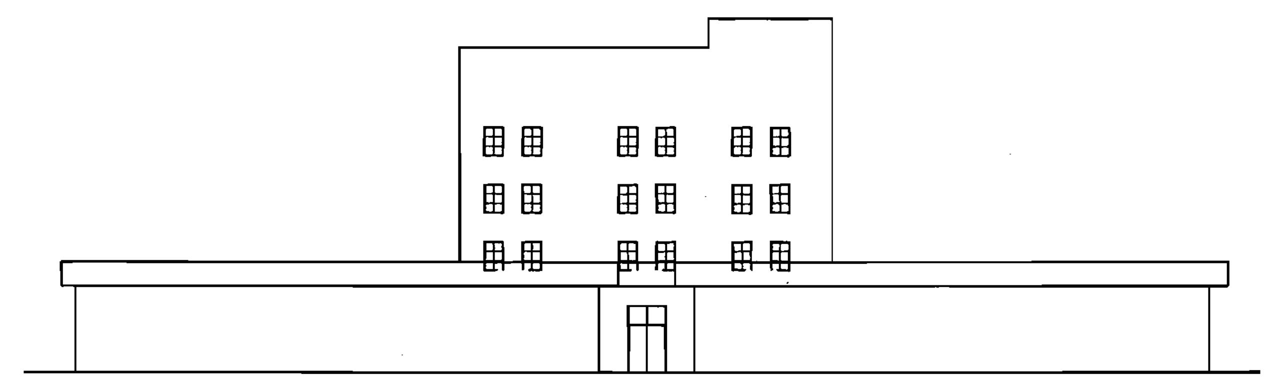


BASEMENT PLAN

SCALE 1" = 20'-0"



NORTH ELEVATION (SOUTH SIMILAR)

SCALE 1" = 20'-0"

FIGURE 4-33
RESIDUALS PROCESSING COMPLEX
ELEVATIONS AND BASEMENT PLAN SCALE 1" = 20'-0"

0 20 40 60
Scale In Feet

CH2MHILL

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ALTERNATIVES FOR DETAILED EVALUATION

SECTION 5

Alternatives for Detailed Evaluation

This section includes a short description of the alternatives that will be evaluated in more detail during the EIS.

5.1 Alternative 1

The no-action alternative is retained as a NEPA requirement.

5.2 Alternative 2

Residuals from the Dalecarlia Sedimentation Basins and the Georgetown Reservoir would be collected and thickened/dewatered at the Northwest Dalecarlia Processing Site before being disposed of in the monofill. Residuals from the Forebay would be processed separately as is currently practiced and periodically hauled offsite.

5.2.1 Facilities

Figure 5-1 shows the location of the sedimentation basins to be upgraded (as shown in "base case" from Section 4), the preliminary location for thickening and dewatering facilities, and the approximate footprint of the monofill. As described in Section 4, and as shown in Figures 4-18 through 4-21, four options are under consideration for the collection of water treatment residuals. Option 1 is recommended for further study.

As currently conceived, the monofill would be approximately 50 ft tall on the Dalecarlia Parkway side and 80 ft tall on the Dalecarlia Reservoir side. The footprint of the monofill is anticipated to occupy approximately 30 acres.

5.2.2 Conveyance and Transport

Pipelines would convey coagulated residuals from both the Dalecarlia sedimentation basins and the Georgetown Reservoir to an onsite thickening facility, unless all sedimentation capacity is centralized at the Dalecarlia WTP. After thickening and dewatering, onsite trucks would be used to haul the residuals to the monofill. On average, 8 on-site truck loads per day (5 days per week) of water treatment residuals would be required.

5.3 Alternative 5

This alternative would eliminate truck traffic associated with residuals on the roads surrounding the Washington Aqueduct by conveying thickened residuals via a dedicated, dual pipeline to the Blue Plains AWWTP for further processing and disposal. Residuals from the Forebay would be processed separately for onsite disposal, as is currently practiced. Figure 5-2 provides an overview of this alternative.

5.3.1 Facilities

Figure 5-3 shows the location of the sedimentation basins to be upgraded and the preliminary location for onsite thickening facilities. This alternative would involve residuals collection at the Georgetown Reservoir and at the Dalecarlia WTP, followed by onsite thickening at the Northwest Dalecarlia Processing Site. The thickened residuals would then be pumped to the Blue Plains AWWTP via a dedicated pipeline. Dewatering facilities would be located at the Blue Plains AWWTP.

5.3.2 Conveyance and Transport

Residuals would be conveyed from both the onsite sedimentation basins and the Georgetown Reservoir to the onsite thickening facility. A dedicated, dual pipeline within existing rights of way could convey the thickened residuals to Blue Plains AWWTP for final processing. This pipe would be approximately 10 miles long and 12 in. in diameter.

5.4 Alternative 25

This alternative consists of thickening and dewatering water treatment residuals at the northwest site. Residuals from the Dalecarlia sedimentation basins and the Georgetown Reservoir would be collected and thickened/dewatered at the Northwest Dalecarlia Processing Site. The dewatered residuals would be disposed of by contract hauling from Dalecarlia WTP to a permitted disposal facility.

5.4.1 Facilities

Figure 5-4 shows the location of the sedimentation basins to be upgraded and the preliminary location for onsite thickening facilities. Figures 4-18 through 4-21 show various options for sedimentation and residuals collection improvements and the preliminary location of thickening and dewatering facilities.

5.4.2 Conveyance and Transport

Pipelines would convey water treatment residuals from both the onsite sedimentation basins and the Georgetown Reservoir to the Dalecarlia thickening facility. After thickening and dewatering, the residuals would be hauled by truck to a permitted offsite disposal facility. The estimated number of truck loads is approximately 8 per day (5 days per week) on average with a peak number of approximately 33 truck loads per day (5 days per week) under maximum loading conditions.

5.5 Public Alternatives Screening Summary

Alternative P71/P80 (alternate site for residuals processing facility on Dalecarlia campus) is the only public alternatives considered consistent with the screening criteria for the project. These alternatives are very similar and have been evaluated as a single alternative in the EIS.

5.5.1 Alternatives P71 and P80

This alternative consists of thickening and dewatering water treatment residuals at the East Dalecarlia Processing Site. Residuals from the Dalecarlia sedimentation basins and the Georgetown Reservoir would be collected and thickened/dewatered at the East Dalecarlia Processing Site. The dewatered residuals would be disposed of by contract hauling from Dalecarlia WTP to a permitted disposal facility.

Facilities

Residuals collection facilities associated with this alternative would be similar to those previously defined for Alternative 25. The major distinction is that the thickening and dewatering facilities for this alternative are located at the East Dalecarlia Processing Site. Figures 5-5 shows the potential location for the thickening and dewatering facilities associated with this alternative.

Conveyance and Transport

Pipelines would convey water treatment residuals from both the onsite sedimentation basins and the Georgetown Reservoir to the Dalecarlia thickening facility. After thickening and dewatering, the residuals would be hauled by truck to a permitted offsite disposal facility. The estimated number of truck loads is approximately eight per day (5 days per week) on average with a peak number of approximately 33 truck loads per day (5 days per week) under maximum loading conditions.

5.6 Designation of Alternatives Evaluated in Detail in the Draft Environmental Impact Statement

The five alternatives recommended for detailed evaluation in the EIS were re-named, following the alternative screening process, to simplify the associated discussion. New designators, A through E, were assigned to these alternatives. The revised alternative designations are as follows:

- **Alternative A:** Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill (*formerly Alternative 2*)
- **Alternative B:** Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking (f*ormerly Alternative 25*)
- **Alternative C:** Thickening and Piping to Blue Plains AWWTP (*formerly Alternative 5*)
- **Alternative D:** No Action Alternative (*formerly Alternative 1*)
- **Alternative E:** Dewatering at East Dalecarlia Processing Site and Disposal by Trucking (*formerly Public Alternatives P71and P80*)

5.7 Cost Summary

Table 5-1 provides a summary of order of magnitude costs for the three alternatives that will be retained for further evaluation during the EIS. The cost of alternatives P71 and P80,also known as alternative E, are very similar to those of Alternative 25. Costs for sedimentation and residuals collection options, as discussed in Section 4, are also summarized in Table 5-1. As was discussed in Section 4, previous cost estimates by WR&A for facilities such as residuals thickening and dewatering were updated for inflation and used as the basis for this estimate.

For Alternative 5 (i.e., dedicated pipeline to Blue Plains AWWTP), it was assumed that a dewatering building, equivalent in cost to the one proposed for the Dalecarlia WTP, would need to be constructed at Blue Plains AWWTP. This assumption was necessary because of the current uncertainty associated with the availability of dewatering capacity at Blue Plains AWWTP.

The cost for the monofill was based on the cost for a monofill of similar size for lime residuals that was constructed in Northern Virginia in the mid-1990s. Actual bid costs were used as the basis for the estimate and were updated for inflation.

The estimated construction cost for Alternate 2, Option 1 is within the cost screening criteria used throughout this study (i.e., project cost is less that 30-percent over the $50,000,000.00 budget for the residuals project). This alternative will be evaluated in detail in the EIS.

The original estimated construction cost for Alternative 5 during the initial screening process was $62,600,000.00. The estimated construction cost for Alternative 5, Option 1 (as only more recently defined due to necessary, but costly, changed in construction techniques, were incorporated as part of the agency coordination during the detailed evaluation process) is now extremely high at $165,100,000.00. This cost , had it been known during the initial screening, would not have allowed this alternative to have passed the screening criteria test of no more than 30-percent above the $50,000,000.00 budget for the project. The evaluation of this alternative in detail in the DEIS had been completed, , however, to allow Washington Aqueduct to obtain a full understanding of the pros and cons of this alternative, not just those related to cost, when compared with the other alternatives.

The estimated construction cost for Alternative 25, Option 1 is the lowest of all the original alternatives ($47,600,000.00). This cost is below the budgeted cost of $50,000,000.00. This alternative will also be evaluated in detail in the EIS. Alternatives P71 and P80 (Option 1) have similar, if not identical, construction costs.

Table 5-2 presents preliminary present worth costs for the “base case” residuals collection and sedimentation option for each of the three alternatives to be retained for detailed evaluation in the EIS. The base case option includes the retrofit of the existing Dalecarlia sedimentation basins with residuals collection equipment and the installation of a dredging system to collect residuals from the Georgetown Reservoir, as well as a thickening and dewatering facility. The present worth cost was calculated for a 20-year project life at a discount factor (i.e., interest rate) of 3 percent.

Table 5-3 provides a summary of the assumptions used to create the annual operations and maintenance (O&M) costs used in the evaluation. The assumptions will be refined further as additional detail is developed for each of the alternatives. At this preliminary level of detail, it can generally be concluded that the monofill alternative (Alternative 2) has the lowest present worth cost. Onsite processing with hauling of dewatered residuals to an offsite location (Alternative 25) has the second lowest present worth cost, and the dedicated pipeline route to the Blue Plains AWWTP (Alternative 5) has the highest present worth cost.

The costs presented in this Engineering Feasibility Study Compendium are preliminary. It is important to note that cost will be only one of the factors to be considered in choosing the recommended alternative for implementation. The EIS will evaluate several other factors, specifically pertaining to environmental and other impacts, that will be used by Washington Aqueduct to choose the recommended alternative for implementation.

TABLE 5-1
Order-of-Magnitude Cost Summary for the Selected Alternatives

	Alternative 2 (Also named Alternative A) Dalecarlia Monofill				Alternative 5 (Also Named Alternative C) Dedicated Pipeline to the Blue Plains AWWTP				Alternative 25 (Also Named Alternatives B) Onsite Processing with Hauling to an Offsite Location			
	Option 1	**Option 2**	**Option 3**	**Option 4**	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 1**	**Option 2**	**Option 3**	**Option 4**
Retrofit of Existing Basins with Collection Equipment	$14,200,000	——	$14,200,000	$14,200,000	$14,200,000	——	$14,200,000	$14,200,000	$14,200,000	——	$14,200,000	$14,200,000
Modifications to Basins 1 & 2 Only	——	$36,700,000	——	——	——	$36,700,000	——	——	——	$36,700,000	——	——
New Sedimentation Basin at Dalecarlia	——	——	$23,800,000	——	——	——	$23,800,000	——	——	——	$23,800,000	——
Dredging System at Georgetown	$2,400,000	——	——	——	$2,400,000	——	——	——	$2,400,000	——	——	——
New Sedimentation Basin at Georgetown	——	——	——	$14,600,000	——	——	——	$14,600,000	——	——	——	$14,600,000
Subtotal – Sedimentation and Residuals Collection	**$16,600,000**	**$36,700,000**	**$38,000,000**	**$28,800,000**	**$16,600,000**	**$36,700,000**	**$38,000,000**	**$28,800,000**	**$16,600,000**	**$36,700,000**	**$38,000,000**	**$28,800,000**
Gravity Thickeners and Thickened Residuals Pump Station	$9,700,000	$9,700,000	$9,700,000	$9,700,000	$9,700,000	$9,700,000	$9,700,000	$9,700,000	$9,700,000	$9,700,000	$9,700,000	$9,700,000
Dewatering Building	$19,700,000	$19,700,000	$19,700,000	$19,700,000	$19,700,000	$19,700,000	$19,700,000	$19,700,000	$19,700,000	$19,700,000	$19,700,000	$19,700,000
Miscellaneous Support Facilities	$1,600,000	$1,600,000	$1,600,000	$1,600,000	$1,600,000	$1,600,000	$1,600,000	$1,600,000	$1,600,000	$1,600,000	$1,600,000	$1,600,000
Subtotal – Collection and Processing Facilities	**$47,600,000**	**$67,700,000**	**$69,000,000**	**$59,800,000**	**$47,600,000**	**$67,700,000**	**$69,000,000**	**$59,800,000**	**$47,600,000**	**$67,700,000**	**$69,000,000**	**$59,800,000**
Dalecarlia Monofill	$6,700,000	$6,700,000	$6,700,000	$6,700,000	——	——	——	——	——	——	——	——
Thickened Residuals Pump Station and Pipeline	——	——	——	——	$95,000,000	$95,000,000	$95,000,000	$95,000,000	——	——	——	——
Total ($2004)	**$54,300,000**	**$74,400,000**	**$75,700,000**	**$66,500,000**	**$142,600,000**	**$162,700,000**	**$164,000,000**	**$154,800,000**	**$47,600,000**	**$67,700,000**	**$69,000,000**	**$59,800,000**
Escalated to Mid-Point of Construction (July 2008)	**$62,900,000**	**$86,200,000**	**$87,700,000**	**$77,000,000**	**$165,100,000**	**$188,400,000**	**$190,000,000**	**$179,300,000**	**$55,100,000**	**$78,400,000**	**$79,900,000**	**$69,300,000**

Notes: The costs for Alternatives B and E are similar.

TABLE 5-2
Preliminary Net Present Value for the Selected Alternatives

Residuals Process	Alternative 2 Dalecarlia Monofill	Alternative 5 Dedicated Pipeline Route to the Blue Plains AWWTP	Alternative 25 Onsite Processing with Hauling to an Offsite Location
Capital Costs			
Collection and Processing	$47,600,000	$47,600,000	$47,600,000
Additional Facilities	$6,700,000	$95,000,000	$0
Total Capital Cost ($2004)	**$54,300,000**	**$142,600,000**	**$47,600,000**
Annual O&M Costs			
Labor (Thickening and Dewatering)	$374,000	$374,000	$374,000
Labor (Monofill Operation)	$69,000	$0	$0
Chemicals (Thickening and Dewatering)	$238,000	$238,000	$238,000
Power	$117,000	$192,000	$117,000
Other (Monofill-Specific Costs)	$79,000	$0	$0
Other (Contract Hauling)	$0	$1,591,000	$1,591,000
Total (Annual O&M Costs)	**$877,000**	**$2,395,000**	**$2,320,000**
Present Worth Costs			
Present Worth of Annual Costs	$13,050,000	$35,600,000	$34,500,000
Salvage Value	$0	$0	$0
Net Present Value	**$67,400,000**	**$178,200,000**	**$82,100,000**

Notes: Alternatives are renamed as follows at the conclusion of this EFS:
- Alternative 2 = Alternative A
- Alternative 5 = Alternative C
- Alternative 25 = Alternative B
- Alternative B and E costs are similar.

TABLE 5-3
Assumptions for the Preliminary Net Present Value Calculations

Category	Assumptions
Residuals Production	
Production	32 dry tons/day @ 30% dry solids; 109 wet tons/day
Average Dewatering Period	16 hours/day; 5 days/week; 52 weeks/year
Chemicals	
Polymer Use	8 to 10 Lbs. active material per ton of dry solids
Polymer Cost	$2.00 per pound of active material
Power	
Electrical Power Costs	$0.045 to $0.070 per KwH ($0.06/KwH was used for the evaluation)
Labor Costs	
Burdened Operations Labor Costs	$33.00 per hour
Burdened Managerial Labor Costs	$47.00 per hour
Managerial to Operations Ratio	1 to 6 (for thickening and dewatering only)
Thickening and Dewatering Labor	2 people; 16 hours/day
Landfill Labor	1 person; 40 hours/week
Contract Hauling	
Contract Hauling	$40.00 per wet ton (150 mile round trip hauled distance assumed)
Net Present Value Calculations	
Discount Rate	3%
Present Worth Period	20 years
Salvage Value	None

Other Assumptions:

1. Maintenance costs for equipment and facilities are not included in the evaluation.
2. Annual costs for the monofill are based on discussions with the Upper Occoquan Sewage Authority (Centreville, VA). Contract hauling costs are based on discussions with neighboring utilities and residuals hauling contractors.
3. Costs for contract hauling will depend on the competitive environment and hauling distances.
4. Capital costs are not escalated to the mid-point of construction.
5. Cost calculations for Alternative 5 assume that the capital and annual costs to thicken at the Dalecarlia WTP and dewater at Blue Plains AWWTP are the same as an all-Dalecarlia WTP operation.

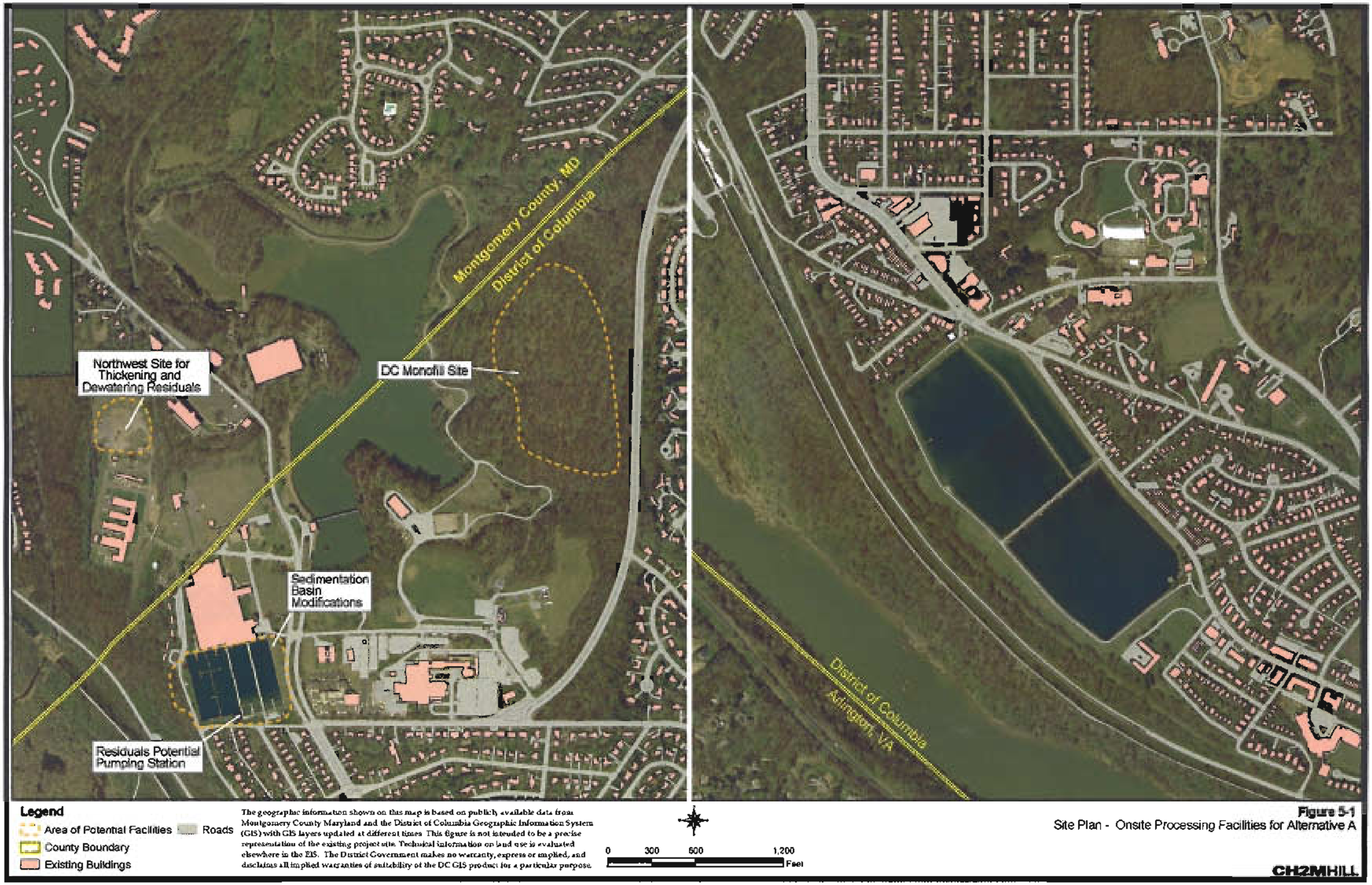

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Figure 5-1
Site Plan - Onsite Processing Facilities for Alternative A

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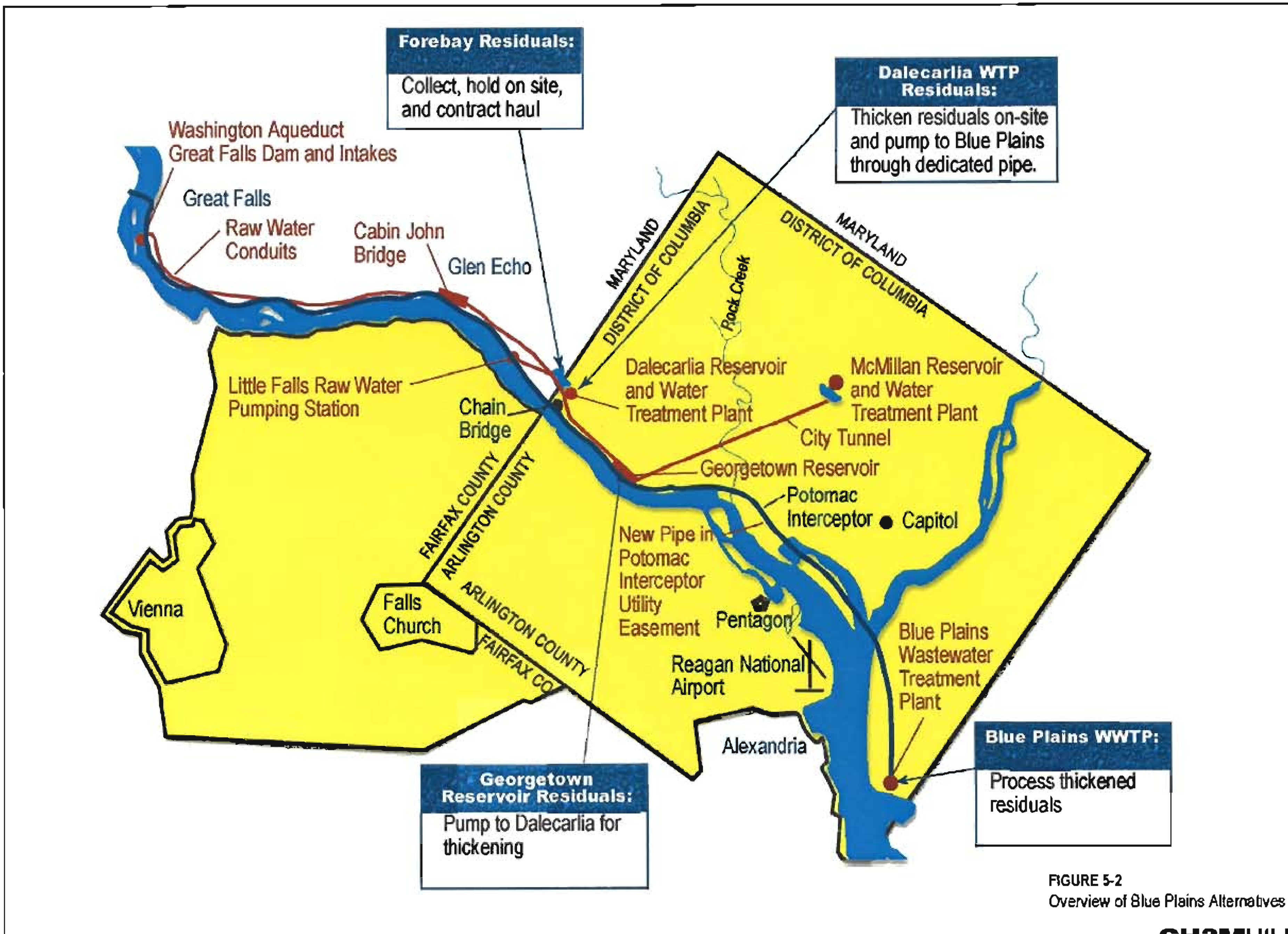

FIGURE 5-2
Overview of Blue Plains Alternatives

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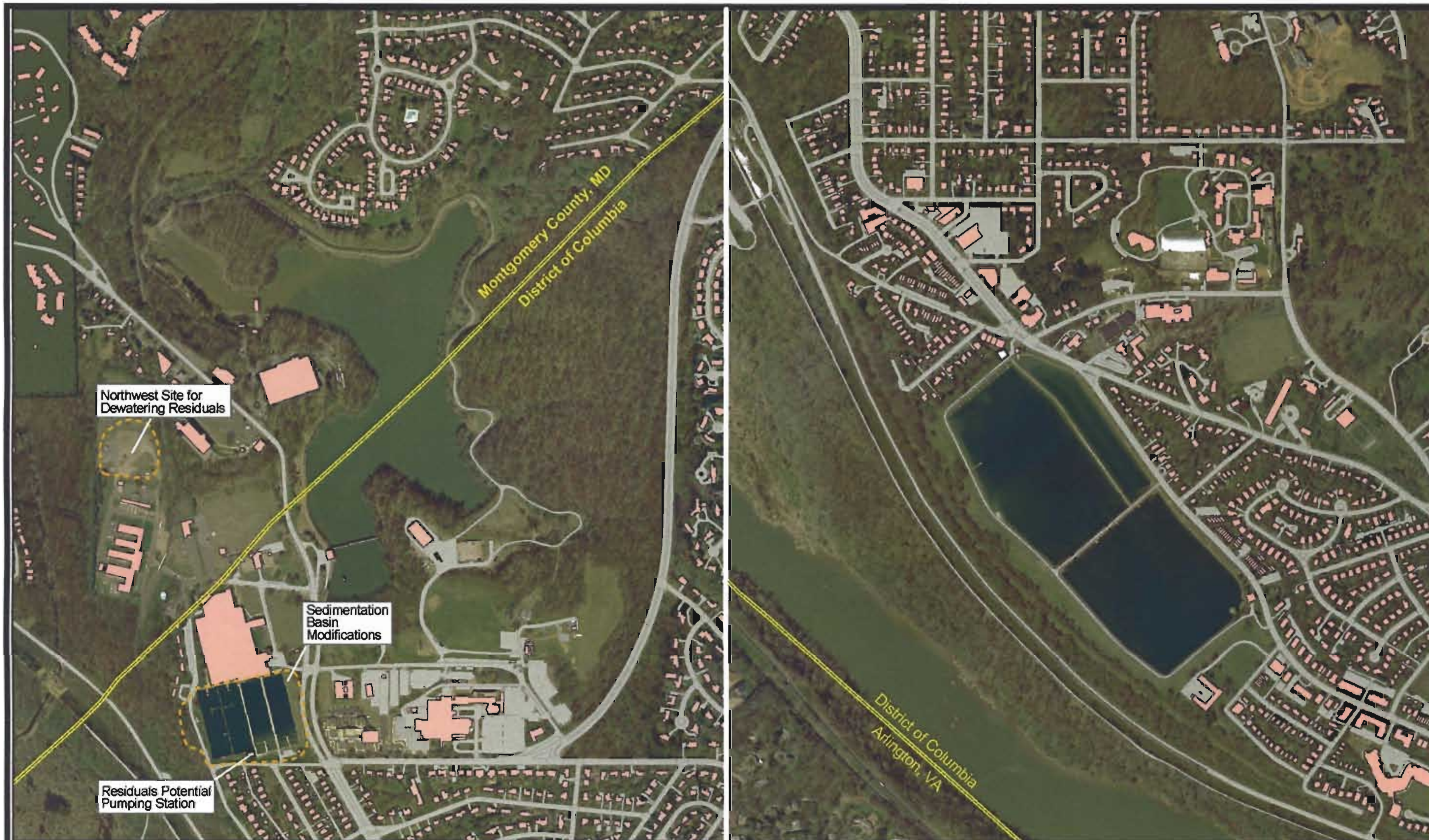
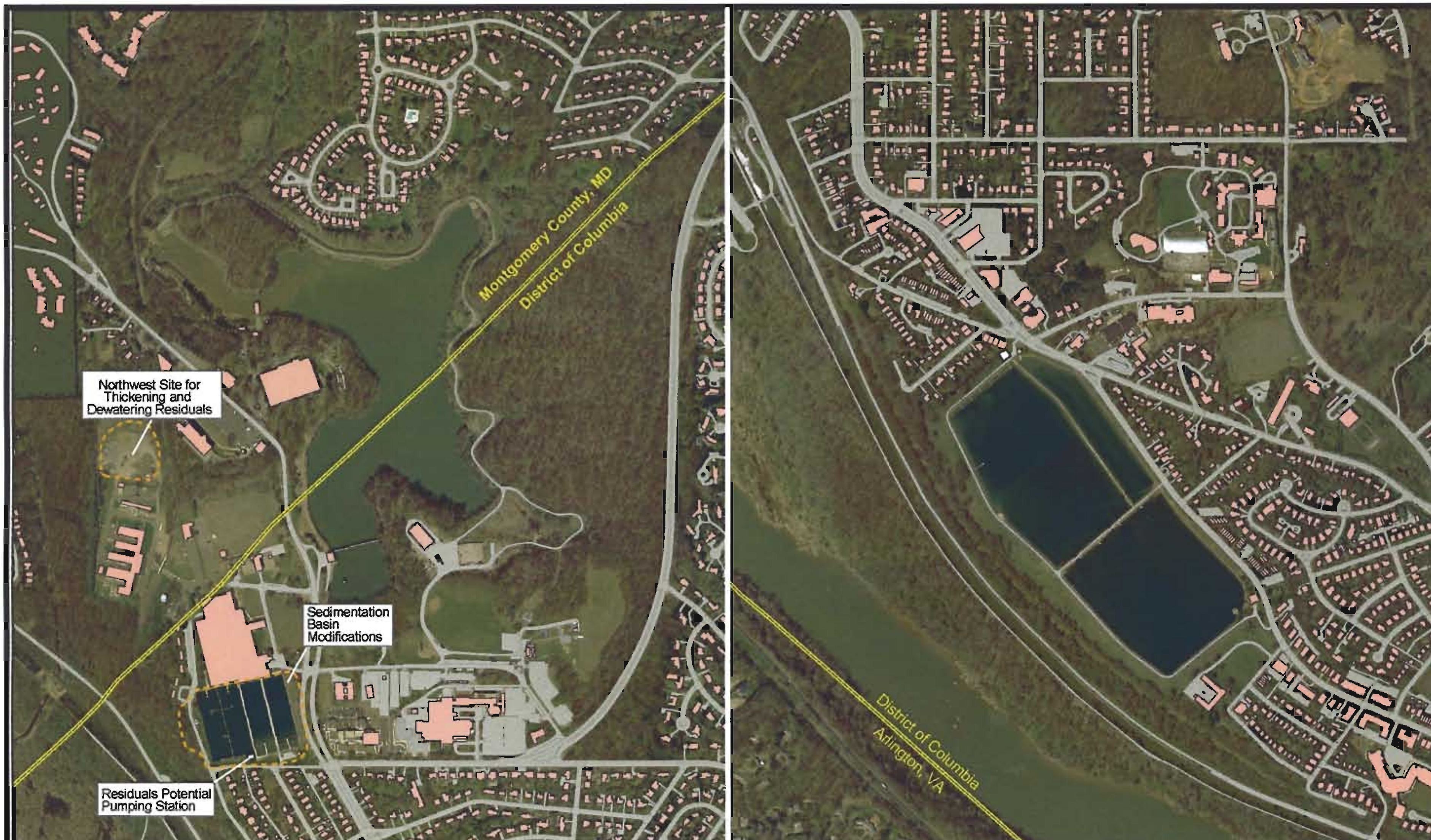


Figure 5-3
Site Plan - Onsite Processing Facilities for Alternative C



Legend
- Area of Potential Facilities
- Roads
- County Boundary
- Existing Buildings

The geographic information shown on this map is based on publicly available data from Montgomery County Maryland and the District of Columbia Geographic Information System (GIS) with GIS layers updated at different times. This figure is not intended to be a precise representation of the existing project site. Technical information on land use is evaluated elsewhere in the EIS. The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

0 300 600 1,200 Feet

Figure 5-4
Site Plan - Onsite Processing Facilities for Alternative B

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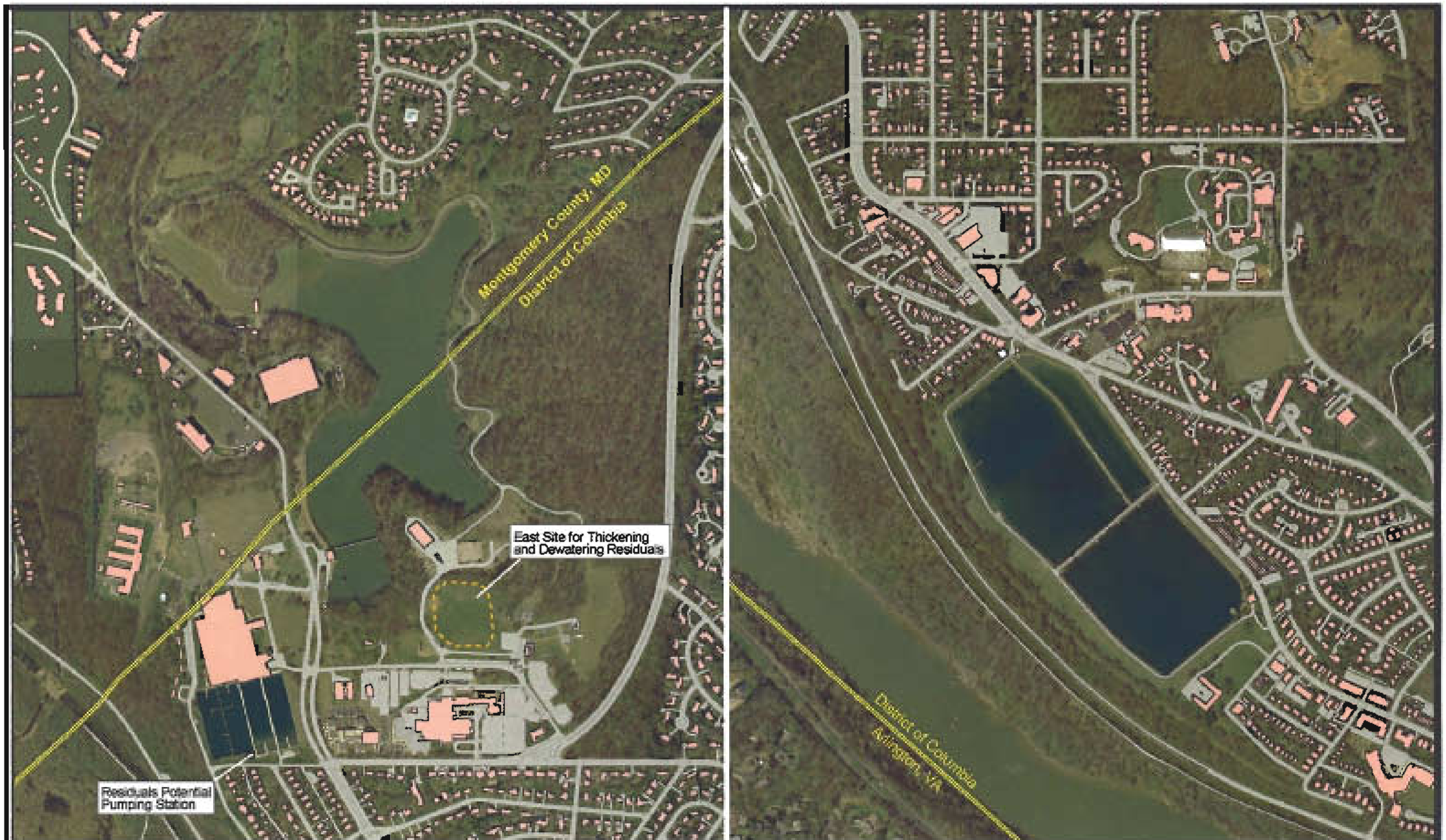

Legend

- Area of Potential Facilities
- Roads
- County Boundary
- Existing Buildings

The geographic information shown on this map is based on publicly available data from Montgomery County Maryland and the District of Columbia Geographic Information System (GIS) with GIS layers updated at different times. This figure is not intended to be a precise representation of the existing project site. Technical information on land use is evaluated elsewhere in the EIS. The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

0 300 600 1,200 Feet

Figure 5-5
Site Plan - Onsite Processing Facilities for Alternative E

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SECTION 6

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APPENDICES

Appendix A
Descriptions of Alternatives

Appendix A

Tables A-1 through A-5 identify each of the residuals-handling steps (i.e., collection, conveyance, processing, and disposal) required for each alternative, list collection and treatment locations, and describe the anticipated residuals disposal location for each alternative.

