MAP & PLAN

CALVERTON SEWER DISTRICT
BOUNDARY EXTENSION #3

Calverton Sewer District
Town of Riverhead
Suffolk County, New York

H2M Project No.
CASD 19-01

NOVEMBER 2019

Prepared for:

Calverton Sewer District
4062 Grumman Boulevard
Calverton, New York 11933

Prepared by:

H2M architects + engineers
538 Broad Hollow Road, 4th Floor East
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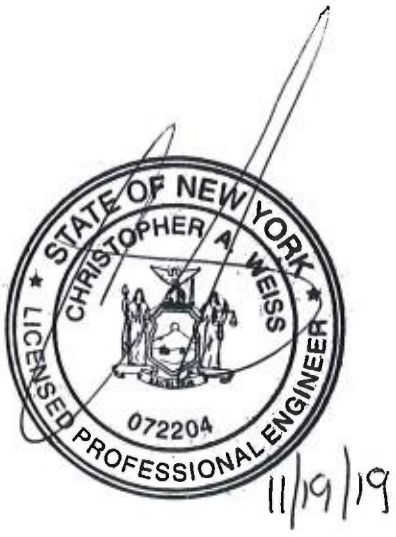

H2M architects + engineers

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1.0 PURPOSE & INTRODUCTION

This Map and Plan is prepared pursuant to New York State Town Law to extend the boundary of the Calverton Sewer District (District). The boundary extension has been requested by the Town to encompass six (6) out of the eight (8) lots identified in the revised subdivision "Map of Enterprise Park at Calverton, Riverhead, NY" (i.e. EPCAL 8-Lot Major Subdivision Maps) prepared by L.K. McLean Associates, P.C., dated March 26, 2019 (**Appendix A**). The referenced subdivision is based on a determination made by the Riverhead Town Board and Community Development Agency (CDA) to replace the prior 50-lot subdivision plan that included attendant interior roads, drainage areas and other infrastructure with the 8-lot subdivision plan. The 8-lot subdivision plan has been granted preliminary approval by the Riverhead Planning Board via Resolution No. 2019-056.

Per New York State Town Law, this document presents the background information and plan, including description of the proposed Calverton Sewer District boundary extension, future infrastructure improvements and associated financial implications necessary for approval of the boundary extension.

As defined in the Town of Riverhead Planning Board Resolution No. 2016-056 and summarized in Section 2.0 of this report, lots 2, 3, 5, 6, 7 and 8 of the sub-division are to be included within the District boundary extension. Ownership of lots 2, 3 and 5 will be retained by the Town and/or CDA and ownership of lots 6, 7 and 8 are pending sale from the CDA to Calverton Aviation and Technology, LLC. Lot 1 is not included in the boundary extension since it is in the Pine Barrens Core Area and will be preserved in accordance with law. Lot 4 is also not included since it will be used as the Recharge Parcel for the District.

No infrastructure improvements to the District as extended are intended at this time. The existing collection, conveyance and treatment infrastructure has available capacity to support the initial 5-year build-out scenario stipulated in the Agreement of Sale between the CDA and Calverton Aviation and Technology, LLC. To sustain water quality and facilitate development, the District is actively constructing an upgrade to the existing treatment facility that can be readily expanded upon in the future to accommodate future build-out beyond the initial 5-year scenario. Furthermore, the terms included in the Agreement of Sale require Calverton Aviation and Technology, LLC to be responsible for the cost of all sewer improvements to serve structures and uses as established on their lots, including, but not limited to piping, force mains, lift stations and appurtenances and the operation and maintenance thereof.

This is the third request for an extension of the Calverton Sewer District boundary and is therefore referred to as Calverton Sewer District Extension No. 3. This Map and Plan is intended to define the boundary of Calverton Sewer District Extension No. 3 and does not provide engineering design and associated project costs for wastewater infrastructure improvements, including but not limited to, sewers,

force mains, pump stations, treatment processes and appurtenances necessary to support future development within the Calverton Sewer District Extension No. 3 area.

The 8-lot subdivision has already undergone a consistency analysis conducted by the Town of Riverhead Planning Board, who determined the revised sub-division meets the conditions and thresholds established by the FSGEIS and Supplemental SEQRA Finding Statement that were prepared for the original 50-lot subdivision. As such, no further review under SEQRA would be required to complete the District boundary extension since the subdivision provides for substantially less lots. Future development of lots 6, 7 and 8 is governed by the EPCAL Revitalization Plan, the Town Comprehensive Master Plan, the Calverton Urban Renewal Plan and the Town's Zoning Code and Zoning Map as all amended and adopted as a result of the full environmental review process that has been undertaken with respect to the original 50 lot sub-division.

As such, if the proposed development is determined to be consistent with the Supplement SEQRA Finding Statement, no further review under SEQRA will be required. However, should future development plans for lots 6, 7 and 8 not comply with the Supplement SEQRA Finding Statement, additional review will be required to comply with 6 NYCRR 617.10 and obtain the necessary State, County and local approvals.

Costs associated with the design, construction, operation and maintenance of any and all required infrastructure improvements to support development of lots 6, 7 and 8 are the responsibility of Calverton Aviation and Technology LTD and/or its developer(s). All improvements must be designed by a Licensed Professional Engineer in accordance with District standards at the time of design and be approved by the District prior to construction. Additional regulatory approvals will also be required by Suffolk County Department of Health Services (SCDHS) and the New York State Department of Environmental Conservation (NYSDEC). Each entity is also responsible to pay all hook-up fees and any other costs required by the District at the time the connection(s) are made. All wastewater infrastructure constructed by any developer on lots 6, 7 and 8 must also be subject to a continuing offer of dedication to the District.

2.0 BACKGROUND INFORMATION AND PLAN

The Town of Riverhead owns and operates the existing wastewater collection, conveyance and treatment infrastructure that was originally constructed to service the Naval Weapons Industrial Reserve Plant in Calverton, New York. The Town formed the Calverton Sewer District after the property ownership was transferred from the United States Navy to the Community Development Agency (CDA). The formation of the District was the necessary mechanism for the Town to maintain the central wastewater collection and treatment infrastructure to service the existing buildings that were at that time connected to the existing infrastructure.

The original boundary of the District was and still is referred to as the "Core Area" as shown on **Exhibit 1**. Subsequent to the original District formation, the Town approved Sewer District Extension No. 1 in 2002 for the so-called "Burman Subdivision," to accommodate planned development located outside of the "Core Area", the boundary of which is depicted on **Exhibit 2**. Another subsequent District extension was later approved by the Town in 2004 as a result of the construction of the Stony Brook University Incubator. This boundary extension was referred to as Sewer District Extension No. 2 as illustrated on **Exhibit 3**.

The lots that comprise Calverton Sewer District Extension No. 3 are summarized below. Note, lots 1 and 4 are excluded, as previously described in Section 1.0.

- **Lot 1**: encompasses 292.7 acres located along the west boundary of the EPCAL site that was determined by the CDA, by applicable Pine Barrens requirements, that this land continue in Town ownership for future preservation and use. As such this lot will not generate any sewage and is not included within the boundary of proposed Sewer District Extension No. 3.

- **Lot 2**: encompasses 98.9 acres comprised of the Ballfield Park, which has been designated parkland and has been constructed with grant funding and placed in service. This lot is currently served by an on-site septic system and is included within the boundary of proposed Sewer District Extension No. 3

- **Lot 3**: encompasses 11.2 acres and is the location of the existing CDA Grumman monument which has been designed by the CDA to have enough area for future fire, emergency and ambulance facilities. As such, any future improvements will need to be served by the Calverton Sewer District and this lot has been included within the boundary of proposed Sewer District Extension No.3.

- **Lot 4**: encompasses 35.1 acres of land that has been designed to construct the groundwater recharge facility for the DEC mandated effluent discharge from the Calverton Sewer District, which must be located north of the groundwater divide. No sewage effluent will be generated by the activity of groundwater recharge at this lot and the lot is excluded from the boundary of proposed Sewer District Extension No. 3.

- **Lot 5**: encompasses 25.5 acres and is the location of the CDA Henry Pfieffer facility, which is currently served by an on-site septic system. A portion of this lot is located within the current boundary of the Calverton Sewer District and the balance of the lot is included within proposed Sewer District Extension No. 3 such that the entire lot will be within the District.

- **Lots 6, 7, and 8**: encompass 727.3 acres, 898.4 acres and 18.1 acres, respectively. These lots are vacant lands which will be subject to future Town review and approval and are the subject of a contract of sale by and between the Riverhead Community Development Agency (CDA) and Calverton Aviation & Technology LLC (Purchaser). Subject to the requirements and conditions stated herein, Lots 6,7 and 8 are included within the boundary of proposed Sewer District Extension No.3.

All lots located within the boundary of Calverton Sewer District Extension No. 3 can be served by the existing Calverton Sewer District infrastructure. Lots 2, 3, 5 & 8 may be accessed for sewer service through the utility easement provided on the Planning Board Preliminary Map, which connects each of these parcels to the roads of the existing Burman Subdivision and the gravity sewer mains existing therein. Lots 6 and 7 may be served through direct access to Burman Boulevard and the gravity sewer main existing therein.

3.0 FUTURE INFRASTRUCTION IMPROVEMENTS

The Contract of Sale between the Riverhead Community Development Agency (Seller) and the Calverton Aviation & Technology LTD (Purchaser) provides all buildings to be constructed on lots 6, 7 and 8 must be connected to the Calverton Sewer District as follows:

- Upon the signing of this Agreement, Seller shall apply for an extension of the boundary of the Calverton Sewer District to cover the property to be conveyed and Lots to be retained by Seller. No physical improvements will be constructed as a result of this boundary extension.

- Purchaser shall be responsible for the cost of all sewer improvements to serve structures and uses as established from time to time on the Property, including, but not limited to, piping, force mains, lift stations and appurtenances and the cost of the operation and maintenance thereof. All such improvements shall be constructed in accordance with the specifications of the Calverton Sewer District and shall be subject to a continuing offer of dedication to the Calverton Sewer District. Purchaser shall also be responsible to pay all hook-up fees and any other costs required by the Calverton Sewer District at the time structures are hooked up to the District.

- The CDA and the Town shall retain a general easement for sewer purposes over portions of Lots 6, 7 and 8, which shall provide that (a) CDA and the Town shall have the right to connect structures and uses on any contiguous lots owned by CDA or the Town to any sewer improvements constructed by Purchaser without payment, subject to restoration to existing conditions, and (b) CDA and the Town shall engage in prior discussions with Purchaser as to the specific portions of the Property over which such easement is exercised, and if CDA, the Town,

and Purchaser are unable to agree on such specific portions, the easement shall be over the portions of the Property that, as reasonably determined by CDA and the Town, are least intrusive, taking into account any existing development by the Purchaser and any development plans of the Purchaser of which CDA or the Town has knowledge;

- An easement as depicted on the map (Appendix A) across lot 7 in favor of CDA, the Town and/or the Calverton Sewer District to access lot 4 (the "Calverton Sewer District New Discharge Property") from Route 25;

- An easement as depicted on the map (Appendix A) across lot 7 in favor of CDA, the Town and/or the Calverton Sewer District to install sewer lines on or under the easement to connect the Calverton Sewer Plant to the Calverton Sewer District New Discharge Property;

The Contract of Sale for lots 6, 7 and 8 also stipulates the Purchaser is required to build 1 million square feet of industrial space within 5-years of closing. Closing is anticipated to occur in May 2020. Sanitary wastewater flow projections for this build-out are based on Suffolk County Department of Health Services (SCDHS) standard design flow criteria, which allocate a total hydraulic load equal to 0.04 gallon per day per square foot (gpd/SF) for general industrial space. Applying this criterion to the required build-out equates to a projected sanitary flow equal to 40,000 gallons per day (GPD) (i.e. 1,000,000 SF × 0.04 g/d/SF). This flow projection does not account for any industrial process water being discharged to the District's sanitary sewer infrastructure. Should discharge of any process water be desired, a formal application will need to be submitted to the District by the Purchaser for review and approval in accordance with the Sewer Use Ordinance.

The potential maximum development build-out defined in the Supplemental SEQRA Finding Statement was comprised of the following uses and associated square-footages:

- 6,886,836 square feet (SF) of industrial/research and development (R&D)/flex space;

- 2,927,232 SF of office/flex and 740,520 SF of medical office space;

- 805,860 SF of commercial/retail space (this was the analysis level in the DSGEIS; a maximum permitted retail space of 500,000 SF was analyzed in the FSGEIS);

- 300 Residential Units (supportive of commercial/industrial development at the EPCAL property),

Despite being permitted under the Supplement SEQRA Finding Statement, a covenant and restriction will be referenced in the Deed for lots 6, 7 and 8 and contained in a separate document to be executed at Closing, providing that there will be no residential uses permitted at the property. As such, the sanitary

flow expected to be generated from the allowed potential maximum development build-out, not including the 300 Residential Units originally defined in the Supplemental SEQRA Finding Statement, will result in a total hydraulic load equal to 558,511 gallons per day (GPD) based on current Suffolk County Department of Health Services (SCDHS) design criteria as summarized in Table 1.1 and Table 1.2 below.

Table 1.1 – Initial 5-year Build-out Flow Projection for Sewer District Extension No. 3

Description	Sanitary Flow Criteria	Build-Out Criteria	Sanitary Flow (GPD)
Initial 5-year Build-out (Industrial Space)	0.04 GPD/SF	1,000,000 SF	40,000 GPD
Initial 5-year Build-out Flow Projection . . .			**40,000 GPD**

Table 1.2 – Potential Max Build-out Flow Projection for Sewer District Extension No. 3

Description	Sanitary Flow Criteria	Build-Out Criteria	Sanitary Flow (GPD)
Maximum Build-out (Industrial Space)	0.04 GPD/SF	6,886,836 SF	275,473 GPD
Maximum Build-out (Office Space)	0.06 GPD/SF	2,927,232 SF	175,634 GPD
Maximum Build-out (Medical Office Space)	0.10 GPD/SF	740,520 SF	74,052 GPD
Maximum Build-out (Retail Space – from FSGEIS)	0.03 GPD/SF	500,000 SF	15,000 GPD
Maximum Build-out (Commercial Space)	0.06 GPD/SF	305,860 SF	18,352 GPD
Maximum Build-out Flow Projection* . . .			**558,511 GPD**

*Includes initial 5-year build-out flow projection

Currently, the Town of Riverhead has finalized plans, let bid documents, awarded contracts and issued a Notice to Proceed on September 4, 2019 to begin construction of the Module No. 1 upgrade to the District's existing treatment facility including the elimination of the surface water outfall to the Peconic Estuary and relocation for disposal on land of the EPCAL property located north of the groundwater divide to comply with the recommendations of the Peconic Estuary Comprehensive Management Plan and the 2007 Total Maximum Daily Load (TMDL) requirements issued by the USEPA. The Module No. 1 upgrade is the first phase of a modular expansion plan for the treatment facility that will enable future capacity expansion dictated by development to minimize process interruptions and maintain process performance. The planned Module No. 1 treatment facility upgrade will result in 100,000 GPD of permitted capacity, some of which will be used to accommodate the initial 5-year development within the subdivision.

As of present date, the average daily sanitary flow being treated by the District is ~25,000 GPD. An additional 16,200 GPD is anticipated to be generated following the completion the Peconic Care Rehabilitation and Research Center (EDBK at Calverton, LLC) development occurring on properties located within Sewer District Extension No. 2. Following completion of the EDBK at Calverton, LLC build-out, the flow to the treatment facility is expected to increase to 41,200 GPD (i.e. 25,000 GPD + 16,200 GPD). Therefore, there will be 58,800 GPD of available capacity to support future development within the subdivision after the treatment facility upgrade is complete (i.e. 100,000 GPD – 41,200 GPD). This remaining capacity is enough to accommodate the additional 40,000 GPD projected for the 1 million SF of required industrial build-out within the subdivision. Following completion of the required industrial build-out and connection to the District, there will be 18,800 GPD (i.e. 58,800 GPD – 40,000 GPD) of remaining treatment capacity to support some of the additional development identified in the maximum build-out projections for the sub-division.

Development that will result in sanitary flows that exceed the permitted flow for the expanded facility will require additional expansion modules to be constructed. The costs of which will be funded by the District via No Net Nitrogen connection funds and sewer taxes collected by the District. A copy of the Engineering Design Report for the Module No. 1 treatment facility upgrade is included as **Appendix B**.

The contract completion date for the ongoing treatment facility upgrade has been established as March 6, 2021. Construction and start-up of the new facility is expected to be completed on or before this date. All grant funding and NYS EFC financing are in place to pay for this construction. As previously mentioned, contracts have been let and awarded for this work. Interim and final SPEDES permit conditions have been issued by the NYSDEC. A copy of the permit conditions is provided as **Appendix C**.

As previously stated in Section 1.0, future infrastructure improvements to support development within the subdivision must comply with the Supplement SEQRA Finding Statement, otherwise additional SEQRA review will be required. In addition, all fees, design, construction and operation and maintenance costs associated with any improvements identified and subsequently approved by the District will be the full responsibility of the Purchaser. The Purchaser is required to adhere to the Sewer Use Ordinance adopted by the Town containing sewer construction standards, industrial waste pretreatment standards, and appropriate requirements for the safe operation of the facilities consistent with the State Pollutant Discharge Elimination System (SPDES) permit issued by the NYSDEC. The Sewer Use Ordinance is on file with the Riverhead Town Clerk.

3.0 FINANCIAL INFORMATION

3.1 Tax Rates

Section 202 of NYS Law requires the Map and Plan to identify the actual apportionment of debt service for a sewer district. Per the Map & Plan/Facility Plan Upgrade of the Sewage Treatment Plant Enterprise Park at Calverton Module No. 1 (0.100 MGD), the annual sewer tax revenue to be collected by the District is expected to be $165,603.38, which will be distributed across all properties within the District boundary to pay the District debt service.

The total assessed value (A.V.) of all properties currently located within the Calverton Sewer District is $12,473,500.00, as provided by the Town Assessor. The assessed value (A.V.) for Lots 6, 7 and 8, which will be included in the District following Town adoption of Calverton Sewer District Extension No. 3, will increase the District A.V. by $6,000,000.00 based on present-worth sale price of $40,000,000.00 and a Town RAR equal to 15% (i.e. Present worth × RAR). Thereby, resulting in a new District A.V. equal to $18,473,500.00.

Distributing the annual tax revenue of $165,603.38 across the new District A.V. will result in a sewer tax rate of $8.96 per $1,000 A.V. Therefore, the sewer tax revenue to be initially collected from the sale of Lots 6, 7 and 8 will be $53,760.00 per year, which equates to 32% of the total tax revenue required for the District debt service.

A.V. and sewer tax revenues required by the District will be re-evaluated on an annual basis as land improvements are made on undeveloped properties within the District and as approved capital improvements are made that impact the District debt service. Increase in A.V. for lots 6, 7 and 8 is to be expected after the build-out of the 1 million SF of industrial space is completed. Increases to the District debt service are anticipated to occur at the time future treatment modules need to be constructed. The exact A.V. and sewer tax adjustment(s) will be computed by the Town Assessor and applied to the current sewer tax rate for the year the adjustment was made.

3.2 Sewer Rent

Like the Tax Rates explained above, the annual operation and maintenance budget for the Calverton Sewer District was also identified in the Map & Plan/Facility Plan Upgrade of the Sewage Treatment Plant Enterprise Park at Calverton Module No. 1 (0.100 MGD) to be $630,000 following the upgrade of the sewage treatment plant. All properties served by District infrastructure are required to contribute to the cost of operation and maintenance (sewer rent) proportionally based on their water usage. Calverton Sewer District bases their sewer rent for operation and maintenance on a per 1,000 gallons used basis.

It is anticipated that as the wastewater infrastructure expands to accommodate new development within Sewer District Extension No. 3, and infrastructure is dedicated to the District, the water usage will

increase proportionally to the increase in future O&M costs. This relationship will be evaluated as needed to maintain the necessary funds to properly operate and maintain the District infrastructure.

3.3 Connection Fees/Sewer Extensions

A "No Net Nitrogen" charge was adopted by the Town Board of the Town of Riverhead via Town Board Resolution # 426 on April 15, 2003. The resolution is on file with the Town Clerk. The Town Board established a "Nitrogen Reduction Policy" to be funded by a "Nitrogen Reduction Fund" paid by applicants prior to connecting to the Calverton Sewer District. The "No Net Nitrogen" charge is $14.20 per gallon per day of flow, such flow to be determined based on Suffolk County Department of Health Services standards. All other costs for sewer extensions, including but not limited to, construction, engineering and other incidental costs, are also to be paid for by the petitioner(s) for such service.

The "No Net Nitrogen" charge associated with the initial 5-year build out of 1 million SF of industrial space will equate to $586,000.00 (i.e. 40,000 GPD × $14.20), with an additional charge associated with the maximum build-out projection equal to $7,362,856.20 (i.e. 518,511 GPD × $14.20) based on the current rate. Should the District "No Net Nitrogen" charge be adjusted by Resolution prior to the connection of new development, the modified charge rate shall govern.

5.0 ENVIRONMENTAL REVIEW

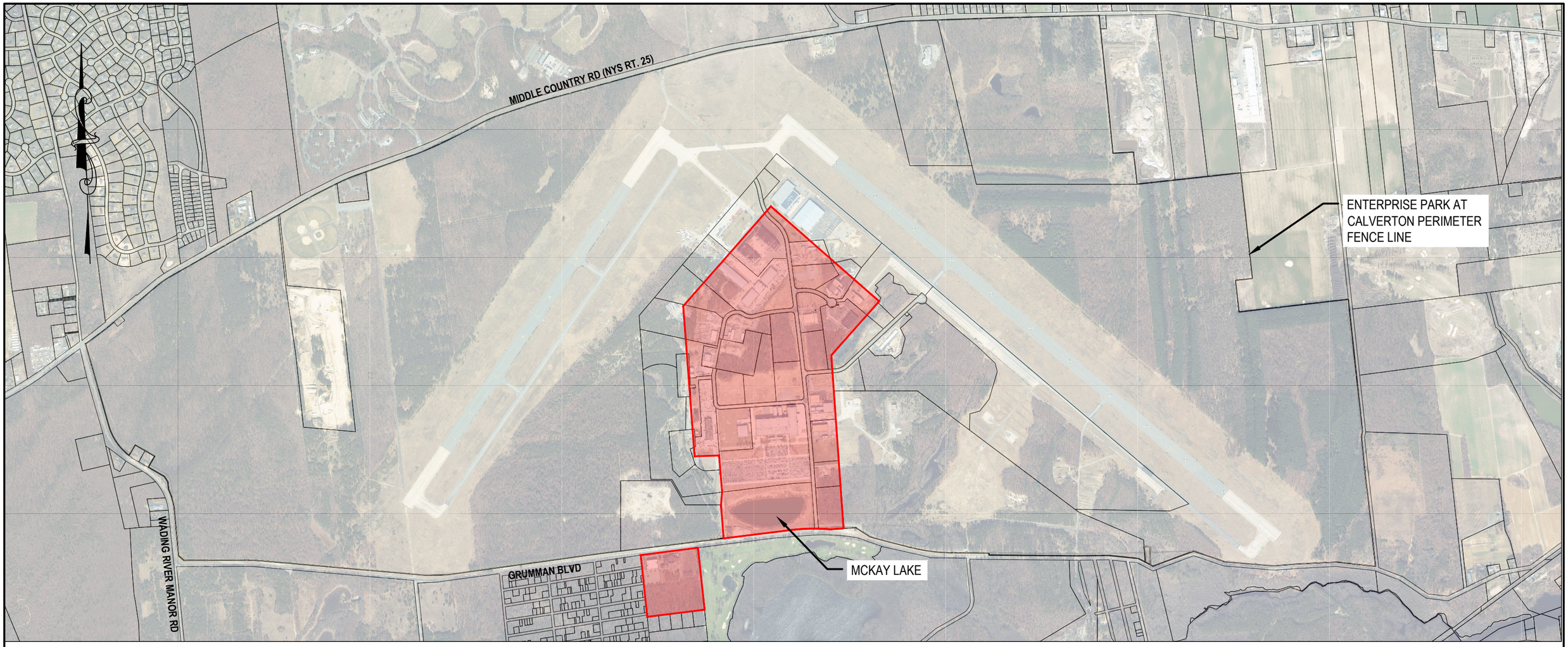
Pursuant to the New York State Environmental Quality Review Act requirements, the Town of Riverhead Planning Board has adopted Resolution No. 2019-026 entitled "Resolution Adopting SEQRA Consistency Analysis and SEQRA Findings with Respect to The Enterprise Park at Calverton Preliminary Subdivision Map (8-Lot Major Subdivision Map)". No additional SEQRA analysis will be required.

6.0 CONCLUSION

All properties which could be benefited by Calverton Sewer District No. 3 are included within the boundary of Calverton Sewer District No. 3, and no property which is benefitted is excluded from the same.

The approval of Calverton Sewer District Extension No. 3 by the Riverhead Town Board is recommended at this time.

EXHIBITS



Calverton Sewer District "Core Area"

SCALE: 1"=1,500'

NOTES:

1. SUFFOLK COUNTY TAX LOT LINES DEPICT 2015 SUFFOLK COUNTY GIS TAX LOT MAPPING. GIS FILES OBTAINED FROM: HTTP://OPENDATA.SUFFOLKCOUNTYNY.GOV/DATASETS?T=GIS%20DATA.
2. BACKGROUND AERIAL IMAGERY REPRESENTS 2016 CONDITIONS. IMAGERY OBTAINED FROM: HTTP://GIS.NY.GOV/GATEWAY/MG/2016/SUFFOLK/16IC_T_RIVERHEAD_E06_4BD.HTM
3. LEGAL DESCRIPTION FOR "CORE AREA" SEWER DISTRICT BOUNDARY PREPARED BY JOHN C. EHLERS LAND SURVEYOR, DATED 4/27/1999.

LEGEND:

SEWER DISTRICT "CORE AREA" BOUNDARY

GRAPHIC SCALE

1500 0 750 1500

(IN FEET)

1 inch = 1500 ft.

EXHIBIT 1

Calverton Sewer District Map & Plan EPCAL - Sewer District Extension No. 3

Project # CASD-1901

DATE: AUG 2019

H2M architects + engineers

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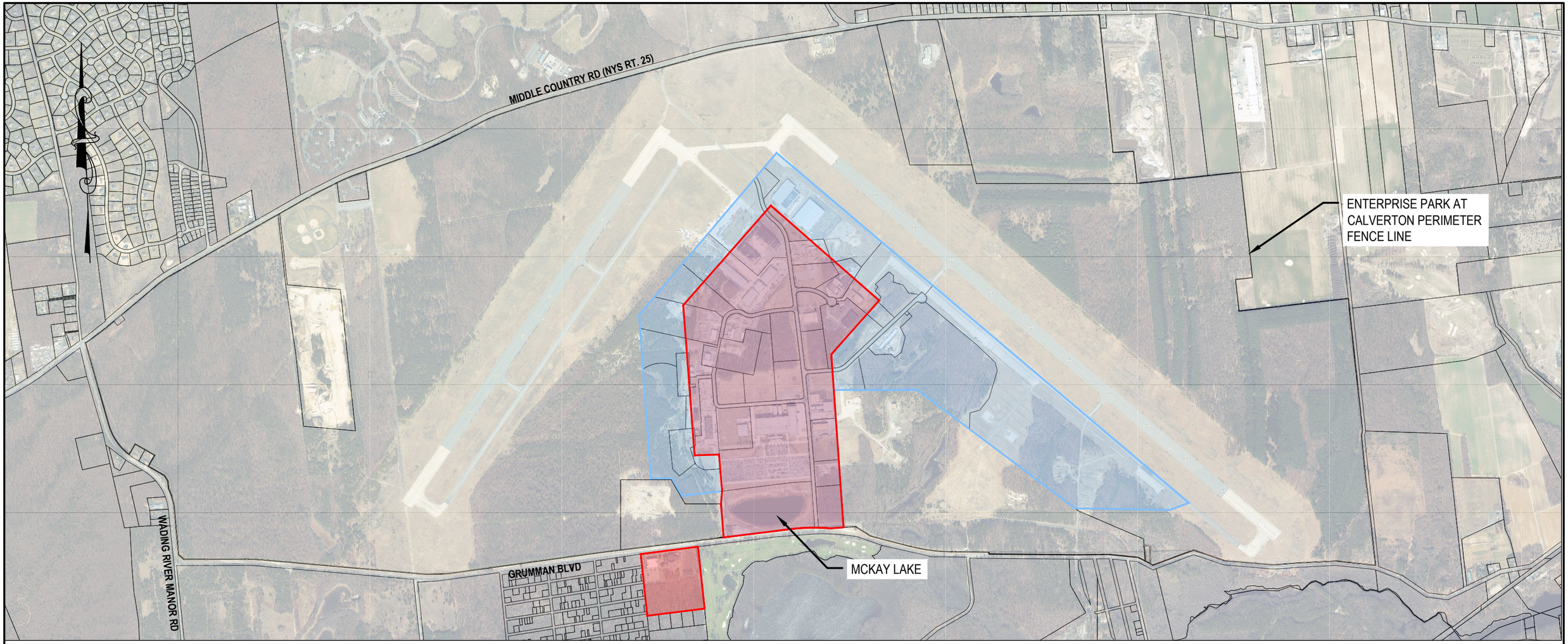

Calverton Sewer District Extension #1

SCALE: 1"=1,500'

NOTES:

1. SUFFOLK COUNTY TAX LOT LINES DEPICT 2015 SUFFOLK COUNTY GIS TAX LOT MAPPING. GIS FILES OBTAINED FROM: HTTP://OPENDATA.SUFFOLKCOUNTYNY.GOV/DATASETS?T=GIS%20DATA.
2. BACKGROUND AERIAL IMAGERY REPRESENTS 2016 CONDITIONS. IMAGERY OBTAINED FROM: HTTP://GIS.NY.GOV/GATEWAY/MG/2016/SUFFOLK/16IC_T_RIVERHEAD_E06_4BD.HTM
3. LEGAL DESCRIPTION FOR "CORE AREA" SEWER DISTRICT BOUNDARY PREPARED BY JOHN C. EHLERS LAND SURVEYOR, DATED 4/27/1999.

LEGEND:

- SEWER DISTRICT "CORE AREA" BOUNDARY
- SEWER DISTRICT EXTENSION BOUNDARY #1 aka "BURMAN SUBDIVISION"

GRAPHIC SCALE

1500 0 750 1500

(IN FEET)

1 inch = 1500 ft.

EXHIBIT 2

Calverton Sewer District Map & Plan EPCAL - Sewer District Extension No. 3

Project # CASD-1901

DATE: AUG 2019

H2M architects + engineers

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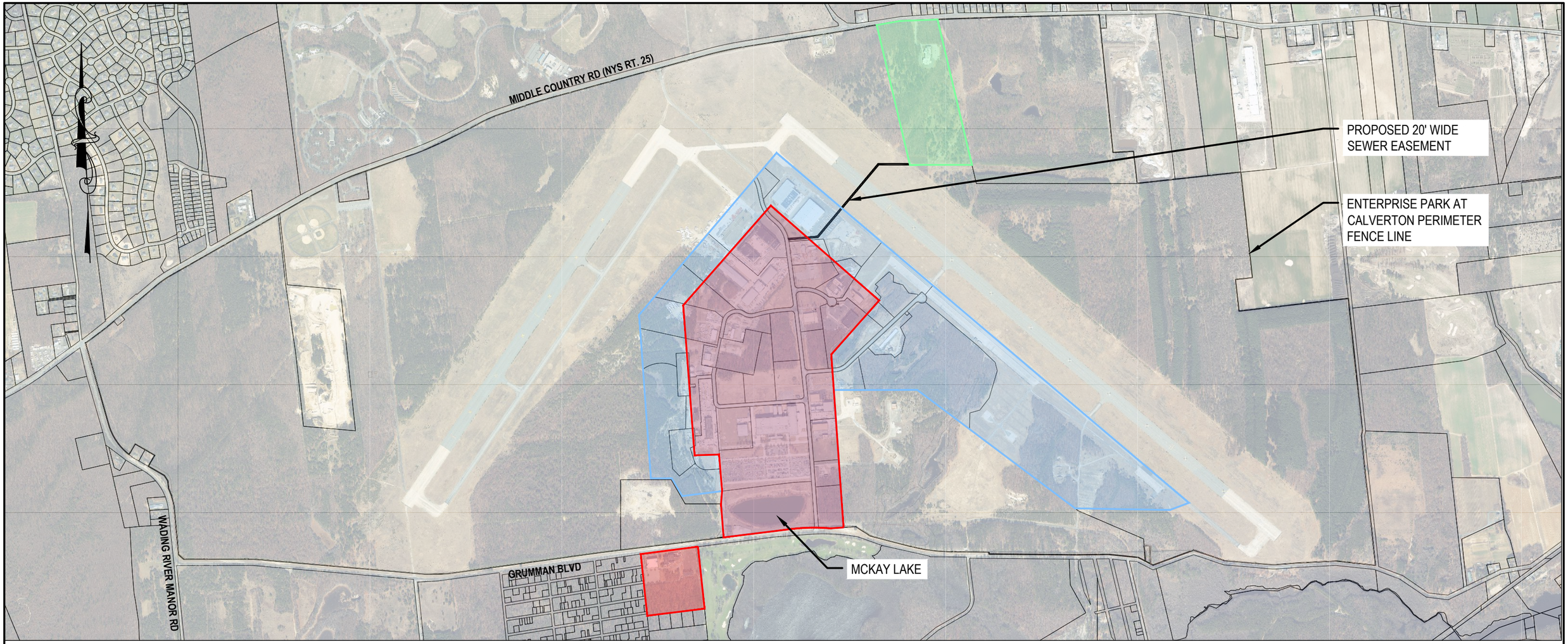

Calverton Sewer District Extension #2

SCALE: 1"=1,500'

NOTES:

1. SUFFOLK COUNTY TAX LOT LINES DEPICT 2015 SUFFOLK COUNTY GIS TAX LOT MAPPING. GIS FILES OBTAINED FROM: HTTP://OPENDATA.SUFFOLKCOUNTYNY.GOV/DATASETS?T=GIS%20DATA.
2. BACKGROUND AERIAL IMAGERY REPRESENTS 2016 CONDITIONS. IMAGERY OBTAINED FROM: HTTP://GIS.NY.GOV/GATEWAY/MG/2016/SUFFOLK/16IC_T_RIVERHEAD_E06_4BD.HTM
3. LEGAL DESCRIPTION FOR "CORE AREA" SEWER DISTRICT BOUNDARY PREPARED BY JOHN C. EHLERS LAND SURVEYOR, DATED 4/27/1999.

GRAPHIC SCALE

1500 0 750 1500

(IN FEET)

1 inch = 1500 ft.

LEGEND:

- SEWER DISTRICT "CORE AREA" BOUNDARY
- SEWER DISTRICT EXTENSION BOUNDARY #1 aka "BURMAN SUBDIVISION"
- SEWER DISTRICT BOUNDARY EXTENSION #2 FOR STONY BROOK UNIVERSITY INCUBATOR

EXHIBIT 3

Calverton Sewer District
Map & Plan
EPCAL - Sewer District
Extension No. 3

Project # CASD-1901

DATE: AUG 2019

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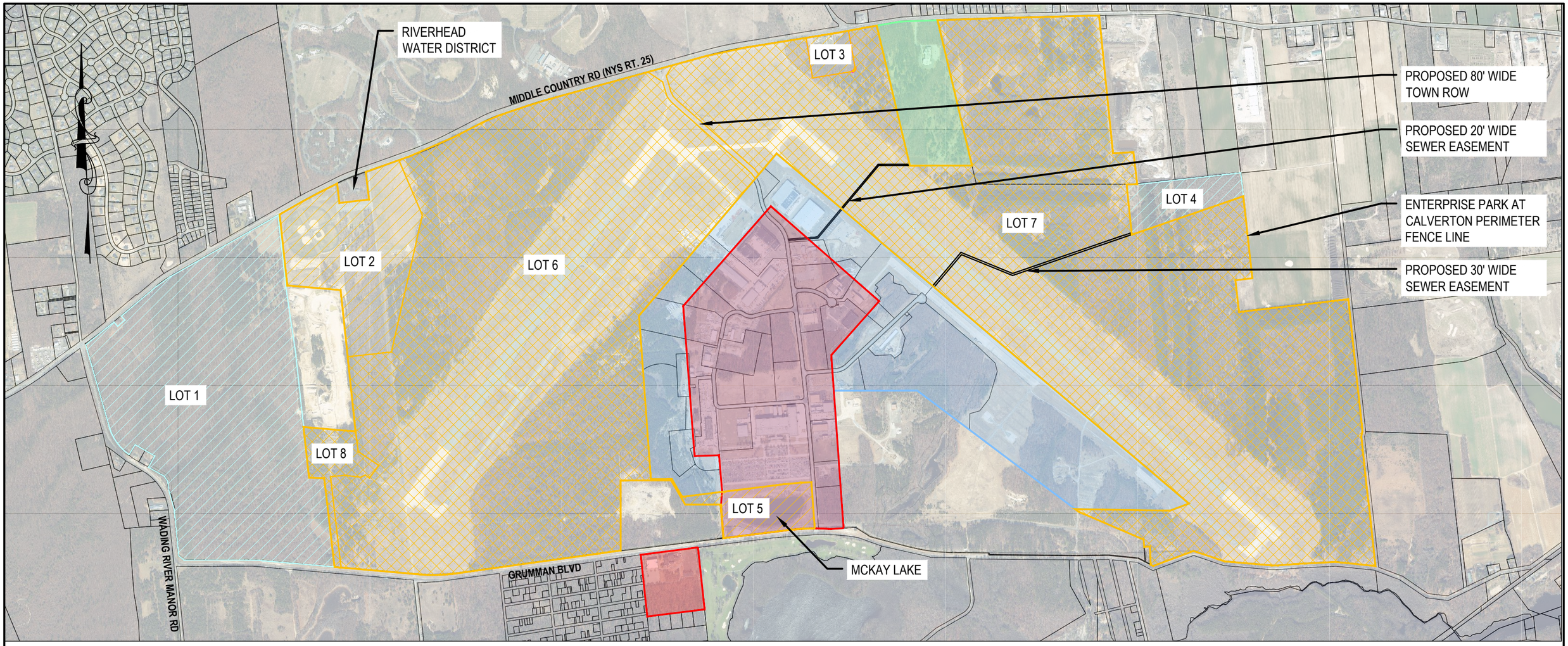

Calverton Sewer District Extension #3

SCALE: 1"=1,500'

LEGEND:

- SEWER DISTRICT "CORE AREA" BOUNDARY
- SEWER DISTRICT EXTENSION BOUNDARY NO.1 aka "BURMAN SUBDIVISION"
- SEWER DISTRICT BOUNDARY EXTENSION NO.2 FOR STONY BROOK UNIVERSITY INCUBATOR
- SEWER DISTRICT EXTENSION NO.3 SUBDIVISION LOTS 6,7 & 8 PENDING SALE TO CALVERTON AVIATION & TECHNOLOGY LLC.
- SEWER DISTRICT EXTENSION NO.3 SUBDIVISION LOTS 2,3 & 5 TO BE RETAINED BY THE TOWN OF RIVERHEAD CDA
- SUBDIVISION LOTS 1 & 2 TO BE RETAINED BY THE TOWN OF RIVERHEAD CDA, NOT TO BE INCLUDED WITHIN SEWER DISTRICT EXTENSION NO.3 BOUNDARY

GRAPHIC SCALE

1500 0 750 1500

(IN FEET)

1 inch = 1500 ft.

NOTES:

1. SUFFOLK COUNTY TAX LOT LINES DEPICT 2015 SUFFOLK COUNTY GIS TAX LOT MAPPING. GIS FILES OBTAINED FROM: HTTP://OPENDATA.SUFFOLKCOUNTYNY.GOV/DATASETS?T=GIS%20DATA.
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EXHIBIT 4

Calverton Sewer District
Map & Plan
EPCAL - Sewer District
Extension No. 3

Project # CASD-1901

DATE: AUG 2019

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APPENDICES

Appendix A

PRELIMINARY SUBDIVISION MAP OF ENTERPRISE PARK AT CALVERTON

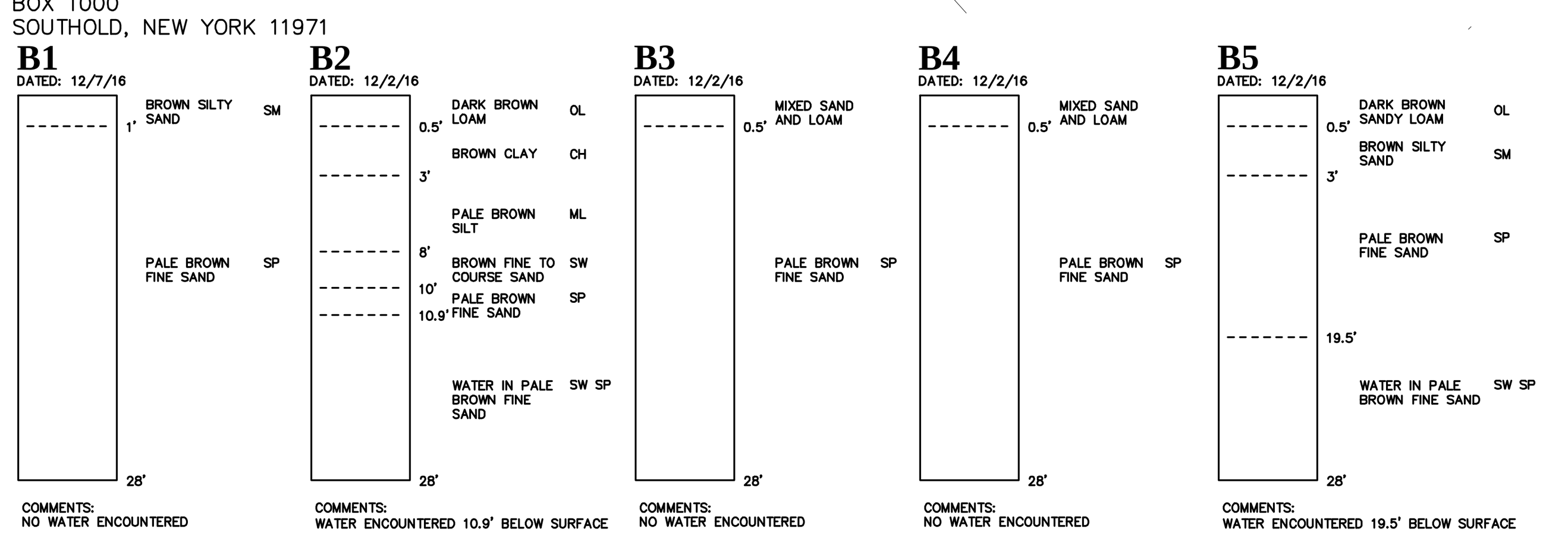
PREPARED FOR
THE TOWN OF RIVERHEAD
LOCATED AT
CALVERTON
TOWN OF RIVERHEAD
SUFFOLK COUNTY, NEW YORK
MARCH 26, 2019

SUBDIVISION SITE DATA:

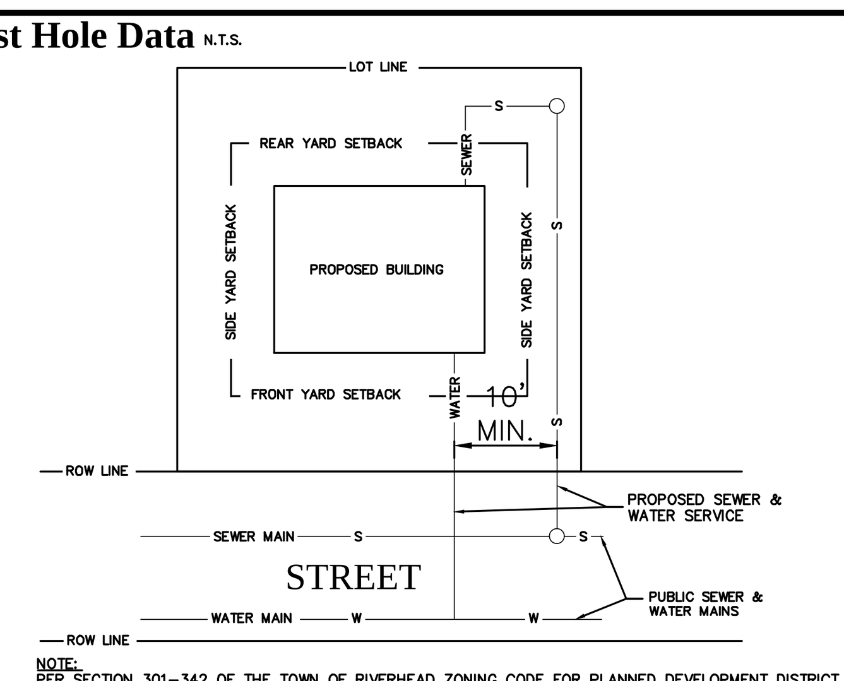
AREA OF PROPERTY .... 2,124.319 ACRES (OVERALL)
.... 2,106.690 ACRES (8 LOTS)
.... 4.931 ACRES (PROPOSED BURMAN BOULEVARD RIGHT OF WAY)
.... 12.698 ACRES (PROPOSED DEDICATION FOR HIGHWAY PURPOSES RT. 25 & GRUMMAN BOULEVARD)

NUMBER OF PROPOSED LOTS...8 LOTS
POST OFFICE............................CALVERTON
SCHOOL DISTRICT......................RIVERHEAD CENTRAL
FIRE DISTRICT...........................RIVERHEAD, MANORVILLE, WADING RIVER
WATER DISTRICT........................RIVERHEAD
SEWER DISTRICT........................CALVERTON
ELECTRIC.................................PSEG LONG ISLAND
CURRENT ZONING.....................PLANNED DEVELOPMENT DISTRICT

TEST HOLE DATA PROVIDED BY:
MCDONALD GEOSCIENCE
BOX 1000
SOUTHOLD, NEW YORK 11971



Test Hole Data N.T.S.



NOTE:
PER SECTION 301–342 OF THE TOWN OF RIVERHEAD ZONING CODE FOR PLANNED DEVELOPMENT DISTRICT, BUILDING INDIVIDUAL LOT SIZES, MINIMUM YARDS AND MINIMUM BUILDING SETBACK DIMENSIONS ARE NOT SPECIFIED AND WILL VARY SUBJECT TO TOWN APPROVAL.

Plot Plan N.T.S.

SUFFOLK COUNTY REAL PROPERTY TAX MAP NO.
DISTRICT 0600
SECTION 135.00
BLOCK 01.00
LOTS 007.033 & 007.004

NOTES

1. *MEASUREMENTS ARE IN ACCORDANCE WITH U.S. STANDARDS.*
2. *BEARINGS SHOWN ARE IN NEW YORK STATE PLANE COORDINATE SYSTEM, LONG ISLAND ZONE.*
3. *VERTICAL DATUM REFERENCES NAVD 1988.*
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7. *RIGHTS-OF-WAY NOT SHOWN ARE NOT CERTIFIED.*
8. *THE SURVEY CLOSES MATHEMATICALLY.*

SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES
GREAT RIVER, NY

DATE ____________________

____

____

This is to certify the proposed Realty Subdivision or development for ENTERPRISE PARK at CALVERTON in RIVERHEAD with a total of 8 lots was approved on the above date. Water supplies and sewage disposal facilities must conform to construction standards in effect at the time of construction and are subject to separate permits pursuant to those standards. This approval shall be valid only if the realty subdivision/development map was duly filed with the County Clerk within one (1) year of this date. Consent is hereby given for the filling of this map on which this endorsement appears in the office of the County Clerk in accordance with the provisions of the Public Health Law and the Suffolk County Sanitary Code.

____
Director, Division of Environmental Quality

SUFFOLK COUNTY TAX MAP DESIGNATION
DISTRICT 0600; SECTION 135; BLOCK 1; LOTS 7.33 & 7.4

THE LAND SHOWN ON THIS MAP AS ROADS, STREETS, OR HIGHWAY OR FOR THE WIDENING THEREOF, AND ALSO EASEMENTS, RECHARGE BASINS, PARK AREAS AND ALL OTHER LAND INDICATED AS DEDICATED FOR OTHER PUBLIC USE AND HEREBY IRREVOCABLY OFFERED FOR DEDICATION TO THE TOWN OF RIVERHEAD. THE TOWN OF RIVERHEAD IS IN NO WAY RESPONSIBLE FOR THE MAINTENANCE OF SUCH ROADS, STREETS, HIGHWAYS OR OTHER PUBLIC AREAS UNTIL THE SAME HAVE BEEN ACCEPTED BY THE TOWN.

BY: ______________________________
OWNER

THIS IS TO CERTIFY THAT THIS SUBDIVISION MAP HAS BEEN APPROVED AS PROVIDED BY ARTICLE 16 OF THE TOWN LAW.

DATE OF APPROVAL

______________, 20____.

TOWN OF RIVERHEAD PLANNING BOARD

BY: __________________________
SECRETARY

THIS APPROVAL OF THIS MAP DOES NOT CONSTITUTE THE ACCEPTANCE OF HIGHWAYS SHOWN HEREON AS PUBLIC ROADS.

CHAIRMAN DATE

ALL EASEMENTS FOR THE INSTALLATION OF COAXIAL CABLE TRUNK DISTRIBUTION LINES, TOGETHER WITH THE NECESSARY ELECTRONIC EQUIPMENT, IS HEREBY GRANTED TO ANY CABLE TELEVISION FIRM FRANCHISED BY THE TOWN OF RIVERHEAD FOR THE LOCATION IN WHICH THE LANDS SHOWN ON THIS MAP ARE SITUATED, PROVIDED THAT SUCH INSTALLATION IS MADE IN THE SAME MANNER AND AT THE SAME TIME AS THE INSTALLATION OF ELECTRIC AND TELEPHONE DISTRIBUTION LINES. AN EASEMENT IS ALSO GRANTED TO THE PSEG LONG ISLAND, VERIZON AND THE LOCAL WATER SUPPLIER FOR THE INSTALLATION AND MAINTENANCE OF ELECTRIC, TELEPHONE AND WATER DISTRIBUTION LINES AND MAINS WITHIN THE ROADS INDICATED ON THIS MAP. AN EASEMENT IS ALSO GRANTED TO THE TOWN OF RIVERHEAD AND ITS EMPLOYEES AND AGENTS FOR THE INSTALLATION, MAINTENANCE AND REPAIR OF TRAFFIC CONTROL DEVICES AND STREET LIGHTING FIXTURES, CABLES AND CONTROLS OVER, UNDER AND THROUGH THE ROADS CONTAINED IN THE SUBJECT DIVISION.

DATED______________________________

OWNER_____________________________

I hereby certify that this map was made from an actual survey completed by me on 10/21/2011

TAMARA L. STILLMAN, P.L.S.
NYSPLS No. 50528

Notes:

1. THE CDA, THE TOWN AND/OR CALVERTON SEWER DISTRICT SHALL RETAIN A GENERAL SURFACE AND SUBSURFACE EASEMENT FOR SEWER PURPOSES OVER LOTS 6 AND 7 TO CONNECT STRUCTURES AND USES ON LOTS 2, 3, 4 AND 5 TO ANY SEWER IMPROVEMENTS CONSTRUCTED ON LOTS 6 AND 7 WITHOUT PAYMENT, SUBJECT TO RESTORATION TO EXISTING CONDITIONS.
2. SITE PLAN REVIEW OR YIELD DETERMINATION FOR LOTS 6, 7, AND 8 SHALL COMPLY WITH AND BE CALCULATED BASED UPON APPLICABLE ZONING, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION WETLAND AND TIGER SALAMANDER BUFFER REQUIREMENTS/REGULATIONS, AND THE TOWN BOARD'S JULY 19, 2018 SUPPLEMENTAL GENERIC FINDINGS STATEMENT AT SUCH TIME AS SPECIFIC SITE DEVELOPMENT IS PROPOSED
3. OWNERSHIP: TAX LOTS 0600–135.00–0100–007.004 & 007.033 ARE OWNED BY THE TOWN OF RIVERHEAD COMMUNITY DEVELOPMENT AGENCY
200 HOWELL AVENUE
RIVERHEAD, NY 11901

DATE	BY	DESCRIPTION	APPROV. BY
07/25/2019	G.L.B.	EDITS PER PLANNING BOARD COMMENTS	T.L.S.

REVISIONS

LKMA

Town of Riverhead
Suffolk County, New York

Preliminary Subdivision Map of Enterprise Park at Calverton

Key Map Sheet

L. K. McLEAN ASSOCIATES, P.C.
CONSULTING ENGINEERS & LAND SURVEYORS
437 SO. COUNTRY ROAD, BROOKHAVEN, NEW YORK

Designed By: G.L.B.	Scale: 1''= 600'	Sheet No.
Drawn By: G.L.B.	Date: 03/26/2019	1 / 4
Approved By: T.L.S.	File No. 19043.000	

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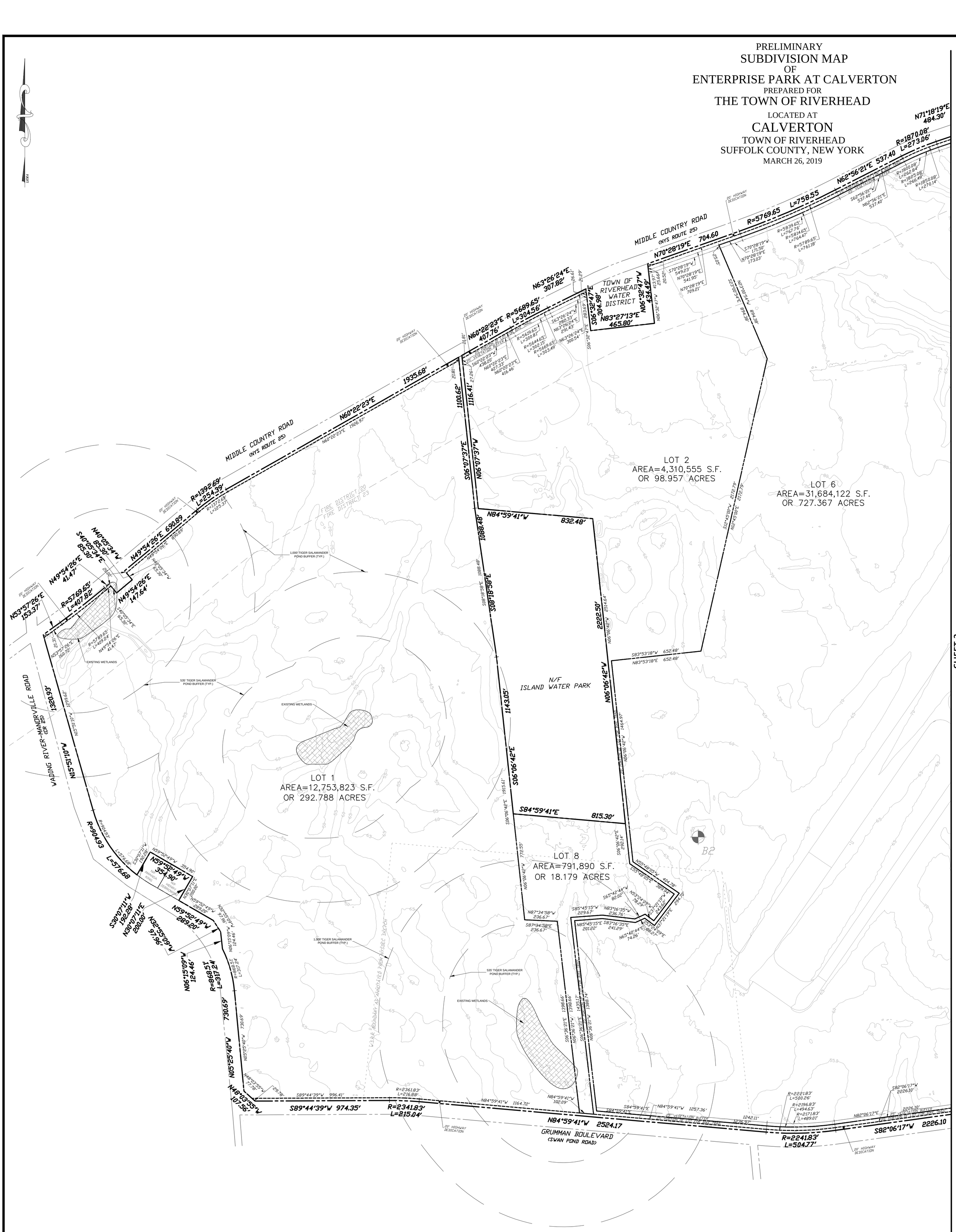
PRELIMINARY

SUBDIVISION MAP
OF
ENTERPRISE PARK AT CALVERTON
PREPARED FOR
THE TOWN OF RIVERHEAD
LOCATED AT
CALVERTON
TOWN OF RIVERHEAD
SUFFOLK COUNTY, NEW YORK
MARCH 26, 2019



SHEET 3

GRAPHIC SCALE

300 0 150 300 600 1200

(IN FEET)
1 inch = 300 ft.

NOTES

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DATE	BY	DESCRIPTION	APPROV. BY
07/25/2019	G.L.B.	EDITS PER PLANNING BOARD COMMENTS	T.L.S.

REVISIONS

Town of Riverhead
Suffolk County, New York

Enterprise Park at Calverton
Calverton, New York

Preliminary Subdivision Map

L. K. McLEAN ASSOCIATES, P.C.
CONSULTING ENGINEERS
437 SO. COUNTRY ROAD, BROOKHAVEN, NEW YORK

Designed By:	G.L.B.	Scale:	1'' = 300'	Sheet No. 2 / 4
Drawn By:	G.L.B.	Date:	03/26/2019	
Approved By:	T.L.S.	File No.	19043.000	

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PRELIMINARY
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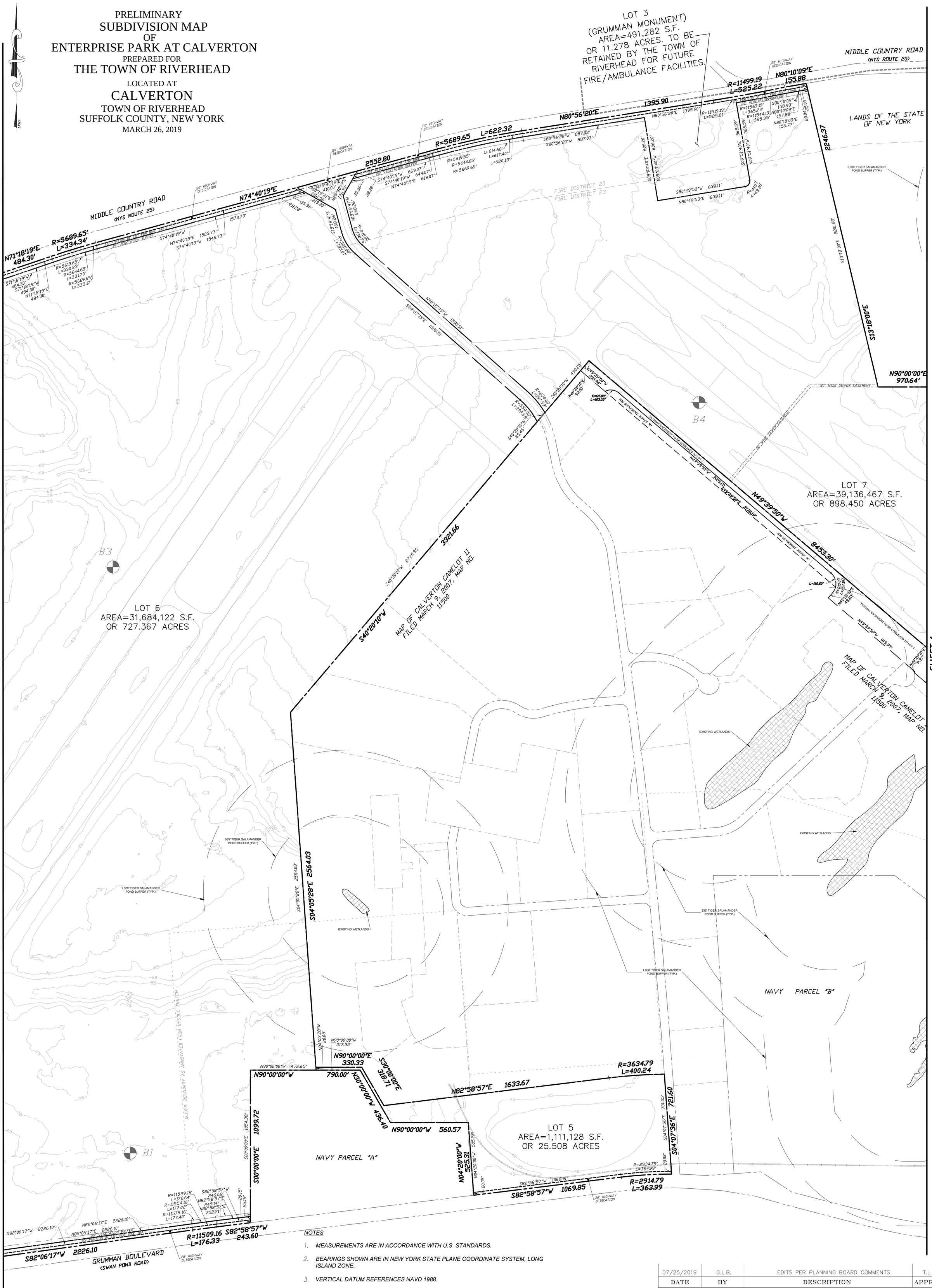
SUFFOLK COUNTY, NEW YORK
MARCH 26, 2019

LKMA



SHEET 2

SHEET 4

NOTES

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GRAPHIC SCALE

300 0 150 300 600 1200

(IN FEET)
1 inch = 300 ft.