TABLE A-1
Description of Alternatives That Do Not Require Continuous OffsiteTrucking from the Dalecarlia Water Treatment Plant

Location	Collection	Conveyance	Processing	Disposal
Alternative 2: Process water treatment residuals at Dalecarlia WTP and dispose in Dalecarlia monofill. Process Forebay residuals by current methods and periodically haul				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to Dalecarlia monofill
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to Dalecarlia monofill
Forebay	Collect Forebay residuals using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years
Alternative 3: Coprocess water treatment and Forebay residuals at Dalecarlia WTP and codispose in Dalecarlia monofill				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to Dalecarlia monofill
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals Dalecarlia monofill
Forebay	Collect Forebay residuals using current methods	Pump residuals to Dalecarlia thickening facility along with water treatment residuals	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to Dalecarlia monofill

TABLE A-1
Description of Alternatives That Do Not Require Continuous OffsiteTrucking from the Dalecarlia Water Treatment Plant

Location	Collection	Conveyance	Processing	Disposal
Alternative 4: Pump unthickened water treatment residuals via Potomac Interceptor to the District of Columbia Water and Sewer Authority (DC WASA) Blue Plains Wastewater Treatment Plant. Process Forebay residuals by current methods and periodically haul				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals into the Potomac Interceptor	Process residuals at Blue Plains with raw sewage	Transport dewatered residuals for disposal per current Blue Plains methods
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals from Dalecarlia to Potomac Interceptor	Process residuals at Blue Plains with raw sewage	Transport dewatered residuals for disposal per current Blue Plains methods
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years
Alternative 5: Thicken water treatment residuals at Dalecarlia WTP, then pump via a new pipeline to DC WASA Blue Plains Wastewater Treatment Plant. Process Forebay residuals by current methods and periodically haul				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening facility Pump thickened residuals to Blue Plains via a new dual pipeline	Thicken collected residuals at Dalecarlia Process thickened residuals at Blue Plains	Transport dewatered residuals for disposal per current Blue Plains methods
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening facility Pump thickened residuals to Blue Plains via a new dual pipeline	Thicken collected residuals at Dalecarlia Process thickened residuals at Blue Plains	Transport dewatered residuals for disposal per current Blue Plains methods
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

TABLE A-1
Description of Alternatives That Do Not Require Continuous OffsiteTrucking from the Dalecarlia Water Treatment Plant

Location	Collection	Conveyance	Processing	Disposal
Alternative 6: Thicken water treatment residuals at Dalecarlia WTP, then transport by barge to DC WASA Blue Plains Wastewater Treatment Plant. Process Forebay residuals by current methods and periodically haul				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening facility Transport thickened residuals to Blue Plains by barge	Thicken collected residuals at Dalecarlia Process thickened residuals at Blue Plains	Transport dewatered residuals for disposal per current Blue Plains methods
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening facility Transport thickened residuals from Dalecarlia to Blue Plains by barge	Thicken collected residuals at the Dalecarlia Process thickened residuals at Blue Plains	Transport dewatered residuals for disposal per current Blue Plains methods
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years
Alternative 7: Thicken water treatment residuals at Dalecarlia WTP, then pump via pipeline to neighboring water utility. Process Forebay residuals by current methods and periodically haul				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening facility Pump thickened residuals to WSSC or FCWA facility	Thicken collected residuals at Dalecarlia Dewater thickened residuals at WSSC or FCWA	Dispose of dewatered residuals with residuals from host facility
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening facility Pump thickened residuals from Dalecarlia to WSSC or FCWA facility	Thicken collected residuals at Dalecarlia Dewater thickened residuals at WSSC or FCWA	Dispose of dewatered residuals with residuals from host facility
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

TABLE A-1
Description of Alternatives That Do Not Require Continuous OffsiteTrucking from the Dalecarlia Water Treatment Plant

Location	Collection	Conveyance	Processing	Disposal
Alternative 8: Thicken water treatment residuals at Dalecarlia WTP and pump via pipeline to new dewatering location. Process Forebay residuals by current methods and periodically haul				
Dalecarlia WTP	Collect water treatment residuals from the existing sedimentation basins	Pump residuals to Dalecarlia thickening facility Pump thickened residuals to new offsite dewatering facility	Thicken the collected residuals at Dalecarlia Dewater the thickened residuals at offsite facility	Contract haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening facility Pump thickened residuals from Dalecarlia to a new dewatering facility	Thicken collected residuals at Dalecarlia facility Dewater the thickened residuals at offsite facility	Contract haul dewatered residuals to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

TABLE A-2
Description of Alternatives With Discharge to the Potomac River

Location	Collection	Conveyance	Processing	Transport
Alternative 9: Process most WTP residuals at Dalecarlia WTP and haul offsite, but dilute some residuals for discharge back to Potomac River. Process Forebay residuals by current methods and periodically haul				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump portion of residuals to Dalecarlia thickening facility	Thicken and dewater portion of collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location
		Pump portion of residuals to Dalecarlia storage and dilution facility (10% assumed)		Discharge diluted residuals to Potomac River
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals from Dalecarlia to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir	Pump residuals to Dalecarlia WTP thickening facility	Thicken and dewater collected residuals at Dalecarlia thickening facility	Haul dewatered residuals to offsite disposal facility every 7 years
Alternative 10: Renegotiate NPDES Permit to allow discharge of all residuals to Potomac River				
Dalecarlia WTP	Renegotiate NPDES Permit to discharge all water treatment residuals to the Potomac River			
Georgetown Reservoir	Renegotiate NPDES Permit to discharge all water treatment residuals to the Potomac River			
Forebay	Collect Forebay residuals from reservoir	Pump residuals to Dalecarlia WTP thickening facility	Thicken and dewater collected residuals at Dalecarlia thickening facility	Haul dewatered residuals to offsite disposal facility every 7 years

TABLE A-2
Description of Alternatives With Discharge to the Potomac River

Location	Collection	Conveyance	Processing	Transport
Alternative 11: Process water treatment residuals at Dalecarlia WTP and haul offsite. Process Forebay residuals by current methods and periodically haul. Dilute treatment side streams and discharge to the Potomac River				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump portion of residuals to Dalecarlia thickening facility Pump thickener overflow and centrate to onsite storage and dilution facility	Thicken and dewater portion of collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location Discharge diluted thickener overflow and centrate to Potomac River
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals from Dalecarlia to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

TABLE A-3
Description of Alternatives Involving the Dalecarlia Reservoir

Location	Collection	Conveyance	Processing	Transport
Alternative 12: Store all residuals in the Dalecarlia Reservoir prior to processing at the Dalecarlia WTP. Coprocess Forebay and water treatment residuals. Dispose in Dalecarlia and McMillan monofills				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia Reservoir	Thicken and dewater collected residuals at Dalecarlia facility	Haul dewatered residuals to monofills on Dalecarlia and McMillan sites
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia Reservoir	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to monofills on Dalecarlia and McMillan sites
McMillan WTP Facilities				Haul dewatered residuals to monofill on the McMillan site
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia facility	Haul dewatered residuals to Dalecarlia and McMillan monofills
Alternative 13: Store all residuals in the Dalecarlia Reservoir prior to processing at the Dalecarlia WTP. Coprocess Forebay and water treatment residuals and haul to offsite disposal				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia Reservoir	Thicken and dewater collected residuals at Dalecarlia facility	Haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia Reservoir	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to a permitted offsite location

TABLE A-3
Description of Alternatives Involving the Dalecarlia Reservoir

Location	Collection	Conveyance	Processing	Transport
Alternative 14: Construct new sedimentation basins at the Dalecarlia Reservoir and process all residuals at Dalecarlia WTP. Coprocess Forebay and water treatment residuals and haul to offsite disposal				
Dalecarlia WTP	Collect water treatment residuals from new sedimentation basins	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Abandon Georgetown Reservoir; all coagulation to occur at Dalecarlia			
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Haul dewatered residuals to a permitted offsite location
Alternative 15: Coagulate all flow in the Dalecarlia Reservoir and process all residuals at the Dalecarlia WTP. Coprocess Forebay and water treatment residuals and haul to offsite disposal				
Dalecarlia WTP	Add Coagulant at Dalecarlia Lift Station; Coagulate in the Dalecarlia Reservoir Dredge the Dalecarlia Reservoir	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Abandon Georgetown Reservoir; all coagulation to occur at Dalecarlia			
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals to permitted offsite location

TABLE A-4
Description of Alternatives with Facilities at the McMillan Water Treatment Plant

Location	Collection	Conveyance	Processing	Transport
Alternative 16: Thicken water treatment residuals at the McMillan WTP and dewater at an existing wholesale customer's treatment facility. Contract haul dewatered residuals. Process Forebay residuals by current methods and periodically haul				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to McMillan thickening facility Pump thickened residuals to Blue Plains, Arlington, or Falls Church dewatering facility	Thicken collected residuals at McMillan facility Dewater thickened residuals at Blue Plains, Arlington, or Falls Church facility	Contract haul dewatered residuals from host facility to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to McMillan thickening facility Pump thickened residuals to Blue Plains, Arlington, or Falls Church dewatering facility	Thicken collected residuals at McMillan facility Dewater thickened residuals at Blue Plains, Arlington, or Falls Church facility	Contract haul dewatered residuals from host facility to a permitted offsite location
McMillan WTP	Collect combined Dalecarlia and Georgetown Reservoir water treatment residuals	Pump residuals to McMillan thickening facility Pump thickened residuals to Blue Plains, Arlington, or Falls Church dewatering facility	Thicken collected residuals at McMillan Dewater thickened residuals at Blue Plains, Arlington, or Falls Church facility	Contract haul the dewatered residuals from host facility to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

TABLE A-4
Description of Alternatives with Facilities at the McMillan Water Treatment Plant

Location	Collection	Conveyance	Processing	Transport
Alternative 17: Coprocess Forebay and water treatment residuals at the McMillan WTP. Dispose of residuals via contract hauling from McMillan WTP				
(Same as Alternative 18 w/ coprocessing)				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to McMillan thickening facility	Thicken and dewater collected residuals at McMillan	Contract haul dewatered residuals from McMillan to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to McMillan	Thicken and dewater collected residuals at McMillan	Contract haul dewatered residuals from McMillan to a permitted offsite location
McMillan WTP Facilities	N/A	Pump water treatment residuals from Dalecarlia WTP and Georgetown Reservoir to McMillan thickening facility	Thicken and dewater collected residuals at McMillan	Contract haul dewatered residuals to a permitted offsite location
Forebay	Collect water treatment residuals from reservoir using current methods	Pump Forebay residuals to McMillan thickening facility	Thicken and dewater collected residuals at McMillan	Contract haul dewatered residuals to a permitted offsite location
Alternative 18: Process water treatment residuals at the McMillan WTP and haul offsite. Process Forebay residuals by current methods and periodically haul				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to McMillan thickening facility	Thicken and dewater collected residuals at McMillan	Contract haul dewatered residuals from McMillan to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to McMillan	Thicken and dewater collected residuals at McMillan	Contract haul dewatered residuals from McMillan to a permitted offsite location
McMillan WTP Facilities	Collect Dalecarlia and Georgetown Reservoir water treatment residuals	Pump residuals to McMillan	Thicken and dewater collected residuals at McMillan	Contract haul dewatered residuals to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

TABLE A-4
Description of Alternatives with Facilities at the McMillan Water Treatment Plant

Location	Collection	Conveyance	Processing	Transport
Alternative 19: Thicken water treatment residuals at the McMillan WTP and dewater at an existing wholesale customer's treatment facility. Dispose of residuals via contract hauling from the existing facility. Discharge Forebay residuals to the Potomac River				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to McMillan Pump thickened residuals to Blue Plains, Arlington, or Falls Church dewatering facility	Thicken collected residuals at McMillan Dewater thickened residuals at Blue Plains, Arlington, or Falls Church facility	Contract haul dewatered residuals from host facility to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to McMillan Pump thickened residuals to Blue Plains, Arlington, or Falls Church dewatering facility	Thicken collected residuals at McMillan Dewater thickened residuals at Blue Plains, Arlington, or Falls Church facility	Contract haul dewatered residuals from host facility to a permitted offsite location
McMillan WTP Facilities	Collect Dalecarlia and Georgetown Reservoir water treatment residuals	Pump residuals to McMillan Pump thickened residuals to Blue Plains, Arlington, or Falls Church dewatering facility	Thicken collected residuals at McMillan Dewater thickened residuals at Blue Plains, Arlington, or Falls Church facility	Contract haul dewatered residuals from host facility to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to Potomac River	None	None

TABLE A-4
Description of Alternatives with Facilities at the McMillan Water Treatment Plant

Location	Collection	Conveyance	Processing	Transport
Alternative 20: Thicken water treatment residuals at the Dalecarlia WTP and the Georgetown Reservoir and dewater at the McMillan WTP. Dispose of water treatment residuals via contract hauling from McMillan WTP. Process Forebay residuals by current methods and periodically haul				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening facility Pump thickened residuals to McMillan dewatering facility	Thicken collected residuals at Dalecarlia facility Dewater thickened residuals at McMillan	Contract haul dewatered residuals from McMillan to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Georgetown thickening facility Pump thickened residuals to McMillan	Thicken collected residuals at Georgetown Dewater thickened residuals at McMillan	Contract haul dewatered residuals from McMillan to a permitted offsite location
McMillan WTP Facilities	Collect thickened Dalecarlia and Georgetown Reservoir water treatment residuals	Pump residuals to McMillan	Dewater residuals at McMillan	Contract haul dewatered residuals to offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years
Alternative 21: Store residuals in lagoons at Forebay, Dalecarlia WTP, and McMillan WTP. Thicken and dewater residuals with portable equipment and dispose via contract hauling from all locations				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia storage lagoon	Thicken and dewater collected residuals at Dalecarlia with portable equipment	Contract haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to McMillan storage lagoon	Thicken and dewater collected residuals at McMillan with portable equipment	Contract haul dewatered residuals to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to Dalecarlia storage lagoon	Thicken and dewater collected residuals at Dalecarlia with portable equipment	Contract haul dewatered residuals to a permitted offsite location

TABLE A-4
Description of Alternatives with Facilities at the McMillan Water Treatment Plant

Location	Collection	Conveyance	Processing	Transport
Alternative 22: Store water treatment residuals in Dalecarlia and Georgetown Reservoirs, prior to thickening and dewatering at the Dalecarlia and McMillan WTPs. Dispose of water treatment residuals via contract hauling from the Dalecarlia and McMillan WTPs. Process Forebay residuals by current methods and periodically haul				
Dalecarlia WTP	Add coagulant at Dalecarlia Lift Station Collect water treatment residuals from existing sedimentation basins Dredge Dalecarlia Reservoir	Pump collected residuals to the Dalecarlia Reservoir Pump dredged residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to McMillan Reservoir	Thicken and dewater dredged residuals at McMillan facility	Contract haul dewatered residuals to a permitted offsite location
McMillan WTP Facilities	Dredge the McMillan Reservoir	Pump dredged residuals to the McMillan thickening facility	Thicken and dewater dredged residuals at McMillan	Contract haul dewatered residuals to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

TABLE A-4
Description of Alternatives with Facilities at the McMillan Water Treatment Plant

Location	Collection	Conveyance	Processing	Transport
Alternative 23: Store water treatment residuals in McMillan Reservoir prior to dewatering at the McMillan WTP. Dispose of water treatment residuals via contract hauling from the McMillan WTP. Process Forebay residuals by current methods and periodically haul				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to McMillan Reservoir	Thicken and dewater dredged residuals at McMillan facility	Contract haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to McMillan Reservoir	Thicken and dewater dredged residuals at McMillan	Contract haul dewatered residuals to a permitted offsite location
McMillan WTP Facilities	Dredge the McMillan Reservoir	Pump dredged residuals to the McMillan thickening facility	Thicken and dewater dredged residuals at McMillan	Contract haul dewatered residuals to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

TABLE A-5
Description of Alternatives with Facilities at the Dalecarlia Water Treatment Plant

Location	Collection	Conveyance	Processing	Transport
Alternative 24: Coprocess Forebay and water treatment residuals at Dalecarlia WTP. Dispose of residuals via contract hauling from the Dalecarlia WTP				
Same as Alternative 25 w/ coprocessing				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir	Pump residuals to Dalecarlia	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location
Alternative 25: Process water treatment residuals at the Dalecarlia WTP; and dispose via contract hauling. Process Forebay residuals by current methods and periodically haul				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening facility	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia	Thicken and dewater collected residuals at Dalecarlia	Contract haul dewatered residuals to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir using current methods	Pump residuals to existing holding pond	Transfer residuals from holding pond to onsite drying bed	Haul dewatered residuals to offsite disposal facility every 7 years

TABLE A-5
Description of Alternatives with Facilities at the Dalecarlia Water Treatment Plant

Location	Collection	Conveyance	Processing	Transport
Alternative 26: Use plasma oven technology to process Forebay and water treatment residuals at the Dalecarlia WTP. Dispose of residuals via contract hauling from the Dalecarlia WTP				
Same as Alternative 25 w/ coprocessing and plasma oven step				
Dalecarlia WTP	Collect water treatment residuals from existing sedimentation basins	Pump residuals to Dalecarlia thickening/ dewatering/plasma oven facility	Use plasma oven process following thickening and dewatering on collected residuals at Dalecarlia	Contract haul processed residuals to a permitted offsite location
Georgetown Reservoir	Collect water treatment residuals from reservoir	Pump residuals to Dalecarlia thickening/ dewatering/plasma oven facility	Use plasma oven process following thickening and dewatering on collected residuals at Dalecarlia	Contract haul processed residuals to a permitted offsite location
Forebay	Collect Forebay residuals from reservoir	Pump residuals to Dalecarlia thickening/ dewatering/plasma oven facility	Use plasma oven process following thickening and dewatering on collected residuals at Dalecarlia	Contract haul processed residuals to a permitted offsite location

Table A-6

Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P1	Sludge Stopper - 1	Single 12" Iron Pipe-in-Pipe Potomac	Build a 12" iron pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains	Alternatives 4 and 5
P2	Sludge Stopper - 2	Single 12" Plastic Pipe-in-Pipe Potomac	Build a 12" HDPE (high density polyethylene) piping inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P3	Sludge Stopper - 3	Single 12" Stainless Pipe-in-Pipe Potomac	Build 12" stainless steel pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P4	Sludge Stopper - 4	Single 12" Composite Pipe-in-Pipe Potomac	Build a 12" composite pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is one the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5
P5	Sludge Stopper - 5	Single 6" Iron Pipe-in-Pipe Potomac	Building a 6" iron pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P6	Sludge Stopper - 6	Single 6" Plastic Pipe-in-Pipe Potomac	Build a 6" HDPE (high density polyethylene) piping inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5

Table A-6
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P7	Sludge Stopper - 7	Single 6" Stainless Pipe-in-Pipe Potomac	Build a 6" stainless steel pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P8	Sludge Stopper - 8	Single 6" Composite Pipe-in-Pipe Potomac	Build a 6" composite pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5
P9	Sludge Stopper - 9	Trio 6-12-6" Iron Pipe-in-Pipe Potomac	Build a 6-12-6" trio of iron pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5
P10	Sludge Stopper - 10	Trio 6-12-6" Plastic Pipe-in-Pipe Potomac	Build a 6-12-6" trio of HDPE (high density polyethylene) pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5
P11	Sludge Stopper - 11	Trio 6-12-6" Stainless Pipe-in-Pipe Potomac	Build a 6-12-6" trio of stainless steel pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5

Table A-6
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P12	Sludge Stopper - 12	Trio 6-12-6" Composite Pipe-in-Pipe Potomac	Build a 6-12-6" trio of composite pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5
P13	Sludge Stopper - 13	Single 12" Iron Pipe-in-Pipe Rock Creek	Build a 12" iron pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P14	Sludge Stopper - 14	Single 12" Plastic Pipe-in-Pipe Rock Creek	Build a 12" HDPE (high density polyethylene) piping inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P15	Sludge Stopper - 15	Single 12" Stainless Pipe-in-Pipe Rock Creek	Build a 12" stainless steel pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P16	Sludge Stopper - 16	Single 12" Composite Pipe-in-Pipe Rock Creek	Build 1 12" composite pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continued inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5

Table A-6
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P17	Sludge Stopper -17	Single 6" Iron Pipe-in-Pipe Rock Creek	Build a 6" iron pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P18	Sludge Stopper - 18	Single 6" Plastic Pipe-in-Pipe Rock Creek	Build a 6" HDPE (high density polyethylene) piping inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P19	Sludge Stopper - 19	Single 6" Stainless Pipe-in-Pipe Rock Creek	Build a 6" stainless steel pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P20	Sludge Stopper - 20	Single 6" Composite Pipe-in-Pipe Rock Creek	Build a 12" stainless steel pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P21	Sludge Stopper - 21	Trio 6-12-6" Iron Pipe-in-Pipe Rock Creek	Build a 6-12-6" trio of iron pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5

Table A-6
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P22	Sludge Stopper - 22	Trio 6-12-6" Plastic Pipe-in-Pipe Rock Creek	Build a 6-12-6" HDPE (high density polyethylene) pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P23	Sludge Stopper - 23	Trio 6-12-6" Stainless Pipe-in-Pipe Rock Creek	Build a 6-12-6" trio of stainless steel pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P24	Sludge Stopper - 24	Trio 6-12-6" Composite Pipe-in-Pipe Rock Creek	Build a 6-12-6" trio of composite pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the Potomac Force Mains to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P25	Sludge Stopper - 25	Single 12" Iron Pipe-in-Pipe Potomac via Main	Build a 12" iron pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5

Table A-6

Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P26	Sludge Stopper - 26	Single 12" Plastic Pipe-in-Pipe Potomac via Main	Build a 12" HDPE (high density polyethylene) pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P27	Sludge Stopper - 27	Single 12" Stainless Pipe-in-Pipe Potomac via Main	Build a 12" stainless steel pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P28	Sludge Stopper - 28	Single 12" Composite Pipe-in-Pipe Potomac via Main	Build a 12" composite pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5
P29	Sludge Stopper - 29	Single 6" Iron Pipe-in-Pipe Potomac via Main	Build a 6" iron pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P30	Sludge Stopper - 30	Single 6" Plastic Pipe-in-Pipe Potomac via Main	Build a 6" HDPE (high density polyethylene) pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P31	Sludge Stopper - 31	Single 6" Stainless Pipe-in-Pipe Potomac via Main	Build a 6" stainless steel pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5

Table A-6
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P32	Sludge Stopper - 32	Single 6" Composite Pipe-in-Pipe Potomac via Main	Build a 6" composite pipeline inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5
P33	Sludge Stopper - 33	Trio 6-12-6" Iron Pipe-in-Pipe Potomac via Main	Build a 6-12-6" trio of pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5
P34	Sludge Stopper - 34	Trio 6-12-6" Plastic Pipe-in-Pipe Potomac via Main	Build a 6-12-6" trio of HDPE (high density polyethylene) pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5
P35	Sludge Stopper - 35	Trio 6-12-6" Stainless Pipe-in-Pipe Potomac via Main	Build a 6-12-6" trio of stainless steel pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The three pipes would be nestled in the crown of the existing conduits and would provide bi-directional redundancy and flexible flow rate capacity.	Alternatives 4 and 5

Table A-6
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P36	Sludge Stopper - 36	Trio 6-12-6" Composite Pipe-in-Pipe Potomac via Main	Build a 6-12-6" trio of composite pipes inside the existing Potomac Relief Sewer to the Potomac Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5
P37	Sludge Stopper - 37	Single 12" Iron Pipe-in-Pipe Rock Creek via Main	Build a 12" iron pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P38	Sludge Stopper - 38	Single 12" Plastic Pipe-in-Pipe Rock Creek via Main	Build a 12" HDPE (high density polyethylene) pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P39	Sludge Stopper - 39	Single 12" Stainless Pipe-in-Pipe Rock Creek via Main	Build a 12" stainless steel pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P40	Sludge Stopper - 40	Single 12" Composite Pipe-in-Pipe Rock Creek via Main	Build a 12" composite pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains. The emphasis in this alternative is on the use of composite piping that would be impervious to all known sewer environments.	Alternatives 4 and 5

Table A-6

Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P41	Sludge Stopper - 41	Single 6" Iron Pipe-in-Pipe Rock Creek via Main	Build a 6" iron pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residuals to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P42	Sludge Stopper - 42	Single 6" Plastic Pipe-in-Pipe Rock Creek via Main	Build a 6" HDPE (high density polyethylene) pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P43	Sludge Stopper - 43	Single 6" Stainless Pipe-in-Pipe Rock Creek via Main	Build a 6" stainless steel piping inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P44	Sludge Stopper - 44	Single 6" Composite Pipe-in-Pipe Rock Creek via Main	Build a 12" stainless steel pipeline inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P45	Sludge Stopper - 45	Trio 6-12-6" Iron Pipe-in-Pipe Rock Creek via Main	Build a 6-12-6" trio of iron pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Truck Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5

Table A-6
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P46	Sludge Stopper - 46	Trio 6-12-6" Plastic Pipe-in-Pipe Rock Creek via Main	Build a 6-12-6" trio of HDPE (high density polyethylene) pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P47	Sludge Stopper - 47	Trio 6-12-6" Stainless Pipe-in-Pipe Rock Creek via Main	Build a 6-12-6" trio of stainless steel pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to the Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P48	Sludge Stopper - 48	Trio 6-12-6" Composite Pipe-in-Pipe Rock Creek via Main	Build a 6-12-6" trio of composite pipes inside the existing Upper Potomac Interceptor to the Rock Creek Pumping Station and continue inside the B Street Trunk Sewer to the Main Sewage Pumping Station then to Blue Plains WWTP. Use this pipeline to pump unthickened residual to Blue Plains and dewater at Blue Plains.	Alternatives 4 and 5
P49	Sludge Stopper - 49	Dalecarlia to WSSC Potomac Over Interceptor	Build a new single, double, or quad pipeline on top of the Potomac Interceptor to the WSSC Potomac Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7
P50	Sludge Stopper - 50	Dalecarlia to WSSC Potomac Inside Interceptor	Build a new single, double, or quad pipeline inside the Potomac Interceptor to the WSSC Potomac Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7
P51	Sludge Stopper - 51	Dalecarlia to WSSC Potomac Over Raw Water Conduit	Build a new single, double, or quad pipeline over the Great Falls raw water conduits to the WSSC Potomac Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7

Table A-6

Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P52	Sludge Stopper - 52	Dalecarlia to WSSC Potomac In Raw Water Conduit	Build a new single, double, or quad pipeline inside one of the Great Falls raw water conduits to the WSSC Potomac Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7
P53	Sludge Stopper - 53	Dalecarlia to WSSC Potomac Via River Road	Build a new single, double, or quad pipeline along River Road, to the WSSC Potomac Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7
P54	Sludge Stopper - 54	Dalecarlia to New Carderock Over Interceptor	Build a new single, double, or quad pipeline on top of the Potomac Interceptor to a new thickening and dewatering plant on the Carderock Naval Research Center grounds, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 8
P55	Sludge Stopper - 55	Dalecarlia to New Carderock Inside Interceptor	Build a new single, double, or quad pipeline inside the Potomac Interceptor to a new thickening and dewatering plant on the Carderock Naval Research Center grounds, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 8
P56	Sludge Stopper - 56	Dalecarlia to New Carderock Over Raw Water Conduit	Build a new single, double, or quad pipeline above the Great Falls raw water conduit to a new thickening and dewatering plan on the Carderock Naval Research Center grounds, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 8
P57	Sludge Stopper - 57	Dalecarlia to New Carderock Inside Raw Water Conduit	Build a new single, double, or quad pipeline inside the Great Falls raw water conduit to a new thickening and dewatering plan on the Carderock Naval Research Center grounds, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 8
P58	Sludge Stopper - 58	Dalecarlia to FCWA Corbalis Via Little Falls	Build a new single, double, or quad pipeline across the Potomac at Little Falls dam, to the FCWA Corbalis Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7
P59	Sludge Stopper - 59	Dalecarlia to FCWA Corbalis Via Chain Bridge	Build a new single, double, or quad pipeline across the Potomac at the Chain Bridge, to the FCWA Corbalis Water Filtration Plant for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternative 7
P60	Sludge Stopper - 60	Blue Plains Via Potomac Channel	Build a new single, double, or quad pipeline and lay it in the Potomac Channel from Dalecarlia to Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5

Table A-6

Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P61	Sludge Stopper - 61	Blue Plains Via Virginia Riverbank from Little Falls Dam	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Little Falls dam, then down the Virginia riverbank to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5
P62	Sludge Stopper - 62	Blue Plains Via Virginia Riverbank from Chain Bridge	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Chain Bridge, then down the Virginia riverbank to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5
P63	Sludge Stopper - 63	Blue Plains Via Virginia Riverbank from Key Bridge	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Key Bridge, then down the Virginia riverbank to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5
P64	Sludge Stopper - 64	Blue Plains Via George Washington Parkway form Little Falls Dam	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Little Falls damn, then down the George Washington Parkway to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, stainless steel, and composite, etc.	Alternatives 4 and 5
P65	Sludge Stopper - 65	Blue Plains Via George Washington Parkway from Chain Bridge	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Chain Bridge, then down the George Washington Parkway to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5
P66	Sludge Stopper - 66	Blue plains Via George Washington Parkway from Key Bridge	Build a new single, double, or quad pipeline from Dalecarlia, across the Potomac at Key Bridge, then down the George Washington Parkway to a river crossing near Blue Plains for dewatering, considering all applicable sizes - 6", 12", 24" etc., and materials - iron, HDPE, stainless steel, and composite, etc.	Alternatives 4 and 5
P68	Sludge Stopper - 68	Dalecarlia to Drained Georgetown 2	Implement plate settlers or other high efficiency technologies at Dalecarlia and/or Georgetown basins such that Georgetown 2 can be drained and the new thickening and dewatering plant built on the floor of the basin, below grade and out of site.	Section 4 of EFS
P70	Sludge Stopper - 70	Georgetown Waterfront CSO Holding Tanks	In conjunction with the DC WASA CIP, utilize or expand upon the current 58 MG Georgetown Waterfront CSO holding tank to store the residual flushes, then dewater the holding tank in a controlled manner via new or existing pumping stations and pipeline to Blue Plains for final processing.	Alternative 5

Table A-6
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P73	SCS Engineers-1	Barge to Bioreactor Landfill	Use new of existing outfall piping to transport residuals to the Potomac River without dewatering, and then transport via barge to a bioreactor landfill	Alternative 6
P74	SCS Engineers-2	Transport Unthickened Residuals to Blue Plains via Riverbed Pipeline	Using the existing outfall piping to transport residuals to the Potomac River without dewatering, and transport via new riverbed pipeline to Blue Plains for treatment.	Alternative 5
P75	SCS Engineers-3	Pipe in a Pipe to Blue Plains	Construct new pipeline within existing pipelines.	Alternative 5
P85	S Deschler 11/15/2004 e-mail	Store Residuals and Discharge to Potomac Interceptor During Dry Conditions	Add more storage to alt. 4 so thickened residuals can be discharged to Potomac Interceptor only during dry weather conditions.	Alternatives 4 and 5
P86	S Deschler 11/15/2004 e-mail	Transport Unthickened to Blue Plains via Pipeline, Install in Potomac Interceptor During Dry Conditions	Convey dewatered residuals from Dalecarlia to Blue Plains in a dedicated pipe. Install pipe during dry days when sewer is near empty. Relatively easy to access Potomac Interceptor.	Alternatives 4 and 5
P88	Stuart Ross 11/15/2004 e-mail		Adopt pipeline to Blue Plains alternative.	Alternative 5
P89	Attach B from M Greenwald letter dated 11/15/2004	Residuals Pipeline to Blue Plains via Metro Tunnels	Attachment B: 2. Option B - Route residuals pipeline in Metro ROWs' to Blue Plains	Alternatives 4 and 5
P90	Attach B from M Greenwald letter dated 11/15/2004	Route Residuals Pipeline to Blue Plains via Abandoned Sewer Pipeline	Attachment B: 3. Option B - Use an abandoned sewer line to route residuals pipeline to Blue Plains or WSSC Potomac WFP.	Alternatives 5 and 7
P93	Kent Slowinski 11/5/2004 e-mail	Build Residuals Facilities at Carderock	Build residuals thickening and dewatering at Carderock or move entire WTP upriver.	Alternative 8
P94	Steve Shapiro 11/15/2004 e-mail	Capital Crescent Pipeline to CSX Railroad	Pipe residuals along Capital Crescent Trail to CSX train line rail cars in Silver Spring, MD	Alternative 8
P95	Steve Shapiro 11/15/2004 e-mail	Capital Crescent Pipeline to Blue Plains	Pipe residuals along Capital Crescent Trail to DC and connect into pipeline to Blue Plains	Alternatives 4 and 5

Table A-6
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P96	Steve Shapiro 11/15/2004 e-mail	Tunnel from Dalecarlia WTP to Monofill	If a landfill is built - build an underground tunnel from Dalecarlia WTP to landfill	Alternative 2
P98	Steve Shapiro 11/15/2004 e-mail	Residuals Island on the Potomac	Create an island in the Potomac to store residuals	Alternative 6
P100	Steve Shapiro 11/15/2004 e-mail	Facilities at Carderock or some other Federal facility	Relocate facilities to Carderock or some other Federal facility	Alternative 8
P102	Kent Slowinski 11/5/2004 e-mail	move entire plant	Move the entire water treatment plant upriver	Alternative 8
P103	Sludge Stopper -1	Carderock East Dewater and Thicken	Purchase or transfer the eastmost tip of the Carderock Navy Research Center form the Navy to the ACE and build the thickening and dewatering facilities there. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit. Contract haul the cake 100 feet to I-495	Alternatives 8, 57
P104	Sludge Stopper -2	Carderock East Dewater - Thicken Carderock West	Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering faculties there. Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit. Contract haul the cake less than 100 feet to I-495	Alternatives 8, 57
P105	Sludge Stopper -3	Carderock East Dewater - Thicken MC	Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering faculties there. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract haul the cake 100 feet to I-495	Alternatives 8, 57
P106	Sludge Stopper -4	Carderock East Dewater - Thicken Sibley	Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract haul the cake 100 feet to I-495	Alternatives 8, 57
P107	Sludge Stopper -5	Carderock East Dewater - Thicken Georgetown	Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Upgrade one or more settling basins at Georgetown using plate settling or other high-efficiency process and repurpose at least one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract haul the cake 100 feet to I-495.	Alternatives 8, 57

Table A-6
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P108	Sludge Stopper -6	Carderock West Dewater - Thicken	Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening and dewatering facilities there. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit. Contract haul the cake less then 1 mile to I-495	Alternatives 8, 57
P109	Sludge Stopper -7	Carderock West Dewater - Thicken MC	Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract haul the cake 1 mile to I-495	Alternatives 8, 57
P110	Sludge Stopper -8	Carderock West Dewater - Thicken Sibley	Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract Haul the cake 1 mile to I-495	Alternatives 8, 57
P111	Sludge Stopper -9	Carderock West Dewater - Thicken Georgetown	Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Upgrade one or more settling basins at Georgetown using place settling or other high-efficiency process and repurpose at lease one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Dalecarlia inside a raw water conduit to Carderock. Contract haul the cake 1 mile to I-495	Alternatives 8, 57
P112	Sludge Stopper -10	Carderock West Dewater & Thicken Carderock East	Purchase of transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the dewatering facilities there. Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit. Contract haul the cake less than 100 feet to I-495	Alternatives 8, 57
P113	Sludge Stopper -11	Rockville WTP Dewater & Thicken	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the thickening and dewatering facilities there. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 52
P114	Sludge Stopper -12	Rockville WTP Dewater & Thicken MC	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the thickening and dewatering facilities there. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 52
P115	Sludge Stopper -13	Rockville WTP Dewater & Thicken Sibley	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the dewatering facilities there. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 52

Table A-6
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P116	Sludge Stopper -14	Rockville WTP Dewtaer and Thicken Georgetown	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the dewatering facilities there. Upgrade one or more settling basins at Georgetown using plate settling or other high-efficiency process and repurpose at least one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 52
P117	Sludge Stopper -15	Rockville WTP Dewater & Thicken Carderock East	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the dewatering facilities there. Purchase or transfer the eastmost top of Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Carderock inside a raw water conduit. Pipe the thickened residuals from Carderock inside a raw water conduit as far as possible, the best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 8, 52
P118	Sludge Stopper -16	Rockville WTP Dewater & Thicken Carderock West	Purchase a portion or share facilities at the Rockville WTP and build and/or expand the dewatering facilities there. Purchase or transfer the westmost top of Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Carderock inside a raw water conduit. Pipe the thickened residuals from Carderock inside a raw water conduit as far as possible, the best practice to Rockville. Contract haul the cake to I-495	Alternatives 7, 8, 52
P119	Sludge Stopper -17	Expand WSSC Potomac - Thicken & Dewater	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property. Pipe the unthickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to WSSC Potomac. Thicken and dewater at WSSC Potomac. Contract haul the cake to I-495	Alternatives 7, 52
P120	Sludge Stopper -18	Expand WSSC Potomac - Thicken & Dewater	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property to dewater. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to WSSC. Contract haul the cake to I-495	Alternatives 7, 52
P121	Sludge Stopper -19	Expand WSSC Potomac Dewater & Thicken Sibley	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property to dewater. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to WSSC. Contract haul the cake to I-495	Alternatives 7, 52
P122	Sludge Stopper -20	Expand WSSC Potomac Dewater & Thick Georgetown	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property to dewater. Upgrade one or more settling basins at Georgetown using plate settling or other high-efficiency process and repurpose at least one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Dalecarlia inside a raw water conduit as far as possible, then best practice to WSSC. Contract haul the cake to I-495	Alternatives 7, 52

Table A-6
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P123	Sludge Stopper -21	WSSC Potomac Dewater & Thicken Carderock East	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property to dewater. Purchase or transfer the eastmost top of Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Carderock inside a raw water conduit. Pipe the thickened residuals from Carderock inside a raw water conduit as far as possible, the best practice to WSSC Potomac. Contract haul the cake to I-495	Alternatives 7, 8, 52
P124	Sludge Stopper -22	WSSC Potomac Dewater & Thicken Carderock West	Expand the existing facilities or build a redundant facility on the WSSC Potomac Property to dewater. Purchase or transfer the westmost top of Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Carderock inside a raw water conduit. Pipe the thickened residuals from Carderock inside a raw water conduit as far as possible, the best practice to WSSC Potomac. Contract haul the cake to I-495	Alternatives 7, 8, 52
P125	Sludge Stopper -23	WSSC Potomac Dewater & Thicken Rockville	Expand the existing facilities or build a redundant facility on the WSSC Potomac property to dewater. Purchase a portion or share facilities at the Rockville WTP and build and/or expand the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Rockville inside a raw water conduit as far as possible, then best practice to Rockville. Pipe the thickened residuals from Rockville to WSSC Potomac using best practice. Contract haul the cake to I-495	Alternatives 7, 52
P126	Sludge Stopper -24	Rockville Dewater & Thicken WSSC Potomac	Expand the existing facilities or build a redundant facility on the Rockville property to dewater. Purchase a portion or share facilities at the WSSC Potomac WTP and build and/or expand the thickening facilities there. Pipe the unthickened residuals from Dalecarlia to Rockville inside a raw water conduit as far as possible, then best practice to Rockville. Pipe the thickened residuals from Rockville to WSSC Potomac using best practice. Contract haul the cake to I-495	Alternatives 7, 52
P127	Sludge Stopper -25	CIA Virginia - Thicken & Dewater	Build a thickening and dewatering facility at the secure CIA property by Turkey Run in Virginia. Pipe the unthickened residuals from Dalecarlia to the CIA property across the Potomac using best practices. Thicken and dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58
P128	Sludge Stopper -26	CIA Virginia Dewater - Thicken MC	Build a thickening and dewatering facility at the secure CIA property by Turkey Run in Virginia. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia to the CIA property across the Potomac using best practices. Dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58
P129	Sludge Stopper -27	CIA Virginia Dewater - Thicken Sibley	Build a thickening and dewatering facility at the secure CIA property by Turkey Run in Virginia. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia to the CIA property across the Potomac using best practices. Dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58

Table A-6

Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P130	Sludge Stopper -28	CIA Virginia Dewater - Thicken Georgetown	Build a thickening and dewatering facility at the secure CIA property by Turkey Run in Virginia. Upgrade one or more settling basins at Georgetown using plate settling or other high-efficiency process and repurpose at least one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Georgetown to the CIA property across the Potomac using best practices. Dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58
P131	Sludge Stopper -29	CIA Virginia Dewater - Thicken Carderock East	Build a thickening facility at the secure CIA property by Turkey Run in Virginia. Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the thickened residuals from Carderock to the CIA property across the Potomac using best practices. Dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123	Alternatives 8, 57, 58
P132	Sludge Stopper -30	CIA Virginia - Thicken Carderock West	Build a thickening facility at the secure CIA property by Turkey Run in Virginia. Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the thickened residuals from Carderock to the CIA property across the Potomac using best practices. Dewater on-site at CIA. Contract haul the cake to I-495 via 193 or 123	Alternatives 8, 57, 58
P133	Sludge Stopper -31	FHA Virginia - Thicken & Dewater	Build a thickening and dewatering facility at the secure FHA property by Turkey Run in Virginia. Pipe the unthickened residuals from Dalecarlia to the FHA property across the Potomac using best practices. Thicken and dewater on site at FHA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58
P134	Sludge Stopper -32	FHA Virginia Dewater - Thicken MC	Build a thickening and dewatering facility at the secure FHA property by Turkey Run in Virginia. Thicken at Dalecarlia, Montgomery County parcel, then pipe the thickened residuals from Dalecarlia to the FHA property across the Potomac using best practices. Dewater on-site at FHA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58
P135	Sludge Stopper -33	FHA Virginia Dewater - Thicken Sibley	Build a thickening and dewatering facility at the secure FHA property by Turkey Run in Virginia. Thicken at Dalecarlia, Sibley parcel, then pipe the thickened residuals from Dalecarlia to the FHA property across the Potomac using best practices. Dewater on-site at FHA. Contract haul the cake to I-495 via 193 or 123.	Alternatives 8, 58
P136	Sludge Stopper -34	FHA Virginia Dewater - Thicken Georgetown	Build a thickening and dewatering facility at the secure FHA property by Turkey Run in Virginia. Upgrade one or more settling basins at Georgetown using plate settling or other high-efficiency process and repurpose at least one of the basins for thickening. Thicken at the new Georgetown basin, then pipe the thickened residuals from Georgetown to the FHA property across the Potomac using best practices. Dewater on-site at FHA. Contract haul the cake to I-495 via 193 or 123	Alternatives 8, 58

Table A-6
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives That Do Not Require Continuous Trucking from the Dalecarlia WTP				
P137	Sludge Stopper -35	FHA Virginia Dewater - Thicken Carderock East	Build a thickening and dewatering facility at the secure FHA property by Turkey Run in Virginia. Purchase or transfer the eastmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the thickened residuals from Carderock to the FHA property across the Potomac using best practices. Dewater on-site at FHA. Contract haul the cake to I-495 via 193 or 123	Alternatives 8, 57, 58
P138	Sludge Stopper -36	FHA Virginia Dewater - Thicken Carderock West	Build a thickening and dewatering facility at the secure FHA property by Turkey Run in Virginia. Purchase or transfer the westmost tip of the Carderock Navy Research Center from the Navy to the ACE and build the thickening facilities there. Pipe the thickened residuals from Carderock to the FHA property across the Potomac using best practices. Dewater on-site at FHA. Contract haul the cake to I-495 via 193 or 123	Alternatives 8, 57, 58
P139	Sludge Stopper -37	Rock Run Treatment Plant	Build a new thickening and dewatering facility in the old Rock Run right-of-way	Alternative 8
P140	Sludge Stopper -38	Expand Blue Plains WWTP - Navy Research	Expand the Blue Plains WWTP through cooperative agreement with the Naval Research Lab to allow use of their southern border. Build thickening and dewatering facilities for the entire region. Pipe either unthickened or thickened residuals from WAD to Blue Plains via best practices.	Alternatives 4 and 5
P141	Sludge Stopper -39	Expand Blue Plains WWTP - Potomac Levy	Expand the Blue Plains WWTP through cooperative agreement with the Army Corps of Engineers allowing the development of a levy reaching into the Potomac using fill from Blue Plains solids removal processes. Build thickening and dewatering facilities for the entire region on this newly created levy. Pipe either unthickened or thickened residuals from WAD to Blue Plains via best practices.	Alternatives 4 and 5
P142	Sludge Stopper -40	Build on Non-Residentail Government Land	Build the thickening or the dewatering or both of them together, or any combination on any parcel or parcels of government controlled land, be it Federal, State, County, or District. The site must be located in the area that impacts the fewest number of people, both at the operation site, as well as any transit route for the disposal of the resulting residuals.	Alternative 8

Table A-7
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives with a Discharge to the Potomac River				
P101	William Harrop 11/9/04 e-mail	Return to the river	Challenge provisions of NPDES permit and discharge to the river	Alternative 10

Table A-8
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives Involving the alternate uses of the Dalecarlia Reservoir				
P82	Steve Luckman 9/30/2004 e-mail	Waste Residuals Lake Alternative	Store water treatment residuals temporarily in a sectioned-off portion of the Dalecarlia Reservoir prior to processing them	Alternatives 12 to 15

Table A-9
Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.

Alternatives with Facilities at the McMillan WTP

None of the public alternatives recommend constructing facilities at the McMillan WTP.

Table A-10

Public Alternative and Option Screening Summary

Public Alternative No.	Alternative Reference No. Assigned by Public	Title Assigned by Public	Description	Similar May 2004 Alternative No.
Public Alternatives with Facilities at the Dalecarlia WTP				
P71	Sludge Stopper - 71	Dalecarlia Campus Alternate Sites	Only as a last resort, build the thickening and dewatering plant on the Dalecarlia property, but on one of several alternative sites further away from residential property.	Alternative 25
P72	Sludge Stopper - 72	Dalecarlia Campus Underground	Only as the very last resort, build the thickening and dewatering plan on the Dalecarlia property, but underground. Build the equipment "floors" in a shaft dug from the back lot metro fill. Dewatered cake could easily be brought to the surface via a conveyor belt. The shaft fill would be used to build a high berm surrounding the facility which would be heavily planted.	Alternative 25
P79	Alma Gates 9/30/2004 e-mail	Alternate Truck Route to Clara Barton Parkway	Alternative truck route to Clara Barton Parkway or Canal Road	Alternative 25
P80	Brookmont meeting Request	Relocate Residuals Facilities on Dalecarlia WTP Site	Relocate residuals processing facility on the Dalecarlia WTP site	Alternative 25
P84	Lehigh Cement 9/28/2004 e-mail	Cement Disposal Alternative	Consider alternate disposal locations such as cement manufacturing plants.	Alternative 25
P87	Attach B from M Greenwald letter dated 11/15/2004	Bury Part of Residuals Facilities	Project approach suggestions: bury thickeners in ground and cover with a slab, bury truck entrance/exit from building, answer questions about residuals disposal sites	Alternative 25
P91	Attach B from M Greenwald letter dated 11/15/2004	Relocate Residuals Facilities on Dalecarlia WTP Site or elsewhere	Consider alternate sites for thickening/dewatering facilities (Carderock, Georgetown Reservoir, Unused West Filter Building, On Top of Sedimentation Basins) - Note that P91 will address facilities at Dalecarlia only. Facitlities at Georgetown and Carderock are addressed under other items.	Alternative 25
P97	Steve Shapiro 11/15/2004 e-mail	Heat Drying	Use heat drying as part of the dewatering facilities to reduce the number of trucks required per day	Alternative 25 + 26
P99	Eric Morrison 9/21/2004 e-mail	Alternate Treatment Processes	Switch to new water treatment processes that do not produce alum-associated residuals such as MIEX, GAC, ultrafiltration membranes, etc.	N/A

Appendix B
Alternative Feasibility – Transporting Liquid Residuals by Barge from Washington Aqueduct to Blue Plains on the Potomac River

Alternative Feasibility—Transporting Liquid Residual by Barge from Washington Aqueduct to Blue Plains on the Potomac River

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PREPARED BY: Ms. Sandra Rice, P.E./CCG

COPIES:

DATE: March 19, 2004

INTRODUCTION

Currently, liquid residual waste from the Washington Aqueduct Water Treatment Plant is discharged into the Potomac River. As it is necessary to discontinue this practice, the feasibility of transporting the liquid residual by barge via Georgetown Channel, an approximate distance of 9.7 nm (nautical miles) on the Potomac River from the Washington Aqueduct Water Treatment Plant to the Blue Plains Wastewater Treatment Plant has been investigated. The analysis of this method of handling the liquid residual required the review of a current NOAA navigational chart and the U.S. Coast Pilot for this portion of the Potomac River as well as discussions with various regulatory agencies and marine contractors regarding the operation. Specifically, personnel from the Corps of Engineers, Baltimore District, the Coast Guard 5th District Waterways Management Office, Norfolk Dredging Company, and Precon Marine Company were contacted. This report and associated drawings describe several key factors affecting the technical and economical feasibility of this operation. Those factors include determination of limiting water depths, horizontal and vertical bridge clearances, and bottom conditions along the route as well as adverse weather conditions and facility constraints at each end of the route that will certainly impact the viability of this operation.