DATE	BY	DESCRIPTION	APPROV. BY
07/25/2019	G.L.B.	EDITS PER PLANNING BOARD COMMENTS	T.L.S.

REVISIONS

LKMA

Town of Riverhead
Suffolk County, New York

Enterprise Park at Calverton
Calverton, New York

Preliminary Subdivision Map

L. K. McLEAN ASSOCIATES, P.C.
CONSULTING ENGINEERS
437 SO. COUNTRY ROAD, BROOKHAVEN, NEW YORK

Designed By:	G.L.B.	Scale:	1'' = 300'	Sheet No. 3/4
Drawn By:	G.L.B.	Date:	03/26/2019	
Approved By:	T.L.S.	File No.	19043.000	

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PRELIMINARY

SUBDIVISION MAP
OF
ENTERPRISE PARK AT CALVERTON
PREPARED FOR
THE TOWN OF RIVERHEAD
LOCATED AT
CALVERTON
TOWN OF RIVERHEAD
SUFFOLK COUNTY, NEW YORK
MARCH 26, 2019

FORMER NAVY PARCEL "D"
Area = 6,305,132 SQ. FT. OR 144.746 Acres
TRANSFERRED TO THE TOWN OF RIVERHEAD
IN L. 12538 CP 990 8/10/2007
S.C.T.M. 0600-135.00-01.00-007.004

LOT 4
AREA=1,488,138 S.F.
OR 34.163 ACRES

LOT 7
AREA=39,136,467 S.F.
OR 898.450 ACRES

NAVY PARCEL "B"

SHEET 3

EXISTING WETLANDS

535' TIGER SALAMANDER POND BUFFER (TYP.)

1,000' TIGER SALAMANDER POND BUFFER (TYP.)

TAXIWAY EASEMENT TO BE CONVEYED TO LOT 7

PROPOSED 30' SANITARY EASEMENT

W.S.R.R. BOUNDARY AS ANNOTATED FROM NYSDEC SKETCH

MAP LINE

N/F EASTERN PROPERTY MANAGEMENT INC

N/F CALVERTON INDUSTRIES, LLC

N/F ROBERT J VOLANTE JR. COLLEEN A VOLANTE & JAMES PATRICK FLEMING & PATRICIA FLEMING

N/F 4245 FARM LLC

N/F AIRCRAFT MARKET WAREHOUSE, INC.

N/F GREEN MEADOWS, LLC

N/F BASH CALVERTON LINKS LLC

N/F CALVERTON PROPERTIES INC

N/F WESTBURY PROPERTIES

LAND OF THE STATE OF NEW YORK

MAP OF JAMES M. SMITH'S FARM FILED DECEMBER 15 1894, FILE NO. 491

MAP OF PROPERTY OF EDWIN H. BROWN FILED MARCH 31, 1920, FILE NO. 761

P/O LOT 1 · P/O LOT 2 · P/O LOT 4 · P/O LOT 5 · P/O LOT 6 · P/O LOT 7 · P/O LOT 8 · P/O LOT 9 · P/O LOT 10 · P/O LOT 11 · P/O LOT 12 · P/O LOT 13 · P/O LOT 14 · P/O LOT 15 · P/O LOT 16 · P/O LOT 17 · LOT 5 · LOT 6 · LOT 11 · LOT 14

B5

GRAPHIC SCALE

300 0 150 300 600 1200

(IN FEET)
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REVISIONS

Town of Riverhead
Suffolk County, New York

Enterprise Park at Calverton
Calverton, New York

Preliminary Subdivision Map

L. K. McLEAN ASSOCIATES, P.C.
CONSULTING ENGINEERS
437 SO. COUNTRY ROAD, BROOKHAVEN, NEW YORK

Designed By:	G.L.B.	Scale:	1'' = 300'
Drawn By:	G.L.B.	Date:	03/26/2019
Approved By:	T.L.S.	File No.	19043.000

Sheet No. 4 / 4

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Appendix B

Town of Riverhead
Calverton Sewer District
Suffolk County, New York

Map & Plan / Facility Plan
Upgrade of the Sewage Treatment Plant
Enterprise Park at Calverton
Module No. 1 (0.100 MGD)

Prepared for:

Supervisor Laura Jens-Smith and Town Board
Town of Riverhead
200 Howell Avenue
Riverhead, New York 11901

Prepared by:

H2M architects + engineers
538 Broad Hollow Road, 4th Floor East
Melville, New York 11747

Revised: March 19, 2019 (Based on costs from bid opening & tax implications)
Final: July 21, 2015 (Based second review by MPR and RAE)
Draft No. 1: May 2015
H2M Project No.: CASD 14-01

H2M architects + engineers

Executive Summary*

The objective of the project is to eliminate the existing surface water outfall to the Peconic Estuary and relocate it for disposal on land of the Calverton Sewer District, which is located north of the groundwater divide, so as to comply with the recommendations of the Peconic Estuary Comprehensive Management Plan and the 2007 Total Maximum Daily Load (TMDL) requirements issued by USEPA.

The purpose of this report is to set forth the measures necessary to upgrade the Calverton Sewer District's existing sewage treatment plant to achieve groundwater discharge standards so that the plant can be permitted by NYSDEC to discharge to new recharge beds constructed on the existing sewer district's land. This document also provides the capital budget opinion and operational and maintenance costs associated with the plant upgrade.

This report complies with the Map and Plan requirements of New York State Town Law. This report also complies with Chapter 10 of the latest edition of the Recommended Standards for Wastewater Facilities (a.k.a. Ten State Standards) as required by New York State Department of Environmental Conservation / (NYSDEC) New York State Environmental Facilities Corp. (NYSEFC) as a required submission of an engineering report for eligibility under the Clean Water State Revolving Fund (CWSRF) program. The Town of Riverhead may be seeking low interest financing for the project from NYSEFC to supplement current grants. The Suffolk County Department of Health Services (SCDHS) has traditionally accepted facility plans and design documents upon approval by NYSEFC. Consequently, formal approval by the Suffolk County Department of Health Services (SCDHS) may not be issued, but a submission will be made.

For the purposes of this plan, the word "Module" is somewhat synonymous with the word "Phase". Modules, for the purpose of this document, is defined as self-contained wastewater units that in combination with future expansion units will add hydraulic and treatment capacity to the facility up to the subdivision's build-out flow. The addition of modules will occur in phases as development warrants. The first module described herein provides 100,000 gpd capacity while achieving groundwater discharge standards of 10 mg/L of total nitrogen. The upgrade measures include the conversion of the existing extended aeration type activated sludge process to the membrane bioreactor process.

The future development and their associated sanitary flows need not be defined at this juncture in the overall plan for the facility. The current development plan for the EPCAL property assumes a multi-decade timeframe. Therefore, the types of uses do not matter in that this report designs a 100,000 gpd (0.100 MGD) first-phase module. Flow capacity will continue to be allocated toward projects that have been approved by the Town. When the actual flow approaches 95% of the first-phase module design flow, then

planning will commence for the second-phase module and so on up to the build-out flow or where land for expansion of the plant and/or the recharge area reach footprint capacity.

Wastewater treatment technologies continue to improve over time where the footprint requirements continue to shrink. It is highly probable that improvements in equipment and technical advancements in wastewater treatment will allow the capacity to expand beyond the land area requirements of today's wastewater treatment systems. Therefore, each module expansion will be analyzed to maximize capacity at a cost-effective design point.

Also, wastewater reuse is gaining in overall acceptance, public perception, cost effectiveness and additional year-round reuse applications continue to develop. The potential exists where future plans may include reuse of wastewater thereby reducing the amount of water for effluent disposal, thus reducing land requirements for new effluent recharge beds.

While this document describes the measures necessary to achieve groundwater discharge standards, the potential always exists that those standards may become stricter as more research is conducted on the impacts on nitrogen and other constituents found in wastewater like pharmaceuticals, personal care products and other currently unidentified/unregulated emerging contaminants of concern. The SPDES permit requirements at the time of the second-phase module planning will be addressed at that time.

The total budget for the project is $10,564,187.50, which is comprised of the accepted low bid construction costs identified at the bid opening held in Town Hall on December 19, 2018, associated engineering design and construction administration fees based on ASCE fee curve, and other miscellaneous soft costs (i.e. special engineering services not included under the ASCE fee curve, supplemental topographic survey, lead and asbestos testing, soil borings and piezometers, printing, O&M manual, process consultation, database, process spreadsheet and start-up services). The total project cost assumes the Town of Riverhead will administer this project in accordance with Wick's Law and all stipulations associated with the various funding sources. A summary of the project cost, funding sources and associated tax implications are summarized in Section 7 of this report.

TABLE OF CONTENTS

** Sections with asterisk have been added/updated based on actual construction costs from bid opening on December 19, 2018*

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

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1. INTRODUCTION

1.1. Purpose and Summary of Proposed Measures

This facility plan provides relevant technical information and describes the measures necessary to upgrade the facility to achieve total nitrogen reduction down to a minimum of 10 mg/L at a design flow of 100,000 gallons per day. A SPDES permit modification will be required. Please refer to the Executive Summary for the overall plan to expand the capacity of the facility in modules.

The recommended wastewater treatment plant (WWTP) upgrade is included as part of this document to satisfy the "Map and Plan" requirements stipulated by Section 202(B) of New York State Town Law for capital improvement projects for special benefit districts (e.g. sewer districts). The background information for the Map and Plan is based on the Draft Supplemental Generic Environmental Impact Statement (DSGEIS) for the Development (Reuse & Revitalization Plan), Including Amendment to the Town of Riverhead Comprehensive Plan, Amendment to Zoning Code and Map, and Subdivision of EPCAL Property at Calverton prepared by VHB Engineering, Surveying and Landscape Architecture, P.C. (VHB).

1.2. Background*

The Town of Riverhead formed the Calverton Sewer District (CSD) in June 1999. This area encompassed 236.28 acres of the former Naval Weapons Industrial Reserve Plant (NWIRP) transferred from the Navy to the Town of Riverhead Community Development Agency in the 1990's.

The original sanitary sewer service area was, and still is, referred to as the "core area" of the Calverton Sewer District. In addition to the core area, the CSD includes a non-contiguous parcel located on the south side of Grumman Road designated by Suffolk County tax map number 0600-141-2-2.1. Currently, sanitary sewer service does not extend to this parcel, and wastewater generated by this parcel is treated via an on-site septic system. The State University of New York (SUNY) Stony Brook University Business Incubator located at 4603 Middle Country Road is another non-contiguous parcel located within the District.

The Town Board designated a superintendent for the Calverton Sewer District to oversee operations and maintenance of the wastewater conveyance and treatment systems. The Town Board also adopted a Sewer Use Ordinance containing sewer construction standards, industrial waste pretreatment standards, and appropriate requirements for the safe operation of the facilities consistent with the State Pollutant Discharge Elimination System (SPDES) permit. The facility is permitted under NY 002 5453. A copy of the current SPDES permit is included in **Appendix A**.

The Town of Riverhead adopted a "No Net Nitrogen" policy to preserve the Peconic River Estuary. This policy was adopted to reduce net nitrogen load into the tributaries of the Peconic River. As such, the Town Board established a "Nitrogen Reduction Policy" to be funded by a "Nitrogen Reduction Fund" paid by

applicants for connection to the Calverton Sewer District. This connection fee is a one-time charge collected at the time of application.

The Town of Riverhead Town Board commissioned VHB Engineering, Surveying and Landscape Architecture, P.C. (VHB) to prepare a planning study to evaluate future development of the EPCAL property. The area evaluated by VHB is comprised of ± 2,332.9 acres located on the south side of Middle Country Road, north of Grumman Boulevard and east of Wading River Road. Refer to **Appendix B** for an overview of the proposed sub-division.

The Town of Riverhead authorized VHB to prepare a Draft Supplemental Generic Environmental Impact Statement (DSGEIS). The DSGEIS was prepared to provide detailed evaluation of the environmental impacts associated with the conceptual development plan in accordance with 6 NYCRR Part 617 of the State Environmental Quality Review Act (SEQRA). The DSGEIS was adopted by the Town Board via Town Board Resolution # 582 on August 7, 2014, and the document was circulated to all involved agencies. The resolution is on file with the Town Clerk. The Town Board issued a notice of public hearing on September 3, 2014 in accordance with Article 8 of the Environmental Conservation Law (the State Environmental Quality Review Act). Final Town Board resolution to adopt the zoning changes and conceptual development plan is pending.

The conceptual development plan was based on implementation over a multi-decade timeline. The short-term build-out, identified in the DSGEIS, was projected to occur through 2025 and would require the existing WWTP to be expanded to accommodate an additional design average daily flow of 252,000 gpd. However, due to the unknown rate at which development of the property will occur and the flexibility required to provide biological process turn-down to maintain treatment at initial low flow conditions, the proposed WWTP upgrade is based on a modular design. The first module will be sized to treat an average daily flow of 100,000 gpd. Future expansion modules will be constructed on an as needed basis to support the future development of the EPCAL site and/or accommodate future changes of use within the core area that were not considered under the current plan. The costs associated with the future AWTF expansion modules will be evaluated in the future at the time of design to adjust for market changes, inflation and advances in technology not currently available.

The sanitary infrastructure improvements necessary to support future development of the EPCAL site include upgrading the existing WWTP from a secondary treatment facility to an AWTF and relocating the existing surface water outfall to a groundwater recharge site located outside the Peconic Estuary watershed. The layout and design of the sanitary sewer collection system for the proposed sub-division is not included in the scope of this report and will be considered at the time of actual development of individual lots within the subdivision.

The cost for the sewer extension, including construction, engineering, legal and other incidental services are to be paid for by the property owner(s) who will benefit from the sewer connection(s). Each property owner who requests connection to the sewer district will be required to submit a sewer connection application to the CSD. Each application will provide the CSD with usage information that will be used to evaluate sanitary flow rates and identify if improvements to downstream facilities are necessary. CSD extensions and out-of-district connections will require the approval of the New York State Department of Environmental Conservation (NYSDEC). Each request will be evaluated on a case-by-case basis. Adequate flow capacity must be demonstrated to obtain approval from NYSDEC.

The cost for the project will be funded by a combination of grants and financing. The Town of Riverhead was awarded a $1.34 million grant in 2013 from the Regional Economic Development Council, $5.0 million from the NYS Senate Aid to Localities Appropriation, a $154,750 Water Infrastructure Improvements Act grant from New York Environmental Facilities Corp, a $125,000 grant from the Suffolk County Water Quality Protection and Restoration Program (WQPRP) and Land Stewardship Initiatives, and $476,000 from New York State Department of Environmental Conservation (NYSDEC) Water Quality Improvement Project (WQIP) funding for treatment facility upgrades at the EPCAL property and elimination of the EPCAL point source discharge to the Peconic Estuary. Total grants for the project equal $7,095,750.

1.2.1. Groundwater Recharge

The Town's "No Net Nitrogen" increase policy to preserve the Peconic River Estuary in conjunction with the United States Environmental Protection Agency (USEPA) 2007 TMDL regulations prevent any increase of the existing wastewater treatment plant discharge to the Peconic River. The treatment facility upgrade includes the elimination of the existing surface water outfall that discharges to the Peconic Estuary via McKay Lake and construction of groundwater recharge beds that will discharge treated effluent outside of the tributary area to the Peconic Estuary watershed. This will permanently remove an existing permitted nitrogen point source from the environmentally sensitive Peconic River.

The location of the proposed groundwater recharge beds is outside the Peconic Estuary watershed. The groundwater flow "divides" approximately coincide with the major surface water drainage areas. The location of the groundwater divide was determined in the *Section 201 Wastewater Facility Plan of the Peconic River Drainage Area* prepared in 1976 under the USEPA *208 Long Island Comprehensive Waste Treatment Management Plan* program and was based on Studies conducted in March 1974 by Suffolk County Water Authority. The groundwater divide location crosses the EPCAL property. Therefore, the groundwater recharge site has been located north of the divide to comply with the Town's "No Net Nitrogen" increase policy and eliminate future increases of nitrogen loading to the Peconic Estuary that would result from an increase in flow from the AWTF.

The new groundwater discharge site for the AWTF will be designed in compliance with Class GA groundwater discharge standards pursuant to Title 6, Chapter X, Parts 700-705 of the New York State Codes, Rules and Regulations. This standard includes an effluent limitation of 10 mg/L total nitrogen. The entire site is in the deep groundwater recharge area classified by Suffolk County Department of Health Services as Groundwater Management Zone III (GMZ III). All wastewater that is discharged within GMZ III must comply with Article 7 of the Suffolk County Sanitary Code. Article 7 contains a comprehensive listing of restricted toxic and hazardous materials that cannot be discharged in this area. For compliance with this requirement, all industrial connections to the Calverton Sewer District must comply with the Calverton Sewer District Sewer Use Ordinance.

2. PLANNING AREA SANITARY FLOW PROJECTIONS

2.1. Existing Core Area Flow

The current average daily wastewater flow rate treated at the existing WWTP is equal to approximately 25,000 gpd. This wastewater flow is based on records maintained at the treatment plant. The existing service area of the Calverton Sewer District includes the commercial/industrial build-out within the core area and the SUNY Stony Brook Incubator property located at 4603 Middle Country Road. Any future development of the EPCAL site and/or change of use within the core area in addition to the 100,000 gpd design flow allocation for the proposed AWTF will require construction of additional treatment modules as described herein.

2.2. EPCAL Sub-division Flow Projections

The type of development proposed for the EPCAL subdivision is based on zoning changes identified in the plan prepared by VHB. The proposed zoning changes would allow mixed-use type development comprised of industrial, commercial, office, retail and residential uses. Since the exact type and extent of development is uncertain, the preliminary wastewater flow projections for the EPCAL subdivision are based on the theoretical 2025 build-out identified in the DSGEIS.

The entire EPCAL subdivision has been allocated a flow density of 2,000 gpd/acre to account for unknown variations in property usages that are constructed when future development occurs. This allocated flow density is representative of typical flow densities seen in other existing industrial parks of similar size and build-out. Distributing the allocated flow density across the entire 2025 build-out area yields a total average daily sanitary flow projection of 252,000 gpd (2,000 gpd/acre x 126 acres). However, due to unknown variables associated with the actual rate of development and turn-down limitations associated with the biological treatment process, the initial treatment facility expansion will be constructed to accommodate a total average daily flow of 100,000 gpd. The 100,000 gpd AWTF will reserve 75,000 gpd of its available capacity for future development of the EPCAL subdivision and the remaining 25,000 gpd for existing flow within the CSD subject to change by the Town Board. The 100,000 gpd AWTF will support future development of approximately 37.5 acres of the EPCAL site (75,000 gpd ÷ 2,000 gpd/acre), thereby providing treatment capacity for 30% of the projected 2025 build-out (37.5 acres ÷ 126 acres × 100%).

NYSDEC regulations require a 5% capacity buffer between the real-time average daily flow and the average daily design flow for a treatment facility. Therefore, the initial upgrade to the existing WWTP will have an available average daily design flow capacity equal to 95,000 gpd (100,000 gpd x 0.05) to account for the 5% capacity buffer required by NYSDEC. AWTF expansion modules will be constructed when the design flow associated with future development connections from the EPCAL site encroaches on the required 5% capacity buffer. Additional tankage would need to be constructed to support flows more than 300,000 gpd.

3. SUMMARY OF EXISTING SANITARY FACILITIES

3.1. Existing Wastewater Treatment Plant (WWTP)

The existing Calverton Sewer District WWTP was last upgraded in 1988. The SPDES permit places effluent limits on several parameters. Continuous monitoring of flow is required. An influent pump station is located on the treatment plant site that collects and conveys all the sanitary sewage generated within the service area to the treatment plant. The pump station configuration is a wet well/dry pit arrangement with three vertical non-clog sewage pumps located in the dry pit. An influent comminutor with a bypass coarse bar screen is in the wet well portion of the station.

The existing wastewater process train provides secondary treatment and consists of two (2) aeration basins, two (2) settling basins, and a chlorine contact basin with automatic chlorine tablet feed system located above the contact basin. One of the two aeration basins is presently serving as a flow equalization basin to regulate the influent flow to the other aeration basin and downstream treatment processes. Each aeration basin is 36 feet x 22 feet x 11 feet with an effective volume of 59,242 gallons with 1 foot of freeboard (36 feet x 22 feet x 10 feet x 7.48 gallons per cubic foot). An airlift pump in the flow equalization basin pumps the wastewater to the aeration basin. The forward flow rate is adjusted at the airlift pump by throttling the airline. Flow equalization was instituted to improve the treatment efficiency due to the current variable and frequently low influent sewage flows to the plant. Wastewater flows by gravity through the remaining process basins to the final effluent outfall in McKay Lake.

Sludge from the two settling basins is pumped via airlift pumps to two (2) aerated sludge-holding basins. A flow splitter box located on top of the settling basins allows the operator to control the wasting rate and return rate of sludge pumped from the airlifts. Liquid sludge is hauled to the Bergen Point Water Pollution Control Facility for final disposal. A Schematic Flow Diagram of the existing treatment plant is included as **Figure 1**.[1]

A STP operations building is located on the plant site and houses the following:

- Operator's office and lab
- Diesel Fueled 100 KW emergency power generator
- Motor control centers
- Effluent flow meter
- Turbine blowers (2)
- Storage room
- Utility room
- Lavatory and shower room

[1] Schematic Diagram from Calverton Sewage Treatment Plant Operations & Maintenance Manual , April 1995.

The building is a concrete block structure with a flat truss roof. The building is in satisfactory condition. Some equipment in the building, although in operable condition, is antiquated or well into the unit's useful life cycle. Therefore, except for the electrical power panels and motor control panels, it is not recommended that the existing equipment be considered for reuse in the proposed AWTF. The existing process basins, influent pump station and building will be refurbished and used under the selected plan to the maximum extent possible.

3.2. Existing Collection and Conveyance System

The existing collection system is comprised of approximately 7,650 linear feet of gravity sewer main that was installed 40 years ago. The collection system collects flow from the existing industrial properties connected to the sewer district via gravity sewers. Flow collected by the gravity sewers drains towards either an intermediate pumping station or directly to the influent pumping station of the existing wastewater treatment facility. The conveyance system is comprised of three intermediate sanitary pumping stations and a main pumping station at the existing WWTP. These pump stations service properties within the core area, and are referred to as the Hangar Pump Station, Ball Field Pump Station and Office Pump Station. Refer to **Figure 2** for an overview map of the existing collection and conveyance infrastructure.

The hydraulic capacity of the existing gravity sewer collection system was evaluated based on a combination of surveyed invert elevations and assumed minimum slope for sections of the collection system where survey information was not available. The survey information used for this evaluation was obtained by H2M in August 2007. Ten States Standards minimum slope requirements were applied to sections of gravity sewer pipe that were not surveyed for evaluation purposes. The hydraulic analysis for the collection system evaluated full pipe capacity of each section of gravity sewer between upstream and downstream manholes. The results of this analysis revealed the existing collection system has adequate capacity to accommodate peak flow contributions from within the existing sewer district and from the development of the EPCAL site. Refer to **Appendix D** for the hydraulic analysis of the existing collection system.

As of the writing of this report, the Hangar Pump Station has been upgraded and the Ball Field Pump Station is in the process of being upgraded to conform to current code requirements. The upgrade for both pump stations consists of replacing the existing pump equipment, replacing the existing electrical service, upgrading the power, control and alarm systems and installation of an onsite emergency stand-by power generation system. The stand-by power generator systems for each station are designed to operate automatically upon disruptions to the incoming utility service to enable continuous pump operation during utility power outage. The stand-by emergency power generation systems are housed in self-contained sound attenuated enclosures to minimize noise pollution to the surrounding areas. Alterations to the mechanical piping configurations and access hatch locations are also included as part of the upgrades to the existing pump stations to facilitate safe pump removal and valve access for operations and maintenance personnel.

In 2005, approximately 2,290 linear feet of dry 6-inch diameter piping was installed during a sewer district improvement project that included a gravity sewer extension along Jan Way. This sewer extension project was completed to provide sewer availability for future development outside the eastern boundary of the core area. The 6-inch pipe was installed with the foresight that it could be used as part of the force main needed for the future diversion of treated effluent from McKay Lake to a groundwater recharge location north of the groundwater divide. This pipe was installed to take advantage of the cost savings opportunity that could be realized by using the common trench with the gravity sewer piping, thereby, reducing future construction costs associated with the effluent force main from the AWTF.

3.3. Reuse of Existing WWTP Tankage

This report, and past facility reports have evaluated several wastewater treatment alternatives for the Town to identify a cost-effective treatment process. The selected alternative is to convert the existing WWTP to a Membrane Biological Reactor (MBR) treatment process as the cost-effective alternative.[2]

Recent advances in MBR technology have resulted in a reduction to the size of the membrane process equipment. The decrease in physical size of the membranes enables a maximum process flow of 300,000 gpd to be treated within the existing WWTP tankage; additional tankage is required only for waste sludge holding under the 300,000 gpd flow scenario when the flow exceeds the 100,000 gpd mark. The 100,000 gpd (Module No. 1) design flow will be completely installed within the existing process tankage footprint to support the installation of an equalization basin, MBR basins, sludge holding tanks, anoxic basins and an effluent pumping station.

[2] *Facility Plan (Revised) for the Wastewater Treatment Plant Upgrade & Recharge Bed Addition*, prepared by H2M for the Town of Riverhead, dated: August 23, 2005.

4. TREATMENT FACILITY DESIGN PARAMETERS

4.1. Planning Period

As previously stated, the first phase of the proposed development will require the existing WWTP to be upgraded and expanded to an AWTF with an average daily design flow of 100,000 gpd. As development approaches the design flow capacity, future expansion of the treatment facility will be considered in 100,000 gpd modules.

4.2. Site, Construction and Treatment Constraints

Site constraints and maintaining existing wastewater process treatment during construction will necessitate the use of special procedures during upgrade and modification of the existing WWTP. These measures are discussed below and add to the cost of the project.

There are no residential properties nearby. The planned development areas are beyond the minimum Suffolk County Department of Health Services (SCDHS) setback distances from the process tanks. Therefore, potential aesthetic considerations and odor considerations are significantly reduced. With the planned buffer, the WWTP upgrade/expansion design does not appear to require additional odor control measures beyond the need to operate the facility in a clean and sanitary manner.

The proposed open recharge bed location may require a variance from the SCDHS setback distances to property lines. The open bed construction will include a perimeter fence around the beds with access openings throughout to facilitate routine bed maintenance.

Mud and dust will be generated throughout the construction site during excavation, structural demolition and from construction related vehicle traffic. Dust control will be required due to the proximity to businesses.

The plan calls for reusing the existing process tanks and the influent pumping station. Consequently, the construction will be sequenced so that temporary by-pass pumping and unit process consolidation will provide for treatment of the existing plant flow during the conversion work phase of construction. At the current flow rates, the discharge permit limits can be maintained by taking process tanks offline. Coordination with the plant operations staff and a detailed maintenance of plant operations (MOPO) will be required to identify process requirements prior to construction.

The preliminary schematic for the selected design is included as **Figure 3**. This schematic considers potential site constraints. The plan considers the problems outlined above and shows the measures necessary to construct the improvements to the facility while minimizing cost. The site of the proposed open recharge beds is heavily wooded and will require clearing to construct the new beds. This adds to the cost of the project. The location was selected with the goal of preserving the natural buffers to minimize impact to any development that may occur in the future.

5. DESIGN WASTEWATER CHARACTERISTICS

5.1. Design Parameters

A Sewer Use Ordinance was prepared following the formation of the Calverton Sewer District. This ordinance stipulates the maximum strength of wastewater that can be discharged to the collection system. The ordinance requires that a user provide pretreatment facilities, if necessary, so their wastewater discharge does not exceed the Sewer District limits. Table 1 summarizes the raw wastewater concentrations that are used as the basis of design for the AWTF process.

Table 1 – AWTF Influent Design Parameters

Design Parameter	Value
pH	5.5 to 9.5
Total Suspended Solids	300 mg/l
TKN	50 mg/l
BOD_5	250 mg/l

5.2. Anticipated Process Performance

The design summary for the MBR process has been prepared by OVIVO USA LLC (OVIVO) and is included in **Appendix E**. The design summary has been reviewed by H2M for conformance with the applicable standards for activated sludge systems and has been used as the basis of design for the 100,000 gpd AWTF. The process equipment has been sized and arranged in accordance with the design requirements developed by H2M for incorporation of the equipment into the existing process tanks. The anticipated effluent concentrations are presented in Table 2.

Table 2 – Anticipated AWTF (MBR) Performance

Parameter	Anticipated Performance
TSS	5 mg/L
BOD_5	5 mg/l
Total Nitrogen	10 mg/l

The Membrane Biological Reactor (MBR) technology has been selected to achieve these effluent limitations. The MBR process is designed to provide carbonaceous BOD removal, nitrification and denitrification in the same way as a traditional activated sludge process. Aeration and mixing are carried out in both treatment processes. One of the benefits of the MBR process, over traditional activated sludge processes, is that the MBR can provide effluent clarification within the aeration tank and does not require separate equipment for effluent filtration. Another benefit is reduced footprint requirements for MBR systems when compared to traditional activated sludge processes.

6. DESIGN OF UPGRADED FACILITIES

6.1. Anticipated Process Performance

The operational settings of an MBR allow the ability to carry higher mixed-liquor suspended solids (MLSS) concentrations when compared to other activated sludge processes. The higher operational MLSS concentration allows for reduced footprint requirements to achieve the same level of treatment as a traditional activated sludge process. The following provides a brief description of the two (2) sequential steps and sludge wasting requirements that are required for operation of the MBR treatment process.

6.1.1. Anoxic Phase

Screened influent is pumped to the anoxic basins from the flow equalization basin. Re-circulated MLSS pumped from the MBR basins is mixed with the nitrified influent wastewater in the anoxic basins. Mechanical mixers located within the anoxic basins blend the re-circulated MLSS with the influent wastewater without the input of oxygen to provide denitrification.

6.1.2. Aeration/MBR Phase

The wastewater is pumped from the anoxic basins to the aerated MBR basins for biological treatment. Dissolved oxygen concentrations are monitored and varied as required to maintain the biological conditions necessary for both nitrification and denitrification within the same basin. Process effluent is withdrawn through the membrane filters, which results in a high-quality effluent.

6.1.3. Waste Sludge

The waste sludge cycle provides the adjustment for the correct amount of sludge to remain present in the MBRs by varying the time the sludge wasting pumps run. The waste sludge is pumped into the liquid waste sludge holding tanks at rates determined by the operator and controlled by the main process control panel.

6.2. Facility Conversion and Upgrades

As previously stated, the AWTF is planned to reuse the influent pump station and process tankage located at the existing facility. The upgrade also requires the construction of new structures to accommodate the new influent screening equipment, and lean-to for new process equipment. The following conversions and upgrades are required for the design:

- Replace the existing dry pit pumps, controls, ventilation equipment and access hatches located at the influent pump station. Remove existing comminutor located on influent gravity sewer and replace with stop gate. Rehabilitate all interior and exposed exterior concrete surfaces.
- Convert one (1) of the existing settling tanks into a flow equalization basin.
- Construct new platform and overhead canopy above the existing settling tank converted into a flow equalization basin to support new influent fine screen.
- Construct a new partitioning wall within the settling tank that was not converted to a flow equalization basin to create an effluent pumping station 10 feet long by 8 feet wide.

- Convert one (1) of the two (2) existing aeration tanks into two (2) anoxic basins and two (2) MBR/Pre-aeration basins.
- The remaining aeration tank will be reserved for future construction of anoxic and MBR/Pre-aeration basin expansion modules.
- Construct four (4) new effluent groundwater recharge beds located approximately 1.9 miles northeast of the existing WWTP.
- Reuse the existing sludge holding tanks for storage of liquid waste sludge generated by the AWTF process. New air headers and diffusers are required inside of the existing sludge holding tanks.
- Install blowers, MBR permeate pump equipment, MBR clean-in-place equipment, process controls and electrical motor control centers for the proposed AWTF within the existing operations building.
- Construct an effluent force main from the AWTF effluent pumping station to the recharge bed site.
- Waste sludge thickening will not be made available as part of the 100,000 gpd AWTF upgrade. However, provisions for sludge thickening will be added during construction of future expansion modules.

Figure 5 illustrates the Process Flow Diagram and Hydraulic Profile for the upgraded facility. The diagram complies with the requirements of Ten States Standards.

6.3. Facility Design

6.3.1. General

Refer to Table 3 for an outline of the design parameters used for the AWTF MBR process:

Table 3 – MBR Design Parameters

Parameter	QTY
Number of MBR Basins	2 (1-duty plus 1-stand by)
Total MBR volume	30,360 gal (15,180 gal per basin)
MBR MLSS	12,000 mg/L
Plant Sludge Age	15 days
Effective Membrane Area per Cassette	5,167 ft^2/cartridge
Number of Cassettes per Unit	1
Total Number Membrane Units	4 (2 per basin)
Design Flux	9.68 gal/(ft^2/day)
Total Number of Membrane Cassettes	4 (2 per basin)
Membrane Unit Type	OV480
Membrane Air Scour Rate	76 scfm / unit
Total Process Air Demand	589 lb. O_2/day
Total Anoxic Basin Volume	25,302 gal (12,651 gal per basin)
Anoxic Basin MLSS	10,286 mg/L
Recycle Rate	6 Q

6.4. Influent Pump Station and Head works

The existing influent pump station was originally designed to accommodate a peak flow of 372,000 gpd (258 gpm).[3] The pump station structure is partitioned into a wet well/dry pit configuration and located below grade with access hatches and ventilation equipment installed on the top slab. Influent wastewater to this pump station passes through a rotary drum-type comminutor with an overflow by-pass to a coarse bar rack located at the discharge point of the influent 12" diameter gravity sewer. Wastewater collected inside of the wet well is conveyed to the existing WWTP process via 6" diameter force main and three (3) single-speed centrifugal pumps located in the dry-pit (2-duty, 1-standby). The existing comminutor, dry-pit pumps and associated controls are antiquated and have exceeded their useful life.

Comminutors are not recommended upstream of MBR processes since they transform influent solid materials into formations that can impede proper operation of the membrane equipment and result in excessive fouling and pre-mature equipment failure, even with an influent fine screen upstream of the MBR process tanks. Therefore, the existing comminutor will be removed and a stop gate will be installed in its place to divert all influent wastewater through the existing bar rack. The existing bar rack will function as a primary coarse screen for the AWTF. The bar rack will provide protection for the influent pumps. New fine screens will be installed between the influent pump station and pre-equalization basin to meet the screening requirements of the MBR process.

The existing single speed sewage pumps and control system will be replaced by new high efficiency variable speed pumps with advanced controls and pressure transducers for liquid level sensing within the wet well. The new influent pumps will be equipped with adaptive impellers to minimize clogging events caused by solids not captured by the primary coarse screen. These pumps will convey wastewater from the wet well to a new fine screen located upstream of the pre-equalization basin. The existing 6" diameter force main between the pump station and WWTP process tankage will be reused and extended to connect to the new fine screen.

The peak flow associated with the 100,000 gpd design flow for the AWTF is determined based on Ten States Standards. The methodology set forth by Ten States Standards, identifies the peak hourly flow rate from gravity sewers as a function of the population served. Ten States Standards recommends using a per capita flow rate equal to 100 gpd/capita. The 100 gpd/capita flow considers normal infiltration for systems built with current construction means; this is the assumption used for the existing infrastructure in the CSD. The formula used to calculate the peak flow for gravity collection systems is provided below:

$$PF = \frac{(18+\sqrt{P})}{(4+\sqrt{P})}$$

[3] The existing influent pump station information was obtained from the *Operation and Maintenance Manual for the Grumman Aerospace Corporation, Calverton Facility, Sewage Treatment Plant, Calverton, New York*, prepared by Dvirka and Bartilucci Consulting Engineers. April 1995.

PF = Peak Flow factor

P = Population in thousands

The peak flow factor (PF) for the 100,000 gpd AWTF is 3.80 (i.e. based on population equivalent of 1,000 capita) resulting in a peak design flow equal to 380,000 gpd or 264 gpm. This peak design flow is used as the basis for sizing the new influent pump station pumps and downstream fine screen equipment.

Three (3) high efficiency dry-pit submersible pumps will be installed in place of the existing influent pumps. The new replacement pumps will reuse the existing pump intake and discharge piping currently in place. Each pump will be capable of 200 gpm or 216,000 gpd and will be VFD controlled for capacity adjustment. Two pumps on will be able to convey the peak flow to the influent fine screen. The third pump will alternate in operation and function as an online stand-by spare. Pipeline velocities greater than 2 feet per second (fps) will be maintained by reusing the existing piping. The existing force main piping at the process tanks will be extended to connect to the new influent fine screen equipment. Each influent pump will be manufactured by Xylem or equal, model N 3102, 152 mm impeller with a 460-volt, 3-phase, 5.0-Hp motor.

Two (2) automatic fine opening bar screens (1-duty and 1-standby) will be provided upstream of the pre-equalization basin to accommodate peak flow from the influent pump station. Each screen will have 2-mm bar openings and be installed inside of a stainless-steel weather-proof box. The stainless-steel fine screen enclosure will be insulated, and heat traced for freeze protection. Integral stop gates will be included within the screen box to divert 100% of the influent wastewater to one screen at a time. The screen will be located at the new platform with overhead canopy that will be constructed above the pre-equalization basin. Screened influent wastewater will discharge direct to the pre-equalization basin via gravity flow.

Materials collected on the fine screen will be removed via automatic rake mechanism. Screened materials will discharge direct to a 5-yard dumpster located at grade. Dewatering of screened material will occur as the screenings are removed by the automatic rake. In the event the automatic rake fails on the duty screen, the operator will be required to adjust the integral stop gates to divert influent flow to the standby screen. The fine screens will be manufactured by Enviroquip or equal, model FS-800S, with a 460-volt, 3-phase, 25-watt waterproof geared motor.

Controls for the influent pump station and fine screen will be located at the influent screen platform with overhead canopy. Local disconnects will be provided for all electric powered equipment. The screenings platform and overhead canopy will be large enough to cover the head works controls, fine screen equipment, and dumpster. Emergency back-up power for the influent pump station and fine screen will be provided by a new stand-by emergency generator sized to meet the electrical power demand from the AWTF and influent pump station. The sizing of the new stand-by emergency power generator will be discussed in further detail in Section 6.12.

6.5. Influent Flow Equalization

Flow equalization is recommended by Ten States Standards when "significant variations in organic and hydraulic loadings can be expected." One of the existing settling tanks will be converted to a flow equalization basin. The total storage capacity of all existing tanks at the WWTP is shown in Table 4.

Table 4 – Existing Tank Capacity

Existing Tank	Total Storage Capacity (gallons)*
Settling Tanks (x2)	43,444 (21,722 each)
Sludge Holding Tanks (x2)	22,909 (11,455 each)
Aeration Tanks (x2)	130,332 (65,166 each)
Total Capacity:	***189,354***

*Total storage capacity represents total tank holding capacity minus 1-foot for free board.

Flow equalization will be provided upstream of the MBR process. Flow equalization provides for uniform flow to the MBR process, which improves process control, treatment efficiency and process reliability. Process control is improved since the forward flow to the MBR process is maintained at the average design flow regardless of the variation in influent raw wastewater flow that occurs during the day.

Given the conditions expected to occur during future development of the EPCAL property, a pre-equalization basin can be used to provide flow equalization during both the initial low flow and peak design flow conditions. The recommended pre-equalization volume is 10 to 20% of the average daily flow. [4] The proposed equalization volume of 21,542 gallons is approximately 21.5% of the average daily design flow (e.g. 100,000 gpd), which is greater than the recommended criteria.

It is anticipated that businesses/industries will only operate during weekdays and are expected that a fraction of the full design flow will be generated on weekends. This flow pattern cannot be equalized over extended weekend low flows with the available equalization and process modifications built into the MBR process.

Under low flow weekend conditions, the MBR basins can store, hold and circulate flow within the process to allow the treatment process conditions to be maintained. As development progresses, the wastewater flow will increase. The forward flow rate from the pre-equalization basins can then be increased as needed to maintain a balanced flow to the treatment basins throughout the week.[5]

Ten States Standards recommends a minimum equalization basin air supply rate of 1.25 cfm per 1000 gallons. Using this rate and a safety factor of 2.0, and compensating for design conditions, the blower rate

[4] USEPA Technology Transfer Seminar Publication, May 1974, pg.8

[5] Variable speed pumps and flow control boxes with adjustable weirs will be used to change the forward flow.

is calculated to be approximately 70 acfm at full volume use of the equalization basins. Two (2) Roots or equal, model 24 URAI, 3.5-Hp blowers will be provided. One blower will be an on-line standby unit.

Two (2) pumps will be provided in the equalization basin. Each pump will have a capacity of at least 70 gpm or 100,000 gpd and will be VFD controlled for capacity adjustment. One pump on will be able to convey the equalized average daily forward flow to the MBR process. The discharge pipe will be 4-inch diameter to provide pipeline velocities greater than 2 feet per second (fps). This pipe will connect the equalization basin to the flow splitter box upstream of the anoxic basins Each pump will be manufactured by Xylem or equal, model N 3085, 152 mm impeller with a 460-volt, 3-phase, 3.0 horsepower motor (Hp), or equal.

6.6. Anoxic Basins

As part of the MBR treatment process, the equalized flow will be pumped from the equalization basin to a flow splitter box located above the two (2) new anoxic basins. Influent to the anoxic basins will be evenly split by the flow splitter box. A portion of the westernmost existing aeration basin will be converted into two (2) anoxic basins. OVIVO requires a minimum tank volume of 12,651 gallons for each anoxic basin. The actual anoxic tank volume is 16.5 ft. x 10.3 ft. with a side water depth (SWD) of 10.0 feet, providing a basin volume of 12,712 gallons per basin, which is greater than the minimum volume required.

Both anoxic basins will have one (1) duty mixer (WILO, 1.65-Hp, or equal) to keep the basin contents homogenous. A spare mixer will be provided as an on-shelf unit. Flow from both anoxic basins will be pumped to the new Pre-Aeration/MBR basins via two (2) pumps (i.e. one in each anoxic basin) with two (2) online spares (i.e. one in each basin). A hydraulic balancing valve will be installed between the anoxic basins. Each pump will be sized to convey 208 gpm (i.e. 6Q with two duty) to the Pre-Aeration/MBR basins. These pumps will be manufactured by WILO or equal, model FA10.51-5.7HP, 5.7 Hp and have VFD control for capacity adjustment.

Influent wastewater to the anoxic basins will be mixed with nitrified wastewater and mixed liquor that is recycled back from the Pre-Aeration/MBR basins, allowing denitrification to occur. The denitrification stage serves to regenerate alkalinity lost during nitrification and thus help to maintain a stable pH within the overall treatment process. In addition, the anoxic stage of the process helps to promote the growth of a suitable biomass for the MBR process and improves overall membrane filterability.

6.7. Combination Pre-Aeration/MBR Basins

The aeration and effluent filtration steps for the MBR process are combined into a common basin to eliminate the \additional space for needed for separate aeration basins. These combination Pre-Aeration/MBR basins (MBR basins) will be constructed using 12-inch thick, 11.5 foot tall, reinforced concrete walls within the remaining portion of the aeration tank used to construct the anoxic basins. Each MBR basin will be 18.0 ft. x 10.3 ft. with a SWD of 11.0 ft. A total of two (2) MBR basins will be constructed

with a total MBR basin volume basin equal to 30,360 gallons (the total MBR basin volume deducts for volumes displaced by in-tank equipment).

One (1) of the MBR basins (15,180 gallons) will be required to process the average daily design flow of 100,000 gpd. The additional MBR basin is provided to allow continuous operation with one MBR shutdown. The recommended MBR system will be provided by OVIVO. The recommended OVIVO membranes will be flat plate-type, model OV480 units. Each OV480 unit contains one (1) OC480 cassette. There will be 2 OV480 units per basin (total of 4 OV480 units for AWTF).

Within the MBR basins, the wastewater will be mixed with active biomass (microorganisms) and oxygen, same as an aeration basin in a traditional activated sludge process. Within this stage of the MBR process, most organics in the wastewater are oxidized with ammonia being converted to nitrate through nitrification. Air diffusers mounted on the membrane units supply some of the process air and mixing air for the activated sludge process. Additional retrievable fine bubble diffuser racks will also be installed in the MBR basins to provide the supplemental oxygen required to complete the biological process. This is where the additional pre-aeration step is combined into the MBR basins.

The diffusers integral to the membrane cartridges also provide a continuous air scour for cleaning of the membrane surfaces. This is accomplished by the rising air bubbles and mixed liquor movement. An automatic chemical clean-in-place system is also provided with the OVIVO MBR for additional cleaning and maintenance purposes. Three (3) Aerzen or equal, model, GM7L-15, 15.0-Hp, 175 scfm blowers will provide the necessary aeration to the membrane units. Two (2) of these blowers will be duty and the other will serve as on-line standby. If the standby basin is required for MBR processing, conversion to an active process unit is easily accomplished.

Additional in-tank diffusers will also be installed within the MBR basins to satisfy the supplemental air requirements for the process. Three (3) Aerzen or equal, model, GM4S-10, 10.0-Hp, 110 scfm blowers will provide the supplemental air to the MBR basins. Two (2) of these blowers will be duty and the other will serve as an on-line standby. If the standby basin is required for MBR processing, conversion to an active process unit is easily accomplished.

There will be two separate airline headers feeding each basin, one connecting to the MBR equipment and the other connected to the diffusers supplying the supplemental process air. Each header will be provided with a butterfly valve that serves to direct air to the appropriate reactor. The aeration system, the retrievable air diffuser racks, and air headers located in the MBR basins will be constructed of stainless steel to reduce maintenance.

A dissolved oxygen (D.O.) control system is proposed to maintain the desired D.O. concentration. The D.O. control system consists of a D.O. probe suspended in each MBR basin. The probe constantly

measures the D.O. concentration and a proportional 4-20mA signal is transmitted to the programmable logic controller (PLC) located in the MBR control panel. The PLC's process program, developed by the system vendor based on specifications provided by H2M, then retransmits a signal to the blower variable frequency drives to automatically speed up or slow down the blower motor speed. In this manner, the blower outputs the correct amount of air to maintain a preset D.O. concentration in each reactor.

The clarification stage of the MBR process differs significantly from traditional activated sludge processes. Instead of being performed in a separate basin by the action of gravity, the treated wastewater or effluent is separated from the biomass solids by filtering through the submerged membranes installed within each basin. Permeate pumps induce suction on the membranes, which separates solids from liquid. This reduces the basin volumes required and provides for lower operational costs due to the simplicity of operation and the typical requirement for process control of the sludge characteristics.

As part of the biological treatment, recycle mixed liquor (6Q) will flow out of the MBR basins back to the anoxic basins by gravity as indicated on the Hydraulic Profile (Figure 5).

6.7.1. Permeate

Clarified effluent (permeate) will be pumped using three (3) Gorman-Rupp or equal, 154 gpm, model 13A20-B, 2.0-Hp pumps (2 duty, 1 shelf spare) to the effluent pump station constructed within the existing settling tank not used to as the pre-equalization basin. The permeate flow rate is required to maintain an equalized process flow through the MBR system. The OVIVO membranes provide for removal of bacteria and viruses thereby providing a very clean effluent for groundwater recharge. Disinfection is not required for groundwater recharge and is not considered as part of the AWTF upgrade.

Each MBR basin will be connected to an individual permeate pump. All permeate pumps will be interconnected to a common stand-by spare pump via pipe manifold.

6.7.2. Waste Sludge

Waste sludge generated, as a by-product of the activated sludge process, will be pumped directly from the MBR basins to the sludge holding tanks via WILO or equal, 2 gpm, model, FA08.41-1.75HP, 1.75-Hp pumps. There will be one (1) duty pump in each MBR basin with a shelf spare located onsite. The waste activated sludge production rate is 1,706 gallons of sludge per day.

6.8. Sludge Holding

The total sludge holding tank volume will provide holding capacity for ten (9) days of waste activated sludge production at anticipated design conditions. Sludge holding will be provided via the two existing sludge holding tanks. The existing sludge holding tanks are 17.5 ft. x 7 ft. x 12.5 ft. depth with a side water depth of 8.5 ft. This equates to a volume of approximately 7,790 gallons for each basin with the total volume equal to 15,578 gallons (2,083 cu. ft.).

A benefit of the MBR process design is the ability to increase the mixed liquor concentrations in the process basins by approximately 33%. As such, this function of the process can increase the duration of sludge holding if so required by an emergency.

6.9. Effluent Groundwater Recharge

Treated effluent from the MBR will be recharged back to groundwater. The two typical methods for groundwater recharge are leaching pools and recharge beds. Each system has advantages when applied at the optimum flow range.

Leaching pool recharge systems are typically used for smaller daily flows. Leaching pool systems are located below the ground surface and therefore do not have visual impacts. Pool system capacity is not easily affected by precipitation with proper grading of the area above the pools. Volume in the recharge beds must account for precipitation. However, recharge beds have the advantage of evaporation during the warm months. Due to regulatory standards for pool depth and spacing, the leaching pool system will require more land area than the recharge bed system at higher daily flow rates. Both systems require periodic off line “resting” periods to allow the ground in the surrounding area to dry. Recharge beds are easily maintainable by scraping off the top layer of the bed floor periodically and placing a new layer of drainable material. Leaching pools are not easily maintained or rehabilitated and typically once a pool system has “clogged” it would be abandoned and a new pool system must be installed to replace the failed system. Local SCDHS standards require an area to be set aside for 100% expansion for each method.

The open bed type effluent recharge system was selected for the effluent recharge from the AWTF due to the design flow, the ability to maintain the system, and its lower cost as compared to leaching pools. The construction cost for leaching pools are significantly more expensive than open recharge beds and consequently the project cost would be increased.

The SCDHS requires that recharge beds be designed based on 10 gallons per day per square foot of bed bottom area for filtered effluent and 5 gallons per day per square foot of bottom area for unfiltered effluent. Four beds must be provided, and the maximum bed depth is 4 feet including freeboard. The recharge beds must be equipped with access ramps for ease of cleaning and splash pads at the end of the influent piping to prevent erosion. An area for 100% expansion of the recharge bed will be provided.

The Calverton MBR system will provide a filtered effluent due to the nature of the treatment process. The effluent will be less than 5 mg/l of total suspended solids. The recharge beds have been sized based on the filtered effluent criteria which permit twice the loading rate per square foot of bed floor area than for the non-filtered effluent, equal to 10 gpd per square foot of recharge area.

The recharge bed calculations are included in **Appendix F**. As shown in these calculations, a minimum of 10,000 square feet of bed bottom area is required to recharge 100,000 gpd at 10 gpd per sq. ft. of bed

bottom. Four beds measuring 50 feet x 50 feet bottom area dimensions will be provided. Each bed will be constructed with a depth of 4 feet. The sidewalls of each bed will taper based on a slope of 1:2. Constructing sloped sidewalls is necessary for soils stability and eliminates the need for retaining walls. Using sloped sidewalls adds an additional 8 feet to the overall dimensions of bed width and length. A 10-foot-wide access drive will also be constructed between all beds to facilitate access to all sides by maintenance personnel. A variance from the SCDHS 300-foot buffer to property line requirement will be necessary.

As future development occurs, and the AWTF design flow increases above 100,000 gpd, additional groups of four bed clusters will need to be constructed to accommodate total future flows. An area for these additional beds and a 100% expansion area for all recharge beds have been established in the design layout as shown in Figure 6.

6.10. Effluent Pump Station

The remote location of the new groundwater recharge site requires all the process effluent to be pumped to the new leaching beds. An effluent pump station and force main will be required to convey treated effluent approximately 1.9 miles to the recharge beds. The force main will consist of 6-inch diameter piping to convey effluent flow from the MBR process. Effluent will be conveyed through a single 6-inch diameter force main that will connect through the existing 6-inch diameter dry pipe installed within Jan Way on its way to the effluent recharge beds.

The new effluent pump station will be constructed within the one existing settling basin that is not utilized for flow equalization under this upgrade phase. The interior dimensions of the wet well will be 8-feet wide x 10-feet long, with a minimum operating depth of approximately 2.2-feet. The wet well will house two (2) submersible effluent pumps. The pumps will be connected to the effluent force main in a below grade pipe manifold vault.

The effluent pumps are sized to handle the maximum effluent flow from the MBR process based on one-duty pump and one online spare pump. Each pump will operate with variable speed drive (VFD) control to allow for further operational efficiency during initial flow rates below the design capacity. The pumps are sized for the minimum and maximum flow capabilities of the MBR process. Any future development resulting in flows greater than the current design flow will require replacement of the pumps to meet increased flow rates.

The effluent pumps will operate with one pump duty and the other as an online standby. The control panel will enable these pumps to alternate every cycle between duty and standby. Pump sizing calculations are included in **Appendix F**. Each pump will be manufactured by Xylem or equal, model NP 3127 SH 3, 146 mm impeller with a 460-volt, 3-phase, 11.0-Hp.

The minimum required wet well volume for this pump station is 521 gallons (i.e. operating depth of 0.9 feet) to maintain at least a 15-minute cycle time at the maximum flow rate from the MBR process equal to 200,000 gpd (139 gpm). Influent to this station is via the MBR permeate pumps.

The controls for the effluent pump station will be located inside of the existing operations building, with local disconnects at the pump station. Emergency back-up power will be provided by a new stand-by emergency generator that will provide back-up power for the entire WWTP upgrade.

6.11. Administration & Operations Building

The existing operations building will be refurbished to consist of:

- Laboratory equipment upgrade casework
- Shop / spare parts storage / tool crib area painting
- Lockers / Changing area painting
- Rest room facilities area painting
- Central control room (located adjacent to the plant superintendent's office) painting
- Blower room painting
- Motor control center (MCC) room painting
- Miscellaneous pump area painting
- Boiler Room and housekeeping storage of miscellaneous spare parts and materials

6.12. Emergency Back-up Power Generation

Emergency back-up power generation will be provided to maintain process operations during periods of utility power outage. The stand-by power generation facilities will be sized to energize only the equipment necessary to maintain effective wastewater conveyance and treatment. All electrical appurtenances onsite will not be connected to the generator to minimize the kW requirement and reduce overall project costs. The emergency back-up power generator will run off natural gas, thereby requiring a new natural gas service be brought to the site. This will eliminate the need for onsite diesel fuel storage and associated permitting. The generator will be located inside of a sound attenuated skin-tight enclosure located outside of the existing operations building. The kW load requirement will be determined during the detailed design phase of this project based on input from the Calverton Sewer District regarding any additional loads they would like added to the back-up power system.

7. COST OPINION & ECONOMIC ANALYSIS

7.1. General

This section of the report presents the total project costs, which are comprised of construction, engineering, survey, soil borings, inspection services, operation & maintenance manuals, printing and other related soft cost items. Also presented herein, is the engineer's opinion of cost for the operation and maintenance of the new AWTF at the design flow of 100,000 gpd. **Appendix G** includes copies of the bid award recommendation letter for all construction contracts, and the associated back-up for the engineering fees, and soft costs that were established and accepted by CSD.

7.2. Project Cost*

The total project cost is $10,564,187.50. This total amount is based on the accepted low bids for each prime construction contract (received by the Town during the December 19, 2018 bid opening), the associated percent of construction fee adjustments for engineering design and construction administration based on the prime construction contract low bids, and other project-related soft costs that were not affected by the contract low bids. *The total project cost, as defined in this report, should be considered a budgetary estimate that may require adjustments as the project progresses through each prime contract completion and should not be considered as a guaranteed price.*

7.3. Direct Expenses

Since the existing Calverton Sewer District service area is much smaller than the proposed EPCAL subdivision and the future AWTF effluent will be discharged to groundwater recharge beds, there will be costs associated with outfitting the CSD with vehicles, tools, materials, housekeeping supplies, specialty sewer related maintenance equipment, office furnishings, filing and map storage cabinets, document copier, fax machine and miscellaneous supplies to ensure proper operation and maintenance can be performed. The costs associated with supplying these items are not included in the total project cost identified in Section 7.2 above, as it will be less expensive for the Town to direct-purchase these items using the County or State supply contracts rather than including them in the construction contracts where they would otherwise be subject to contractor mark-up.

A general-purpose road vehicle (pick-up truck) is suggested for routine operation and maintenance of the pump stations and recharge beds. A back-hoe type excavator is also needed for general sewer repairs, snow removal, and for maintenance around the plant and recharge beds.

A total budget of $200,000 is recommended for the direct expenses and assumes that the Town will purchase the furnishings and vehicles through State and/or County contracts. This is the suggested starting budget to purchase just the necessities for operating a plant of this complexity and is assumed to be a one-time expenditure.

7.4. Report & Design Engineering Fees*

The American Society of Civil Engineer's fee curve "A" for projects of above average complexity was used to define the project costs associated with the engineering design and construction administration for this project. The total adjusted basic fee, based on the total low bid construction cost of all prime construction contracts, is $759,000.

7.5. Construction Observation Budget

The construction period for the AWTF, as described herein, is estimated to be 18 months. This is the time from the date of the Contractor's Notice to Proceed to the date of the Final Certificate of Completion.

A full-time resident engineer for the entire construction period will be required as the project is complex in nature and is spread out over the entire industrial area. Inspectors, reporting to the resident engineer, will be required during periods of simultaneous construction activities.

The budget for construction observation, based on a multi-prime project, is $550,000. This estimate considers a full-time resident engineer for 18-month construction duration and part-time inspector for 12-month duration.

7.6. O & M Manual / Process Spreadsheet / Equipment Database / Consultation

A detailed operations and maintenance manual is required pursuant to local regulatory requirements. A process spreadsheet using Microsoft Excel® will also be prepared to assist the operators in logging critical process data, computing process variables, and to graph key operational parameters. H2M also suggests that a computerized equipment database be established.

A retainer is recommended to be established to assist the plant operators in process operation after the basic training period has ended. As the operators become accustomed to the MBR process, the spreadsheet may require modifications to customize its application to the specific needs of this facility. The spreadsheet revisions would also be charged to the engineering retainer. A one-time budget of $50,000 should be set aside for these special services.

7.7. Miscellaneous Project Costs

The following table summarizes the miscellaneous costs associated with the project:

Table 5 – Miscellaneous Budget for Related Engineering Services

Description	Amount
Supplemental Topographic Survey (Est.) *	$30,000
Lead and Asbestos Testing (Est.)	$8,000
Soil Borings & Piezometers (Est.)	$25,000
Printing **	$1,500
O&M Manual / Process Consultation / Database / Process Spreadsheet	$50,000
Start-Up Services	$15,000
Total Miscellaneous Project Costs	**$129,500**

*Survey for the AWTF upgrade, effluent force main route and recharge bed site. VHB survey for site will be used.

**Plans and specifications will be uploaded to Town of Riverhead website for project bid phase. However, an additional fee for printing of plans and specifications is added since we will be required to furnish the Town and contractors with hard copies of the confirmed bid documents.

7.8. Total Project Budget/Financial Impact to District*

The total project budget, based on multi-prime (Wick's Law) construction contracts, is summarized in Table 6.

Table 6 – Total Project Budget Summary*

Description	Budget Amount
Cost for Construction (4 Prime Contracts)	$9,051,187.50
Eng. for Facility Plan, Design, Construction Administration (ASCE Curve) *	$759,000
Extra Services Not Included in ASCE Curve ** (P.O. Pending)	$8,000
Draft Facility Plan of Oct. 6, 2014 for .3 MGD ***	$34,500
Construction Observation (18-month construction period – Hourly Rate Basis)	$550,000
Additional Services as Needed ****	$32,000
Table 5 Budget	$129,500
Total Project Budget:	**$10,564,187.50**
(Less Grants - See Paragraph 1.2)	(7,095,750)
Net Project Cost:	**$3,468,437.50**

*Includes $89,000 for Map & Plan/Facility Plan (Town P.O. No. 140939)

** Accounts for revising prior 0.3 MGD Facility Plan to 0.1 MGD

*** Facility Plan Abandoned - Funding Unavailable to Proceed

**** SPDES Permit Modification, Grant Applications, Sewer District Tax Implications, CWSRF Funding Assistance, Etc.

As summarized in Table 6, the total project cost is $10,564,187.50. This does not include interest during construction, legal services, bond council, advertisements, other miscellaneous and direct expenses and District and Town expenses as previously discussed herein. The net project cost, less grants, is $3,468,437.50.

7.9. Operation and Maintenance Cost Opinion/Sewer Rent*

The following section presents our opinion of the costs associated with operating and maintaining the AWTF at the design flow of 100,000 gpd. This includes the annual operation and maintenance cost for the collection system, existing pump stations and AWTF.

Based on our experience with projects of similar size and complexity, we recommend that the AWTF be operated using 3 full time operators. The middle and third shift operation, although unmanned, will be remotely monitored by a central alarm system that would notify plant operators of emergency issues via e-mail and cellular notification systems. The critical unit processes will be monitored on a 24-hour basis to alert the operators of current conditions that may lead to problems and equipment malfunctions.

The operators will be responsible for maintaining the MBR process, daily sampling and testing of the wastewater, routine log and record keeping, completing the process spreadsheet, chemical ordering, sludge hauling coordination and scheduling, grounds maintenance, general housekeeping, and basic process sampling, and testing.

Table 7 summarizes the annual operation and maintenance cost for the Calverton Sewer District. The projected annual budget for the operation and maintenance of the Calverton Sewer District facilities is approximately $630,000. Please note the projected budget is based on 2014 dollars.

Table 7 – Annual O & M Budget (Plant, Collection System & Pump Stations)

Description	Amount
Labor (3 operators for day shift)	$225,000
Electricity / Utilities / Fuel / Telephone / Water	$200,000
Sludge & Solids Disposal (at design flow)	$100,000
Bldg. Repair & Maintenance / Alarms / Plant Equipment	$35,000
Generator Maintenance / PS Equipment	$20,000
Engineering & Legal Counsel Annual Retainer	$25,000
Spare Parts, Supplies, Tools, Misc. Expenses, Uniforms, Other	$25,000
Total Annual O & M Budget:	**$630,000**

The total annual operation and maintenance budget for the Calverton Sewer District is expected to increase from the current $429,106.36 following the upgrade of the sewage treatment plant. The properties within

the CSD would be required to contribute to the cost of operation and maintenance (sewer rent) proportionally based on their water usage. Calverton Sewer District bases their sewer rent for operation and maintenance on a per 1,000 gallons used basis.

The current annual water usage for the existing Calverton Sewer District is 11,068,000 gallons, which equates to an average daily water usage rate equal to 30,323.3 gallons per day (i.e. 11,068,000 gallons per year ÷ 365 days per year = 30,323.3 gallons per day). The current sewer rent is $38.770/1,000 gallons, according to the Town's 2018-2019 tax rates ($38.770/1,000 gallons * 11,068,000 gallons = $429,106.36), to cover the $429,106.36 annual operation and maintenance budget. The estimated annual O&M cost for the upgraded AWTF is budgeted to total $630,000. Therefore, the sewer rent for the existing CSD would increase from $38.770 to $56.921 per 1,000 gallons (i.e. 146% increase), which is a conservative projection assuming the water usage remains the same.

7.10. Total Project Cost Debt Service*

Article 12, Section 202 of NYS Law gives the Town Board the authority to apportion the annual capital debt service incurred by the sewer district (service area) across all properties within the sewer district regardless of whether they are located within the benefitted service area. In accordance with NYS Law, the Town has decided to distribute the capital cost for the upgrade of the sewage treatment plant across all properties within the district by requiring properties within the service area to pay the annual debt service. This decision was made on the premise that water quality within the Peconic Estuary is a responsibility that the entire district shares.

7.11. Apportionment of Costs Total Project Cost Debt Service*

Section 202 of NYS Law requires the Map and Plan to identify the actual apportionment of debt service for a sewer district. The Map and Plan must identify the area of local assessment and the apportionment based on the benefit received by each property within the benefitted service area. The recommended apportionment method for the costs of the sewer district is based on "ad valorem." Ad valorem-based debt service distributes the project costs across the assessed value of benefitted properties using the assessed property values as the proportion across which the debt will be serviced.

The multiplier used to determine the annual debt service is referred to as the capital recovery factor (CRF). The CRF is calculated using the following formula:

$$CRF = \frac{i(1+i)^n}{(1+i)^n-1}$$

i = interest rate
n = payback period

The CRF is dependent upon the interest rate and payback period associated with the bond used to fund the capital cost of the district.

Funding for this project is based on a New York State Environmental Facilities Corporation (NYSEFC) loan to determine the anticipated annual debt service for the Calverton Sewer District sewage treatment plant. The presumed bond is based on a 3.5% interest rate over a 30-year term. The CRF associated with a loan comprised of a 3.5% interest rate over a 30-year term is equal to 0.05437.

As previously summarized, the total project cost is $10,564,187.50. To date, the Town has paid $527,000 and is scheduled to receive $7,095,750 in grant money. The remaining cost to the sewer district is $2,941,437.50 (i.e. $10,564,187.50 - $527,000 - $7,095,750), which will be financed via low interest (i.e. 3.5%) long-term loan from NYSEFC. In addition to paying the interest rate, NYSEFC loans also have a one-time administrative fee of 1.0% on the total bond amount plus an additional annual administrative fee on the outstanding balance of 0.25%. After adding these fees to the financed portion of the total project cost and compounding the loan interest rate for the life of the loan, the total amount to be paid by the CSD to service the debt is equal to $4,880,911.40. Distributing the total debt service across the 30-year loan period results in an annual average cost of $162,697.05 to the CSD.

The current sewer tax for the Calverton Sewer District is based on a rate equal to $0.233/$1,000 A.V., which equates to an annual tax revenue of $2,906.33 when applied to the $12,473,500 A.V. for the existing CSD. Distributing the annual average cost to cover the debt services for the upgrade of the sewage treatment plant across the existing CSD, the new sewer tax rate will equal $13.043/$1,000 A.V. to cover the $162,697.05 annual average cost. This equates to a total tax of $13.276/$1,000 A.V. to cover the existing tax revenue and the new debt service for a gross annual revenue of $165,598.19.

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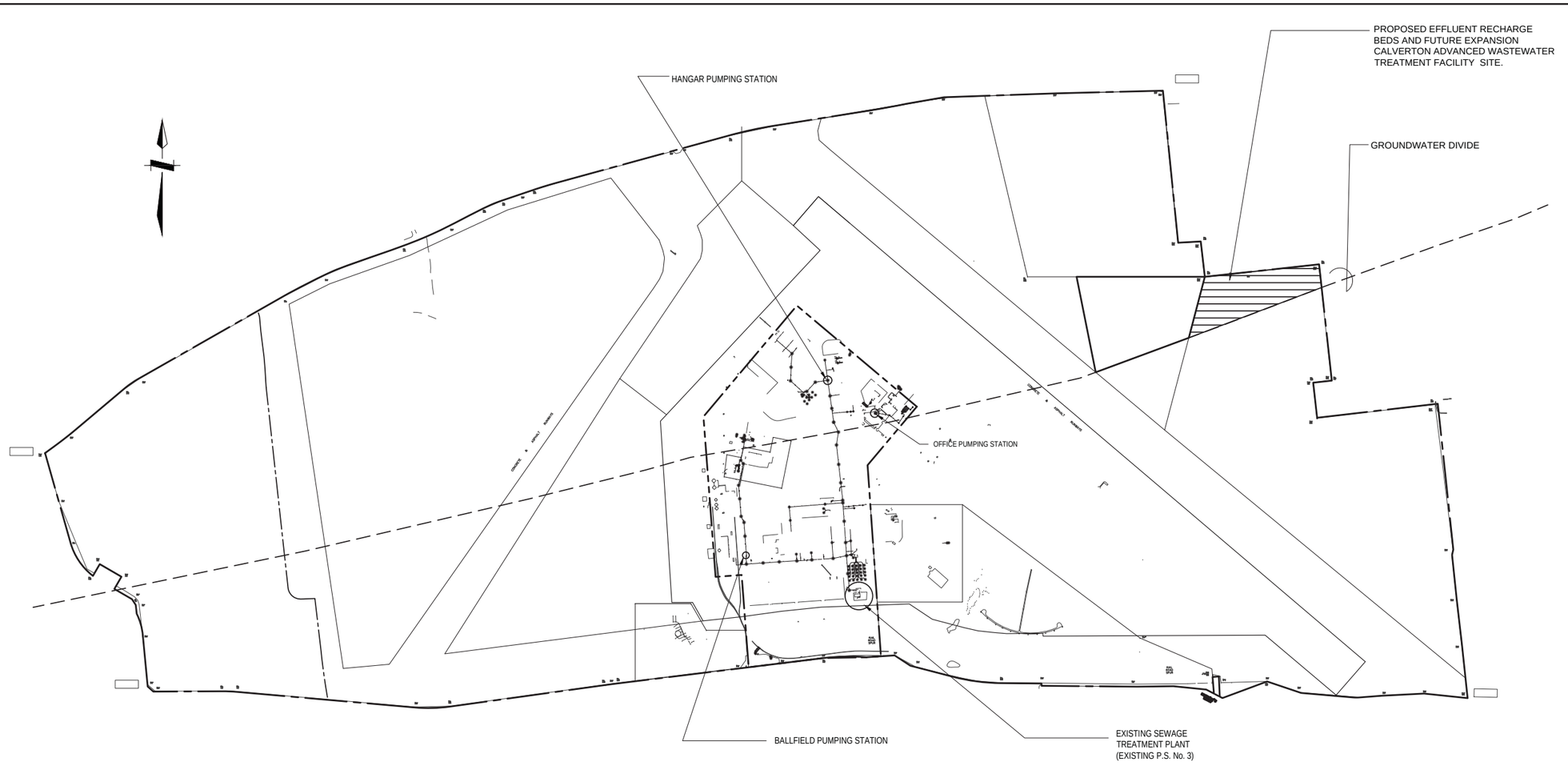
FIGURES



LEGEND:

- SITE BOUNDARY
- CALVERTON SEWER DISTRICT BOUNDARY
- GROUNDWATER DIVIDE
- 23.2 ACRES GROUNDWATER RECHARGE SITE

H2M architects + engineers

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New City, NY 10956
Parsippany, NJ 07054
Howell, NJ 07731

CONSULTANTS:

MARK	DATE	DESCRIPTION

PROJECT #: CASD 1401

DATE: SEPT 2014

DESIGNED BY: KRG

DRAWN BY: DRW

CHECKED BY: | REVIEWED BY:

SEAL

"ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL"

CLIENT

TOWN OF RIVERHEAD CALVERTON SEWER DISTRICT

WASTEWATER TREATMENT EXTENSION No. 2

SUFFOLK COUNTY, NY

CONTRACT

CONTRACT G
GENERAL CONSTRUCTION

STATUS

NOT FOR CONSTRUCTION

SHEET TITLE

GROUNDWATER DIVIDE MAP

SHEET #

FIG.1

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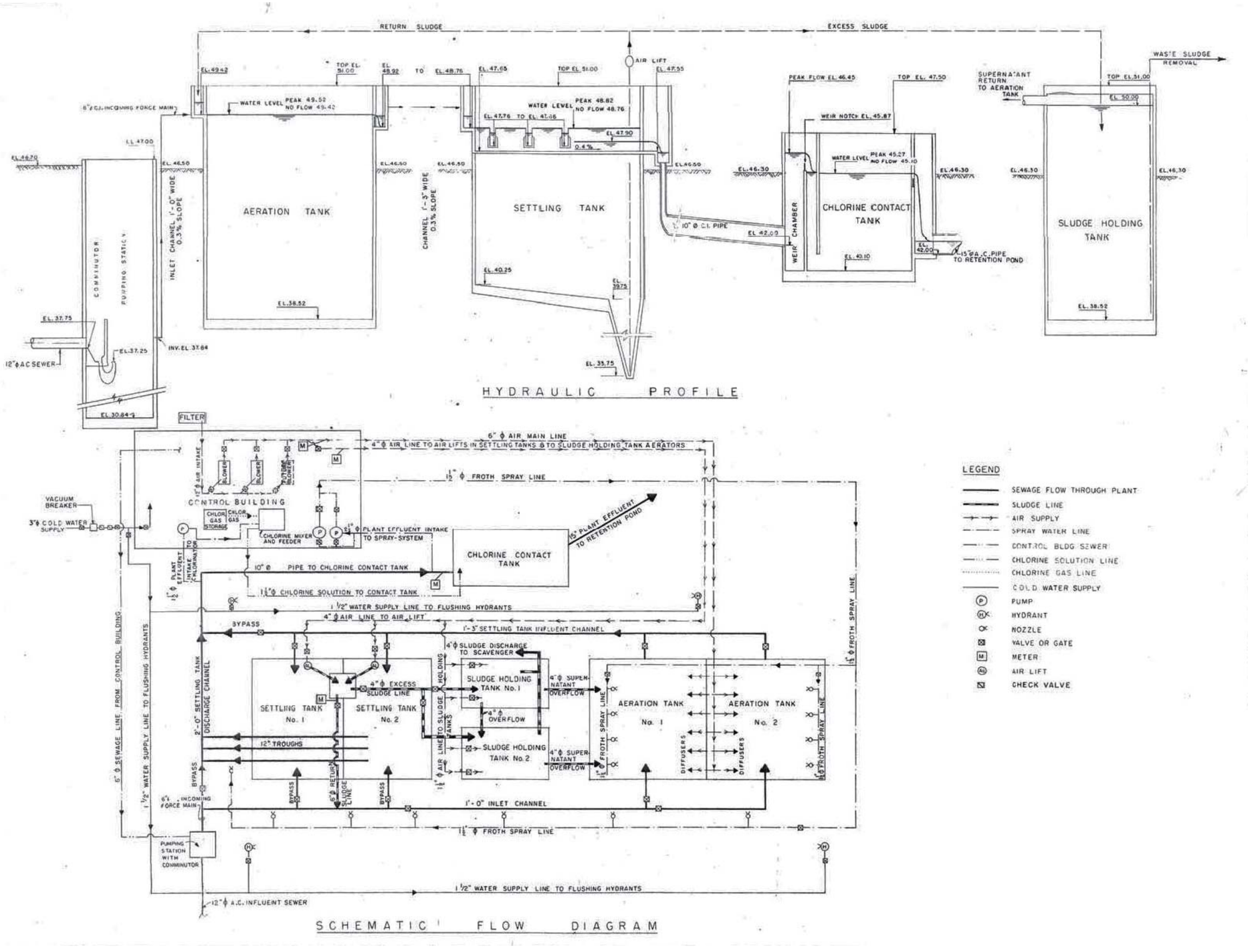

* EXISTING WWTP INFO SHOWN HEREON IS BASED ON PLANS PREPARED BY JOHN,J. BAFF CONSULTUNG ENGINEERS, JUNE 1968.

H2M architects + engineers

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Albany, NY 12205
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New City, NY 10956
Parsippany, NJ 07054
Howell, NJ 07731

CONSULTANTS :

MARK	DATE	DESCRIPTION

PROJECT #: CASD 1401
DATE: SEPT 2014
DESIGNED BY: KRG
DRAWN BY: DRW
CHECKED BY: | REVIEWED BY:
SEAL

CLIENT
TOWN OF RIVERHEAD CALVERTON SEWER DISTRICT

WASTEWATER TREATMENT EXTENSION No. 2

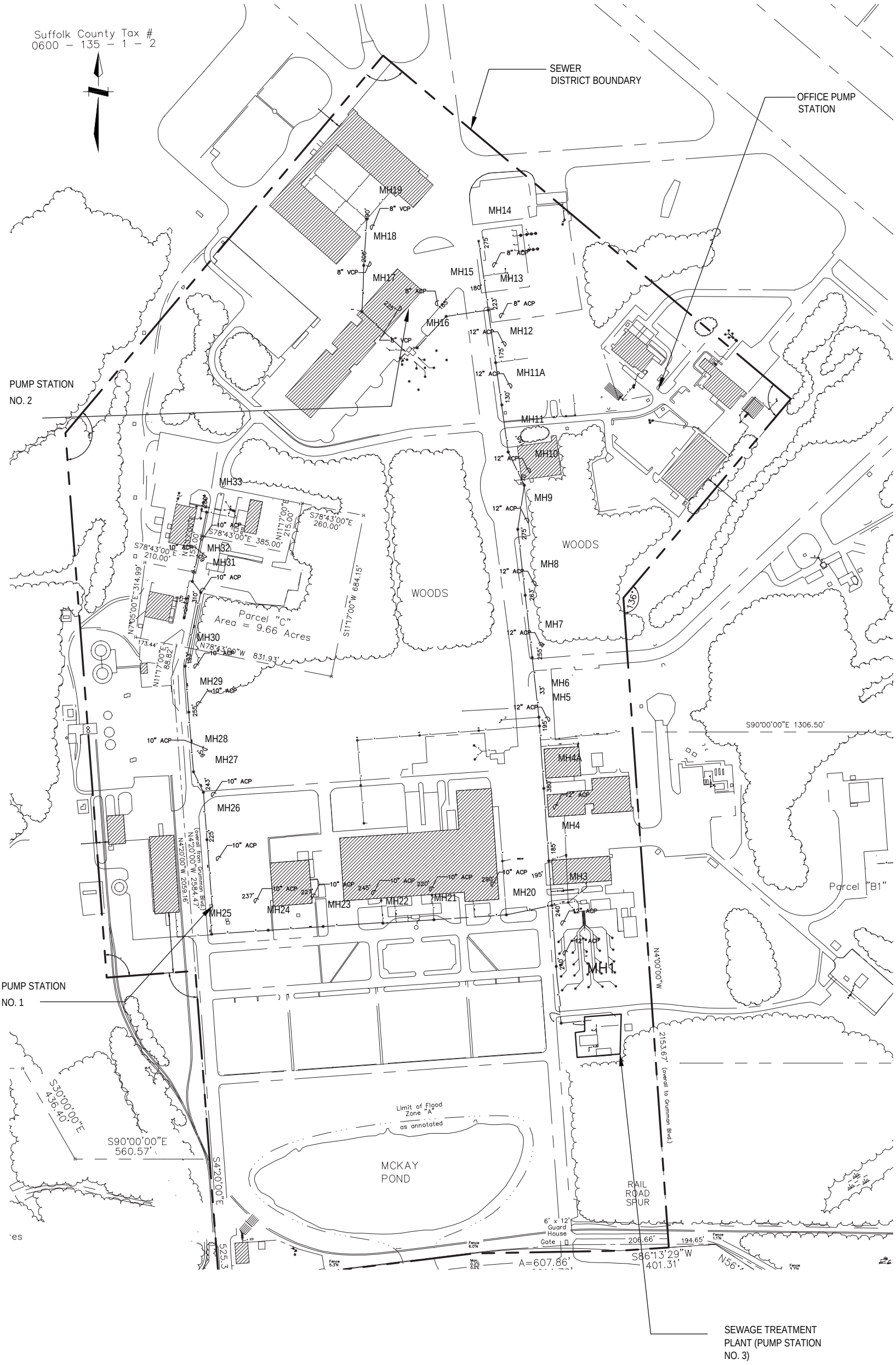
SUFFOLK COUNTY, NY

CONTRACT
CONTRACT G
GENERAL CONSTRUCTION

STATUS
NOT FOR CONSTRUCTION

SHEET TITLE
FLOW SCHEMATIC FOR EXISTING WWTP

SHEET #
FIG. 2



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New City, NY 10956
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Howell, NJ 07731

CONSULTANTS:

MARK	DATE	DESCRIPTION

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DATE: DATE
DESIGNED BY:
DRAWN BY:
CHECKED BY: REVIEWED BY:
SEAL

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CLIENT

TOWN OF RIVERHEAD
CALVERTON SEWER DISTRIC

WASTEWATER TREATMENT EXPANSION No.2

SUFFOLK COUNTY , NY

CONTRACT

CONTRACT G
GENERAL CONSTRUCTION

STATUS

NOT FOR CONSTRUCTION

SHEET TITLE

OVERVIEW MAP OF EXISTING COLLECTION AND CONVEYANCE SYSTEM

SHEET #

FIG 3

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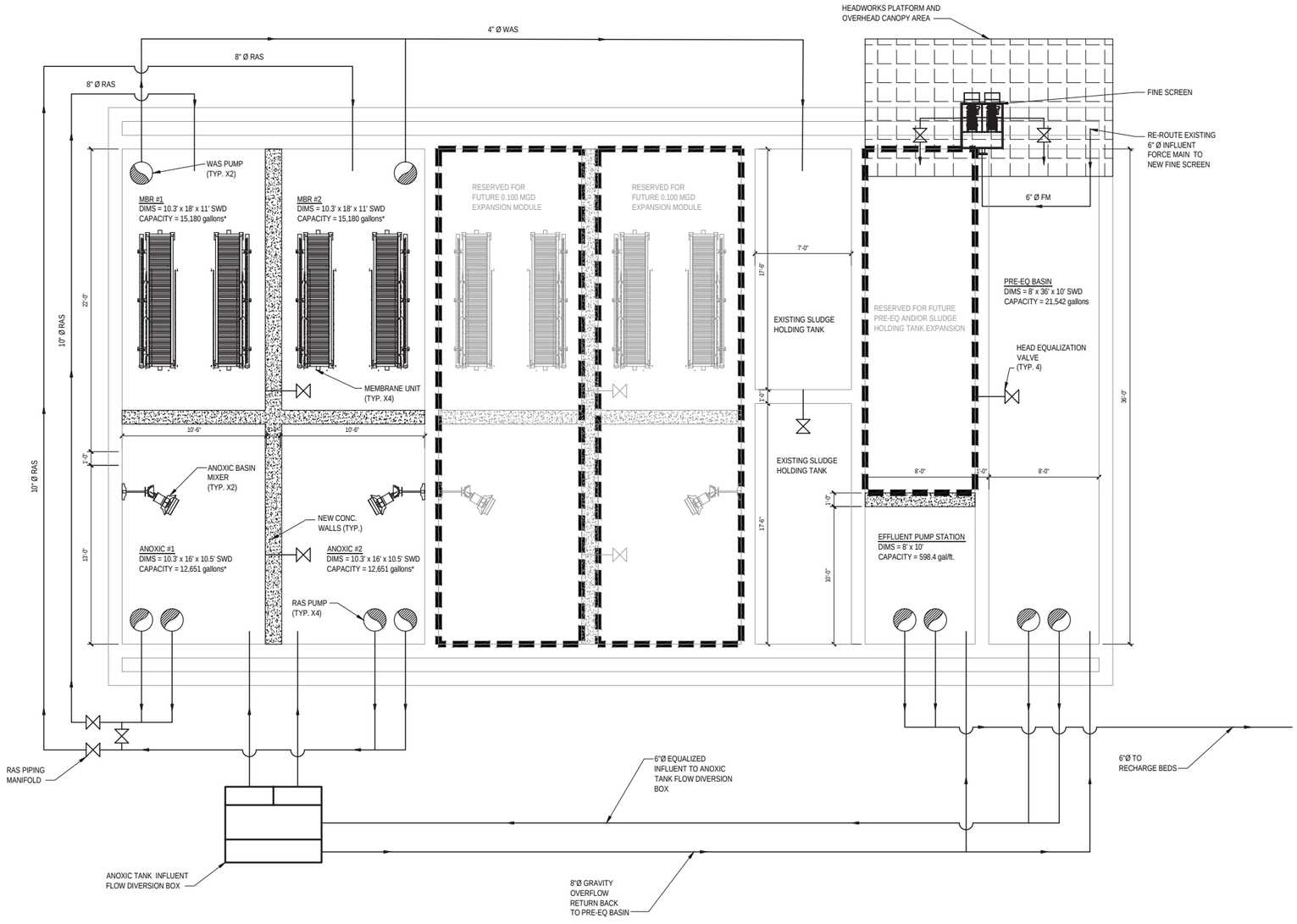

LEGEND:

- EXISTING TANK STRUCTURE
- PROPOSED NEW STRUCTURES

* - TANK VOLUMES INCLUDE VOLUME DISPLACED BY EQUIPMENT

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F:(631)694-4122

Melville, NY 11747
Albany, NY 12205
White Plains, NY 11601
New City, NY 10956
Parsippany, NJ 07054
Howell, NJ 07731

CONSULTANTS:

MARK	DATE	DESCRIPTION

PROJECT #: CASD 1401

DATE: SEPT 2014

DESIGNED BY:

DRAWN BY:

CHECKED BY: | REVIEWED BY:

SEAL

"ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL"

CLIENT

TOWN OF RIVERHEAD CALVERTON SEWER DISTRICT

WASTEWATER TREATMENT EXTENSION No. 2

SUFFOLK COUNTY, NY

CONTRACT

CONTRACT G

GENERAL CONSTRUCTION

STATUS

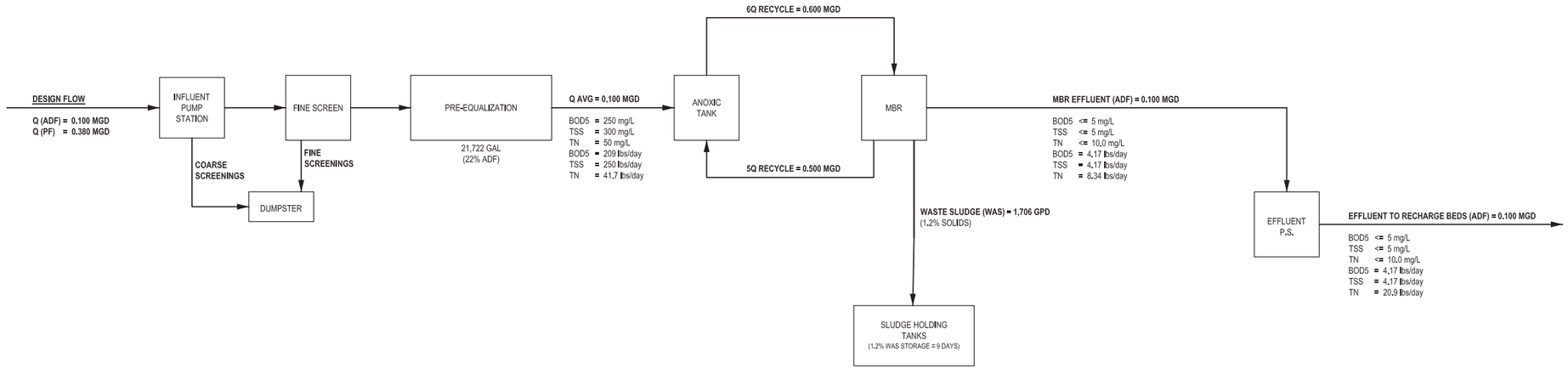
NOT FOR CONSTRUCTION

SHEET TITLE

WWTP TANK CONVERSION OVERVIEW FOR AWTF

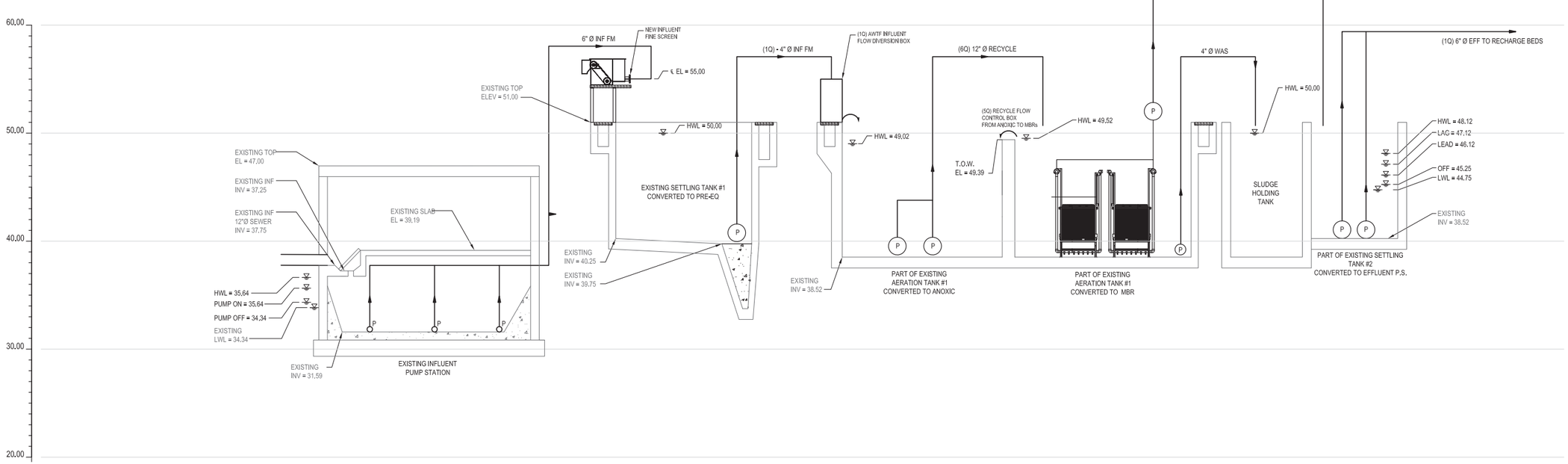
SHEET #

FIG. 4



AWFT PROCESS SCHEMATIC

SCALE: NTS



AWTF HYDRAULIC PROFILE

SCALE: NTS

NOTE:

HWL = HIGH WATER LEVEL
LWL = LOW WATER LEVEL
INV = INVERT ELEVATION

DESIGN FLOWS:

1. COLLECTION SYSTEM AVG. DAILY INFLUENT DESIGN FLOW (ADF) = 0.100 MGD ±
2. COLLECTION SYSTEM PEAK HOURLY INFLUENT DESIGN FLOW (PF) = 0.380 MGD ±
3. HEADWORKS + INF PUMP STATION DESIGN FLOW (PF) = 0.380 MGD
4. MBR PROCESS DESIGN FLOW (ADF) = 0.100 MGD

H2M architects + engineers

538 Broad Hollow Road
4th Floor East
Melville, NY 11747
P:(631)756-8000
F:(631)694-4122

Melville, NY 11747
Albany, NY 12205
White Plains, NY 11601
New City, NY 10956
Parsippany, NJ 07054
Howell, NJ 07731

CONSULTANTS:

MARK	DATE	DESCRIPTION

PROJECT #: CASD 1401
DATE: SEPT 2014
DESIGNED BY:
DRAWN BY:
CHECKED BY: | REVIEWED BY:

SEAL

CLIENT

TOWN OF RIVERHEAD CALVERTON SEWER DISTRICT

WASTEWATER TREATMENT EXTENSION No. 2

SUFFOLK COUNTY, NY

CONTRACT

CONTRACT G
GENERAL CONSTRUCTION

STATUS

NOT FOR CONSTRUCTION

SHEET TITLE

AWTF PROCESS SCHEMATIC & HYDRAULIC PROFILE

SHEET #

FIG. 5

M:\casd\CASD 1401\Figs\FIG 5 AWTF PROCESS SCHEMATIC & HYD PROF FOR 0.100 MGD.AWTF.dwg Last Modified: May 01, 2015 - 11:18am Plotted on May 05, 2015 - 2:45pm By rbono

NEW OPEN AIR RECHARGE BEDS

SCALE: 1/8" - 1'

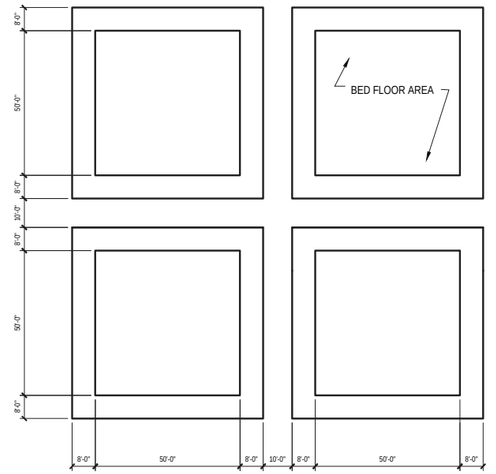
LEGEND:

EFFLUENT RECHARGE BEDS

AVERAGE DAILY FLOW	APPLICATION RATE	TOTAL BED AREA REQ'D	NO. OF BEDS	FLOOR AREA OF EACH BED	DIMS OF EACH BED
GPD	GPD/SF	SF		SF	FT
100,000	10	10,000	4	2,500	50 X 50

NOTES:

1. MUST HAVE AREA SET ASIDE FOR 100% EXPANSION OF BED AREA.
2. MINIMUM NUMBER OF BEDS REQUIRED BY SCDHS IS FOUR (4).
3. VARIANCE REQUIRED FROM REGULATORY AGENCY FOR MINIMUM SEPARATION DISTANCE TO PROPERTY LINE FROM EFFLUENT RECHARGE BEDS OF 300'.



1 TYPICAL RECHARGE BED GROUPING

SCALE: 1/2 " - 1'

H2M architects + engineers

538 Broad Hollow Road
4th Floor East
Melville, NY 11747
P:(631)756-8000
F:(631)694-4122

Melville, NY 11747
Albany, NY 12205
White Plains, NY 11601
New City, NY 10956
Parsippany, NJ 07054
Howell, NJ 07731

CONSULTANTS:

MARK	DATE	DESCRIPTION

PROJECT #: CASD 1401

DATE: SEPT 2014

DESIGNED BY:

DRAWN BY:

CHECKED BY: REVIEWED BY:

SEAL

"ALTERATION OF THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL IS ILLEGAL"

CLIENT

TOWN OF RIVERHEAD CALVERTON SEWER DISTRICT

WASTEWATER TREATMENT EXTENSION No. 2

SUFFOLK COUNTY, NY

CONTRACT

CONTRACT G

GENERAL CONSTRUCTION

STATUS

NOT FOR CONSTRUCTION

SHEET TITLE

GROUNDWATER RECHARGE BED LAYOUT

SHEET #

FIG. 6

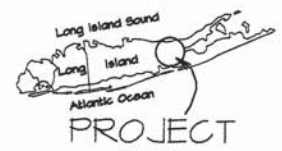
C:\Users\rbono\appdata\local\temp\AcPublish_31348\FIG 6.GROUNDWATER RECHARGE BED LAYOUT FOR IC100 MOD AWTF.dwg Last Modified: May 01, 2015 - 11:12am Plotted on: May 01, 2015 - 11:18am By rbono

APPENDIX A

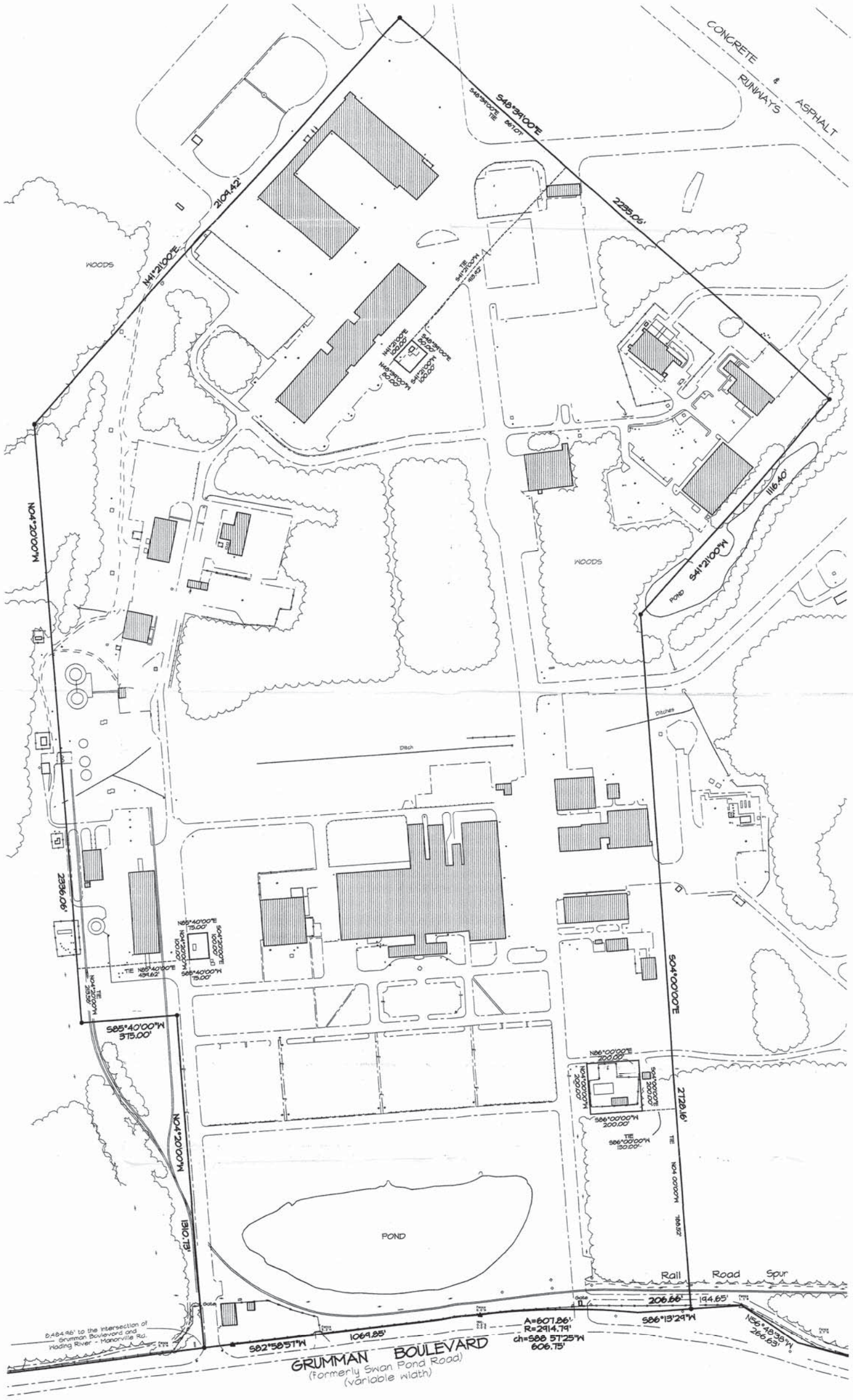
PROPOSED "CALVERTON SEWER DISTRICT"
SITUATE: CALVERTON
TOWN OF RIVERHEAD
SUFFOLK COUNTY, NEW YORK

PART OF SUFFOLK COUNTY TAX #
DISTRICT - 0600
SECTION - 135
BLOCK - 010.00
LOT - 002.0

MAP PREPARED 04-24-99



KEY MAP
(not to scale)



"Proposed" Legal Description.

Commencing at the point of beginning, which is on the northerly side of Grumman Boulevard, being distant 8,484.98 westerly along the northerly side of said road from a highway monument at the intersection formed by the northerly side of Grumman Boulevard and the easterly side of Wading River - Manorville Road;

from said point of beginning; running thence North 04°20'00" West, a distance of 1310.73 feet; thence South 85°40'00" West, a distance of 375.00 feet; thence North 04°20'00" West, a distance of 2336.06 feet; thence North 41°21'00" East, a distance of 2109.42 feet; thence South 48°39'00" East, a distance of 2235.06 feet; thence South 41°21'00" West, a distance of 1116.40 feet; thence South 04°00'00" East, a distance of 2728.16 feet; thence South 86°13'29" West, a distance of 206.66 feet to the beginning of a curve concave to the south having a radius of 2914.79 feet, a central angle of 11°56'55", an arc length of 607.86 feet and subtended by a chord which bears South 88°57'25" West 606.75 feet; thence South 82°58'57" West, a distance of 1069.85 feet to the point or place of beginning containing 236.28 acres.

LEGEND

- MONUMENT TO BE SET
- NEW YORK STATE HIGHWAY MARKER FOUND
- CONCRETE MONUMENT FOUND
- STAKE FOUND
- CHAIN LINK FENCE
- GUIDE RAIL
- MANHOLE
- LEACHING GRATE
- UTILITY POLE
- LIGHT POLE
- HYDRANT

GRAPHIC SCALE 1" = 200'

STATE OF NEW YORK
JOHN C. EHLERS
LICENSED LAND SURVEYOR
No. 50202

Signed _____ Date: 4-27-99

JOHN C. EHLERS LAND SURVEYOR
6 EAST MAIN STREET
RIVERHEAD, N.Y. 11901
369-8288 Fax 369-8287
N.Y.S. LIC. NO. 50

REFERENCE # 99-CAL

APPENDIX B

95-19-5 (1/99)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

APPLICATION FOR PERMIT TRANSFER

(In Accordance with Uniform Procedures, Part 621.13)

Please read ALL instructions on back before completing this application. Please TYPE or PRINT clearly in ink.

PART 1—TRANSFEREE (NEW OWNER/OPERATOR/LESSEE) COMPLETES:

1. LIST PERMIT NUMBER(S) AND THEIR EFFECTIVE AND EXPIRATION DATES.

Effective Date 7/31/01

1-4730-00013/00043 Air State Facility Expiration Date Non-

2. NAME OF TRANSFEREE: M-GBC LLC - c/o Grumman Mgmt

If other than an individual, provide Taxpayer ID Number 11-3631456

STREET: 95 Executive Blvd - 2nd. Floor

TELEPHONE NUMBER: ( )

CITY: Melville

STATE: NY

ZIP CODE: 11747

3. TRANSFEREE IS A/AN: ☒ Owner ☐ Operator ☐ Lessee

4. NAME OF FACILITY/PROJECT: Calverton Enterprise Park

STREET: 4062 Grumman Blvd

CITY: Calverton

STATE: NY

ZIP CODE: 11933

COUNTY: Suffolk

TOWN: Riverhead

5. HAS WORK BEGUN ON THE PROJECT? ☐ Yes ☐ No If no, proposed starting date: _____ Approximate completion date: _____

If there will be any modifications to the current operation, the transferee must attach a statement specifying the details.

6. CERTIFICATION: This certifies that the transferee is the current owner/operator/lessee of the named facility, has a copy of the permit, understands it will comply with all conditions in the referenced permit. Facility operations/project scope/discharges/emissions will remain the same. Further, I hereby affirm that under penalty of perjury that information provided on this form and all attachments submitted herewith is true to the best of my knowledge and belief. False statements made herein are punishable as a Class A misdemeanor pursuant to Section 210.45 of the Penal Law.

Signature and Title: Manager Date: 12-19-02

PART 2—TRANSFEROR (FORMER OWNER/OPERATOR/LESSEE) COMPLETES:

1. NAME OF TRANSFEROR: Town of Riverhead

If other than an individual, provide Taxpayer ID Number: 11-6001932

STREET: 200 Howell Ave

TELEPHONE NUMBER: (631) 727-3200

CITY: Riverhead

STATE: NY

ZIP CODE: 11901

2. NAME OF FACILITY/PROJECT, IF DIFFERENT FROM NAME IN PART 1: Calverton Enterprises

3. CERTIFICATION: This certifies that the facility referenced in Part 1 of this form will be/was transferred to the party identified as the new transferee (owner/operator/lessee) on 12/19/02 (date).

Signature and Title: Supervisor Date: 2/8/02

PART 3—PERMIT TRANSFER VALIDATION SECTION—DEPARTMENT OF ENVIRONMENTAL CONSERVATION COMPLETES:

☒ Transfer of permit approved. Transferee subject to conditions of permit, without exception.

☐ Transfer of permit approved, with the following modifications: ☐ See attached revised permit page(s) _____

☐ New application required. Please complete the enclosed permit application and return it to the undersigned Regional Permit Administrator.

Division of Environmental Permits

Signature: George W. Hammarth / George W. Hammarth Regional Permit Administrator Date: 4/11/02

New York State Department of Environmental Conservation
Division of Environmental Permits, Room 538
50 Wolf Road, Albany, New York 12233-1760
Phone: (518) 457-2224 FAX: (518) 457-5965

John P. Cahill
Commissioner

July 15, 1999

FACILITY INFORMATION

ANDREA LOHNEISS
RIVERHEAD (T), COMMUNITY DEVELOPMENT AGE
200 HOWELL AVE
RIVERHEAD, NY 11901

FORMER NWIRP CALVERTON, NEW YORK
LOCATION : RIVERHEAD (T)
COUNTY : SUFFOLK
DEC NO : 1-4730-00013-00034-
SPDES NO : NY 002 5453

Dear SPDES Permittee:

Enclosed please find your renewed State Pollutant Discharge Elimination System (SPDES) permit. This renewal permit together with the previously issued valid permit constitute authorization to discharge wastewater in accordance with all terms, conditions and limitations specified in your previously issued permit, including any valid modifications. Under the Environmental Benefit Permit Strategy, SPDES permits are renewed at a central location in Albany in order to make the process more efficient. All other concerns with your permit such as permittee-initiated modifications, permit transfers to a new owner, name changes, and other questions should be directed to the Regional Permit Administrator at the following address:

John Pavacic
NYSDEC REGION 1
Bldg 40 SUNY @ Stony Brook
Stony Brook, NY 11790-2356
(516) 444-0355

IMPORTANT NOTICE - In accordance with Article 17 Title 8 (State Pollutant Discharge Elimination System) and Article 70 (Uniform Procedures) of the Environmental Conservation Law, your permit is subject to the Discharge Notification Act (DNA). This law requires permittees to post a sign near each outfall of a wastewater discharge to surface waters, and also to provide a public repository for Discharge Monitoring Reports (DMRs) required by the SPDES permit. To initiate your complying with the provisions of the DNA, the Department has elected to modify your permit during this renewal period.

Please note, however, that *compliance with DNA requirements can be waived in certain cases*. *If* an outfall meets any of the circumstances listed in (g) under **DISCHARGE NOTIFICATION REQUIREMENTS**, in the enclosed modified permit, you need only notify the DNA Program Specialist using the enclosed *Notice of Waiver* form. If applicable, this completed form must be sent to the Bureau of Water Permits, NYSDEC, 50 Wolf Road, Albany, NY 12233-3505. In this case, construction of a sign and maintaining of DMRs in a public repository, *for the specific outfall or outfalls indicated in the Notice of Waiver*, is not required.

Sign and repository requirements will become effective (unless waived) 30 DAYS after the date of this letter. Should you object to this DNA modification, you must submit a written statement to the Regional Permit Administrator within 15 days of the date of this letter, giving supporting reasons why the permit should not be modified, or to request a hearing, or both.

If you have questions concerning this permit renewal, please contact Erin Burns at (518) 457-2224. If you have questions pertaining to the requirements of the Discharge Notification Act, please contact your Regional Water Engineer (see attached list and Region Map). Thank you.

Sincerely,

Lenore R. Kuwik
Deputy Chief Permit ADministrator

Enclosures
cc: RPA
RWE
BWP

SUFFOLK COUNTY

91-20-5 (5/97)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

State Pollutant Discharge Elimination System (SPDES)

NOTICE / RENEWAL APPLICATION / PERMIT

Please read **ALL** instructions on the back before completing this application form. Please **TYPE** or **PRINT** clearly in ink.

PART 1 - NOTICE

04/15/1999

1-4730-00013/00034

Permittee Contact Name, Title, Address

RIVERHEAD (T), COMMUNITY DEVELOPMENT AGE
ANDREA LOHNEISS
200 HOWELL AVE
RIVERHEAD NY 11901

Facility and SPDES Permit Information

Name: FORMER NWIRP CALVERTON, NEW YORK
Ind. Code: 3479 County: SUFFOLK
DEC No.: 1-4730-00013/00034
SPDES No.: NY 002 5453
Expiration Date: 02/01/2000
Application Due By: 08/05/1999

Are these name(s) & address(es) correct? if not, please write corrections above.

The State Pollutant Discharge Elimination System Permit for the facility referenced above expires on the date indicated. You are required by law to file a complete renewal application **at least 180 days prior to expiration of your current permit. Note the "Application Due By" date above.**

CAUTION: This short application form and attached questionnaire are the only forms acceptable for permit renewal. Sign Part 2 below and mail only this form and the completed questionnaire using the enclosed envelope. *Effective April 1, 1994 the Department no longer assesses SPDES application fees.*

If there are changes to your discharge, or to operations affecting the discharge, then in addition to this renewal application, you must also submit a separate permit modification application to the Regional Permit Administrator for the DEC region in which the facility is located, as required by your current permit. See the reverse side of this page for instructions on filing a modification request.

PART 2 - RENEWAL APPLICATION

CERTIFICATION: I hereby affirm that under penalty of perjury that the information provided on this form and all attachments submitted herewith is true to the best of my knowledge and belief. False statements made herein are punishable as a Class A misdemeanor pursuant to section 210.45 of the Penal Law.

Frank M. Russo, P.E.
Name of person signing application (see instructions on back)

Project Manager, H2M Group
Title

Frank M. Russo amf
Signature

5/5/99
Date

RECEIVED MAY 7 1999 NYSDEC

PART 3 - PERMIT (Below this line - Official Use Only)

Effective Date: 02/01/00 **Expiration Date:** 02/01/05

Lenore R. Kuwik
Permit Administrator

Address: NYSDEC - Division of Environmental Permits
Bureau of Environmental Analysis
50 Wolf Road, Albany, NY 12233-1760

Lenore R. Kuwik
Signature

7/15/99
Date

This permit together with the previous valid permit for this facility issued 01/20/95 and subsequent modifications constitute authorization to discharge wastewater in accordance with all terms, conditions and limitations specified in the previously issued valid permit, modifications thereof or issued as part of this permit, including any special or general conditions attached hereto. Nothing in this permit shall be deemed to waive the Department's authority to initiate a modification of this permit on the grounds specified in 6NYCRR §621.14, 6NYCRR §754.4 or 6NYCRR §757.1 existing at the time this permit is issued or which arise thereafter.

Attachments: General Conditions dated 11/90

Effective Date of Modification: 08/12/99

DISCHARGE NOTIFICATION REQUIREMENTS

(a) Except as provided in (c), (f) and (g) of these Discharge Notification Act requirements, the permittee shall install and maintain identification signs at all outfalls to surface waters listed in this permit. Such signs shall be installed within 90 days of the Effective Date of this Modification.

(b) Subsequent modifications to or renewal of this permit does not reset or revise the deadline set forth in (a) above, unless a new deadline is set explicitly by such permit modification or renewal.

(c) The Discharge Notification Requirements described herein do not apply to outfalls from which the discharge is composed exclusively of storm water, or discharges to ground water.

(d) The sign(s) shall be conspicuous, legible and in as close proximity to the point of discharge as is reasonably possible while ensuring the maximum visibility from the surface water and shore. The signs shall be installed in such a manner to pose minimal hazard to navigation, bathing or other water related activities. If the public has access to the water from the land in the vicinity of the outfall, an identical sign shall be posted to be visible from the direction approaching the surface water.

The signs shall have **minimum** dimensions of eighteen inches by twenty four inches (18" x 24") and shall have white letters on a green background and contain the following information:

N.Y.S. PERMITTED DISCHARGE POINT

SPDES PERMIT No.: NY_____

OUTFALL No. :____

For information about this permitted discharge contact:

Permittee Name: _____

Permittee Contact: _____

Permittee Phone: ( ) - ### - ####

OR:

NYSDEC Division of Water Regional Office Address :

NYSDEC Division of Water Regional Phone: ( ) - ### -####

(e) For each discharge required to have a sign in accordance with a), the permittee shall, concurrent with the installation of the sign, provide a repository of copies of the Discharge Monitoring Reports (DMRs), as required by the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of this permit. This repository shall be open to the public, at a minimum, during normal daytime business hours. The repository may be at the business office repository of the permittee or at an off-premises location of its choice (such location shall be the village, town, city or county clerk's office, the local library or other location as approved by the Department). In accordance with the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of your permit, each DMR shall be maintained on record for a period of three years.

(continued)

(f) If, upon November 1, 1997, the permittee has installed signs that include the information required by 17-0815-a(2)(a) of the ECL, but do not meet the specifications listed above, the permittee may continue to use the existing signs for a period of up to five years, after which the signs shall comply with the specifications listed above.

(g) All requirements of the Discharge Notification Act, including public repository requirements, are waived for any outfall meeting any of the following circumstances, provided Department notification is made in accordance with (h):

(i) such sign would be inconsistent with any other state or federal statute;

(ii) the Discharge Notification Requirements contained herein would require that such sign could only be located in an area that is damaged by ice or flooding due to a one-year storm or storms of less severity;

(iii) instances in which the outfall to the receiving water is located on private or government property which is restricted to the public through fencing, patrolling, or other control mechanisms. Property which is posted only, without additional control mechanisms, does not qualify for this provision;

(iv) instances where the outfall pipe or channel discharges to another outfall pipe or channel, before discharge to a receiving water; or

(v) instances in which the discharge from the outfall is located in the receiving water, two-hundred or more feet from the shoreline of the receiving water.

(h) If the permittee believes that any outfall which discharges wastewater from the permitted facility meets any of the waiver criteria listed in (g) above, notification (form enclosed) must be made to the Department's Bureau of Water Permits, Central Office, of such fact, and, provided there is no objection by the Department, a sign and DMR repository for the involved outfall(s) are not required. This notification must include the facility's name, address, telephone number, contact, permit number, outfall number(s), and reason why such outfall(s) is waived from the requirements of discharge notification. The Department may evaluate the applicability of a waiver at any time, and take appropriate measures to assure that the ECL and associated regulations are complied with.

(i) The permittee shall periodically inspect the outfall identification signs in order to ensure that they are maintained, are still visible and contain information that is current and factually correct.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Please enter the numbers from your current permit:

DEC Number: 1 - 4730 - 00013 / 00034 - __

SPDES Number: NY 0025453

SPDES RENEWAL APPLICATION
QUESTIONNAIRE

THIS PAGE MUST BE COMPLETED AND RETURNED WITH YOUR COMPLETED APPLICATION

Please **TYPE** or **PRINT** neatly using adaquate pressure to make ALL copies legible. Keep the GOLD copy for your records.

1. Has the SPDES permit for your facility been modified in the past 5 years ☐ YES ☒ NO

2. Dischargers who use, manufacture, store, handle or discharge toxic or hazardous pollutants are subject to Industrial Best Management Practices (BMP) plan requirements for toxic or hazardous substances. A BMP plan prevents o minimizes the potential for release of pollutants to receiving waters from such ancillary industrial activities, including material storage areas; plant site runoff; in-plant transfer; process and material storage areas; loading and unloading operations, and sludge and waste disposal areas.

   Does your facility conduct ancillary activities as described above, which are not covered by BMP requirements in your current permit? ☐ YES ☒ NO

Please indicate which of the following best describes the situation at your facility:

☒ None of the concerns on the "Self Evaluation List" seem to apply to my facility at this time and I will not be applying for a modification of the SPDES permit in the foreseeable future.

☐ Yes, some of the items on the "Self Evaluation List" have led me to believe my permit needs to be modified. I already have a complete modification application pending with the Department.

☐ Yes, some of the items on the "Self Evaluation List" have led me to believe that the SPDES permit for this facility may need to be Modified. I have requested the appropriate forms by phone OR I have completed and attached the "Request For SPDES Application Forms" (included in this renewal package) to allow me to submit a permittee-initiated Modification application. See The "Request For SPDES Application Forms" page for a toll free 800 number.

☐ The items on the "Self Evaluation List" have left me unable to conclude whether my permit needs to be modified at this time. I am reporting the following general concerns about my permit:

DISTRIBUTION: Regional Water Engineer – WHITE
Central Office (BWFD) – YELLOW
Regional Permit Administrator – PINK
Applicant – GOLD

State Pollutant Discharge Elimination System (SPDES)
APPLICATION SUPPLEMENT
DISCHARGES WITHIN SOLE SOURCE AQUIFERS

Facility Name:	SPDES Number:
Former NWIRP Calverton, NY	NY 002 5453

Your facility is located in a sole source aquifer area, which is an area designated by Federal or State statutes. Chapter 663 of the Laws of 1983 added Section 17-0828 of the Environmental Conservation Law requiring any person applying for a SPDES permit, or for a renewal of an existing SPDES permit, for a facility located in a sole source aquifer to provide a list of all water purveyors within a three mile radius of the applicant's facility. Please list the names and addresses of the public and private water supply purveyors within a three mile radius of your facility in the table below.

Maps of water purveyor's service area boundaries are available for viewing in the offices of the following NYSDEC Regional Water Engineers and County Health Departments:

NYSDEC Region 1 (Nassau and Suffolk County maps) Building 40, SUNY Stony Brook, NY 11790-2356	Nassau County Health Department (Nassau County Maps) 240 Old Country Road Mineola, NY 11501
NYSDEC Region 2 (Brooklyn and Queens maps) 1 Hunters Point Plaza 47-40 21st Street Long Island City, NY 11101	Suffolk County Department of Health Services (Suffolk County Maps) 225 Rabro Drive East Hauppauge, NY 11787

1. Water Purveyors within a three mile radius of your facility:

Please complete the following information and attach it to your application. Attach additional copies of this sheet as necessary.

	Name	Address
1.	Suffolk County Water Authority	4060 Sunrise Highway, Oakdale, New York 11769
2.	Riverhead Water District	1035 Pulaski St., Riverhead, New York 11901
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

JAN-28-98 WED

9: 20-5 (4/92)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERV

State Pollutant Discharge Elimination System (SPDES)

NOTICE/RENEWAL APPLICATION/PERMIT

6-0043

Please read ALL instructions on the back before completing this application form. Please TYPE or PRINT clearly in Ink.

PART 1 - NOTICE Date: NOV 15 1993

OWNER ID _____ DEC # 1-4730-00013/00034-0 APPL DUE BY 3/5/94

Permittee Contact Name, Title, Address

[illegible] NY 11794-5457
GRUMMAN AEROSPACE CORP
[illegible]
1111 STEWART AVE MAIL STOP: 006-GH0
BETHPAGE NY 11714

Facility Name, Location, SPDES Number, Expiration Date

NWIRP 0U0 46e
COUNTY : SUFFOLK
PERMIT NO : NY [illegible]
EXPIRE : 94-06-01
SIC : 3728 CE1

Are these labels correct? If not, please write corrections on the labels.

The State Pollutant Discharge Elimination System Permit for the facility referenced above expires on the date indicated. You are required by law to file a complete renewal application at least 180 days prior to expiration of your current SPDES permit. Note the "Application Due By" date above.

CAUTION: This short application form and attached questionnaire are the only forms acceptable for permit renewal. Sign Part 2 below and mail only this form, the completed questionnaire and proper filing fee to the appropriate Regional Permit Administrator (see attached Filing Locations & Fee Schedule pages).