LIQUID RESIDUAL TRANSPORT REQUIREMENT

The volume of liquid residual to transport was given at 885,000 gallons per day, occurring on the five work days of each week. This is a volume of 118,325 cf or 7.46 million lbs of residual (3,730 tons or 3,330 long tons) based on a weight density of 63 pcf. It was estimated that the loading and unloading from two or more barges at each end of the route could be accomplished at a rate of 9,000 gpm.

TRANSPORT BARGE OPERATIONAL SCENARIOS

Two barge operation scenarios were investigated. The first concept involved specifying a standard size barge for a two-barge operation that would be large enough to handle each day's volume of liquid residual, permitting loading and unloading operations at the up-river and down-river locations simultaneously. The second concept evaluated how many barges were required to handle the daily volume of residual liquid considering the navigational constraints of the Potomac River over a 6.5 nm stretch from the Francis Scott Key Bridge (referred to subsequently as Key Bridge) and Marbury Pt., the location of the Blue Plains plant.

Regardless of which operation is considered, navigation between the Washington Aqueduct and Key Bridge is not feasible for several reasons detailed below.

NAVIGATIONAL RESTRICTIONS AND WEATHER CONCERNS

Portions of NOAA Chart 12285 Potomac River have been compiled on Sheets 1 and 2 in Appendix A. These drawings identify key landmarks and bridges along the proposed barge route and describe local water depths, bottom conditions, and tide, current, and weather conditions as given in the U.S. Coast Pilot, Atlantic Coast. The primary navigational constraints on any barge transport operation are identified as follows:

- Arlington Memorial Bridge: clear width of 80 ft with vertical clearance of 30 ft;
- 14th St. Bridge Complex: clear width of 104 ft with vertical clearance of 18 ft above Mean High Water (MHW) resulting in maximum air draft of 14 to 16 ft for barge/pushboat operation;
- Obstructions (old stone bridge piers) at 10 feet below Mean Low Water (MLW) just north of Key Bridge;
- Strong currents, irregular water depths and bottom conditions, numerous rocks and shallows north of Key Bridge to Washington Aqueduct;
- Minimum water depth of 10 feet below MLW resulting in maximum water draft of 7 ft for barge/pushboat operation between Key Bridge and Marbury Pt.;
- Transit distance of 6.5 nm with maximum speed of 5 knots for 4.1 nm from Key Bridge to Hains Pt. and 8 knots for 2.4 nm from Hains Pt. to the Blue Plains plant at Marbury Pt.;
- One-way transit time estimated to range from 1.5 to 2.5 hours for small barge/push boat operation making only 2.5 knots against the current;
- Average ebb and flood currents of approx. 0.6 knots from Key Bridge to Hains Pt. and up to 1 knot from Hains Pt. to Marbury Pt.; and
- Transit above Key Bridge to the Washington Aqueduct facility, a distance of 3.2 nm, is unsafe for navigation for all but very limited recreational craft such as kayaks and canoes, conditions permitting, and emergency response vessels.

The barge operation between Key Bridge and Marbury Pt. may also be affected by seasonal adverse weather conditions including ice on the river in the coldest winter months, higher than normal water levels, flooding and swift currents caused by rapid snow and ice melt, heavy rains, or tropical storm activity along the Atlantic coast. The occurrence or passing of one or more of these events may temporarily halt a barge operation on the river for several days at a time. Refer to Sheet 1 for additional detailed information regarding navigation and weather concerns.

DUAL BARGE OPERATIONAL SCENARIO

It was estimated that a single hopper barge with dimensions of 260 ft long by 52 ft wide by 9 ft draft can hold 885,000 gallons of liquid residual corresponding to a load of 7.46 million lbs (3,730 tons or 3,330 long tons). However, the beam and draft of this size barge are considered unsafe for navigation based on limiting water depths and bridge clearances along the route. In addition, small pushboats capable of operating within the water depth and bridge clearance limitations identified will likely not have enough power to maneuver the barges effectively and safely. Moran Towing, the largest towing company on the east coast indicated that their tugs do not operate in this area of the Potomac River due to minimum air and water draft requirements of 45 and 15 feet, respectively.

MULTIPLE BARGE OPERATIONAL SCENARIO

It was estimated that at least three smaller single hopper barges with minimum dimensions of 150 ft long by 40 ft wide by 7 ft draft would be required to handle the daily load of liquid residual. Each barge could hold on the order of 295,000 gallons of liquid residual corresponding to a load of 2.48 million lbs (1,250 tons or 1,110 long tons). Based only on the information available on the NOAA Chart and contained in the U.S. Coast Pilot, the small barge dimensions would be considered safe for navigation under most conditions normally experienced on the Potomac River between Key Bridge and Marbury Pt. A marine contractor from Chesapeake, Virginia, has indicated that small pushboats, properly powered, are capable of operating within the water depth and bridge clearance limitations identified and would be able to safely and effectively maneuver the barges. Other considerations impacting the feasibility of the multiple barge operational scenario are as follows:

- Difficult coordination and scheduling and significant manpower and facility requirements for loading, unloading, and transit of three barges in each 24-hour period, five days per week;
- Locations in the river to safely stand-down one or more barges to allow opposing barge traffic to pass would have to be identified;
- Facilities at each end of the transit route would have to accommodate at least two barges for weekends and periods when environmental conditions make the river unnavigable for this operation; and
- Alternate means of handling or storing the liquid residual would be required during periods when environmental conditions make the river unnavigable for this operation.

Phonecon with Precon Marine, Chesapeake, Virginia (POC: Joe Anson, 757-545-4400)

Precon could support this operation with the small barges using small pushboats that have radar equipment set at low elevation and by folding down communications antennas. They can provide pushboats with 5 or 6 feet of draft to move barges. This company was involved in a similar operation on the Schuylkill River, Philadelphia, PA. Precon Marine has also worked in and around the 14th St. Bridge Complex, so they are familiar with this part of the Potomac River, bridge clearances, and water depth issues. Barge freeboard is not a problem under bridges. They identified water depths as the most significant limit to an efficient operation. Self-propelled barges are normally not well controlled and not used for an operation such as this. Self-propelled barges are designed more for operating in one local area for small personnel, equipment or fuel shuttle or transfer tasks.

Phonecon with Norfolk Dredging Co., Norfolk, VA (POC: Mike Haverty, 757-547-9391)

In his opinion, there is no question that establishing a pipeline/pumping operation for the 6.5 nm or longer route would be more cost effective than any sort of barge operation, particularly given the limitations with bridge clearances and navigational water depth. His company would have or could acquire small pushboats that would maneuver the smaller barges at speeds slower than 5 knots. He thinks the biggest limitation is the 18 ft clearance at the 14th St. Bridge Complex. He suggests that the labor associated with handling and re-handling the liquid residual will be costly compared to an operation strictly involving a pipeline/pumping operation because unloading/loading/transit requires an operator, a mate, an engineer, and a deckhand to secure barge at each end of route. Norfolk Dredging Co. (NDC) has pumped slurry 60,000 feet, nearly 10 nm, using pipeline and two booster pumps. NDC suggests that a this would be much more efficient and less costly than barging the liquid residual product. NDC further suggests calling GIW Co. in Georgia, (POC: Ben

Hagler, 706-738-0303), for information regarding the specification and engineering requirements for a pipeline/pumping operation.

Phonecon with U.S. Army Corps of Engineers, Baltimore District (POC: George Harrison, 410-962-6002)

The Corps performs maintenance dredging in the Anacostia and Washington Channels and directly across from Bowling Air Force Base, essentially from Hains Pt. to Marbury Pt. The Corps does not maintain the Georgetown Channel where the majority of the barge traffic route would be. Any required dredging within the Georgetown Channel would require extensive coordination between regulatory agencies for permitting approval. There would also likely be significant opposition by businesses and residential communities along both sides of the Georgetown Channel to this entire barge transport operation. He suggests calling local Coast Guard about navigation rules/restrictions north of Hains Pt.

Phonecon with U.S. Coast Guard Sector Baltimore, Waterways Management Branch (POC: Ron Houck, 410-576-2674)

The Coast Guard generally leaves control and response for this area of the Potomac River to the Washington D.C Marine Police. It was confirmed that only two aids to navigation are found marking the Georgetown Channel between Hains Pt. and the 14th St. Bridge Complex. The lack of navigation aids will require careful attention to pilotage of the barges for most of the route between Hains Pt. and Key Bridget and increases the risk of grounding the barges at various locations along the route.

Phonecon with Harbormaster, Washington D.C. Marine Police (POC: Lt. Al Durham, 202-727-4582)

The marine police respond to emergencies and security concerns on the Potomac River adjacent to the District. Because there is no maintenance dredging of Georgetown Channel nor aids to navigation, mariners are responsible to manage their vessels within the waterway using latest available navigation charts and ancillary navigation equipment onboard their vessels. The harbormaster emphasized that navigating above Key Bridge is very dangerous due to strong and variable currents and irregularity of water depths and bottom conditions including rocks, shoals, and numerous obstructions. The marine police respond to emergencies above Key Bridge via 24-ft Boston Whaler with draft of about 1 ft. Because of the treacherous conditions, regulations require that all boaters on the river above Key Bridge wear personal flotation devices (PFDs) at all times. The marine police would likely oppose any sort of barge operation above Key Bridge.

MAJOR OBSTACLES TO THE BARGE OPERATION

- No navigable access from Key Bridge to the Washington Aqueduct facility. Because operation is only feasible from Key Bridge to Marbury Pt., getting the liquid residual from the Washington Aqueduct facility to the Key Bridge or privately owned commercial wharves at Georgetown still must be addressed. Note: a privately owned commercial wharf at Georgetown, just north of Rock Creek, was known to be operational in 1980, receiving sand and gravel and stone shipped by barge.
- Potential for initial dredging and periodic maintenance dredging requirements to maintain navigable waterway for this type of operation.
- Periods when barge operations may be shut down due to weather requiring storage or other means of handling liquid residual.
- Whether the transport operation is owned and operated by the respective facilities or the service is contracted, the entire operation requires significant capital investment and

annual spending for facilities, equipment, and personnel at each end of the route and operations and maintenance of same.

APPENDIX A

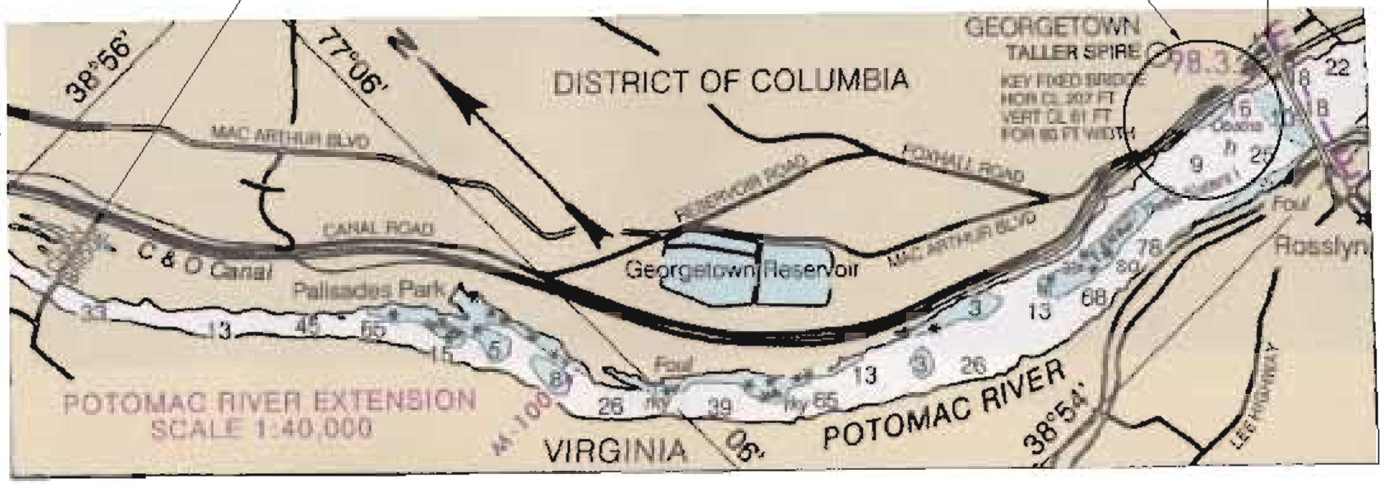
Sheet 1	Potomac River – Hains Pt. to Chain Bridge
Sheet 2	Potomac River – Marbury Pt. to Hains Pt.

CHAIN BRIDGE (HEAD OF TIDEEWATER NAVIGATION ON THE POTOMAC RIVER)

NORTHERN LIMIT FOR BARGE OPERATIONS

KEY BRIDGE

TO WASHINGTON AQUEDUCT (APPROX. 0.5 NM ABOVE CHAIN BRIDGE)



PLAN: CHAIN BRIDGE TO KEY BRIDGE

PRIVATELY OWNED COMMERCIAL WHARVES

14TH ST. BRIDGE COMPLEX (SEE PHOTO LOOKING SOUTH)

PLAN: KEY BRIDGE TO HAINS PT.

HAINS PT.

NOTES:

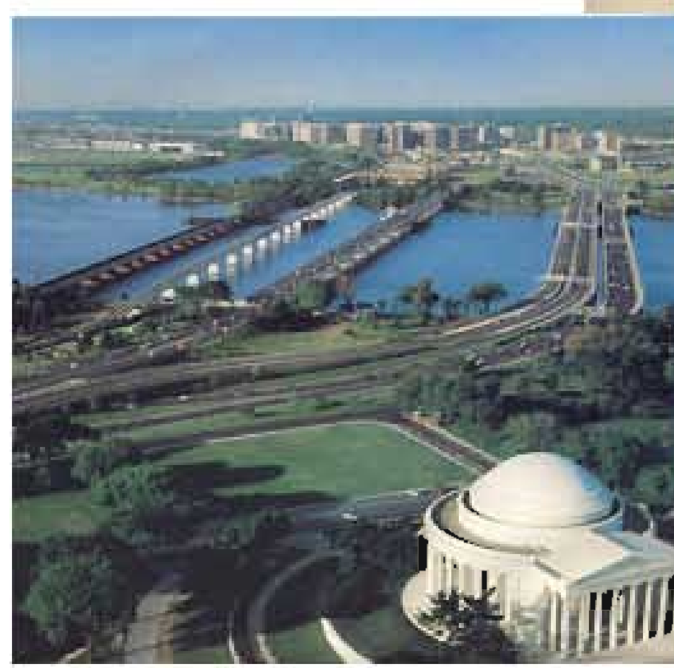
1. REFERENCES:
   A. UNITED STATES COAST PILOT, ATLANTIC COAST: SANDY HOOK TO CAPE HENRY, 2002 (35TH) EDITION, CHAPTER 12: CHESAPEAKE BAY, POTOMAC RIVER.
   B. NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) CHART 12285 POTOMAC RIVER, 35TH EDITION, JANUARY 2003.

2. NAVIGATION REGULATIONS AND NOTES:
   A. THE DISTRICT OF COLUMBIA HARBORMASTER, HARBOR PRECINCT OF THE METROPOLITAN POLICE DEPARTMENT, REGULATES THE OPERATION, NAVIGATION, MOORING, AND ANCHORING OF ALL VESSELS WITHIN THE WATERS OF THE DISTRICT OF COLUMBIA.
   B. COMMERCIAL TUG SERVICE IS NOT AVAILABLE FOR HIRE AT ALEXANDRIA OR WASHINGTON D.C.
   C. SPEED LIMIT IS 10 MPH (8.7 KNOTS) WHEN PASSING THE WHARF AREA OF ALEXANDRIA, EXCEPT FOR EMERGENCIES.
   D. SPEED LIMIT IS 6 MPH (5.2 KNOTS) NORTH OF HAINS PT.
   E. A PRIVATELY BUOYED CHANNEL WITH REPORTED DEPTHS OF APPROXIMATELY 12 FEET LEADS TO MARBURY POINT. THE BLUE PLAINS ADVANCED WASTEWATER TREATMENT PLANT IS JUST NORTH OF MARBURY POINT.
   F. A GOVERNMENT PIER AT THE NAVAL RESEARCH LAB, ABOUT 0.4 MILES NORTH OF MARBURY POINT, EXTENDS OUT TO DEEP WATER WITH USE RESTRICTED TO GOVERNMENT VESSELS.
   G. GEORGETOWN CHANNEL EXTENDS FROM HAINS PT. TO JUST ABOVE CHAIN BRIDGE. VESSEL TRAFFIC SHOULD NOT ATTEMPT TO PASS BETWEEN THEODORE ROOSEVELT ISLAND AND THE VIRGINIA SHORE.
   H. DISTANCE FROM MARBURY POINT TO THE WASHINGTON AQUEDUCT JUST NORTH OF FRANCIS SCOTT KEY BRIDGE IS APPROXIMATELY 6.5 NAUTICAL MILES. STONE PIERS OF THE FORMER AQUEDUCT BRIDGE, JUST NORTH OF KEY BRIDGE, HAVE BEEN REMOVED TO A DEPTH OF 10 FEET EXCEPT FOR THE ONE NEAREST THE VIRGINIA SHORE, WHICH IS 9 FEET ABOVE WATER.
   I. CONTROL WATER DEPTH AT MID-CHANNEL IN THE GEORGETOWN CHANNEL RANGES FROM 12 FEET BETWEEN HAINS PT. AND BUOY 4, THEN 11 FEET TO 0.4 MILES BELOW ARLINGTON MEMORIAL BRIDGE, THEN 14 FEET TO THE FRANCIS SCOTT KEY BRIDGE. ABOVE KEY BRIDGE, WATER DEPTHS VARY WITH SHOALS AND ROCKS. CONTROL DEPTHS ARE NOT GIVEN FOR THE CHANNEL BETWEEN MARBURY PT. AND HAINS PT. THE CHART SUGGESTS A MINIMUM WATER DEPTH OF 23 FEET FOR THIS AREA. THESE WATER DEPTHS ARE RELATIVE TO MEAN LOWER LOW WATER (MLLW).
   J. ABOVE KEY BRIDGE AND BEYOND CHAIN BRIDGE TO THE WASHINGTON AQUEDUCT FACILITY, WATER DEPTHS AND BOTTOM CONDITIONS ARE HIGHLY IRREGULAR AND DANGEROUS AND NOT CONSIDERED SAFE FOR NAVIGATION. USE OF THIS PORTION OF THE RIVER IS LIMITED TO RECREATIONAL PURSUITS. CHAIN BRIDGE IS CONSIDERED THE HEAD OF TIDEWATER FOR NAVIGATION ON THE POTOMAC RIVER.

3. TIDES, CURRENT, AND WEATHER:
   A. THE MEAN TIDE RANGE IS 2.9 FEET FROM MEAN LOW WATER (MLW) TO MEAN HIGH WATER (MHW).
   B. CURRENTS VARY AND USUALLY RUN IN THE DIRECTIONS OF THE CHANNELS. AVERAGE EBB AND FLOOD CURRENTS ARE ON THE ORDER OF 0.6 KNOTS FROM HAINS PT. TO KEY BRIDGE AND AS MUCH AS 1 KNOT SOUTH OF HAINS PT. TO MARBURY PT.
   C. THE CHANNEL NORTH OF KEY BRIDGE TO CHAIN BRIDGE, APPROXIMATELY 2.7 MILES, HAS UNPREDICTABLE CURRENTS AND NUMEROUS SHOALS AND ROCKS. THIS PART OF THE CHANNEL IS USED BY SMALL CRAFT WITH LOCAL KNOWLEDGE; MARINERS ARE ADVISED TO EXERCISE CAUTION.
   D. DURING COLD WINTERS, ICE MAY DEVELOP ON THE RIVER CAUSING FLOODING IN THE SPRING FROM ICE PIECES BREAKING UP. OCCASIONAL OVERFLOWS FROM THE POTOMAC RIVER RESULT FROM HEAVY RAIN OVER THE BASIN AND/OR MELTING SNOW. THERE IS LITTLE OR NO FLOOD CURRENT DURING HEAVY RAINS OR TIMES OF RAPID ICE/SNOW MELT.
   E. THE POTOMAC RIVER CAN ALSO EXPERIENCE ABOVE NORMAL TIDES WITH FLOODING ASSOCIATED WITH HURRICANE OR SEVERE STORMS ALONG THE COAST.

4. BRIDGE CLEARANCES:
   A. GEORGETOWN CHANNEL IS CROSSED BY EIGHT BRIDGES BETWEEN HAINS PT. AND CHAIN BRIDGE. ALL BRIDGES HAVE FIXED SPANS OR DRAWSPANS FIXED IN THE CLOSED POSITION. THE TABLE BELOW PROVIDES THE VERTICAL AND HORIZONTAL BRIDGE STRUCTURE CLEARANCES.

POTOMAC RIVER FIXED BRIDGE	HORIZONTAL CLEARANCE (FEET)	VERTICAL CLEARANCE (FEET ABOVE MHW)
RAILROAD	104	18
WMATA METRORAIL	104	18
14TH STREET NORTHBOUND	104	18
14TH STREET EXPRESS	104	18
14TH STREET SOUTHBOUND	104	18
ARLINGTON MEMORIAL	80	30
ROOSEVELT MEMORIAL	198	24
FRANCIS SCOTT KEY	80	61



14TH ST. BRIDGE COMPLEX

1250' 0 1250' 2500' 3750'
1" = 1250'-0"

PRELIMINARY

NOT FOR CONSTRUCTION

DSGN SDR						
DR ARD/SDR						
CHK						
APVD	NO.	DATE	REVISION	BY	APVD	

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

CH2MHILL
ONE HARVARD CIRCLE
WEST PALM BEACH, FLORIDA 33409
LB 0002934 AA C000656

POTOMAC RIVER - HAINS PT. TO CHAIN BRIDGE

RESIDUAL TRANSPORT BY BARGE ALTERNATIVE

SHEET 1
DWG 186970-1
DATE 03/10/04
PROJ

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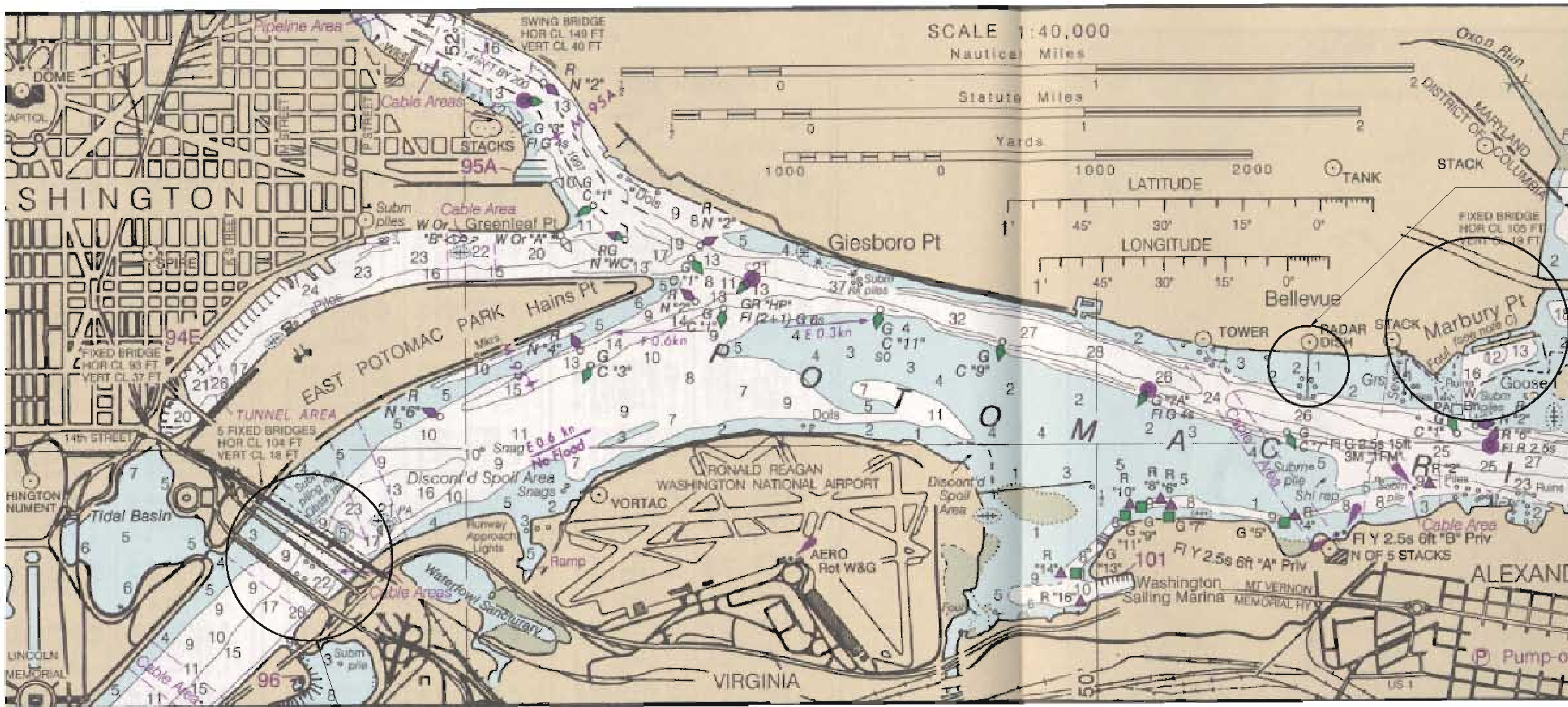

NRL PIER (GOVERNMENT USE)

BLUE PLAINS PLANT AND PRIVATE PIER WITH ACCESS CHANNEL

14TH ST. BRIDGE COMPLEX

PLAN: MARBURY PT. TO HAINS PT.

1250' 0 1250' 2500' 3750'
1" = 1250'-0"

NOTES:

1. SEE SHEET 1 FOR NOTES APPLICABLE TO THE PORTION OF THE POTOMAC RIVER FROM MARBURY PT. TO HAINS PT.

PRELIMINARY

NOT FOR CONSTRUCTION

DSGN	SDR				
DR	ARD/SDR				
CHK					
APVD		NO.	DATE	REVISION	BY	APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

CH2MHILL
ONE HARVARD CIRCLE
WEST PALM BEACH, FLORIDA 33409
LB 0002934 AA C000656

POTOMAC RIVER - MARBURY PT. TO HAINS PT.

RESIDUAL TRANSPORT BY BARGE ALTERNATIVE

SHEET	2
DWG	186970-2
DATE	03/10/04
PROJ	

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Appendix C
Manufacturer's Information

F.B. Leopold Co., Inc.

FEATURED PRODUCTS

Back to all featured products of this company

CT2 Submerged Sludge Collector

The advanced features and performance of the CT2 evolved from the Leopold Clari-Trac™ sluc
system. For over ten years, these units have quietly done their job, delivering reliable operation,
maintenance costs and good sludge production to hundreds of facilities. By simplifying the wate
process, the CT2 increases plant efficiency, reduces maintenance time, and total system opera
The CT2 submerged sludge collector operates on the simple principle, but powerful force, of gra
pressure in the main tank forces the sludge through the header collector into the outlet piping ar
sludge removal trough. Careful selection of smooth bore piping for the suction header keeps he
minimum for the most efficient sludge removal and low driving head requirements. The CT2 sys
optimum choice for flat bottomed or sloped floor tanks. As the suction head glides through the s
removes the settled sludge without gross disturbance and with minimal dilution. The CT2 syster
high-rate sedimentation applications, has multi-pass control options, and a double header can b
heavy sludge production. Engineered simplicity is integral to the design of the CT2 system. Usir
head to push sludge from the basin eliminates pumping costs. Cable drives require far less pow
compared to other submerged sludge collectors, the CT2 is far simpler to maintain because it h
number of moving parts. CT2 has a Fit and Forget quality that not only simplifies the water treat
but also reduces total system operation costs. The header, locked onto the guide rail, goes whe
you want it. The cable drive pulls the header through the sludge with a positive motion and mini
disturbance, removing the sludge without dilution. For the most efficient and cost-effective sludg
system, the CT2 is the best choice.

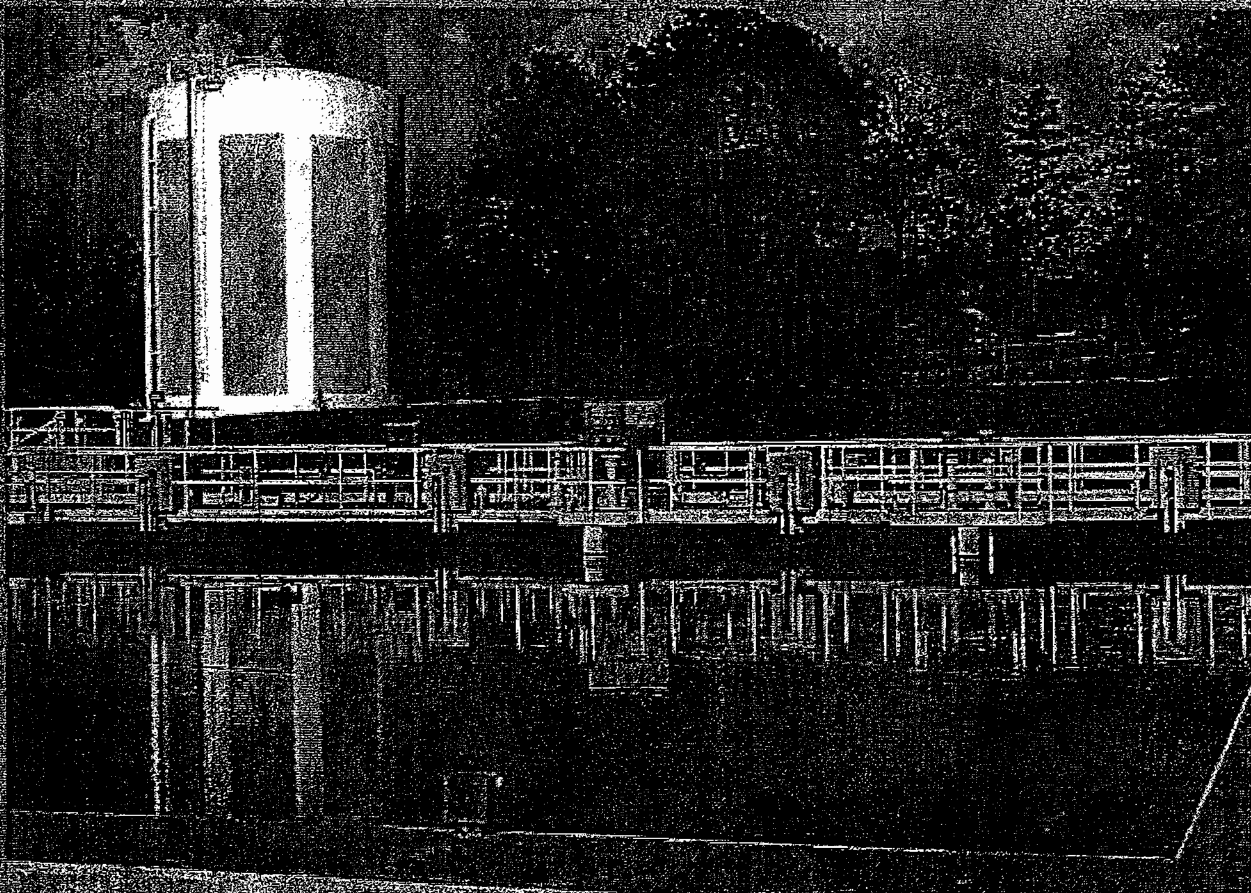
Brand:	CT2 Submerged Sludge Collector
Date of introduction:	August 6, 2002

Main categories	**Subcategories**
Sludge	Sludge collectors

The Leopold CT2 Submerged Sludge Collector

GF

Sludge Sucker™



Sludge Removal Systems

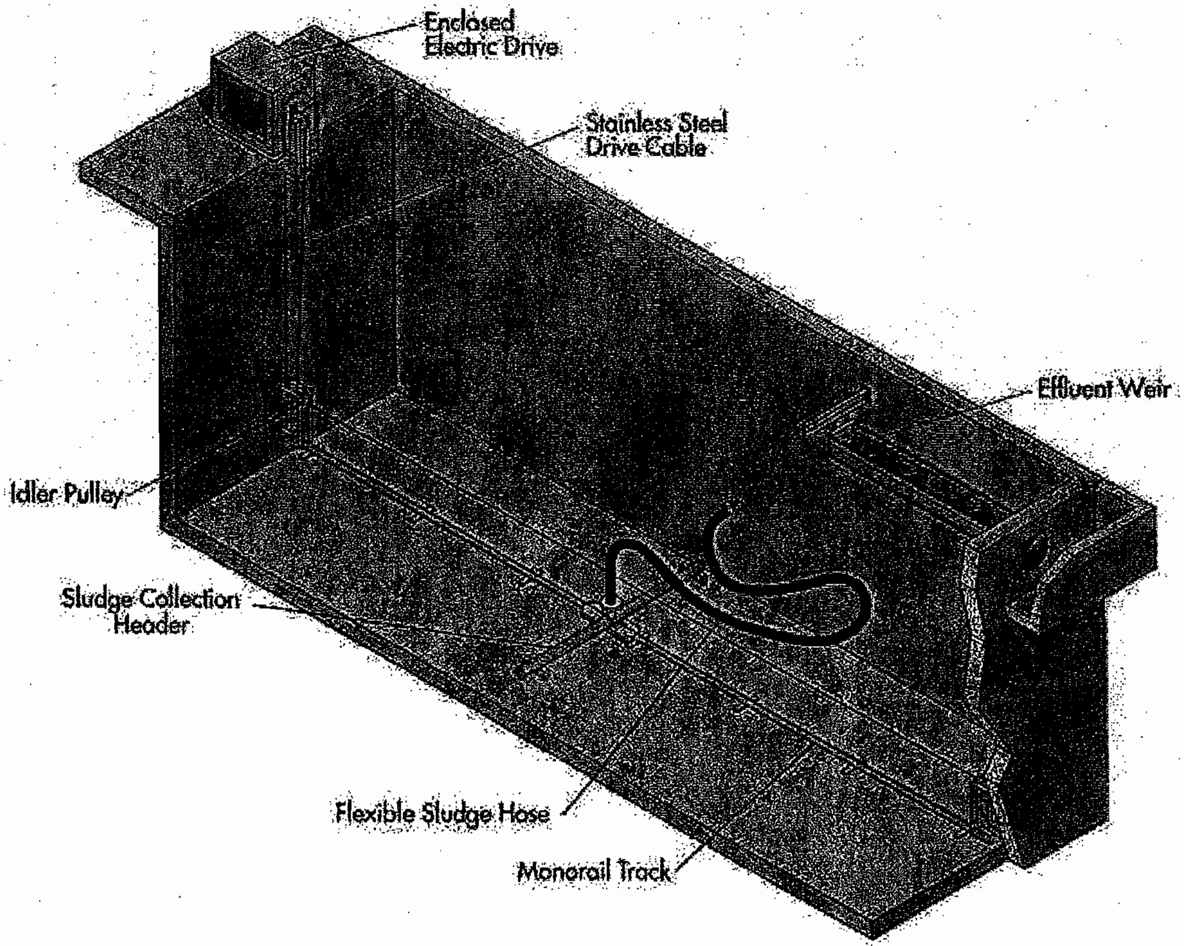
General Filter Company

Sludge Sucker

General Filter Company's Sludge Sucker℠ is a gravity driven sludge collecting mechanism for cost effective and efficient removal of lightweight sludges from rectangular settling basins. It is available in two configurations to best fit either your retrofit needs into existing basins or a new installation. Where obstructions exist at the surface of the basin, the totally submerged version is preferred. The floating type is much easier to monitor and has no moving parts below the water surface. Corrosion resistant materials throughout and a positive cable drive system generate very low maintenance cost. Simplicity is the key and when combined with the following key features and advantages, Sludge Sucker is your economical and efficient sludge removal unit of choice.

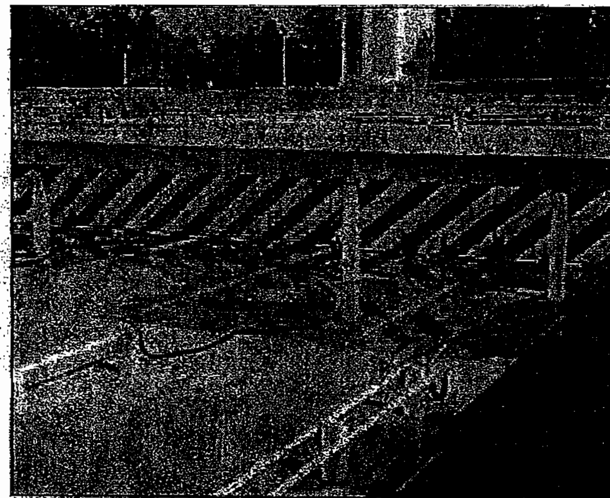
Key Features and Advantages

- **Positive Cable Drive Assembly**
- **Corrosion-Resistant Submerged Parts**
- **Collector Arm Movement Visible from Drive Cable**
- **Wheeled Track Design is Standard for Positive Tracking**
- **Rapid Sludge Removal with Variable Speed Collection Header**
- **Solid State Control Panel for Programmable Operation**
- **Readily Accessible Service Panels for Easy Drive Maintenance**
- **Low Capital, Operating and Maintenance Costs**
- **Modular Lightweight Construction Results in Easy Installation**



Operation

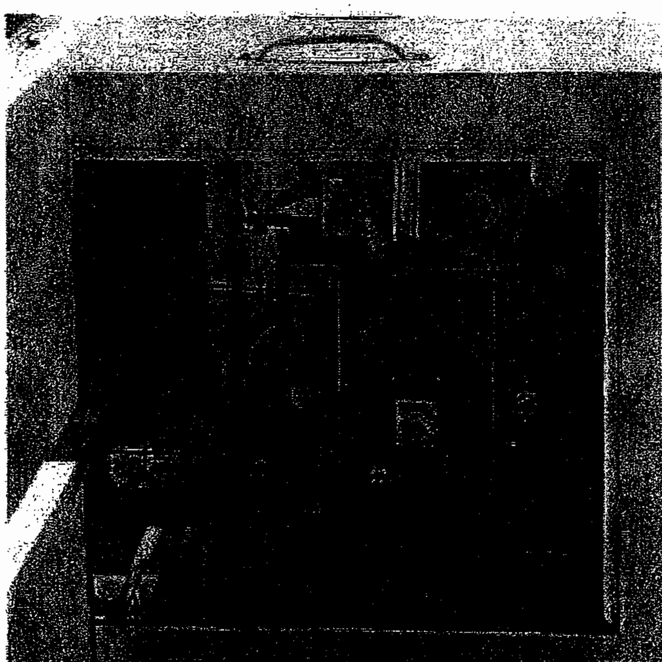
Operational simplicity is accomplished by hydraulic pressure between the water surface and sludge discharge pipe elevation which forces sludge collecting in the bottom of the basin through orifices located in a header pipe. The sludge then migrates through a durable flexible hose which, in turn, is connected to the sludge discharge pipe. A truck assembly, with header pipe attached, is pulled smoothly across the basin by a cable system connected to a drive assembly conveniently mounted above water. For versatile sludge removal, a programmable controller lets you easily adjust the speed of travel at various locations in the basin. Single units are used for basins typically up to 30 ft. wide while multiple units can be provided for wider basins.



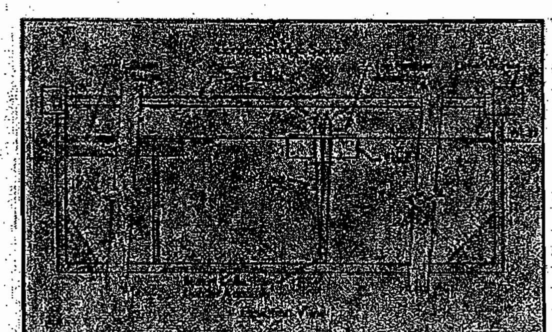
20 Sludge Sucker units installed in a 25 MGD facility.

Floating Sludge Sucker

Optional features and advantages can be realized with the unique Floating Sludge Sucker. As opposed to the submerged, rail type Sludge Sucker, the floating unit has the added benefit of being drawn across the basin on an easily accessible "pontoon-like" float system. This allows the Sludge Sucker to be pulled continuously and effortlessly across an open type basin with minimal loading on the drive system and allows you to see the unit in motion. Other notable features include a separate priming valve and sight glass for each collection header. For added convenience when multiple units are used, each header also has its own sludge valve which allows the rate of sludge removal to be adjusted separately. As with the submerged type mechanism, reliability and simplicity are synonymous with the Floating Sludge Sucker.



Electric drive unit with aluminum enclosure.



Floating Sludge Sucker.

Applications

The primary application for Sludge Sucker sludge collecting systems is in surface water treatment plants for effective removal of light sludges such as alum or ferric hydroxide, or light iron and manganese precipitates in potable water supplies. The Sludge Sucker is ideally suited in light sludge applications when lower capital cost and long-term reliability is essential to the proper operation of your treatment facility.

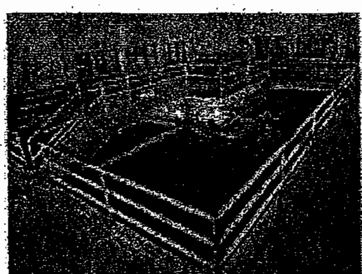
Sludge Sucker can be easily retrofitted into most any existing rectangular settling basin that has no sludge collecting mechanism. It is especially effective for retrofitting basins that are cluttered with overhead obstructions such as crosswalks, skimmers, troughs, tube settlers, or anything that projects from the walls above the bottom of the basin. Accumulated sludge can be readily removed from beneath these obstacles.