If there are changes to your discharge, or to operations affecting the discharge, then in addition to this renewal application, you must also submit a separate permit modification application to the Department as required by your current permit. Such application forms may be requested from the appropriate Regional Permit Administrator (see the attached list of Filing Locations).

PART 2 - RENEWAL APPLICATION

CERTIFICATION: I hereby affirm that under penalty of perjury that the information provided on this form and all attachments submitted herewith is true to the best of my knowledge and belief. False statements made herein are punishable as a Class A misdemeanor pursuant to section 210.45 of the Penal Law.

John Ohlmann, P.E., Director, Corporate Environmental Technology & Compliance
Name of person signing application (see instructions on back) Title

J. Ohlmann 2/16/94
Signature Date

PART 3 - PERMIT (Below this line - Official Use Only)

Effective Date: 2/1/95 Expiration Date: 2/1/2000

Regulatory Affairs
Region 1 - Bldg. 40 SUNY
Stony Brook, N.Y. 11790-2356

Regional Permit Administrator Address

Eger Evans 1/20/95
Signature Date

This permit together with the previous valid permit for this facility issued 9/1/89 and subsequent modifications constitute authorization to discharge wastewater in accordance with all terms, conditions and limitations specified in the previously issued valid permit, modifications thereof or issued as part of this permit, including any special or general conditions attached hereto. Nothing in this permit shall be deemed to waive the Department's authority to initiate a modification of this permit on the grounds specified in 6NYCRR §621.14, 6NYCRR §754.4 or 6NYCRR §757.1 existing at the time this permit is issued or which arise thereafter.

Attachments: General Conditions dated 10/90

cc: [illegible], A. Yannacone & Assoc., T. Malone (SCDH)

JAN 28 98 REC'D 11:10

(F)

1506307

RECEIVED

AUG 21 1989

S.C. DEPT OF HEALTH SERVICES

81-20-2 (1/89) NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

State Pollutant Discharge Elimination System (SPDES)

DISCHARGE PERMIT

Special Conditions (Part I)

Industrial Code: 3479
Discharge Class (CL): 01
Toxic Class (TX): T
Major Drainage Basin: 17
Sub Drainage Basin: 01
Water Index Number: 112-5-P570-2
Compact Area:

SPDES Number: NY-0025453
DEC Number: 10-88-1677
Effective Date (EDP): September 1, 1989
Expiration Date (ExPD): September 1, 1994
Modification Date(s):
Attachment(s): General Conditions (Part II) Date 2/86

This SPDES permit is issued in compliance with Title 8 of Article 17 of the Environmental Conservation Law of New York State and in compliance with the Clean Water Act, as amended, (33 U.S.C. §1251 et seq.)(hereinafter referred to as "the Act"). Issuance of this permit does not acknowledge or imply that permittee is in compliance with the requirements of this permit.

PERMITTEE NAME AND ADDRESS:

Attention: John Ohlmann, Director

Name: Grumman Aerospace Corp.
Street: Mail Stop B08-30
City: Bethpage State: NY Zip Code: 11714
is authorized to discharge from the facility described below:

FACILITY NAME AND ADDRESS:

Name: Grumman Aerospace Corp. NWIRP DOD 466
Location (C,T,V): Riverhead County: Suffolk
Facility Address: Grumman Blvd.
City: Calverton State: NY Zip Code: 11933
NYTM-E: NYTM-N: 4
From Outfall No. 001-003 at Latitude: 40°54'26" & Longitude: 72°47'30"
Into receiving waters known as: McKay Lake to Swan Pond to Peconic Riv. Class: C
and (list other Outfalls, Receiving Waters & Water Classifications)

004-006 Groundwaters GA
008-023 Groundwaters GA

Suffolk County Tax Map ID:
District: 0600 Section: 141 Block: 2 Lot: 2.
135 1 6/

in accordance with the effluent limitations, monitoring requirements and other conditions set forth in Special Conditions (Part I) and General Conditions (Part II) of this permit.

DISCHARGE MONITORING REPORT (DMR) MAILING ADDRESS

Mailing Name: Grumman Aerospace Corp.
Street: Mail Stop B08-30
City: Bethpage State: NY Zip Code: 11714
Responsible Official or Agent: John Ohlmann, Director Phone: (516)575-2365

This permit and the authorization to discharge shall expire on midnight of the expiration date shown above and the permittee shall not discharge after the expiration date unless this permit has been renewed, or extended pursuant to law. To be authorized to discharge beyond the expiration date, the permittee shall apply for permit renewal not less than 180 days prior to the expiration date shown above.

DISTRIBUTION: R. Hannaford
P. Barbato
T. Sanford
J. Maloney
EPA, Region II
file

Deputy Regional Permit Administrator: David DeRidder
Address: Bldg. 40, SUNY, Stony Brook, N.Y. 11790
Signature: David DeRidder Date: 8/4/89

FINAL

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the Period Beginning September 1, 1989

and lasting until September 1, 1994

the discharges from the permitted facility shall be limited and monitored by the permittee as specified below:

Outfall Number & Effluent Parameter	Discharge Limitations Daily Avg.	Daily Max.	Units	Minimum Monitoring Requirements: Measurement Frequency	Sample Type
001 Process & Sanitary					
Flow	NA	Monitor	gpd	Continuous	Recorded
Cadmium, Total	.1	.2	mg/l	Monthly	Composite
Chromium, Total	.5	1	mg/l	Monthly	Composite
Chromium, Hexavalent #	.05	.1	mg/l	Monthly	Composite
Cyanide, Total	.4	.8	mg/l	Monthly	Composite
Fluoride	10	20	mg/l	Monthly	Composite
Iron, Total	1	2	mg/l	Monthly	Composite
Lead, Total	.1	.2	mg/l	Monthly	Composite
Silver, Total	.05	.1	mg/l	Monthly	Composite
Zinc, Total	.5	1	mg/l	Monthly	Composite
Phenols, Total	.5	1	mg/l	Monthly	Composite
BOD,	30	45	mg/l	Weekly	Composite
Solids, Total Suspended	30	45	mg/l	Weekly	Composite
Oil & Grease	NA	15	mg/l	Weekly	Grab
Settleable Solids	NA	.1	ml/l	Weekly	Grab
Fecal Coliform	200	400	MPN/100 ml	Weekly	Grab
pH (Range)	6.0 - 9.0		SU	Weekly	Grab
*Chloroform	NA	0.05	mg/l	Quarterly	Grab
*1,1,1-Trichloroethane	NA	0.05	mg/l	Quarterly	Grab
*Methylene Chloride	NA	0.05	mg/l	Quarterly	Grab
*Toluene	NA	0.05	mg/l	Quarterly	Grab
*Xylene	NA	0.05	mg/l	Quarterly	Grab
*Trichlorotrifluoroethane	NA	0.05	mg/l	Quarterly	Grab
*Trichloroethene	NA	0.05	mg/l	Quarterly	Grab

*The sum total concentration of these parameters shall not exceed 100 ug/l.

cyanide
metals
Cr+6
O+G
organics
BOD
TSS

FINAL

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the Period Beginning September 1, 1989

and lasting until September 1, 1994

the discharges from the permitted facility shall be limited and monitored by the permittee as specified below:

Outfall Number & Effluent Parameter	Discharge Limitations Daily Avg.	Daily Max.	Units	Minimum Monitoring Requirements Measurement Frequency	Sample Type
002 Non Contact Cooling Water					
Flow	NA	Monitor	gpd	Monthly	Instantaneous
Temperature	NA	90	°F	Monthly	Grab
003 Non Contact Cooling Water					
Flow	NA	Monitor	gpd	Monthly	Instantaneous
Temperature	NA	90	°F	Monthly	Grab

004, 005, 006 Non Contact Cooling Water

No Monitoring Required

008 - 023 Sanitary

No monitoring required.

91-20-2e (7/84)

SPDES No. NY 002 5453

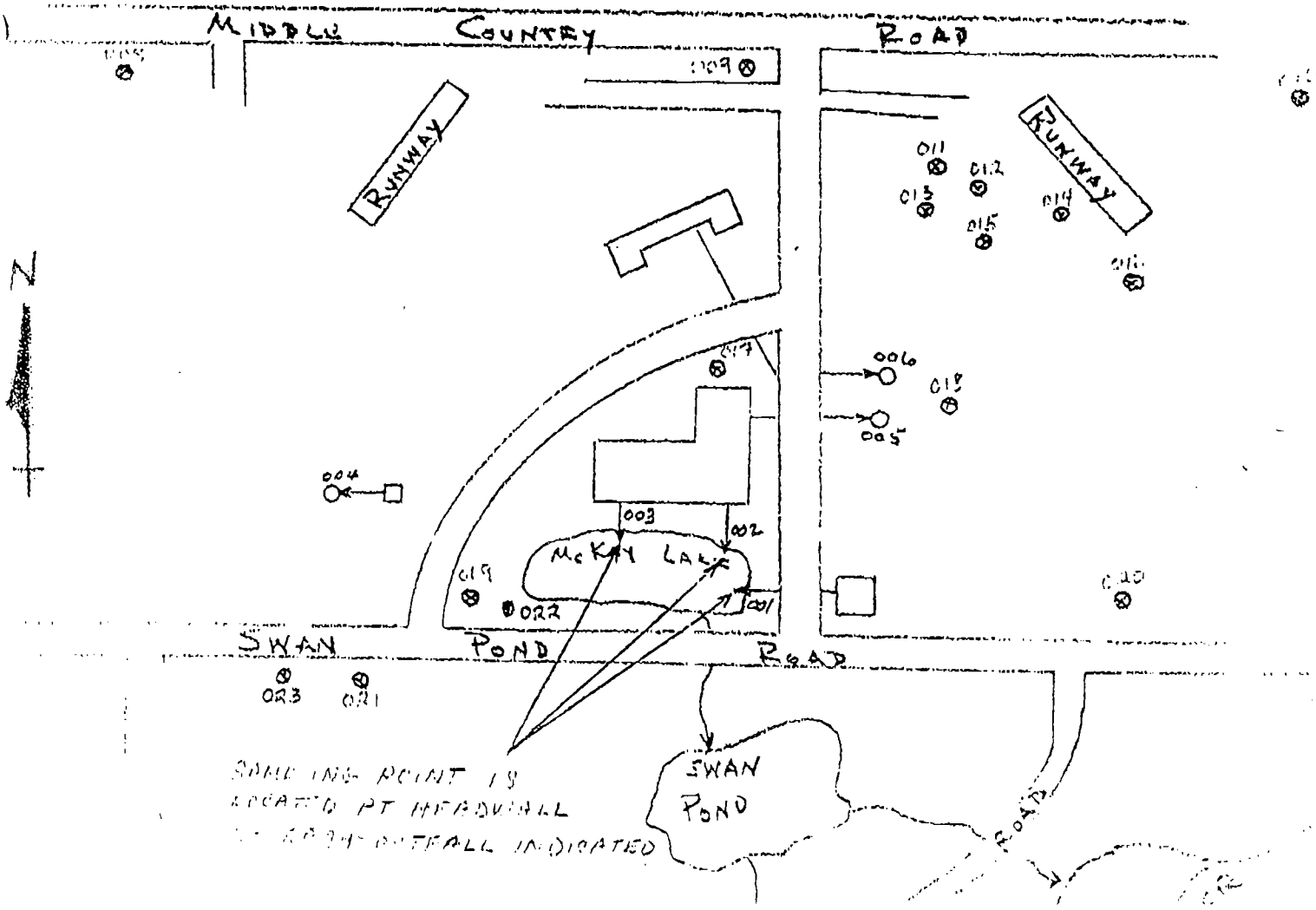
Definition of Daily Average and Daily Maximum

The daily average discharge is the total discharge by weight or in other appropriate units as specified herein, during a calendar month divided by the number of days in the month that the production or commercial facility was operating. Where less than daily sampling is required by this permit, the daily average discharge shall be determined by the summation of all the measured daily discharges in appropriate units as specified herein divided by the number of days during the calendar month when the measurements were made.

The daily maximum discharge means the total discharge by weight or in other appropriate units as specified herein, during any calendar day.

Monitoring Locations

Permittee shall take samples and measurements to meet the monitoring requirements at the location(s) indicated below. (Show locations of outfalls with sketch or flow diagram as appropriate).



RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS

a) The permittee shall also refer to the General Conditions (Part II) of this permit for additional information concerning monitoring and reporting requirements and conditions.

b) The monitoring information required by this permit shall be summarized, signed and retained for a period of three years from the date of the sampling for subsequent inspection by the Department or its designated agent. Also:

[x] (if box is checked) monitoring information required by this permit shall be summarized and reported by submitting completed and signed Discharge Monitoring Report (DMR) forms for each One month reporting period to the locations specified below. Blank forms are available at the Department's Albany office listed below. The first reporting period begins on the effective date of this permit and the reports will be due no later than the 28th day of the month following the end of each reporting period.

Send the original (top sheet) of each DMR page to:

Department of Environmental Conservation
Division of Water
Bureau of Wastewater Facilities Operations
50 Wolf Road
Albany, New York 12233-3506

Phone: (518) 457-3790

Send the first copy (second sheet) of each DMR page to:

Department of Environmental Conservation
Regional Water Engineer
Bldg. 40, SUNY
Stony Brook, N.Y. 11794

Phone: (516) 751-7725

Send the second copy (third sheet) to:

Suffolk County Dept. of Health Service
15 Horseblock Place
Farmingville, N.Y. 11738
Att: James Maloney, PE
Include a copy of the laboratory analysis with the SCDHS DMR.

c) A monthly "Wastewater Facility Operation Report..." (form 92-15-7) shall be submitted (if box is checked) to the [ ] Regional Water Engineer and/or [ ] County Health Department or Environmental Control Agency listed above.

d) Noncompliance with the provisions of this permit shall be reported to the Department as prescribed in the attached General Conditions (Part II).

e) Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

f) If the permittee monitors any pollutant more frequently than required by the permit, using test procedures approved under 40 CFR Part 136 or as specified in this permit, the results of this monitoring shall be included in the calculations and recording of the data on the Discharge Monitoring Reports.

g) Calculation for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this permit.

h) Unless otherwise specified, all information recorded on the Discharge Monitoring Report shall be based upon measurements and sampling carried out during the most recently completed reporting period.

i) Any laboratory test or sample analysis required by this permit for which the State Commissioner of Health issues certificates of approval pursuant to section five hundred two of the Public Health Law shall be conducted by a laboratory which has been issued a certificate of approval. Inquiries regarding laboratory certification should be sent to the Environmental Laboratory Accreditation Program, New York State Health Department Center for Laboratories and Research, Division of Environmental Sciences , The Nelson A. Rockerfeller Empire State Plaza, Albany New York 12201.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM (SPDES)
DISCHARGE PERMIT

GENERAL CONDITIONS
(PART II)

GENERAL PROVISIONS

a. This permit, or a true copy, shall be kept readily available for reference at the wastewater treatment facility.

b. A determination has been made on the basis of a submitted application, plans, or other available information, that compliance with the specified permit provisions will reasonably protect classified water use and assure compliance with applicable water quality standards. Satisfaction of permit provisions notwithstanding, if operation pursuant to the permit causes or contributes to a condition in contravention of State water quality standards, or if the Department determines, on the basis of notice provided by the permittee and any related investigation, inspection or sampling, that a modification of the permit is necessary to prevent impairment of the best use of the waters or to assure maintenance of water quality standards or compliance with other provisions of ECL Article 17, or the Act, the Department may require such a modification and may require abatement action to be taken by the permittee and may also prohibit the noticed act until the permit has been modified.

c. All discharges authorized by this permit shall be consistent with the terms and conditions of this permit. Facility expansion or other modifications, production increases, product changes, product process modifications, and wastewater collection, treatment and disposal system changes which will result in new or increased discharges of pollutants into the waters of the state must be reported by submission of a new SPDES application, in which case the permit may be modified accordingly. The discharge of any pollutant, not identified and authorized, or the discharge of any pollutant more frequently than, or at a level in excess of, that identified and authorized by this permit shall constitute a violation of the terms and conditions of this permit. Facility modifications, process modifications, or production decreases which result in decreased discharges of pollutants must be reported by submission of written notice to the permit-issuing authority, in which case the permit-issuing authority may require the permittee to submit a new SPDES application.

d. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

e. If the discharge(s) permitted herein originate within the jurisdiction of an interstate water pollution control agency, then the permitted discharge(s) must also comply with any applicable effluent standards or water quality standards promulgated by that interstate agency.

f. The permittee must comply with all terms and conditions of this permit. Any permit noncompliance constitutes a violation of the Environmental Conservation Law and the Clean Water Act and is grounds for: enforcement action; for permit suspension, revocation and modification; and for denial of a permit renewal application.

g. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Department, the permittee shall promptly submit such facts or information.

h. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

i. The permittee shall comply with effluent standards or prohibitions established under section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

j. The Clean Water Act provides that any person who violates a permit condition implementing sections 301, 302, 306, 307, 308, 318, or 405 of the Clean Water Act is subject to a civil penalty not to exceed $25,000 per day of such violations. Any person who willfully or negligently violates permit conditions implementing sections 301, 302, 306, 307, or 308 of the Clean Water Act is subject to a fine of not less than $5,000 nor more than $50,000 per day of violation, or by imprisonment for not more than three years, or both.

k. The filing of a request by the permittee for a permit modification, revocation, transfer, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

l. The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, suspending, or revoking this permit, or to determine compliance with this permit. The permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

m. Nothing in this permit relieves the permittee from a requirement to obtain other permits required by law, including, but not limited to:

(1) an air contamination source permit/certification under 6NYCRR Part 201;

(2) a waste transporter permit under 6NYCRR Part 364; or

(3) a radioactive waste discharge permit under 6NYCRR Part 380.

2. SPECIAL REPORTING REQUIREMENTS FOR EXISTING MANUFACTURING, COMMERCIAL, MINING, AND SILVICULTURAL DISCHARGERS

All existing manufacturing, commercial, mining and silvicultural dischargers must notify the Department as soon as they know or have reason to believe:

a. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not specifically controlled in the permit, pursuant to General Provision 1 (c) herein. For the purposes of this section, recurrent accidental or unintentional spills or releases shall be considered to be a discharge on a frequent basis.

b. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

(1) 500 micrograms/liter;

(2) 1.0 milligram/liter for antimony;

(3) five times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR §122.21(g)(7); or

(4) the level established by the Department in accordance with 40 CFR §122.44(f).

c. That they have begun or expect to begin to use, or manufacture as an intermediate or final product or by-product, any toxic pollutant which was not reported in the permit application under 40 CFR §122.21(g)(9) and which is being or may be discharged to waters of the state.

3. EXCLUSIONS

a. The issuance of this permit by the Department and the receipt thereof by the Applicant does not supersede, revoke or rescind an order or modification thereof on consent or determination by the Commissioner issued heretofore by the Department or any of the terms, conditions or requirements contained in such order or modification thereof unless specifically intended by said order.

b. The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations; nor does it obviate the necessity of obtaining the assent of any other jurisdiction as required by law for the discharge authorized.

c. This permit does not authorize or approve the construction of any onshore or offshore physical structures or facilities or the undertaking of any work in any navigable waters.

d. Oil and hazardous substance liability: The imposition of responsibilities upon, or the institution of any legal action against the permittee under Section 311 of the Clean Water Act shall be in conformance with regulations promulgated pursuant to Section 311 governing the applicability of Section 311 of the Clean Water Act to discharges from facilities with NPDES permits.

4. MODIFICATION, SUSPENSION, REVOCATION

a. If the permittee fails or refuses to comply with any requirement in this permit, such noncompliance shall constitute a violation of the permit for which the Commissioner may modify, suspend, or revoke the permit after notice and opportunity for hearing and take direct enforcement action pursuant to law. When, at any time during or prior to a period for compliance, the permittee announces or otherwise lets it be known, or the Commissioner on reasonable cause determines, that the permittee will not make the requisite efforts to achieve compliance with an interim or final requirement, the Commissioner may modify, suspend or revoke the permit and take direct enforcement action pursuant to law, without waiting for expiration of the period for compliance with such requirements.

notice and opportunity for a hearing, the Department may modify, suspend or revoke this permit in ole or in part during its term for cause including, but not limited to, the following:

violation of any provision of this permit; or

obtaining this permit by misrepresentation or failure to disclose fully all relevant facts at any time; or materially false or inaccurate statements or information in the application or the permit; or

a change in any physical circumstances, requirements or criteria applicable to discharges,including, but not limited to:

(i) standards for construction or operation of the discharging facility;

(ii) the characteristics of the waters into which such discharge is made;

(iii) the water quality criteria applicable to such is made;

(iv) the classification of such waters; or

(v) effluent limitations or other requirements applicable pursuant to the Act or State Law.

a determination that the permitted activity endangers human health or the environment and can only be regulated to acceptable levels by permit modification, a suspension, or revocation.

violation of any order of the Commissioner or provision of ECL or regulation promulgated thereunder, which is related to the permitted activity.

Newely discovered material information or material change in environmental conditions, relevant technology or applicable law or regulations since the issuance of this permit.

any applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under section 307(a) of the Clean Water Act for a toxic pollutant and that a standard or prohibition is more stringent than any limitation on the pollutant in the permit, the Department shall institute proceedings to modify the permit in order to achieve conformance with the toxic effluent standard or prohibition and in conformance with ECL 17-0809.

ORTING NONCOMPLIANCE

Anticipated noncompliance. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

Twenty-four hour reporting. The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written noncompliance report shall also be provided within five (5) days of the time the permittee becomes aware of the circumstances. The written noncompliance report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent the noncompliance and its reoccurrence.

(1) The following shall be included as information which must be reported within 24 hours under paragraph (b) above:

(i) any unanticipated bypass which violates any effluent limitation in the permit;

(ii) any upset which violates any effluent limitation in the permit;

(iii) violation of a maximum daily discharge limitation for any of the pollutants listed by the Department in the permit to be reported within 24 hours.

(iv) any unusual situation, caused by a deviation from normal operation or experience (e.g. upsets, bypasses, inoperative treatment process units, spills or illegal chemical discharges or releases to the collection system) which create a potentially hazardous condition.

(v) any dry weather overflow(s).

(2) The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

(3) Reports required by this section shall be filed with the Department's regional office having jurisdiction over the permitted facility. During weekends, oral noncompliance reports, required by this paragraph, may be made at (518) 457-7362.

c. Other noncompliance. The permittee shall report all instances of noncompliance not otherwise required to be reported under this section or other sections of this permit, with each submitted copy of its Discharge Monitoring Reports until such noncompliance ceases. Such noncompliance reports shall contain the information listed in paragraph (b) of this section.

d. Duty to mitigate. The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

6. INSPECTION AND ENTRY

The permittee shall allow the Commissioner of the Department, the EPA Regional Administrator, the County Health Department, or their authorized representatives, upon the presentation of credentials and other documents as may be required by law, to:

a. enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

b. have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit, including records maintained for purposes of operation and maintenance;

c. inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices or operations regulated or required under this permit;

d. sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act or Environmental Conservation Law, any substances or parameters at any location; and

e. enter upon the property of any contributor of wastewater to the system under authority of the permittee's Sewer Use Ordinance (municipalities) or Regulations.

7. TRANSFER OF PERMIT

a. A permit is transferable only with prior written approval of the Department.

b. To transfer a permit to a new owner or operator, written application must be made to the Department. Application for Permit Transfer forms can be obtained from, and must be submitted to, the appropriate regional office of the Department's Division of Regulatory Affairs.

c. In order for operation of the facility to continue without interruption, application must be made at least 30 days in advance of the transfer.

d. If, when the ownership or operation is transferred, the volume or composition of the facility discharge will be altered, a new application for permit may be required.

8. PERMIT RENEWAL

a. Any permittee who wishes to continue to discharge after the expiration date of a permit shall apply for renewal of its permit no later than 180 days prior to the permit's expiration date (unless permission for a later date has been granted by the Department) by submitting any forms, fees, or supplemental information which may be required by the Department. Upon request, the Department shall provide the permittee with specific information concerning the forms, fees, and supplemental information required.

b. When a permittee has made timely and sufficient application for the renewal of a permit or a new permit with reference to any activity of a continuing nature, the existing permit does not expire until the application has been finally determined by the Department, and, in case the application is denied or the terms of the new permit limited, until the last day for seeking review of the Department order or a later date fixed by order of the reviewing court, provided that this subdivision shall not affect any valid Department action then in effect summarily suspending such permit.

c. A municipality applying for a permit (renewal) shall submit evidence that it is enforcing an up-to-date enacted Sewer Use Ordinance which was approved by the Department.

A municipality applying for a permit (renewal) shall have an approved method of residuals disposal in compliance with Part 6-NYCRR 360 and 364.

A municipality receiving industrial waste shall submit evidence that it is operating (or implementing) its industrial pretreatment program in accordance with Part 6 NYCRR 651.53(f).

SPECIAL PROVISIONS - NEW OR MODIFIED DISPOSAL SYSTEMS OR SERVICE AREAS

Prior to construction of any new or modified waste disposal system or modification of a facility or service area generating wastewater which could alter the design volume of, or the method or effect of treatment or disposing of the sewage, industrial waste or other wastes, from an existing waste disposal system, the Permittee shall submit to the Department or its designated field office for review, an approvable engineering report, plans, and specifications which have been prepared by a person or firm licensed to practice Professional Engineering in the State of New York.

The construction of the above new or modified disposal system shall not start until the Permittee receives written approval of the system from the Department or its designated field office.

The construction of the above new or modified disposal system shall be under the general supervision of a person or firm licensed to practice Professional Engineering in New York State. Upon completion of construction, that person or firm shall certify to the Department or its designated field office that the system has been fully completed in accordance with the approved engineering report, plans and specifications, permit and letter of approval; and the permittee shall receive written acceptance of such certificate from the Department or designated field agency prior to commencing discharge.

The Department and its designated field offices review wastewater disposal system reports, plans, and specifications for treatment process capability only, and approval by either office does not constitute approval of the system's structural integrity.

MONITORING, RECORDING, AND REPORTING

GENERAL

a. The permittee shall comply with all recording, reporting, monitoring and sampling requirements specified in this permit and such other additional terms, provisions, requirements or conditions that the Department may deem to be reasonably necessary to achieve the purposes of the Environmental Conservation Law, Article 17, the Act, or rules and regulations adopted pursuant thereto.

b. Samples and measurements taken to meet the monitoring requirements specified in this permit shall be representative of the quantity and character of the monitored discharges. Composite samples shall be composed of a minimum of 8 grab samples, collected over the specified collection period, either at a constant sample volume for a constant flow interval or at a flow-proportioned sample volume for a constant time interval, unless otherwise specified in Part I of this permit. For GC/MS Volatile Organic Analysis (VOA), aliquots must be combined in the laboratory immediately before analysis. At least 4 (rather than 8) aliquots or grab samples should be collected over the specified collection period. Grab sample means a single sample, taken over a period not exceeding 15 minutes.

c. Accessable sampling locations must be provided and maintained. New sampling locations shall be provided if existing locations are deemed unsuitable by the Department or its designated field agency.

d. Actual measured values of all positive analytical results obtained above the Practical Quantitation Limit (PQL)[1] for all monitored parameters shall be recorded and reported, as required by this permit; except, where parameters are limited in this permit to values below the PQL, actual measured values for all positive analytical results above the Method Detection Limit (MDL)[2] shall be reported.

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1 Practical Quantitation Limit (PQL) is the lowest level that can be measured within specified limits of precision and accuracy during routine laboratory operations on most effluent matrices.

2 Method Detection Limit (MDL) is the level at which the analytical procedure referenced is capable of determining with a 99% probability that the substance is present. This value is determined in distilled water with no interfering substances present. The precision at this level is +/- 100%.

e. The permittee shall periodically calibrate and perform manufacturer's recommended maintenance procedures on all monitoring and analytical instrumentation to insure accuracy of measurements. Verification of maintenance shall be logged into the daily record book(s) of the facility. The permittee shall notify the Department's regional office immediately if any required instrumentation becomes inoperable. In addition, the permittee shall verify the accuracy of their measuring equipment to the Department's Regional Office annually.

f. The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit, shall upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than 2 years per violation or by both. If a conviction of such person is for a violation committed after a first conviction of such person under this paragraph, punishment shall be a fine of not more than $20,000 per day of violation, or by imprisonment of not more than 4 years, or by both.

10.2 SIGNATORIES AND CERTIFICATION

a. All reports required by this permit shall be signed as follows:

(1) for a corporation: by a responsible corporate officer. For the purposes of this section, a responsible corporate officer means:

(i) a president, secretary, treasurer, or a vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making function for the corporation, or

(ii) the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars),if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(2) for a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

(3) for a municipality, state, federal, or other public agency: by either a principal or executive officer or ranking elected official. For purposes of this section, a principal executive officer of a federal agency includes: (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency; or

(4) a duly authorized representative of the person described in items (1), (2), or (3). A person is a duly authorized representative only if:

(i) the authorization is made in writing by a person described in paragraph (a)(1), (2), or (3) of this section;

(ii) the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and

(iii) the written authorization is submitted to the Department.

b. Changes to authorization: If an authorization under subparagraph (a)(4) of this section is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of subparagrapph (a)(4) of this section must be submitted to the Department prior to or together with any reports, information, or applications to be signed by an authorized representative.

c. Certification: Any person signing a report shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision, in accordance with a system, designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the permit or persons who manage the

em, or those persons directly responsible for gathering the information, the information submitted o the best of my knowledge and belief, true, accurate, and complete. I am aware that there are ificant penalties for submitting false information including the possibility of fine and imprisonment nowing violations."

Clean Water Act provides that any person who knowingly makes any material false statement, esentation, or certification in any application, record, report, plan, or other document filed or ired to be maintained under this permit, including monitoring reports or reports of compliance or ncompliance shall, upon conviction, be punished by a fine of not more than $10,000, or by prisonment for not more than 2 years, or by both. If a conviction of such person is for a violation mitted after a first conviction of such person under this paragraph, punishment shall be a fine of not e than $20,000 per day of violation, or by imprisonment of not more than 4 years, or by both.

ECORDING OF MONITORING ACTIVITIES AND RESULTS

permittee shall retain records of all monitoring information, including all calibration and maintenance rds and all original strip chart recordings for continuous monitoring instrumentation, copies of all orts required by this permit, and records of all data used to complete the application for this permit, a period of at least 3 years from the date of the sample, measurement, report or application. This od may be extended by request of the Department at any time.

ords of monitoring information shall include:

the date, exact place, and time of sampling or measurements;

the individual(s) who performed the sampling or measurements;

the date(s) analyses were performed;

the individual(s) who performed the analyses;

the analytical techniques or methods used; and

the results of such analyses.

TEST AND ANALYTICAL PROCEDURES

onitoring and analysis must be conducted using test procedures promulgated, pursuant to 40 CFR art 136, except:

should the Department require the use of a particular test procedure, such test procedure will be specified in Part I of this permit.

should the permittee desire to use a test method not approved herein, prior Department approval is required, pursuant to paragraph (b) of this section.

pplication for approval of test procedures shall be made to the Department's Regional Permit dministrator (see Part 1, page 1 for address), and shall contain:

(1) the name and address of the applicant or the responsible person making the discharge, the DEC permit number and applicable SPDES identification number of the existing or pending permit, name of the permit issuing agency name and telephone number of applicant's contact person;

(2) the names of the pollutants or parameters for which an alternate testing procedure is being requested, and the monitoring location(s) at which each testing procedure will be utilized;

(3) justification for using test procedures, other than those approved in paragraph (a) of this section; and

(4) a detailed description of the alternate procedure, together with:

(i) references to published studies, if any, of the applicability of the alternate test procedure to the effluent in question;

(ii) information on known interferences, if any; and

(5) a comparability study, using both approved and the proposed methods. The study shall co... of 8 replicates of 3 samples from a well mixed waste stream for each outfall if less than 5 ou... are involved, or from 5 outfalls if 5 or more outfalls are involved. Four (4) replicates from eac... the samples must be analyzed using a method approved in paragraph (a) of this section, an... of the replicates of each sample must be analyzed using the proposed method. This result... analyses per outfall up to a maximum of 120 analyses per permit. A statistical analysis of th... must be submitted that shall include, as a minimum:

(i) calculated statistical mean and standard deviation;

(ii) a test for outliers at the mean ± 3 standard deviations level. Where an outlier is dete... an additional sample must be collected and 8 replicates of the sample must be ana... as specified above;

(iii) a plot distribution with frequency counts and histogram;

(iv) a test for equality among with-in sample standard deviation;

(v) a check for equality of pooled with-in sample variance with an F-Test;

(vi) a t-Test to determine equality of method means; and

copies of all data generated in the study.

Additional information can be obtained by contacting the Bureau of Technical Services & Rese... (NYSDEC, 50 Wolf Road, Albany, New York 12233 - 3502).

11. DISPOSAL SYSTEM OPERATION AND QUALITY CONTROL

11.1 GENERAL

a. The disposal system shall not receive or be committed to receive wastes beyond its design capacity a... to volume and character of wastes treated, nor shall the system be materially altered as to: type, degre... or capacity of treatment provided; disposal of treated effluent; or treatment and disposal of separate... scum, liquids, solids or combination thereof resulting from the treatment process without writte... approval of the Department of Environmental Conservation or its designated field office.

b. The permittee shall, at all times, properly operate and maintain all facilities and systems of treatment and... control (or related appurtenances) which are installed or used by the permittee to achieve compliance... with the conditions of this permit. Proper operation and maintenance also includes as a minimum, th... following: 1) A preventive/corrective maintenance program. 2) A site specific action orientated operation... and maintenance manual for routine use, training new operators, adequate laboratory controls and... appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary... facilities or similar systems which are installed by a permittee only when the operation is necessary to... achieve compliance with the conditions of the permit.

c. When required under Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of... New York (6NYCRR 650), sufficient personnel meeting qualifications for operators of sewage treatment... works as required therein and additional maintenance personnel shall be employed to satisfactorily... operate and maintain the treatment works.

d. The permittee shall not discharge floating solids or visible foam.

11.2 BYPASS

a. Definitions:

(1) "Bypass" means the intentional or unintentional diversion of waste stream(s) around any portion of a treatment facility for the purpose or having the effect of reducing the degree of treatment intended for the bypassed portion of the treatment facility.

(2) "Severe property damage" means substantial damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which would not reasonably be expected to occur in the absence of a bypass. Severe property damange does not mean economic loss caused by delays in production.

b. Bypass not exceeding limitations:

The permittee may allow any bypass to occur which does not cause effluent limitations to be violated, but only if it also is for essential maintenance, repair or replacement to assure efficient and proper operation. These bypasses are not subject to the provisions of pargraph (c) and (d) of this section, provided that written notice is submitted prior to bypass (if anticipated) or as soon as possible after bypass (if unanticipated), and no public health hazard is created by the bypass.

c. Notice:

(1) Anticipated bypass - If the permittee knows in advance of the need for a bypass, it shall submit prior written notice, at least forty five (45) days before the date of the bypass.

(2) Unanticipated bypass - The permittee shall submit notice of an unanticipated bypass as required in Section 5, paragraph b. of this Part (24 hour notice).

d. Prohibition of bypass:

(1) Bypass is prohibited, and the Department may take enforcement action against a permittee for bypass, unless:

(i) bypass was unavoidable to prevent loss of life, personal injury, public health hazard, or severe property damage;

(ii) there were no feasible alternatives to the bypass such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal period of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance or if designed and installed backup equipment which could have prevented or mitigated the impact of the bypass is not operating during the bypass; and

(iii) the permittee submitted notices as required under paragraph (c) of this section and, excepting emergency conditions, the proposed bypass was accepted by the Department.

11.3 UPSET

a. Definition:

"Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

b. Effect of an upset:

An upset constitutes an affirmative defense to an action brought for noncompliance with such permit effluent limitations if the requirements of paragraph (c) of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset:

A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operation logs, or other relevant evidence that:

(1) an upset occurred and that the permittee can identify the cause(s) of the upset;

(2) the permitted facility was at the time being properly operated; and

(3) the permittee submitted notice of the upset as required in Section 5, paragraph b of this part (24 hour notice).

(4) the permittee complied with any remedial measures required under Section 5, paragraph d of this part.

d. Burden of proof:

In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

11.4 SPECIAL CONDITION - DISPOSAL SYSTEMS WITH SEPTIC TANKS

If a septic tank is installed as part of the disposal system, it shall be inspected by the permittee or his agent for scum and sludge accumulation at intervals not to exceed one year's duration, and such accumulation will be removed before the depth of either exceeds one-fourth (1/4) of the liquid depth so that no settleable solids or scum will leave in the septic tank effluent. Such accumulation shall be disposed of in an approved manner.

11.5 SLUDGE DISPOSAL

The storage or disposal of collected screenings, sludges, other solids, or precipitates separated from the permitted discharges and/or intake or supply water by the permittee shall be done in such a manner as to prevent creation of nuisance conditions or entry of such materials into classified waters or their tributaries, and in a manner approved by the Department. Any live fish, shellfish, or other animals collected or trapped as a result of intake water screening or treatment should be returned to their water body habitat. The permittee shall maintain records of disposal on all effluent screenings, sludges and other solids associated with the discharge(s) herein described. The following data shall be compiled and reported to the Department or its designated field office upon request:

a. the sources of the materials to be disposed of;

b. the approximate volumes, weights, water content and (if other than sewage sludge) chemical composition;

c. the method by which they were removed and transported, including the name and permit number of the waste transporter; and

d. their final disposal locations.

12. CONDITIONS APPLICABLE TO A PUBLICLY OWNED TREATMENT WORKS (POTW)

12.1 GENERAL

a. All POTWs must provide adequate notice to the Department of the following:

(1) any new introduction of pollutants into the POTW from an indirect discharger which would be subject to sections 301 or 306 of the Clean Water Act if it were directly discharging those pollutants; and

(2) any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

(3) For purposes of this paragraph, adequate notice shall include information on:

(i) the quality and quantity of effluent introduced into the POTW; and

(ii) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

b. Dry weather overflows are prohibited. The occurance of any dry weather overflow constitutes a bypass exceeding limitations as defined in Section 11.2 of this Part and shall be promptly abated and reported to the Department in accord with Section 5 of this Part. The permittee shall inspect all overflow facilities at least twice per year (once each spring and fall) during periods of dry weather flow to ensure they are functioning properly. Records of all inspections shall be maintained for inspection by the Department or its designated representative

c. The permittee shall identify all inflow to the tributary system and remove excessive infiltration/inflow to an extent which is economically feasible.

d. The permittee shall enact, maintain and enforce an up-to-date and effective Sewer Use Ordinance which has been approved by the Department.

e. New connections to a publicly owned sewer system or a privatized municipal sewer system are prohibited when the permittee is notified by the Department:

(1) that the discharge(s) regulated by this permit create(s) or is likely to create a public health or potential public health hazard, a contravention of water quality standards or the impairment of the best use of waters, as determined by the Commissioner; or

(2) that the discharge(s) regulated by this permit exceeded the permit limit for a specific parameter, including flow, in four of any six consecutive month periods or exceeded a permit limit by 1.4 (1.2 for toxics) times the permit limit in two of any six consecutive month periods; or

(3) that the permittee has failed or is likely to fail to carry out, meet or comply with any requirement of this permit, compliance schedule, order of the Department, judicial order, or consent decree.

f. The provisions provided for in e. above shall remain in effect until the Permittee can demonstrate to the Department's satisfaction and approval that adequate available capacity exists in the plant and that the facility is in full compliance with all of effluent limitations required by this permit.

12.2 NATIONAL PRETREATMENT STANDARDS: PROHIBITED DISCHARGES

a. General prohibitions:

Pollutants introduced into POTW's by a non-domestic source shall not pass through the POTW or Interfere with the operation or performance of the works or disposal of sludge. These general prohibitions and the specific prohibitions in paragraph (b) of this section apply to all non-domestic sources introducing pollutants into a POTW whether or not the source is subject to other National Pretreatment Standards or any national, State, or local Pretreatment Requirements.

b. Specific prohibition:

In addition, the following pollutants shall not be introduced into a POTW:

(1) pollutants which create a fire or explosion hazard in the POTW;

(2) pollutants which will cause corrosive structural damage to the POTW, but in no case discharge with pH lower than 5.0 unless the works is specifically designed to accommodate such discharges;

(3) solid or viscous pollutants in amounts which will cause obstruction to the flow in the POTW resulting in Interference;

(4) any pollutant, including oxygen demanding pollutants (BOD, etc.) released in a Discharge at a flow rate and/or pollutant concentration which will cause Interference with the POTW.

(5) heat in amounts which will inhibit biological activity in the POTW resulting in Interference, but in no case heat in such quantities that the temperature at the POTW Treatment Plant exceeds 40^0 C (104^0 F) unless the Approval Authority, upon request of the POTW, approves alternate temperature limits.

c. When Specific Limits Must be Developed by a POTW:

(1) POTW's developing POTW Pretreatment Programs pursuant to §403.8 shall develop and enforce specific limits to implement the prohibitions listed in §403.5(a) and (b).

(2) All other POTW's shall, in cases where pollutants contributed by User(s) result in Interference or Pass-Through, and such violation is likely to recur, develop and enforce specific effluent limits for Industrial User(s), and all other users, as appropriate, which, together with appropriate changes in the POTW Treatment Plant's Facilities or operation, are necessary to ensure renewed and continued compliance with the POTW's SPDES permit or sludge use or disposal practices.

(3) Specific effluent limits shall not be developed and enforced without individual notice to persons or groups who have requested such notice and an opportunity to respond.

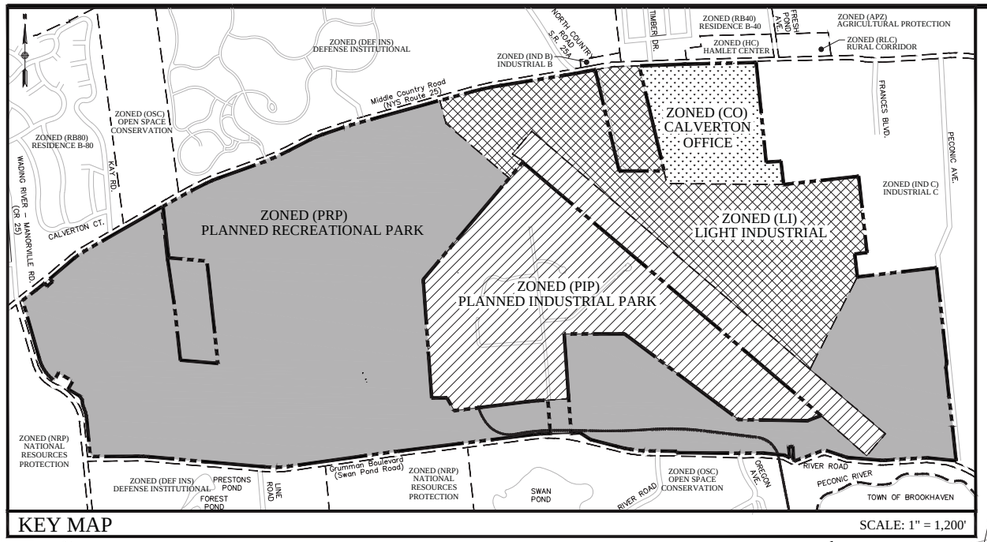
d. Local Limits:

Where specific prohibitions or limits on pollutants or pollutant parameters are developed by a POTW in accordance with paragraph (c) above, such limits shall be deemed Pretreatment Standards for the purposes of §307(d) of the Act.

e. EPA and State Enforcement Actions:

If, within 30 days after notice of an Interference or Pass Through violation has been sent by EPA or DEC to the POTW, and to persons or groups who have requested such notice, the POTW fails to commence appropriate enforcement action to correct the violation, EPA and DEC may take appropriate enforcement action.

APPENDIX C



KEY MAP SCALE: 1" = 1,200'

Legend	
	Overall Property Boundary
	Fire District Boundary
	School District Boundary
W.S.R.R. BOUNDARY	Existing W.S.R.R. Boundary as Annotated from NYSDEC Sketch
W.S.R.R.	Proposed W.S.R.R. Boundary
	Interior Lot Lines
42	Lot number
	Existing Monument Locations
	Proposed Monument Locations
	Existing Rail Spur
	Future Rail Spur in 50' ROW
	Wetland Area

Legend	
	Declaration of Protective Covenant to the New York State Department of Environmental Conservation Dated 2/5/2004 and Recorded in l. 12300 cp 850
	Cultural Resources Covenant Areas as Described in l. 12499 cp. 148
	Pine Barrens Core Preservation Area / Add'l wooded area to remain

VHB
Engineering, Surveying & Landscape Architecture, P.C.
Transportation
Land Development
Environmental Services

2150 Joshua's Path, Suite 300
Hauppauge, New York 11788
631.234.3444 • FAX 631.234.3477

NOTE:
CONTINOUS WALKWAK / BIKE TRAIL TO BE MAINTAINED AROUND PERIMETER OF SITE TO CONSIST OF PORTIONS OF EXISTING PAVED & UNPAVED TRAILS & SUPPLEMENTS AS NECESSARY AS PART OF SITE PLAN APPROVALS. LOTS CONTAINING THE TRAIL SHALL BE SUBJECT TO C& R'S REQUIRING CONSTRUCTION AND / OR MAINTENANCE OF THE TRAIL.

GRUMMAN MONUMENT
NOTE:
LOT 21 TO BE RETAINED BY THE TOWN OF RIVERHEAD FOR FUTURE FIRE/ AMBULANCE FACILITIES

NOTE:
TEMPORARY ACCESS TO NYS ROUTE 25 FOR LOTS 1 THROUGH 9 AND 17 THROUGH 22 TO BE ELIMINATED UPON CONSTRUCTION OF ROAD B. THEREAFTER, NO ACCESS PERMITTED FROM NYS 25

LANDS OF THE STATE OF NEW YORK
Area = 2,178,088± SQ. FT. OR 50.002± Acres
S.C.T.M. 0600-135.00-01.00-007.030

1,000' TIGER SALAMANDER POND BUFFER
535' TIGER SALAMANDER POND BUFFER
EXISTING WETLANDS

MAP OF JAMES M. SMITH'S FARM
FILED DECEMBER 15 1894, FILE NO. 491
FORMER NAVY PARCEL "D"
Area = 6,305,132± SQ. FT. OR 144.746± Acres
TRANSFERRED TO THE TOWN OF RIVERHEAD IN L. 12538 CP 990 8/10/2007
S.C.T.M. 0600-135.00-01.00-007.004

N/F
ROBERT & COLLEEN JOLMUT, JAMES & PATRICIA FLEMING

N/F
ROBERTA KORUS

N/F
CALVERTON INDUSTRIES, LLC

N/F
AIRCRAFT WAREHOUSE, INC.

LOT 1 51.8 Ac
LOT 2 30.5 Ac
LOT 3.1 29.1 Ac
LOT 7.4 28.7 Ac
LOT 7.2 108.8 Ac

N/F
GREEN MEADOWS, LLC

FIRE DISTRICT 20
FIRE DISTRICT 23
SCHOOL DISTRICT 4
SCHOOL DISTRICT 2

CALVERTON NATIONAL CEMETERY

Middle Country Road (NYS Route 25)

N/F
ISLAND WATER PARK, CORP.

50 TOWN OF RIVERHEAD WATER DISTRICT
Area = 175,154± SQ. FT. OR 4.021± Acres
S.C.T.M. 0600-135.00-01.00-007.029

DECLARATION OF PROTECTIVE COVENANT TO THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION DATED 2/5/2004 AND RECORDED IN L. 12300 CP 850

SECTION 115 BLOCK 4 LOT 2.1 STATE OF NEW YORK

SECTION 115 BLOCK 3 LOT 1 (MOTEL)

SECTION 115.01 BLOCK 1 LOTS 1 - 67 (RESIDENCES)

SECTION 115 BLOCK 1 LOT 9 (FIELD CROPS)

SECTION 115 BLOCK 1 LOT 10.59 (RECHARGE BASIN NO. 2)

SECTION 115 BLOCK 1; LOT 10.26 STATE OF NEW YORK (OPEN SPACE D)

1 7.8Ac
2 10.9 Ac
3 5.0Ac
4 5.5Ac
5 5.0Ac
6 10.7 Ac
7 5.0Ac
8 9.6 Ac
9 5.0Ac
10 13.2 Ac
11 15.0 Ac
12 13.5 Ac
13 17.2 Ac
14 14.0 Ac
15 10.0 Ac
16 11.6 Ac
17 11.7 Ac
18 6.0 Ac
19 5.9 Ac
20 10.0 Ac
21 10.0 Ac
22 7.1 Ac
23 21.3 Ac
24 17.7 Ac
25 10.8 Ac
26 8.8 Ac
27 20.0 Ac
28 16.3 Ac
29 21.2 Ac
30 24.9 Ac
31 15.4 Ac
32 13.7 Ac
33 12.9 Ac
34 12.7 Ac
35 19.0 Ac
36 20.5 Ac
37 14.9 Ac
38 14.2 Ac
39 16.0 Ac
40 22.1 Ac
41 28.4 Ac
42 23.6 Ac
43 23.2 Ac
44 OPEN SPACE 725.5 Ac
45 2.93 Ac
46 TOWN OF RIVERHEAD 44.2 Ac
47 OPEN SPACE 276.2 Ac
48 OPEN SPACE 352.0 Ac
49 TOWN PARK 92.4 Ac

ROAD 'A'
ROAD 'B'
ROAD 'C'
BURMAN BLVD.
DAVID COURT
SCOTT AVENUE
JAN WAY
Beconic Avenue

Drainage Reserve Area 9.3 Ac
Drainage Reserve Area 3.0 Ac
Drainage Reserve Area 19.4 Ac
Drainage Reserve Area 7.0 Ac
Drainage Reserve Area 11.5 Ac

STP RECHARGE PARCEL

OPEN SPACE

LOT/BLOCK 2
LOT/BLOCK 17

LOT 1
LOT 3
LOT 4
LOT 5
LOT 6
LOT 7
LOT 9
LOT 10
LOT 12
LOT 13
LOT 15
LOT 18
LOT 19
LOT 21
LOT 22
LOT 23
LOT 25
LOT 26
LOT 27
LOT 28
LOT 29 (DEDICATED OPEN SPACE)
LOT 30
LOT 32
LOT 34
LOT 35
LOT 14 (DEDICATED OPEN SPACE)
LOT 16 (DEDICATED OPEN SPACE)
LOT 17 (DEDICATED OPEN SPACE)

NAVY PARCEL C
NAVY PARCEL "A" Area = 1,331,149± SQ. FT. OR 30.559± Acres S.C.T.M. 0600-135.00-01.00-007.001
NAVY PARCEL "B" Area = 7,357,357± SQ. FT. OR 168.902± Acres S.C.T.M. 0600-135.00-01.00-007.002

MAP OF CALVERTON CAMELOT II FILED MARCH 9, 2007, MAP NO. 11500

PROPOSED 50' ROW FOR ACCESS TO OPEN SPACE PARCEL FROM BURMAN BLVD.

EXISTING 20' WIDE SEWER EASEMENT

W.S.R.R. BOUNDARY

W.S.R.R./200' BUFFER

535' TIGER SALAMANDER POND BUFFER
1,000' TIGER SALAMANDER POND BUFFER

EXISTING WETLANDS

EXISTING RAIL SPUR

LOT 10 CALVERTON SEWER DISTRICT AREA = 154,610± SQ. FT. OR 3.549± ACRES S.C.T.M. 0600-135.20-01.00-026.000

PROPOSED 50' RAIL ROW TO BOUNDARY OF LOT 29 FOR FUTURE RAIL SPUR

PROPOSED 50' ROW FOR ACCESS TO LOT 46 TOWN PARK FROM GRUMMAN BLVD. (P/O LOT 46)

CULTURAL RESOURCES COVENANT AREA "A" AS DESCRIBED IN L. 12499 CP. 148

CULTURAL RESOURCES COVENANT AREA "B" AS DESCRIBED IN L. 12499 CP. 148

CULTURAL RESOURCES COVENANT AREA "C" AS DESCRIBED IN L. 12499 CP. 148

CULTURAL RESOURCES COVENANT AREA "F" AS DESCRIBED IN L. 12499 CP. 148

Wading River-Manorville Road (CR 25)

Grumman Boulevard (Swan Pond Road)

500 0 500 1000
SCALE IN FEET

SKETCH PLAN for ENTERPRISE PARK at CALVERTON
JUNE 10, 2013

Owner: TOWN OF RIVERHEAD
200 Howell Avenue, Riverhead, NY 11901

Existing Zoning: LI, PIP, PRP, CO, NRP	Proposed Zoning: Planned Development District (PDD)

TOWN OF RIVERHEAD SUFFOLK COUNTY, NEW YORK
December 18, 2012
District 0600; Section 135; Block 1; Lots 7.1, 7.2, 7.29, 7.33 & 7.4

Total Site Area = 2323.9 Acres

APPENDIX D

H 2 M architects + engineers

CASD - Gravity Sewer
Flow Analysis

Connection Information									DESIGN FLOWS										Pipe Information			Input Values		Flowing Full															
Line Number	Location		Length	Owner	Parcel ID (Feasibility Study)	House No.	Zoning	Tax Map No.		Projected Daily Flow			Cumulative Projected Daily Flow	Peaking Factor	Peak Hourly Flow			Cumulative Peak Hourly Flow	Inside Diameter		ID Area	Slope	" n " Value	Hydraulic Radius (R)	$R^{2/3}$	$S^{1/2}$	1.486 / n	Velocity Full (V)	Capacity Full (Q)	Capacity Full (Q)	Comments	Sewer Invert Elevation		Ground Surface Elevation		Depth of Sewer		Excavation	
	From	To	Feet							gpd	mgd	cfs	cfs		gpd	mgd	cfs	cfs	in.	ft.	sq. ft.	ft./ft.		ft.				fps	cfs	gpm		Upper	Lower	Upper MH	Lower MH	Upper MH	Lower MH	Average Depth	Quantity (CY)
BALLFIELD P.S. - SEWERS																																						
1	MH33	MH32	280							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 1									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	11.12	0.93	0.67	0.0028	0.011	0.23	0.38	0.05	135.09	2.70	1.82	816.15	- MH33/32 info not available from survey	45.65	44.87	54.00	52.00	8.35	7.13	7.74	642.23
2	MH32	MH31	60							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 2									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	11.12	0.93	0.67	0.0028	0.011	0.23	0.38	0.05	135.09	2.70	1.82	816.15	- MH31 info not available from survey	44.87	44.70	52.00	51.00	7.13	6.30	6.72	119.42
3	MH31	MH30	310							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 3									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	11.12	0.93	0.67	0.0028	0.011	0.23	0.38	0.05	135.09	2.70	1.82	816.15	- MH30 info not available from survey	44.70	43.83	51.00	50.00	6.30	6.17	6.24	572.71
4	MH30	MH29	193							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 4									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	11.12	0.93	0.67	0.0028	0.011	0.23	0.38	0.05	135.09	2.70	1.82	816.15	- MH29 info not available from survey	43.83	43.29	50.00	49.00	6.17	5.71	5.94	339.65
5	MH29	MH28	255							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 5									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	11.12	0.93	0.67	0.0028	0.011	0.23	0.38	0.05	135.09	2.70	1.82	816.15	- MH28 info not available from survey	43.29	42.58	49.00	48.00	5.71	5.42	5.57	420.59
6	MH28	MH27	95							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 6									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	11.12	0.93	0.67	0.0028	0.011	0.23	0.38	0.05	135.09	2.70	1.82	816.15	- MH27 info not available from survey	42.58	42.31	48.00	48.00	5.42	5.69	5.56	156.41
7	MH27	MH26	243							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 7									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	11.12	0.93	0.67	0.0028	0.011	0.23	0.38	0.05	135.09	2.70	1.82	816.15	- MH26 info not available from survey	42.31	41.63	48.00	47.00	5.69	5.37	5.53	398.15
8	MH26	BALLFIELD P.S.	225							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 8									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	11.12	0.93	0.67	0.0028	0.011	0.23	0.38	0.05	135.09	2.70	1.82	816.15	- Ballfield PS info not available from survey	41.63	41.00	47.00	46.00	5.37	5.00	5.19	345.67
9	BALLFIELD P.S.	MH25	101							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 9									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	11.12	0.93	0.67	0.0028	0.011	0.23	0.38	0.05	135.09	2.70	1.82	200.00	- MH25 info not available from survey	44.00	43.72	46.00	46.00	2.00	2.28	2.14	64.08
10	MH25	MH24	237							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 10									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	11.12	0.93	0.67	0.0028	0.011	0.23	0.38	0.05	135.09	2.70	1.82	816.15	- MH24 info not available from survey	43.72	43.05	46.00	45.00	2.28	1.95	2.11	148.49
11	MH24	MH23	227							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 11									Subtotal	0	0.0000	0.0000	#REF!	Subtotal	0	0.0000	0.0000	#REF!	11.12	0.93	0.67	0.0028	0.011	0.23	0.38	0.05	135.09	2.70	1.82	816.15	- MH23 info not available from survey	43.05	42.42	45.00	44.00	1.95	1.58	1.76	118.66
12	MH23	MH22	245							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 12									Subtotal	0	0.0000	0.0000	#REF!	Subtotal	0	0.0000	0.0000	#REF!	11.12	0.93	0.67	0.0028	0.011	0.23	0.38	0.05	135.09	2.70	1.82	816.15	- MH22 info not available from survey	42.42	41.73	44.00	45.00	1.58	3.27	2.43	176.04
13	MH22	MH21	220							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 13									Subtotal	0	0.0000	0.0000	#REF!	Subtotal	0	0.0000	0.0000	#REF!	11.12	0.93	0.67	0.0028	0.011	0.23	0.38	0.05	135.09	2.70	1.82	816.15	- MH21 info not available from survey	41.73	41.12	45.00	45.00	3.27	3.88	3.58	233.10
14	MH21	MH20	290							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 14									Subtotal	0	0.0000	0.0000	#REF!	Subtotal	0	0.0000	0.0000	#REF!	11.12	0.93	0.67	0.0028	0.011	0.23	0.38	0.05	135.09	2.70	1.82	816.15	- MH20 info not available from survey	41.12	40.30	45.00	46.00	3.88	5.70	4.79	411.59
15	MH20	MH3	195							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 15									Subtotal	0	0.0000	0.0000	#REF!	Subtotal	0	0.0000	0.0000	#REF!	11.12	0.93	0.67	0.00079	0.011	0.23	0.38	0.03	135.09	1.43	0.97	433.45	-MH3 from xr-site 8/21/07 survey	40.30	40.15	46.00	48.12	5.70	7.97	6.83	394.80
OFFICE P.S. - SEWERS																																						
1	OFFICE P.S.	MH11A	190							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 1									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	FM													- Based on peak pumping capcity of PS	46.49	48.49	50.00	55.53	3.51	7.04	5.28	296.96
HANGAR P.S. - SEWERS																																						
1	MH19	MH18	190							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 1									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	9.02	0.75	0.44	0.004	0.011	0.19	0.33	0.06	135.09	2.80	1.24	558.25	- MH19 info not available from survey	50.00	49.24	55.00	55.00	5.00	5.76	5.38	302.87
2	MH18	MH17	200							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 2									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	9.02	0.75	0.44	0.004	0.011	0.19	0.33	0.06	135.09	2.80	1.24	558.25	- MH18 info not available from survey	49.24	48.44	55.00	54.00	5.76	5.56	5.66	335.41
3	MH17	HANGAR P.S.	225							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 3									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	9.02	0.75	0.44	0.004	0.011	0.19	0.33	0.06	135.09	2.80	1.24	558.25	- MH17 info not available from survey	48.44	45.83	54.00	55.00	5.56	9.17	7.36	490.90
4	HANGAR P.S.	MH16	26							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 4									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	9.02	0.75	0.44	0.004	0.011	0.19	0.33	0.06	135.09	2.80	1.24	200.00	- Hangar PS from plans (CASD0504)	52.25	52.14	55.00	54.00	2.75	1.86	2.31	17.76
5	MH16	MH15	185							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 5									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	9.02	0.75	0.44	0.004	0.011	0.19	0.33	0.06	135.09	2.80	1.24	558.25	- MH16/15 info not available from survey	52.14	51.40	54.00	54.00	1.86	2.60	2.23	122.24
6	MH15	MH13	180							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 6									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	9.02	0.75	0.44	0.017667	0.011	0.19	0.33	0.13	135.09	5.89	2.61	1173.20	- MH13 from xr-site 8/21/07 survey	51.40	48.22	54.00	54.07	2.60	5.85	4.23	225.33
MAIN INTERCEPTOR																																						
1	MH14	MH13	275							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 1									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	9.02	0.75	0.44	0.00636	0.011	0.19	0.33	0.08	135.09	3.54	1.57	704.12	- MH13 from xr-site 8/21/07 survey	49.82	48.07	55.02	54.07	5.20	6.00	5.60	456.30
2	MH13	MH12	223							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 2									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	9.02	0.75	0.44	0.004395	0.011	0.19	0.33	0.07	135.09	2.94	1.30	585.14	- MH12 from xr-site 8/21/07 survey	47.58	46.60	54.07	55.53	6.49	8.93	7.71	509.43
3	MH12	MH11A	175							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 3									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	13.22	1.10	0.95	0.0022	0.011	0.28	0.42	0.05	135.09	2.68	2.56	1147.47	- MH11A info not available from survey	46.88	46.49	55.53	55.53	8.65	9.04	8.85	458.63
4	MH11A	MH11	130							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 4									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	13.22	1.10	0.95	0.0022	0.011	0.28	0.42	0.05	135.09	2.68	2.56	1147.47	- MH11 info not available from survey	46.49	46.20	55.53	55.53	9.04	9.33	9.19	353.79
5	MH11	MH10	155							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 5									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	13.22	1.10	0.95	0.0022	0.011	0.28	0.42	0.05	135.09	2.68	2.56	1147.47	- MH10 info not available from survey	46.20	45.85	55.53	55.53	9.33	9.68	9.51	436.53
6	MH10	MH9	170							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 6									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	13.22	1.10	0.95	0.005353	0.011	0.28	0.42	0.07	135.09	4.18	3.99	1789.89	- MH9 from xr-site 8/21/07 survey	45.85	44.94	55.53	53.13	9.68	8.19	8.94	450.06
7	MH9	MH8	275							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 7									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	13.22	1.10	0.95	0.0022	0.011	0.28	0.42	0.05	135.09	2.68	2.56	1147.47	- MH8 info not available from survey	45.26	44.65	53.13	53.13	7.87	8.48	8.18	666.11
8	MH8	MH7	263							0	0.0000	0.0000		3.80	0	0.0000	0.0000																				
Sewer Stretch No. 8									Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	13.22	1.10	0.95	0.004373	0.011	0.28	0.42	0.07	135.09	3.78	3.60	1617.71	- MH7 from xr-site 8/21/07 survey	44.65	43.50	53.13	51.16	8.48	7.66	8.07	628.86