The cost-effective Sludge Sucker can also be used in certain industrial and municipal wastewater applications with either the floating or submerged type designs. For your next sludge removal system design, specify Sludge Sucker as the design of choice.

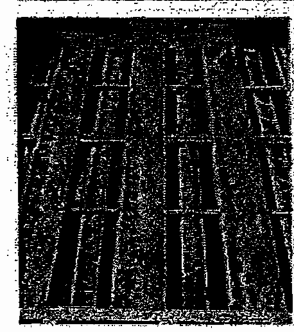
Other General Filter Products

If it's in the water, General Filter's engineered processes and equipment can take it out, economically and dependably. Our comprehensive line includes solutions to simple and complex water treatment and conditioning needs, all backed by working installations and years of experience. Our line includes:

- Floc-clarifiers
- CONTRAFLO® solids contact clarifiers
- SPIRACONE® sludge blanket clarifiers
- Sludge thickeners
- SURF® for surface water treatment
- Vertical and horizontal pressure filters
- Aerators
- CenTROL® gravity filters
- AERALATER® packaged treatment
- MULTIWASH® Filtration Process
- Gravity filtration equipment
- MULTICRETE II™ monolithic underdrain system
- Surface washers
- ESSD™ filter washtroughs and launder systems
- Control consoles



Clockwise from upper left: Concrete CenTROL Filter; CONTRAFLO Clarifiers; MULTIWASH Filtration Process.



For more information, contact your local General Filter sales representative, or:

GF U.S. FILTER company
600 Arrasmith Trail, Ames, IA 50010-9021
Phone: 515/232-4121 Fax: 515/232-2571

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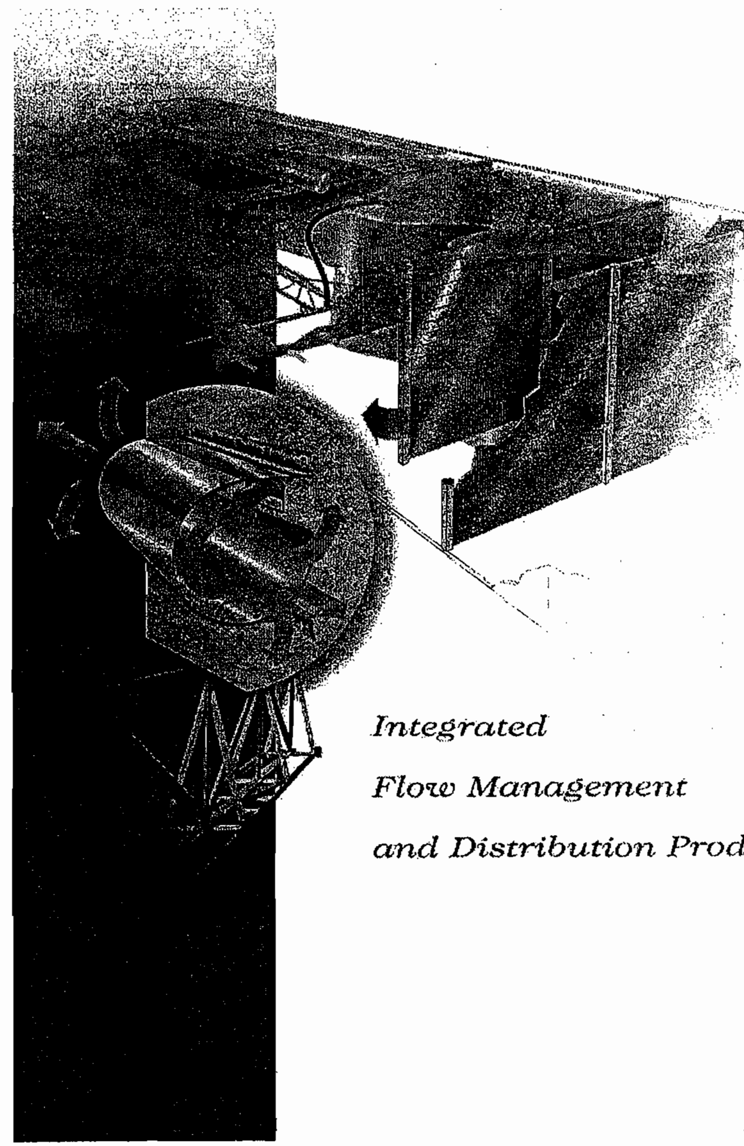
Golden, Colorado 80401
(303) 279-8373 FAX (303) 279-8429
E-MAIL: SALES@MEURERRESEARCH.COM
WWW.MEURERRESEARCH.COM

MRI FLOW MANAGEMENT



Integrated
Flow Management
and Distribution Products

MRI FLOW MANAGEMENT

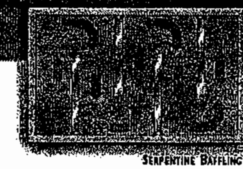
MRI baffles: *The key to efficient flow management.*

For more than 25 years, Meurer Research, Inc. (MRI) has been developing innovative sedimentation technology such as its patented inclined plate and tube settler systems, as well as the Cable-Vac™ sludge collector system. To achieve maximum performance in water and waste water clarifiers, MRI's considerable experience in settleable solids removal processes has led to the development of a complete family of flow management devices. These all-stainless steel products include baffles, troughs, supports and flow diffusers.

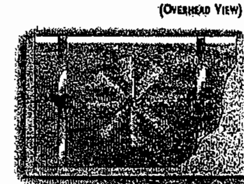
MRI's stainless steel planks slide into support channels mounted on concrete or stainless steel columns. Planks are typically 12" wide x 1-1/2" thick and up to 10' long. Other widths are also available.

In circular clarifiers, MRI's anti-roll baffles stop density currents which move up the outer wall of the clarifier, creating floc carry-over.

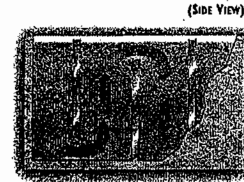
In flow distribution applications, baffles from Meurer can be set up in a variety of configurations as shown at right. Planks can be spaced apart or ported.



Serpentine Baffling (Overhead View)



Staging Baffles (Side View)

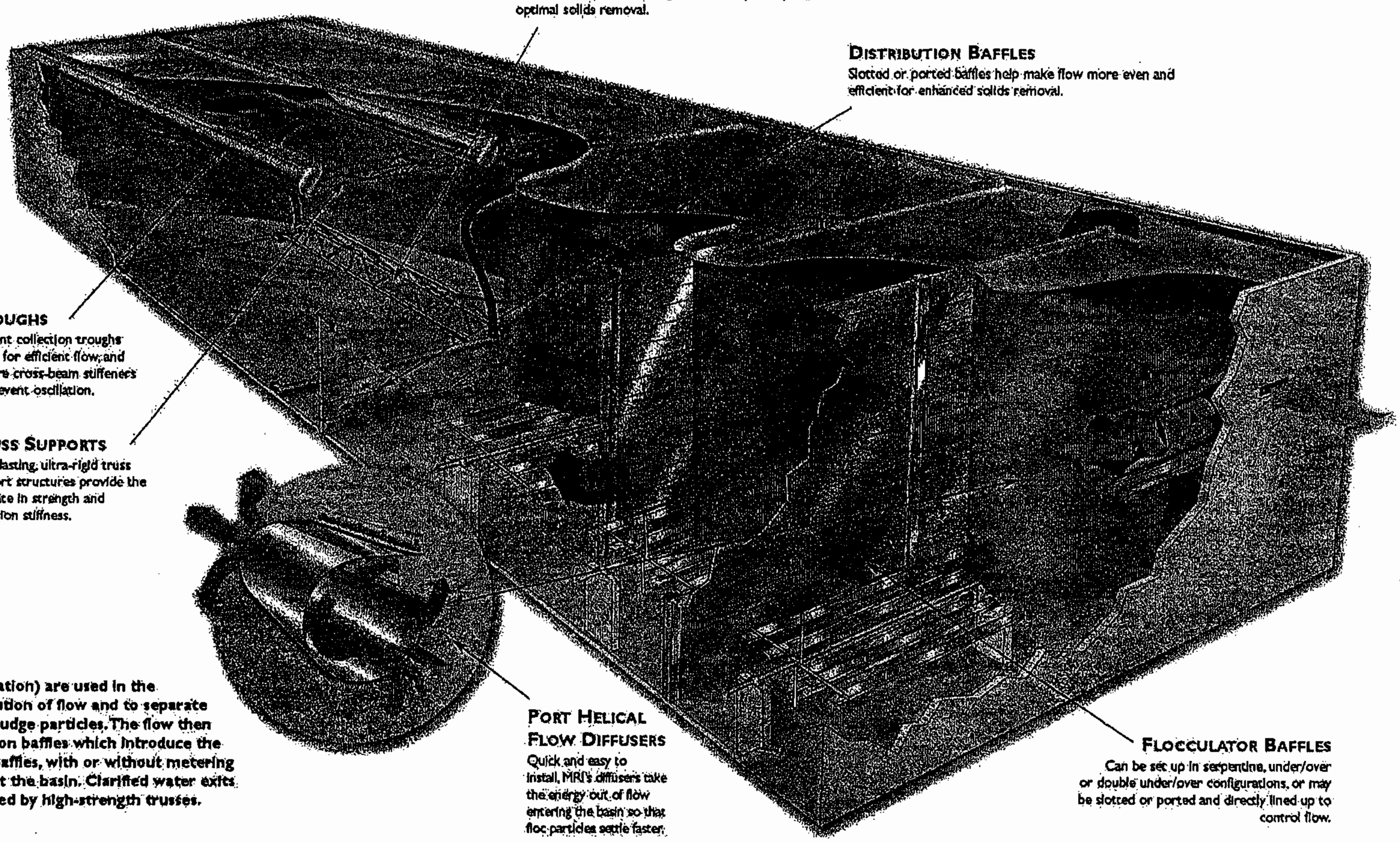


Under/Over Baffling (Side View)

The strategic placement of baffles in flocculators, clarifiers and aerators helps control flow distribution and the duration of treatment at various stages in the process. MRI's stainless steel plank baffles provide a better alternative to redwood planks, fiberglass and concrete. They are quicker and easier to install or reconfigure, and—in the case of redwood planks—save natural resources and prevent possible chemical contamination from treated wood. Baffles can be installed or retrofitted in virtually any basin to improve efficiency and may be slotted, ported or solid depending on the application.

High-quality products for every part of the treatment process.

Meurer Research, Inc. brings together all the components necessary for improved flow management and distribution to boost settling efficiency in clarifiers. Manufactured at MRI's facility in Colorado, the company's flocculation, distribution and aeration baffles can be retrofit to replace redwood planks. MRI baffles,* helical flow diffusers,* troughs* and trusses* are NSF-61 approved and manufactured of T304/316 stainless steel.



CABLE-VAC™ SLUDGE COLLECTOR
MRI's state-of-the-art sludge collector system provides optimal solids removal.

DISTRIBUTION BAFFLES
Slotted or ported baffles help make flow more even and efficient for enhanced solids removal.

TROUGHS
Effluent collection troughs allow for efficient flow, and feature cross-beam stiffeners to prevent oscillation.

TRUSS SUPPORTS
Long-lasting, ultra-rigid truss support structures provide the ultimate in strength and precision stiffness.

PORT HELICAL FLOW DIFFUSERS
Quick and easy to install, MRI's diffusers take the energy out of flow entering the basin so that floc particles settle faster.

FLOCCULATOR BAFFLES
Can be set up in serpentine, under/over or double under/over configurations, or may be slotted or ported and directly lined up to control flow.

MRI FLOW MANAGEMENT AND DISTRIBUTION APPLICATIONS IN USE

Baffles (pictured here in a serpentine configuration) are used in the flocculation chamber(s) for controlling distribution of flow and to separate each stage to facilitate the agglomeration of sludge particles. The flow then enters the sedimentation basin through diffusion baffles which introduce the flow evenly across the full width of the basin. Baffles, with or without metering orifices, are also used to direct flow throughout the basin. Clarified water exits the system via MRI collection troughs supported by high-strength trusses.

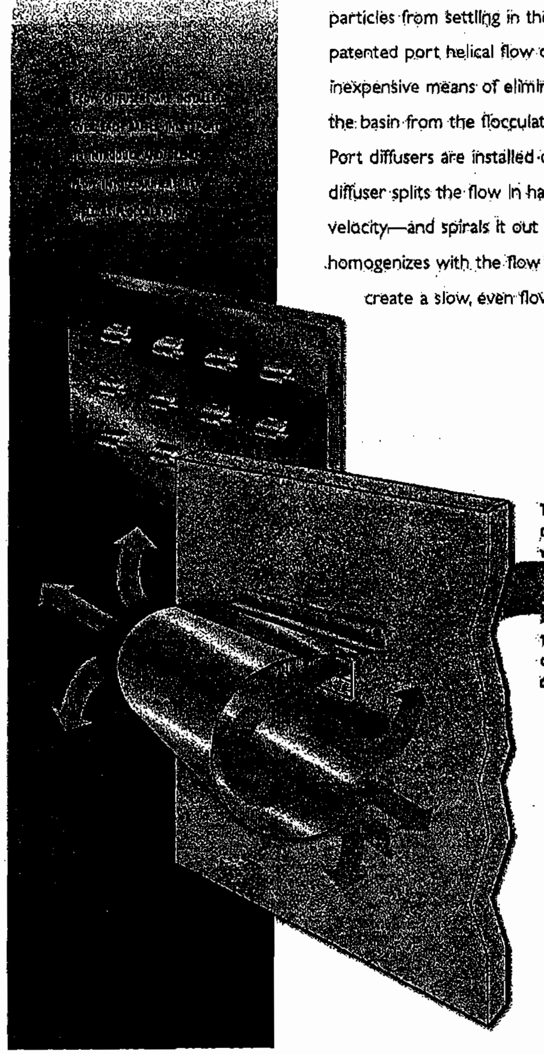
**Patented*

MRI FLOW MANAGEMENT

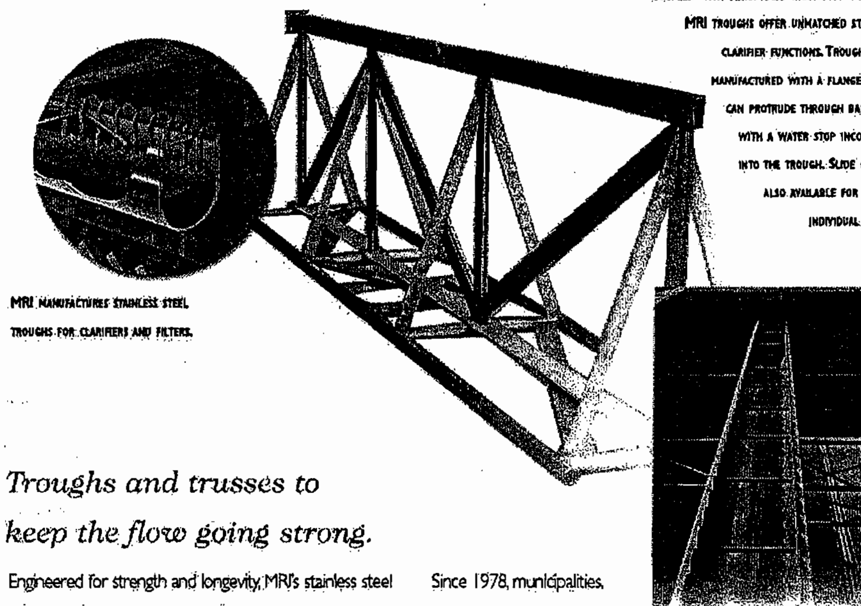
MRI FLOW MANAGEMENT

Port diffusers for more effective control of flow velocity.

Over time, higher treatment demand creates higher flows and velocities through inlet ports, which can prevent floc particles from settling in the sedimentation basin. MRI's patented port helical flow diffuser is designed as an inexpensive means of eliminating high flow rates entering the basin from the flocculators through the diffusion wall. Port diffusers are installed over each port on the wall. Each diffuser splits the flow in half—thereby reducing the velocity—and spirals it out each end. The exiting flow then homogenizes with the flow from adjacent diffusers to create a slow, even flow throughout the basin.



THE PATENTED DESIGN OF THE PORT HELICAL FLOW DIFFUSER FROM MRI RAPIDLY DIFFUSES INLET VELOCITIES IN THE CLARIFIER TO PREVENT DISRUPTION. [illegible] FLOW ENTERING THE DIFFUSER IS [illegible] AND EXITS THE ENDS IN A SPIRALING MOTION AT LESS THAN .5 FPS. AS IT EXITS, THE FLOW COVERS A 180° AREA, WHICH FURTHER CUTS DOWN THE VELOCITY, ASSURING EVEN DISTRIBUTED FLOW IN THE REST OF THE BASIN.



COUPLED WITH ULTRA-RIGID TRUSS SUPPORT SYSTEMS, MRI TROUGHS OFFER UNMATCHED STABILITY IN CLARIFIER FUNCTIONS. TROUGHS CAN BE MANUFACTURED WITH A FLANGED END OR CAN PROTRUDE THROUGH BASIN WALLS WITH A WATER STOP INCORPORATED INTO THE TROUGH. SLIDE GATES ARE ALSO AVAILABLE FOR ISOLATING INDIVIDUAL TROUGHS.

MRI MANUFACTURES STAINLESS STEEL TROUGHS FOR CLARIFIERS AND FILTERS.

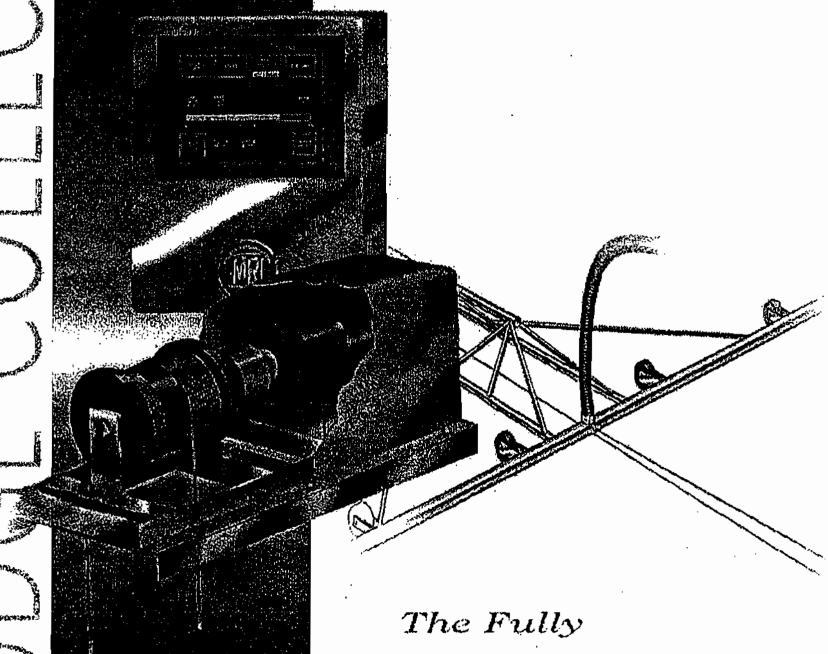
Troughs and trusses to keep the flow going strong.

Engineered for strength and longevity, MRI's stainless steel effluent collection troughs and filter troughs are designed with a special "tulip" round-bottom shape. Built-in cross-beam stiffeners guarantee stability with no oscillation during system operation. In addition, they come equipped with micro-adjustable weirs allowing for precise control.

Meurer's truss systems provide a "backbone" of stable support for troughs and baffles, as well as plate settlers and tube settlers. The structures utilize high-strength, stainless steel tubing designed into three-dimensional trusses resulting in stronger, yet lighter-weight alternatives to conventional steel beams. MRI truss support systems are also quicker and easier to install.

Since 1978, municipalities, utility companies and consulting engineers around the world have used Meurer Research, Inc. as their complete source for shallow depth sedimentation products. Integrated flow management and distribution components represent one more way in which MRI provides efficient, cost-effective water and waste water treatment solutions.

MRI SLUDGE COLLECTORS



The Fully Engineered Cable-Vac™ Sludge Collector System

Meurer Research Inc.
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Golden, Colorado 80401
(303) 279-8373
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MRI SLUDGE COLLECTORS

Sludge collection products built on experience.

Meurer Research, Inc. began developing high-quality equipment in 1978 to supply water and waste water treatment facilities with an effective, reliable and economical method of removing sludge from clarifiers. Over the years, the company has built upon those standards by incorporating new ideas and technology into the design and manufacture of its products, many of which have been patented. The latest result is a fully engineered, all-electric system that represents a breakthrough approach to sludge collection.

The ***Cable-Vac™*** sludge collector consists of three main components, each of which features a quality that today's plants count on to operate at peak levels. The uniquely designed tandem collector offers more efficient removal of solids. The reel-to-reel drive provides dependability and the simple control system ensures ease of operation. Coupled with its installation flexibility and corrosion-resistant longevity, the ***Cable-Vac™*** system is the ultimate choice for low-maintenance, cost-effective sludge collection in both new and existing basins.

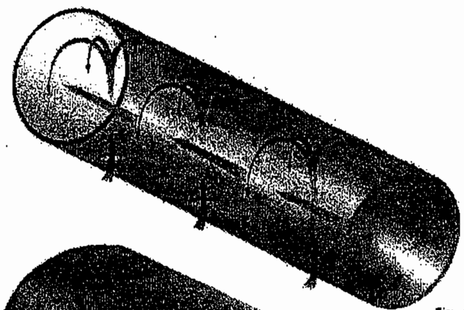


Figure A

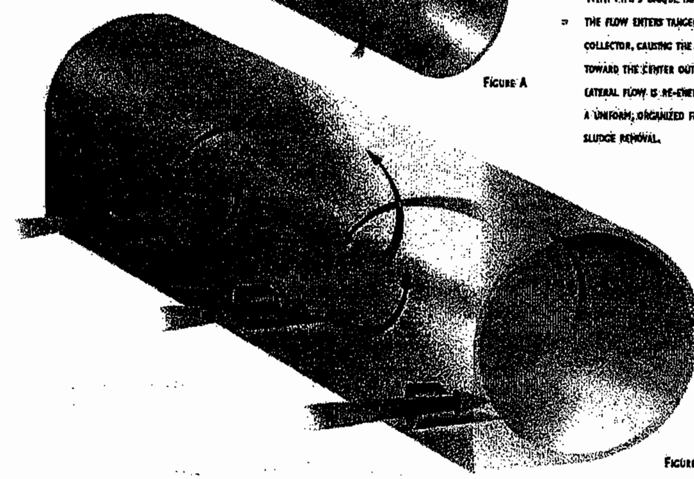
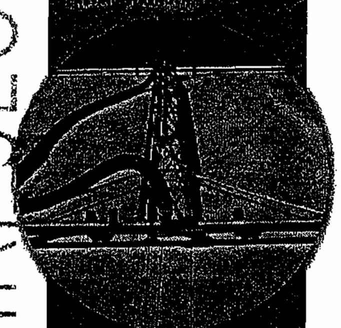


Figure B

In conventional sludge collectors (Figure A), the incoming flow entering the bottom and lateral flow moving toward the center outlet travel perpendicular to each other and collide at the orifices, resulting in a disrupted flow pattern and decreased sludge removal.

With MRI's unique tandem collector design (Figure B), the flow enters tangentially to the bottom of each collector, causing the lateral flow to travel in a spiral toward the center outlet. As it passes each orifice, the lateral flow is re-energized by the incoming flow to create a uniform, organized flow pattern that greatly enhances sludge removal.



A tandem collector designed for maximum efficiency.

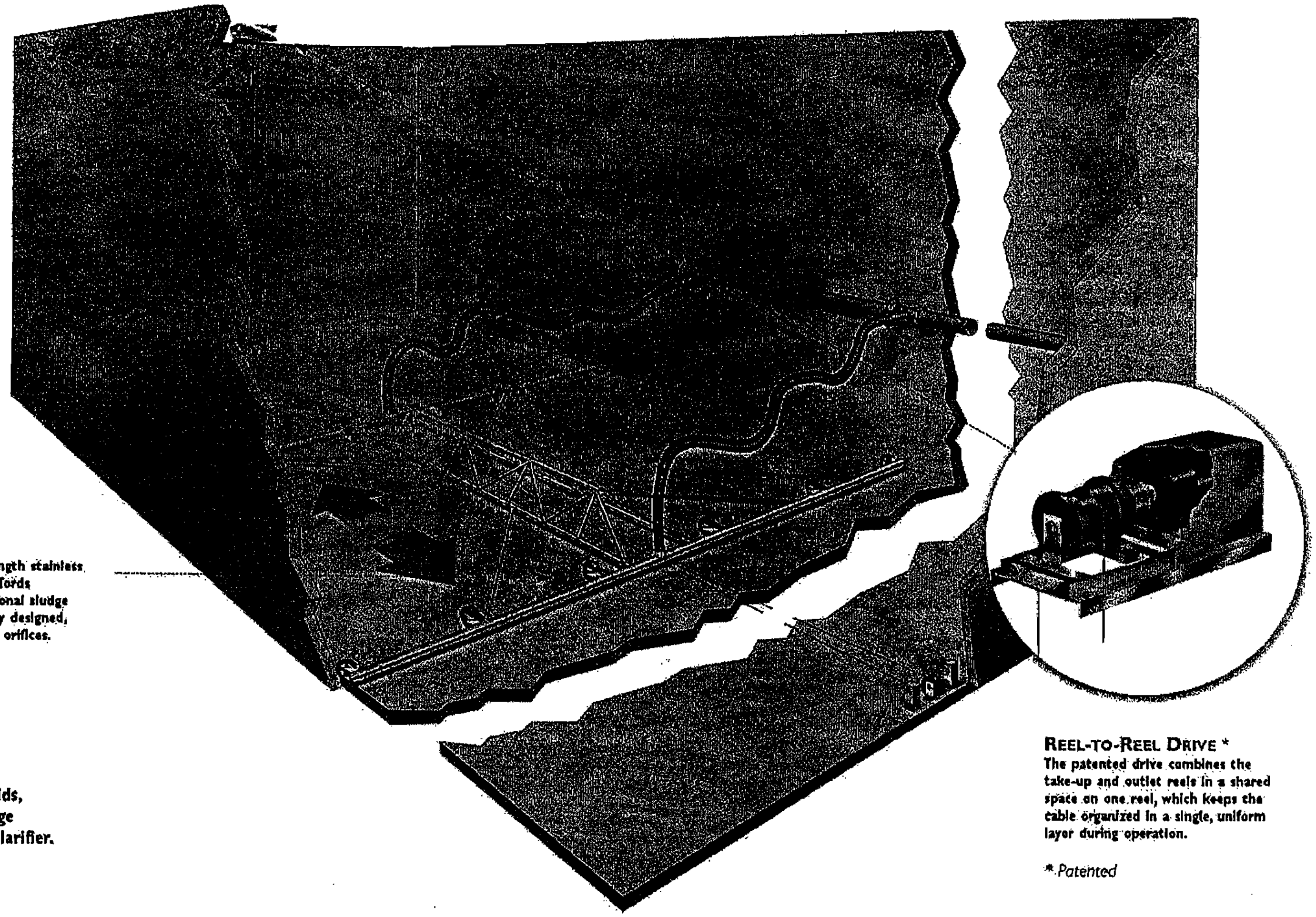
The key to the ***Cable-Vac's™*** ability to deliver proven increased solids removal is the innovative design of its tandem collector.* Unlike conventional equipment, it has two collectors instead of one, with sludge collection orifices facing forward on the side, rather than the bottom, of each collector. This allows for enhanced two-way directional sludge extraction as the assembly moves back and forth across the basin floor. Moreover, the orifices in the collectors are angled to let sludge enter tangentially, which organizes the flow (see illustration above) to pick up a greater amount of solids, as well as prevent clogs from occurring.*

MRI's ***Cable-Vac™*** operates without the use of guide rails or tracks on the basin floor, so installation is quick and easy. It can be retro-fitted to most existing clarifier basins with flat, sloping or slanted floors. Plus, the collector's all-stainless steel construction, long-life wheel bearings and low rolling resistance provide lasting, virtually maintenance-free operation—even in continuous waste water applications.

* *Patented*

Uniting technology and simplicity of design.

Years of experience in producing water treatment equipment have made MRI's state-of-the-art ***Cable-Vac™*** collector system* the most reliable sludge collector on the market. Completely engineered to provide optimal solids removal, the system can be customized for new or retro-fit installations. In addition, all components are manufactured and tested in-house at MRI's facility before being shipped to the job site.



CABLE-VAC™
Constructed of high-strength stainless steel, the *Cable-Vac™* affords effective two-way directional sludge removal through specially designed, forward-facing collection orifices.

REEL-TO-REEL DRIVE *
The patented drive combines the take-up and outlet reels in a shared space on one reel, which keeps the cable organized in a single, uniform layer during operation.

** Patented*

THE RTR SYSTEM AT WORK

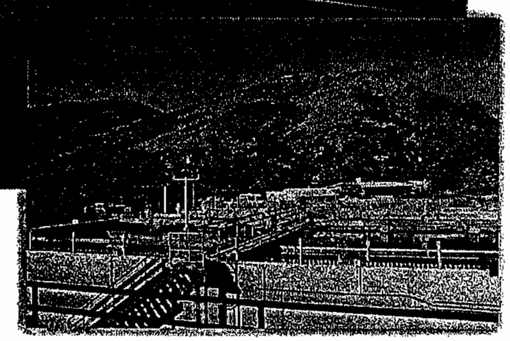
Powered by the reel-to-reel drive (RTR), the *Cable-Vac™* travels back and forth across the sedimentation basin floor to extract settled solids, which are then discharged through flexible sludge hoses connected to fixed piping that exits the clarifier.

MRI SLUDGE COLLECTORS

MRI SLUDGE COLLECTORS

Reliably powered by the reel-to-reel drive.

The reel-to-reel drive is what makes **Cable-Vac™** systems from MRI so dependable. Its simple, patented design allows the take-up and outlet reels to utilize the same space, affording a compact drum length that maintains the cable in a single layer with no tensioning necessary. Capable of continuous, energy-efficient operation using DC power, the drive can withstand an indefinite stall without failing or sustaining damage. The assembly is housed in a durable safety enclosure that offers visual monitoring of the cable to indicate the tandem collector's working position in the clarifier. And because it has a minimum of moving parts and needs no lubrication, the above-water drive is easy to maintain and service.



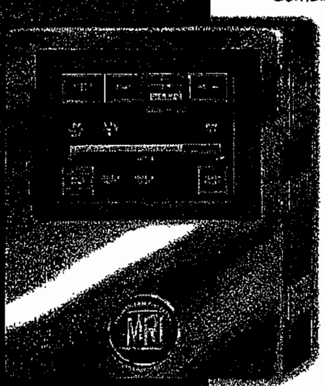
Pictured clockwise from upper left:

Garrett Morgan Water Treatment Plant, Cleveland, Ohio — View of cable pulleys in basin floor below MRI's patented, above-water reel-to-reel drive.

Semper Water Treatment Plant, Westminster, Colorado — Cable-Vac™ collectors were retrofitted to existing basins, as well as installed in a new basin.

City of Golden Water Treatment Plant, Colorado — Overview of two sedimentation basins, each equipped with two Cable-Vac™ collectors.

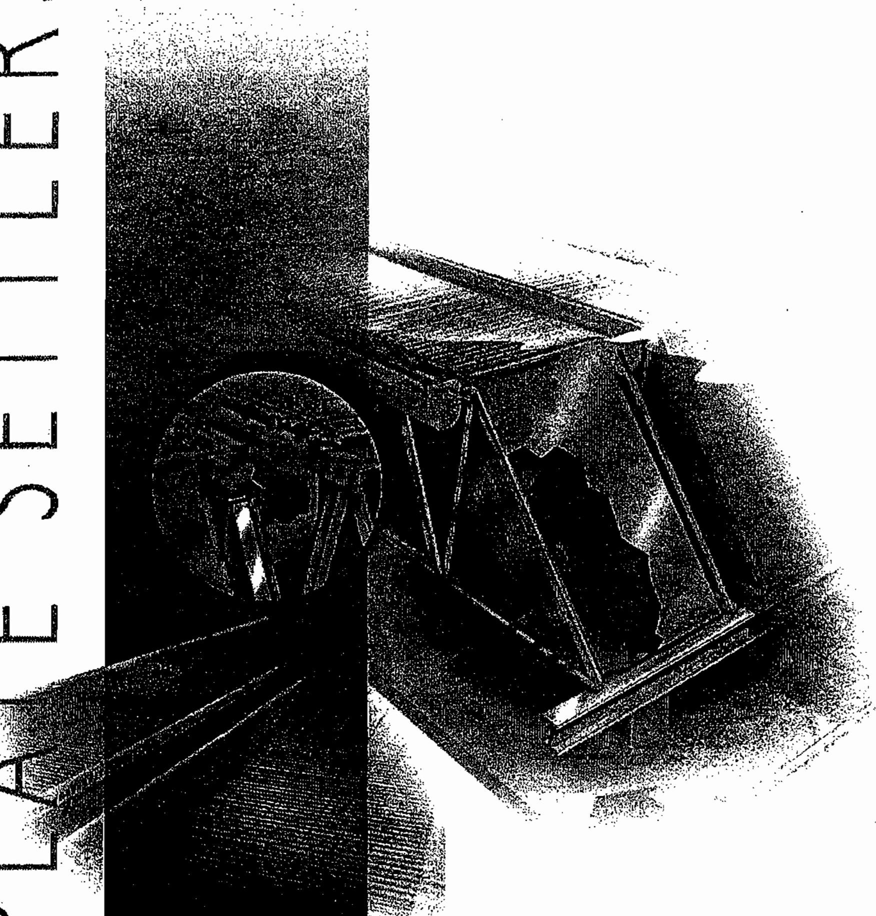
Adaptable control system provides simplified operation.



Combining state-of-the-art technology with versatility, the simple-to-use control system automatically displays and handles all of the sludge collector's functions. It can be programmed easily through a menu-driven, LCD touch screen to control drive variables such as duration, speed and frequency of operation to fully meet a plant's specific needs. The UL-listed system operates on 120 VAC power and is housed in an anodized aluminum enclosure. In addition, security coding is an option, and conventional button and switch controls are also available.

For effectiveness, reliability and simplicity, the fully engineered systems from MRI deliver outstanding performance—especially when used in conjunction with the company's plate and tube settler systems. From design and manufacturing through service and support, Meurer Research, Inc. is the supplier that utility operators, contractors and engineers can rely on for the very latest in sludge collection equipment.

MRI PLATE SETTLERS



The High-Capacity Inclined Plate Settler System

MEURER RESEARCH INC.
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FAX (303) 279-8429

MRI PLATE SETTLERS

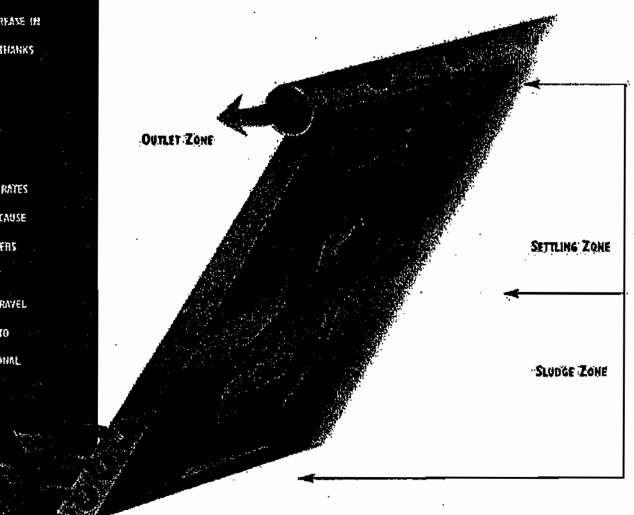
Patented solutions 25 years in the making.

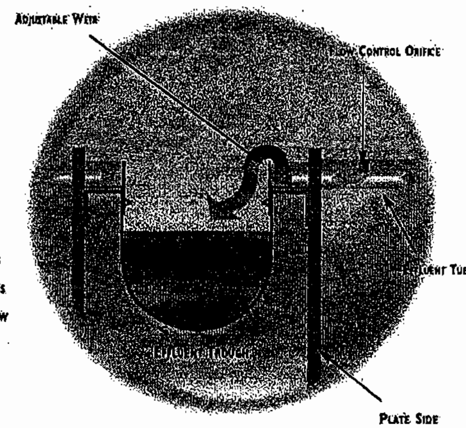
The Golden Water Treatment Plant, Colorado—This facility in scenic Golden handles several million gallons more per day without any increase in basin size or land area, thanks to MRI plate settlers.

Clear water production rates are greatly increased because MRI inclined plate settlers dramatically shorten the distance particles must travel (a few inches compared to several feet in conventional clarifiers).

Today's water and waste water treatment facilities are always looking for ways to improve clarifier system performance with an eye to practicality, efficiency and economics. The solution? An inclined plate settler system from Meurer Research, Inc. These plates deliver the highest flow rate and solids capture available for the ultimate in clarifier function. What's more, the all-stainless steel, self-cleaning system provides long-lasting strength, is extremely cost effective and can be configured for virtually any new or existing basin.

Since 1978, utility companies, municipalities and consulting engineers have relied on MRI for the latest shallow-depth sedimentation technology. With more than 50 patents and hundreds of installations, Meurer Research continues to lead the way with innovative, high quality equipment. Furthermore, MRI is the only 100% employee-owned company in the industry that designs and manufactures all its products in-house in the U.S.





As clarified water is discharged from the effluent tubes at the top of the plates into the effluent troughs, MRI's micro-adjustable weir allows for precise control of flow velocity and equalization for enhanced efficiency.

A process proven to increase solids removal.

Designed around the principle that inclined plates in a basin increase the capacity of water production, the patented MRI plate settling system consists of a set of plates with a combination outlet support tube at the top of each plate edge. Supported by the tubes, the plates are installed at a 55° to 60° angle between two effluent troughs. The sides of the plates fit together to form a wall with inlet ports at the lower end of each side. A stainless steel truss structure supports the system to position the top of the system at the water line.

The plate settlers provide a fast, efficient way to remove solids from water by increasing the settling surface area while decreasing vertical settling distance. When the flow is introduced to the basin, it enters the inlet ports and rises up between each inclined plate as solids fall to the lower surface. The solids agglomerate, gain weight and slide down the plate, accumulating more particles until the sludge drops from the end of the plates to the basin floor where it is removed by sludge collection equipment.

In the meantime, clear water is conducted upward between the plates and into six orifices in the outlet (or effluent) tubes, where it flows to the side of the plates and across a weir (which is adjustable to maintain equal flow for greater efficiency) into the effluent trough. The troughs then take the flow to the end of the basin and out.

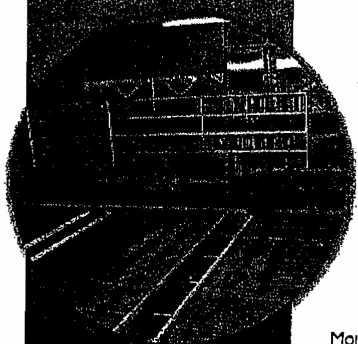
MRI PLATE SETTLERS

Uniquely designed for efficiency and convenience.

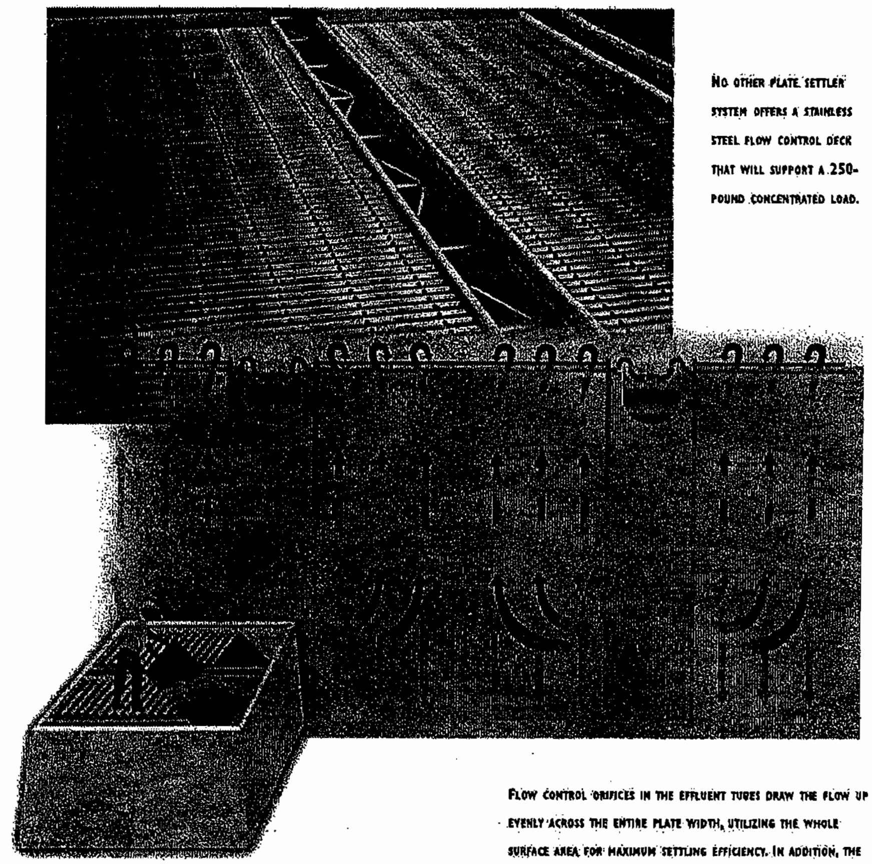
The all-stainless steel construction of MRI's plate settler system provides superior strength and durability. However, what truly sets our plates apart from other plate settling systems is the patented hydraulic flow control deck.

Meurer's flow control deck is made up of a set of stainless steel tubes which are actually the top edge of each plate settler. Each tube has a series of metering orifices that extract flow evenly from across the width of each plate for the most uniform flow distribution available. Coupled with the adjustable weir, MRI's system offers more flow control, capacity and efficiency than any other system.

Moreover, since the plates are mounted in rows at water level in an array that forms an extremely solid deck, it is strong enough to be walked on during installation, inspection or repairs. Whereas other systems have plates that are trapped under effluent troughs or permanently attached to the structure, MRI plates are easily viewed and removed from above without disassembling other components.



BROOMFIELD WATER TREATMENT PLANT, COLORADO—THIS CITY NEEDED TO EXPAND PLANT OPERATIONS BY 100% ON A PROPERTY THAT WAS ALMOST FULLY UTILIZED, SO ANY MODIFICATIONS HAD TO BE VERY COMPACT. INCLINED PLATE SETTLERS WERE INSTALLED IN THE FILTER BACKWASH RECLAIM SYSTEM IN AN UNDERGROUND VAULT, AND TODAY ARE TREATING 6,000 GALLONS PER MINUTE—WITHOUT CHEMICAL FEED.