H 2 M architects + engineers

CASD - Gravity Sewer
Flow Analysis

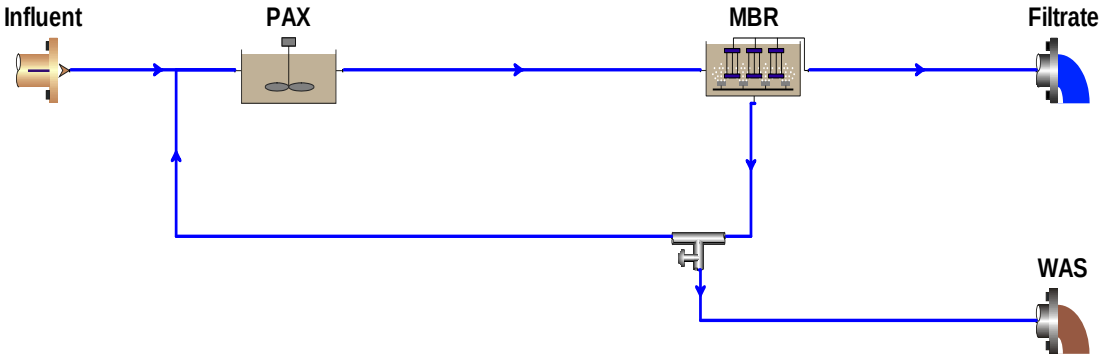
Connection Information									DESIGN FLOWS										Pipe Information			Input Values		Flowing Full															
Line Number	Location		Length	Owner	Parcel ID (Feasibility Study)	House No.	Zoning	Tax Map No.		Projected Daily Flow			Cumulative Projected Daily Flow	Peaking Factor	Peak Hourly Flow			Cumulative Peak Hourly Flow	Inside Diameter		ID Area	Slope	" n " Value	Hydraulic Radius (R)	R $^{2/3}$	S $^{1/2}$	1.486 / n	Velocity Full (V)	Capacity Full (Q)	Capacity Full (Q)	Comments	Sewer Invert Elevation		Ground Surface Elevation		Depth of Sewer		Excavation	
	From	To	Feet							gpd	mgd	cfs	cfs		gpd	mgd	cfs	cfs	in.	ft.	sq. ft.	ft./ft.		ft.				fps	cfs	gpm		Upper	Lower	Upper MH	Lower MH	Upper MH	Lower MH	Average Depth	Quantity (CY)
9	MH7	MH6	255							0	0.0000	0.0000		3.80	0	0.0000	0.0000																					
					Sewer Stretch No. 9				Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	13.22	1.10	0.95	0.004549	0.011	0.28	0.42	0.07	135.09	3.86	3.68	1650.02	- MH6 from xr-site 8/21/07 survey	43.81	42.65	51.16	50.19	7.35	7.54	7.45	562.51
10	MH6	MH5	33							0	0.0000	0.0000		3.80	0	0.0000	0.0000																					
					Sewer Stretch No. 10				Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	13.22	1.10	0.95	0.0022	0.011	0.28	0.42	0.05	135.09	2.68	2.56	1147.47	- MH5 info not available from survey	42.57	42.49	50.19	50.19	7.62	7.70	7.66	74.90
11	MH5	MH4A	195							0	0.0000	0.0000		3.80	0	0.0000	0.0000																					
					Sewer Stretch No. 11				Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	13.22	1.10	0.95	0.001744	0.011	0.28	0.42	0.04	135.09	2.39	2.28	1021.53	- MH4A from xr-site 8/21/07 survey	42.49	42.15	50.19	50.33	7.70	8.18	7.94	458.76
12	MH4A	MH4	380							0	0.0000	0.0000		3.80	0	0.0000	0.0000																					
					Sewer Stretch No. 12				Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	13.22	1.10	0.95	0.003553	0.011	0.28	0.42	0.06	135.09	3.41	3.25	1458.16	- MH5 from xr-site 8/21/07 survey	42.20	40.85	50.33	48.80	8.13	7.95	8.04	905.24
13	MH4	MH3	185							0	0.0000	0.0000		3.80	0	0.0000	0.0000																					
					Sewer Stretch No. 13				Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	13.22	1.10	0.95	0.007081	0.011	0.28	0.42	0.08	135.09	4.81	4.59	2058.63	- MH3 from xr-site 8/21/07 survey	41.41	40.10	48.80	48.12	7.39	8.02	7.71	422.35
14	MH3	MH2	240							0	0.0000	0.0000		3.80	0	0.0000	0.0000																					
					Sewer Stretch No. 14				Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	13.22	1.10	0.95	0.0022	0.011	0.28	0.42	0.05	135.09	2.68	2.56	1147.47	- MH2 info not available from survey	40.17	39.64	48.12	48.12	7.95	8.48	8.22	584.18
15	MH2	MH1	240							0	0.0000	0.0000		3.80	0	0.0000	0.0000																					
					Sewer Stretch No. 15				Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	13.22	1.10	0.95	0.006583	0.011	0.28	0.42	0.08	135.09	4.64	4.42	1984.96	- MH1 from xr-site 8/21/07 survey	39.64	38.06	48.12	45.32	8.48	7.26	7.87	559.64
15	MH1	WWTP	125							0	0.0000	0.0000		3.80	0	0.0000	0.0000																					
					Sewer Stretch No. 16				Subtotal	0	0.0000	0.0000	0.0000	Subtotal	0	0.0000	0.0000	0.0000	13.22	1.10	0.95	0.0022	0.011	0.28	0.42	0.05	135.09	2.68	2.56	1147.47	-WWTP info not available from survey	38.09	37.81	45.32	45.32	7.23	7.51	7.37	272.96
TOTALS			7,501	35														#REF!																				14133.29

APPENDIX E

Calverton, NY Ovivo MBR Design Summary – R8

MMF: 0.1 MGD

Flowsheet



Steady state solution

Target SRT: 15.00 days

Operating MLSS: 12,000 mg/l

Temperature: 10.0°C

Configuration information for all Bioreactor units

Physical data

Element name	Volume [Mil. Gal]	Area [ft2]	Depth [ft]	# of diffusers
PAX	0.0126	168.4375	10.000	Un-aerated

Operating data Average (flow/time weighted as required)

Element name	Average DO Setpoint [mg/L]
PAX	0

Configuration information for all Membrane bioreactor units

Physical data

Element name	Volume [Mil. Gal]	Area [ft2]	Depth [ft]	# of cassettes	Displaced volume / cassette [ft3/cassette]	Membrane area / cassette [ft2/cassette]	Total displaced volume [Mil. Gal]	Membrane surface area [ft2]
MBR	0.0151	183.5070	11.000	2.00	21.200	4306.00	0.00	8612.00

Operating data Average (flow/time weighted as required)

Element name	Average DO Setpoint [mg/L]
MBR	2.0

Element name	Split method	Average Split specification
MBR	Flow paced	600.00 %

Aeration equipment parameters

Element name	Alpha (surf) OR Alpha F (diff) [-]	Beta [-]	Surface pressure [kPa]	Fractional effective saturation depth (Fed) [-]
MBR	0.5000	0.9500	101.3250	0.3520

Configuration information for all BOD Influent units

Operating data Average (flow/time weighted as required)

Element name	Influent
Flow	0.1
Total Carbonaceous BOD mgBOD/L	250.00
Volatile suspended solids mgVSS/L	240.00
Total suspended solids mgTSS/L	300.00
Total Kjeldahl Nitrogen mgN/L	50.00
Total P mgP/L	8.00
Nitrate N mgN/L	0
pH	7.00
Alkalinity mmol/L	8.00
Calcium mg/L	160.00
Magnesium mg/L	25.00
Dissolved oxygen mg/L	0

Element name	Influent
Fbs - Readily biodegradable (including Acetate) [gCOD/g of total COD]	0.1600
Fac - Acetate [gCOD/g of readily biodegradable COD]	0.1500

Fxsp - Non-colloidal slowly biodegradable [gCOD/g of slowly degradable COD]	0.9003
Fus - Unbiodegradable soluble [gCOD/g of total COD]	0.0500
Fup - Unbiodegradable particulate [gCOD/g of total COD]	0.1300
Fna - Ammonia [gNH3-N/gTKN]	0.6600
Fnox - Particulate organic nitrogen [gN/g Organic N]	0.5000
Fnus - Soluble unbiodegradable TKN [gN/gTKN]	0.0200
FupN - N:COD ratio for unbiodegradable part. COD [gN/gCOD]	0.0350
Fpo4 - Phosphate [gPO4-P/gTP]	0.5000
FupP - P:COD ratio for unbiodegradable part. COD [gP/gCOD]	0.0110
FZbh - OHO COD fraction [gCOD/g of total COD]	0.0200
FZbm - Methylotroph COD fraction [gCOD/g of total COD]	1.000E-4
FZaob - AOB COD fraction [gCOD/g of total COD]	1.000E-4
FZnob - NOB COD fraction [gCOD/g of total COD]	1.000E-4
FZamob - ANAMMOX COD fraction [gCOD/g of total COD]	1.000E-4
FZbp - PAO COD fraction [gCOD/g of total COD]	1.000E-4
FZbpa - Propionic acetogens COD fraction [gCOD/g of total COD]	1.000E-4
FZbam - Acetoclastic methanogens COD fraction [gCOD/g of total COD]	1.000E-4
FZbhm - H2-utilizing methanogens COD fraction [gCOD/g of total COD]	1.000E-4
FZe - Endogenous products COD fraction [gCOD/g of total COD]	0

Configuration information for all Splitter units

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
WAS splitter	Flowrate [MGD]	0.00170723617879061

BioWin Album

Album page - Influent

Influent			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Volatile suspended solids	240.00	200.29	
Total suspended solids	300.69	250.94	
Particulate COD	382.61	319.30	
Filtered COD	144.22	120.36	
Total COD	526.84	439.67	
Soluble PO4-P	4.00	3.34	
Total P	8.00	6.68	
Filtered TKN	40.42	33.73	
Particulate TKN	9.58	8.00	
Total Kjeldahl Nitrogen	50.00	41.73	
Filtered Carbonaceous BOD	83.63	69.79	
Total Carbonaceous BOD	250.00	208.64	
Nitrite + Nitrate	0	0	
Total N	50.00	41.73	
Total inorganic N	33.00	27.54	
Alkalinity	8.00	3.03	mmol/L and kmol/d
pH	7.00		
Volatile fatty acids	12.64	10.55	
ISS precipitate	0	0	
ISS cellular	0.69	0.57	
ISS Total	60.69	50.65	
Ammonia N	33.00	27.54	
Nitrate N	0	0	
Parameters	Value	Units	

Album page - PAX

PAX			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Volatile suspended solids	6921.59	40335.80	
Total suspended solids	10339.35	60252.91	
Particulate COD	10254.62	59759.16	
Filtered COD	29.17	169.96	
Total COD	10283.79	59929.13	
Soluble PO4-P	4.20	24.45	
Total P	190.25	1108.67	
Filtered TKN	8.64	50.36	
Particulate TKN	588.40	3428.91	
Total Kjeldahl Nitrogen	597.04	3479.27	
Filtered Carbonaceous BOD	0.87	5.04	
Total Carbonaceous BOD	2709.05	15787.10	
Nitrite + Nitrate	0.17	0.99	
Total N	597.21	3480.26	
Total inorganic N	7.03	40.94	
Alkalinity	6.16	16.29	mmol/L and kmol/d
pH	7.03		
Volatile fatty acids	0.42	2.42	
ISS precipitate	0	0.00	
ISS cellular	398.01	2319.39	
ISS Total	3417.76	19917.11	
Ammonia N	6.86	39.95	
Nitrate N	0.14	0.83	
Parameters	Value	Units	
Hydraulic residence time	0.4	hours	

Velocity gradient	62.08	1/s	
VSS destruction	0	%	
Total solids mass	1087.20	lb	
Total readily biodegradable COD	1.10	mg/L	
OUR - Total	3.95	mgO/L/hr	
OUR - Carbonaceous	3.28	mgO/L/hr	
OUR - Nitrification	0.66	mgO/L/hr	
Nit - Ammonia removal rate	0.20	mgN/L/hr	
Nit - Nitrous oxide production rate	0	mgN/L/hr	
Nit - Nitrite production rate	0.20	mgN/L/hr	
Nit - Nitrate production rate	0.02	mgN/L/hr	
Denit - Nitrate removal rate	7.81	mgN/L/hr	
Denit - Nitrite removal rate	4.64	mgN/L/hr	
Denit - N2 production rate	9.33	mgN/L/hr	
Off gas flow rate (dry)	0.13	ft3/min	
Off gas Oxygen	0	%	
Off gas Carbon dioxide	75.50	%	
Off gas Ammonia	0.00	%	
Off gas Hydrogen	9.10	%	
Off gas Methane	0.03	%	
Off gas Nitrous oxide	0	%	
Actual DO sat. conc.	10.43	mg/L	
OTR	0	lb/hr	
SOTR	0	lb/hr	
OTE	100.00	%	
SOTE	100.00	%	
Air flow rate	0	ft3/min (20C, 1 atm)	
Air flow rate / diffuser	0	ft3/min (20C, 1 atm)	
# of diffusers	38.00		

Album page - MBR summary

MBR			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Volatile suspended solids	0	0	
Total suspended solids	0	0	
Particulate COD	0	0	
Filtered COD	27.99	22.96	
Total COD	27.99	22.96	
Soluble PO4-P	4.31	3.53	
Total P	4.31	3.53	
Filtered TKN	3.79	3.11	
Particulate TKN	0	0	
Total Kjeldahl Nitrogen	3.79	3.11	
Filtered Carbonaceous BOD	1.06	0.87	
Total Carbonaceous BOD	1.06	0.87	
Nitrite + Nitrate	4.81	3.95	
Total N	8.60	7.06	
Total inorganic N	6.43	5.27	
Alkalinity	5.46	2.03	mmol/L and kmol/d
pH	6.92		
Volatile fatty acids	0.01	0.01	
ISS precipitate	0	0	
ISS cellular	0	0	
ISS Total	0	0	
Ammonia N	1.62	1.33	
Nitrate N	4.11	3.37	
Parameters	Value	Units	
Hydraulic residence time	0.5	hours	

Velocity gradient	281.77	1/s	
VSS destruction	100.00	%	
Total solids mass	1482.21	lb	
Total readily biodegradable COD	1.49	mg/L	
OUR - Total	97.05	mgO/L/hr	
OUR - Carbonaceous	57.11	mgO/L/hr	
OUR - Nitrification	39.94	mgO/L/hr	
Nit - Ammonia removal rate	9.66	mgN/L/hr	
Nit - Nitrous oxide production rate	0	mgN/L/hr	
Nit - Nitrite production rate	9.56	mgN/L/hr	
Nit - Nitrate production rate	8.19	mgN/L/hr	
Denit - Nitrate removal rate	0.39	mgN/L/hr	
Denit - Nitrite removal rate	0.21	mgN/L/hr	
Denit - N2 production rate	0.42	mgN/L/hr	
Off gas flow rate (dry)	309.37	ft3/min	
Off gas Oxygen	20.14	%	
Off gas Carbon dioxide	0.85	%	
Off gas Ammonia	0.00	%	
Off gas Hydrogen	0.04	%	
Off gas Methane	0.00	%	
Off gas Nitrous oxide	0	%	
Actual DO sat. conc.	10.58	mg/L	
OTR	12.46	lb/hr	
SOTR	37.79	lb/hr	
OTE	3.73	%	
SOTE	11.58	%	
Air flow rate	319.85	ft3/min (20C, 1 atm)	
Air flow rate / diffuser	39.98	ft3/min (20C, 1 atm)	
# of diffusers	8.00		
Mixed liquor flow	0.60	mgd	

Membrane flux	11.41	gal/ft2/d (gfd)	
# of cassettes	2.00		
Air flow rate / cassette	159.93	ft3/min (20C, 1 atm)	

Album page - MBR state variable

MBR			
State variable	Conc. (mg/L)	Mass rate (lb/d)	Notes
Ordinary heterotrophic organisms (OHO)	0	0	
Methylotrophs	0	0	
Ammonia oxidizing biomass (AOB)	0	0	
Nitrite oxidizing biomass (NOB)	0	0	
Anaerobic ammonia oxidizers (ANAMMOX)	0	0	
Polyphosphate accumulating organisms (PAO)	0	0	
Propionic acetogens	0	0	
Methanogens - acetoclastic	0	0	
Methanogens - hydrogenotrophic	0	0	
Endogenous products	0	0	
Slowly bio. COD (part.)	0	0	
Slowly bio. COD (colloid.)	0	0	
Part. inert. COD	0	0	
Part. bio. org. N	0	0	
Part. bio. org. P	0	0	
Part. inert N	0	0	
Part. inert P	0	0	
Stored PHA	0	0	
Releasable stored polyP	0	0	
Fixed stored polyP	0	0	
Readily bio. COD (complex)	1.49	1.22	
Acetate	0.00	0.00	
Propionate	0.00	0.00	

Methanol	0	0	
Dissolved H2	0.15	0.12	
Dissolved methane	0.00	0.00	
Ammonia N	1.62	1.33	
Sol. bio. org. N	1.17	0.96	
Nitrous Oxide N	0	0	
Nitrite N	0.71	0.58	
Nitrate N	4.11	3.37	
Dissolved nitrogen gas	19.19	15.74	
PO4-P (Sol. & Me Complexed)	4.31	3.53	
Sol. inert COD	26.35	21.62	
Sol. inert TKN	1.00	0.82	
ISS Influent	0	0	
Struvite	0	0	
Hydroxy-dicalcium-phosphate	0	0	
Hydroxy-apatite	0	0	
Magnesium	25.00	20.51	
Calcium	160.00	131.25	
Metal	0	0	
Other Cations (strong bases)	4.90	1.82	meq/L and keq/d
Other Anions (strong acids)	9.12	3.39	meq/L and keq/d
Total CO2	6.74	2.51	mmol/L and kmol/d
User defined 1	0	0	
User defined 2	0	0	
User defined 3	0	0	
User defined 4	0	0	
Dissolved oxygen	2.00	1.64	
Parameters	Value	Units	

Hydraulic residence time	0.5	hours	
Velocity gradient	281.77	1/s	
VSS destruction	100.00	%	
Total solids mass	1482.21	lb	
Total readily biodegradable COD	1.49	mg/L	
OUR - Total	97.05	mgO/L/hr	
OUR - Carbonaceous	57.11	mgO/L/hr	
OUR - Nitrification	39.94	mgO/L/hr	
Nit - Ammonia removal rate	9.66	mgN/L/hr	
Nit - Nitrous oxide production rate	0	mgN/L/hr	
Nit - Nitrite production rate	9.56	mgN/L/hr	
Nit - Nitrate production rate	8.19	mgN/L/hr	
Denit - Nitrate removal rate	0.39	mgN/L/hr	
Denit - Nitrite removal rate	0.21	mgN/L/hr	
Denit - N2 production rate	0.42	mgN/L/hr	
Off gas flow rate (dry)	309.37	ft3/min	
Off gas Oxygen	20.14	%	
Off gas Carbon dioxide	0.85	%	
Off gas Ammonia	0.00	%	
Off gas Hydrogen	0.04	%	
Off gas Methane	0.00	%	
Off gas Nitrous oxide	0	%	
Actual DO sat. conc.	10.58	mg/L	
OTR	12.46	lb/hr	
SOTR	37.79	lb/hr	
OTE	3.73	%	
SOTE	11.58	%	
Air flow rate	319.85	ft3/min (20C, 1 atm)	
Air flow rate / diffuser	39.98	ft3/min (20C, 1 atm)	
# of diffusers	8.00		

Mixed liquor flow	0.60	mgd	
Membrane flux	11.41	gal/ft2/d (gfd)	
# of cassettes	2.00		
Air flow rate / cassette	159.93	ft3/min (20C, 1 atm)	

Album page - Filtrate

Filtrate			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Volatile suspended solids	0.00	0.00	
Total suspended solids	0.00	0.00	
Particulate COD	0.00	0.00	
Filtered COD	27.99	22.96	
Total COD	27.99	22.96	
Soluble PO4-P	4.31	3.53	
Total P	4.31	3.53	
Filtered TKN	3.79	3.11	
Particulate TKN	0	0	
Total Kjeldahl Nitrogen	3.79	3.11	
Filtered Carbonaceous BOD	1.06	0.87	
Total Carbonaceous BOD	1.06	0.87	
Nitrite + Nitrate	4.81	3.95	
Total N	8.60	7.06	
Total inorganic N	6.43	5.27	
Alkalinity	5.46	2.03	mmol/L and kmol/d
pH	7.00		
Volatile fatty acids	0.01	0.01	
ISS precipitate	0	0	
ISS cellular	0.00	0.00	
ISS Total	0.00	0.00	
Ammonia N	1.62	1.33	

Nitrate N	4.11	3.37	
Parameters	Value	Units	

Album page - WAS

WAS			
Parameters	Conc. (mg/L)	Mass rate (lb/d)	Notes
Volatile suspended solids	8035.81	114.49	
Total suspended solids	12014.49	171.18	
Particulate COD	11901.02	169.56	
Filtered COD	28.00	0.40	
Total COD	11929.02	169.96	
Soluble PO4-P	4.31	0.06	
Total P	220.71	3.14	
Filtered TKN	3.79	0.05	
Particulate TKN	684.78	9.76	
Total Kjeldahl Nitrogen	688.57	9.81	
Filtered Carbonaceous BOD	1.06	0.02	
Total Carbonaceous BOD	3133.08	44.64	
Nitrite + Nitrate	4.81	0.07	
Total N	693.39	9.88	
Total inorganic N	6.43	0.09	
Alkalinity	5.46	0.04	mmol/L and kmol/d
pH	7.00		
Volatile fatty acids	0.01	0.00	
ISS precipitate	0	0	
ISS cellular	464.22	6.61	
ISS Total	3978.67	56.69	
Ammonia N	1.62	0.02	

Nitrate N	4.11	0.06	
Parameters	Value	Units	

Headworks General Equipment Information

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
SCREENING	FINE SCREEN	1mm BAR SCREEN	200	gpm	SS bars and rakes	OVIVO	FS-800S	0.25	2
SCREEN CONTAINER	SCREEN BOX	DOUBLE	FS-800S	N/A	SS	OVIVO	FS-800S-BOX-DOUBLE	N/A	1
INFLUENT FLOW MEASUREMENT	FLOW METER	ELECTROMAGNETIC	4	Inch	POLYURETHANE	ENDRESS & HAUSER	PROMAG 10W1H-ULGA1RA0B4AA	N/A	1
PLANT WATER ISOLATION	VALVE	BALL	2	Inch	PVC	ASAHI	1601-020	N/A	1
LEVEL MEASUREMENT	LEVEL SWITCH	FLOAT	N/A	N/A	POLYURETHANE	CONERY	2900B1S1	N/A	3

Equalization Zone General Equipment Information

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
LEVEL MEASUREMENT	LEVEL SWITCH	FLOAT	N/A	N/A	POLYURETHANE	CONERY	2900B1S1	N/A	2
LEVEL MEASUREMENT	LEVEL TRANSMITTER	HYDROSTATIC	23	feet	SS	BLUE RIBBON	BC001-10-40	N/A	1
BASIN MIXING	DIFFUSER	MEDIUM BUBBLE	15	SCFM	SS	OVIVO	TRANSMAX	N/A	4
TRANSFER PUMP	PUMP	SUBMERSIBLE	69	gpm	CAST IRON	WILO	FA08.41-1.75HP	1.75	2
PUMP ISOLATION	VALVE	BALL	4	Inch	PVC	ASAHI	1602-040	N/A	4
PUMP INLET PRESSURE	GAUGE	COMPOUND	-30-+15	Inch Hg/PSI	SS	MCDANIEL	MPB/SCA-GF	N/A	2
PUMP OUTLET PRESSURE	GAUGE	PRESSURE	0-15	PSI	SS	MCDANIEL	MPB/SCU-GF	N/A	2
FLOW DIRECTION	VALVE	SWING CHECK	4	Inch	PVC	ASAHI	1201-040	N/A	2
EQ TRANSFER FLOW MEASUREMENT	FLOW METER	ELECTROMAGNETIC	4	Inch	POLYURETHANE	ENDRESS & HAUSER	PROMAG 10W1H-ULGA1RA0B4AA	N/A	1

Anoxic Zone General Equipment Information

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
BASIN MIXING	MIXER	SUBMERSIBLE	12,650	gallons	SS304	WILO	TR36-.89-8/8	1.65	2
MIXER SUPPORT	MIXER SUPPORT HARDWARE & GUIDE RAIL	RAIL MOUNT	SS	N/A	N/A	N/A	N/A	N/A	2
LEVEL MEASUREMENT	LEVEL TRANSMITTER	HYDROSTATIC	23	feet	SS	BLUE RIBBON	BC001-10-40	N/A	2
LEVEL MEASUREMENT	LEVEL SWITCH	FLOAT	N/A	N/A	POLYURETHANE	CONERY	N/A	N/A	4

Internal Recycle General Equipment Information

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
Feed Forward	PUMP	SUBMERSIBLE	243	gpm	CAST IRON	WILO	FA10.51-5.7HP	5.7	4

PUMP ISOLATION	VALVE	BALL	4	Inch	PVC	ASAHI	1602-040	N/A	4
FLOW DIRECTION	VALVE	SWING CHECK	4	Inch	PVC	ASAHI	1201-040	N/A	4
PUMP INLET PRESSURE	GAUGE	COMPOUND	-30-+15	Inch Hg/PSI	SS	MCDANIEL	MPB/SCA-GF	N/A	4
PUMP OUTLET PRESSURE	GAUGE	PRESSURE	0-15	PSI	SS	MCDANIEL	MPB/SCU-GF	N/A	4
Feed Forward FLOW METER	FLOW METER	ELECTROMAGNETIC	4	Inch	POLYURETHANE	ENDRESS & HAUSER	PROMAG 10W1H-ULGA1RA0B4AA	N/A	2
MBR BASIN ISOLATION	VALVE	BALL	4	Inch	PVC	ASAHI	1602-040	N/A	2

AERATION General Equipment Information

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
AERATION	DIFFUSER SYSTEM	FINE BUBBLE	89	SCFM / basin	N/A	AEROSTRIP	N/A	N/A	2
DIFFUSER CIP	AUTOMATED VALVE	SOLENOID	1.5	Inch	BRASS	ASCO	TBD	N/A	2
DISSOLVED OXYGEN MEASURMENT	DO PROBE	LDO	0-10	mg/L DO	SS	HACH	57900-00	N/A	2
DO TRANSMITTER	ANALOG TRANSMITTER	SC200	N/A	N/A	N/A	HACH	LXV404.99.70112	N/A	2

MBR/PA Zone General Equipment Information

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
MEMBRANE FILTRATION	OVIVO MEMBRANE UNIT	FLAT SHEET	N/A	N/A	SS	OVIVO	OV480	N/A	4
DIFFUSER CIP	AUTOMATED VALVE	SOLENOID	1.5	Inch	BRASS	ASCO	TBD	N/A	2
DIFFUSER INLET ISOLATION	VALVE	BUTTERFLY	2.50	Inch	CAST IRON	KEYSTONE	221-025	N/A	4
PERMEATE BRANCH ISOLATION	VALVE	BALL	4.00	Inch	PVC	ASAHI	1602-040	N/A	4
LEVEL MEASUREMENT	LEVEL SWITCH	FLOAT	N/A	N/A	POLYURETHANE	CONERY	N/A	N/A	4
CHEMICAL CLEANING ISOLATION	VALVE	BALL	2	Inch	PVC	ASAHI	1601-020	N/A	3
CIP VENT	VALVE	BALL	2	Inch	PVC	ASAHI	1601-020	N/A	2
SLUDGE RETURN	TELESCOPING VALVE	SLIP TUBE+ Hand Wheel ASSY	6	Inch	SS	OVIVO	TV-ST-6	N/A	2
PERMEATE HEADER ISOLATION	VALVE	BALL	3	Inch	PVC	ASAHI	1602-030	N/A	2
FABRICATION	FASTENERS	N/A	N/A	N/A	SS316	OVIVO	N/A	N/A	4
FABRICATION	OVIVO UNIVERSAL MOUNTING KIT	N/A	N/A	N/A	SS316	OVIVO	N/A	N/A	4

FABRICATION	OVIVO UMK LIFTING TOOL	N/A	N/A	N/A	SS316	OVIVO	N/A	N/A	1
FABRICATION	OVIVO UMK PLATFORM	N/A	N/A	N/A	SS316	OVIVO	N/A	N/A	1
FABRICATION	IN-BASIN PIPING & SUPPORTS FOR OMUs	N/A	N/A	N/A	SS316 & Flex Hose	OVIVO	N/A	N/A	4

WAS Zone General Equipment Information

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
TRANSFER PUMP	PUMP	SUBMERSIBLE	2	gpm	3	WILO	FA08.41-1.75HP	1.75	2
WAS TRANSFER FLOW METER	FLOW METER	ELECTROMAGNETIC	3	Inch	POLYURETHANE	ENDRESS & HAUSER	PROMAG 10W80-ULGA1RA0B4AA	N/A	1
PUMP ISOLATION	VALVE	BALL	3	Inch	PVC	ASAHI	1602-030	N/A	2
PUMP INLET PRESSURE	GAUGE	COMPOUND	-30-+15	Inch Hg/PSI	SS	MCDANIEL	MPB/SCA-GF	N/A	1
PUMP OUTLET PRESSURE	GAUGE	PRESSURE	0-15	PSI	SS	MCDANIEL	MPB/SCU-GF	N/A	1
FLOW DIRECTION	VALVE	BALL CHECK	3	Inch	PVC	ASAHI	1210-030	N/A	1
LEVEL MEASUREMENT	LEVEL SWITCH	FLOAT	N/A	N/A	POLYURETHANE	CONERY	N/A	N/A	2
BASIN MIXING	DIFFUSER	MEDIUM BUBBLE	15	SCFM	SS	OVIVO	TRANSMAX	N/A	8

Permeate Control General Equipment Information

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
TMP MEASUREMENT	PRESSURE TRANSMITTER	DIAPHRAGM	-15-+15	PSI	N/A	ENDRESS & HAUSER	CERABAR T PMC 131-A22F1V6N/Q4H	N/A	2
PERMEATE PUMP	PUMP	CENTRIFUGAL	154	gpm	GRAY IRON	GORMAN RUPP	13A20-B 2HP	2	3
PUMP ISOLATION	VALVE	BALL	3	Inch	PVC	ASAHI	1602-030	N/A	6
PUMP INLET PRESSURE	GAUGE	COMPOUND	-30-+15	Inch Hg/PSI	SS	MCDANIEL	MPB/SCA-GF	N/A	3
PUMP OUTLET PRESSURE	GAUGE	PRESSURE	0-15	PSI	SS	MCDANIEL	MPB/SCU-GF	N/A	3
FLOW DIRECTION (PUMPED)	VALVE	BALL CHECK	3	Inch	PVC	ASAHI	1210-030	N/A	3
ON/OFF	VALVE	NEEDLE	0.25	Inch	POLYPROPYLENE	ASAHI	5313.002	N/A	1
FLOW MEASUREMENT	FLOW METER	ELECTROMAGNETIC	3	Inch	POLYURETHANE	ENDRESS & HAUSER	PROMAG 10W80-ULGA1RA0B4AA	N/A	2
FLOW CONTROL	AUTOMATED VALVE	MODULATING BALL	3	Inch	PVC	ASAHI / BETTIS	1601-030 / EM310F-15-C4-02-102	N/A	2
TURBIDITY MEASUREMENT	TURBIDITY METER	OPTICAL	0-100	NTU	N/A	HACH	60101-01	N/A	1

TURBIDITY / PH TRANSMITTER	ANALOG TRANSMITTER	SC200	N/A	N/A	N/A	HACH	LXV404.99.70112	N/A	1

MBR Aeration General Equipment Information

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
MBR BLOWER	BLOWER	POSITIVE DISPLACEMENT	175	SCFM	CAST IRON	AERZEN	GM7L-15	15	3
MBR NOISE SUPPRESSION	SOUND ENCLOSURE	WITH BLOWER	N/A	N/A	N/A	AERZEN	N/A	N/A	3
MBR BLOWER TEMP	TEMPERATURE GAUGE	WITH BLOWER	N/A	N/A	N/A	AERZEN	N/A	N/A	3
MBR BLOWER PRESSURE	PRESSURE GAUGE	WITH BLOWER	N/A	N/A	N/A	AERZEN	N/A	N/A	3
MBR BLOWER TEMP SWITCH	TEMPERATURE SWITCH	WITH BLOWER	N/A	N/A	N/A	AERZEN	N/A	N/A	3
MBR BLOWER FLOW CONTROL	VALVE	CHECK (WITH BLOWER)	N/A	N/A	N/A	AERZEN	N/A	N/A	3
MBR BLOWER PRESSURE RELIEF	VALVE	PRESSURE RELIEF (WITH BLOWER)	N/A	N/A	N/A	AERZEN	N/A	N/A	3
MBR BLOWER PRESSURE	PRESSURE TRANSMITTER	DIAPHRAGM	-15-+15	PSI	N/A	ENDRESS & HAUSER	CERABAR T PMC 131-A22F1V6N/Q4H	N/A	3
MBR AIR ISOLATION	VALVE	BUTTERFLY	4	Inch	CAST IRON	KEYSTONE	221-040	N/A	5
MBR AIR FLOW MEASUREMENT	FLOW METER	MASS AIR FLOW	4	Inch	SS	ENDRESS & HAUSER	65I-40AA0AD1ACBBBA	N/A	2

PA Air Supply General Equipment Information

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
PA BLOWER	BLOWER	POSITIVE DISPLACEMENT	110	SCFM	CAST IRON	AERZEN	GM4S-10	10	3
PA NOISE SUPPRESSION	SOUND ENCLOSURE	WITH BLOWER	N/A	N/A	N/A	AERZEN	N/A	N/A	3
PA BLOWER TEMP	TEMPERATURE GAUGE	WITH BLOWER	N/A	N/A	N/A	AERZEN	N/A	N/A	3
PA BLOWER PRESSURE	PRESSURE GAUGE	WITH BLOWER	N/A	N/A	N/A	AERZEN	N/A	N/A	3
PA BLOWER TEMP SWITCH	TEMPERATURE SWITCH	WITH BLOWER	N/A	N/A	N/A	AERZEN	N/A	N/A	3
PA BLOWER FLOW CONTROL	VALVE	CHECK (WITH BLOWER)	N/A	N/A	N/A	AERZEN	N/A	N/A	3
PA BLOWER PRESSURE RELIEF	VALVE	PRESSURE RELIEF (WITH BLOWER)	N/A	N/A	N/A	AERZEN	N/A	N/A	3
PA BLOWER PRESSURE	PRESSURE TRANSMITTER	DIAPHRAGM	-15-+15	PSI	N/A	ENDRESS & HAUSER	CERABAR T PMC 131-A22F1V6N/Q4H	N/A	3
PA AIR ISOLATION	VALVE	BUTTERFLY	3	Inch	CAST IRON	KEYSTONE	221-025	N/A	3

Supplemental Aeration General Equipment Information for WAS and EQ

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
WAS/EQ BLOWER	BLOWER	POSITIVE DISPLACEMENT	310	SCFM	N/A	AERZEN	GM10S-20	20	2
WAS/EQ NOISE SUPPRESSION	SOUND ENCLOSURE	WITH BLOWER	N/A	N/A	N/A	AERZEN	N/A	N/A	2
WAS/EQ BLOWER TEMP	TEMPERATURE GAUGE	WITH BLOWER	N/A	N/A	N/A	AERZEN	N/A	N/A	2
WAS/EQ BLOWER PRESSURE	PRESSURE GAUGE	WITH BLOWER	N/A	N/A	N/A	AERZEN	N/A	N/A	2
WAS/EQ BLOWER TEMP SWITCH	TEMPERATURE SWITCH	N/A	N/A	N/A	N/A	DWYER	RRT2300U	N/A	2
WAS/EQ BLOWER FLOW DIRECTION	VALVE	CHECK (WITH BLOWER)	N/A	N/A	N/A	AERZEN	N/A	N/A	2
WAS/EQ BLOWER PRESSURE RELIEF	VALVE	PRESSURE RELIEF (WITH BLOWER)	N/A	N/A	N/A	AERZEN	N/A	N/A	2
WAS/EQ BLOWER PRESSURE	PRESSURE TRANSMITTER	DIAPHRAGM	-15-+15	PSI	N/A	ENDRESS & HAUSER	CERABAR T PMC 131-A22F1V6N/Q4H	N/A	2
WAS/EQ AIR ISOLATION	VALVE	BUTTERFLY	4	Inch	CAST IRON	KEYSTONE	221-040	N/A	2

OMU CIP General Equipment Information

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
MAZZIE INJECTOR	INJECTOR	VENTURI	2	Inch	POLYPROPYLENE	MAZZEI INJECTOR CORP	2081	N/A	1
WATER SUPPLY VALVE	AUTOMATED VALVE	2 POSITION BALL	2	Inch	PVC	ASAHI / BETTIS	1601-020 / EM310F-10-C4-02-102	N/A	1
CIP THROTTLING	VALVE	BALL	2	Inch	PVC	N/A	N/A	N/A	2
INJECTOR PRESSURE	GAUGE	PRESSURE	0-15	PSI	SS	MCDANIEL	MPB/SCU-GF	N/A	2
DRAIN	VALVE	BALL CHECK	1	Inch	PVC	ASAHI	1210-010	N/A	1
CHEMICAL ISOLATION	VALVE	BALL	2	Inch	PVC	ASAHI	1601-020	N/A	1
PRESSURE CONTROL	VALVE	PRESSURE REGULATOR VALVE	2	Inch	N/A	WILKINS	600/DUC	N/A	1
CHEMICAL FLOW	FLOW METER	ROTOMETER	0	gpm	POLYSULPHONE	KOBOLD	KSM-4005	N/A	1
FLOW MEASUREMENT	FLOW METER	ELECTROMAGNETIC	2	Inch	POLYURETHANE	ENDRESS & HAUSER	PROMAG 10W50-ULGA1RA0B4AA	N/A	1
INJECTOR ASSEMBLY	PIPE SPOOL	SUCTION	N/A	N/A	N/A	OVIVO	N/A	N/A	1
CHEMICAL TRANSFER TO MBR	HOSE	SUCTION	1	Inch	PVC	TIGERFLEX	W100	N/A	1

Controls General Equipment Information

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
PLANT CONTROL	SCADA	SOFTWARE	N/A	N/A	N/A	WONDERWARE	N/A	N/A	1
PLANT CONTROL	HMI	PANEL MOUNT/DESKTOP PC	N/A	N/A	N/A	N/A	N/A	N/A	1
PLANT CONTROL	PLC PANEL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1

Miscellaneous General Equipment Information

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
PROJECT KICKOFF MEETING	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3
MECHANICAL INSPECTION	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5
START-UP / COMMISSIONING / TRAINING	N/A	N/A	19	days	N/A	N/A	N/A	N/A	1
QC & INSPECTION	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
SHIPPING & RECEIVING	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
INBOUND FREIGHT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
OUTBOUND FREIGHT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1

Basis of Design				
Parameter	**Flow**	**Temperature**	**Typical Event Duration**	**Design Durations**
Average Annual Flow (AAF)	0.08 MGD *	15 °C *	9 consecutive months	9.0 months *
Max Month Flow (MMF)	0.10 MGD *	10 °C *	3 consecutive months	3.0 months *
Peak Week Flow (PWF) **	0.12 MGD *	10 °C *	3 non-consecutive weeks	3.0 weeks *
Peak Day Flow (PDF) **	0.20 MGD *	10 °C *	8 non-consecutive days	8.0 days *
Peak Hourly Flow (PHF) **	0.20 MGD *	10 °C *	4 hrs with 24 hrs between PHF	4.0 hours *

Parameter	Influent	Effluent Limits
BOD	250 mg/L *	< 5 mg/L *
TSS	300 mg/L *	< 5 mg/L *
TKN	50 mg/L *	< 4 mg/L *
NH_3	36 mg/L *	< 2 mg/L *
TP	8 mg/L *	< 8 mg/L *
TN	50 mg/L *	< 10 mg/L *
Alkalinity	300 mg/L *	< 75 mg/L *
Maximum Wastewater Temperature	25 °C *	
Elevation	500 ft *	

* Value assumed by Ovivo, to be verified by consulting engineer.

** Peak values assumed to occur during MMF, to be verified by consulting engineer

MBR/PA Zone (Membrane) Design		
Parameter	**Value**	**Notes**
No. of Membrane Basins	2	Retrofit in one aeration tank
No. of Membrane Rows per Basin	1	
No. of Membrane Units per Basin	2	4 units total
Membrane Unit Type	OV480	Cassette: OC480
No. of Cassettes per Unit	1	4 membrane Cassettes total
Surface Area per Cassette	5166.68 ft2/cartridge	20,667 sq ft total
Flux @ 0.08 MGD (AAF)	7.45 gal/(ft2 x day)	Flux with one MBR basin online
Flux @ 0.10 MGD (MMF)	9.68 gal/(ft2 x day)	Flux with one MBR basin online
Flux @ 0.12 MGD (PWF)	11.61 gal/(ft2 x day)	Flux with one MBR basin online
Flux @ 0.20 MGD (PDF)	19.35 gal/(ft2 x day)	Flux with one MBR basin online
Flux @ 0.20 MGD (PHF)	19.35 gal/(ft2 x day)	Flux with one MBR basin online
Membrane Basin Volume	15,180 gal/basin	18ft x 10.3ft x 11ft SWD
Membrane Air Scour Rate for Sizing	76.0 scfm/unit	@ 5.6 PSIG discharge
Total System AOR	589 lb O2/day	
AOR Satisfied by Air Scour	271 lb O2/day	Existing aeration tank 36 ft * 22 ft
MBR Basin MLSS	12,000 mg/L	

Equalization Zone Design		
Parameter	**Value**	**Notes**
Basin Volume	20,146 gal/basin	20,146 gal total
Basin Dimensions	TBD	

Anoxic Zone Design		
Parameter	**Value**	**Notes**
Basin Volume	12,651 gal/basin	25,302 gal total
Basin Dimensions	16.5ft x 10.3ft x 10ft SWD	
Anoxic MLSS	10,286 mg/L	
Recycle Rate	6 Q	From MBR to Anoxic Basin

MBR/PA Zone Design		
Parameter	**Value**	**Notes**
Fine Bubble Diffuser AOR	319 lb O2/day	

MBR Waste Activated Sludge Production Parameters		
Parameter	**Value**	**Notes**
WAS Sludge Production	171 lbs sludge / day	
Chemical Sludge Production	0 lbs sludge / day	Based on Chem-P process
Total Sludge Production	171 lbs sludge / day	
Sludge Concentration	1.2%	solids
Sludge Flow	1,706 gal sludge / day	
WAS Volatile Fraction	0.75	Assumed

WAS by others Parameters (Liquid) Design		
Parameter	**Value**	**Notes**
Basin Volume	56,103 gal/basin	56,103 gal total
Basin Dimensions	TBD	At 1.2% solids

System Design Parameters		
Parameter	**Value**	**Notes**
Plant HRT	13.2 hrs	With both trains online
Design Plant SRT	15 days	
F:M ratio	0.04	

Feed Forward Pump Design		
Parameter	**Value**	**Notes**
Feed Forward Pumps	4	2 Duty, 2 Stdby
Type	SUBMERSIBLE	
Unit Capacity	243 GPM	
TDH	20.0 ft	

Permeate Pump Design		
Parameter	**Value**	**Notes**
Permeate Pumps	3	2 Duty, 1 Stdby
Type	CENTRIFUGAL	Suction Design
Unit Permeate Pump Capacity	154 GPM	
TDH	42.0 ft	

Blower Design		
Parameter	**Value**	**Notes**
MBR Blowers	3	2 duty, 1 Stdby
Type	POSITIVE DISPLACEMENT	
Unit MBR Blower Capacity	175 SCFM	
MBR Blower Discharge Pressure	5.63 PSIG discharge	
Pre-Aeration (PA) Blowers	3	2 duty, 1 Stdby
Type	POSITIVE DISPLACEMENT	
Unit PA Blower Capacity	110 SCFM	
PA Blower Discharge Pressure	6.22 PSIG discharge	
WAS Blowers	2	1 duty, 1 Stdby
Type	POSITIVE DISPLACEMENT	
Unit WAS Blower Capacity	310 SCFM	
WAS Blower Discharge Pressure	5.07 PSIG discharge	

Chemical Cleaning Design		
Parameter	**Value**	**Notes**
Cleaning chemical (organic fouling)	Sodium Hypochlorite	2 times/yr
Typical Cleaning Schedule	1-2	cleanings/basin/yr
Volume per Membrane	190.20 gal/cassette	
Volume of Cleaning Solution	380.41 gal/basin	
Cleaning Solution Concentration	0.001	
Volume of 12.5% Stock solution	3 gal/basin/cleaning	
Cleaning chemical (inorganic fouling)	Oxalic Acid	2 times/yr
Typical Cleaning Schedule	1-2	cleanings/basin/yr
Volume per Membrane	190.20 gal/cassette	
Volume of Cleaning Solution	380.41 gal/basin	
Cleaning Solution Concentration	0.01	
Volume of 100.0% Stock solution	4 gal/basin/cleaning	

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APPENDIX F

H 2 M architects + engineers

CALVERTON SEWER DISTRICT AWTF

PROCESS AIR CALCULATIONS

Conversion Spreadsheet From SCFM to ACFM

Terms:		Value
PS	Standard Pressure (psia)	14.700
Pb	Atmospheric Pressure-barometer (psia) Corrected for blower filter inlet losses	14.400
Pa	Actual Pressure (psia)	14.696
RHs	Standard Relative Humidity	0.36
Rha	Actual Relative Humidity	0.85
PVs	Saturated Vapor Pressure of Water at Standard Temperature (psi)	0.3391
PVa	Saturated Vapor Pressure of Water at Actual Temperature (psi)	0.9503
Ts	Standard Temperature (oR) R=Fo + 460 = 528	528
Ta	Actual Temperature	560

Application:	scfm	acfm	Submergence of diffusers	Pressure Req.	Use		
Pre Equalization Blowers (2)	**53.9**	60.0	9.0 ft	3.87 psi	70 acfm	at 6 psi	(two units each approx 3.5 Hp)
Sludge (WAS) Holding Tank Blowers (2) - Existing Sludge Tanks	**62.5**	69.7	8.5 ft	3.66 psi	70 acfm	at 5 psi	(two units each approx 3.5 Hp)

Notes:

1. For flow equalization aeration, Ten State Standards Section 65.52 recommends 1.25 cfm/1000 gallons;
used (2.5 cfm/1000 gallons) * 21,542 gallons) = 53.9 scfm.
Use two blowers, one duty & one stand-by, to meet the requirement for the equalization basin, each sized at 70 cfm. Use common standy with SHT blower
Each blower aprox 3.5 hp.
2. For sludge holding aeration, Ten State Standards Section 85.5 recommends 30 cfm/1000 cu.ft;
used (30 cfm/1000 cu. ft.) * 2,082.5 cu. ft.) = 62.5 scfm.
3. MBR Blowers are supplied by MBR manufacturer. Air flow requirements are provided in manufacturer's design summary

EFFLUENT PUMP STATION: WET WELL SIZING

Phase	Max. Effluent Flow from MBR	Wet Well Volume Required[1]	Tank Area		SWD[2]	Operating Depth	Min. Pump Flow Rate Req'd [4]	Selected Pumping Rate
	gpd	Gallons	Length, ft	Width,ft	ft	ft	gpm	gpm
MBR ADF	200,000	521	10	8	2.4	0.9	150	**150**

1. Volume calculation = (15 minutes x (Influent Design Flow /1440)) / 4
2. Side water depth (SWD) is total operating depth plus 1-foot liquid level maintained for pump coverage and plus 0.5-foot for LOW LEVEL alarm below PUMP SHUT OFF elev
3. Minimum fill time of 15 minutes and minimum fill cycles of 4 per hour

Definitions:	
TDH =	Total Dynamic Head
Hd =	Total Discharge Head
Hs =	Total Suction Head
TDH = Hd - Hs	The total discharge head less the total suction head.

Hd = hsd + hfd	
Where:	
hsd =	Static Discharge Head (ft.). The vertical distance in feet above the pump centerline to the free level of discharge .
hfd =	Friction head in discharge line (pipe loss + fitting & valve losses).

Hs = hs - hfs	
Where:	
hs =	Static Suction Head (ft.).
	The vertical distance in feet above the centerline of the pump inlet to the free level of the fluid source.
	In this case, "hs" is positive (+).
	If the free level of the fluid source is below the inlet, hs will be negative (-). This is known as static suction lift.
hfs =	Friction head in suction line (pipe loss + fitting & valve losses).

Substituting:	
TDH = (hsd - hs) + hfs + hfd	*(Pay attention to the sign of the value "hs")*

General Explanation of Worksheets:	
Data Input Worksheet	Input your data here
Worksheet No. 1	Calculates the velocity and velocity head for any pipe sizes. Default values are 8" - 24"
Worksheet No. 2	Calculates the pipe loss due to friction in the discharge line of the pump.
Worksheet No. 3	Calculates the " k " factor for minor losses in the pump discharge line.
Worksheet No. 4	Calculates minor losses in pump discharge line. This worksheet uses the "Total KT " calculated in Worksheet 3.
Worksheet No. 5	Calculates the pipe loss due to friction in the suction line of the pump.
Worksheet No. 6	Calculates the " k " factor for minor losses in the pump suction line.
Worksheet No. 7	Calculates minor losses in pump suction line. This worksheet uses the "Total KT " calculated in Worksheet 6.
TDH Calc. (Old Pipe)	Calculates TDH for a "C" value and max. & min. static heads.
TDH Calc. (New Pipe)	Calculates TDH for a "C" value and max. & min. static heads.
System Curves	Plots System Head Curve at C values
Station Loss (Pipe)	Calculates the pipe loss due to friction for station loss section of pipe
Station Loss (Minor)	Calculates the " k " factor for minor losses for the station loss section
Station Loss - Minor Head Loss	Calculates minor losses for the station loss section. This worksheet uses the "Total KT " calculated in Worksheet 6.
Modified - TDH Curve	Plots the worst case system head curve, pump performance curve, and modified pump curve.

Note: Values to be inserted have a yellow cell background. Type the value in the highlighted cell only.
Values in Red are cell references. Do not edit red values. Values in Blue are calculated values. Only edit the formula.

Step #			
1	*Select System Flow Rates Used To Generate System Head Curves:*		
	Point No. 1	100	gpm
	Point No. 2	150	gpm
	Point No. 3	200	gpm
	Ponit No. 4	250	gpm
	Point No. 5	300	gpm
2	*Select "C" values*		
	New Pipe:	140	
	Older Pipe:	120	

Assumption: DR-18 PVC PIPE
Use C = 140 FOR NEW, C= 120 FOR OLD

WORKSHEET DIRECTIONS		
3	Worksheet No. 1	Insert pipe information. Pipe area is calculated based on ID.
4	Worksheet No. 2	Calculates pipe loss for input "C" values in the discharge pipe.
5	Worksheet No. 3	Input the total no. of fittings, valves in the column marked "QTY." Worksheet calculates "Total Kt" for each pipe diameter.
6	Worksheet No. 4	No input is required. Total minor head loss in discharge line is automatically calculated.
7	Worksheet No. 5	Same as Worksheet 2 except for suction line of the pump.
8	Worksheet No. 6	Same as Worksheet 3 except for suction line of the pump.
9	Worksheet No. 7	No input is required. Total minor head loss in suction line is automatically calculated.
10	Worksheet "TDH Calc.". (OLD PIPE)	Input information with yellow cell background. For "hs" pay attention to it's sign (-) or (+). *(Misc. Losses shown are treated as additional static head.)* *Note: You should have input for Maximum Static Head and Minimum Static Head.*
11	Worksheet "TDH Calc.". (NEW PIPE)	Input information with yellow cell background. For "hs" pay attention to it's sign (-) or (+). *(Misc. Losses shown are treated as additional static head.)* *Note: You should have input for Maximum Static Head and Minimum Static Head.*
12	Worksheet " System Curve"	Worksheet " System Curve" - Plots system head curves for Min. & Max. static heads and at selected "C" values.
13	Station Loss (Pipe)	Calculates pipe loss for input "C" values.
14	Station Loss (Minor)	Input the total no. of fittings, valves in the column marked "QTY." Worksheet calculates "Total Kt" for each pipe diameter.
15	Station Loss - Minor Head Loss	No input is required. Total minor head loss in discharge line is automatically calculated.
16	Modified - TDH Curve	Insert the required information for the pump you have selected.

Pipe Hydraulic Parameters

System Head Points				Point No.1		Point No. 2		Point No. 3		Point No. 4		Point No. 5	
			gpm	100		150		200		250		300	
			cfs	0.2228		0.3342		0.4456		0.557		0.6684	
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)		Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)
6	6.09	0.20		1.10	0.02	1.65	0.04	2.20	0.08	2.75	0.12	3.30	0.17
8	7.98	0.35		0.64	0.01	0.96	0.01	1.28	0.03	1.60	0.04	1.92	0.06
10	9.79	0.52		0.43	0.00	0.64	0.01	0.85	0.01	1.07	0.02	1.28	0.03
12	11.65	0.74		0.30	0.00	0.45	0.00	0.60	0.01	0.75	0.01	0.90	0.01
14	14	1.07		0.21	0.00	0.31	0.00	0.42	0.00	0.52	0.00	0.63	0.01
16	16	1.40		0.16	0.00	0.24	0.00	0.32	0.00	0.40	0.00	0.48	0.00
18	18	1.77		0.13	0.00	0.19	0.00	0.25	0.00	0.32	0.00	0.38	0.00
20	20	2.18		0.10	0.00	0.15	0.00	0.20	0.00	0.26	0.00	0.31	0.00

Edit the values in the yellow cells for the pipe sizes of your application

Pipe Loss On Discharge Side Of Pump

System Head Points					Point No.1		Point No. 2		Point No. 3		Point No. 4		Point No. 5	
				gpm	100		150		200		250		300	
				cfs	0.22		0.33		0.45		0.56		0.6684	
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)	Length (ft.)	"C" Values	120	140	120	140	120	140	120	140	120	140
6	6.09	0.20	8750		9.92	7.46	21.01	15.80	35.77	26.90	54.06	40.64	75.74	**56.95**
8	7.98	0.35			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
10	9.79	0.52			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
12	11.65	0.74			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
14	14	1.07			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
16	16	1.40			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
18	18	1.77			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
20	20	2.18			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
			Total Pipe Loss		**9.92**	**7.46**	**21.01**	**15.80**	**35.77**	**26.90**	**54.06**	**40.64**	**75.74**	**56.95**

Type the length for each size pipe in your system in the yellow cells.

" k " Factors For Discharge Line

	PIPE DIAMETER (IN.)																							
	6			8			10			12			14			16			18			20		
	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt
Loss Type																								
90 EL.	4	0.42	1.68		0.42	0		0.39	0		0.39	0		0.39	0		0.36	0		0.36	0		0.36	0
45 EL.	2	0.22	0.44		0.22	0		0.21	0		0.21	0		0.21	0		0.19	0		0.19	0		0.19	0
22.5 EL.		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.08	0		0.08	0		0.08	0
Butterfly		0.63	0		0.63	0		0.35	0		0.35	0		0.35	0		0.3	0		0.3	0		0.3	0
Gate		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	0
Tee (thru)	34	0.28	9.52		0.28	0		0.26	0		0.26	0		0.26	0		0.24	0		0.24	0		0.24	0
Tee (branch)		0.84	0		0.84	0		0.78	0		0.78	0		0.78	0		0.72	0		0.72	0		0.72	0
Cross (thru)		0.48	0		0.48	0		0.45	0		0.45	0		0.45	0		0.4	0		0.4	0		0.4	0
Cross (branch)		0.88	0		0.88	0		0.8	0		0.8	0		0.8	0		0.75	0		0.75	0		0.75	0
Reducer		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0
Check			0			0			0		0.8	0			0			0			0			0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
Entrance	1	0.78	0.78		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0
Exit	1	1	1		1	0	1	1	1		1	0		1	0		1	0		1	0		1	0
Total Kt			**13.4**			**0**			**1**			**0**			**0**			**0**			**0**			**0**

You can enter minor loss components in the yellow cells.

Minor Discharge Head Loss Calculation (Discharge Side)

(HL = Vh * Kt)

		100		150		200		250		300	
Pipe Dia.	**Kt**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**
6	13.42	0.02	0.25	0.04	0.57	0.08	1.01	0.12	1.58	0.17	2.28
8	0.00	0.01	0.00	0.01	0.00	0.03	0.00	0.04	0.00	0.06	0.00
10	1.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.03
12	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Minor Head Loss			**0.26**		**0.58**		**1.02**		**1.60**		**2.30**

This table is automatically generated based on the previous worksheet inputs.

Pipe Loss On Suction Side Of Pump

System Head Points					Point No.1		Point No. 2		Point No. 3		Point No. 4		Point No. 5	
				gpm	100		150		200		250		300	
				cfs	0.22		0.33		0.45		0.56		0.67	
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)	Length (ft.)	"C" Values	120	140	120	140	120	140	120	140	120	140
6	6.09	0.20	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	7.98	0.35	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	9.79	0.52	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	11.65	0.74	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	14	1.07	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	16	1.40	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	18	1.77	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	20	2.18	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Total Pipe Loss		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Input the total length of each size pipe on the suction side of the pump.