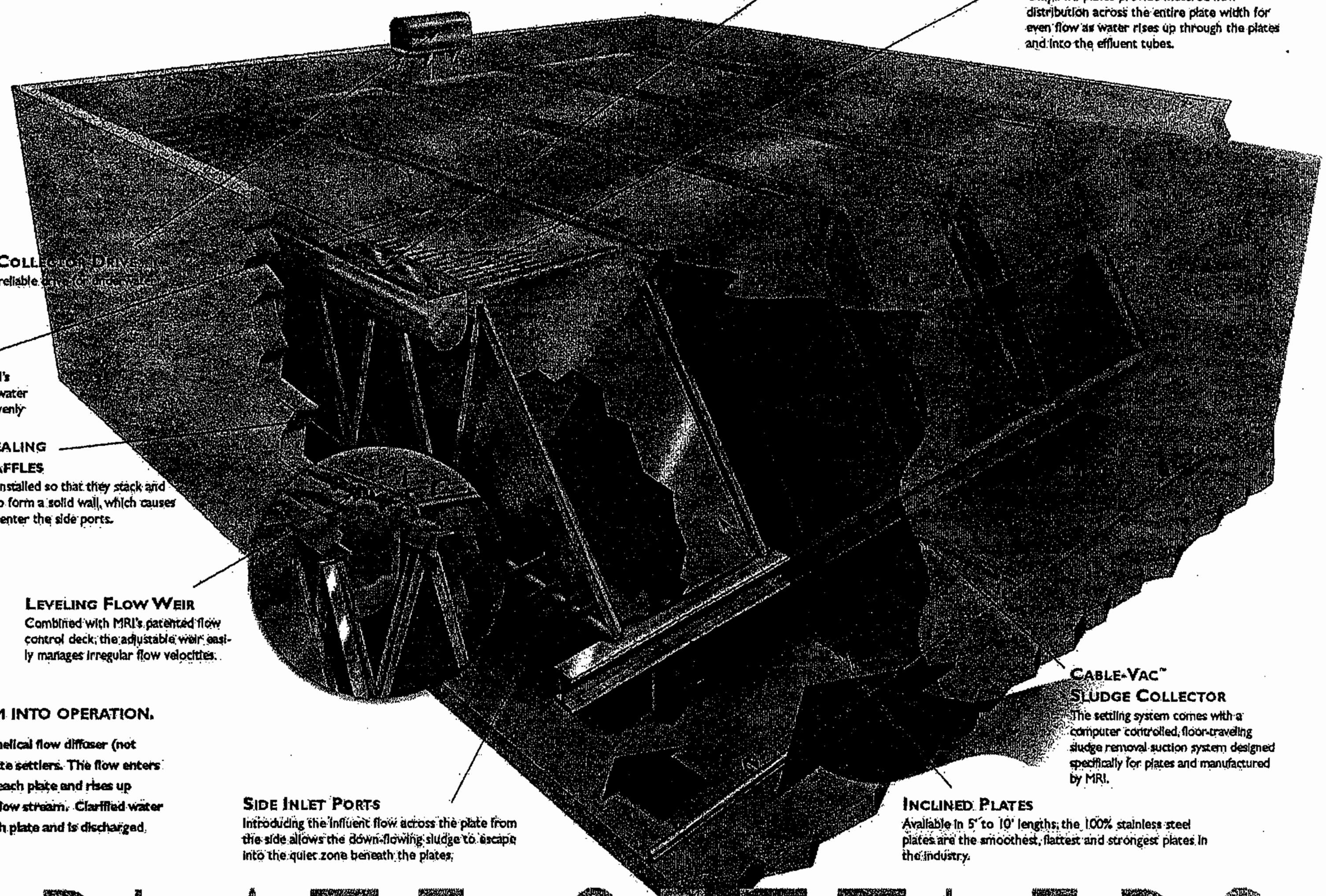
NO OTHER PLATE SETTLER SYSTEM OFFERS A STAINLESS STEEL FLOW CONTROL DECK THAT WILL SUPPORT A 250-POUND CONCENTRATED LOAD.

FLOW CONTROL ORIFICES IN THE EFFLUENT TUBES DRAW THE FLOW UP EVENLY ACROSS THE ENTIRE PLATE WIDTH, UTILIZING THE WHOLE SURFACE AREA FOR MAXIMUM SETTLING EFFICIENCY. IN ADDITION, THE INFLUENT FLOW IS INTRODUCED ACROSS THE PLATE FROM THE LOWER SIDE, RATHER THAN STRAIGHT UP FROM THE BOTTOM, ENSURING MINIMUM INTERFERENCE WITH DOWN-FLOWING SLUDGE.

PLATES CAN BE EASILY INSPECTED AND REMOVED INDIVIDUALLY FOR CLEANING, MAINTENANCE OR REPAIR—ALL WITHOUT DRAINING THE BASIN TO GAIN ACCESS.

For ultimate performance, the choice is clear.

Engineered for simple precision, MRI's state-of-the-art plate settler system* allows for more water flow and settling area to greatly enhance clarification effectiveness and productivity. NSF-61 approved plates, troughs and support structures are manufactured using solid stainless steel for longevity.



Effluent Troughs
Side-mounted troughs work with the flow control deck to provide even flow distribution off the tops of the plates.

Flow Control Orifices
Only MRI plates provide metered flow distribution across the entire plate width for even flow as water rises up through the plates and into the effluent tubes.

RTR Sludge Collector Drive
Compact, powerful, reliable drive for underwater sludge collector.

Flow Control Deck
Composed of top support/outlet tubes, MRI's unique flow control deck extracts clarified water evenly across the plates and distributes it evenly into the effluent troughs.

Self-Sealing Side Baffles
Plates are installed so that they stack and interlock to form a solid wall, which causes influent to enter the side ports.

Leveling Flow Weir
Combined with MRI's patented flow control deck, the adjustable weir easily manages irregular flow velocities.

Cable-Vac™ Sludge Collector
The settling system comes with a computer controlled, floor-traveling sludge removal suction system designed specifically for plates and manufactured by MRI.

Side Inlet Ports
Introducing the influent flow across the plate from the side allows the down-flowing sludge to escape into the quiet zone beneath the plates.

Inclined Plates
Available in 5' to 10' lengths, the 100% stainless steel plates are the smoothest, flattest and strongest plates in the industry.

Putting the plate settler system into operation.

The influent enters the clarifier basin through the helical flow diffuser (not shown), which creates a quiet zone beneath the plate settlers. The flow enters the plates through feed ports in the lower sides of each plate and rises up between the plates as solids are settled out of the flow stream. Clarified water emerges through the outlet pipes at the top of each plate and is discharged into the collection troughs.

*Patented

MRI PLATE SETTLERS

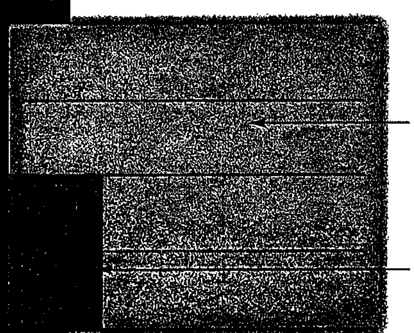
MRI PLATE SETTLERS

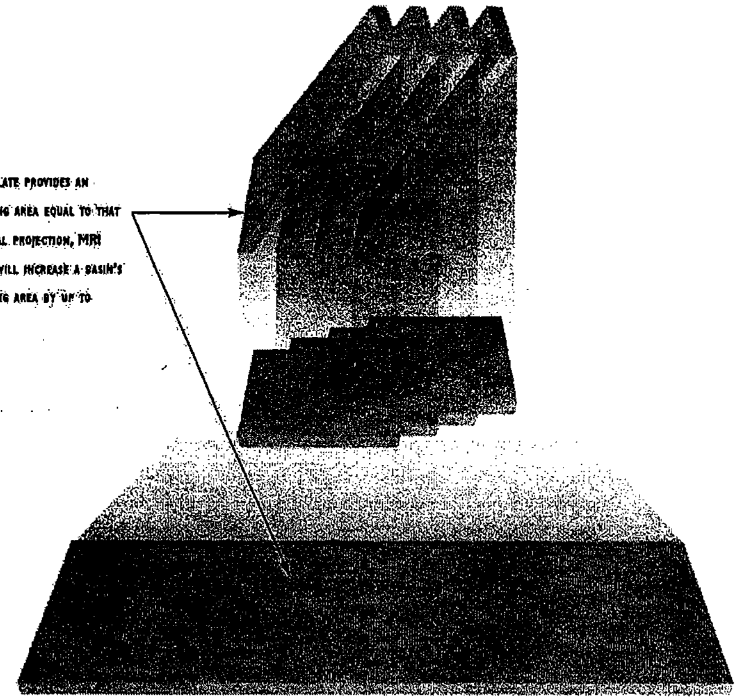
Improved clarifier capacity. Improved cost savings.

In the sedimentation process, a clarifier's capacity is proportional to the surface area of the basin. Using the MRI plate settling system, surface area for solids settling is provided by rows of inclined plates installed at 55° to 60°, in effect compressing the capacity of a large conventional clarifier into a significantly smaller footprint. As more plates are utilized, productivity increases proportionally, along with the cost-effectiveness of clarifying operations.

In fact, MRI systems are far more economical compared to the costs of a medium or large clarifier with no sedimentation enhancement. Whether building a new facility or expanding an existing one, plate settlers provide maximum flow using minimum space—which adds up to dramatic savings in land and construction costs. Additionally, plate settlers produce a consistently higher quality effluent, resulting in typical chemical cost savings of 30%. Further costs can be saved by using plate settlers in reclaiming filter backwash waste water and in treating membrane reject water.

By installing MRI plates at a 55° to 60° angle, more settling surface area can be accommodated in less space, providing for increased efficiency and cost savings.





Because each plate provides an effective settling area equal to that of its horizontal projection, MRI plate settlers will increase a basin's effective settling area by up to eight times.

Adaptable to meet specific requirements.

The Meurer Research plate settling system effectively enhances clarification in a wide variety of applications, including treatment of potable water, primary, secondary and tertiary domestic waste water, and various industrial waste products. The plates can also be specifically configured to fit any basin—even those of unusual shape or size.

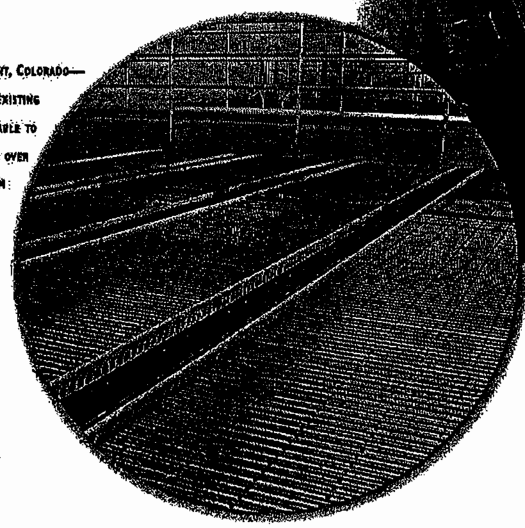
In addition, MRI ships equipment in two different forms depending on a facility's unique installation and design needs or limitations. The cartridge form combines the plates, effluent troughs, truss frame and flow control deck in a preassembled module, or "plate pack" that can be placed in the basin by a crane, minimizing field labor. The component form is shipped as individual elements that are placed in the basin item by item, allowing the system to be installed inside or beneath a facility.

MRI PLATE SETTLERS

On-site success: The inclined plate settler system in action.

Trust MRI for innovation that sets the trend.

Experience, reliability, creativity and know-how. These are the qualities that have allowed Meurer Research to become a leader in the field of sedimentation technology for more than a quarter of a century. That is also why customers have come to trust MRI as their complete source for all settleable solids removal products, including troughs, baffles, diffusers, supports and sludge collectors. Count on Meurer Research to continue its commitment to serving the industry's needs, from design, engineering and production to installation, education and after-market customer service.



CITY OF ARVADA WATER TREATMENT PLANT, COLORADO—BY ADDING MRI PLATE SETTLERS TO ITS EXISTING DIRECT FILTRATION PLANT, THE CITY WAS ABLE TO DECREASE BASIN SIZE BY A FACTOR OF 10 OVER NON-PLATE DESIGNS, ALLOWING THE SYSTEM TO BE HOUSED IN A NEW BUILDING. THE PROJECT WAS COMPLETED IN LESS THAN A YEAR, INCLUDING THE NEW BUILDING.

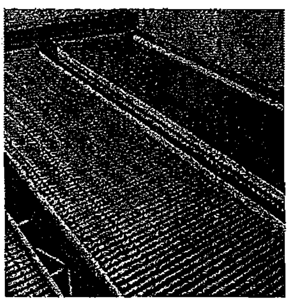
BELLEVILLE WATER TREATMENT PLANT, ONTARIO, CANADA—THE MRI PLATE SETTLING SYSTEM IS BEING USED IN BOTH MAIN CLARIFIERS, AS WELL AS IN TREATMENT UNITS FOR BACKWASH WASTE, SLUDGE FROM TRAVELING SUCTION SLUDGE REMOVAL UNITS AND SCUM FROM DAF UNITS. MRI WAS INVOLVED IN THE DESIGN PROCESS AND ANALYSIS, AND MANUFACTURED THE ENTIRE SYSTEM WITHIN THREE MONTHS.

Home Up

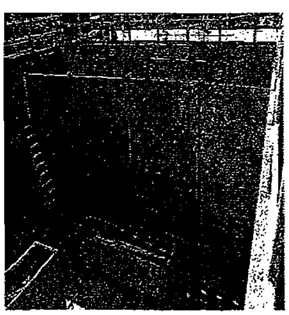
Plate Settlers

- Photo Gallery
- Illustration Gallery

Plate Settlers



Baffles



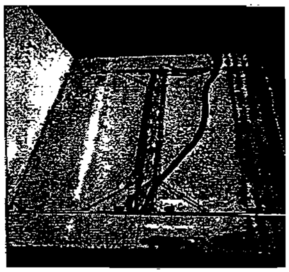
Sludge Collectors

Plate settlers have been in existence since the turn of the century. Only recently has the technology advanced to the point that allows plate settlers to be cost effective. As more engineers and plant personal realize the cost savings associated with plate settlers they are becoming more and more popular. Plate settlers can decrease the footprint of the settling basin by as much as 90% over an open basin or as much as 50% over a basin with tube settlers which results in real estate and concrete cost savings. There are design issues that must be considered for plate settlers to function properly. Since settling enhancement has been our expertise for over 25 years and we design, patent, and manufacture our own plate settlers, all of these issues have been addressed and we offer the most efficient and easy to maintain plate settler on the market today.

The advantages of MRI plate settlers are:

- **INFLUENT DISTRIBUTION** – MRI's Helical Flow Inlet Diffuser* is a compact way to introduce flow into the basin evenly. introduces the flow evenly into the basin to blend , which maintains floc structure, and allows flow to travel evenly down the side channels without short circuiting.

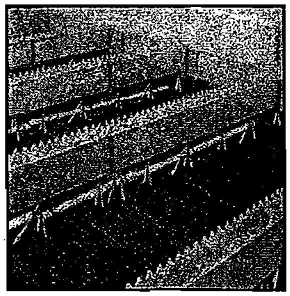
- **SMOOTH PLATE SURFACE** – The surface of MRI plates are completely smooth. They have nothing that would interfere with the



distribution across the plate or the movement of solids down the plate, i.e. textures, ribs, corrugations or stampings either vertical or horizontal.

EFFLUENT DISTRIBUTION – MRI has incorporated two very important features which guarantee even distribution through each plate and over the entire basin.

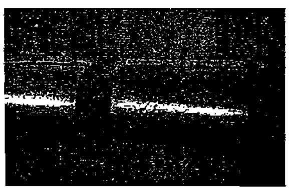
Tube Settlers



Top Tube* - As the flow reaches the top of the MRI plate settler it is distributed evenly across the entire width of the plate by the orifices spaced across the top tube. This functions as the effluent weir and assures use of the entire plate.

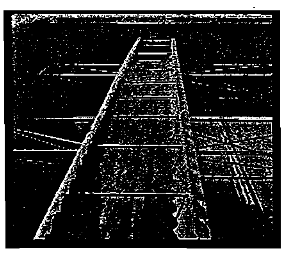
Effluent Weir - The water then flows over the adjustable effluent weir which establishes equal distribution between each plate pack.

Inlet Diffusers



* Indicates items either patented or patent pending

Troughs



Flow Description

Flow is introduced to the basin through the helical flow diffuser (not shown) which blends the incoming water with the water already in the basin without shearing floc particles. The flow is then channeled between the plate packs and enters the plates via the openings located in the sides of the plates at the bottom. (See the green arrows in Fig. 1, in the illustration gallery) The flow then travels up the plate while the settled solids travel downward (see the red arrows in Fig. 1, in the illustration gallery) and drop to the basin floor where they are removed by the sludge collector.

As the flow travels upward over the plate, (green arrow Fig. 2, in the illustration gallery) it spreads out over the entire width of the plate due to the orifices spaced evenly across the top tube. This even distribution eliminates short circuiting and allows for even settling. As the solids settle onto the plate settler (see red arrow Fig 2, in the illustration gallery) they are allowed to slide down the 55^0 angle and off of the bottom of the plate to the basin floor. It is very important that there are no ribs, textures, corrugations or indentions (sometimes used for strength) to interfere with the settled solids. Any slight obstruction will accumulate solids and block off the plate.

The flow enters the top tube via the orifices and travels through the tube and over the weir into the effluent trough. (See the green arrows in Fig. 2, in the illustration gallery).

Manufacturing:

_MRI has designed, patented and manufactured its own products since our inception in 1975.

Our 25,000 square foot production facility is located in Colorado, which is centrally located for shipping to the east coast or the west coast. Our production techniques have been years in the making and are custom designed to fit our requirements. MRI's plate production utilizes the most modern, up to date machinery available today. Our employees are trained in the manufacturing of plate settlers. Stringent quality control measures are implemented to insure a quality product. When the plate settler module is completed and checked it is loaded onto a truck and delivered directly to the jobsite.

Another important advantage to making our own plates is that should the contractor have any questions he can talk directly to the person in charge of manufacturing. This has been extremely important should the contractor have special requests i.e. last minute changes due to unforeseen situations.

Installation:

The plates are shipped in a "module or plate pack" which consists of a row of plates installed into a truss type structure. This module is assembled at the MRI manufacturing facility in Colorado. They are then loaded onto a flat bed trailer and shipped to the jobsite. Usually 2 modules are loaded onto a truck. Once at the jobsite, the modules can be lifted off by a crane directly into the basin or placed in a safe place for later installation.

This reduces the installation time by a considerable amount compared to installing the individual components.

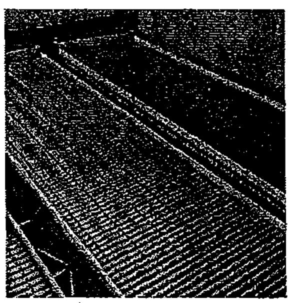
Inside the basin the modules are supported at each end by a support beam. This beam can be provided by MRI in stainless steel or the contractor can pour them out of concrete. After the modules are set in place the troughs are installed. The modules are spaced the right distance apart to allow the troughs to be dropped into place and bolted. The installation is now complete. The effluent weirs are leveled to insure even distribution. This task is made simple as the plates can be walked on for easy access to the weirs.

For further information on the Meurer Research plate settler line of products, contact us at:

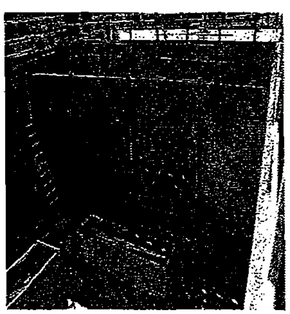
Meurer Research Inc. Email- sales@meurerresearch.com

Photo Gallery

Plate Settlers

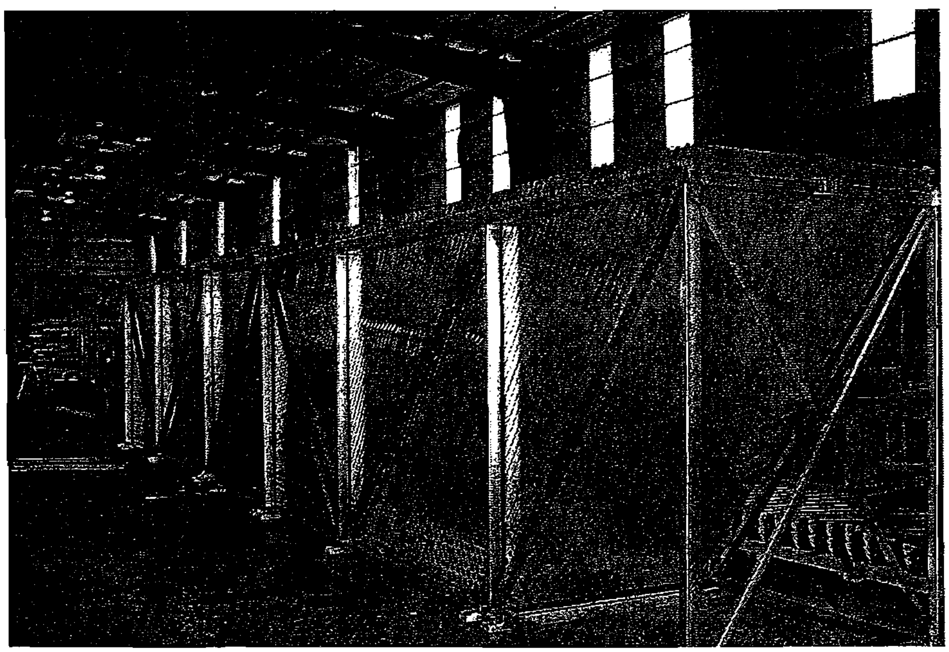


Baffles

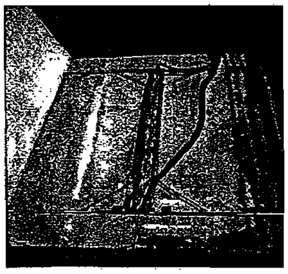


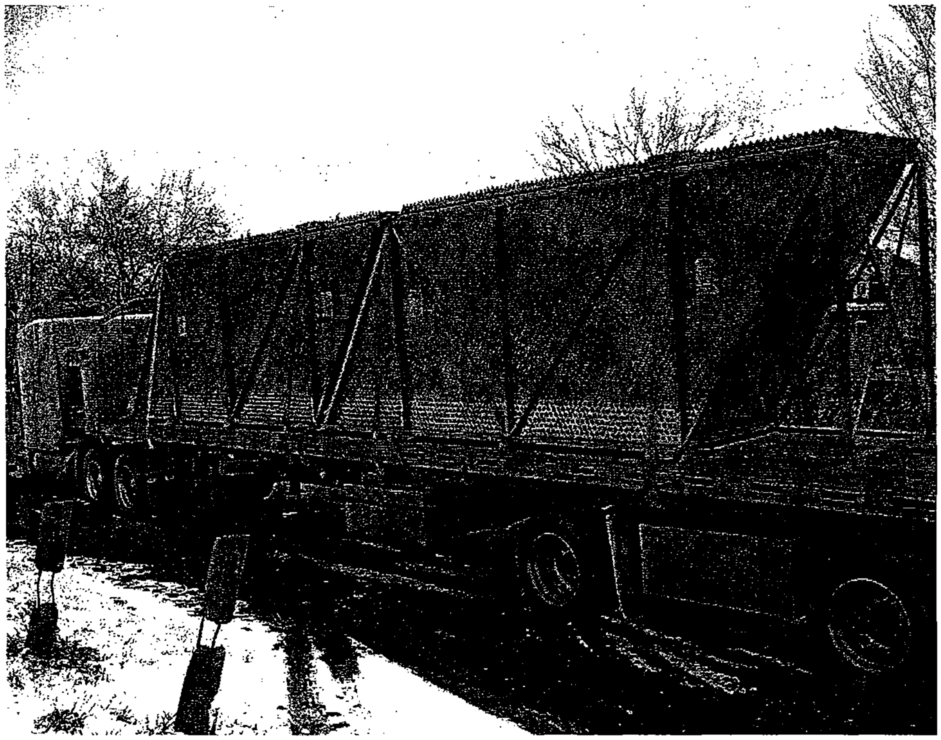
Sludge Collectors

Manufacturing

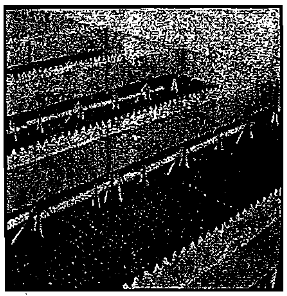


Shipping

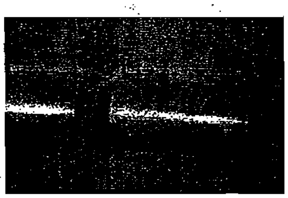




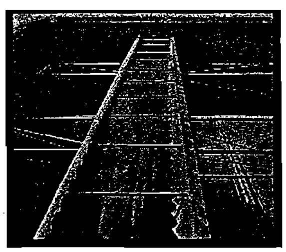
Tube Settlers



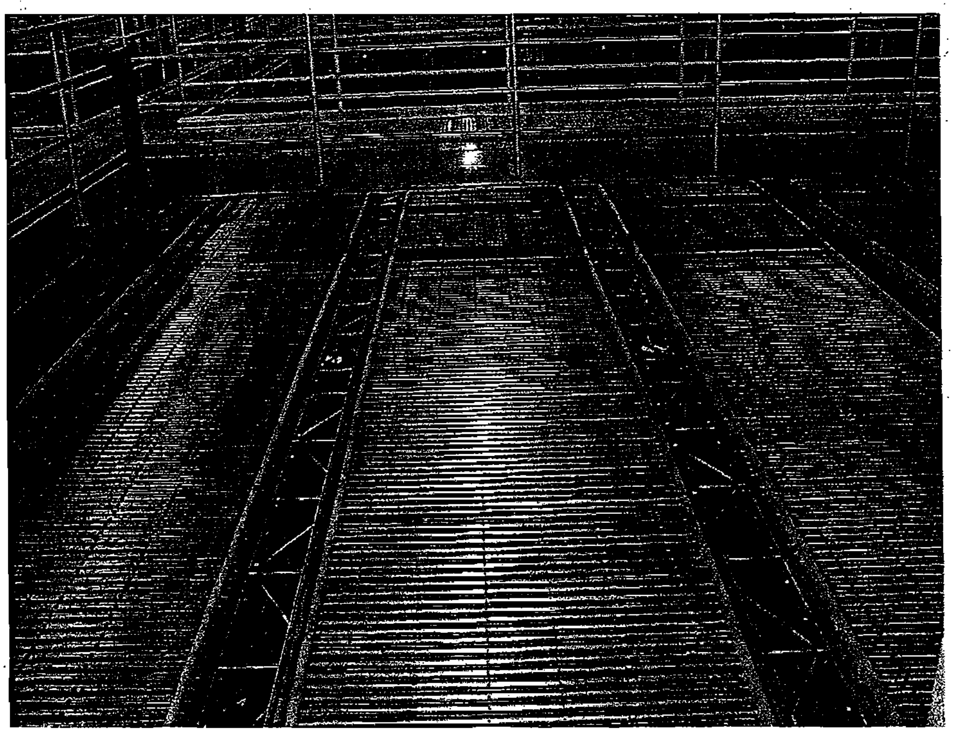
Inlet Diffusers

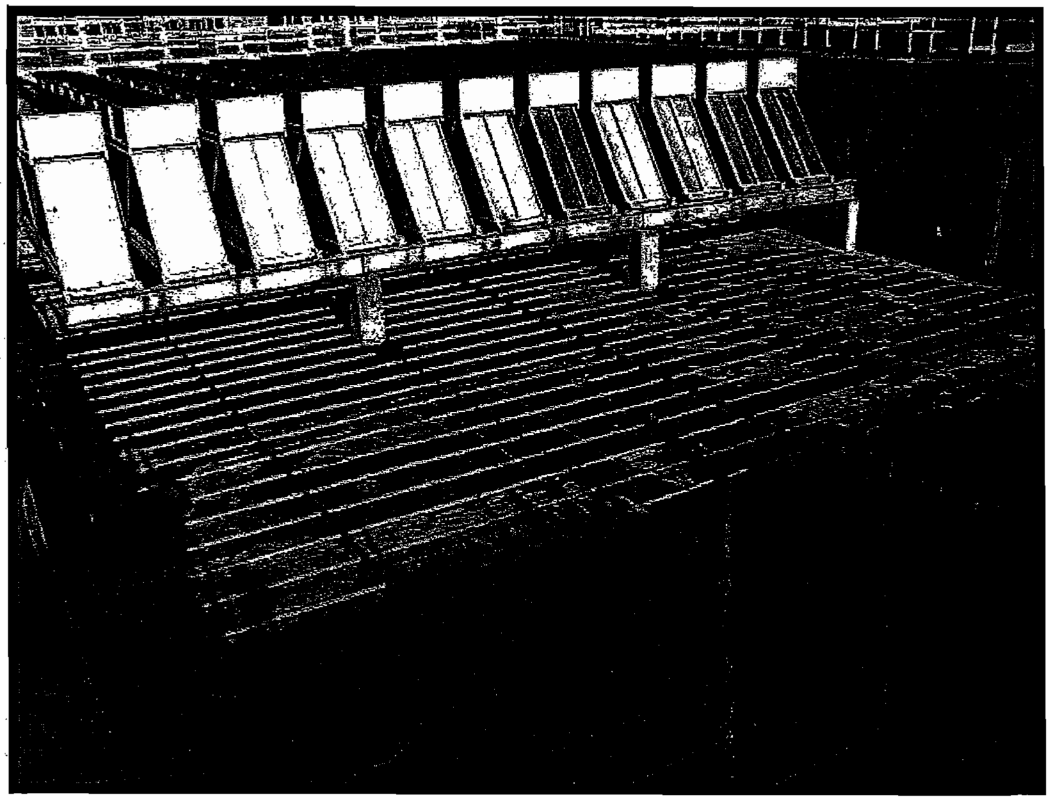


Troughs

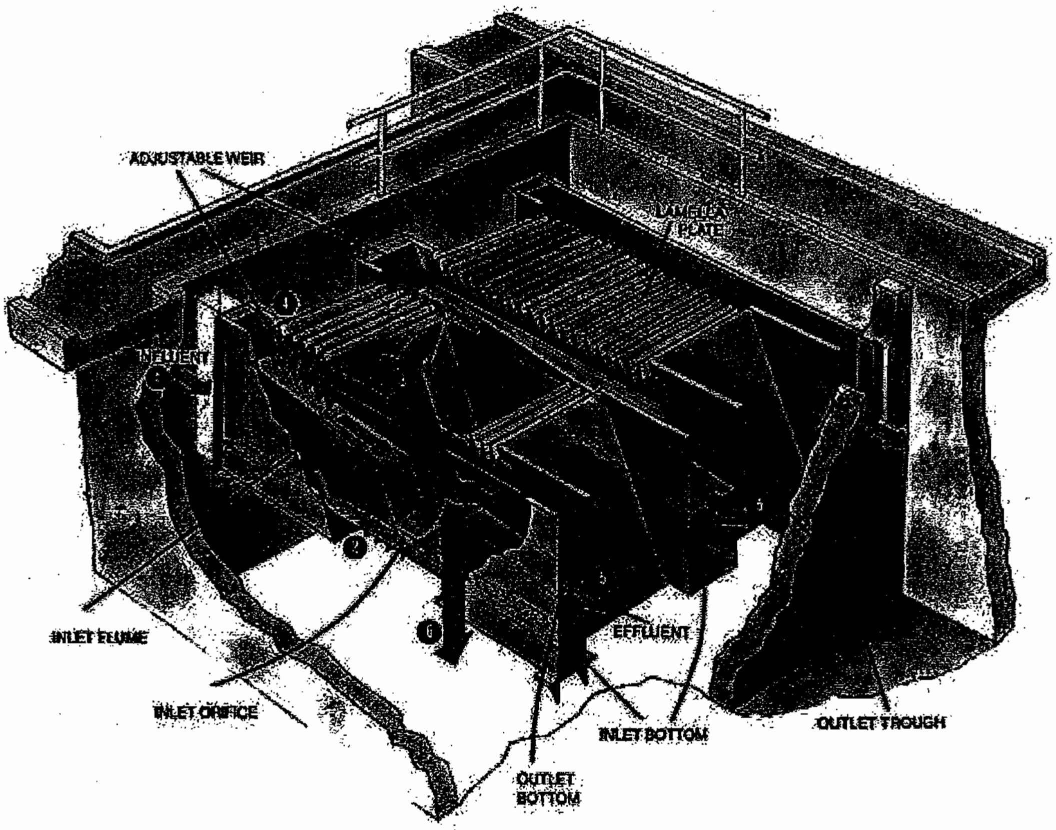


Finished Product

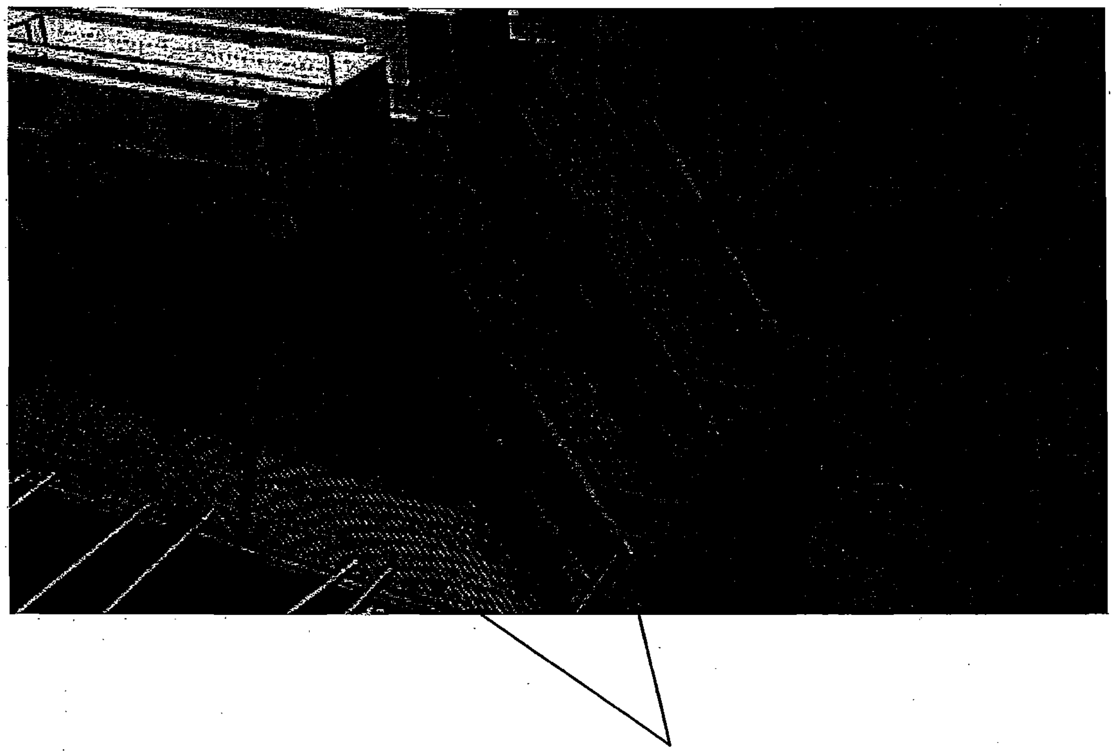




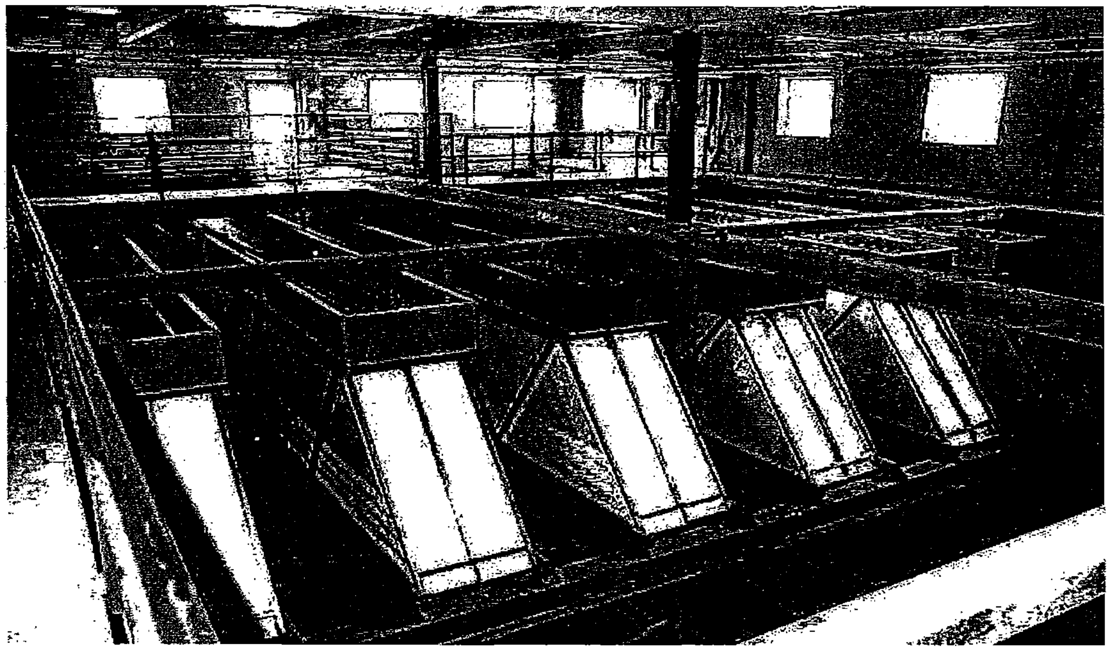
Photograph of Parallel Plate Packs inside a Clarifier.



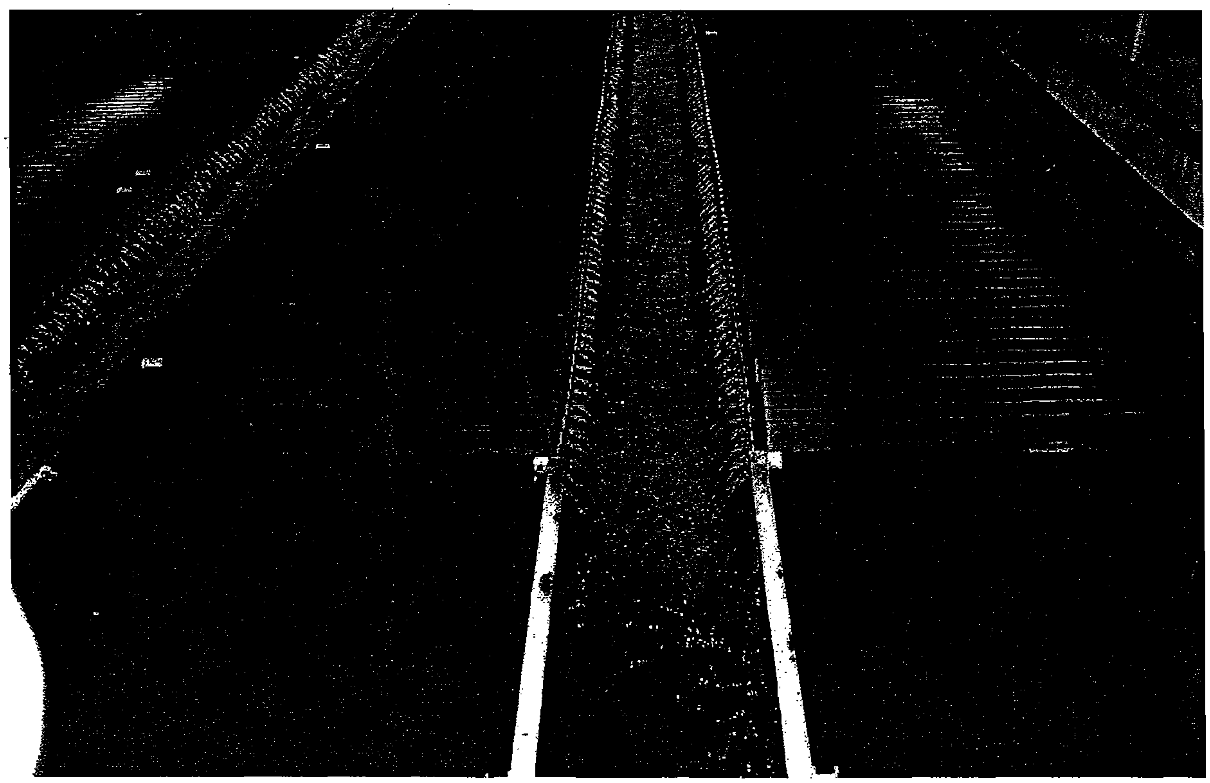
Schematic Diagram for Inclined Plate Settlers



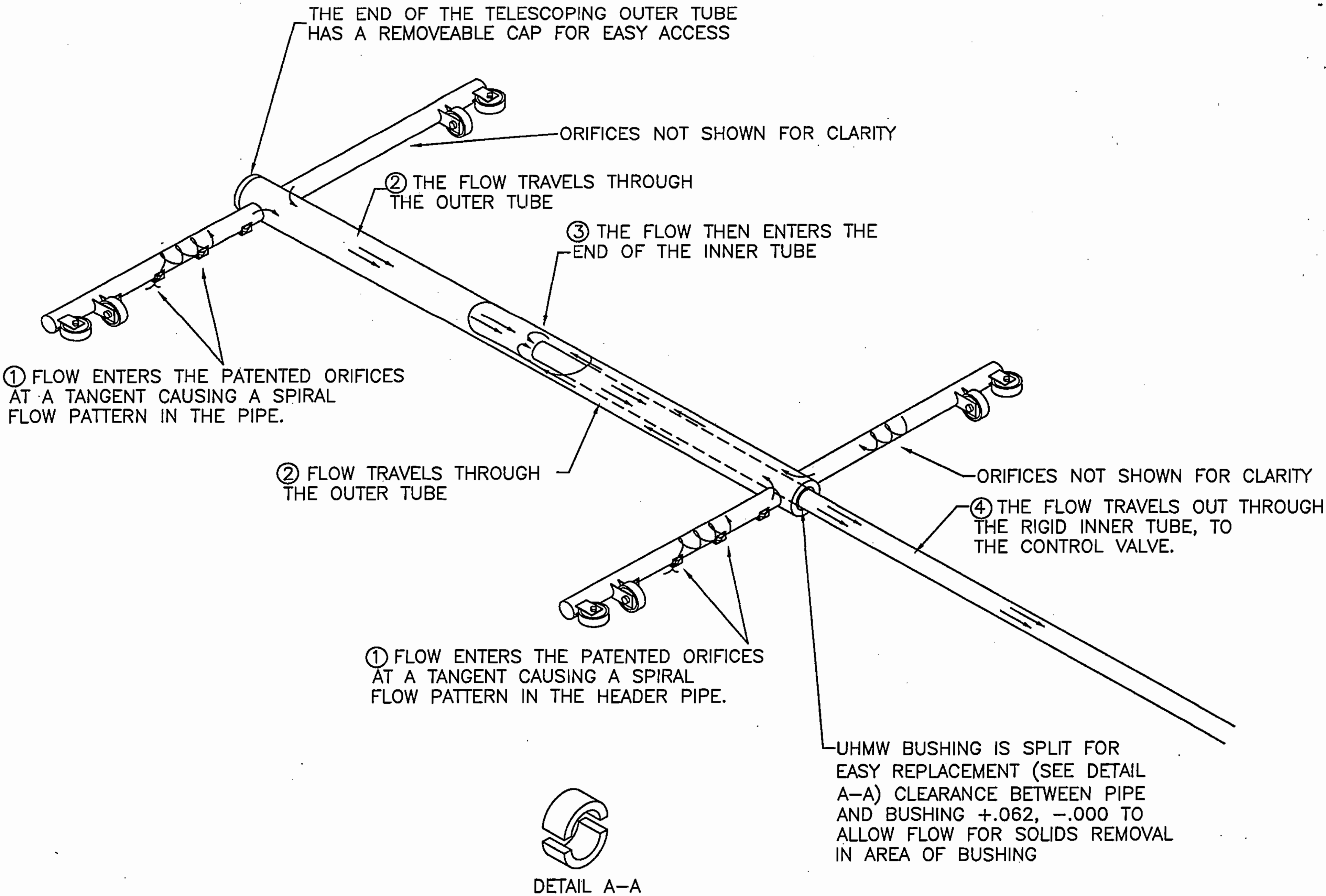
Photograph of Plate Assembly showing the Inlet Openings.