" k " Factors For Suction Line

	PIPE DIAMETER (IN.)																							
	6			8			10			12			14			16			18			20		
	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt
Loss Type																								
90 EL.		0.42	0		0.42	0		0.39	0		0.39	0		0.39	0		0.36	0		0.36	0		0.36	0
45 EL.		0.22	0		0.22	0		0.21	0		0.21	0		0.21	0		0.19	0		0.19	0		0.19	0
22.5 EL.		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.08	0		0.08	0		0.08	0
Butterfly		0.63	0		0.63	0		0.35	0		0.35	0		0.35	0		0.3	0		0.3	0		0.3	0
Gate		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	0
Tee (thru)		0.28	0		0.28	0		0.26	0		0.26	0		0.26	0		0.24	0		0.24	0		0.24	0
Tee (branch)		0.84	0		0.84	0		0.78	0		0.78	0		0.78	0		0.72	0		0.72	0		0.72	0
Cross (thru)		0.48	0		0.48	0		0.45	0		0.45	0		0.45	0		0.4	0		0.4	0		0.4	0
Cross (branch)		0.88	0		0.88	0		0.8	0		0.8	0		0.8	0		0.75	0		0.75	0		0.75	0
Reducer		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
Entrance		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0
Exit		1	0		1	0		1	0		1	0		1	0		1	0		1	0		1	0
Total Kt			**0**			**0**			**0**			**0**			**0**			**0**			**0**			**0**

Minor Suction Head Loss Calculation (Suction Side)

(HL = Vh * Kt)

		100		150		200		250		300	
Pipe Dia.	**Kt**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**
6	0.00	0.02	0.00	0.04	0.00	0.08	0.00	0.12	0.00	0.17	0.00
8	0.00	0.01	0.00	0.01	0.00	0.03	0.00	0.04	0.00	0.06	0.00
10	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.02	0.00	0.03	0.00
12	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Minor Head Loss		**0.00**		**0.00**		**0.00**		**0.00**		**0.00**

This table is automatically generated based on the previous worksheet inputs.

System Summary

Maximum & Minimum Static Heads For Old Pipe

(Note: All values in this table must be in feet of water.)

		Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No. 5
		100	150	200	250	300
	SYSTEM CURVE FOR C =	120	120	120	120	120
Misc. Loss Here:		0	0	0	0	0
Misc. Loss Here:		0	0	0	0	0
Misc. Loss Here:		0	0	0	0	0
	Discharge Pipe Loss	9.92	21.01	35.77	54.06	75.74
	+ Discharge Minor Loss	0.26	0.58	1.02	1.60	2.30
	hfd =	10.18	21.59	36.80	55.65	78.04
	Suction Pipe Loss	0.00	0.00	0.00	0.00	0.00
	+ Suction Minor Loss	0.00	0.00	0.00	0.00	0.00
	hfs =	0.00	0.00	0.00	0.00	0.00

System Head Curve @ Maximum Static Head Condition

	hsd (Static Discharge Head)	37.00	37.00	37.00	37.00	37.00
	- hs (Static Suction or Lift)		0.00	0.00	0.00	0.00
Max. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	47.18	58.59	73.80	92.65	115.04

System Head Curve @ Minimum Static Head Condition

	hsd (Static Discharge Head)	32.00	32.00	32.00	32.00	32.00
	- hs (Static Suction or Lift)		0.00	0.00	0.00	0.00
Min. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	42.18	53.59	68.80	87.65	110.04

Input the static discharge head and static suction (or lift) in the yellow cells.

Remember: If the free level of the fluid source is below the inlet of the pump, "hs" will be negative (-).

System Summary

Maximum & Minimum Static Heads For New Pipe

(Note: All values in this table must be in feet of water.)

		Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No. 5
		100	150	200	250	300
	SYSTEM CURVE FOR C =	140	140	140	140	140
Misc. Loss Here:			0	0	0	0
Misc. Loss Here:		0	0	0	0	0
Misc. Loss Here:		0	0	0	0	0
	Discharge Pipe Loss	7.46	15.80	26.90	40.64	56.95
	+ Discharge Minor Loss	0.26	0.58	1.02	1.60	2.30
	hfd =	7.72	16.37	27.92	42.24	59.25
	Suction Pipe Loss	0.00	0.00	0.00	0.00	0.00
	+ Suction Minor Loss	0.00	0.00	0.00	0.00	0.00
	hfs =	0.00	0.00	0.00	0.00	0.00

System Head Curve @ Maximum Static Head Condition

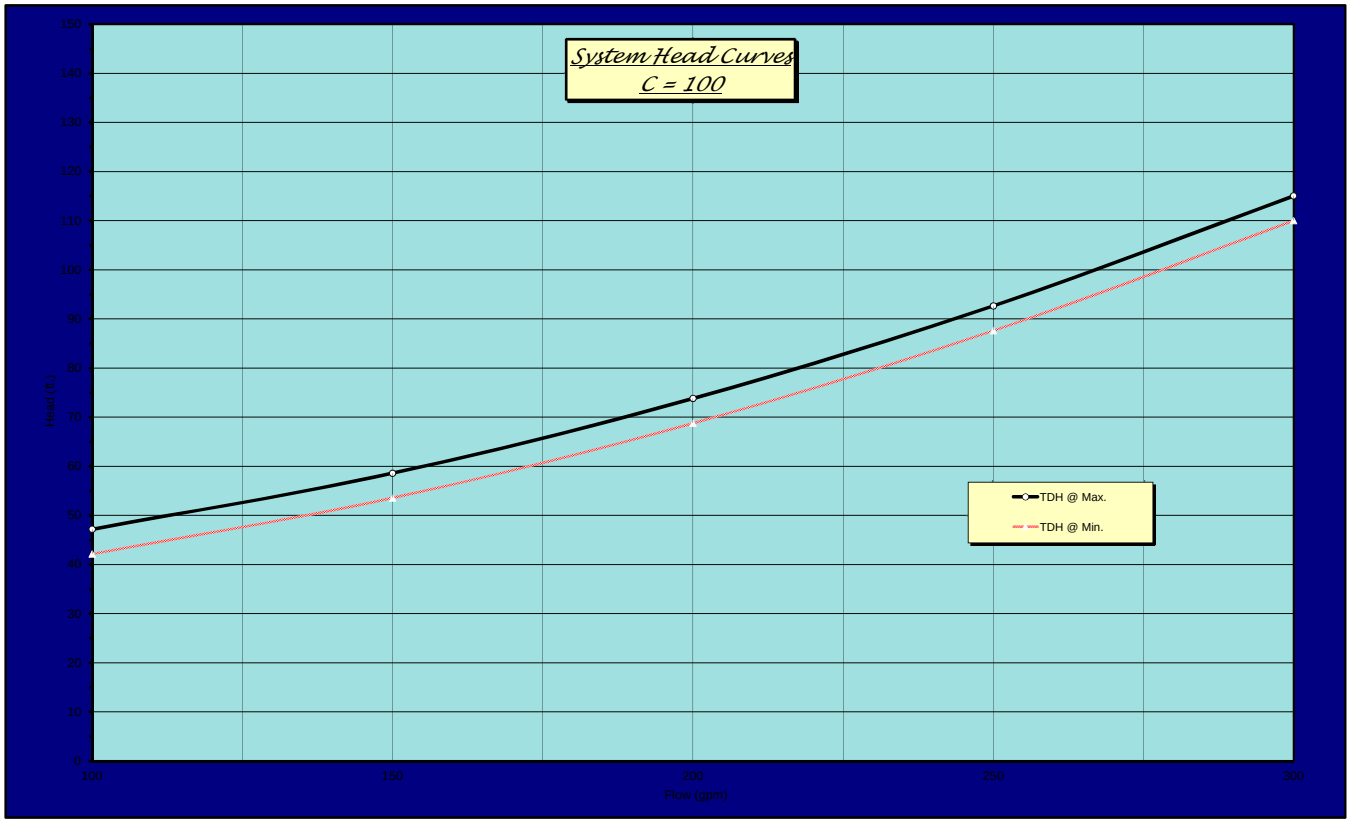
	hsd (Static Discharge Head)	37.00	37.00	37.00	37.00	37.00
	- hs (Static Suction or Lift)	0.00	0.00	0.00	0.00	0.00
Max. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	44.72	53.37	64.92	79.24	96.25

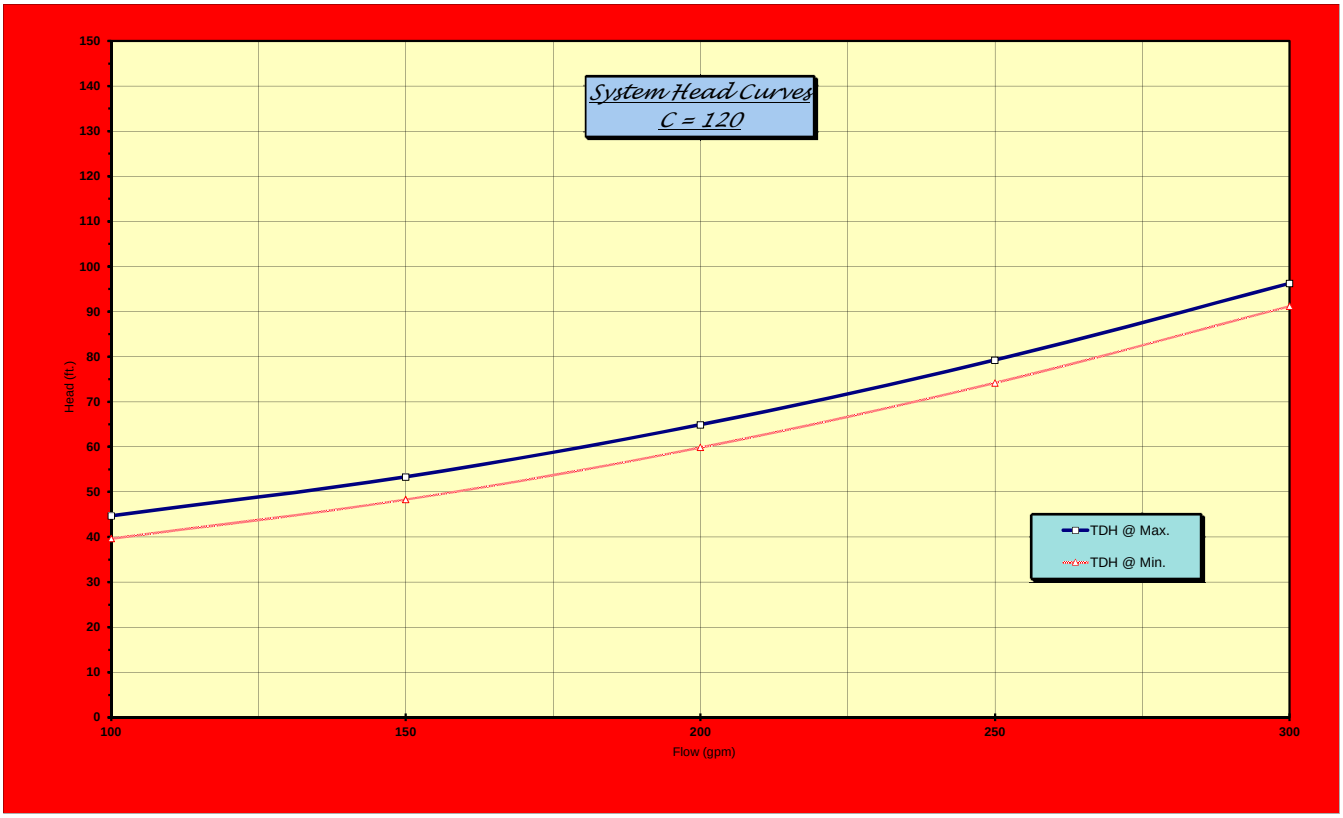
System Head Curve @ Minimum Static Head Condition

	hsd (Static Discharge Head)	32.00	32.00	32.00	32.00	32.00
	- hs (Static Suction or Lift)	0.00	0.00	0.00	0.00	0.00
Min. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	39.72	48.37	59.92	74.24	91.25

Input the static discharge head and static suction (or lift) in the yellow cells.

Remember: If the free level of the fluid source is below the inlet of the pump, "hs" will be negative (-).


System Head Curves
C = 100
Head (ft.)
Flow (gpm)
TDH @ Max.
TDH @ Min.


System Head Curves
C = 120
Head (ft.)
Flow (gpm)
TDH @ Max.
TDH @ Min.

Station Pipe Loss On Discharge Side Of Pump (Header Loss)

System Head Points					Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No. 5
Select Flow Rates For Modified Pump Curve Here:					150	200	250	300	350
				cfs	0.33	0.45	0.56	0.67	0.7798
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)	Length (ft.)	Select "C" Value Here:	100	100	100	100	100
6	6.09	0.20	8		0.03	0.05	0.07	0.10	0.13
8	7.98	0.35			0.00	0.00	0.00	0.00	0.00
10	9.79	0.52			0.00	0.00	0.00	0.00	0.00
12	11.65	0.74			0.00	0.00	0.00	0.00	0.00
14	14	1.07			0.00	0.00	0.00	0.00	0.00
16	16	1.40			0.00	0.00	0.00	0.00	0.00
18	18	1.77			0.00	0.00	0.00	0.00	0.00
20	20	2.18			0.00	0.00	0.00	0.00	0.00
			Total Pipe Loss		0.03	0.05	0.07	0.10	0.13

" k " Factors For Station Loss Discharge Line

	PIPE DIAMETER (IN.)																					
	6			8			10			12			14			16			18			20		
	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt
Loss Type																								
90 EL.		0.42	0		0.42	0		0.39	0		0.39	0		0.39	0		0.36	0		0.36	0		0.36	0
45 EL.		0.22	0		0.22	0		0.21	0		0.21	0		0.21	0		0.19	0		0.19	0		0.19	0
22.5 EL.		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.08	0		0.08	0		0.08	0
Butterfly		0.63	0		0.63	0		0.35	0		0.35	0		0.35	0		0.3	0		0.3	0		0.3	0
Gate		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	0
Tee (thru)		0.28	0		0.28	0		0.26	0		0.26	0		0.26	0		0.24	0		0.24	0		0.24	0
Tee (branch)		0.84	0		0.84	0		0.78	0		0.78	0		0.78	0		0.72	0		0.72	0		0.72	0
Cross (thru)		0.48	0		0.48	0		0.45	0		0.45	0		0.45	0		0.4	0		0.4	0		0.4	0
Cross (branch)		0.88	0		0.88	0		0.8	0		0.8	0		0.8	0		0.75	0		0.75	0		0.75	0
Reducer		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0
Check			0		8.4	0		8.4	0			0			0			0			0			0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
Entrance		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0
Exit		1	0		1	0		1	0		1	0		1	0		1	0		1	0		1	0
Total Kt			**0**			**0**			**0**			**0**			**0**			**0**			**0**			**0**

Minor Station Loss Head Loss Calculation
(HL = Vh * Kt)

		150		200		250		300		350	
Pipe Dia.	Kt	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)
6	0.00	0.01	0.00	0.02	0.00	0.03	0.00	0.05	0.00	0.06	0.00
8	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.02	0.00	0.03	0.00
10	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Minor Loss			**0.00**		**0.00**		**0.00**		**0.00**		**0.00**

This table is automatically generated based on the previous worksheet inputs.

Total Station Loss

	Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No. 5
	150	**200**	**250**	**300**	**350**
C =	100	100	100	100	100
Station Loss (Pipe)	0.03	0.05	0.07	0.10	0.13
+ Station Loss (Minor)	0.00	0.00	0.00	0.00	0.00
Total Station Loss	**0.03**	**0.05**	**0.07**	**0.10**	**0.13**

This table is automatically generated based on the previous worksheet inputs.

These curves were already plotted on Worksheet "System Curves".

System Head Curves From Worksheet

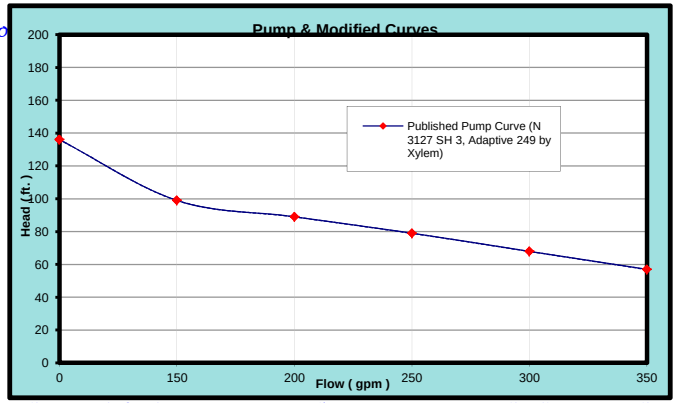
	C = 120			C = 140	
FLOW (gpm)	TDH @ Max.	TDH @ Min.	FLOW (gpm)	TDH @ Max.	TDH @ Min.
100	47.18	42.18	100	44.72	39.72
150	58.59	53.59	150	53.37	48.37
200	73.80	68.80	200	64.92	59.92
250	92.65	87.65	250	79.24	74.24
300	115.04	110.04	300	96.25	91.25

From the manufacturer's published pump curve select the head at the flo

Pump & Modified Pump Curves

FLOW (gpm)	Published Pump Curve (N 3127 SH 3, Adaptive 249 by Xylem)	Modified Pump Curve Points (ft.)	Total Station Loss (ft.)
0	136	136.00	0.00
150	99	98.97	0.03
200	89	88.95	0.05
250	79	78.93	0.07
300	68	67.90	0.10
350	57	56.87	0.13

These columns are plotted at the right. (The last column is subtracted from the pump curve points).



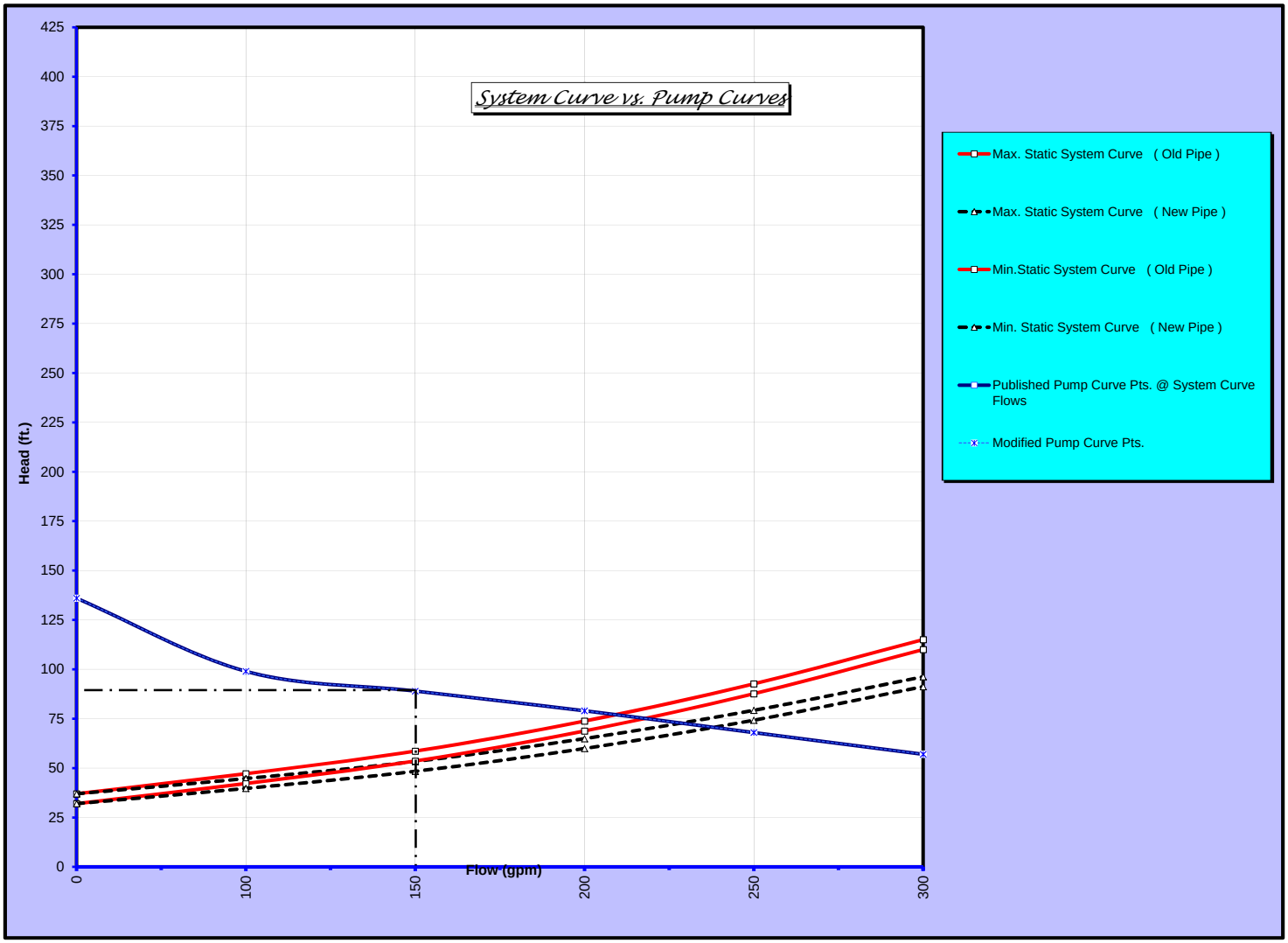
The modified pump curve takes into account the losses in the "station". They must be added back into the system in order to specify the duty point.

This portion of the table summarizes all of the system curves.

Curve Plot

Flow	Max. Static System Curve (Old Pipe)	Max. Static System Curve (New Pipe)	Min.Static System Curve (Old Pipe)	Min. Static System Curve (New Pipe)	Published Pump Curve Pts. @ System Curve Flows	Modified Pump Curve Pts.
0	37.00	37.00	32.00	32.00	136	136.00
100	47.18	44.72	42.18	39.72	99	99.00
150	58.59	53.37	53.59	48.37	89	89.00
200	73.80	64.92	68.80	59.92	79	79.00
250	92.65	79.24	87.65	74.24	68	68.00
300	115.04	96.25	110.04	91.25	57	57.00
	Curve #1	Curve #2	Curve #3	Curve #4	Curve #5	Curve #6

The station losses have to be manually input. From the plot above interpolate, if necessary, and input the modified pump curve point in this column.


System Curve vs. Pump Curves
Head (ft.)
425
400
375
350
325
300
275
250
225
200
175
150
125
100
75
50
25
0
0
100
150
200
250
300
Flow (gpm)
Max. Static System Curve (Old Pipe)
Max. Static System Curve (New Pipe)
Min.Static System Curve (Old Pipe)
Min. Static System Curve (New Pipe)
Published Pump Curve Pts. @ System Curve Flows
Modified Pump Curve Pts.

INFLUENT PUMP STATION: WET WELL SIZING

Phase	Average Daily influent Flow	Peak Factor	Peak Flow - Pump Design Flow	Wet Well Volume Required[1]	Tank Area		SWD[2]	Operating Depth	Min. Pump Flow Rate Req'd [4]	Selected Pumping Rate
	gpd		gpd	gallons	Length, ft	Width,ft	ft	ft	gpm	gpm
100,000 gpd Flow	100,000	3.80	380,000	990	15	8	3.1	1.7	399	**400**

1. Volume calculation = (15 minutes x (Pump Design Flow /1440)) / 4
2. Side water depth (SWD) is total operating depth plus 0.9-foot liquid level maintained for pump coverage and plus 0.5-foot for freeboard between invert and liquid level
3. Influent pump station will be chambered to provide operational flexibility and adjustment to capacity needed as future build-out occurs.
4. Minimum fill time of 15 minutes and minimum fill cycles of 4 per hour

Definitions:	
TDH =	Total Dynamic Head
Hd =	Total Discharge Head
Hs =	Total Suction Head
TDH = Hd - Hs	The total discharge head less the total suction head.

Hd = hsd + hfd	
Where:	
hsd =	Static Discharge Head (ft.). The vertical distance in feet above the pump centerline to the free level of discharge .
hfd =	Friction head in discharge line (pipe loss + fitting & valve losses).

Hs = hs - hfs	
Where:	
hs =	Static Suction Head (ft.).
	The vertical distance in feet above the centerline of the pump inlet to the free level of the fluid source.
	In this case, "hs" is positive (+).
	If the free level of the fluid source is below the inlet, hs will be negative (-). This is known as static suction lift.
hfs =	Friction head in suction line (pipe loss + fitting & valve losses).

Substituting:	
TDH = (hsd - hs) + hfs + hfd	*(Pay attention to the sign of the value "hs")*

General Explanation of Worksheets:	
Data Input Worksheet	Input your data here
Worksheet No. 1	Calculates the velocity and velocity head for any pipe sizes. Default values are 8" - 24"
Worksheet No. 2	Calculates the pipe loss due to friction in the discharge line of the pump.
Worksheet No. 3	Calculates the " k " factor for minor losses in the pump discharge line.
Worksheet No. 4	Calculates minor losses in pump discharge line. This worksheet uses the "Total KT " calculated in Worksheet 3.
Worksheet No. 5	Calculates the pipe loss due to friction in the suction line of the pump.
Worksheet No. 6	Calculates the " k " factor for minor losses in the pump suction line.
Worksheet No. 7	Calculates minor losses in pump suction line. This worksheet uses the "Total KT " calculated in Worksheet 6.
TDH Calc. (Old Pipe)	Calculates TDH for a "C" value and max. & min. static heads.
TDH Calc. (New Pipe)	Calculates TDH for a "C" value and max. & min. static heads.
System Curves	Plots System Head Curve at C values
Station Loss (Pipe)	Calculates the pipe loss due to friction for station loss section of pipe
Station Loss (Minor)	Calculates the " k " factor for minor losses for the station loss section
Station Loss - Minor Head Loss	Calculates minor losses for the station loss section. This worksheet uses the "Total KT " calculated in Worksheet 6.
Modified - TDH Curve	Plots the worst case system head curve, pump performance curve, and modified pump curve.

Note: Values to be inserted have a yellow cell background. Type the value in the highlighted cell only.
Values in Red are cell references. Do not edit red values. Values in Blue are calculated values. Only edit the formula.

Step #			
1	Select System Flow Rates Used To Generate System Head Curves:		
	Point No. 1	150	gpm
	Point No. 2	200	gpm
	Point No. 3	250	gpm
	Ponit No. 4	300	gpm
	Point No. 5	450	gpm
2	Select "C" values		
	New Pipe:	120	
	Older Pipe:	100	

Assumption: Class 53, Ductile Iron, Cement Lined.
Use C = 120 and C = 100 for DI pipe

WORKSHEET DIRECTIONS		
3	Worksheet No. 1	Insert pipe information. Pipe area is calculated based on ID.
4	Worksheet No. 2	Calculates pipe loss for input "C" values in the discharge pipe.
5	Worksheet No. 3	Input the total no. of fittings, valves in the column marked "QTY." Worksheet calculates "Total Kt" for each pipe diameter.
6	Worksheet No. 4	No input is required. Total minor head loss in discharge line is automatically calculated.
7	Worksheet No. 5	Same as Worksheet 2 except for suction line of the pump.
8	Worksheet No. 6	Same as Worksheet 3 except for suction line of the pump.
9	Worksheet No. 7	No input is required. Total minor head loss in suction line is automatically calculated.
10	Worksheet "TDH Calc.". (OLD PIPE)	Input information with yellow cell background. For "hs" pay attention to it's sign (-) or (+). *(Misc. Losses shown are treated as additional static head.)* *Note: You should have input for Maximum Static Head and Minimum Static Head.*
11	Worksheet "TDH Calc.". (NEW PIPE)	Input information with yellow cell background. For "hs" pay attention to it's sign (-) or (+). *(Misc. Losses shown are treated as additional static head.)* *Note: You should have input for Maximum Static Head and Minimum Static Head.*
12	Worksheet " System Curve"	Worksheet " System Curve" - Plots system head curves for Min. & Max. static heads and at selected "C" values.
13	Station Loss (Pipe)	Calculates pipe loss for input "C" values.
14	Station Loss (Minor)	Input the total no. of fittings, valves in the column marked "QTY." Worksheet calculates "Total Kt" for each pipe diameter.
15	Station Loss - Minor Head Loss	No input is required. Total minor head loss in discharge line is automatically calculated.
16	Modified - TDH Curve	Insert the required information for the pump you have selected.

Pipe Hydraulic Parameters

System Head Points				Point No.1		Point No. 2		Point No. 3		Point No. 4		Point No. 5	
			gpm	150		200		250		300		450	
			cfs	0.3342		0.4456		0.557		0.6684		1.0026	
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)		Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)
6	6.22	0.21		1.58	0.04	2.11	0.07	2.64	0.11	3.17	0.16	4.75	0.35
8	8.33	0.38		0.88	0.01	1.18	0.02	1.47	0.03	1.77	0.05	2.65	0.11
10	10.34	0.58		0.57	0.01	0.76	0.01	0.96	0.01	1.15	0.02	1.72	0.05
12	12.4	0.84		0.40	0.00	0.53	0.00	0.66	0.01	0.80	0.01	1.20	0.02
14	14.46	1.14		0.29	0.00	0.39	0.00	0.49	0.00	0.59	0.01	0.88	0.01
16	16.54	1.49		0.22	0.00	0.30	0.00	0.37	0.00	0.45	0.00	0.67	0.01
18	18.62	1.89		0.18	0.00	0.24	0.00	0.29	0.00	0.35	0.00	0.53	0.00
20	20.7	2.34		0.14	0.00	0.19	0.00	0.24	0.00	0.29	0.00	0.43	0.00

Edit the values in the yellow cells for the pipe sizes of your application

Pipe Loss On Discharge Side Of Pump

System Head Points					Point No.1		Point No. 2		Point No. 3		Point No. 4		Point No. 5	
				gpm	150		200		250		300		450	
				cfs	0.33		0.45		0.56		0.67		1.0026	
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)	Length (ft.)	"C" Values	100	120	100	120	100	120	100	120	100	120
6	6.22	0.21	75		0.23	0.16	0.39	0.28	0.59	0.42	0.82	0.59	1.74	**1.24**
8	8.33	0.38			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
10	10.34	0.58			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
12	12.4	0.84			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
14	14.46	1.14			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
16	16.54	1.49			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
18	18.62	1.89			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
20	20.7	2.34			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
				Total Pipe Loss	**0.23**	**0.16**	**0.39**	**0.28**	**0.59**	**0.42**	**0.82**	**0.59**	**1.74**	**1.24**

Type the length for each size pipe in your system in the yellow cells.

" k " Factors For Discharge Line

	PIPE DIAMETER (IN.)																							
	6			8			10			12			14			16			18			20		
	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt
Loss Type																								
90 EL.	8	0.42	3.36		0.42	0		0.39	0		0.39	0		0.39	0		0.36	0		0.36	0		0.36	0
45 EL.	4	0.22	0.88		0.22	0		0.21	0		0.21	0		0.21	0		0.19	0		0.19	0		0.19	0
22.5 EL.		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.08	0		0.08	0		0.08	0
Butterfly		0.63	0		0.63	0		0.35	0		0.35	0		0.35	0		0.3	0		0.3	0		0.3	0
Gate		0.12	0		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	0
Plug	1	0.27	0.27		0.25	0		0.25	0		0.23	0		0.23	0		0.23	0		0.22	0		0.22	0
Tee (thru)	1	0.3	0.3		0.28	0		0.28	0		0.26	0		0.26	0		0.26	0		0.24	0		0.24	0
Tee (branch)		0.9	0		0.84	0		0.84	0		0.78	0		0.78	0		0.78	0		0.72	0		0.72	0
Reducer		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0
Check		0.75	0		0.7	0		0.7	0		0.65	0		0.65	0		0.65	0		0.6	0		0.6	0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
Entrance		0.5	0		0.5	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0
Exit	1	1	1		1	0		1	0		1	0		1	0		1	0		1	0		1	0
Total Kt			**5.81**			**0**			**0**			**0**			**0**			**0**			**0**			**0**

You can enter minor loss components in the yellow cells.

Minor Discharge Head Loss Calculation (Discharge Side)

(HL = Vh * Kt)

		150		200		250		300		450	
Pipe Dia.	**Kt**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**
6	5.81	0.04	0.23	0.07	0.40	0.11	0.63	0.16	0.91	0.35	2.04
8	0.00	0.01	0.00	0.02	0.00	0.03	0.00	0.05	0.00	0.11	0.00
10	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.02	0.00	0.05	0.00
12	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.02	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Minor Head Loss			**0.23**		**0.40**		**0.63**		**0.91**		**2.04**

This table is automatically generated based on the previous worksheet inputs.

Pipe Loss On Suction Side Of Pump

System Head Points					Point No.1		Point No. 2		Point No. 3		Point No. 4		Point No. 5	
				gpm	150		200		250		300		450	
				cfs	0.33		0.45		0.56		0.67		1.00	
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)	Length (ft.)	"C" Values	100	120	100	120	100	120	100	120	100	120
6	6.22	0.21	5		0.02	0.01	0.03	0.02	0.04	0.03	0.05	0.04	0.12	0.08
8	8.33	0.38	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	10.34	0.58	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	12.4	0.84	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	14.46	1.14	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	16.54	1.49	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	18.62	1.89	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	20.7	2.34	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Total Pipe Loss		0.02	0.01	0.03	0.02	0.04	0.03	0.05	0.04	0.12	0.08

Input the total length of each size pipe on the suction side of the pump.

" k " Factors For Suction Line

	PIPE DIAMETER (IN.)																							
	6			8			10			12			14			16			18			20		
	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt
Loss Type																								
90 EL.		0.42	0		0.42	0		0.39	0		0.39	0		0.39	0		0.36	0		0.36	0		0.36	0
45 EL.		0.22	0		0.22	0		0.21	0		0.21	0		0.21	0		0.19	0		0.19	0		0.19	0
22.5 EL.		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.08	0		0.08	0		0.08	0
Butterfly		0.63	0		0.63	0		0.35	0		0.35	0		0.35	0		0.3	0		0.3	0		0.3	0
Gate		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	0
Tee (thru)		0.28	0		0.28	0		0.26	0		0.26	0		0.26	0		0.24	0		0.24	0		0.24	0
Tee (branch)		0.84	0		0.84	0		0.78	0		0.78	0		0.78	0		0.72	0		0.72	0		0.72	0
Cross (thru)		0.48	0		0.48	0		0.45	0		0.45	0		0.45	0		0.4	0		0.4	0		0.4	0
Cross (branch)		0.88	0		0.88	0		0.8	0		0.8	0		0.8	0		0.75	0		0.75	0		0.75	0
Reducer		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
Entrance	*1*	0.78	0.78		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0
Exit		1	0		1	0		1	0		1	0		1	0		1	0		1	0		1	0
Total Kt			**0.78**			**0**			**0**			**0**			**0**			**0**			**0**			**0**

Minor Suction Head Loss Calculation (Suction Side)

(HL = Vh * Kt)

		150		200		250		300		450	
Pipe Dia.	**Kt**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**
6	0.78	0.04	0.03	0.07	0.05	0.11	0.08	0.16	0.12	0.35	0.27
8	0.00	0.01	0.00	0.02	0.00	0.03	0.00	0.05	0.00	0.11	0.00
10	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.02	0.00	0.05	0.00
12	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.02	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Minor Head Loss			**0.03**		**0.05**		**0.08**		**0.12**		**0.27**

This table is automatically generated based on the previous worksheet inputs.

System Summary

Maximum & Minimum Static Heads For Old Pipe

(Note: All values in this table must be in feet of water.)

		Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No. 5
		150	200	250	300	450
	SYSTEM CURVE FOR C =	100	100	100	100	100
Misc. Loss Here:		*0*	0	0	0	0
Misc. Loss Here:		*0*	0	0	0	0
Misc. Loss Here:		*0*	0	0	0	0
	Discharge Pipe Loss	0.23	0.39	0.59	0.82	1.74
	+ Discharge Minor Loss	0.23	0.40	0.63	0.91	2.04
	hfd =	0.45	0.79	1.21	1.73	3.77
	Suction Pipe Loss	0.02	0.03	0.04	0.05	0.12
	+ Suction Minor Loss	0.03	0.05	0.08	0.12	0.27
	hfs =	0.05	0.08	0.12	0.18	0.39

System Head Curve @ Maximum Static Head Condition

	hsd (Static Discharge Head)	*21.16*	21.16	21.16	21.16	21.16
	- hs (Static Suction or Lift)	*0.00*	0.00	0.00	0.00	0.00
Max. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	21.66	22.03	22.50	23.06	25.32

System Head Curve @ Minimum Static Head Condition

	hsd (Static Discharge Head)	*19.16*	19.16	19.16	19.16	19.16
	- hs (Static Suction or Lift)	*0.00*	0.00	0.00	0.00	0.00
Min. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	19.66	20.03	20.50	21.06	23.32

Input the static discharge head and static suction (or lift) in the yellow cells.

Remember: If the free level of the fluid source is below the inlet of the pump, "hs" will be negative (-).

System Summary

Maximum & Minimum Static Heads For New Pipe

(Note: All values in this table must be in feet of water.)

		Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No. 5
		150	200	250	300	450
	SYSTEM CURVE FOR C =	120	120	120	120	120
Misc. Loss Here:		0	0	0	0	0
Misc. Loss Here:		0	0	0	0	0
Misc. Loss Here:		0	0	0	0	0
	Discharge Pipe Loss	0.16	0.28	0.42	0.59	1.24
	+ Discharge Minor Loss	0.23	0.40	0.63	0.91	2.04
	hfd =	0.39	0.68	1.05	1.49	3.28
	Suction Pipe Loss	0.01	0.02	0.03	0.04	0.08
	+ Suction Minor Loss	0.03	0.05	0.08	0.12	0.27
	hfs =	0.04	0.07	0.11	0.16	0.36

System Head Curve @ Maximum Static Head Condition

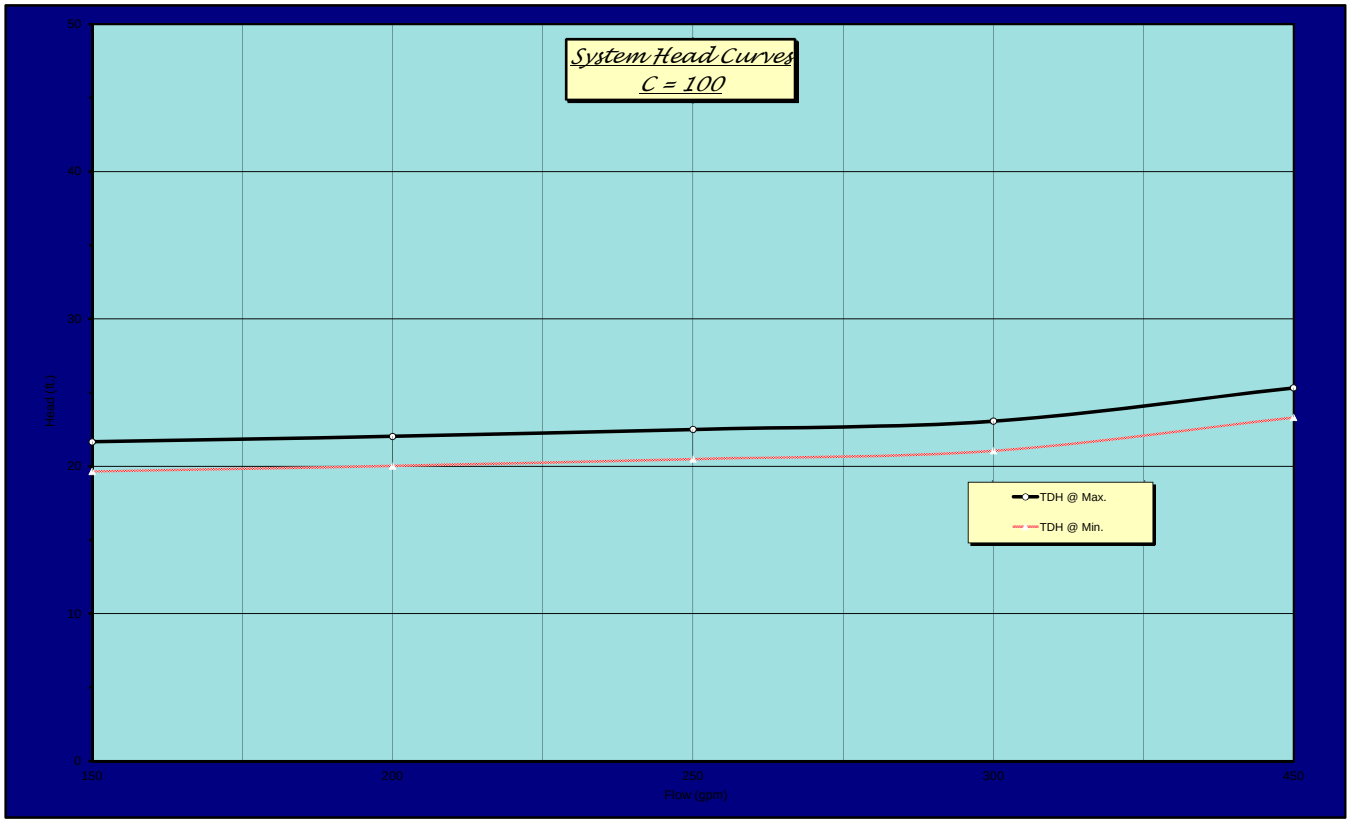
	hsd (Static Discharge Head)	21.16	21.16	21.16	21.16	21.16
	- hs (Static Suction or Lift)	0.00	0.00	0.00	0.00	0.00
Max. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	21.59	21.91	22.32	22.81	24.79

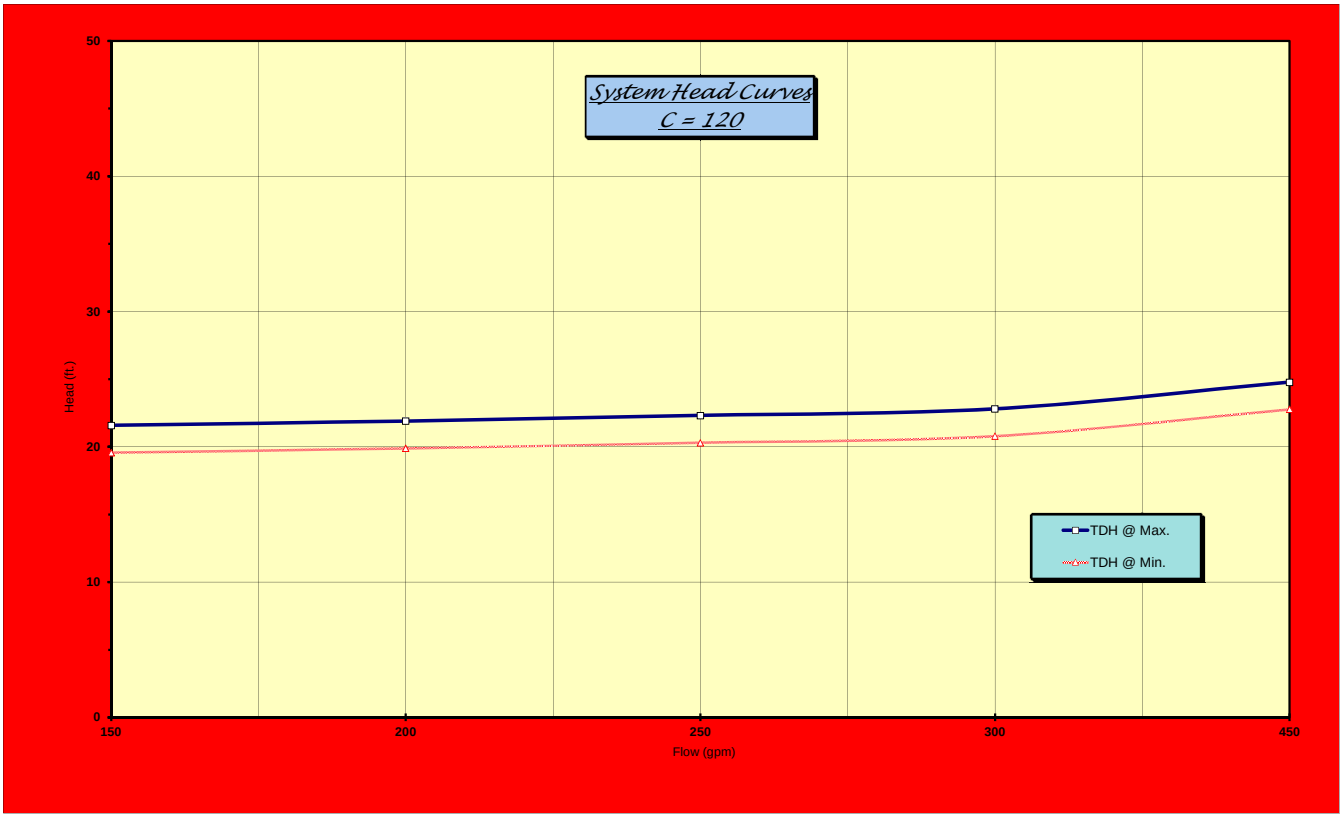
System Head Curve @ Minimum Static Head Condition

	hsd (Static Discharge Head)	19.16	19.16	19.16	19.16	19.16
	- hs (Static Suction or Lift)	0.00	0.00	0.00	0.00	0.00
Min. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	19.59	19.91	20.32	20.81	22.79

Input the static discharge head and static suction (or lift) in the yellow cells.

Remember: If the free level of the fluid source is below the inlet of the pump, "hs" will be negative (-).


System Head Curves
C = 100
Head (ft.)
Flow (gpm)
TDH @ Max.
TDH @ Min.
0
10
20
30
40
50
150
200
250
300
450


System Head Curves
C = 120
Head (ft.)
Flow (gpm)
TDH @ Max.
TDH @ Min.
0
10
20
30
40
50
150
200
250
300
450

Station Pipe Loss On Discharge Side Of Pump (Header Loss)

System Head Points					Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No. 5
Select Flow Rates For Modified Pump Curve Here:					75	100	125	150	225
				cfs	0.17	0.22	0.28	0.33	0.5013
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)	Length (ft.)	Select "C" Value Here:	100	100	100	100	100
4	4.16	0.09	15		0.09	0.15	0.23	0.32	0.68
6	6.22	0.21			0.00	0.00	0.00	0.00	0.00
8	8.33	0.38			0.00	0.00	0.00	0.00	0.00
10	10.34	0.58			0.00	0.00	0.00	0.00	0.00
12	12.4	0.84			0.00	0.00	0.00	0.00	0.00
14	14.46	1.14			0.00	0.00	0.00	0.00	0.00
16	16.54	1.49			0.00	0.00	0.00	0.00	0.00
18	18.62	1.89			0.00	0.00	0.00	0.00	0.00
20	20.7	2.34			0.00	0.00	0.00	0.00	0.00
				Total Pipe Loss	0.00	0.00	0.00	0.00	0.00

" k " Factors For Station Loss Discharge Line

	PIPE DIAMETER (IN.)																							
	4			6			8			10			12			14			16			18		
	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt
Loss Type																								
90 EL.	2	0.42	0.84		0.42	0		0.42	0		0.39	0		0.39	0		0.39	0		0.36	0		0.36	0
45 EL.		0.22	0		0.22	0		0.22	0		0.21	0		0.21	0		0.21	0		0.19	0		0.19	0
22.5 EL.		0.11	0		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.08	0		0.08	0
Butterfly		0.63	0		0.63	0		0.63	0		0.35	0		0.35	0		0.35	0		0.3	0		0.3	0
Gate		0.12	0		0.12	0		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.1	0
Plug	1	0.27	0.27		0.27	0		0.25	0		0.25	0		0.23	0		0.23	0		0.23	0		0.22	0
Tee (thru)	1	0.3	0.3		0.3	0		0.28	0		0.28	0		0.26	0		0.26	0		0.26	0		0.24	0
Tee (branch)		0.9	0		0.9	0		0.84	0		0.84	0		0.78	0		0.78	0		0.78	0		0.72	0
Reducer	1	0.15	0.15		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0
Check	1	0.75	0.75		0.75	0		0.7	0		0.7	0		0.65	0		0.65	0		0.65	0		0.6	0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
Entrance		0.5	0		0.5	0		0.5	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0
Exit		1	0		1	0		1	0		1	0		1	0		1	0		1	0		1	0
Total Kt			**2.31**			**0**			**0**			**0**			**0**			**0**			**0**			**0**

Minor Station Loss Head Loss Calculation
(HL = Vh * Kt)

		75		100		125		150		225	
Pipe Dia.	Kt	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)
4	2.31	0.01	0.02	0.02	0.04	0.03	0.06	0.04	0.09	0.09	0.20
6	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.03	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Minor Loss			**0.02**		**0.04**		**0.06**		**0.09**		**0.20**

This table is automatically generated based on the previous worksheet inputs.

Total Station Loss

	Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No. 5
	75	100	125	150	225
C =	100	100	100	100	100
Station Loss (Pipe)	0.00	0.00	0.00	0.00	0.00
+ Station Loss (Minor)	0.02	0.04	0.06	0.09	0.20
Total Station Loss	0.02	0.04	0.06	0.09	0.20

This table is automatically generated based on the previous worksheet inputs.

These curves were already plotted on Worksheet "System Curves".

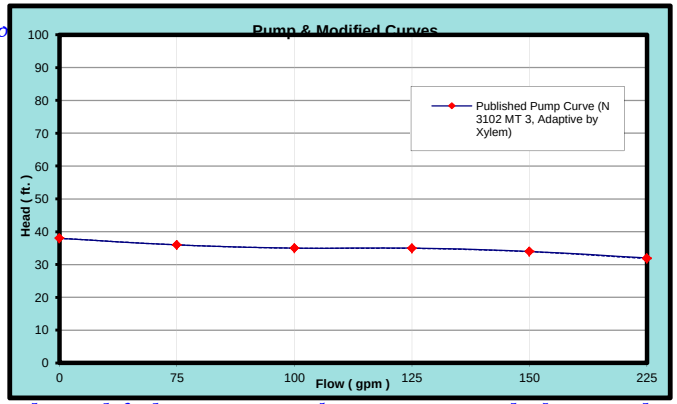
System Head Curves From Worksheet

	C = 100			C = 120	
FLOW (gpm)	TDH @ Max.	TDH @ Min.	FLOW (gpm)	TDH @ Max.	TDH @ Min.
150	21.66	19.66	150	21.59	19.59
200	22.03	20.03	200	21.91	19.91
250	22.50	20.50	250	22.32	20.32
300	23.06	21.06	300	22.81	20.81
450	25.32	23.32	450	24.79	22.79

From the manufacturer's published pump curve select the head at the flo

Pump & Modified Pump Curves			
FLOW (gpm)	Published Pump Curve (N 3102 MT 3, Adaptive by Xylem)	Modified Pump Curve Points (ft.)	Total Station Loss (ft.)
0	38	38.00	0.00
75	36	35.98	0.02
100	35	34.96	0.04
125	35	34.94	0.06
150	34	33.91	0.09
225	32	31.80	0.20

These columns are plotted at the right. (The last column is subtracted from the pump curve points).

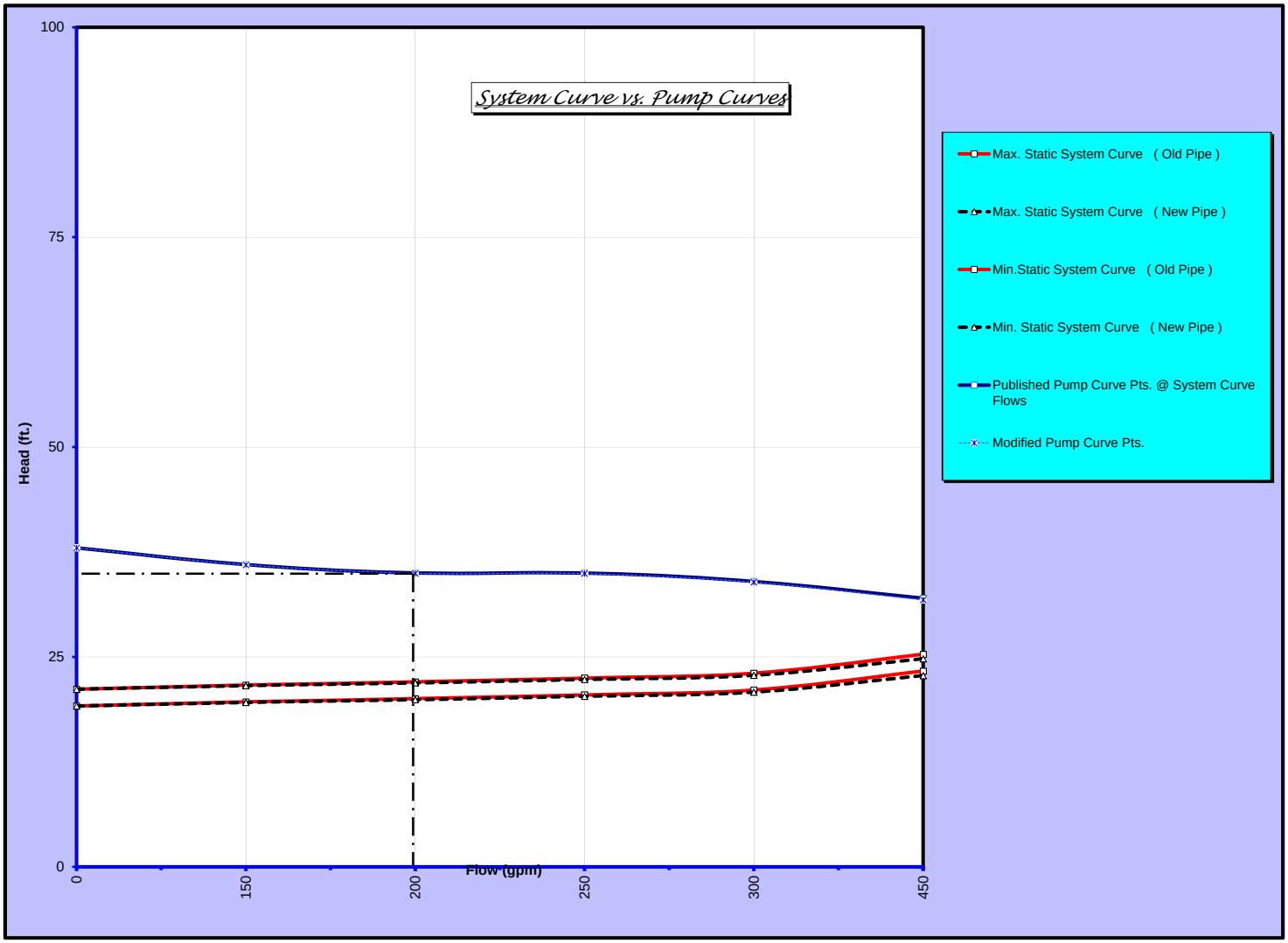


The modified pump curve takes into account the losses in the "station". They must be added back into the system in order to specify the duty point.

This portion of the table summarizes all of the system curves.

Curve Plot						
Flow	Max. Static System Curve (Old Pipe)	Max. Static System Curve (New Pipe)	Min.Static System Curve (Old Pipe)	Min. Static System Curve (New Pipe)	Published Pump Curve Pts. @ System Curve Flows	Modified Pump Curve Pts.
0	21.16	21.16	19.16	19.16	38	38.00
150	21.66	21.59	19.66	19.59	36	35.98
200	22.03	21.91	20.03	19.91	35	34.96
250	22.50	22.32	20.50	20.32	35	34.94
300	23.06	22.81	21.06	20.81	34	33.91
450	25.32	24.79	23.32	22.79	32	31.80
	Curve #1	*Curve #2*	*Curve #3*	*Curve #4*	*Curve #5*	*Curve #6*

The station losses have to be manually input. From the plot above interpolate, if necessary, and input the modified pump curve point in this column.


System Curve vs. Pump Curves
Head (ft.)
100
75
50
25
0
Flow (gpm)
0
150
200
250
300
450
Max. Static System Curve (Old Pipe)
Max. Static System Curve (New Pipe)
Min.Static System Curve (Old Pipe)
Min. Static System Curve (New Pipe)
Published Pump Curve Pts. @ System Curve Flows
Modified Pump Curve Pts.

H 2 M architects + engineers

PRE-EQUALIZATION: TANK SIZING

Phase	Average Daily Flow	Recycle flow per week	Weekly Total flow[1]	Equalized Flow Per Day to be treated[2] (over 5 day work week)	Total Flow remaining for weekend treatment (over 2 days)	Proposed Number of Tanks Req'd.	Existing Settling Tank Volume per tank[4]	Total Volume[4]	TOTAL Pre-eq Volume
	gpd	gallons	gallons	gallons	gallons		gallons	gallons	% of ADF
Existing	25,000	-	125,000	20,692	21,542	1	21,542	21,542	86.2%
100,000 gpd Flow	100,000	-	500,000	95,692	21,542	1	21,542	21,542	**21.5%**

Phase	Average Daily Flow	Recycle flow per week	Weekly Total flow[1]	Equalized Flow Per Day to be treated[2] (over 7 day work week)	Proposed Number of Tanks	SWD Depth [3]	Apprx Tank Sq. Size	Total Effective Vol. per tank
	gpd	gallons	gallons	gallons		ft	ft x ft	gallons
Existing	25,000	-	125,000	14,780	1	10	288.0	17,234
100,000 gpd Flow	100,000	-	500,000	68,351	1	10	288.0	17,234

Phase	Average Daily Flow	Recycle flow per week	Weekly Total flow [1]	Equalized Flow Per Day to be treated[2] (over 5 day work week)	Forward Flow Rate	Number Of Pumps Required	Flowrate Per Pump
	gpd	gallons	gallons	gallons	gpm		gpm
Existing	25,000	-	125,000	20,692	14.37	2	7
100,000 gpd Flow	100,000	-	500,000	95,692	66.45	2	33

1. Assuming 5 day work week with negligible flow contribution on weekends
2. Weekly total flow (5 day period) that will be treated at an equalized flow rate over a 7 day period
3. Side water depth (SWD) is tank depth minus 1.0 foot freeboard
4. Total volume **does** account for liquid level for diffuser coverage
5. Use two (2) pre-eq pumps, each rated at 200 gpm. One pump will be an on line spare. All pumps are variable speed controlled and will pump through a flow splitter box located above the top of tank. During intital plant start-up existing flow can be recycled back through the influent wet well from the splitter box to reduce energy consumption through operation of the Pre-Eq pumps; influent wet well will serve as equalization tank for existing low flow.

Definitions:	
TDH =	Total Dynamic Head
Hd =	Total Discharge Head
Hs =	Total Suction Head
TDH = Hd - Hs	The total discharge head less the total suction head.

Hd = hsd + hfd	
Where:	
hsd =	Static Discharge Head (ft.). The vertical distance in feet above the pump centerline to the free level of discharge .
hfd =	Friction head in discharge line (pipe loss + fitting & valve losses).

Hs = hs - hfs	
Where:	
hs =	Static Suction Head (ft.).
	The vertical distance in feet above the centerline of the pump inlet to the free level of the fluid source.
	In this case, "hs" is positive (+).
	If the free level of the fluid source is below the inlet, hs will be negative (-). This is known as static suction lift.
hfs =	Friction head in suction line (pipe loss + fitting & valve losses).