Photograph of Plate Packs with a V-notch Effluent Collection Channels.



Photograph of GEWE Inclined Plate System with Collection Channels between Plate Raws.



HOSELESS CABLE–VAC BY MEURER RESEARCH INC.

THE HOSELESS CABLE-VAC™ SLUDGE COLLECTOR

The "Hoseless" Cable-Vac™ sludge collector was developed to operate in the restricted area below plate settlers where vertical space is limited and many overhead obstructions exist.

The "Hoseless" design eliminates the only problem with operation of a suction sludge collector under plates; the flexible hose which by design must float and can, therefore, become entangled in the plates.

The beauty of the hoseless device is that it utilizes components from the traditional Cable-VAC™ sludge collectors which have been in service in varied applications for many years.

In the hoseless Cable-Vac™, the floating hose has been replaced by a horizontal telescoping pipe sludge conduit.

OPERATION OF THE HOSELESS CABLE-VAC™:

Sludge which has settled on the bottom of the sedimentation basin is collected by the traveling sludge collector which consists of two collection header pipes connected to a large center telescoping pipe. Patented directional orifices along the bottom of the collector pipes extract sludge from across the floor of the sedimentation basin and send it in a spiral pattern to the large center pipe. The flow then passes through the outer telescoping pipe to the inner telescoping pipe and to the end of the sedimentation basin and out through the wall. A sludge valve at the end of the outlet pipe controls the flow.

The unit is half of the total length of the basin; each header pipe covers half of the basin.

The low profile of our "Hoseless" Cable-Vac™ can also be used to extend under baffles to allow for cleaning areas in the flocculators or behind distribution walls. (Baffles must be the plank stainless steel baffles provided by MRI which have the rotating bottom plank designed specifically for this purpose.

PARTIAL LIST OF CABLE-VAC™ INSTALLATIONS

INTRODUCTION:

Meurer Research, Inc. of Golden, Colorado was established in 1978 to design and manufacture equipment to enhance the performance of settling basins. This included sludge removal equipment. Since that time MRI has provided hundreds of sludge collector systems in the U.S, Canada, Mexico and abroad. In 2002, MRI introduced the "Hoseless Sludge Collector" which eliminated the flexible sludge hose. The following is a partial list of sludge collector installations, both units with hoses and Hoseless units:

Job Name/Location

Broomfield, CO Rocky Mtn Consultants	7 units	Rick Sofel (303) 464-5602
Erie, CO HDR Engineers	4 units	Joe Klefner (303) 665-3557
Weirton Steel	6 units	Mike McZkowski (304) 794-5754
Centennial, CO CH2M Hill	6 units	John Croullard (303) 791-7185
Dillon, CO Black & Veatch	2 units	Conde Benoist (970) 468-5794
Roseville, CA Montgomery Watson	4 units	Jim Mehl (916) 791-4586
Ft. Collins, CO T.E.C. Engineers	4 units	Jim Ford (970) 482-3141
Littlestown, PA Herbert, Rowland, Grubic	2 units	Mike Sneering (717) 359-5636

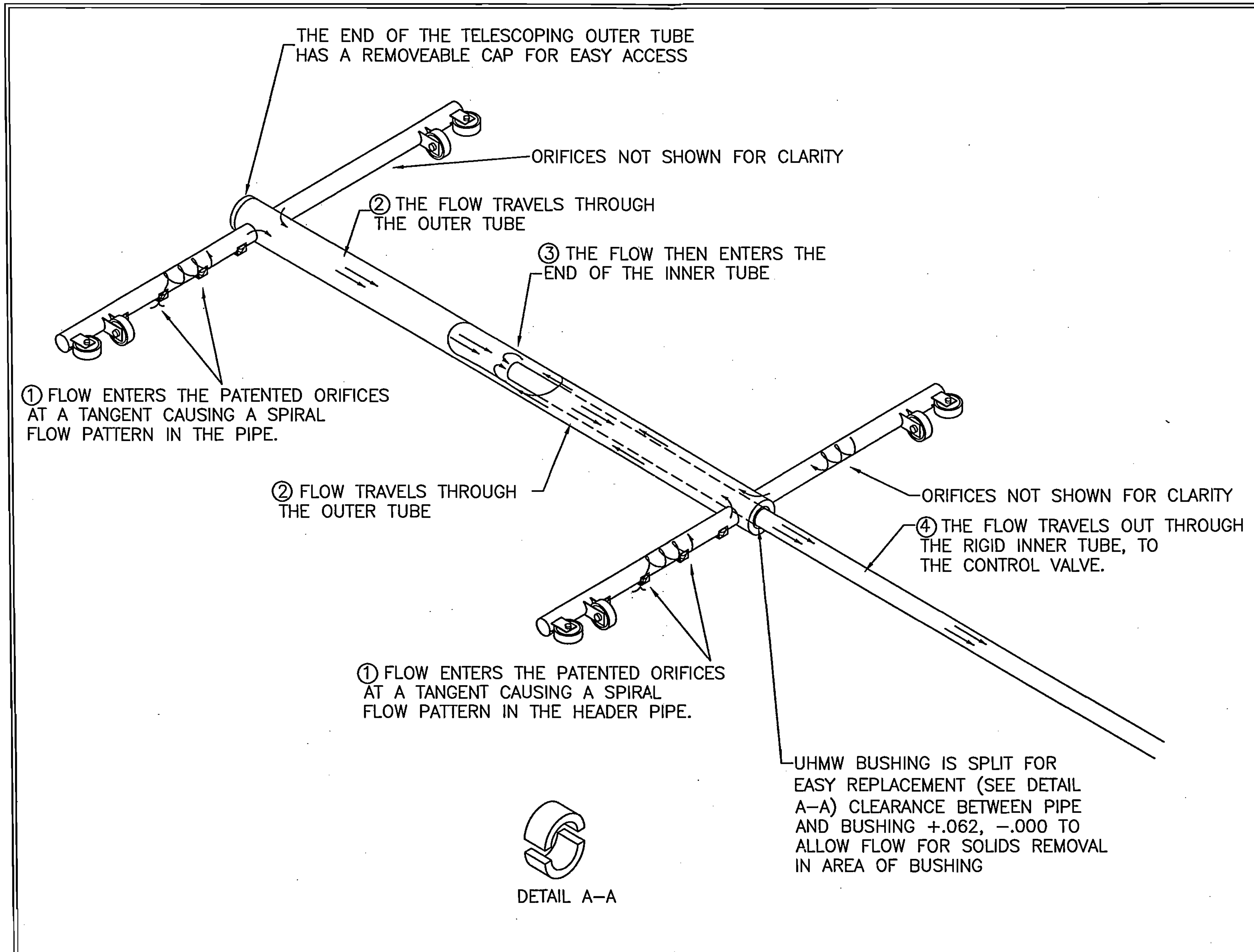
Eagle River WTP	4	Tom Fiddler (970) 949-5887
Wellington, CO Sear Brown/Bill Lane (970) 482-5922	2 units	Bill Bodkins (970) 568-3284
Louisville, CO Tetra Tech Engineers	2 units	Sid Copeland (303) 665-3199
Dallas Creek, CO (McLaughlin Engineers)	1 unit	Carl Cockle (970) 626-3889
Soldier's Canyon, CO TEC Engineers Kyle Snyder	4 units	Bob Reed (970) 482-3143
Golden WTP, CO TST Engineers	4 units	John McEncroe (303) 384-8186
Belleville, Ontario, Canada CH2M	2 units	Bob McEwen (613) 966-3657 x 2221

Hoseless Cable-Vac™ installations

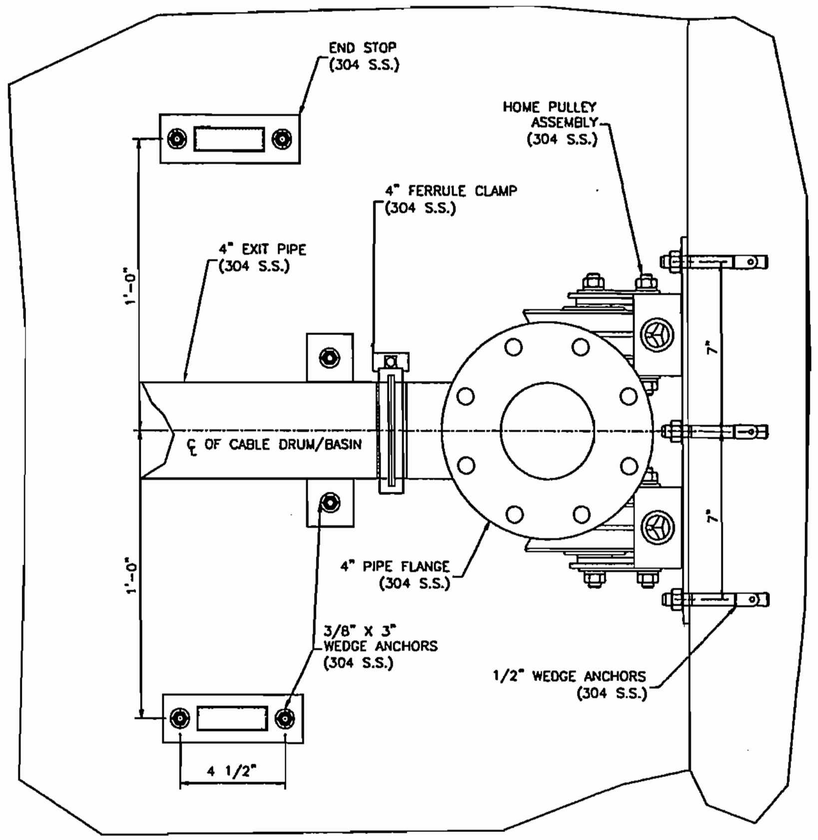
Forest Park, PA Gannett Fleming	12 units (1 year)	Wayne LeTourneau (215) 822-5950 x 10
WEB Water	2 installed, 4 in progress	Tom Tollefson (605) 229 4647 x 17
Rio Grand, TX Kyle Engineering	2 units	Duke Levy (228) 343-9691
Ralston Road WTP Arvada, CO Burns & McDonnell/ Paul Fischer (303)721-9292	4 units	Larry Hack/ Superintendent (720) 898-7820
L. G. Phillips Korea	14 units	Complete
Lander, WY Burns & McDonnell Paul Fischer (303) 721-9292	2	Complete

Lake Havasu, AZ Burns & McDonnell Paul Fischer (303) 721-9292	1	Complete
Longmont, CO Black & Veatch	4	New/In Progress
Augusta, GA MWH Engineers	4	New/In Progress
New Oxford, PA C.E.T. Engineers	2	New/In Progress
Carpenter Springs Tennessee	1	Complete
Kanawha, PA Gannett Fleming	1	Complete
Greeley, CO	6	New/In Progress
San Jose, CA CH2M Hill	2	Randy Houston (408) 316-0094
Grande Prairie WTP Texas	2	Jeff Johnston (780) 532-3996
Kennewick, WA	2	New/In Progress
Nelson, B.C.	2	New/In Progress
Lake Pleasant, AZ Black & Veatch	2	New/In Progress
El Paso, TX CH2M Hill	4	New/In Progress
Muskegon, MI Tetra Tech/Dennis Benoit	6	New/In Progress
Breese, IL	2	New/In Progress
Ft. Collins, CO CH2M/City	4	New/In Progress

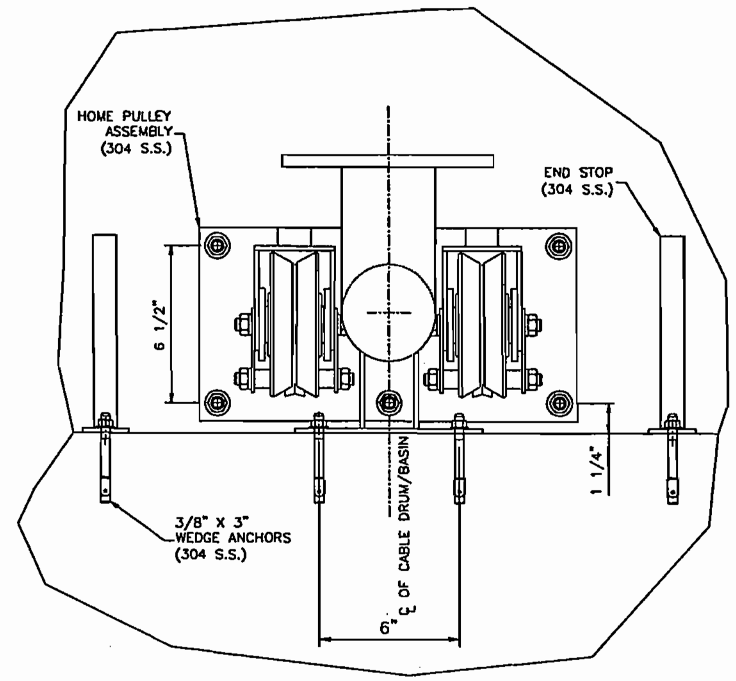
Arencia Foods	1	New/In Progress
Meadows, CO	1	New/In Progress
Castle Rock, CO	5	New/In Progress
New Baltimore, MI FTC&H		New/In Progress
Erie, CO Burns & McDonnell		New/In Progress



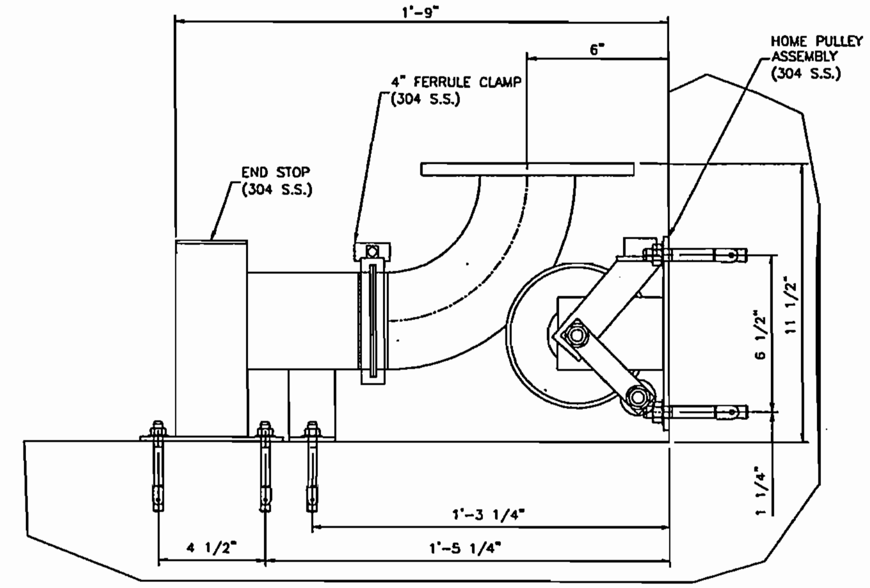
HOSELESS CABLE–VAC BY MEURER RESEARCH INC.



PLAN VIEW



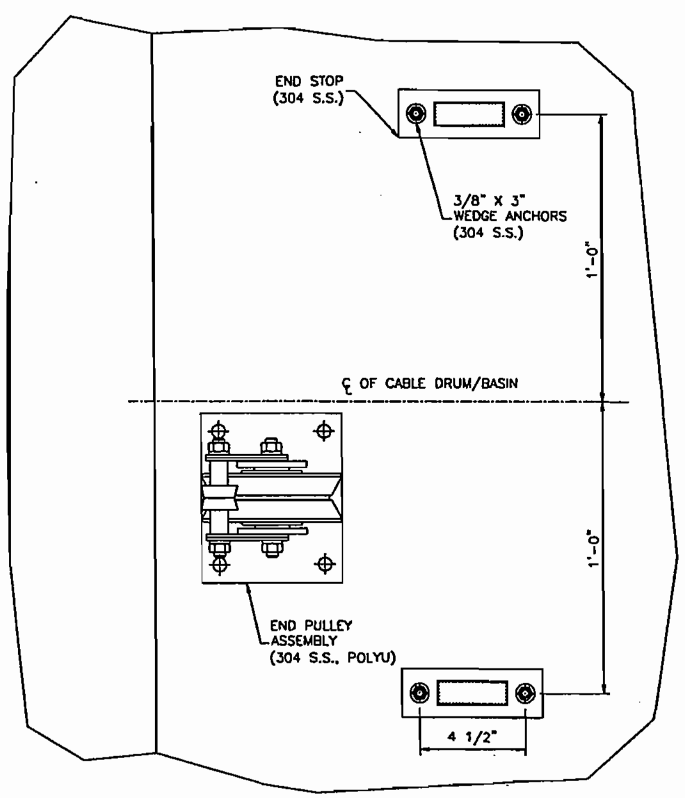
END VIEW



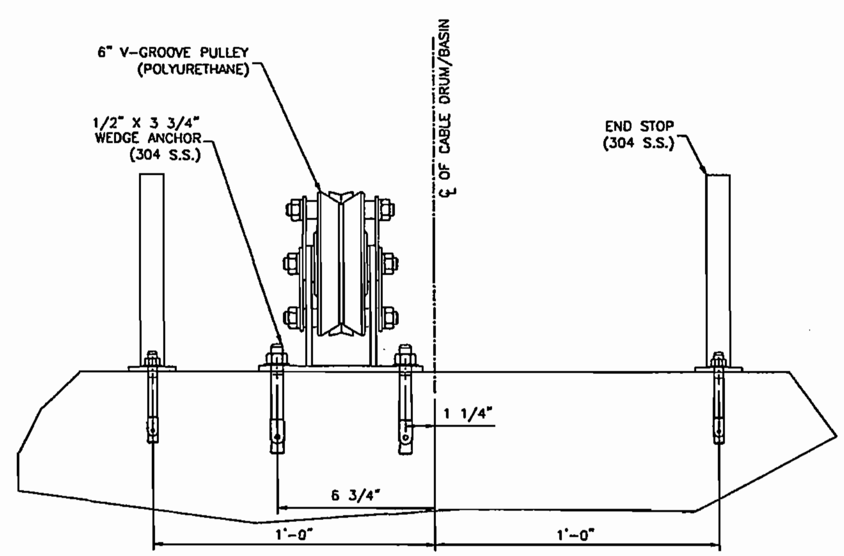
SIDE VIEW

SECTION DETAIL B/D10

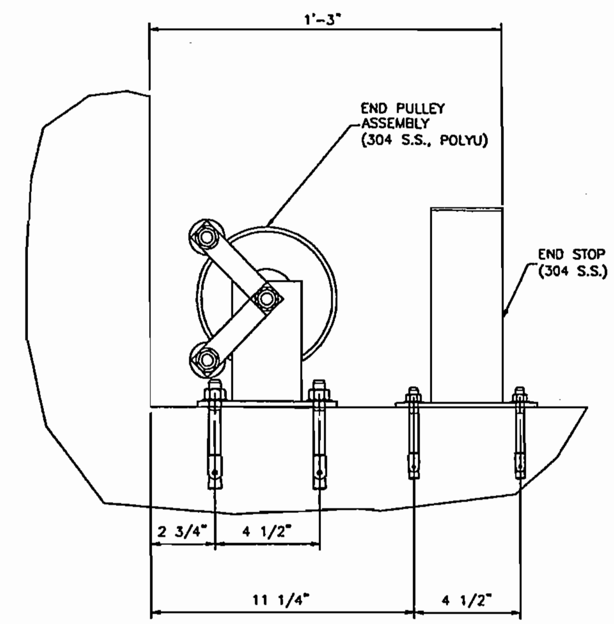
HOME PULLEY/ END STOP/ EXIT PIPE MOUNTING



PLAN VIEW



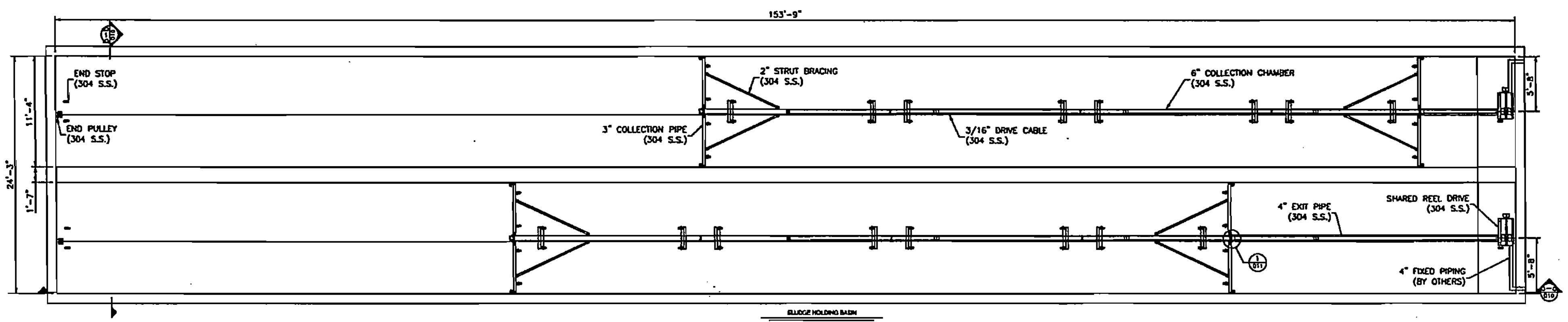
END VIEW

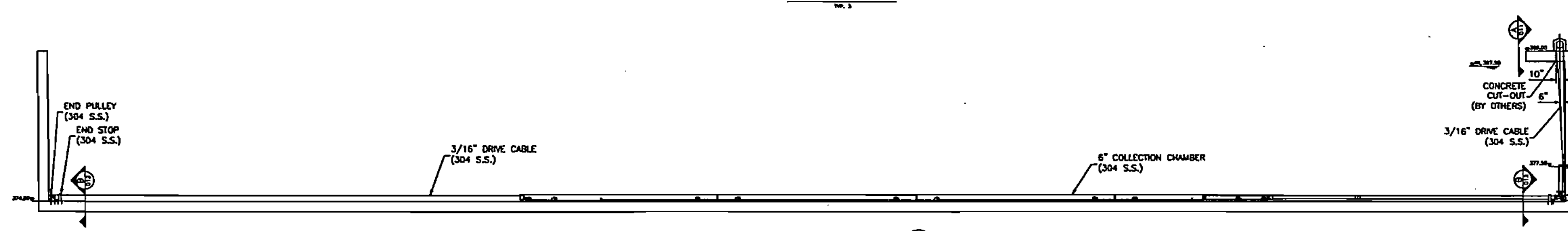


SIDE VIEW

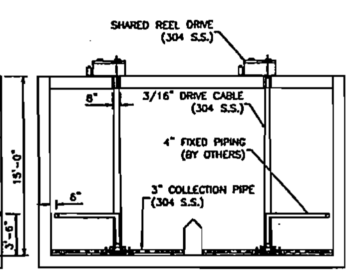
SECTION DETAIL C/D10

END PULLEY/END STOP

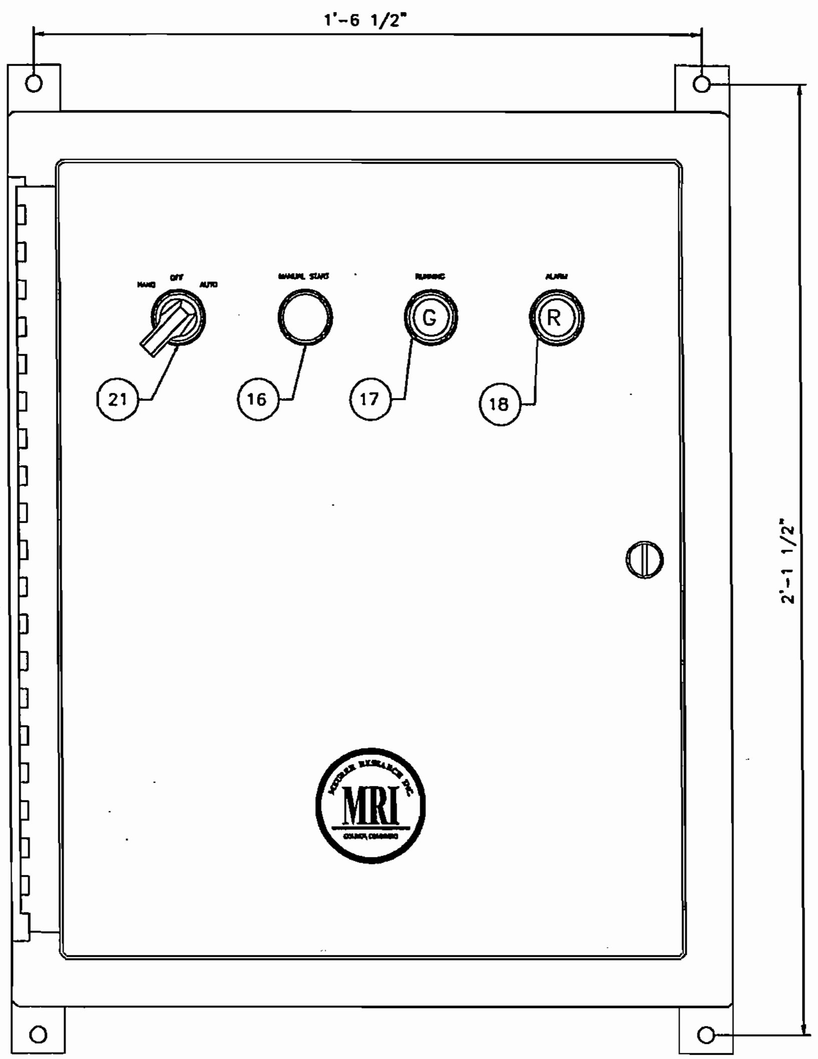




ILLUSTRATIVE SECTION A-A / D10



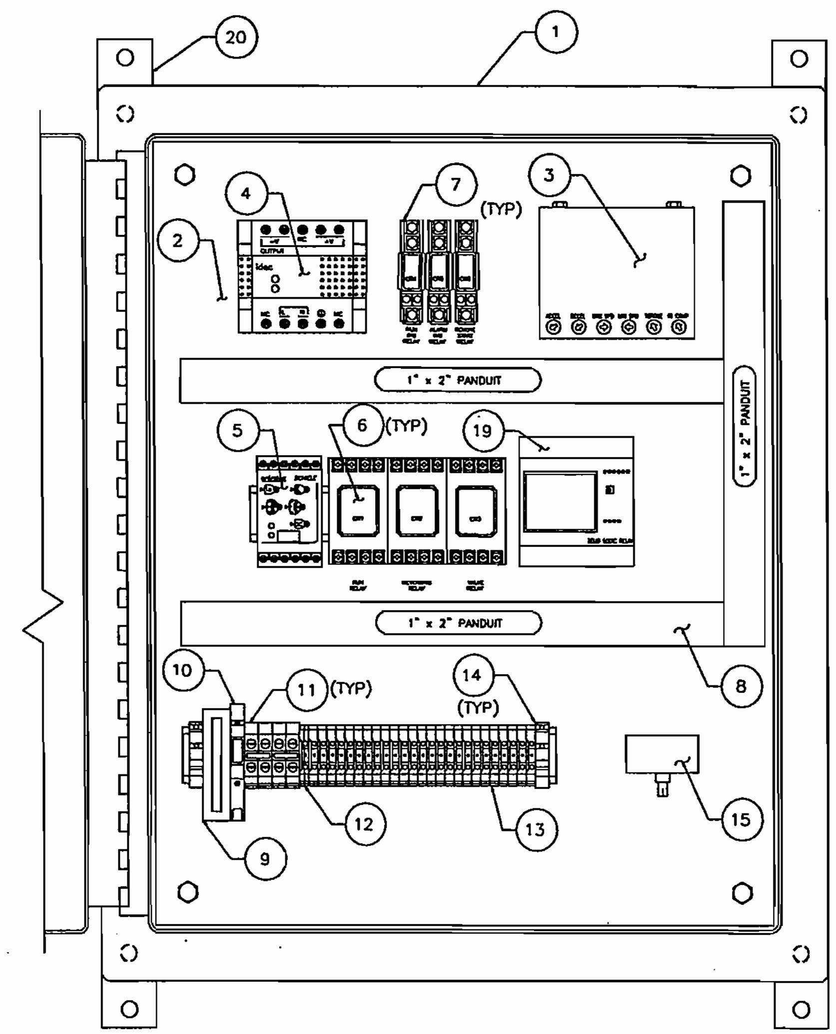
ILLUSTRATIVE SECTION B-B / D10



EXTERIOR VIEW

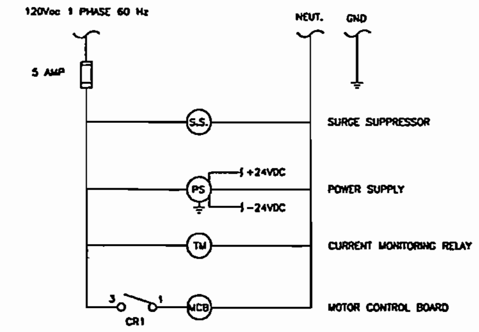
TOTAL QTY. (1)- 1 PER UNIT

SUPPLY- 120 Vac



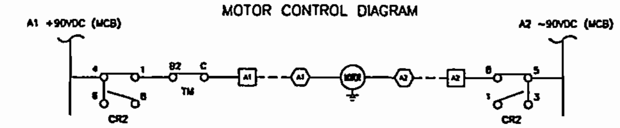
INTERIOR VIEW

POWER DIAGRAM

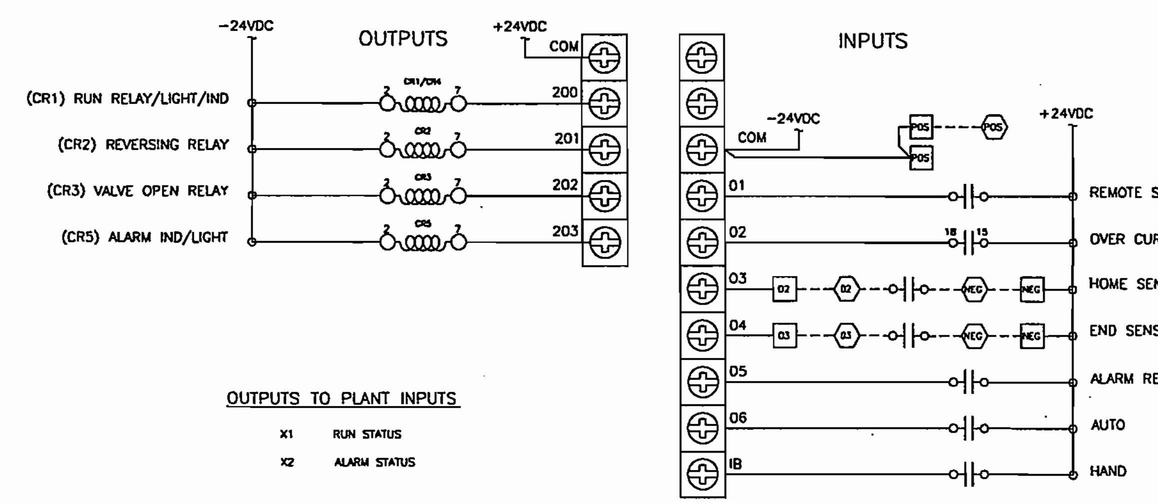


ITEM NO.	QUANTITY	DESCRIPTION	MANUFACTURER	MODEL NO.
1	1	24" x 20" x 8" NEMA 4X RATED 304 SS ENCL.	HOFFMAN	C-SD24208SS
2	1	24" X 20" SUB PANEL	HOFFMAN	CP-2420
3	1	MOTOR CONTROL BOARD	MINARIK	MM23001C
4	1	POWER SUPPLY	IDEC	PS5RD-24
5	1	CURRENT MONITORING RELAY	ENTRELEC	2 450 120 01
6	3	2-pole 24v RELAY w/BASE	IDEC	RR2P-U/SR2P06
7	3	1-pole 24v RELAY w/BASE	IDEC	RH1B-U/SH1B05
8	AR	2" x 1" WIRE WAY	PANDUIT	E1x2LG6
9	1	SURGE SUPPRESSER w/BASE	PHOENIX	2839334/2839282
10	1	CIRCUT BREAKER (5 AMP)	CBI	QZ113D205
11	4	POWER TERMINAL BLOCK	ENTRELEC	115129.14
12	1	GROUND TERMINAL BLOCK	ENTRELEC	165113.16
13	25	CONTROL TERMINAL BLOCK	ENTRELEC	115116.07
14	2	TERMINAL END BLOCK	ENTRELEC	103002.26
15	1	POTENTIOMETER (10K)	MINARIK	202-0031
16	1	PUSHBUTTON	CUTLER-HAMMER	10250T101/10250T53
17	1	INDICATOR LIGHT	CUTLER-HAMMER	10250T206NC2N
18	1	ILLUMINATED PUSHBUTTON	CUTLER-HAMMER	10250T476/C21/53
19	1	10 I/O LOGIC RELAY	SQUARE D	SR1B121BD
20	1	WALL BRACKET	RITTAL	2433000
21	1	3 POS SWITCH	CUTLER-HAMMER	10250T3011/T2

MOTOR CONTROL DIAGRAM



I/O CONTROL DIAGRAM

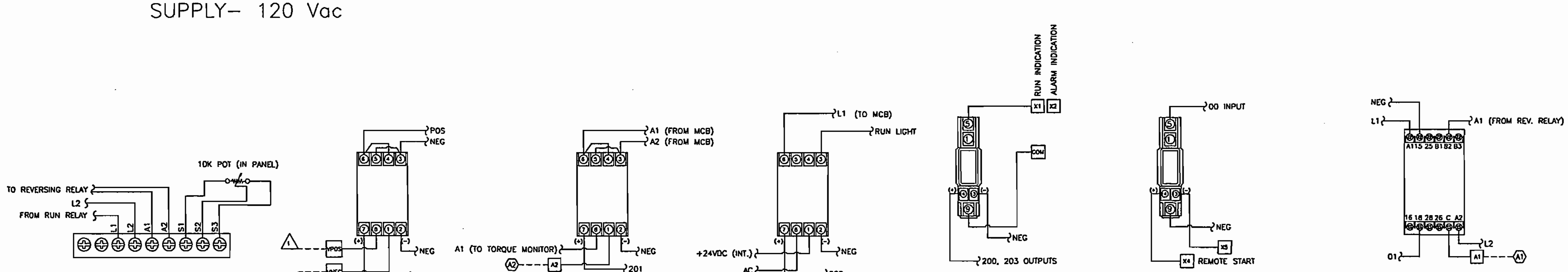


OUTPUTS TO PLANT INPUTS

X1 RUN STATUS
X2 ALARM STATUS

INPUTS FROM PLANT OUTPUTS

X3,X4 REMOTE START



MCB TERMINAL STRIP DETAIL — VALVE RELAY DETAIL — REVERSING RELAY DETAIL — RUN RELAY DETAIL — INDICATION RELAY DIAGRAM — REMOTE START RELAY DIAGRAM — CURRENT MONITORING RELAY DETAIL

WIRING SCHEMATIC KEY

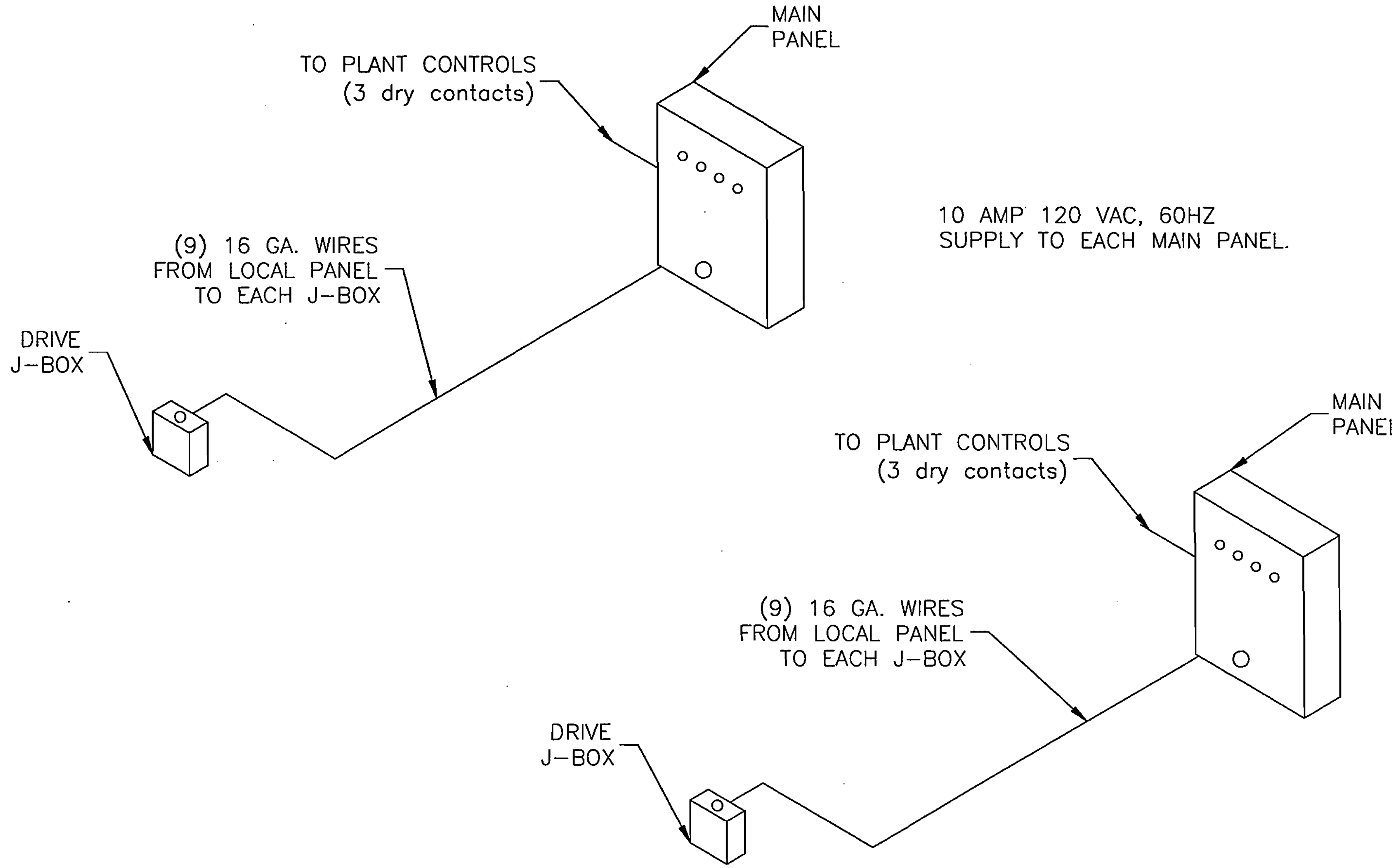
- (00) = TERMINAL IN JUNCTION BOX
- [00] = TERMINAL BLOCK IN SATELLITE PANEL
- △ = TERMINAL BLOCK IN SLUDGE VALVE
- —— = INTERNAL PANEL WIRING
- - - - = FIELD WIRING (NOT BY MRI)

1. POWER WIRING TO BE SIZED FOR LOAD (MIN. 14 GAUGE)
2. WIRING SHALL BE COLOR CODED AS FOLLOWS
   BLUE - DC CONTROL CIRCUITS (MIN. 16 GAUGE)
   RED - AC CONTROL CIRCUITS (MIN. 14 GAUGE)
   GREEN - EQUIPMENT GROUNDING CONDUCTORS
   WHITE - NEUTRAL
3. CONTROL CIRCUIT VOLTAGE IS 24 VDC.
4. PANEL DIMENSIONS ARE 24"h x 20"w x 8"d.

MEURER RESEARCH, INC.

PROJECT NAME: PROJECT NUMBER: PROJECT LOCATION:	DRAWN BY: SCALE: DATE:	REV 1: REV 2: REV 3:	Sludge Collector Control Panel Wiring & Layout

CUSTOMER NUMBER — DRAWING NUMBER



SYSTEM SCHEMATIC

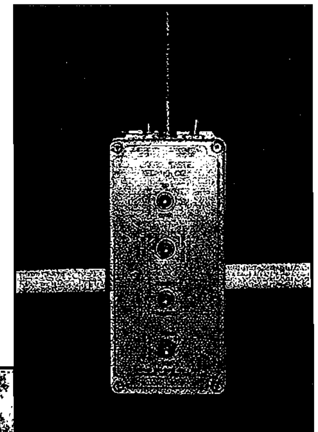
MEURER RESEARCH, INC.