Substituting:	
TDH = (hsd - hs) + hfs + hfd	*(Pay attention to the sign of the value "hs")*

General Explanation of Worksheets:	
Data Input Worksheet	Input your data here
Worksheet No. 1	Calculates the velocity and velocity head for any pipe sizes. Default values are 8" - 24"
Worksheet No. 2	Calculates the pipe loss due to friction in the discharge line of the pump.
Worksheet No. 3	Calculates the " k " factor for minor losses in the pump discharge line.
Worksheet No. 4	Calculates minor losses in pump discharge line. This worksheet uses the "Total KT " calculated in Worksheet 3.
Worksheet No. 5	Calculates the pipe loss due to friction in the suction line of the pump.
Worksheet No. 6	Calculates the " k " factor for minor losses in the pump suction line.
Worksheet No. 7	Calculates minor losses in pump suction line. This worksheet uses the "Total KT " calculated in Worksheet 6.
TDH Calc. (Old Pipe)	Calculates TDH for a "C" value and max. & min. static heads.
TDH Calc. (New Pipe)	Calculates TDH for a "C" value and max. & min. static heads.
System Curves	Plots System Head Curve at C values
Station Loss (Pipe)	Calculates the pipe loss due to friction for station loss section of pipe
Station Loss (Minor)	Calculates the " k " factor for minor losses for the station loss section
Station Loss - Minor Head Loss	Calculates minor losses for the station loss section. This worksheet uses the "Total KT " calculated in Worksheet 6.
Modified - TDH Curve	Plots the worst case system head curve, pump performance curve, and modified pump curve.

Note: Values to be inserted have a yellow cell background. Type the value in the highlighted cell only.
Values in Red are cell references. Do not edit red values. Values in Blue are calculated values. Only edit the formula.

Step #			
1	Select System Flow Rates Used To Generate System Head Curves:		
	Point No. 1	30	gpm
	Point No. 2	50	gpm
	Point No. 3	70	gpm
	Ponit No. 4	100	gpm
	Point No. 5	130	gpm
2	Select "C" values		
	New Pipe:	120	
	Older Pipe:	100	

Assumption: Class 53, Ductile Iron, Cement Lined.
Use C = 120 and C = 100 for DI pipe

WORKSHEET DIRECTIONS		
3	Worksheet No. 1	Insert pipe information. Pipe area is calculated based on ID.
4	Worksheet No. 2	Calculates pipe loss for input "C" values in the discharge pipe.
5	Worksheet No. 3	Input the total no. of fittings, valves in the column marked "QTY." Worksheet calculates "Total Kt" for each pipe diameter.
6	Worksheet No. 4	No input is required. Total minor head loss in discharge line is automatically calculated.
7	Worksheet No. 5	Same as Worksheet 2 except for suction line of the pump.
8	Worksheet No. 6	Same as Worksheet 3 except for suction line of the pump.
9	Worksheet No. 7	No input is required. Total minor head loss in suction line is automatically calculated.
10	Worksheet "TDH Calc.". (OLD PIPE)	Input information with yellow cell background. For "hs" pay attention to it's sign (-) or (+). *(Misc. Losses shown are treated as additional static head.)* *Note: You should have input for Maximum Static Head and Minimum Static Head.*
11	Worksheet "TDH Calc.". (NEW PIPE)	Input information with yellow cell background. For "hs" pay attention to it's sign (-) or (+). *(Misc. Losses shown are treated as additional static head.)* *Note: You should have input for Maximum Static Head and Minimum Static Head.*
12	Worksheet " System Curve"	Worksheet " System Curve" - Plots system head curves for Min. & Max. static heads and at selected "C" values.
13	Station Loss (Pipe)	Calculates pipe loss for input "C" values.
14	Station Loss (Minor)	Input the total no. of fittings, valves in the column marked "QTY." Worksheet calculates "Total Kt" for each pipe diameter.
15	Station Loss - Minor Head Loss	No input is required. Total minor head loss in discharge line is automatically calculated.
16	Modified - TDH Curve	Insert the required information for the pump you have selected.

Pipe Hydraulic Parameters

System Head Points				Point No.1		Point No. 2		Point No. 3		Point No. 4		Point No. 5	
			gpm	30		50		70		100		130	
			cfs	0.06684		0.1114		0.15596		0.2228		0.28964	
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)		Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)
4	4.16	0.09		0.71	0.01	1.18	0.02	1.65	0.04	2.36	0.09	3.07	0.15
6	6.22	0.21		0.32	0.00	0.53	0.00	0.74	0.01	1.06	0.02	1.37	0.03
8	8.33	0.38		0.18	0.00	0.29	0.00	0.41	0.00	0.59	0.01	0.77	0.01
10	10.34	0.58		0.11	0.00	0.19	0.00	0.27	0.00	0.38	0.00	0.50	0.00
12	12.4	0.84		0.08	0.00	0.13	0.00	0.19	0.00	0.27	0.00	0.35	0.00
14	14.46	1.14		0.06	0.00	0.10	0.00	0.14	0.00	0.20	0.00	0.25	0.00
16	16.54	1.49		0.04	0.00	0.07	0.00	0.10	0.00	0.15	0.00	0.19	0.00
18	18.62	1.89		0.04	0.00	0.06	0.00	0.08	0.00	0.12	0.00	0.15	0.00
20	20.7	2.34		0.03	0.00	0.05	0.00	0.07	0.00	0.10	0.00	0.12	0.00

Edit the values in the yellow cells for the pipe sizes of your application

Pipe Loss On Discharge Side Of Pump

System Head Points					Point No.1		Point No. 2		Point No. 3		Point No. 4		Point No. 5	
				gpm	30		50		70		100		130	
				cfs	0.07		0.11		0.16		0.22		0.28964	
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)	Length (ft.)	"C" Values	100	120	100	120	100	120	100	120	100	120
4	4.16	0.09	100		0.11	0.08	0.28	0.20	0.52	0.37	1.02	0.72	1.65	**1.18**
6	6.22	0.21			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
8	8.33	0.38			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
10	10.34	0.58			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
12	12.4	0.84			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
14	14.46	1.14			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
16	16.54	1.49			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
18	18.62	1.89			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
20	20.7	2.34			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
			Total Pipe Loss		**0.11**	**0.08**	**0.28**	**0.20**	**0.52**	**0.37**	**1.02**	**0.72**	**1.65**	**1.18**

Type the length for each size pipe in your system in the yellow cells.

" k " Factors For Discharge Line

	PIPE DIAMETER (IN.)																							
	4			6			8			10			12			14			16			18			20		
	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt
Loss Type																										
90 EL.	3	0.42	1.26		0.42	0		0.42	0		0.39	0		0.39	0		0.39	0		0.36	0		0.36	0		0.36	0
45 EL.	2	0.22	0.44		0.22	0		0.22	0		0.21	0		0.21	0		0.21	0		0.19	0		0.19	0		0.19	0
22.5 EL.		0.11	0		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.08	0		0.08	0		0.08	0
Butterfly		0.63	0		0.63	0		0.63	0		0.35	0		0.35	0		0.35	0		0.3	0		0.3	0		0.3	0
Gate		0.12	0		0.12	0		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	0
Plug	1	0.27	0.27		0.27	0		0.25	0		0.25	0		0.23	0		0.23	0		0.23	0		0.22	0		0.22	0
Tee (thru)	1	0.3	0.3		0.3	0		0.28	0		0.28	0		0.26	0		0.26	0		0.26	0		0.24	0		0.24	0
Tee (branch)		0.9	0		0.9	0		0.84	0		0.84	0		0.78	0		0.78	0		0.78	0		0.72	0		0.72	0
Reducer		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0
Check		0.75	0		0.75	0		0.7	0		0.7	0		0.65	0		0.65	0		0.65	0		0.6	0		0.6	0
			0			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0			0
Entrance		0.5	0		0.5	0		0.5	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0
Exit	1	1	1		1	0		1	0		1	0		1	0		1	0		1	0		1	0		1	0
Total Kt			3.27			0			0			0			0			0			0			0			0

You can enter minor loss components in the yellow cells.

Minor Discharge Head Loss Calculation (Discharge Side)

(HL = Vh * Kt)

		30		50		70		100		130	
Pipe Dia.	**Kt**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**
4	3.27	0.01	0.03	0.02	0.07	0.04	0.14	0.09	0.28	0.15	0.48
6	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.03	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Minor Head Loss			**0.03**		**0.07**		**0.14**		**0.28**		**0.48**

This table is automatically generated based on the previous worksheet inputs.

Pipe Loss On Suction Side Of Pump

System Head Points					Point No.1		Point No. 2		Point No. 3		Point No. 4		Point No. 5	
				gpm	30		50		70		100		130	
				cfs	0.07		0.11		0.16		0.22		0.29	
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)	Length (ft.)	"C" Values	100	120	100	120	100	120	100	120	100	120
4	4.16	0.09	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	6.22	0.21	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	8.33	0.38	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	10.34	0.58	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	12.4	0.84	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	14.46	1.14	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	16.54	1.49	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	18.62	1.89	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	20.7	2.34	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Total Pipe Loss		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Input the total length of each size pipe on the suction side of the pump.

" k " Factors For Suction Line

	PIPE DIAMETER (IN.)																										
	4			6			8			10			12			14			16			18			20		
	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt
Loss Type																											
90 EL.		0.42	0		0.42	0		0.42	0		0.39	0		0.39	0		0.39	0		0.36	0		0.36	0		0.36	0
45 EL.		0.22	0		0.22	0		0.22	0		0.21	0		0.21	0		0.21	0		0.19	0		0.19	0		0.19	0
22.5 EL.		0.11	0		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.08	0		0.08	0		0.08	0
Butterfly		0.63	0		0.63	0		0.63	0		0.35	0		0.35	0		0.35	0		0.3	0		0.3	0		0.3	0
Gate		0.11	0		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	0
Tee (thru)		0.28	0		0.28	0		0.28	0		0.26	0		0.26	0		0.26	0		0.24	0		0.24	0		0.24	0
Tee (branch)		0.84	0		0.84	0		0.84	0		0.78	0		0.78	0		0.78	0		0.72	0		0.72	0		0.72	0
Cross (thru)		0.48	0		0.48	0		0.48	0		0.45	0		0.45	0		0.45	0		0.4	0		0.4	0		0.4	0
Cross (branch)		0.88	0		0.88	0		0.88	0		0.8	0		0.8	0		0.8	0		0.75	0		0.75	0		0.75	0
Reducer		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0
			0			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0			0
Entrance		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0
Exit		1	0		1	0		1	0		1	0		1	0		1	0		1	0		1	0		1	0
Total Kt			**0**			**0**			**0**			**0**			**0**			**0**			**0**			**0**			**0**

Minor Suction Head Loss Calculation (Suction Side)

(HL = Vh * Kt)

		30		50		70		100		130	
Pipe Dia.	**Kt**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**	**Vh**	**HL (ft.)**
4	0.00	0.01	0.00	0.02	0.00	0.04	0.00	0.09	0.00	0.15	0.00
6	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.03	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Minor Head Loss		**0.00**		**0.00**		**0.00**		**0.00**		**0.00**

This table is automatically generated based on the previous worksheet inputs.

System Summary

Maximum & Minimum Static Heads For Old Pipe

(Note: All values in this table must be in feet of water.)

		Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No. 5
		30	50	70	100	130
	SYSTEM CURVE FOR C =	100	100	100	100	100
Misc. Loss Here:		0	0	0	0	0
Misc. Loss Here:		0	0	0	0	0
Misc. Loss Here:		0	0	0	0	0
	Discharge Pipe Loss	0.11	0.28	0.52	1.02	1.65
	+ Discharge Minor Loss	0.03	0.07	0.14	0.28	0.48
	hfd =	0.13	0.35	0.66	1.30	2.13
	Suction Pipe Loss	0.00	0.00	0.00	0.00	0.00
	+ Suction Minor Loss	0.00	0.00	0.00	0.00	0.00
	hfs =	0.00	0.00	0.00	0.00	0.00

System Head Curve @ Maximum Static Head Condition

	hsd (Static Discharge Head)	20.00	20.00	20.00	20.00	20.00
	- hs (Static Suction or Lift)	0.00	0.00	0.00	0.00	0.00
Max. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	20.13	20.35	20.66	21.30	22.13

System Head Curve @ Minimum Static Head Condition

	hsd (Static Discharge Head)	10.00	10.00	10.00	10.00	10.00
	- hs (Static Suction or Lift)	0.00	0.00	0.00	0.00	0.00
Min. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	10.13	10.35	10.66	11.30	12.13

Input the static discharge head and static suction (or lift) in the yellow cells.

Remember: If the free level of the fluid source is below the inlet of the pump, "hs" will be negative (-).

System Summary

Maximum & Minimum Static Heads For New Pipe

(Note: All values in this table must be in feet of water.)

		Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No. 5
		30	50	70	100	130
	SYSTEM CURVE FOR C =	120	120	120	120	120
Misc. Loss Here:			0	0	0	0
Misc. Loss Here:		0	0	0	0	0
Misc. Loss Here:		0	0	0	0	0
	Discharge Pipe Loss	0.08	0.20	0.37	0.72	1.18
	+ Discharge Minor Loss	0.03	0.07	0.14	0.28	0.48
	hfd =	0.10	0.27	0.51	1.01	1.66
	Suction Pipe Loss	0.00	0.00	0.00	0.00	0.00
	+ Suction Minor Loss	0.00	0.00	0.00	0.00	0.00
	hfs =	0.00	0.00	0.00	0.00	0.00

System Head Curve @ Maximum Static Head Condition

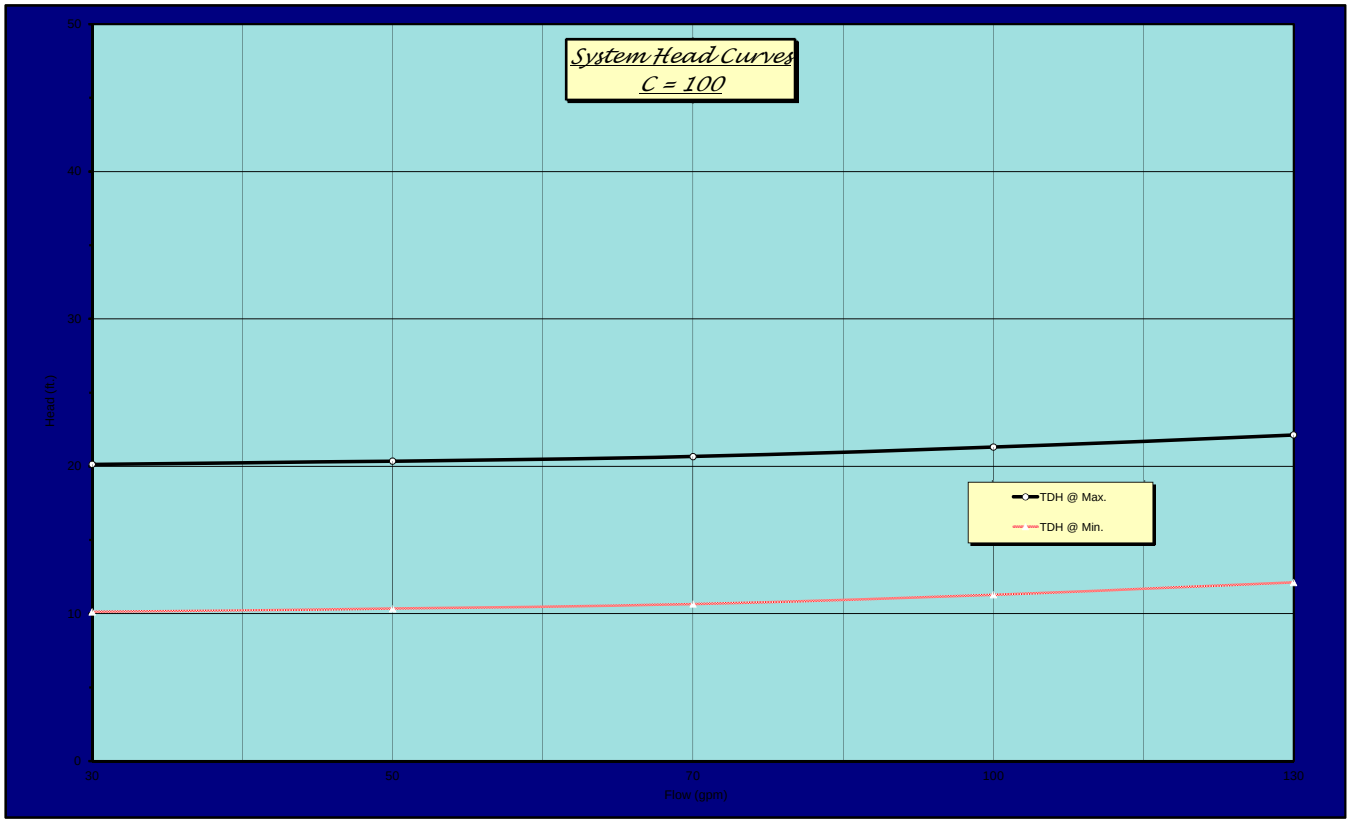
	hsd (Static Discharge Head)	20.00	20.00	20.00	20.00	20.00
	- hs (Static Suction or Lift)	0.00	0.00	0.00	0.00	0.00
Max. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	20.10	20.27	20.51	21.01	21.66

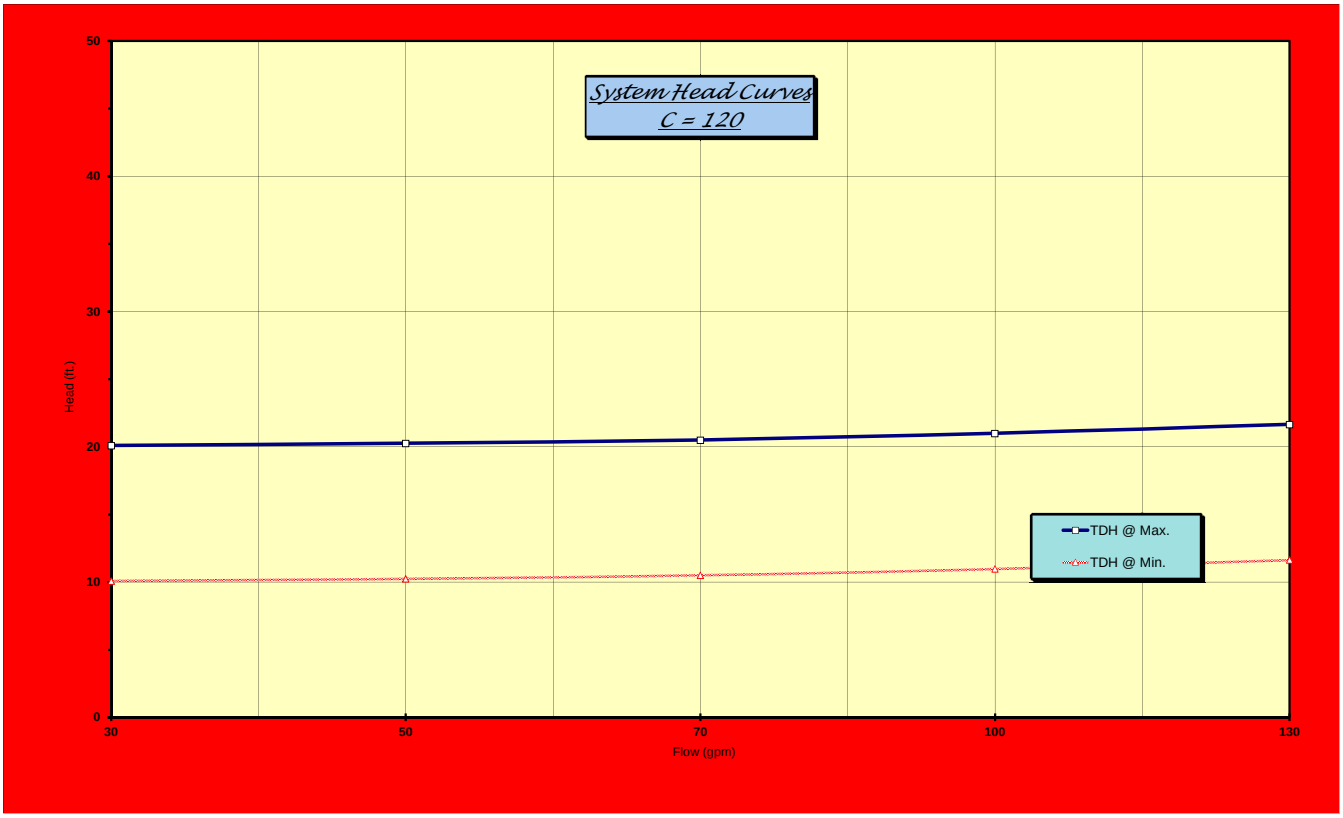
System Head Curve @ Minimum Static Head Condition

	hsd (Static Discharge Head)	10.00	10.00	10.00	10.00	10.00
	- hs (Static Suction or Lift)	0.00	0.00	0.00	0.00	0.00
Min. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	10.10	10.27	10.51	11.01	11.66

Input the static discharge head and static suction (or lift) in the yellow cells.

Remember: If the free level of the fluid source is below the inlet of the pump, "hs" will be negative (-).


System Head Curves
C = 100
Head (ft.)
Flow (gpm)
TDH @ Max.
TDH @ Min.
0
10
20
30
40
50
30
50
70
100
130


System Head Curves
C = 120
Head (ft.)
Flow (gpm)
TDH @ Max.
TDH @ Min.
0
10
20
30
40
50
30
50
70
100
130

Station Pipe Loss On Discharge Side Of Pump (Header Loss)

System Head Points					Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No. 5
Select Flow Rates For Modified Pump Curve Here:					15	25	35	50	65
				cfs	0.03	0.06	0.08	0.11	0.14482
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)	Length (ft.)	Select "C" Value Here:	100	100	100	100	100
6	6.22	0.21			0.00	0.00	0.00	0.00	0.00
8	8.33	0.38			0.00	0.00	0.00	0.00	0.00
10	10.34	0.58			0.00	0.00	0.00	0.00	0.00
12	12.4	0.84			0.00	0.00	0.00	0.00	0.00
14	14.46	1.14			0.00	0.00	0.00	0.00	0.00
16	16.54	1.49			0.00	0.00	0.00	0.00	0.00
18	18.62	1.89			0.00	0.00	0.00	0.00	0.00
20	20.7	2.34			0.00	0.00	0.00	0.00	0.00
				Total Pipe Loss	0.00	0.00	0.00	0.00	0.00

" k " Factors For Station Loss Discharge Line

	PIPE DIAMETER (IN.)																							
	6			8			10			12			14			16			18			20		
	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt
Loss Type																								
90 EL.		0.42	0		0.42	0		0.39	0		0.39	0		0.39	0		0.36	0		0.36	0		0.36	0
45 EL.		0.22	0		0.22	0		0.21	0		0.21	0		0.21	0		0.19	0		0.19	0		0.19	0
22.5 EL.		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.08	0		0.08	0		0.08	0
Butterfly		0.63	0		0.63	0		0.35	0		0.35	0		0.35	0		0.3	0		0.3	0		0.3	0
Gate		0.12	0		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	0
Plug		0.27	0		0.25	0		0.25	0		0.23	0		0.23	0		0.23	0		0.22	0		0.22	0
Tee (thru)		0.3	0		0.28	0		0.28	0		0.26	0		0.26	0		0.26	0		0.24	0		0.24	0
Tee (branch)		0.9	0		0.84	0		0.84	0		0.78	0		0.78	0		0.78	0		0.72	0		0.72	0
Reducer		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0
Check		0.75	0		0.7	0		0.7	0		0.65	0		0.65	0		0.65	0		0.6	0		0.6	0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
Entrance		0.5	0		0.5	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0
Exit		1	0		1	0		1	0		1	0		1	0		1	0		1	0		1	0
Total Kt			**0**			**0**			**0**			**0**			**0**			**0**			**0**			**0**

Minor Station Loss Head Loss Calculation
(HL = Vh * Kt)

		15		25		35		50		65	
Pipe Dia.	Kt	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Minor Loss			**0.00**		**0.00**		**0.00**		**0.00**		**0.00**

This table is automatically generated based on the previous worksheet inputs.

Total Station Loss

	Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No. 5
	15	25	35	50	65
C =	100	100	100	100	100
Station Loss (Pipe)	0.00	0.00	0.00	0.00	0.00
+ Station Loss (Minor)	0.00	0.00	0.00	0.00	0.00
Total Station Loss	0.00	0.00	0.00	0.00	0.00

This table is automatically generated based on the previous worksheet inputs.

These curves were already plotted on Worksheet "System Curves".

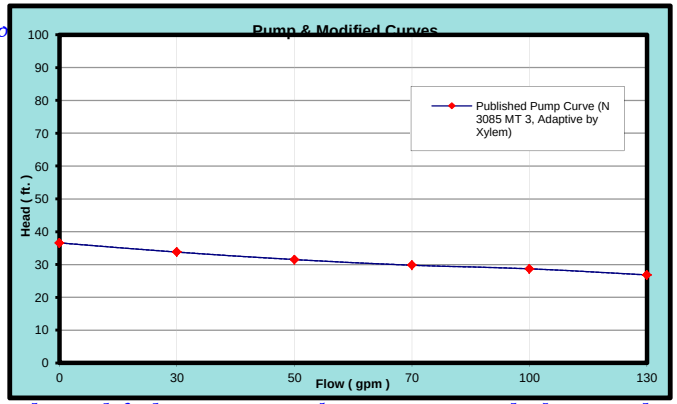
System Head Curves From Worksheet

	C = 100			C = 120	
FLOW (gpm)	TDH @ Max.	TDH @ Min.	FLOW (gpm)	TDH @ Max.	TDH @ Min.
30	20.13	10.13	30	20.10	10.10
50	20.35	10.35	50	20.27	10.27
70	20.66	10.66	70	20.51	10.51
100	21.30	11.30	100	21.01	11.01
130	22.13	12.13	130	21.66	11.66

From the manufacturer's published pump curve select the head at the flo

Pump & Modified Pump Curves			
FLOW (gpm)	Published Pump Curve (N 3085 MT 3, Adaptive by Xylem)	Modified Pump Curve Points (ft.)	Total Station Loss (ft.)
0	36.6	36.60	0.00
30	33.8	33.80	0.00
50	31.5	31.50	0.00
70	29.8	29.80	0.00
100	28.7	28.70	0.00
130	26.8	26.80	0.00

These columns are plotted at the right. (The last column is subtracted from the pump curve points).

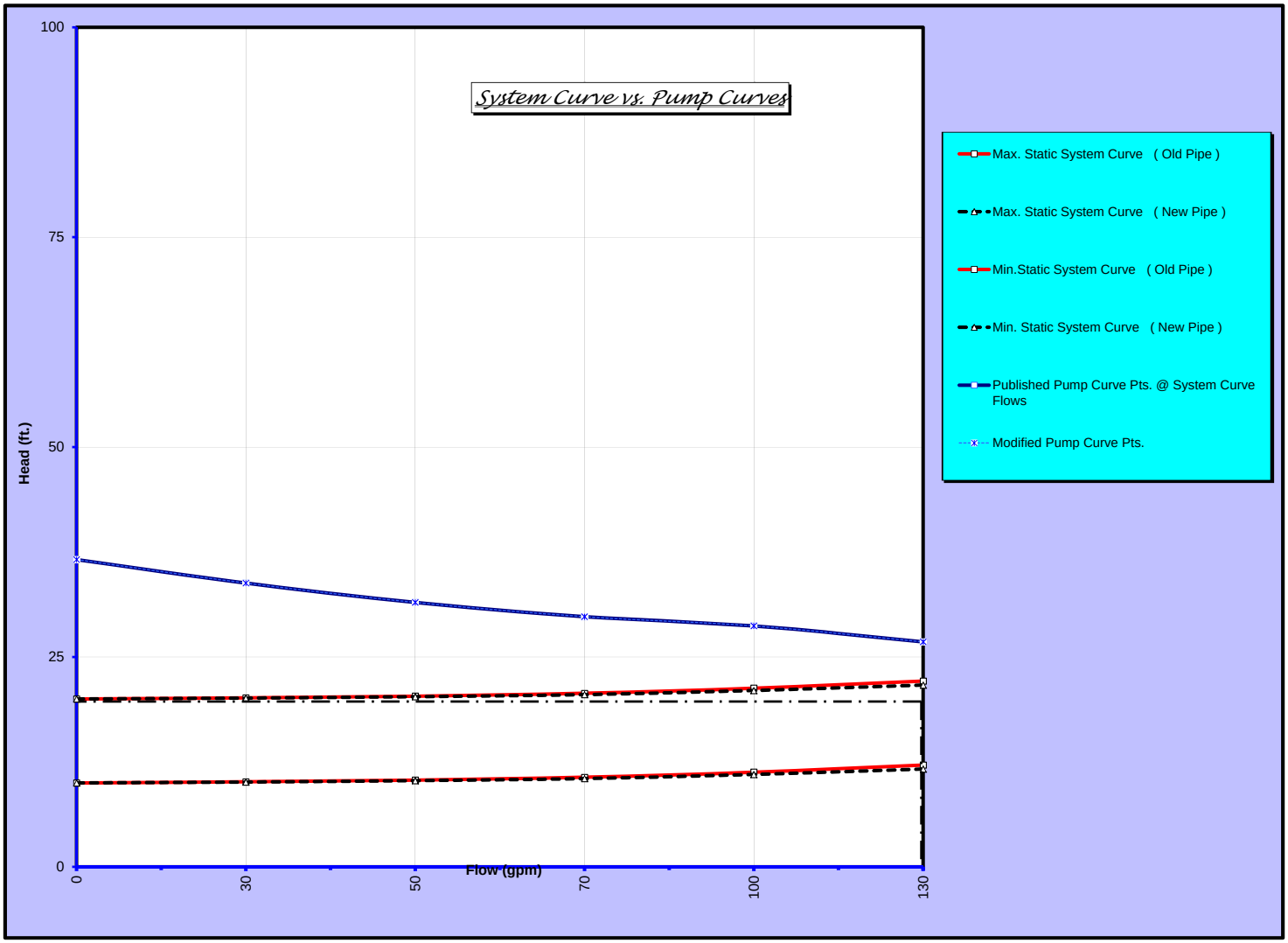


The modified pump curve takes into account the losses in the "station". They must be added back into the system in order to specify the duty point.

This portion of the table summarizes all of the system curves.

Curve Plot						
Flow	Max. Static System Curve (Old Pipe)	Max. Static System Curve (New Pipe)	Min.Static System Curve (Old Pipe)	Min. Static System Curve (New Pipe)	Published Pump Curve Pts. @ System Curve Flows	Modified Pump Curve Pts.
0	20.00	20.00	10.00	10.00	36.6	37
30	20.13	20.10	10.13	10.10	33.8	34
50	20.35	20.27	10.35	10.27	31.5	32
70	20.66	20.51	10.66	10.51	29.8	30
100	21.30	21.01	11.30	11.01	28.7	29
130	22.13	21.66	12.13	11.66	26.8	27
	Curve #1	Curve #2	Curve #3	Curve #4	Curve #5	Curve #6

The station losses have to be manually input. From the plot above interpolate, if necessary, and input the modified pump curve point in this column.


System Curve vs. Pump Curves
Head (ft.)
100
75
50
25
0
0
30
50
70
100
130
Flow (gpm)
Max. Static System Curve (Old Pipe)
Max. Static System Curve (New Pipe)
Min.Static System Curve (Old Pipe)
Min. Static System Curve (New Pipe)
Published Pump Curve Pts. @ System Curve Flows
Modified Pump Curve Pts.

SLUDGE HOLDING TANK SIZING

Phase	Average Daily Flow	Number of MBR Online Tanks	Maximum Waste Sludge per MBR per day[1]	Days of Un-thickened Sludge Storage (10 States Standards)	Total Sludge Volume to be Stored
	gpd		gallons	days	gallons
Existing	25,000	1	427	30	12,795
100,000 gpd Flow	100,000	2	853	30	51,180

Phase	Average Daily Flow	Total Tank Depth (Existing Sludge Tanks)	Existing Sludge Tank SWD Depth[2]	Approximate Tank Sq. Size (Existing Sludge Tanks)	
	gpd		feet	feet	feet
Existing	25,000	12.50	8.50	7.00	35.00
100,000 gpd Flow	100,000	12.50	8.50	7.00	35.00

Phase	Average Daily Flow	Effective Volume[3]	Number of Tanks	Total Effective Volume	Total volume per tank[4]	Actual Days of Storage
	gpd	gallons	qty.	gallons	gallons	days
Existing	25,000	15,578	1	15,578	22,909	36.5
100,000 gpd Flow	100,000	15,578	1	15,578	22,909	**9.1**

1. Based on design info provided by Ovivo (MBR manufacturer)
2. Side water depth (SWD) is total side water depth **including** 2 foot liquid level maintained for pump/diffuser coverage & 2 feet of freeboard
3. Effective volume **does not** include the 2 foot liquid level maintained for pump/diffuser coverage
4. Total volume **includes** the 2 foot liquid level maintained for pump/difusser coverage

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APPENDIX G

Calverton Sewer District
0.100 MGD AWTF
Total Project Cost Opinion
(May 2015)

Task	Cost Opinion
Probable Cost for Construction (4 Prime Contracts)	$6,190,000
Eng. For Facility Plan, Design, Construction Administration (ASCE Curve) *	$530,000
Extra Services Not Included in ASCE Curve ** (P.O. Pending)	$8,000
Draft Facility Plan of Oct. 6, 2014 for .3 MGD ***	$34,500
Construction Observation (18 month construction period - Hourly Rate Basis)	$550,000
Additional Services as Needed ******	$32,000
Table 5 Budget	$129,500
Contingency	$86,000
Supplemental Topographic Survey (Est.) *	$30,000
Lead and Asbestos Testing (Est.)	$8,000
Soil Borings & Piezometers (Est.)	$25,000
Printing **	$1,500
O&M Manual/Process Consultation/Database/Process Spreadsheet	$50,000
Startup Services	$15,000
Total Project Budget:	**$7,560,000**
(Less Grants - See Paragraph 1.2)	($6,941,000)
Net Project Cost:	$619,000

* Includes $89,000 for Map & Plan/Facility Plan (Town P.O. No. 140939)
** Accounts for revising prior 0.3 MGD Facility Plan to 0.1 MGD
*** Facility Plan Adandoned - Funding Unavailable to Proceed
**** SPDES Permit Modification, Grant Applications, Sewer District Tax Implications, CWSRF Funding Assistance, Etc.

Calverton Sewer District
0.100 MGD AWTF
Const-Eng Fee May 2015

Prepared By:NFB

Col. No. 1	Col. No. 2	Col. No. 3	Col. No. 4	Col. No. 5	Col. No. 6	Col. No. 7	Col. No. 8	Col. No. 9	Col. No. 10	Col. No. 11
Project Information			DESIGN						CONSTRUCTION ADMINISTRATION	
Contract Description	Contract Name	Construction Cost Opinion (October 2014)	ASCE % OF Construction	Basic Fee From ASCE Curve	ASCE Increase Factor	Total ASCE Allowed Fee[4]	ASCE Design Fee (75% of Col. No. 7)	% of Construction (Col. No. 8 / Col. No. 3)	ASCE Construction Administration Fee (25% of Col. 7)	% of Construction (Col. No. 14 / Col. No. 3)
	Contract G	$ 3,110,000	6.59%	$ 204,932	1.33	$ 273,000	$ 204,750	6.58%	$ 68,250	2.19%
	Contract P	$ 600,000	8.27%	$ 49,601	1.00	$ 50,000	$ 37,500	6.25%	$ 12,500	2.08%
	Contract E	$ 930,000	7.69%	$ 71,471	1.33	$ 96,000	$ 72,000	7.74%	$ 24,000	2.58%
	Contract S	$ 1,550,000	7.14%	$ 110,640	1.00	$ 111,000	$ 83,250	5.37%	$ 27,750	1.79%
Total.	*Total. . . . . .*	**$ 6,190,000**				**$ 530,000**	**$ 397,500**		**$ 132,500**	

Calverton Sewer District
0.100 MGD AWTF
Contract for General

	Cost Component	Cost (May 2015)
	Allowances	
	Owner's Computer / Camera / Scanner / Printer	$10,000
	Safety, Lab & Maintenance Equipment	$20,000
	Independent Laboratory Testing	$15,000
	Contingency Account	$20,000
1	***Subtotal:***	$65,000
	General Requirements	
	Full-Time Superintendent	$144,000
	Temporary Facilities & Controls	$200,000
	Submittals	$15,000
	Project Schedule	$10,000
	Survey for Construction	$7,500
	Periodic & Final Cleaning	$15,000
	Record Documents	$10,000
2	***Subtotal:***	$401,500
	Site Work	
	Removal/Abandoning of existing surface water outfall	$10,000
	Site Clearing & Grubbing	$10,622
	Crane Rental	$178,560
	Sheeting & Bracing	$0
	Excavation	$121,489
	Fencing around recharge beds	$18,000
	Access gates to recharge beds	$10,000
	Dewatering	$0
	Tank Cleaning/Demo	$75,000
	Backfilling / Compaction	$18,056
	Rough Grading	$10,500
	Final Grading	$5,500
	Drainage Structures	$50,000
	Landscaping	$15,000
	Topsoil & Seeding	$2,500
3	***Subtotal:***	$525,226
	Concrete	
	Eff Pump Station	$3,556
	Headworks Screen Footings	$400
	Add'l Process Tank Walls/Modifications	$23,467
4	***Subtotal:***	$27,422
	Masonry / Steel Joists / Roof Deck / Carpentry / Thermal & Moisture Protection / Doors & Windows /	
	Floor Coating System	$13,000
	Headworks Canopy	$3,200
5	***Subtotal:***	$16,200

	Cost Component	Cost (May 2015)
	Metals	
	Process Tankage Handrailing	$15,000
	Grating at Process Tanks	$30,000
	Ladders	$13,500
	FRP Fabrications	$20,000
	Slide gates/flow control weirs between anoxic and MBR tanks	$15,000
	Access Hatches	$6,000
6	***Subtotal:***	$99,500
	Specialties	
	Signage	$2,500
	Fire Extinguishers	$1,500
7	***Subtotal:***	$4,000
	Equipment	
	Fine Mechanical Bar Screens (2)	$85,000
	MBR Process Equipment	$800,000
	Inf. Pump Station Pumps (3)	$45,000
	Inf. Pump Station Controls	$40,000
	Eff. Pumps (2)	$35,000
	Pre-Eq. Pumps (2)	$25,000
	Subtotal Equipment Costs:	$1,030,000
	Contractor Equipment Markup:	$154,500
	Installation of Equipment	$412,000
8	***Subtotal for This Category:***	$1,596,500
	HVAC	
	Air conditioning, heating, exhaust fans, louvers, ductwork, environmental controls, etc.	$15,000
	Subtotal Equipment Costs:	$15,000
	Contractor Equipment Markup:	$2,250
	Installation of Equipment	$6,000
9	***Subtotal for This Category:***	$23,250
	Conveying Systems	
	Jib Crane at Pre-EQ/Eff P.S.	$4,500
	Subtotal:	$4,500
	Installation of Equipment	$1,800
10	***Subtotal for This Category:***	$6,300
11	**Total All Above Categories**	$2,764,899
	General Conditions	
	Bonds	$27,650
	Insurance	$27,650
12	***Subtotal:***	$55,300
13	***Subtotal Categories 1 - 13:***	$2,820,199
14	Non-itemized work construction costs (10%)	$282,020
15	**Total Construction Cost For Contract G**	$3,102,219
	Say:	**$3,110,000**

Calverton Sewer District
0.100 MGD AWTF
Contract for Plumbing

	Cost Component	Cost (May 2015)
	Allowances	
	Contingency Account	$10,000
	New Water Service	$10,000
	New Gas Service	$35,000
	Testing Allowance	$10,000
1	***Subtotal:***	$65,000
	General Requirements	
	Full-Time Superintendent	$90,000
	Temporary Facilities & Controls	$50,000
	Submittals	$10,000
	Project Schedule	$5,000
	Periodic & Final Cleaning	$10,000
	Piping Pressure Testing	$10,000
	Record Documents	$7,500
2	***Subtotal:***	$182,500
	Concrete	
	Thrust blocking	$8,250
3	***Subtotal:***	$8,250
	Special Construction	
	Effluent Pumps Magnetic Flow meter	$7,500
	Subtotal:	$7,500
	Installation of Equipment	$3,000
4	***Subtotal for This Category:***	$10,500
	Mechanical	
	Yard Piping Modification - Inf. Pump Station to Fine Screen	$1,500
	Yard Piping - Permeate piping to Operations Building	$26,000
	Yard Piping - Permeate Piping from Operations Building to Effluent Pump Station	$26,000
	Yard Piping - Recharge Bed Site	$15,000
	Exposed Copper at Operations Building	$7,500
	Exposed D.I. Piping in Operations Building	$10,000
	Exposed PVC at Operations Building	$2,500
	Exposed D.I. Piping in Process Tanks	$25,000
	Exposed PVC Piping at Process Tanks	$2,500
	Air Piping and Diffuser in Pre-EQ and Sludge Tanks	$125,000
	Miscellenous Pipe Relocations	$5,500
	Electrical Conduit Relocations	$10,000
	Mechanical Identification	$10,000
5	***Subtotal for This Category:***	$266,500
6	**Total All Above Categories**	$532,750
	General Conditions	
	Bonds	$5,330
	Insurance	$5,330
7	***Subtotal:***	$10,660
8	***Subtotal Categories 1 - 13:***	$543,410
9	Non-itemized work construction costs (10%)	$54,341
10	**Total Construction Cost For Contract P**	$597,751
	Say:	**$600,000**

Calverton Sewer District
0.100 MGD AWTF
Contract for Electrical

	Cost Component	Cost (May 2015)
	Allowances	
	New Telephone Service	$10,000
	Telephone Service for Construction	$7,500
	Testing Allowance	$7,500
	PSEG Transformer Replacement	$20,000
1	***Subtotal:***	$45,000
	General Requirements	
	Full-Time Superintendent	$63,000
	Temporary Facilities & Controls	$50,000
	Submittals	$10,000
	Project Schedule	$5,000
	Periodic & Final Cleaning	$10,000
	Record Documents	$5,000
2	***Subtotal:***	$143,000
	Electrical	
	MCC's, electrical servies, underground conduit, site lighting, local disconnects, control panel installation, terminations, concrete duct banks, electrical startup, testing, training, etc.	$200,000
	Control Panel for Effluent Pump Station	$15,000
	Video Chart Recorders (1)	$4,500
	Annunciator (1)	$2,500
	Float Switches (8)	$4,000
	Level Transducers (4)	$5,000
	Site Lighting at Recharge Bed Site	$75,000
	Site Lighting ar AWTF	$15,000
	Emergency Stand-by Gen Set	$300,000
3	***Subtotal:***	$621,000
4	***Subtotal 1 - 3***	$809,000
	General Conditions	
	Bonds	$12,140
	Insurance	$12,140
	Miscellaneous Requirements	$8,090
5	***Subtotal:***	$32,370
6	***Subtotal Categories 1 - 3***	$841,370
7	Non-itemized work construction costs (10%)	$84,137
8	**Total Construction Cost For Contract E**	$925,507
	Say:	**$930,000**

Calverton Sewer District
0.100 MGD AWTF
Contract for Sewer

	Cost Component	Cost (May 2015)
	Allowances	
	Independent Laboratory Testing	$17,500
1	***Subtotal:***	$17,500
	General Requirements	
	Full-Time Superintendent	$30,000
	Submittals	$5,000
	Project Schedule	$1,500
	Site Survey for Construction	$20,000
	Periodic & Final Cleaning	$10,000
	Record Documents	$5,000
2	***Subtotal:***	$71,500
	Site Work	
	Effluent force main to recharge bed site	$1,150,000
	Clean-outs	$90,000
	Pavement Restoration along paved roadways	$26,250
	Pavement Restoration in vicinity of directional drill pits	$22,500
3	***Subtotal:***	$1,288,750
11	**Total All Above Categories**	$1,377,750.00
	General Conditions	
	Bonds	$13,780
	Insurance	$13,780
12	***Subtotal:***	$27,560
13	***Subtotal Categories 1 - 13:***	$1,405,310
14	Non-itemized work construction costs (10%)	$140,531
15	**Total Construction Cost For Contract S**	$1,545,841
	Say:	**$1,550,000**

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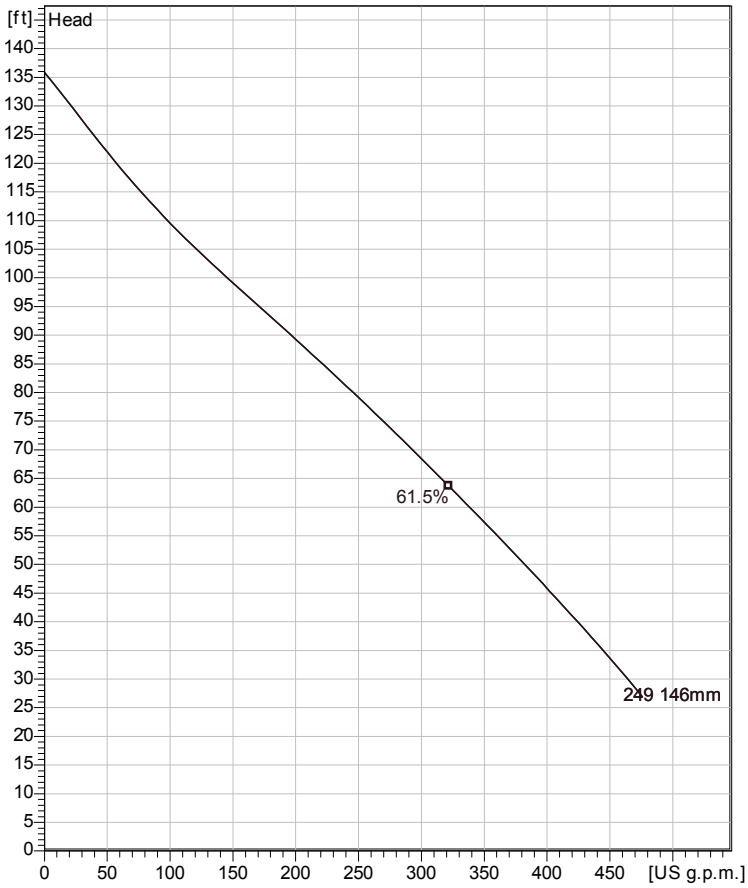
APPENDIX H

NP 3127 SH 3~ Adaptive 249

Technical specification



Water, pure *Curve according to: ISO 9906 grade 2 annex 1 or 2*

Note: Picture might not correspond to the current configuration.

General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

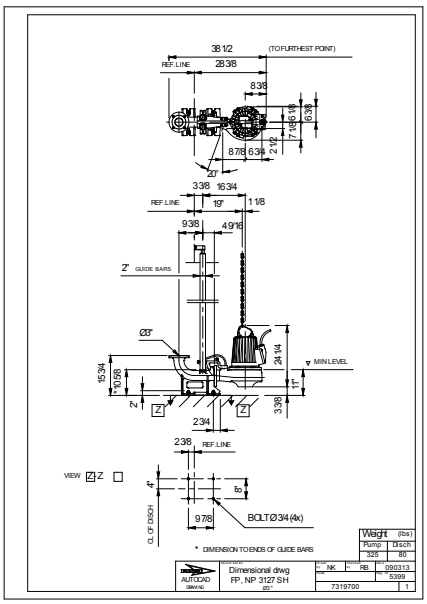
Impeller material	Grey cast iron
Discharge Flange Diameter	3 1/8 inch
Suction Flange Diameter	80 mm
Impeller diameter	146 mm
Number of blades	2

Motor

Motor #	N3127.160 21-11-2AL-W 11hp
Stator variant	38
Frequency	60 Hz
Rated voltage	460 V
Number of poles	2
Phases	3~
Rated power	11 hp
Rated current	13 A
Starting current	130 A
Rated speed	3510 rpm
Power factor	
1/1 Load	0.88
3/4 Load	0.85
1/2 Load	0.77
Efficiency	
1/1 Load	88.3 %
3/4 Load	88.5 %
1/2 Load	87.0 %

Configuration

Installation: P - Semi permanent, Wet



Project	Project ID	Created by	Created on	Last update
			2015-04-29	

NP 3127 SH 3~ Adaptive 249

Performance curve

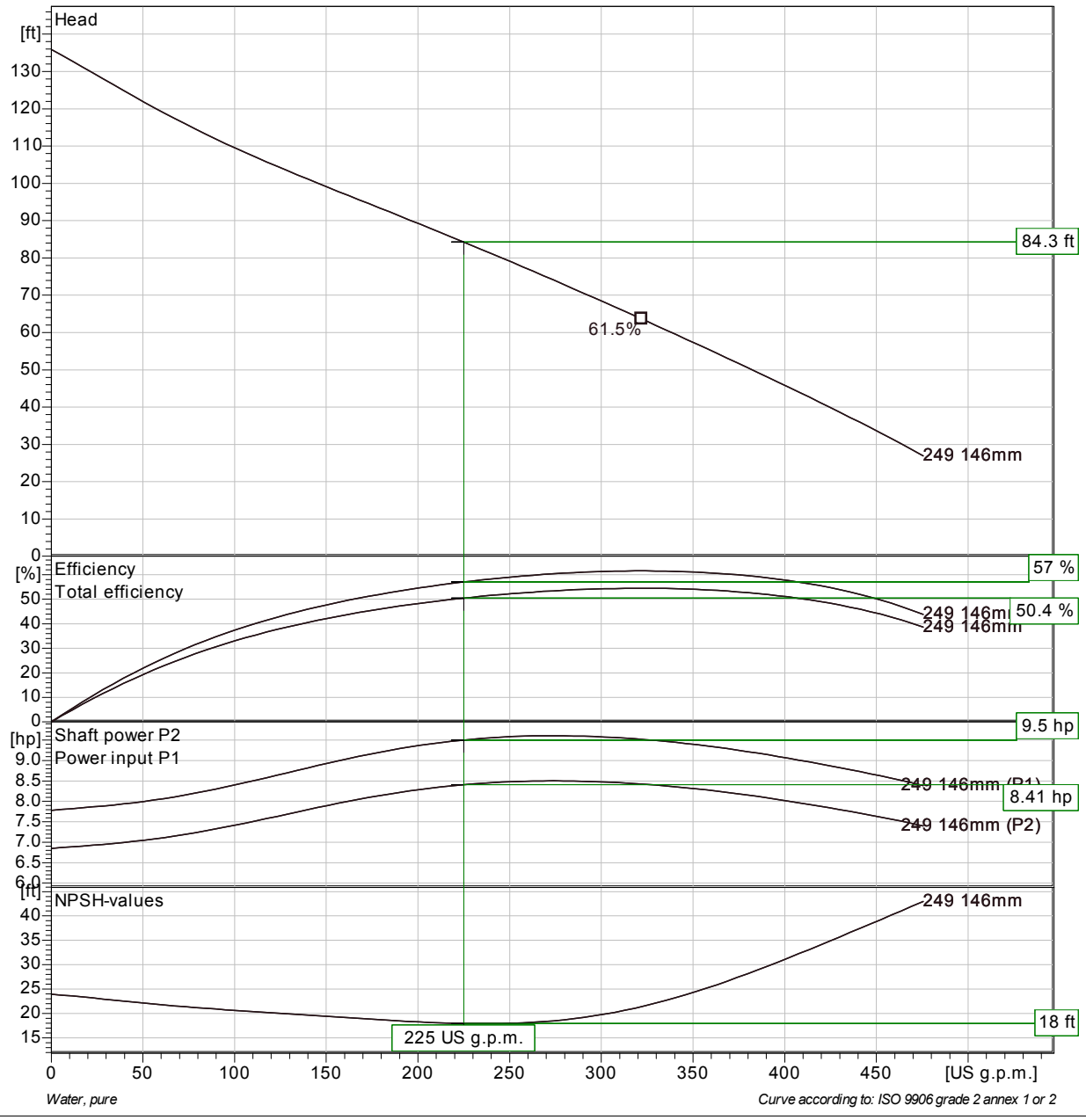
Pump

Discharge Flange Diameter	3 1/8 inch
Suction Flange Diameter	80 mm
Impeller diameter	$5^{3}/_{4}$"
Number of blades	2

Motor

Motor #	N3127.160 21-11-2AL-W 11hp
Stator variant	38
Frequency	60 Hz
Rated voltage	460 V
Number of poles	2
Phases	3~
Rated power	11 hp
Rated current	13 A
Starting current	130 A
Rated speed	3510 rpm

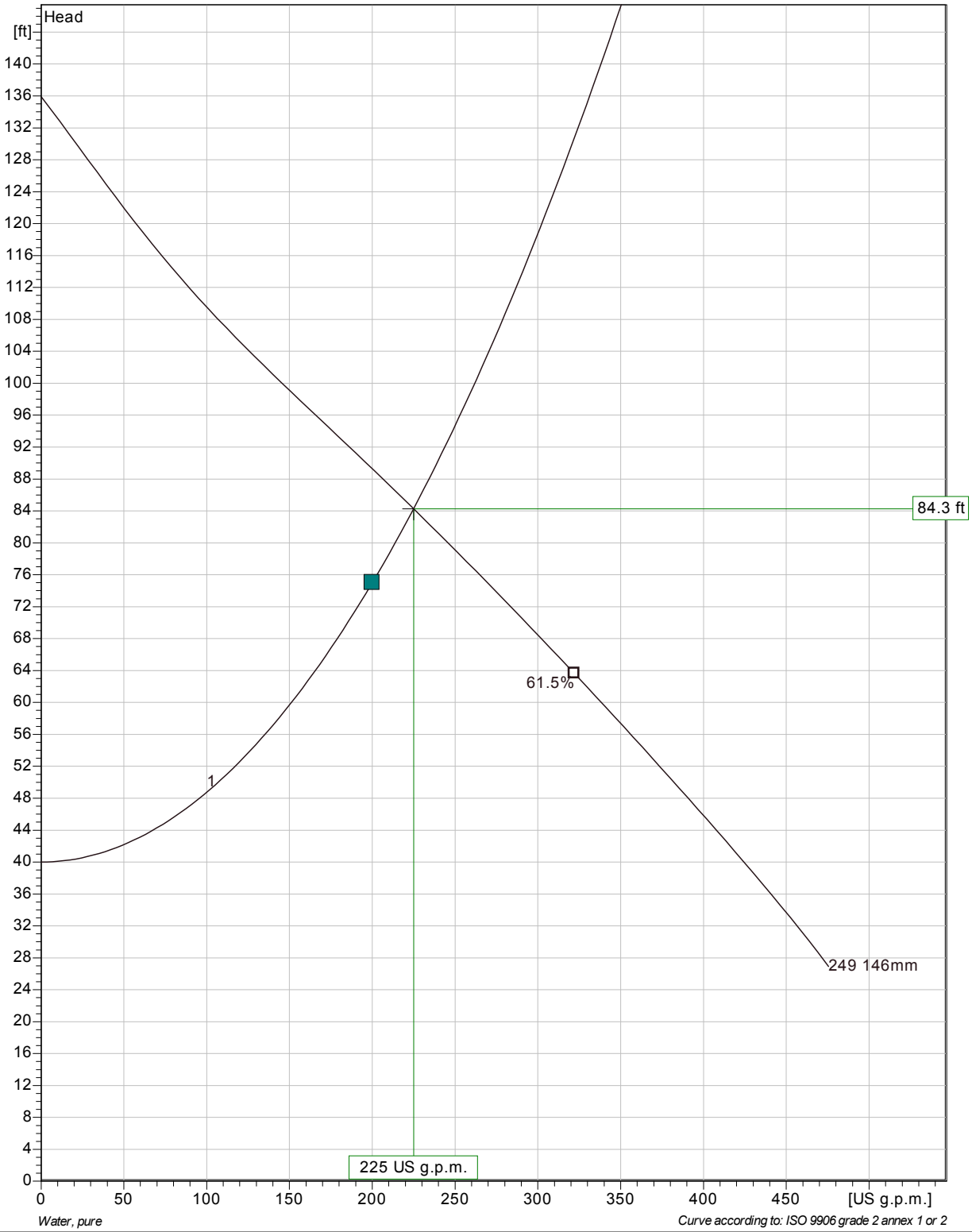
Power factor	
1/1 Load	0.88
3/4 Load	0.85
1/2 Load	0.77
Efficiency	
1/1 Load	88.3 %
3/4 Load	88.5 %
1/2 Load	87.0 %



Project	Project ID	Created by	Created on	Last update
			2015-04-29	

NP 3127 SH 3~ Adaptive 249

Duty Analysis

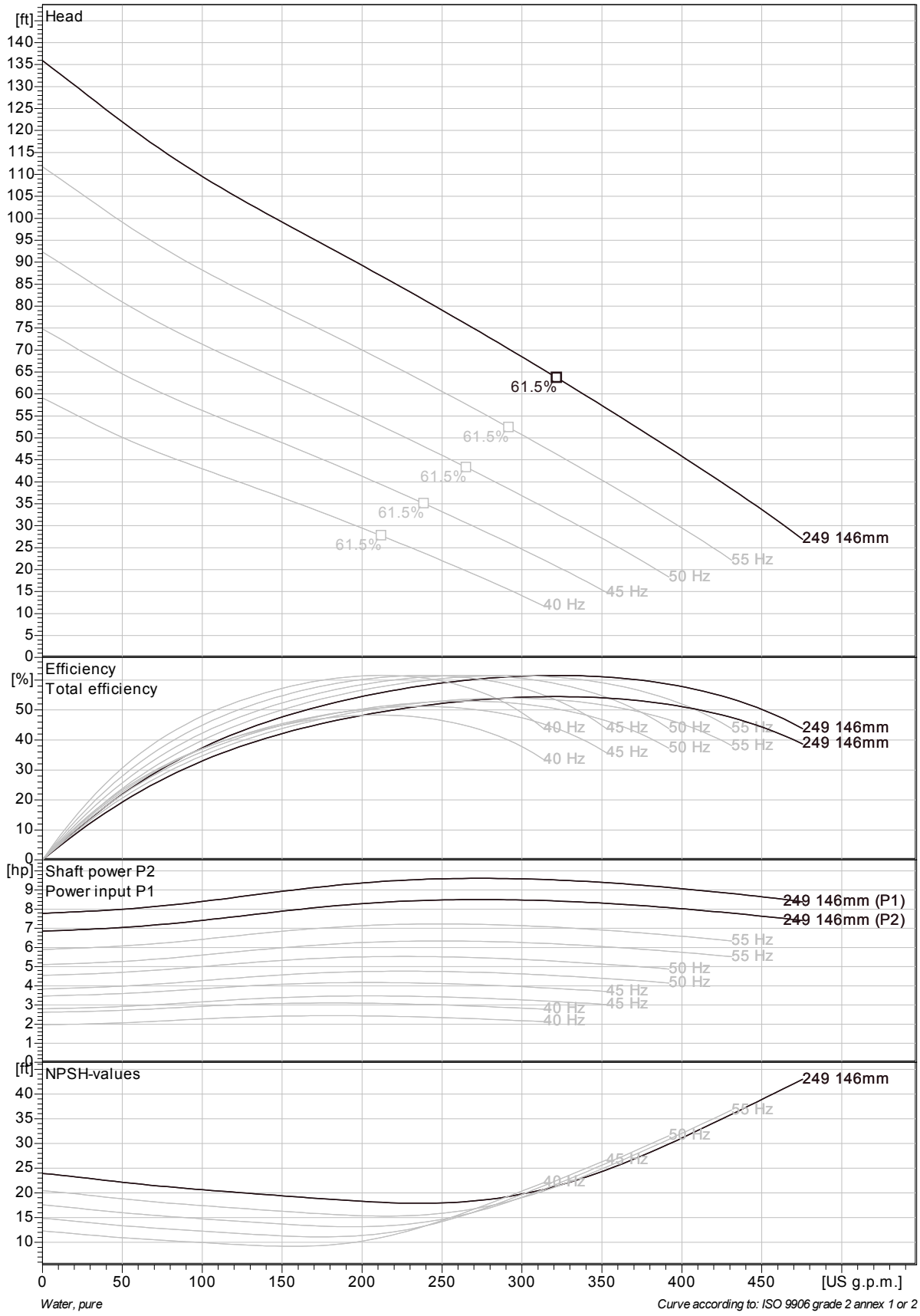


	Individual pump			Total					
Pumps running /System	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	225 US g.p.m.	84.3 ft	8.41 hp	225 US g.p.m.	84.3 ft	8.41 hp	57 %	525 kWh/US MG	18 ft