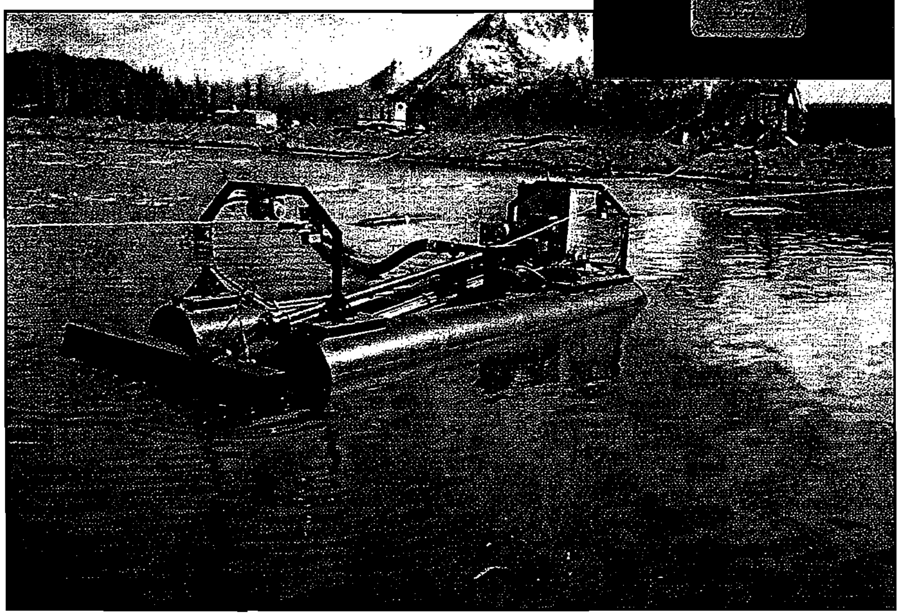
PROJECT NAME: PROJECT NUMBER: PROJECT LOCATION:	DRAWN BY: DFB SCALE: NTS DATE:	REV 1: REV 2: REV 3:	Control Plan Control System Overview	CUSTOMER NUMBER DRAWING NUMBER b10

LIQUID WASTE TECHNOLOGY®

PIT HOG® pumps sludge fast.™

Cost Effective Lagoon Sludge Removal





Features:

- Solids Control
- Radio Remote Control
- Cost Effective
- Effective Solids Removal
- Efficient Pump
- Unmanned Remote Control
- Low Maintenance
- Quality Components
- Ruggedly Built
- Easily Mobilized

LWT™ PIT HOG RUNT

LWT™ engineered the PIT HOG RUNT (Model RCLPE) for projects where economical dredging is the prime concern. This basic unit is designed to keep your sludge handling costs down and to meet your operational requirements. LWT™ builds with quality components for simple remote control operations, low maintenance and long term use.

LIQUID WASTE TECHNOLOGY®

BOX 250 422 MAIN ST. SOMERSET, WISCONSIN 54025 USA

715-247-5464 • 800-243-1406 • FAX: 715-247-3934

www.lwtpithog.com • info@lwtpithog.com

LWT™ PIT HOG RUNT

LWT™ used our vast experience in building dredging and sludge handling equipment when designing th RUNT. This simple, yet functional unit meets the need for periodic maintenance dredging at industrial and municipal facilities. The unit is simply moved and launched by available plant vehicles and equipment. The RUNT can be customized to meet your specific application needs with optional LWT™ automation and control systems. Bottom Sense™ protects pond liners and allows the auger head to automatically follow uneven bottom contours. The Solids Sense™ system automatically maintains a consistent slurry density. Both of these systems may be incorporated into our totally automated Lateral Sense™ dredging systems. This integrated electronic PLC control system is programmed to provide complete automation of physical dredging functions and movement (forward/reverse and lateral) to cover the entire pond, while unattended.

Specifications

PHYSICAL

- Maximum working depth, feet: 12' to 24' (2.44m)
- Floatation: Two Foam Filled Pontoons 28" (584 mm) Dia. x 16'-0" (4.88 m) OAL x 10 guage
- Weight: 3,265 Lbs. (1481 Kg)
- Operational Draft: 13" (330 mm)
- Length, Overall: 19'-7" (5.97 m)
- Transport Width: 7'-0" (2.13 m)
- Height: 5'-4 1/4" (1.63 m)
- Heavy Duty Steel Frame

POWER

- 230/460 VAC, 3 Phase, 60 Hz Electric Power
- Slurry Pump Motor: 20 HP (14.9 kw) TEFC (optional 10 to 40 HP)
- Hydraulic System Motor: 7-1/2 HP (5.6 kw) TEFC

CONTROL

- Radio Remote Control for Speed and Direction (Hand-held)
- Optional Automated Control Systems

SLURRY PUMP

- Centrifugal, Enclosed Impeller Pump (High Efficiency)
- Cast Iron
- Pump Speed: 1750 RPM
- Suction & Discharge Diameter: 4" (102 mm)
- Impeller Diameter: 9.5" (241 mm)
- Sphere Size (max): 3" (76 mm)
- Typical Head - Capacities: with 20 HP
  - 900 GPM @ 55 ft. (56.8 l/s@16.8 m) Head (SpG 1.0) (73% eff.)
  - 300 GPM @ 84 ft. (18.9 l/s@25.6 m) Head (SpG 1.0) (63% eff.)
  - (Optional) 1000 GPM Chopper Pump 40 HP

AUGER HEAD

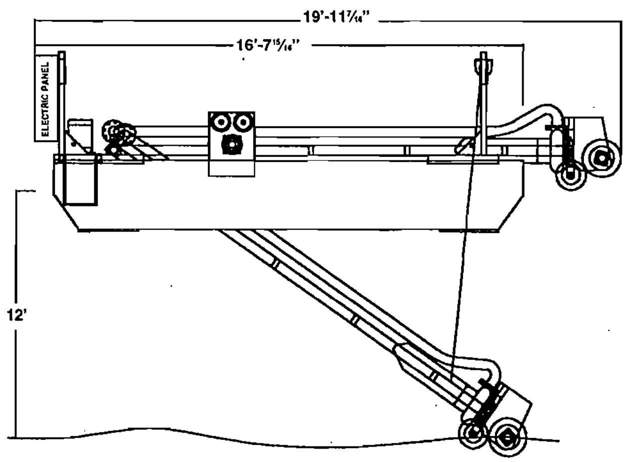
Auger with Shroud
- Speed: 50 RPM
- Length, Overall: 4'-0" (1.22 m) (Optional 8' Width)

PROPULSION

- Treble Sheave Hydraulic Winch w/ 5/16" (8 mm) Diameter Wire Rope
- Hydralic Motor - Traverse Speed,Variable from 0 to 30 FMP (0 to 9.1 m/min.)

HYDRAULICS

- Three Circuits: Auger-Cutter, Traverse Winch and Hoist Winch
- Flow Controls: 3-Position, 4-Way Directional Control Valves w/Electronic Flow, Control for Winch Speed



Call and ask for additional information. LWT™ can customize the specifications for your specific application. Contact LWT™ via phone, fax or Email and let us address your needs.

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L.W.T.
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Somerset, Wisconsin 54025

PIT HOG® pumps sludge fast.

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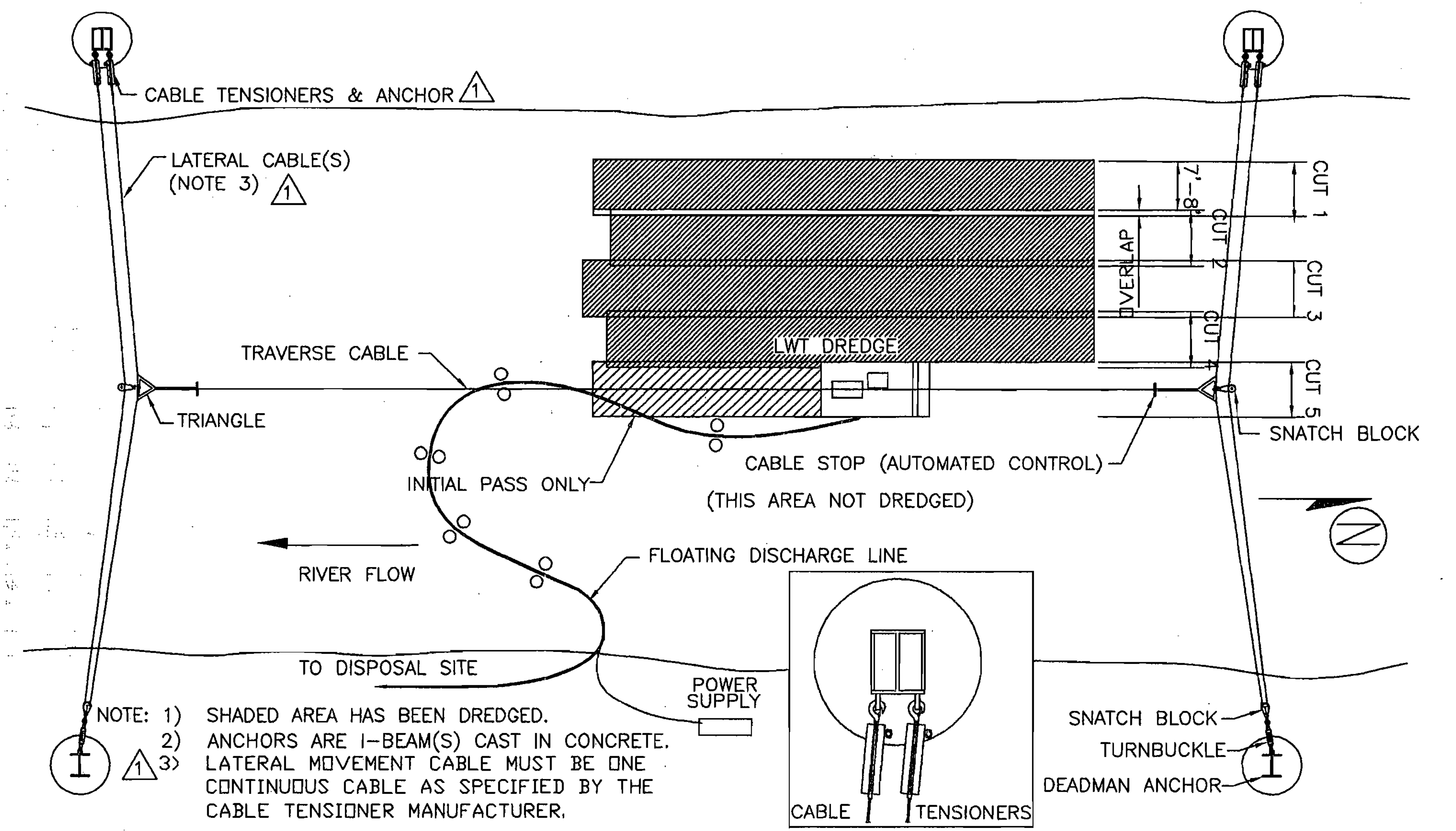

SCALE: ±

DECIMAL

FRACTIONAL ±

ANGULAR ±

TOLERANCES EXCEPT AS NOTED

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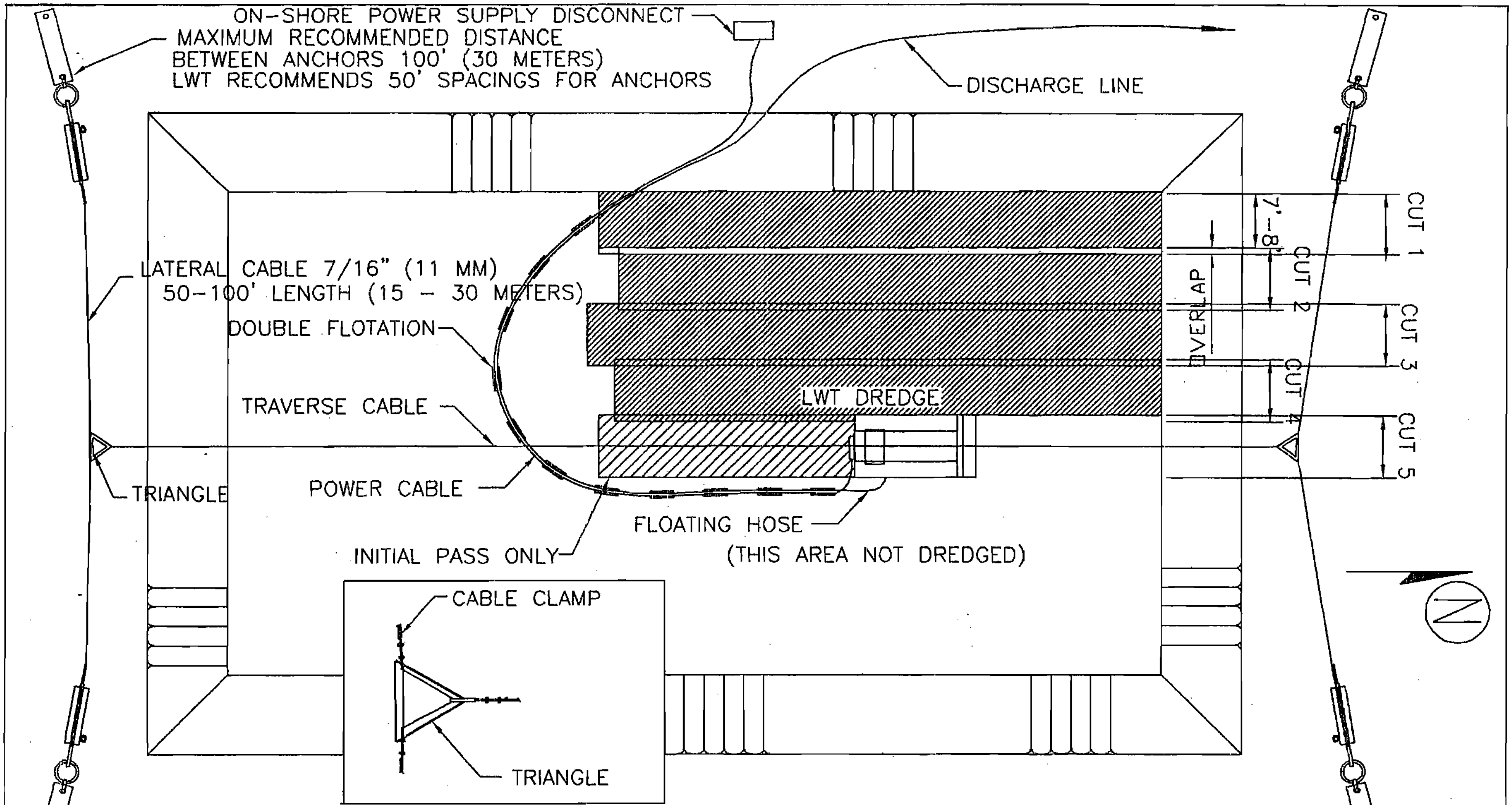
SOMERSET, WISCONSIN 54025

LWT PIT HOG DREDGING SCHEME
LATERAL MOVE LAYOUT
4 ANCHORS AND 4 MANUAL WINCHES

DATE: 3-31-98	DRAWN BY: CO'B	DRAWING NUMBER 3663
REVISED: 1-7-03	CHECKED BY:	



NOTE: 1) SHADED AREA IN NORTH END OF POND HAS ALREADY BEEN DREDGED.
2) DREDGE MUST BE TURNED 180° TO DREDGE SOUTH END OF POND.

SCALE:

DECIMAL ± | FRACTIONAL ± | ANGULAR ± — TOLERANCES EXCEPT AS NOTED

LIQUID WASTE TECHNOLOGY INC.

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SOMERSET, WISCONSIN 54025

LWT PIT HOG POND DREDGING SCHEME
MANUAL LATERAL MOVE LAYOUT
FOUR ANCHORS WITH CABLE TENSIONERS
LIGHT APPLICATION

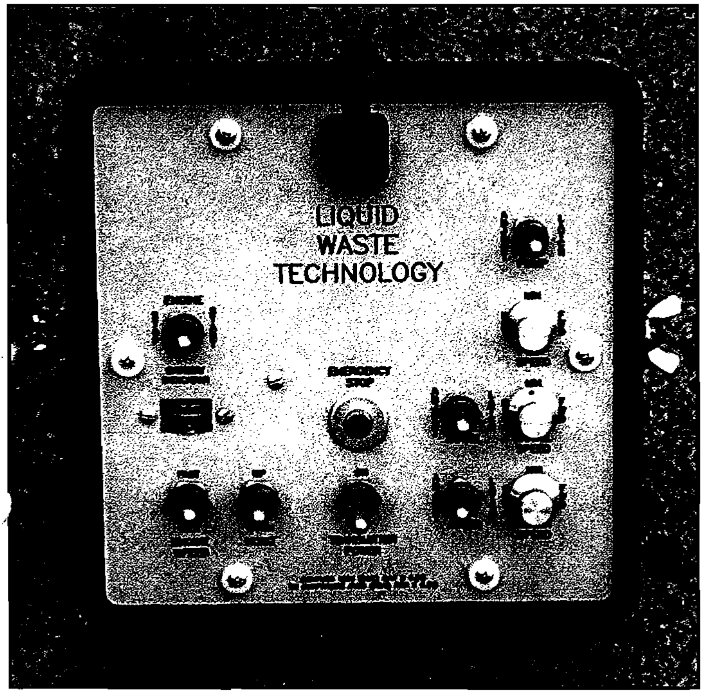
DATE: 3-8-00	DRAWN BY: J.J.C.	DRAWING NUMBER
REVISED:	CHECKED BY:	3856 3 OF 3

PIT HOG pumps sludge fast.™

LWT™ PIT HOG SENSE™ SYSTEMS

RADIO, SOLIDS & DEPTH SENSING

RADIO REMOTE SENSE™ LWT™ has designed this system to allow complete remote control of the dredging operation with a portable radio system. RADIO REMOTE SENSE™ controls the functions of speed and direction of the slurry pump, auger and travel, power on/off and the dredging depth. The hand held control



panel may be operated at distance of at least 2,000 feet from the dredging unit, with three revolving lights on board the dredge indicating when the auger, pump, and travel motors are running. As LWT™ integrates electronic control systems on its PIT HOG equipment, this control system may be used to drive either electric or engine power plants .

SOLIDS SENSE™ Incorporation of LWT's SOLIDS SENSE™ solids control dredging system will automatically work to maintain delivery of a constant solids density. Set the desired solids density concentration level from an adjustable range and the control system will continually respond to maintain that level. The SOLIDS SENSE™ control system reacts faster than an operator and virtually eliminates the need for hands on operator control while dredging to optimize solids production.

BOTTOM SENSE™ Use LWT's BOTTOM SENSE™ system to protect pond bottoms and liners. Switch on BOTTOM SENSE™ and the sensing system will automatically raise the auger head when the bottom is contacted, lower the head when it senses that the bottom is not present, following the bottom contour.

AUTO SENSE™ Cable stops are set on the traverse cable at the limits of the area to be dredged. When the dredge contacts the forward stop the unit will automatically stop forward travel, raise the auger, slow the slurry pump speed, and reverse at a high rate of travel until it makes contact with the rear stop. The dredge will then lower the auger head and shut down (or alternatively wait for a command to go forward).

LATERAL SENSE™ When the project application calls for automated lateral movement LWT™ can incorporate and control this function by installing an on board radio system.

COMBINE SENSE FEATURES FOR TOTAL REMOTE CONTROL BY RADIO Combine these features to for efficient automated dredging, while minimizing labor. The dredge travels forward with the SOLIDS SENSE™ system controlling production and travel across the pond, while automatically maximizing solids. BOTTOM SENSE™ protects the pond bottom and follows pond contours. LATERAL SENSE™ is combined with AUTO SENSE™ and the other systems described above for complete control cable free automation. Utilizing these features effectively minimizes the labor requirement and the hands on intensity of any project while maintaining optimum production levels.

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PIT HOG™
pumps sludge fast.

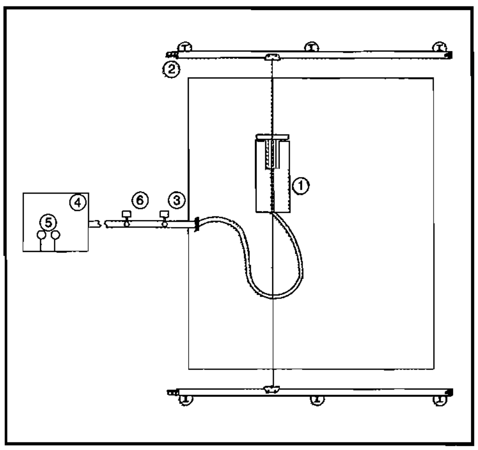
LWT™ PIT HOG AUTOMATED SYSTEMS

FOR SOLIDS CONTROL DREDGING

CONCEPT FOR AUTOMATED SOLIDS CONTROL DREDGING LWT™ has specifically designed this system to continuously deliver consistent solids and flow volumes. Totally automated, and remote operations are achieved with low voltage electronic controls. A PLC (programmable logic controller) is programmed to provide control over the dredges automated functions and control loops, minimizing labor and maximizing production of solids at the set flow rate. This system is ideally suited for providing material to both de-watering or continuous process systems. LWT™ supplies components and will provide customized operational features to meet your specific operational needs.

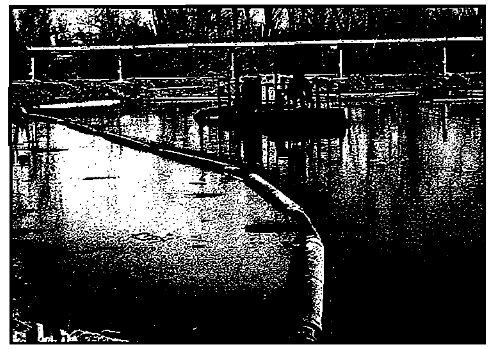
AUTOMATIC REMOTE CONTROL DREDGING

Settled solids are excavated from the lagoon bottom by the LWT™ dredging unit (1) which may be operated either remotely on shore/and or manually on board. The units forward and reverse travel, as well as, its side to side lateral movements are totally automated by a steel rail system (2) located on the ends of the lagoon. Controlled by the PLC, the electronic control system directs the dredge to make "sweeps" covering the entire lagoon, automatically without an operator. The dredge is programmed to travel forward at a controlled speed, taking eight foot wide passes through the solids bed. When the dredge comes to the end of the run it automatically, goes into high speed reverse, slows the pumping rate, and travels until it reaches the initial starting point for that pass. The dredge then raises the auger head, shifts laterally to the starting point of the next pass, lowers the auger head, restores the slurry pump speed and moves forward to continue dredging. Incorporation of LWT's BOTTOM SENSE™ will "float" the auger head and allow it to follow the bottom contour or stay a set depth off the bottom.

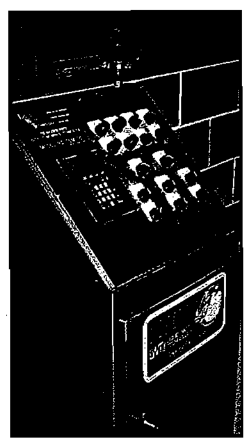


AUTOMATIC SOLIDS AND FLOW CONTROL

The solids/flow control system is also controlled by the PLC. The dredge travel function is electronically linked to the density meter (3) providing an electronic signal proportional to the density of the slurry, to the PLC. The PLC control loop compares the incoming signal to the adjustable solids set point and continuously regulates the solids delivered by the dredge. The same principle is used to regulate the flow volume. An electronic magnetic induction flow meter (6) provides feedback to the PLC control loop which, in turn, regulates the flow delivered from the dredge slurry pump.



DISPLAY AND CONTROLS The NEMA rated control panel for the Automated Rail Lateral Move System has displays and input controls for the speed and direction of the slurry pump, auger and the traverse system. An alphanumeric readout displays slurry density, slurry flow rate, and shutdown fault messages. The display may optionally show the location of dredge in the pond, depth of operations, slurry pump pressure or other required functional feedback data. This system is compatible for a continuous process system or supplying material to a tank for batch feeding a dewatering system (4). For a batching application, level monitors (5) may signal the dredge to run until the tank is full, then turn off until the low level sensor signal turns the dredge back on again.



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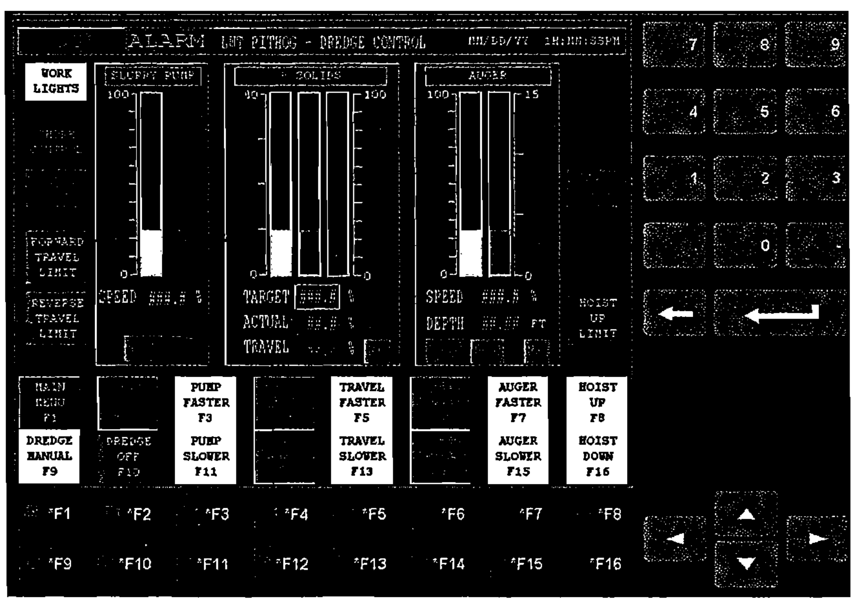
Automated Lagoon Dredging System:

Design Features and Requirements

by Liquid Waste Technology



Liquid Waste Technology (LWT) has pioneered the development of fully automated dredging systems (and radio remote controlled) for the most efficient and safe cleanup of sludge lagoons. These systems are state-of-the-art, and LWT has many successful installations so that reliable operations are the norm.

LWT utilizes a monitoring screen (R) showing automated dredging features with mouse controls to click on image to see enlargement. The objectives for most automated dredging systems include:

*Less human labor input, so costs less to operate;
*Safer because less human exposure and fewer compliance issues;
*Steady solids output so more efficient sludge processing;
*Reduced polymer use, so significant savings (hard cost reductions in polymer use alone has frequently yielded one year payback or less on investment required);
*Optimal sludge percentages reduce tank truck transport costs (minimize water weight);
*Better record keeping capabilities.

Dredge Slurry Pump

LWT has different pump sizes and options to fit your needs. The solids handling impeller is capable of passing solids sizes generally 3.0 in. (76 mm) or less. The pump casing, impeller and bearing housing will be cast iron or optional stainless steel.

The hydraulic control system provides independent, variable speed capability within the pump's design curve, with an electric speed control. The pump speed can be set and then maintained without further hands-on control, with the ability to adjust speed easily.

Dredge Controls: Shore Control Panel

All controls necessary to start, stop and control platform speed and operation are on a shore-mounted control panel. The control panel has electronic controls over the hydraulic valves which control the hydraulic functions of the dredge (i.e. pump, auger, traverse system and pump hoist winch) and the lateral move system.

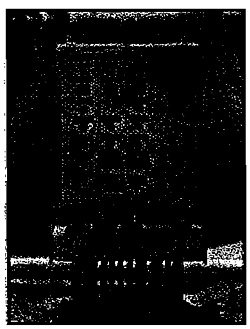
The Shore Control Panel should have the following functions, controls or displays:

*On and off power switches with indicator lights;

*Slurry pump variable speed;

*Raise/lower auger excavator;

*Auger excavator speed control speed rotary throttle, forward/reverse;



Shore Control Panel

*Traverse speed control, forward/reverse;

*Select on board/shore control (if controlled on board) Selector switch hand/automatic control, lateral move function;

*Indicator lift for lateral move operation;

*Automatic lateral move shift direction switch left/right;

*Manual lateral move start/stop.

On board the floating dredge has the following functions, or gauges:

*Pressure on circuit for each hydraulic pump;

*Hydraulic oil level;

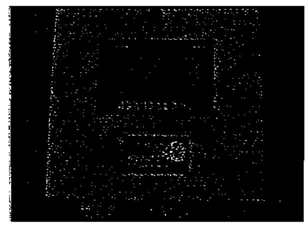
*Safety shutdown for hydrostatic drive and fluid level;

*Combination disconnect, starter and overload.

Programmable Logic Controller (PLC)

The dredge can be controlled with mechanical switches or with a PLC .

With the inclusion of the PLC, the system can also be tied to a solids control loop program and/or flow control program.



PLC

All the controls are in an on-board control panel at a second shore mounted remote control panel located with the owner's input. There are corresponding switches mounted on the shore control panel selecting operations between the panels.

The On-Board Control Panel (or radio remote hand held panel) has the following functions, controls and displays;

*On and off power switches with indicator lights;

*Slurry pump variable speed control;

*Elevation hoist raise/lower;

*Auger speed control, forward/reverse;

*Traverse speed control, forward/reverse;

*Selector switch hand/automatic control, lateral move function;

*Indicator light for lateral move operation;

*Automatic lateral move shift direction switch left/right;

*Manual lateral move start/stop

*Slurry pressure gauge (optional).

*Slurry density meter (optional).

The Remote Control Panel typically has the following functions, controls, and displays:

*On and off power switches with indicator lights;

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*Pumper on indicator light;

*Slurry pump with variable speed control.

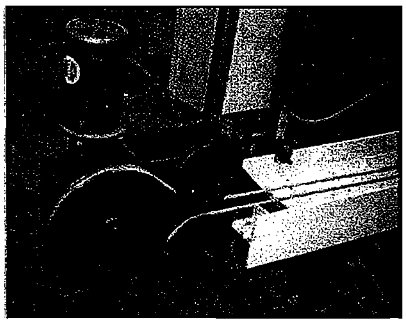
*General pumper system warning light display and alarm horn which activate due to any of the following conditions:

(a.) Failure due to low hydraulic oil level or temperature;

(b.) Failure of lateral move system.

Automated Rail Type Lateral Move System

One of the keys to LWT's automated lagoon pumping system is an automated lateral movement system designed for a completely automated movement of one sweep over the lagoon when combined with a traverse system on the dredge.



Triple Sheave Winch

The lateral system consists of an anchored steel rail system on each of the short ends of the lagoon of sufficient strength to handle the tension forces developed by the pumping system.

The system can be set to be operated in a manual or automated mode.

The system sequence is activated by the proximity switches, mounted on the front and rear of the unit, sensing the cable stops that are mounted on the traverse cable.

After a forward pass across the pond, the system automatically performs the following dredge functions:

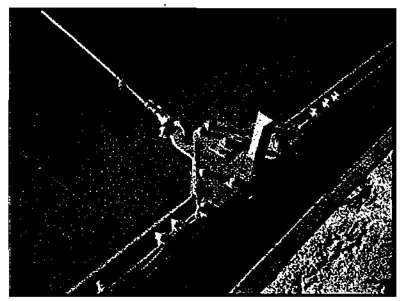
(a.) Reverse and increase travel speed, slow the pumping rate, travel to pass start point.

(b.) Then raises the auger head, side shifts the selected direction and distance, lowers the auger head, and starts the next run, or optionally, the unit could wait for a start command.

The distance of lateral movement is controlled in the shore mounted control box by an adjustable run timer.

Trolleys

The lateral move system consists of steel rail and anchor post, cables, pulleys, turn-buckles, controls, drive motors, disconnects, reduction and triple sheave drive winch, limit sensors, trolleys, galvanized cable and miscellaneous accessories as required for a complete system.

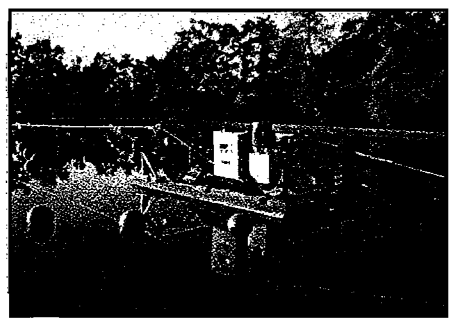


Trolleys

The owner provides incoming electric power to the switches and winch motors. Each rail has an electric motor driven gear reduction box with triple sheave winch and trolley.

The traverse cable for the pumping unit attaches to this trolley and can be tensioned with a grip hoist endless winch.

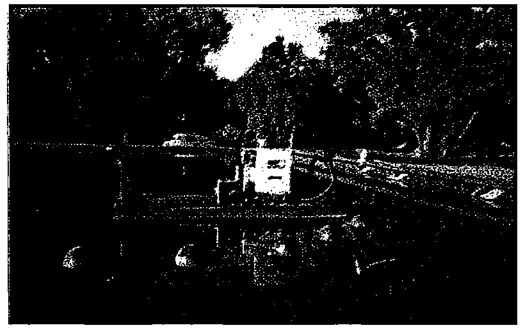
The on-shore control panel is housed in a *NEMA* enclosure with controls and switches mounted on the face of the panel.



Proximity Switches

Watertight sealed fittings are used where conduit enters the enclosures and any unused openings have watertight sealed covers. The main power supply and function control cable furnishes power from the disconnect on shore to the floating dredge.

The float ball system in the lagoon is attached to the discharge hose and power cable. The power cable is



Cable Floats

Automated Lagoon Dredging System:

Design Features and Requirements *Continued*

properly sized for a maximum of 3% voltage drop with color-coded conductor insulation.

The cable should be UL listed, type W as a minimum. Cables shall include strain reliefs and may be optionally equipped with quick couple pin connectors with matching receptacles on the appropriate shore boxes.

The dredge disconnect has double lugs to provide power to both the pump motor starter and the auxiliary equipment.

The switch is a three-pole manual switch rated for power amperes, 600 volts, 60 Hz, with quick-make and quick-break mechanism and housed in a NEMA enclosure. The starter typically has 120 volt control.

On board, 120 volt power is supplied by a dry type transformer rated at a minimum of 3 KVA.

The following dredge system features chosen by the **Sioux Falls, South Dakota** project owner are optional but increase efficiency:

Automated Bottom Sensor

The shroud is equipped with a 10" (254) mm) roller system to prevent contact and hold the shroud 6" (152) off the bottom of the work area. The auger is equipped with a sensor unit that will automatically raise or *float* the head when contacting the bottom of the pond.

Gauge Wheels

Adjusting guide wheels mounted to the shroud hold the shroud off pond bottom and protect the liner or bottom.

PLC

The PLC is housed in the shore control panel and is programmed to control the automated traverse sequence and report the specific failure message to the shutdown read out. The PLC system will take control signals from shore, convert to voltage or 4-20 voltage or 4-20 ma signal, and communicate them to the dredge where they are converted back to DC to operate the electronic proportional valve.

Upon occurrence of one of the following failures the beacon light will activate, and the monitor will read out the fault:

* Hydraulic oil level
* Hydraulic oil temperature high and low;
* Hydraulic oil high pressure and low pressure;
* Lateral move motor failure.

The same PLC is used with a solids control loop and a flow control loop.

Solids Sense Solids Control Loop

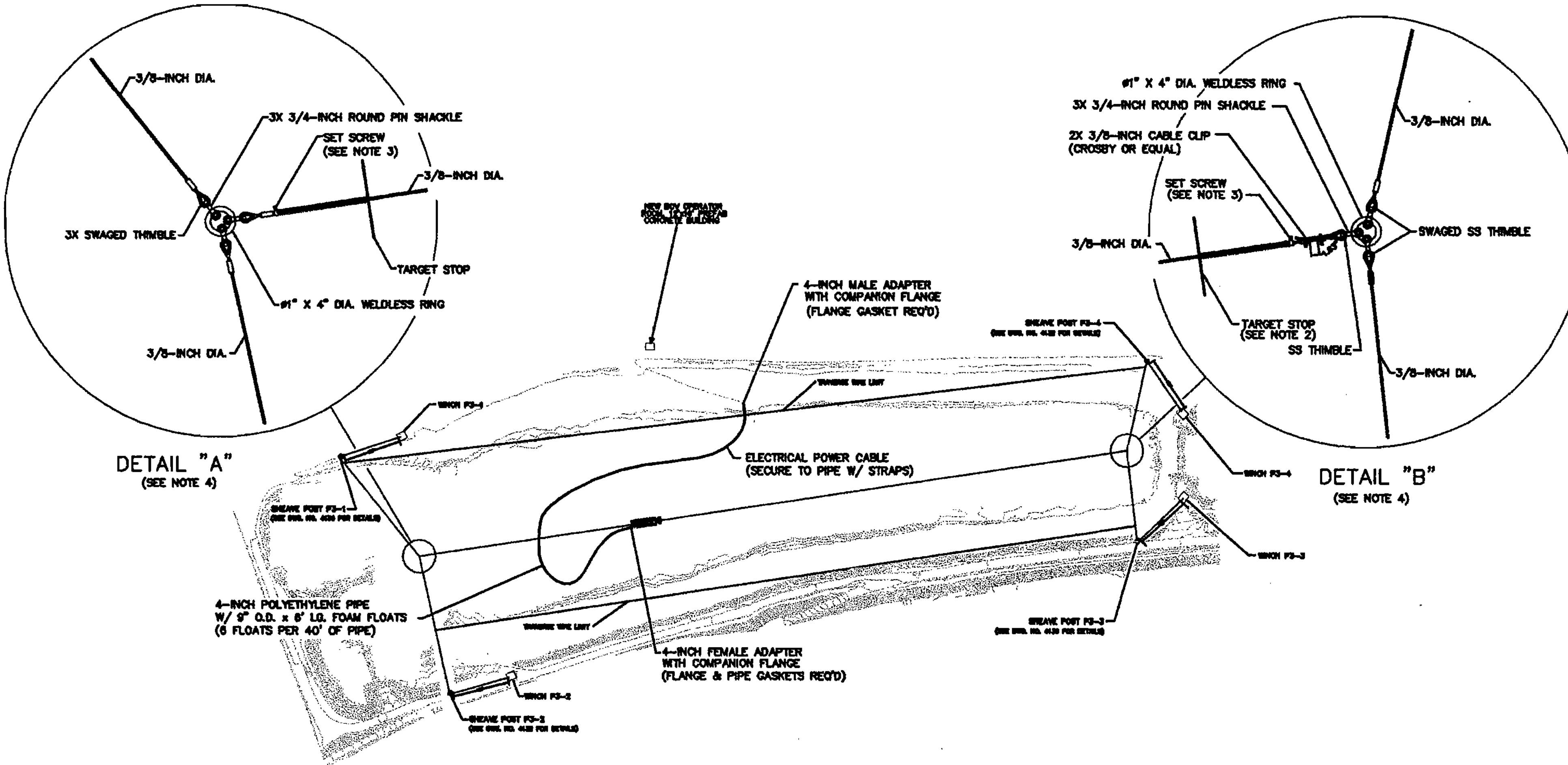
This system uses a density meter and a PLC. The LWT density meter feeds density data to the PLC. The PLC is programmed to process the data.

If the density is lower than the adjustable targe value, the PLC automatically commands changes in the lagoon pumpers' operational functions, which are designed to shift the density results toward the target value, (i.e., increase dredge forward movement to increase solids density).

Flow Control Loop

This system required a magnetic induction flow meter and a PLC. The LWT flow meter feeds flow data to the PLC.

The PLC is programmed to process data. If the flow is lower than the adjustable target value, the PLC will automatically command changes in the dredges operational functions, which are designed to shift the flow rate results toward the target value.



NOTES:

1. THE LENGTH OF THE FLOATING PIPELINE MUST BE SUFFICIENT TO ALLOW THE DREDGE TO TRAVERSE THE DESIRED DISTANCE AND TO MOVE LATERALLY ACROSS THE POND. MID-POND TRANSITION POINT FROM WATER TO LAND IS ASSUMED-- ADJUST TO ACTUAL CONDITONS.
2. INSTALL TARGET STOPS ON TRAVERSE WIRE BEFORE INSTALLING SS THIMBLE AND CABLE CLIPS AT FREE END OF WIRE ROPE. STEEL DISCS MUST FACE DREDGE!
3. WHEN TARGET STOP IS PROPERLY POSITIONED, TIGHTEN SET SCREW.
4. DETAILS "A" OR "B" CAN BE AT EITHER END OF THE POND.
5. WIRE ROPE TO BE 6X37 IWRC eips GALVANIZED.
6. STAINLESS STEEL THIMBLES REQUIRED.

REV.	DATE	DESCRIPTION	APP.

10-15-03
CFO
330

LIQUID WASTE TECHNOLOGY, LLC
BOX 250 422 MAIN STREET
SOMERSET, WISCONSIN 54025

ORANGE COUNTY WATER DISTRICT
BCV-7 CABLE RIGGING & PIPE ASSEMBLY
DESILTING POND #3

4142

OF 1

Appendix D
Forebay HEADCELL ™ Support Information

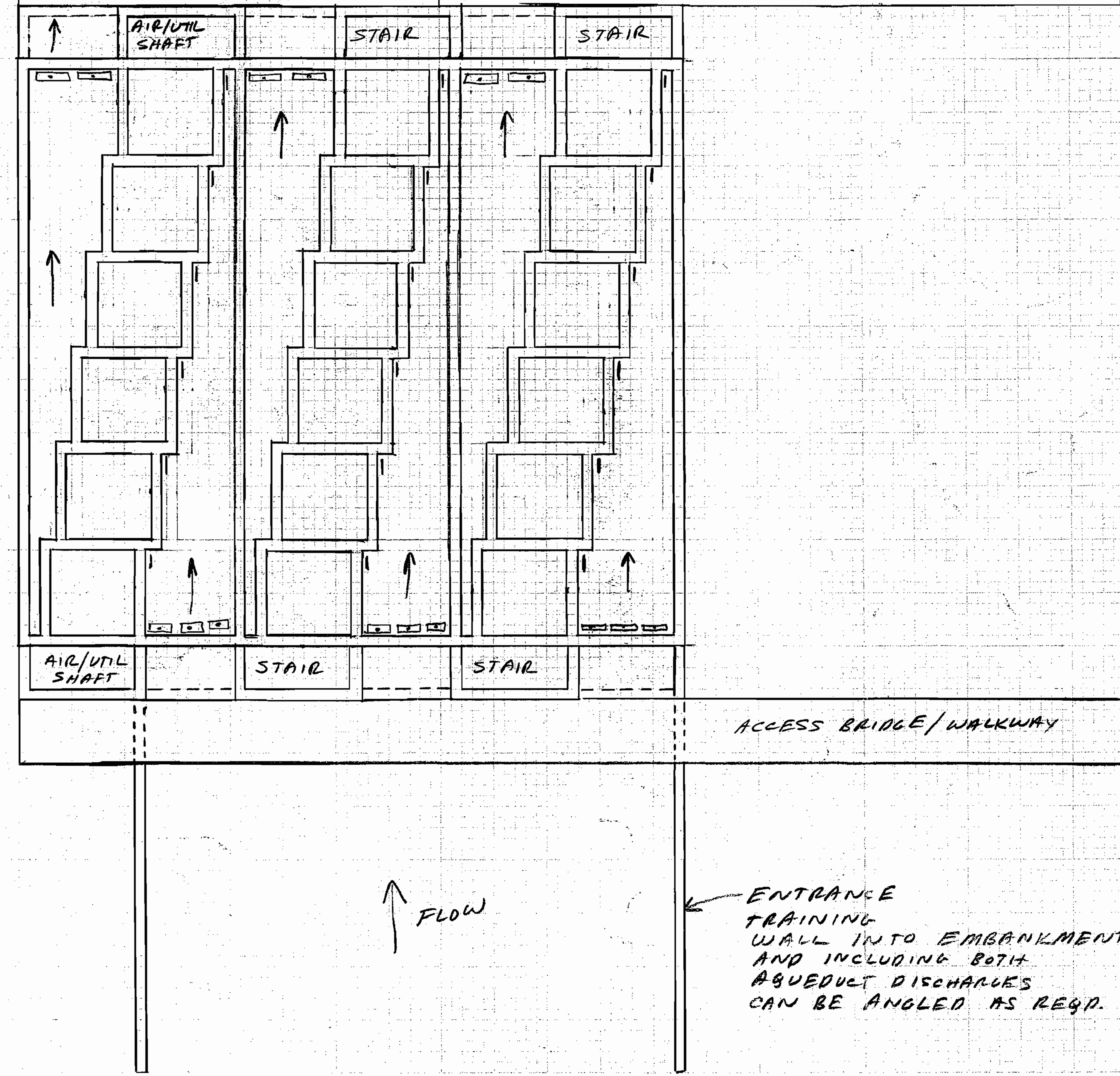
WASHINGTON AQUEDUCT AUTHORITY

Date: 06/04/2004
By: AMW

Conceptual Cost Estimate for Raw Water Silt Removal System						
Description	Quantity - Unit	Unit Price	Costs	Installation	Total	
Division 2 Subtotal						847,060
Steel Sheet Pile Coffer Wall	18,240 SF	20	364,800		364,800	
Excavation	1,600 CY	25	40,000		40,000	
Dewatering	1 LS	120,000	120,000		120,000	
Piles/Anchors	262 ea.	1,230	322,260		322,260	
Division 3 Subtotal						2,676,300
Concrete						
Base slab - 24" t	1,505 CY	250	376,250		376,250	
Perimeter walls - 21" t	676 CY	500	338,000		338,000	
Interior walls - 21" t	2,082 CY	500	1,041,000		1,041,000	
Baffle walls - 9"t	27 CY	550	14,850		14,850	
Channel invert fill - 6" t	124 CY	150	18,600		18,600	
Exterior baffle/train walls - 24"t	300 CY	475	142,500		142,500	
Interior columns - 15" sq.	4 CY	1,000	4,000		4,000	
Exterior columns - 24" dia.	68 CY	1,000	68,000		68,000	
Elevated wet slabs - 15" t	698 CY	700	488,600		488,600	
Elevated dry slabs - 12" t	246 CY	750	184,500		184,500	
Division 4 Subtotal						55,968
Brick Masonry	5,088 SF	11	55,968		55,968	
Division 5 Subtotal						241,958
Stairs - risers	152 ea.	350	53,200		53,200	
Handrail, 42" 3 rail alum.	334 LF	60	20,040		20,040	
Bridge - Walkway Guardrails	856 LF	28	23,968		23,968	
Grating	4,754 SF	25	118,850		118,850	
Hatches - 4x4	12 ea.	1,325	15,900		15,900	
Hatches - 6x6	4 ea.	2,500	10,000		10,000	
Division 7 Subtotal						315,616
Insulation, foamglass, 3" R9	9,504 SF	4	38,016		38,016	
Channel W.P. membranes	18,500 SF	8	148,000		148,000	
Roofing, slate	2,592 SF	50	129,600		129,600	
Division 8 Subtotal						21,600
Doors, alum, with hardware	12 ea.	1,800	21,600		21,600	
Division 9 Subtotal						104,482
Finishes = percentage of total	1 %		0		104,482	
Division 11 Subtotal						5,333,769
Cast iron sluice gates,						
54" W x 72" H, w/electric op.	18 ea.	21,300	383,400	47,925	431,325	
Headcell units, 12' dia. x14 trays	18 ea.	103,900	1,870,200	149,616	2,019,816	
Eutek Slurry cup units, 56" dia.	9 ea.	79,400	714,600	71,460	786,060	
Eutek Snail units, 10 cy/h	9 ea.	142,200	1,279,800	76,788	1,356,588	
Wemco model "C" pumps,						
400 gpm @ 125 ft TDH, 60 Hp	18 ea.	23,000	414,000	62,100	476,100	
Auxiliary water pumps						
1600 gpm @ 125 ft TDH	2 ea.	12,600	25,200	3,780	28,980	
Fabricated SST slide gates						
27" W x 72" H, w/electric op.	18 ea.	11,600	208,800	26,100	234,900	
Division 13 Subtotal						731,372
I & C = percent of total	7 %		0		731,372	
Division 14 Subtotal						84,413
Hoists	7 ea.	7,660	53,620	8,043	61,663	
Monorails	650 LF	35	22,750		22,750	
Division 15 Subtotal						871,487
Interior Process Piping						
6" Flg. DIP	252 LF	60	15,120		15,120	
6" Flg. DI Fittings	36 ea.	600	21,600		21,600	
6" Flg. EC Plug valve, Manual	36 ea.	1,200	43,200		43,200	
6" Flg. Check valve	18 ea.	1,320	23,760		23,760	
10" Flg. DIP	775 LF	100	77,500		77,500	
10" Flg. DI Fittings	38 ea.	1,000	38,000		38,000	
10" Flg. EC Plug valve, Manual	6 ea.	2,000	12,000		12,000	
10" Flg. EC Plug valve, electric	9 ea.	4,500	40,500		40,500	
12" Flg. DIP	20 ea.	120	2,400		2,400	
12" Flg. DI Fittings	4 ea.	1,200	4,800		4,800	
12" Flg. EC Plug valve, Manual	2 ea.	2,400	4,800		4,800	
12" Flg. Check valve	2 ea.	2,640	5,280		5,280	
Interior Process Piping in T & D Bldg.						
8" Flg. DIP	90 LF	80	7,200		7,200	
8" Flg. DI Fittings	9 ea.	800	7,200		7,200	
8" Flg. EC Plug valve, Manual	9 ea.	1,600	14,400		14,400	
10" Flg. DIP	346 LF	100	34,600		34,600	
10" Flg. DI Fittings	12 ea.	1,000	12,000		12,000	
10" Flg. EC Plug valve, Manual	10 ea.	2,000	20,000		20,000	
10" Flg. EC Plug valve, electric	9 ea.	4,500	40,500		40,500	
Exterior Process Piping to T & D Bldg.						
10" MJ DIP	4,152 LF	60	249,120		249,120	
10" MJ DI Fittings	57 ea.	600	34,200		34,200	
HVAC	130,012 CF	0.61	79,307		79,307	
Plumbing	14,000 SF	6	84,000		84,000	
Division 16 Subtotal						1,044,817
Electrical = percent of total	10 %		0		1,044,817	
Subtotal			$10,002,359	$445,812	$12,328,842	$12,328,842
Main Office Overhead	6 %					$739,731
General Requirements	5 %					$653,429
Bonds/Mobilization/Insurance	6 %					$823,320
Subtotal						$14,545,321
Profit	5 %					$727,266
Estimated Construction Contract Price						**$15,300,000**
Contingency at	20 %					$3,060,000
Estimated Total						**$18,360,000**

CH2M HILL

SUBJECT ACCESS BRIDGE/ WALKWAY PROJECT NO. ____ BY ____ SHEET NO. ____ OF ____ DATE ____



Application Bulletin: HEADCELL™ Headworks

EUTEK SYSTEMS
Solids Spinoffs for Water Reclamation and Reuse

APPLICATION PARAMETERS

- 1 – 46 mgd per HEADCELL™
- 75 to 200 micron standard designs are available.
- Custom designs available at request.
- Headloss less than 12 inches at peak flow.
- Screening prior to the HEADCELL™ is required in wastewater applications.

Headworks Application

The flexible HEADCELL™ design provides optimum grit capture with a space-efficient configuration that uses no moving parts. The primary application of the HEADCELL™ is to remove grit as small as 50 microns (S. G. 2.65) from screened sewage in the headworks of wastewater treatment plants. Historically, grit removal has usually been installed in the headworks of the plant. It is an important part of design to prevent grit deposits in pipelines, channels, and in anaerobic digesters, thickening tanks, digestion tanks, and aeration basins. Headworks grit removal protects primary sludge pumps, centrifuges, digestion systems, solids handling equipment, high-pressure progressing cavity and diaphragm pumps, and other mechanical equipment by reducing abrasive wear.

Vital design and application considerations for choosing grit removal equipment include: headloss requirements, space requirements, removal efficiency, organic content, life-cycle costs, and characteristics of the native grit. Plant grit load should be investigated to quantify the impacts of sugar sand or light grit. When all of these are considered, the HEADCELL™ is often the most cost effective grit removal solution.

HEADCELL™ Description

The HEADCELL™ offers a low headloss option to removing fine grit and abrasives as small as 50 microns (S.G. 2.65). The HEADCELL™ is a non-mechanical, forced vortex grit removal unit using stacked tray clarification. Grit is removed by utilizing large amounts of surface area, short settling distances, and the boundary layer effect. When combined, these allow the HEADCELL™ to remove grit as small as 50 microns.

Application benefits:

- Small Footprint.
- Low headloss.
- No moving parts to wear out.
- High efficiency fine grit removal.
- High added value to plant through reduced O&M costs.
- All Hydraulic design.
- Simple maintenance.

HEADCELL™ Selection Criteria

The HEADCELL™ is typically sized for 95% removal of 75 to 200 micron material (S.G. 2.65), and larger, with headloss of 12 inches at its peak design flow. Capacity of a single unit can be as high as 46 mgd. Multiple units can be used for higher flows. Flow to the unit can be pumped or flow by gravity. Flow is introduced to the HEADCELL™ via an inlet channel and exits over a weir. The HEADCELL™ offers design flexibility by allowing multiple inlet and outlet orientations. These varied configurations allow the HEADCELL™ to be integrated into virtually any hydraulic profile and plant layout.

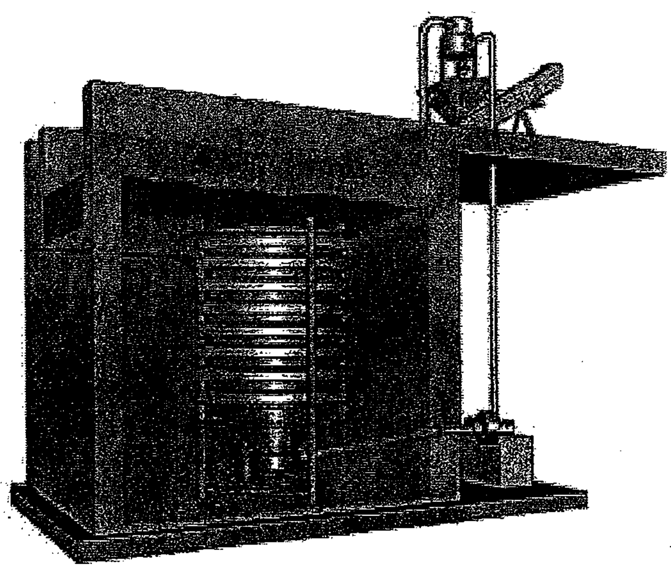
The HEADCELL™ is a non-mechanical forced vortex grit removal unit. Therefore, removal efficiency increases with decreasing flow. Because the greatest quantity of grit enters the plant during the highest flow, the HEADCELL™ is sized for peak day flows. At peak day flow, the HEADCELL™ will remove 95% of the specified particle. At lower flows, removal efficiency is increased.

When combined with SLURRYCUP™ and GRIT SNAIL™ grit washing system the HEADCELL™ can remove up to 95% of the total grit load and discharges clean, dry grit with less than 20% organic solids and at least 60% total solids.

HEADCELL™ Requirements

The HEADCELL™ can be operated in a start-stop scheme or continuous flow as necessary. Screening is required prior to the HEADCELL™ in the process stream. Acceptable screen opening is ¾". ½" or finer is recommended.

Refer to EUTEK® SYSTEMS™, INC. TEACUP™ and SLURRYCUP™ bulletins for other grit removal options.



EUTEK® SYSTEMS™, INC.
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EUTEK SYSTEMS

Grit Facts

Why should grit be removed from water and wastewater?

First, grit is abrasive and wears out equipment. The extent of this wear depends on the type of process used at the wastewater treatment plant. Equipment with moving parts will have higher maintenance costs resulting from this abrasive wear.

Secondly, grit accumulates in the bottom of channels, tanks and pipes. When the liquid velocity in a channel, tank or pipe falls below the transport velocity required to move grit forward, the grit settles to the bottom. Re-suspending this settled grit requires a higher energy input, so it often collects until physically removed during periodic cleaning. Prior to cleaning, the performance of the treatment process deteriorates, increasing maintenance costs and potentially jeopardizing compliance permits. This cleaning more often involves expensive "Confined Space" procedures, increasing the cost of clean-up.

Effective grit removal means comparing the capital cost of an effective grit removal system with the long-term operating costs resulting from abrasive wear, periodic cleaning and reduced process performance.

Why Remove Grit?
Abrasive Issues - Wears out Equipment

- Collector Chains, Flights and Buckets
- Clarifier Rakes
- Pumps
- Pipes
- Centrifuges

What is Grit? (Conventional Definition)

- >300μ (50 mesh)
- 1 to 5 ppm Load

Traditionally, grit is defined as high density, inorganic solids greater than 300 microns (50 mesh) in size. These solids will consist of not only sand and gravel, but also seeds, ash, cigarette filters, corn kernels, melon rinds and other inorganic solids. Traditionally, most specifications require removing 50 mesh, 300 micron sand that has a specific gravity of 2.65.

The common misconception is that abrasives, referred to as grit, are predominantly larger than 200 micron (70 mesh) sand. Through multiple pilot studies and grit analysis performed within North America by EUTEK® SYSTEMS™, a more accurate definition for grit has been developed.

Grit is more accurately defined as high density inorganic solids or abrasives as small as 50 micron (270 mesh) with specific gravity 2.65. Regardless of geographic location, to remove 99% of the abrasives, it is necessary to remove all sand larger than 40-45 microns (325 mesh) in size.

As much as 95% of the grit entering a wastewater treatment plant is smaller than 300 microns (50 mesh) in size. Thus, conventional grit control systems designed to remove 100% of sand larger than 300 microns can at best remove as little as 5 to 10% of the total abrasives load during peak flow events, when grit loads are at their highest.

Grit or abrasives are rarely well defined materials in water and wastewater treatment plants. They are most usually found with attached greases and oils which modify their settling and transport characteristics significantly from that of the inorganic grit "kernel". Attached greases and oils can reduce the specific gravity of the fine abrasives to less than that of water, often making them floatable. The condition can remain until subsequent processes remove the grease layer. Then the inorganic grit "kernels" settle rapidly in downstream processes accounting for nuisance solids deposits.

Another misconception is the amount or concentration of abrasives entering wastewater treatment plants. The average is about five parts per million during dry weather conditions and up to 40 times that amount during peak wet weather events.

Grit More Accurately Defined

- $>50\mu$ (270 mesh)
- 2.65 Specific Gravity
- 5 to 240 ppm Load

Looking at a treatment plant with a 4:1 peaking factor and a combined storm/sewer system (Table 2), 50 pounds of fixed solids per million gallons enter the treatment plant during the average daily 95 MGD flow, 359 days per year, for a total annual load of 1.7 million pounds. In contrast, during the 6 peak wet weather days experienced each year, the 380 MGD flow carries 2000 pounds of fixed solids per million gallons for a total annual load for 4.6 million pounds deposited each year of the total load of 6.3 million pounds. Almost 3/4 of the total annual load enters the treatment plant during six (6) days per year. During these six days, higher performance grit removal is essential to prevent subsequent problems.

A plant with a more typical 3:1 peaking factor will result in 10 to 20 peak events per year with less grit entering during each event. However, the total annual load ratio does not significantly change, with 2/3 of the annual grit load entering under these smaller but more numerous peak events.

Grit size distribution varies significantly depending on native soil characteristics and plant location (Table 1).

Larger treatment plants should invest in a grit study to determine actual grit size distribution. Knowledge of the grit size distribution will help determine actual grit removal system performance requirements.

Table 1: Grit Size Distribution

Mesh	Micron	Coastal Areas	Inland Areas
50	300	3 - 5%	5 - 40%
70	210	5 - 10%	10 - 60%
100	150	10 - 40%	10 - 75%
150	100	10 - 75%	10 - 95%
200	75	10 - 85%	10 - 98%

Table 2: Grit Load Example

Flow (MGD)	Grit Load (lbs. fixed solids per million gallons)	Days Per Year	Annual Load (lbs. fixed solids)	% of Total Annual Grit Load
95 MGD, ADWF	50	359	1,705,000 #FS	27.20%
380 MGD, PWWF	2000	6	4,560,000 #FS	72.80%
	TOTAL	**365**	**6,265,000 #FS**	**100.00%**

* For additional application information, please view our application datasheets.

MGD = Million Gallons per Day (1 MGD = 3785 M^3 per Day)
FS = Fixed Solids
ADWF = Average Dry Weather Flow
PWWF = Peak Wet Weather Flow

Grit can be removed at various process locations. Most commonly, it is removed at the headworks, thus removing the grit before it enters the treatment processes. Another common practice is to remove the grit from dilute sludge (0.5 to 1%) prior to thickening. Grit removal at other stages in the treatment process is common and may be better for some treatment plants.

Home Products Literature Requests Proposal Requests

Appendix E
Washington Aqueduct: Sample Water Treatment Residuals Calculations

Note: In appendix E the term "trucks" refers to 20 ton dump trucks.

Washington Aqueduct EIS: Methodology Used to Predict the Anticipated Number of Water Treatment Residuals Loads per Day

TO: Tom Jacobus/Washington Aqueduct
Patty Gamby/Washington Aqueduct
Mike Peterson/Washington Aqueduct

COPIES: Jennifer Armstrong/CH2M HILL

FROM: Glenn Palen/CH2M HILL

DATE: June 26, 2005

This memo describes the methodology used to predict the number of anticipated water treatment residuals loads per day for the Draft EIS (DEIS). Specifically, it discusses how historical Potomac River and Dalecarlia Reservoir effluent turbidity data and historical alum coagulant dose information were evaluated. This data was used in combination with plant flow projections to estimate the anticipated number of residuals loads per day representative of the end of the 20-year planning period selected for the DEIS.

Historical Water Quality Data

Approximately 11-years of daily Washington Aqueduct raw water quality data were evaluated for the DEIS. This data included raw water turbidity data sampled at the upstream end of the Dalecarlia Reservoir Forebay, Dalecarlia Reservoir effluent data, and alum coagulant dose information. The Dalecarlia Reservoir Forebay influent turbidity data can be considered indicative of the turbidity in the Potomac River on the same day. The Dalecarlia Reservoir effluent turbidity represents the turbidity entering the water treatment basins. These turbidity values are lower than the corresponding Forebay influent turbidity values for the same day because a significant percentage of the solids settles out in the Dalecarlia Reservoir.

Water treatment residuals are comprised of both residuals associated with turbidity present in the Dalecarlia Reservoir effluent and residuals attributable to the addition of alum coagulant. Both of these types of residuals either settle out of suspension in the Dalecarlia sedimentation basins (or Georgetown Reservoir).

Data Analysis

Eleven years of daily Dalecarlia Reservoir Forebay influent and Dalecarlia Reservoir effluent turbidity data collected between 1993 and 2003 were converted to daily total suspended solids (TSS) concentration data using average TSS/turbidity conversion factors selected after reviewing engineering studies performed by three different engineers that published evaluations on the Potomac River in 1996 and 1998. Once converted to TSS, the daily solids concentration data and water treatment plant alum dose data was grouped into categories associated with different frequencies of occurrence. The following frequency categories were defined for each year:

- Annual average
- Maximum Consecutive 30-day Period Rolling Average
- Maximum Consecutive 7-day Period Rolling Average

These categories are commonly considered when sizing water treatment residuals facilities. Maximum 30-day and maximum 7-day values are commonly used to predict peak residuals quantities and to size residuals removal and processing facilities. In the case of the Washington Aqueduct facilities, a peak residuals removal rate equivalent to the maximum 30-day design year quantity is recommended to size the Georgetown Reservoir residuals removal facilities. A peak residuals removal rate equivalent to the maximum 7-day design year quantity (a higher peak quantity than the maximum 30-day peak) is recommended for the Dalecarlia sedimentation basin facilities. A higher design residuals removal rate is recommended for the Dalecarlia sedimentation basins because the basins are relatively small in footprint, when compared with the Georgetown Reservoir. As a result, they are not capable of storing as large a volume of residuals as the Georgetown Reservoir. The residuals removal mechanisms proposed for the Dalecarlia sedimentation basins are also less capable of traveling through a deep layer of "stored" residuals than are the dredges proposed for the Georgetown Reservoir.

Annual average residuals quantities are typically considered by regulatory agencies responsible for permitting land application disposal. Load rates for land application sites are typically defined on an annual average basis.

In addition to categorizing TSS data by frequency of occurrence, data was also grouped by type of year (i.e., wet versus average weather conditions). Two of the eleven years were defined as wet years based upon their significantly higher annual average and peak TSS concentrations. These conclusions were drawn based upon a comparison of the average TSS values for each of the 11 years of historical data.

Future Plant Flow (i.e., Water Demand) Projections

Average and peak water demands were estimated based upon historical flow peaking factors. Historically, plant flows have averaged between 170 and 180 mgd on an average annual basis. Average and maximum water production rates have either remained constant or, in some cases, declined over the last 10-15 years.

An anticipated future average flow of 230 mgd was used as the basis of predicting residuals quantities for the DEIS. This flow is considered a conservative estimate of average flows at the end of the 20 year planning period used for the EIS. If the demand does not grow in the next 20 years to the projected 220 mgd, loads of residuals displayed in the DEIS will be fewer.

Predicted Water Treatment Residuals Quantities and Trucks per Day

Appendix E of Volume 4 of the DEIS, entitled Engineering Feasibility Study Compendium, includes a sample calculation that illustrates how we estimated average quantities of water treatment residuals in the DEIS. This sample calculation shows how we used plant flow, alum coagulant dose concentration, and TSS concentrations to predict water treatment residuals quantities and associated trucks per day. A copy of this appendix information is also attached to this memo for reference. An additional sample calculation showing maximum conditions is included with this memorandum.

Residuals quantities (and associated predictions for trucks per day of residuals) were estimated for a variety of potential future operating conditions including the following:

- Wet Design Year Annual Average
- Wet Design Year Maximum Consecutive 30-day Period Rolling Average
- Wet Design Year Maximum Consecutive 7-day Period Rolling Average
- Long Term Average Rainfall Design Year Annual Average
- Long Term Average Rainfall Maximum Consecutive 30-day Period Rolling Average
- Long Term Average Rainfall Maximum Consecutive 7-day Period Rolling Average

Annual average conditions represent the average conditions that are expected to occur over a given year. Maximum consecutive 30-day period rolling average conditions represent the average conditions predicted to occur during the maximum 30 consecutive days of a given year. Maximum consecutive 7-day average conditions represent the average conditions predicted to occur during the peak 7 consecutive days of a given year.

Washington Aqueduct: Sample Water Treatment Residuals Calculations

Assumptions:

Plant flows:

- Design Flow Treated at Dalecarlia WTP + Georgetown Reservoir = 230 mgd
- Dalecarlia WTP Flow = 158 mgd
- Georgetown Reservoir Flow = 72 mgd

Solids concentrations entering the Dalecarlia WTP and Georgetown Reservoir:

Wet Year Conditions (approximately 2 out of every 11 years):

- Average annual Total Suspended Solids (TSS) concentration = 27 mg/l
- Annual average alum dose = 45 mg/l

Long Term Average Year Conditions:

- Average annual Total Suspended Solids (TSS) concentration = 18 mg/l
- Annual average alum dose = 42 mg/l

Alum residuals production factor:

Based on previous experience, it is assumed that 0.44 dry pounds of alum residuals is produced per pound of alum fed to the raw water flow stream.

Residuals solids concentrations:

- Residuals from sedimentation basins or Georgetown Reservoir = 0.5% solids
- Thickened residuals = 2.0% solids (or greater)
- Dewatered residuals = 30% solids, with a density of 67 lbs/cf

Residuals Projections

Case 1: Wet Year, Annual Average Residuals Quantities:

Dry lbs/day residuals = 230 mgd(8.34)[27.0 mg/l + 0.44(45)] = 90,000 dry lbs/day (7 day/week basis)

Wet pounds/day residuals = 90,000 lbs/day/0.30 solids concentration = 300,000 wet lbs/day (7 day/week basis)

Wet tons/day = 300,000 wet lbs/day/2,000 lbs/ton = 150 wet tons/day (7 day/week basis)

Number of haul trucks/day = 150 wet tons/day/20 tons/truck = 7.5 trucks/day - say 8.0 trucks/day (7 day/week basis)

Number of haul trucks/day (5 day/week basis) = 7.5(7)/5 = 10.5 trucks/day - **say 11 trucks/day (5 day/week basis)**

Case 2: Long-Term Average Year, Annual Average Residuals Quantities:

Dry lbs/day residuals = 230 mgd(8.34)[18.0 mg/l + 0.44(42)] = 70,000 dry lbs/day (7 day/week basis)

Wet pounds/day residuals = 70,000 lbs/day/0.30 solids concentration = 233,000 wet lbs/day (7 day/week basis)

Wet tons/day = 233,000 wet lbs/day/2,000 lbs/ton = 117 wet tons/day (7 day/week basis)

Number of haul trucks/day = 117 wet tons/day/20 tons/truck = 5.8 trucks/day - say 6 trucks/day (7 day/week basis)

Number of haul trucks/day (5 day/week basis) = 5.8(7)/5 = 8.1 trucks/day - **say 8 trucks/day (5 day/week basis)**

Case 3: Long-Term Wet Year, Maximum Consecutive 7-day Rolling Average (Dalecarlia basins) and Maximum Consecutive 30-day Rolling Average (Georgetown) Residuals Quantities

1. Assumed future average plant flow = 230 mgd total +/- (estimated based on 320 mgd max day rated capacity for existing plants and max day/average flow ratios obtained from reviewing historical data). Dalecarlia treats 158 mgd and Georgetown treats 72 mgd.
2. Maximum wet year 7-day Dalecarlia Reservoir effluent TSS = 146.5 mg/l (from historical data review)
3. Maximum wet year 30-day Dalecarlia Reservoir effluent TSS = 53 mg/l (from historical data review)
4. Maximum wet year 7-day alum dose = 65 mg/l (from historical data review)
5. Maximum wet year 30-day alum dose = 53 mg/l (from historical data review)
6. Residuals attributable to alum = 44% of alum dose (industry standard value used by CH2M HILL)
7. Dewatered Residuals: 30% solids with a density of 67 lbs/CF
8. Haul residuals 5 d/wk
9. Peak residuals removal rate from Georgetown Reservoir can be limited to maximum 30-day rate (store peaks above this in reservoir)
10. Peak residuals removal rate from Dalecarlia sedimentation basins will be equivalent to maximum 7-day rate (limited ability to store residuals in these basins without negatively impacting residuals removal mechanisms)

Max Design Residuals from Dalecarlia Sed Basins:

Design wet year max 7-day residuals = 158 mgd(8.34)[146.5 + 65(0.44)] = 230,700 dry lbs/day

Max Design Residuals from Georgetown Reservoir:

Design wet year max 30-day residuals = 72 mgd(8.34)[53 + 0.44(55)] = 46,400 dry lbs/day

Total dry lbs/day = 230,700 + 46,400 = 277,100 dry lbs/day

Wet lbs/day = 277,100 dry lbs/day/0.3 = 924,000 wet lbs/day

Wet tons/day = 924,000/2,000 = 462 wet tons/day

Trucks per day @ 7 days/week = 462 wet tons/day/20 tons/truck = 23 trucks/day (7 days/week basis)

Trucks per day @ 5 days/week = 23 (7/5) = 33 trucks/day (5 day per week basis)

Washington Aqueduct Residuals - Impact of Gravity Thickeners and Dewatered Residuals Cake Storage Bins on Maximum Design Truckloads per Day

TO: Patty Gamby/Washington Aqueduct

COPIES: Jennifer Armstrong/CH2M HILL

FROM: Glenn Palen/CH2M HILL

DATE: August 24, 2005

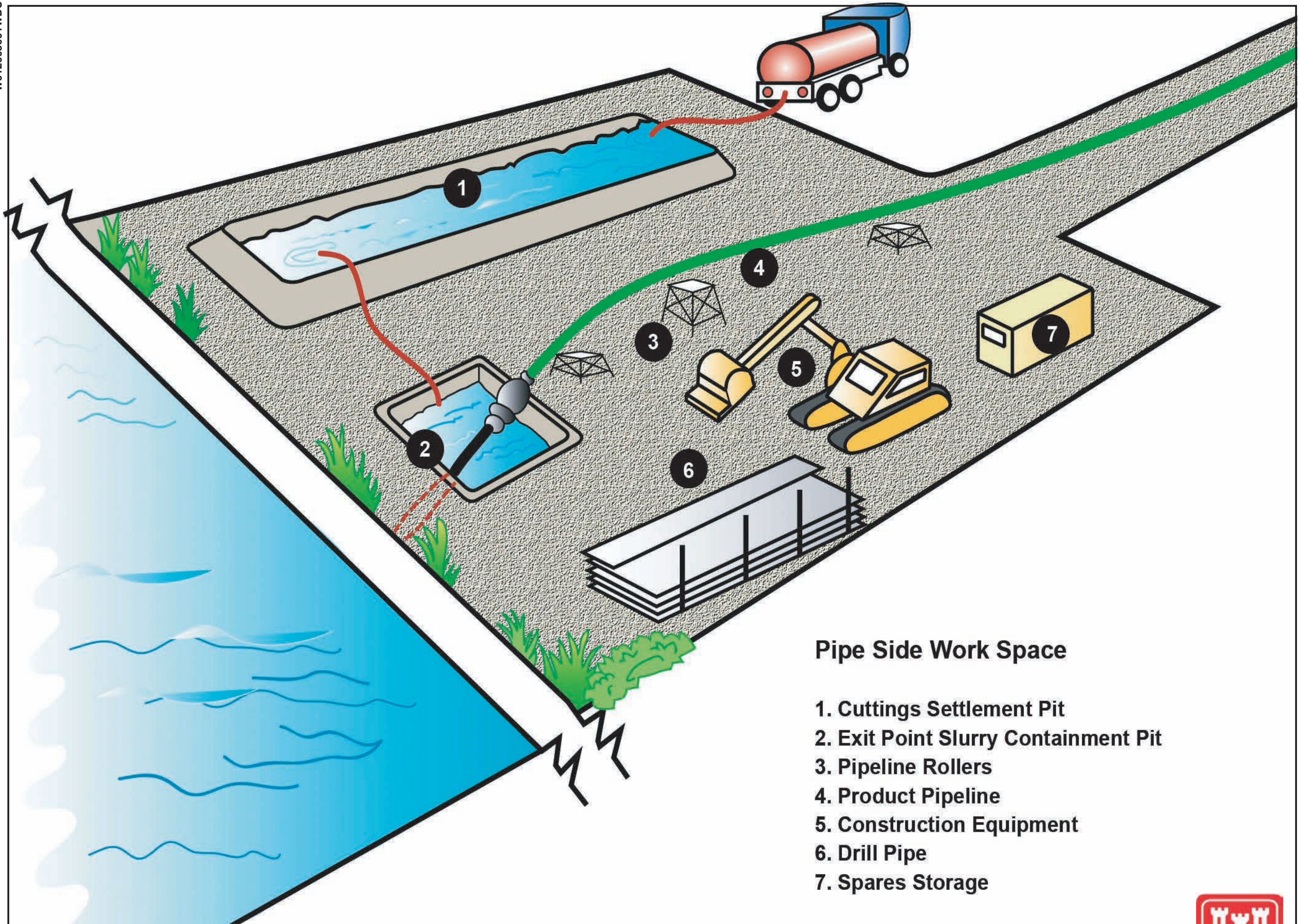
This memo describes how the gravity thickeners and the dewatered residuals storage bins, located in the Residuals Processing Building, could be used to equalize (i.e., decrease) the maximum number of truckloads of residuals requiring hauling per day in the design wet year. Previous calculations have concluded that a maximum of 33 truckloads per day of dewatered residuals would require hauling during the maximum design wet year event (based on 20 ton trucks hauling 5 days per week). This magnitude of truckloads would only be expected to occur approximately over a 14 day period on a frequency of 2 out of 11 years and only if the design year production was actually met. Under typical (long term average) conditions, a maximum of 8 truckloads of residuals are anticipated to require hauling per day.

An analysis was performed to determine if a combination of the liquid residuals storage volume, provided by the gravity thickeners, and the dewatered cake storage volume, provided by the dewatered residuals cake storage bins located in the Residuals Processing Building, could be used to reduce the predicted peak residuals truckloads per day. The analysis evaluated a theoretical peak residuals event that superimposed a maximum 7-day residuals production event on maximum 30-day residuals quantities. Conservative, design, wet year residuals quantities based worst case river turbidities and future demands were used in the analysis.

The results of the analysis indicate that the maximum number of dewatered water treatment residuals truckloads per day could be reduced from 33 truckloads per day to 25 truckloads per day if a portion of the storage volume provided in the gravity thickeners and dewatered residuals cake storage bins is reserved for peak residuals events. This operational procedure would not reduce the total number of truckloads of residuals that require disposal from the Dalecarlia WTP site. However, it would lower the peak daily number of truckloads required during the worst case design period by spreading them out over time.

Based on this analysis, Washington Aqueduct is committed to decrease the maximum number of truckloads of water treatment residuals requiring disposal from the Dalecarlia WTP residuals processing facility from 33 truckloads per day to no more than 25 truckloads per day.

Appendix F
Directional Drilling Illustrations



Simulation of directional drilling pipe side work space

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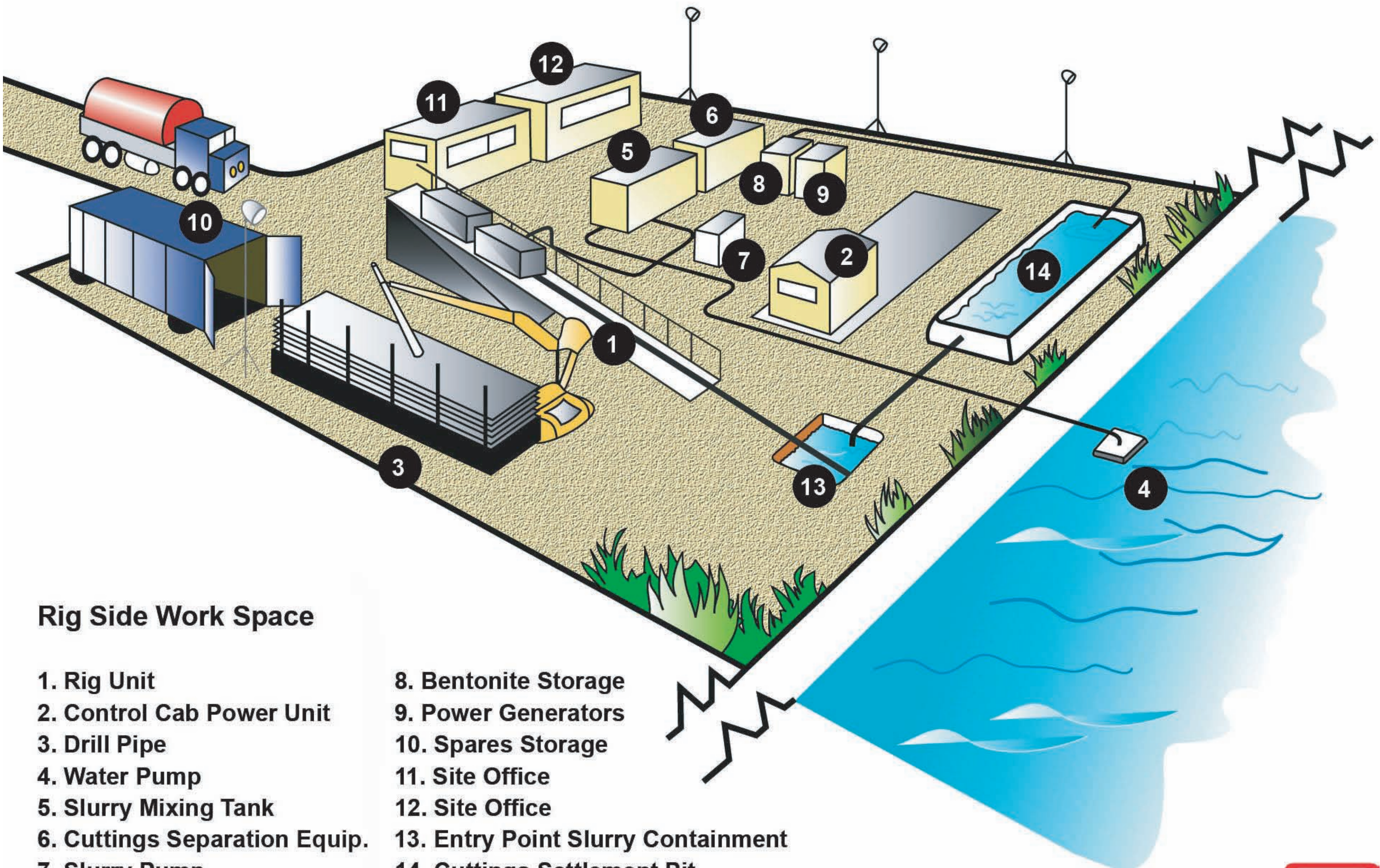

Rig Side Work Space

1. Rig Unit
2. Control Cab Power Unit
3. Drill Pipe
4. Water Pump
5. Slurry Mixing Tank
6. Cuttings Separation Equip.
7. Slurry Pump
8. Bentonite Storage
9. Power Generators
10. Spares Storage
11. Site Office
12. Site Office
13. Entry Point Slurry Containment
14. Cuttings Settlement Pit

Simulation of directional drilling rig side work space

Appendix G
Alum Recovery

Alum Recovery

TO: Patty Gamby/Washington Aqueduct
Tom Jacobus/Washington Aqueduct
Mike Peterson/Washington Aqueduct

COPIES: Glenn Palen/CH2M HILL
Jennifer Armstrong/CH2M HILL

FROM: Ed Fleischer/CH2M HILL

DATE: August 16, 2005

This memo consists of the alum recovery options available to Washington Aqueduct and evaluates their relative feasibility.

Several processes to recover the aluminum (Al+3) or iron (Fe+3) contained in water treatment residuals have been developed. The potential benefits of such processes are two-fold: (1) to reduce the volume and mass of water treatment residuals that need treatment and disposal, and (2) to beneficially recycle and reuse coagulant materials.

These recovery processes take advantage of the fact that aluminum and iron hydroxides are more soluble under acidic or alkaline conditions. Typically, the collected residuals are treated with either acid or alkaline solutions to dissolve the aluminum or iron contained within residual solids. The solution is then decanted, so that the aluminum or iron coagulant contained in the supernatant can be recovered for reuse within the plant.

Acid digestion of residuals has more often been contemplated, than it has been placed into practice. For a full-scale facility, this process would typically begin with thickening of the collected residuals, as is done in most water treatment plants. The thickened residuals are then treated for 30 to 60 minutes with sulfuric acid to lower the pH to between 1 and 3. Following acid treatment, the residuals are usually thickened again, so that the supernatant can be collected for reuse. The acidified solids must then be conditioned, usually with lime, before being dewatered and hauled from the site for disposal.

For a plant that uses alum as a coagulant, aluminum recovery can typically range from 50-98% of the aluminum dose fed to the raw water, depending on the quality of the residuals and the efficiency of the recovery process. Disadvantages of the process include the potential for accumulation of contaminants, such as heavy metals, natural organic matter (NOM), and colloidal materials in the recovered solution, which would decrease its value for future uses. Testing results for the effectiveness of recovered coagulants have been mixed and highly variable, depending on the quality of the recovered coagulant and the raw water characteristics of the water being treated.

The solids recovered from the acidification process generally settle well and have good dewatering characteristics. A substantial reduction in residuals volume (>20%) is possible through use of the process if the majority of the aluminum added to the raw water can be successfully recovered and reused. The majority (i.e., 80% +/-) of the residuals volume would still need to be hauled to an offsite disposal location, however, since a significant percentage of the water treatment residuals are made up of silt transported from the Potomac River. Alum recovery processes do not dissolve these particles, just a portion of the aluminum hydroxide waste product formed when alum is added to the raw water.

The economic and non-economic impacts of the following issues would need to be addressed to determine whether coagulant recovery is viable for a particular plant, according to an American Water Works Association Research Foundation (AWWARF) report:

1. Acidification requirements for optimal process performance
2. Quality and effectiveness of the recovered product
3. Residual sludge solids mass and conditioning requirements
4. Finished-water quality when recovered coagulants are used

Because of the difficulties associated with assessing these and other issues on a case-by-case basis, coagulant recovery has not often been used for plant-scale applications. Concerns regarding quality of the recovered coagulant (noted above), the potential capital and operating costs, and corrosion of tanks and equipment due to the acidic nature of the process have limited the use of the process in practice. For example, a full-scale coagulant recovery system provided for the 80-mgd Jersey City Water Treatment Plant in the 1970's was never put into operation because of startup and operations problems with the acid feed system. Similarly, at least 15 plants in Japan practiced alum recovery during the 1970's. Most of these plants no longer use the process because of concerns over the accumulation and recycling of heavy metals. Coagulant recovery may be practiced on a limited basis at a few full-plants in the United States today. However, it is certainly not commonly used and is generally considered to be too costly to implement.

Researchers have recently investigated the use of innovative membrane processes for the recovery of coagulants in an effort to improve the sustainability of water treatment processes. A United States patent was recently issued for the development of one such process that uses Donnan Membrane Process (DMP) for the selective recovery of alum or iron. Researchers note that the process has the following benefits:

- Recovered alum is essentially free of NOM and colloidal material
- The concentration of aluminum in the recovered alum can be significantly greater than that in the water treatment residuals
- The process works on an electro-chemical potential gradient across a cationic membrane, minimizing the potential for membrane fouling
- The volume of solids are greatly reduced

While this process appears to be promising because of the greatly improved quality of the recovered product compared to the acid digestion process, it has only been investigated at the laboratory level and is not currently being used at any full-scale facility. An evaluation to determine the cost-effectiveness of the process compared to conventional residuals management processes has not been conducted. Acidification of the residuals is still required with this process to dissolve the hydroxide precipitates. Consequently, while the total volume of residuals that must be dewatered and disposed of may ultimately decrease through the use of the membrane-based coagulant recovery process, the number and size of residuals management facilities needed might actually increase, limiting the benefits that can be attained from coagulant recovery (as was the case with acid digestion processes). In addition to the considerations noted above, it is unclear whether the total number of trucks required to haul off waste residuals and deliver acid and lime (or sodium hydroxide) to lower and then raise the pH of the thickened residuals would decrease if alum recovery was practiced by Washington Aqueduct. Membrane-based coagulant recovery is, however, an interesting development, and further research in this area is recommended.

In conclusion, many coagulant recovery processes have been researched and developed over the last several decades. To date, however, they have not shown themselves to be practical or cost-effective and have seen only limited use at full-scale facilities. The requirement for additional chemical delivery trucks to deliver acidification and neutralization chemicals to support this treatment process may also offset any theoretical truck count reduction associated with reusing a portion of the alum coagulant fed to the raw water. Based on these factors, it can be concluded that coagulant recovery is not a viable process for the Washington Aqueduct at this time.