Project	Project ID	Created by	Created on	Last update
			2015-04-29	

NP 3127 SH 3~ Adaptive 249

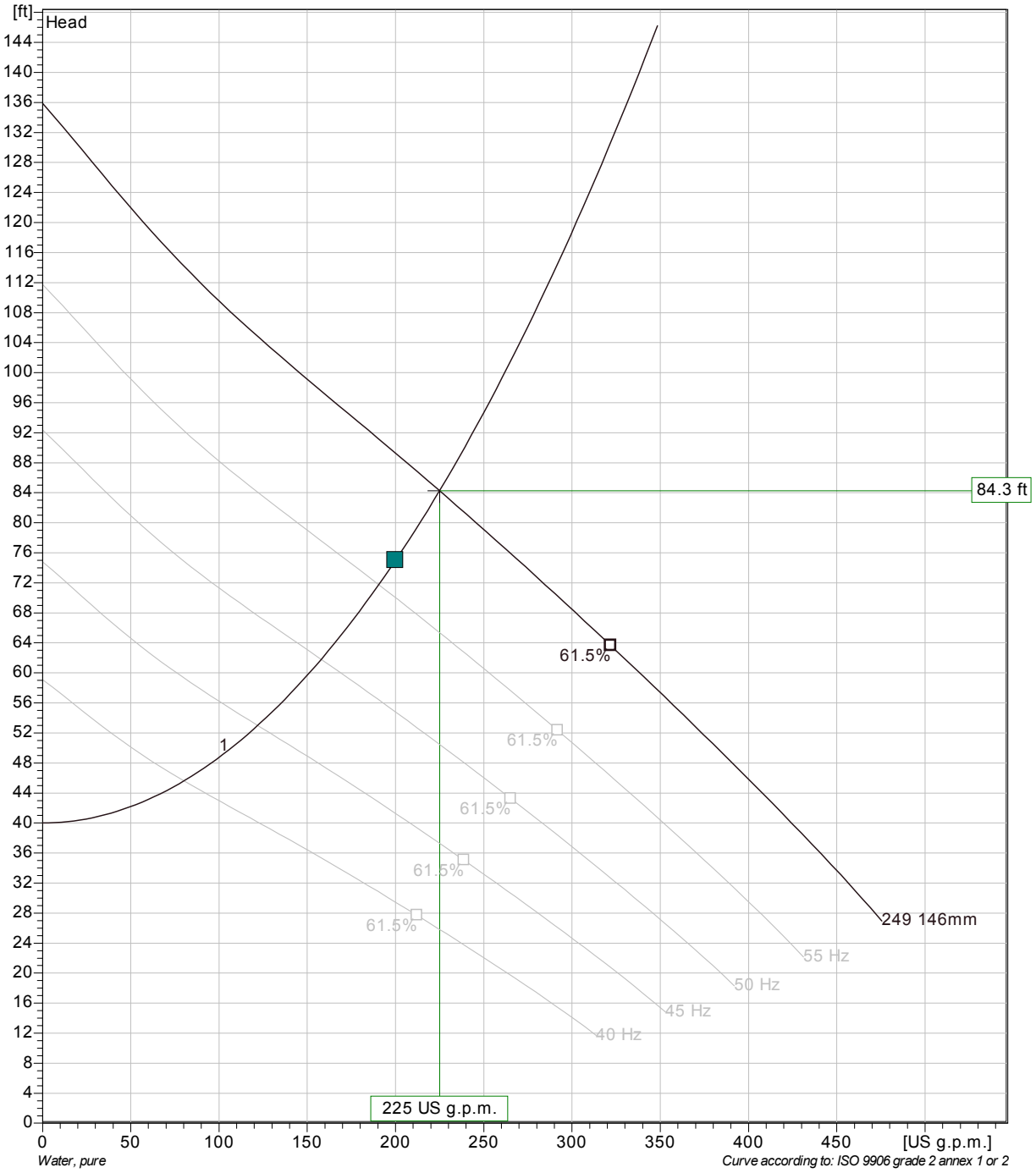
VFD Curve



Project	Project ID	Created by	Created on	Last update
			2015-04-29	

NP 3127 SH 3~ Adaptive 249

VFD Analysis

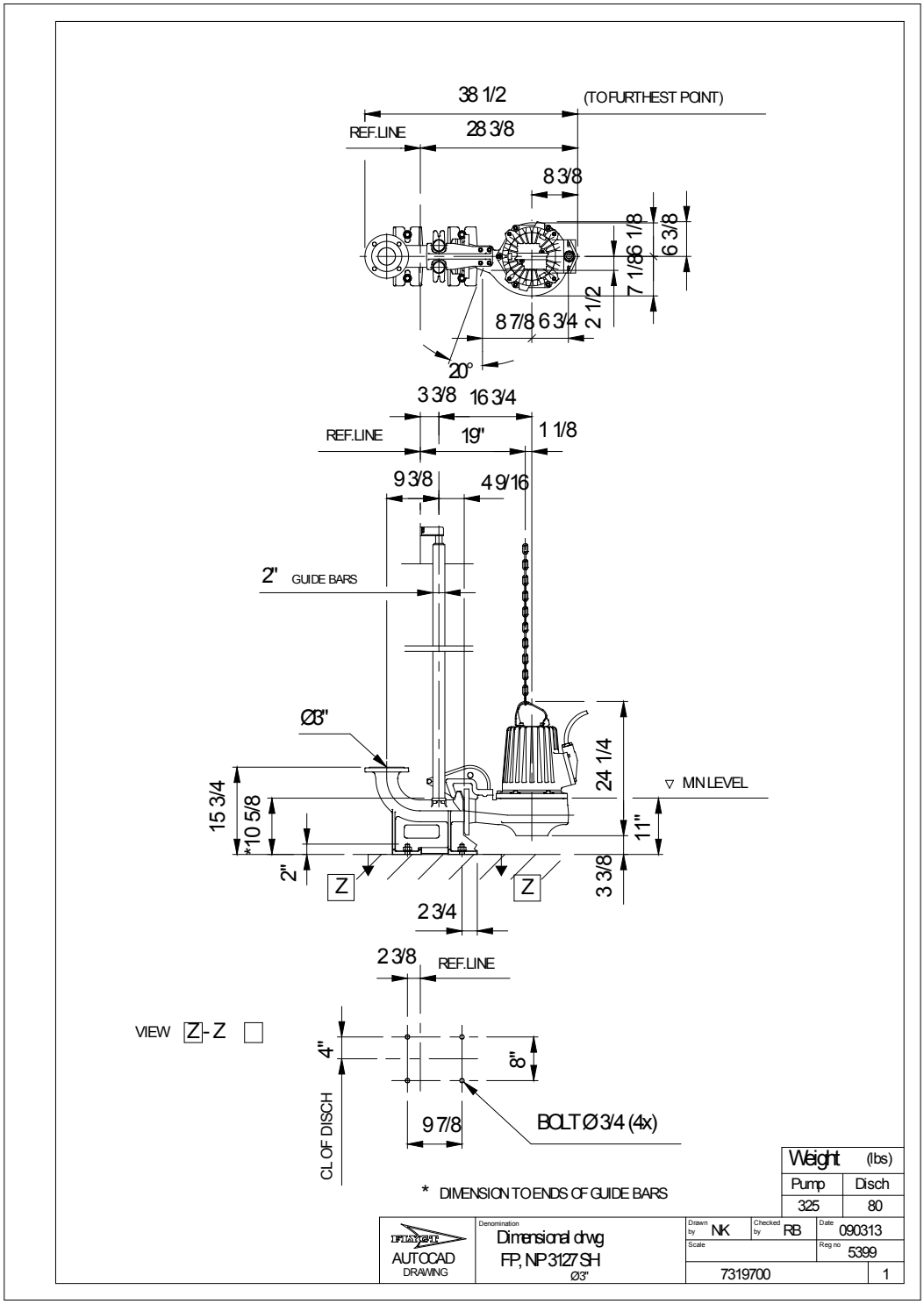


Pumps running /System	Individual pump Frequency	Flow	Head	Shaft power	Total Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	60 Hz	225 US g.p.m.	84.3 ft	8.41 hp	225 US g.p.m.	84.3 ft	8.41 hp	57 %	525 kWh/US MG	18 ft
1	55 Hz	191 US g.p.m.	71.8 ft	6.22 hp	191 US g.p.m.	71.8 ft	6.22 hp	55.6 %	463 kWh/US MG	15.5 ft
1	50 Hz	158 US g.p.m.	61.8 ft	4.61 hp	158 US g.p.m.	61.8 ft	4.61 hp	53.5 %	423 kWh/US MG	13.5 ft
1	45 Hz	122 US g.p.m.	53 ft	3.28 hp	122 US g.p.m.	53 ft	3.28 hp	49.9 %	404 kWh/US MG	11.8 ft
1	40 Hz	80.1 US g.p.m.	45.6 ft	2.18 hp	80.1 US g.p.m.	45.6 ft	2.18 hp	42.3 %	441 kWh/US MG	10.3 ft

Project	Project ID	Created by	Created on	Last update
			2015-04-29	

NP 3127 SH 3~ Adaptive 249

Dimensional drawing



Project	Project ID	Created by	Created on	Last update
			2015-04-29	

Enviroquip

a division of Eimco Water Technologies

Automatic Fine Opening Bar Screen

Product Profile

Model FS-1100S
5mm openings

- **Simple operation, non-corrosive materials of construction, maintenance free**
- **Standard openings: 1, 2, 2.5, 5, 9 and 14mm**
- **Can be installed in a stainless steel box or in concrete channels**
- **Built-in seals allow installation in new and existing channels**
- **All non-corrosive components:**
  - Screen frame is type 304 stainless steel
- **De-watering of screenings occurs automatically as material is removed up the screen**
- **All weather proof drive unit**

Model FS-600S
2mm openings

APPLICATIONS:

- **Membranes**
- **Screening domestic waste**
- **Screening industrial wastes such as food and beverage processing**
- **Scum separation**

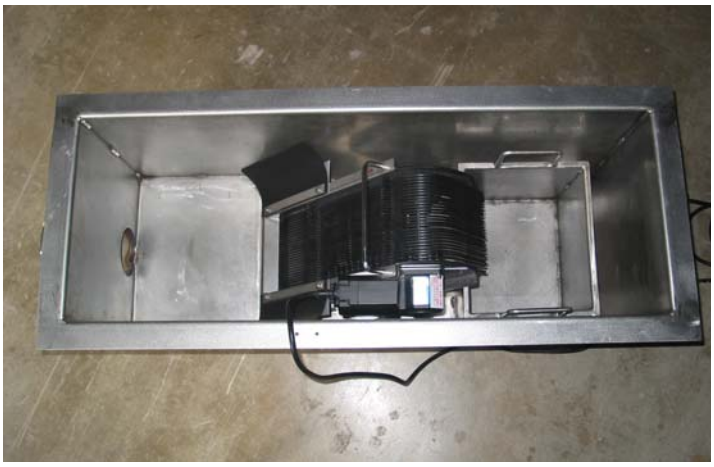
Model FS	Flow range 100 gpm to 1,050 gpm (up to 16" wide)
Model FM	Flow range 220 gpm to 4,000 gpm (up to 32" wide)
Model FL	Flow range 570 gpm to 14,400 gpm (up to 55" wide)

ENVIROQUIP, a Division of Eimco Water Technologies 2404 Rutland Drive ▪ Austin, Texas 78758
Tel: 512-834-6020 ▪ Fax: 512-834-6039 ▪ Email: Aeration@enviroquip.com ▪ Website: www.enviroquip.com

Enviroquip

a division of Eimco Water Technologies

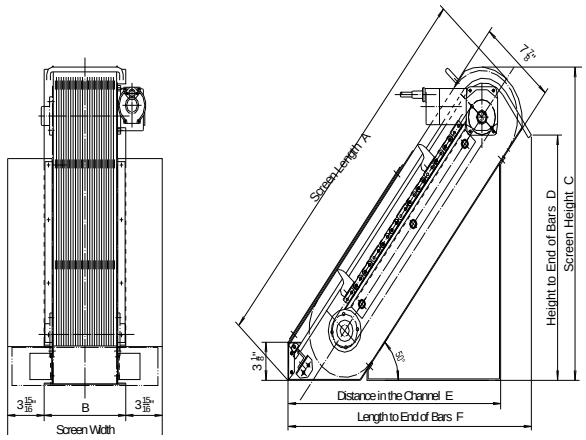
Model FS-600S



Model FS-600S in 304 SS Box

- 25w waterproof geared motor is coupled directly to the screen
- 3/60/220v or 460v power
- It is lightweight
- Easy to handle
- Maintenance free
- Two Year Warranty

SPECIFICATIONS

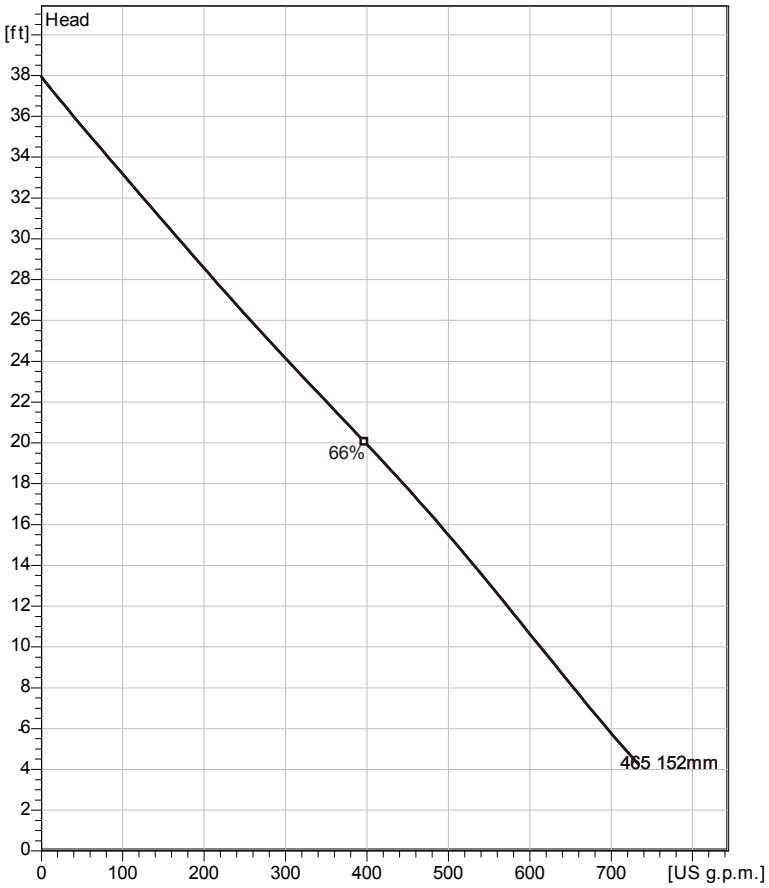


Dimensions																		
Model	**FS-600S**						**FS-800S**						**FS-1100S**					
Clear Openings(mm)	1	2	2.5	5	9	14	1	2	2.5	5	9	14	1	2	2.5	5	9	14
Max Flow Rate (gpm)	100	150	180	250	320	400	150	300	330	450	600	750	220	450	500	700	850	1050
Weight (lbs)	33						49						88					
A	1'-10 1/2"						2'-10 1/4"						3'-8 1/4"					
B	9"						9"						9"					
C	1'-5"						2'-2"						2'-9 1/2"					
D	11 1/4"						1'-7 1/4"						2'-3"					
E	1'-1 3/4"						1'-8"						2'-1 1/2"					
F	1'-6 3/4"						2'-3 1/8"						2'-9 5/8"					

ENVIROQUIP, a Division of Eimco Water Technologies 2404 Rutland Drive ▪ Austin, Texas 78758
Tel: 512-834-6020 ▪ Fax: 512-834-6039 ▪ Email: Aeration@enviroquip.com ▪ Website: www.enviroquip.com

NP 3102 MT 3~ Adaptive 465

Technical specification



Water, pure

Curve according to: ISO 9906 grade 2 annex 1 or 2

Note: Picture might not correspond to the current configuration.

General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

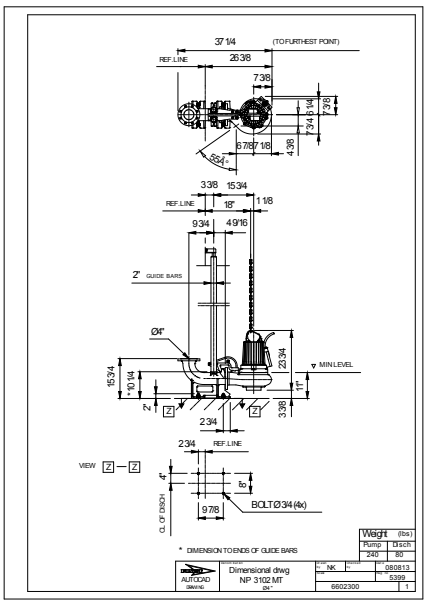
Impeller material	Grey cast iron
Discharge Flange Diameter	3 15/16 inch
Suction Flange Diameter	100 mm
Impeller diameter	152 mm
Number of blades	2

Motor

Motor #	N3102.160 18-11-4AL-W 5hp
Stator variant	68
Frequency	60 Hz
Rated voltage	400 V
Number of poles	4
Phases	3~
Rated power	5 hp
Rated current	7.4 A
Starting current	40 A
Rated speed	1735 rpm
Power factor	
1/1 Load	0.86
3/4 Load	0.82
1/2 Load	0.74
Efficiency	
1/1 Load	84.5 %
3/4 Load	85.5 %
1/2 Load	85.0 %

Configuration

Installation: P - Semi permanent, Wet



Project	Project ID	Created by	Created on	Last update
			2015-04-27	

NP 3102 MT 3~ Adaptive 465

Performance curve

Pump

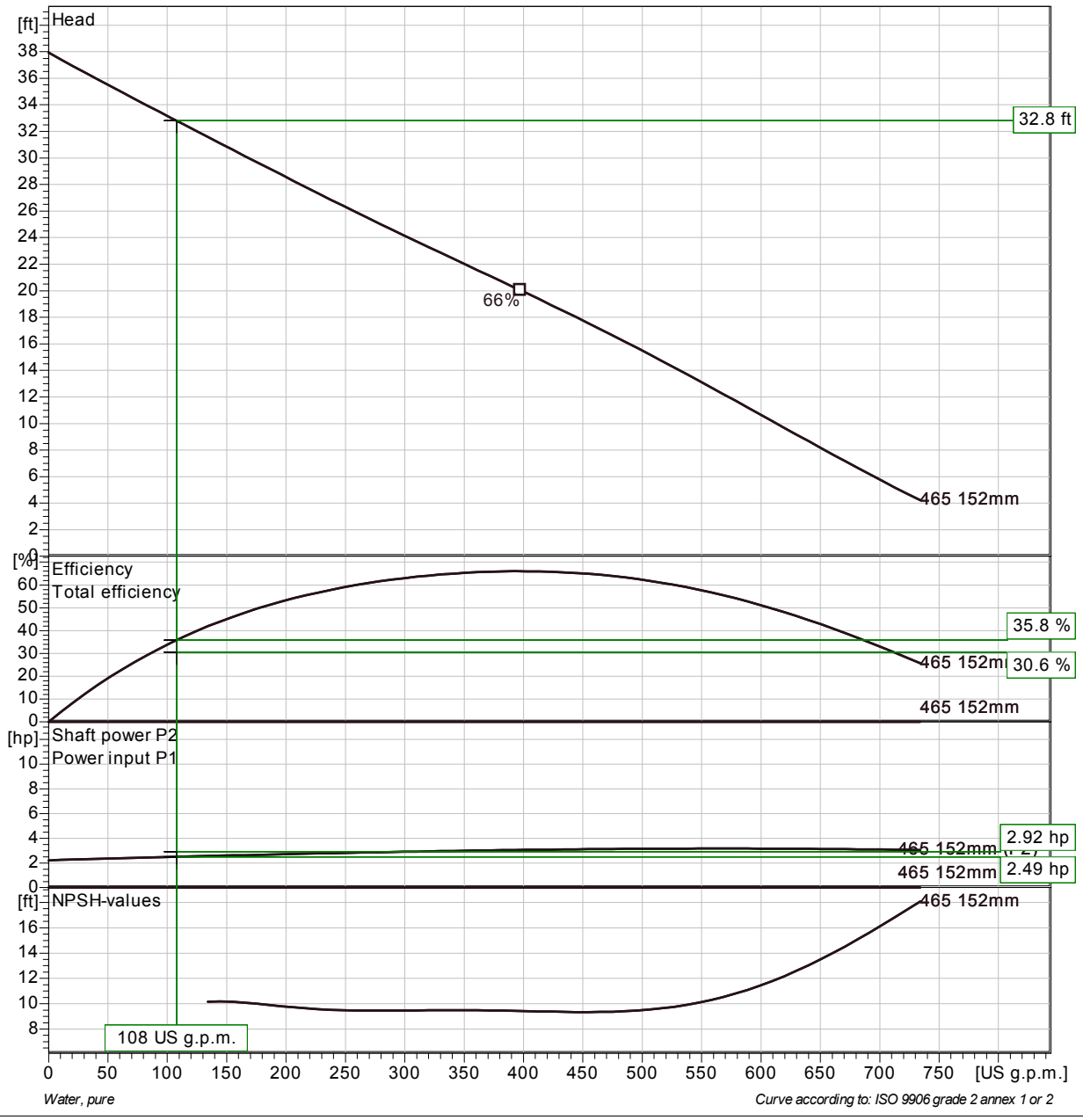
Discharge Flange Diameter	3 15/16 inch
Suction Flange Diameter	100 mm
Impeller diameter	6"
Number of blades	2

Motor

Motor #	N3102.160 18-11-4AL-W 5hp
Stator variant	68
Frequency	60 Hz
Rated voltage	400 V
Number of poles	4
Phases	3~
Rated power	5 hp
Rated current	7.4 A
Starting current	40 A
Rated speed	1735 rpm

Power factor	
1/1 Load	0.86
3/4 Load	0.82
1/2 Load	0.74

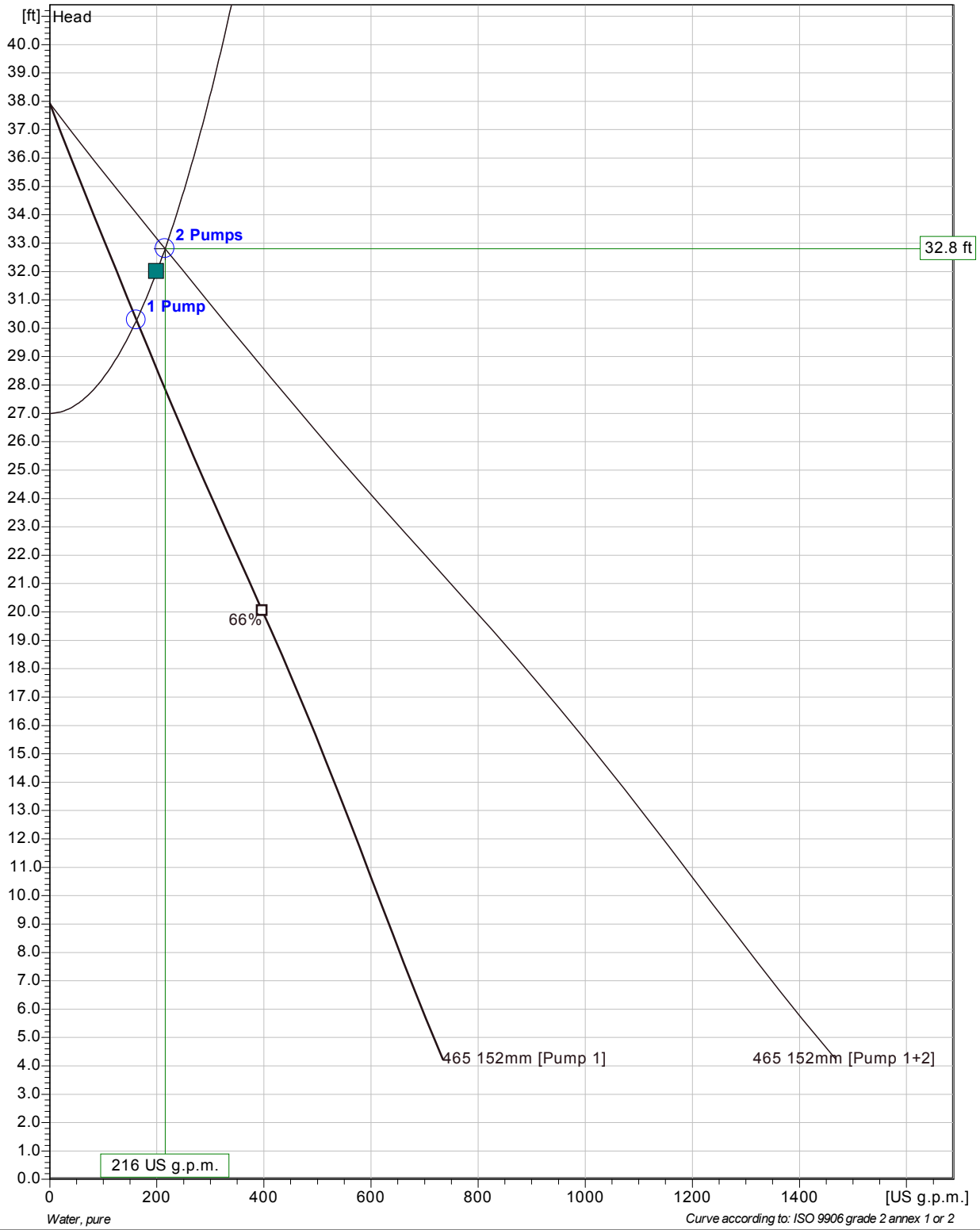
Efficiency	
1/1 Load	84.5 %
3/4 Load	85.5 %
1/2 Load	85.0 %



Project	Project ID	Created by	Created on	Last update
			2015-04-27	

NP 3102 MT 3~ Adaptive 465

Duty Analysis

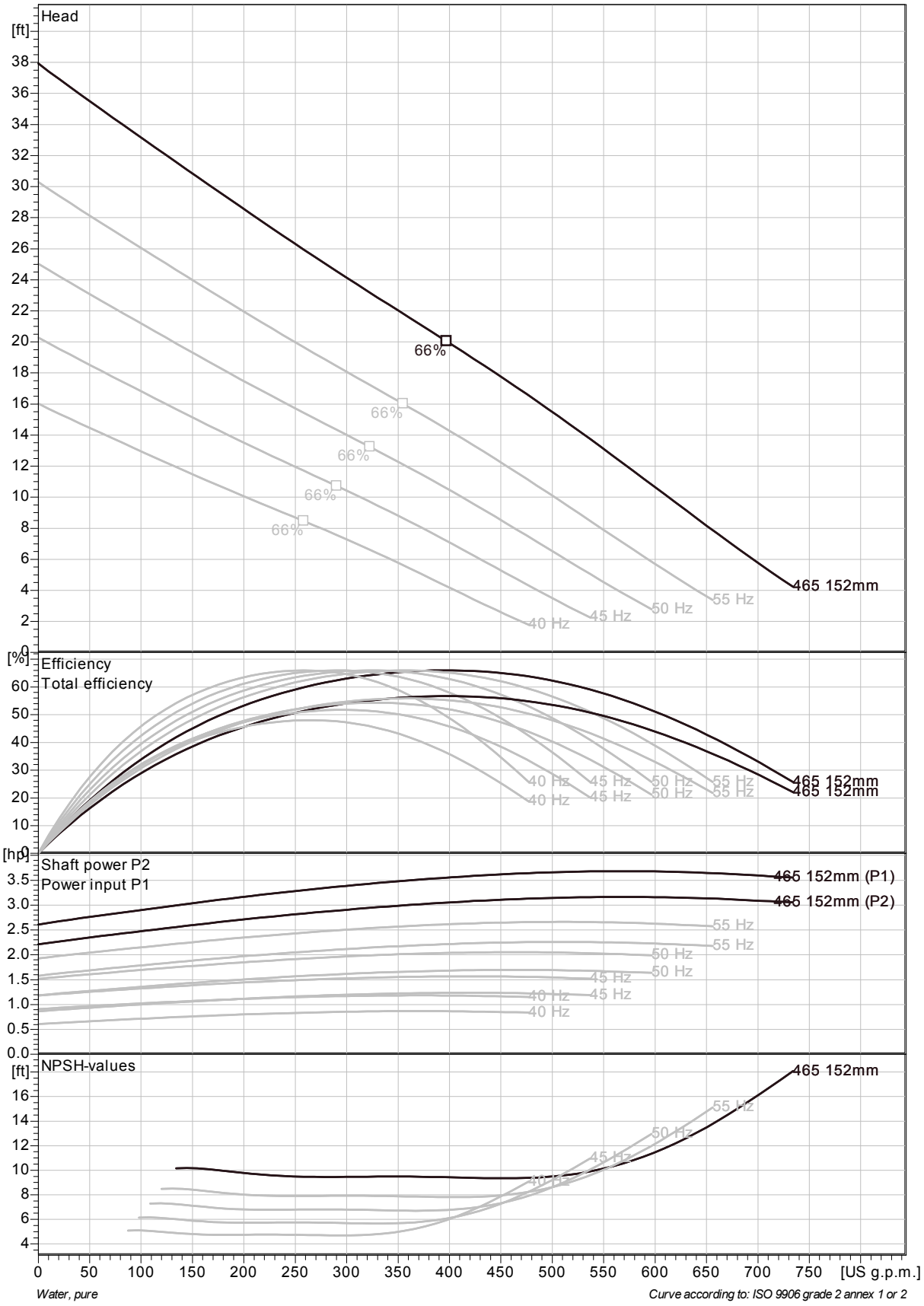


Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
2	108 US g.p.m.	32.8 ft	2.49 hp	216 US g.p.m.	32.8 ft	4.99 hp	35.8 %	337 kWh/US MG	
1	162 US g.p.m.	30.3 ft	2.63 hp	162 US g.p.m.	30.3 ft	2.63 hp	47.3 %	236 kWh/US MG	10.1 ft

Project	Project ID	Created by	Created on	Last update
			2015-04-27	

NP 3102 MT 3~ Adaptive 465

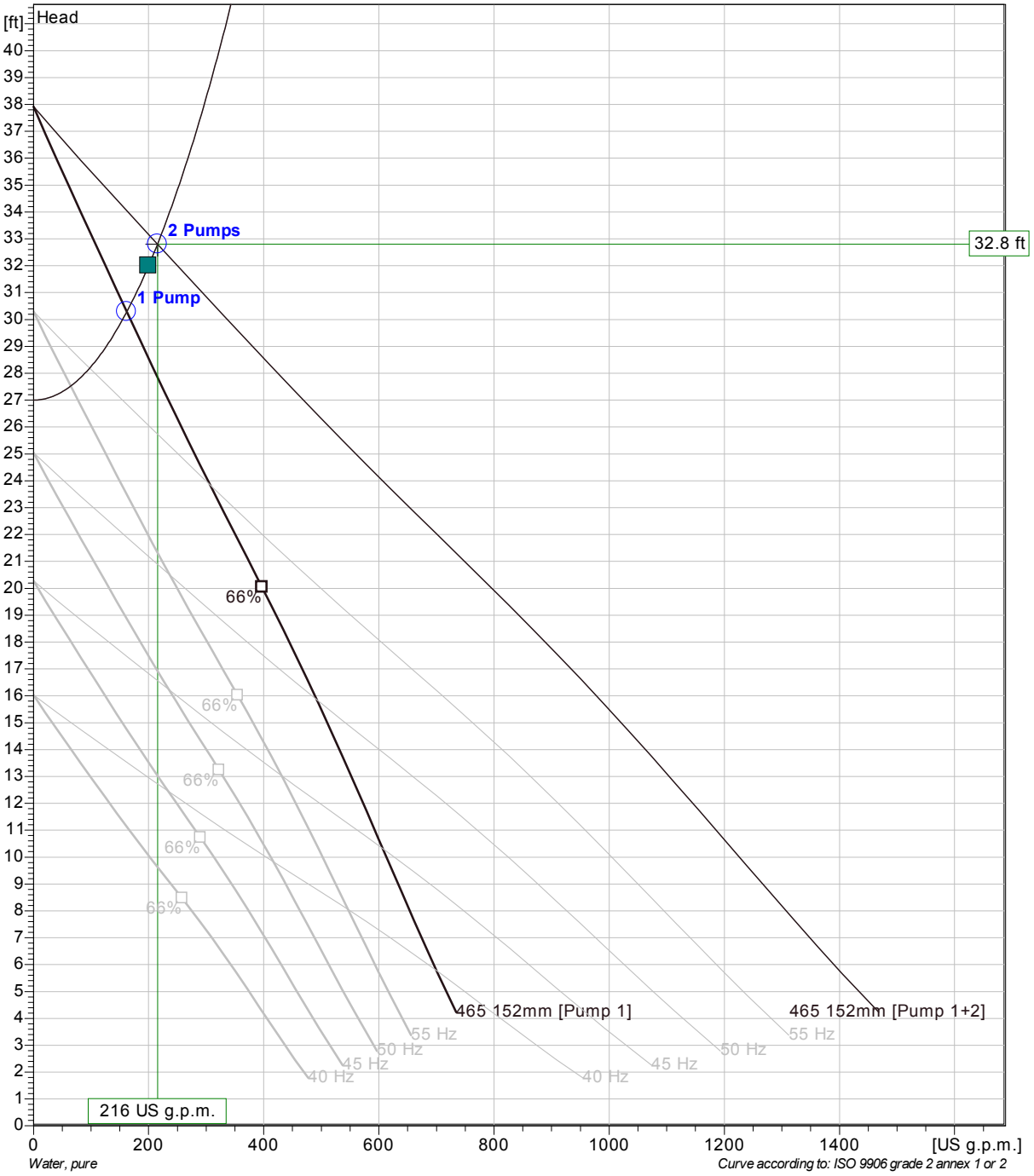
VFD Curve



Project	Project ID	Created by	Created on	Last update
			2015-04-27	

NP 3102 MT 3~ Adaptive 465

VFD Analysis

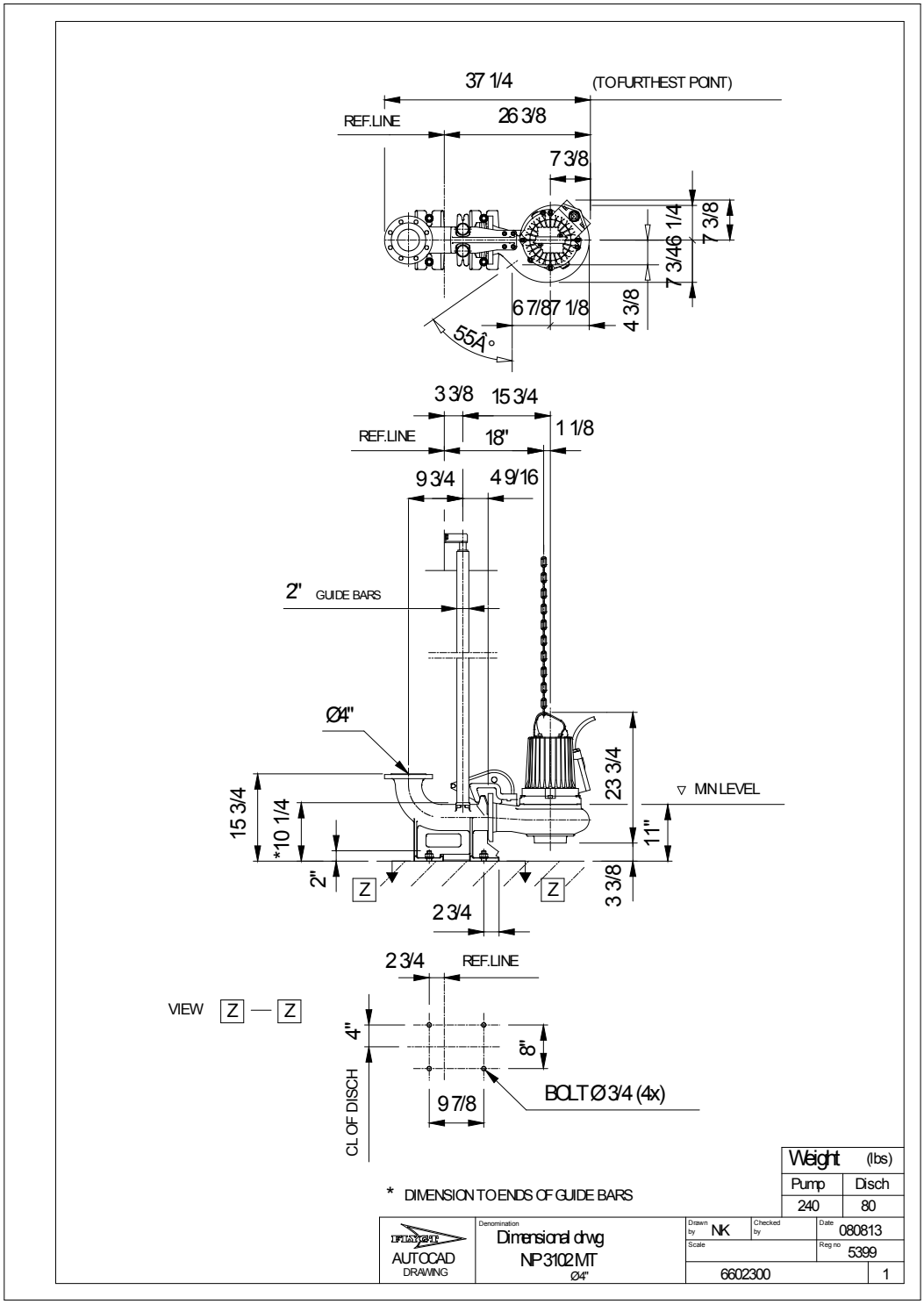


	Individual pump				Total					
Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
2	60 Hz	108 US g.p.m.	32.8 ft	2.49 hp	216 US g.p.m.	32.8 ft	4.99 hp	35.8 %	337 kWh/US MG	
2	55 Hz	48.8 US g.p.m.	28.2 ft	1.69 hp	97.6 US g.p.m.	28.2 ft	3.37 hp	20.6 %	520 kWh/US MG	
2	50 Hz									
2	45 Hz									
2	40 Hz									
1	60 Hz	162 US g.p.m.	30.3 ft	2.63 hp	162 US g.p.m.	30.3 ft	2.63 hp	47.3 %	236 kWh/US MG	10.1 ft
1	55 Hz	64.7 US g.p.m.	27.5 ft	1.72 hp	64.7 US g.p.m.	27.5 ft	1.72 hp	26.2 %	401 kWh/US MG	
1	50 Hz									
1	45 Hz									
1	40 Hz									

Project	Project ID	Created by	Created on	Last update
			2015-04-27	

NP 3102 MT 3~ Adaptive 465

Dimensional drawing



Project	Project ID	Created by	Created on	Last update
			2015-04-27	

Enviroquip® MBR

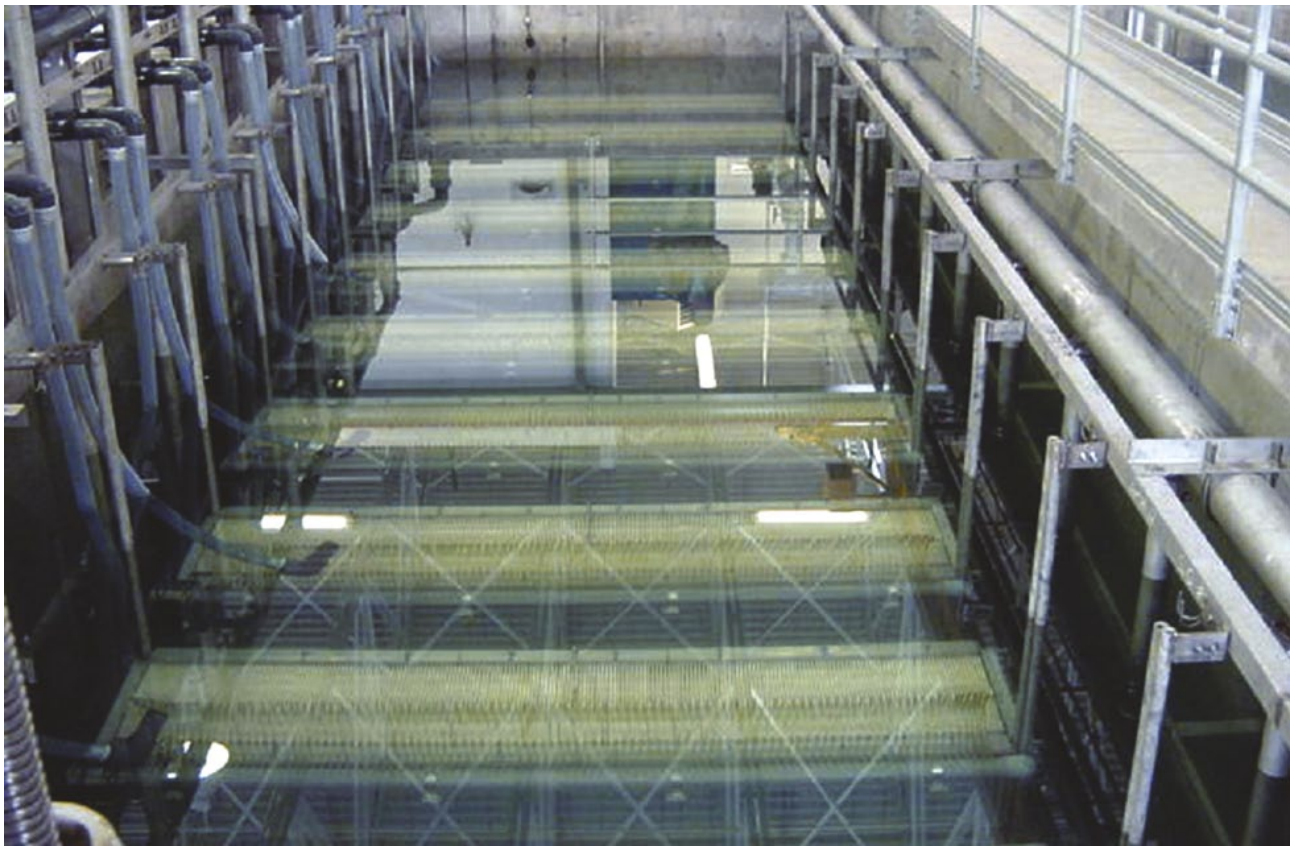
Submerged Membrane Bio-Reactor (MBR) Systems for wastewater treatment and reuse

Key features & benefits

- Fully integrated, complete solutions (Systems) to wastewater treatment and solids handling problems
- Demonstrated lowest total installed (constructed) cost
- Sustainable (green) solutions with reduced equalization, concrete, energy and chemical requirements
- The easiest System to operate, troubleshoot and optimize

How we create value

- Bringing more, true MBR System experience to new projects than any other company
- Tailoring solutions using proven integrated design and automation techniques
- Developing energy saving technologies and control strategies
- Offering storm flow management and pure oxygen designs
- Providing 24/7 real-time customer support (EQuipTech®), web-based services (EQVue™) and a network of certified contractors



Enviroquip® MBR

MBR Systems

Membrane Bioreactors have been used for the successful treatment of municipal, commercial and industrial wastewaters for discharge and reuse since the 1980s. With thousands of installations operating worldwide, MBR technology is shaping the way we view wastewater treatment and water conservation across the globe.

Submerged within each MBR are membranes that physically reject pathogens and other suspended solids. Additional biological processes are required to removal contaminants such as Biochemical Oxygen Demand (BOD), nitrogen and phosphorous. As such, MBRs have traditionally been just one part of a system designed for the biological treatment of wastewater. However, as a provider of complete Waste Water Treatment Plants (WWTPs), Ovivo understands that systems, not just components, must operate simply and reliably as a whole. That is why we offer complete MBR systems, not just their constituent parts, and supply the most user-friendly Submerged Membrane Unit (SMU) on the market today.

RW Submerged Membrane Unit

ES Submerged Membrane Unit

Enviroquip® MBR

How it works

The Membrane Bioreactor (MBR)
A membrane bioreactor is an activated sludge process that uses membranes to filter out suspended solids including harmful microorganisms such as viruses, bacteria and cysts. In an MBR, SMUs are connected via common permeate, air supply and diffuser cleaning pipes.

The Submerged Membrane Unit (SMU)
Each SMU is comprised of an integral air diffuser assembly and one or two membrane cassettes. The diffuser provides air for scouring, mixing and cellular activity. A membrane cassette contains between 25 and 200 membrane that are connected to, or form, a common permeate manifold. Multiple SMU are connected to a common header in each MBR.

The Membrane Cartridge
Each membrane cartridge is constructed by ultrasonically welding a sheet of thin polymeric metal to the front and back of a support panel. Between the panel and the membrane material is a porous spacer material that distributes water to a series of grooves that channel filtered water to the top of the cartridge.

Biofilms
In an Enviroquip® MBR system, flat sheet membranes are used to filter a concentrated mixture of organisms commonly referred to as mixed liquor. The microorganisms consume BOD, nutrients and refractory organic compounds such as NDMA. They also attach themselves to the membrane's surface to form a thin film called a biofilm. Within seconds, the biofilm begins to function as a dynamic membrane. Properly maintained, this biofilm protects membrane material from fouling and creates a second, densely packed barrier to pathogen breakthrough.

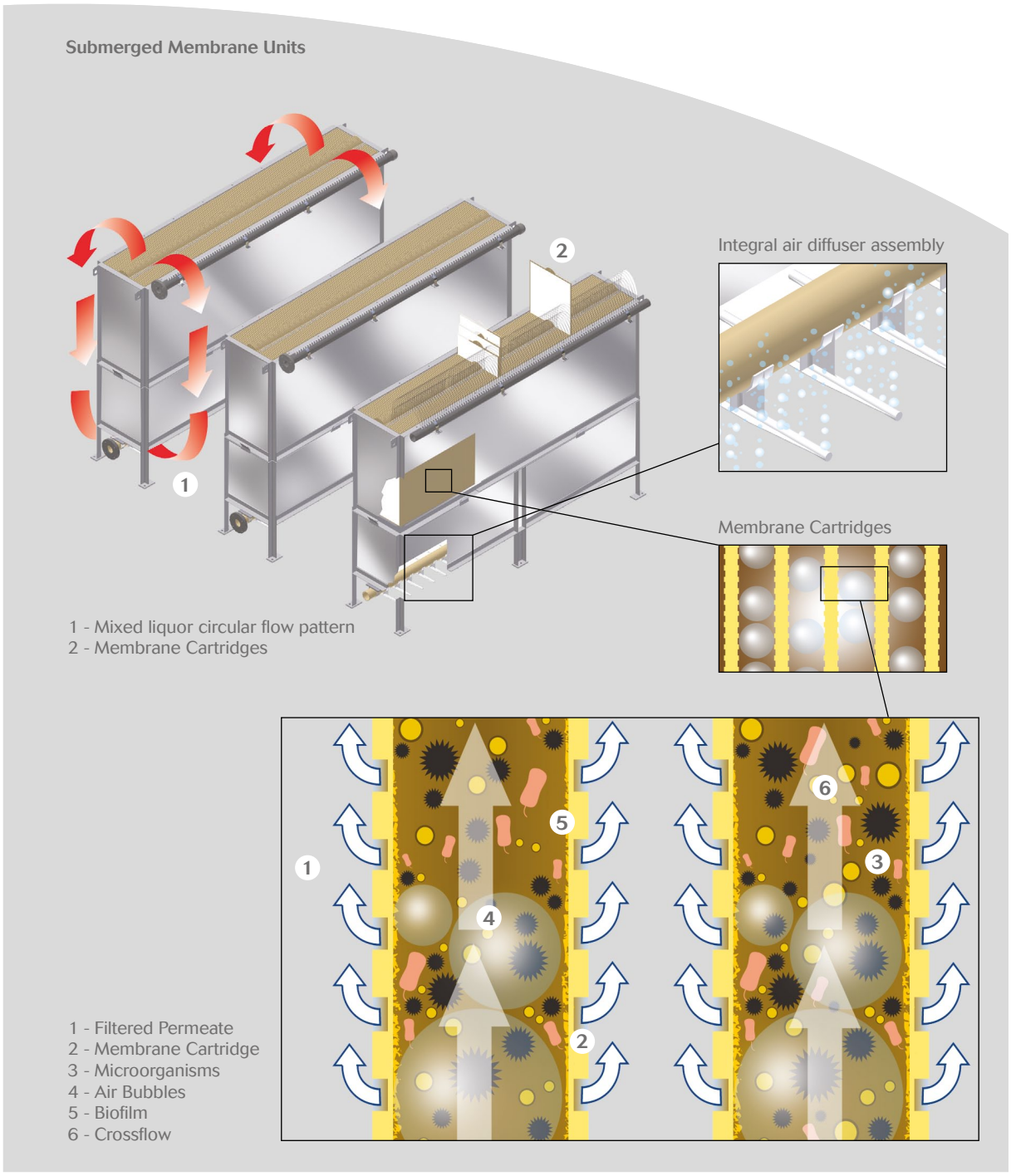
Biohydraulics
Irrespective of the type and shape of membrane, biofilms do most of the filtering and create the most resistance to water flow. Maintaining biofilm thickness and porosity through effective air scouring and proper biological process control is key to optimizing the hydraulic performance of any submerged membrane technology in MBR applications. The link between biological process conditions and membrane hydraulics referred to as biohydraulics.

Our SMU are engineered to maximize air-scouring efficiency and eliminate opportunities for hair and debris to accumulate. Efficient, even air-scouring dramatically reduces the pressure it takes to filter solids from treated wastewater, often referred to as transmembrane pressure (TMP).

Operating at a low TMP reduces the propensity for membrane fouling and eliminates the need for weekly chemical cleanings or backpulsing common to other systems, meaning that our flat sheet membranes last longer.

Submerged Membrane Units

Bottom: Multiple barriers – membranes and biofilms.



Enviroquip® MBR

The Enviroquip® MBR System

Enviroquip® MBR systems include multiple, proven technologies allowing for flexible, adaptable operation. The ability to operate over a range of different conditions improves overall system performance as compared to conventional treatment processes and MBRs that use hollow fiber membranes.

Enviroquip® MBR systems can include:

Headworks
Complete packages including roughing screens, fine screens and grit removal.

Proven Membrane Technology
Our SMUs are installed in more MBR plants around the world than any other MBR technology.

Digestion / Thickening
Membrane-based systems designed to digest and / or pre-thicken waste-activated sludge. Class B systems also available.

Ancillary Process Equipment
A full complement of proven components for a fully functioning MBR system including pumps, blowers, mixers etc.

Integration and Controls
Supervisory Control and Data Acquisition (SCADA) packages to reduce energy costs, maximize membrane performance and allow for remote plant control.

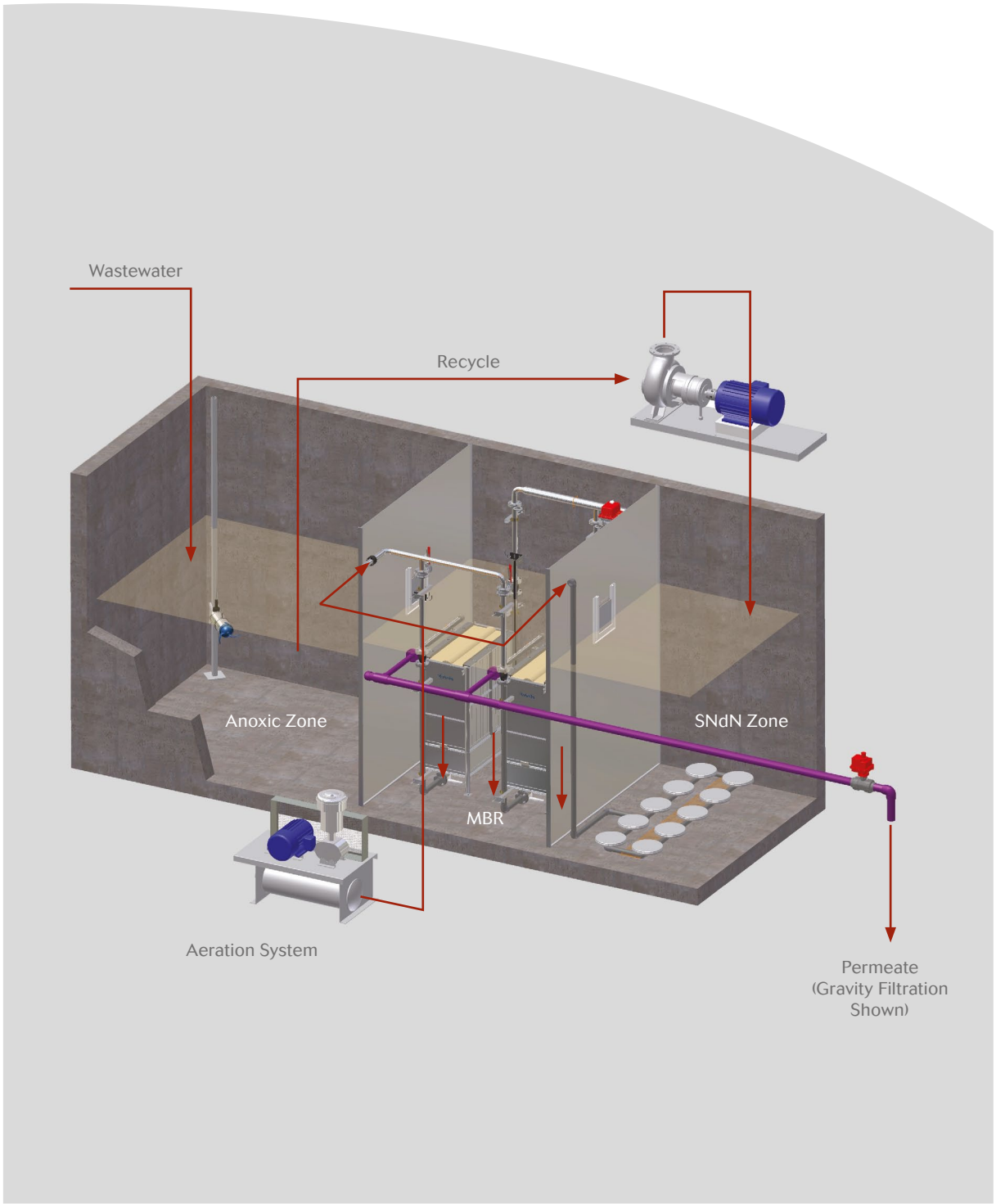
Pure Oxygen & Peak Flow Management Systems (Optional)
Pure oxygen systems (DOCS™ + SDOX™) and side-stream physical/chemical treatment technologies (using iSEP™) are available to achieve smaller footprints and reduce project costs.

Enviroquip® MBR versus conventional treatment processes
- Fewer unit operations
- Smaller footprint
- Reduced UV dosage required
- Superior water quality

Enviroquip® MBR versus hollow fiber processes
- Better process control
- Easier to operate
- Smaller footprint
- No side-stream screening
- Fewer recycle streams
- Reduced maintenance
- Higher peaking capabilities

Top down: Headworks, Membrane Equipment, Ancillary Process Equipment, Integration and Controls

MBR Process Train (UNR® 1)



Enviroquip® MBR

Features and Benefits

Single-Source Responsibility
- Comprehensive, integrated wastewater treatment solutions
- Standardized, proven automation with operator approved feature sets
- Membrane-based solids handling technologies
- Extended warranty options and service plans including process guaranties

Cost Effective, Green Solutions
- Demonstrated lowest total installed (capital) cost
- Reduced equalization, concrete, energy and chemical requirements
- Energy saving strategies backed by guaranties
- Storm flow management and pure oxygen designs

The Most Reliable Systems
- > 250 Systems in some stage of design, commissioning or operation
- ~30% less instrumentation, rotating equipment and control valving
- ~90% fewer failure points within membrane modules versus hollow fiber systems
- Manual control options built into fully automated systems for emergency operation
- Gravity filtration option and infrequent clean-in-place (CIP) only for routine maintenance

Highest Effluent Quality

At the heart of an Enviroquip MBR system is a tailored biological process that virtually eliminates pollutants such as Biochemical Oxygen Demand (BOD), nitrogen and phosphorous that can cause fish kills and algae growth (eutrophication).

The UNR® Ultimate Nutrient Removal process has been developed to meet the most stringent nutrient limits. Different treatment levels, and their corresponding typical effluent qualities, are shown in the tables below.

Microorganisms (created during biological uptake of dissolved pollutants) are filtered through multiple protective barriers and reduced to levels that are generally undetectable by standard methods. Fecal coliform concentrations are normally non-detectable in MBR permeate before post-disinfection, as compared to 100,000 cfu / 100 ml in traditional secondary effluent.

Permeate Quality		
Parameters	**Typical Values**	**Achievable Values[a,c]**
BOD_5	<2.0 mg/l	Non-Detect[b]
Ammonia	<1.0 mg/l	Non-Detect[b]
Total Nitrogen	<10.0 mg/l	<3.0 mg/l[c]
Phosphorus	<1.0 mg/l	<0.03 mg/l
TSS	<2.0 mg/l	Non-Detect[b]
Turbidity	<0.1 NTU	<0.05 NTU
Fecal Coliform	<2.2 CFU/100ml	Non-Detect[b,c]
SDI	<3	<2

a Contingent on plant design and operation.

b Assuming Standard Methods of detection.

c Requires UNR® Process.

d Post-disinfection may be required.

Typical Guarantee Limits[e,f]				
UNR Level	**BOD_5**	**Ammonia**	**Total Nitrogen**	**Phosphorous[g]**
1	<5.0 mg/l	<1.0 mg/l	<10.0 mg/l	<1.0 mg/l
2	<5.0 mg/l	<1.0 mg/l	<7.0 mg/l	<.5 mg/l
3	<5.0 mg/l	<1.0 mg/l	<3.0 mg/l	<.1 mg/l

e Limits are a function of process design and are dependent on operating conditions.

e Assuming Standard Methods of detection and an average of a least four 24-hr composite samples.

g Assumes combination of enhanced biological phosphorus removal and chemical coagulation.

Applications

Core MBR Technology
For over 15 years Ovivo has been supplying our core MBR technology to the world using widely accepted design guidelines and conventional diffused aeration technologies. We can offer simple membrane equipment packages to meet project specifications or complete solutions to wastewater treatment problems.

ECOBLOX™
The latest innovation from Ovivo in biological systems is our MBR System using high purity oxygen (HPO). Unlike other HPO based technologies, our patent pending method of saturating influent using oxygen generated onsite eliminates all safety, siting and regulatory concerns. These safe, easy to operate systems are based on military applications requiring extreme reliability in the most adverse conditions. ECOBLOX Systems are specifically designed for ease of operation but the biggest advantage to end users is ultimately reduced cost of ownership.

STORMBLOX™
The Achilles Heel of MBR Systems in general remains short-term, dilute peak flows that generally occur during storm events. In fact, peak flows in excess of three times the rated capacity of a plant can often make MBR technology cost prohibitive. Ovivo has recently developed a means of handling storm events using direct membrane filtration followed by activated carbon and zeolite; all known, proven commodities. Trimming off peak flows can dramatically simplify operations, reduce energy bills and create new funding opportunities given ease of future expansion.

Reclamation: Irrigation, stream augmentation, aquifer recharge, sewer mining, RO pre-treatment

Municipal: New construction, retrofits, upgrades, sludge thickening

Industrial: Food processing, pharmaceutical, manufacturing

Satellite Plants: Private developments, resorts, golf courses, rest stops, parks

Commercial: Shopping centers, office buildings, casinos, restaurants

Enviroquip® MBR

Our Expertise

Our multidisciplinary staff draws on over forty years of experience to integrate state-of-the-art technologies into custom plants or pre-engineered packages (MPAC®) to maximize energy efficiency, optimize process control and protect membrane equipment. Our goal is to provide customers with comprehensive solutions to their wastewater problems.

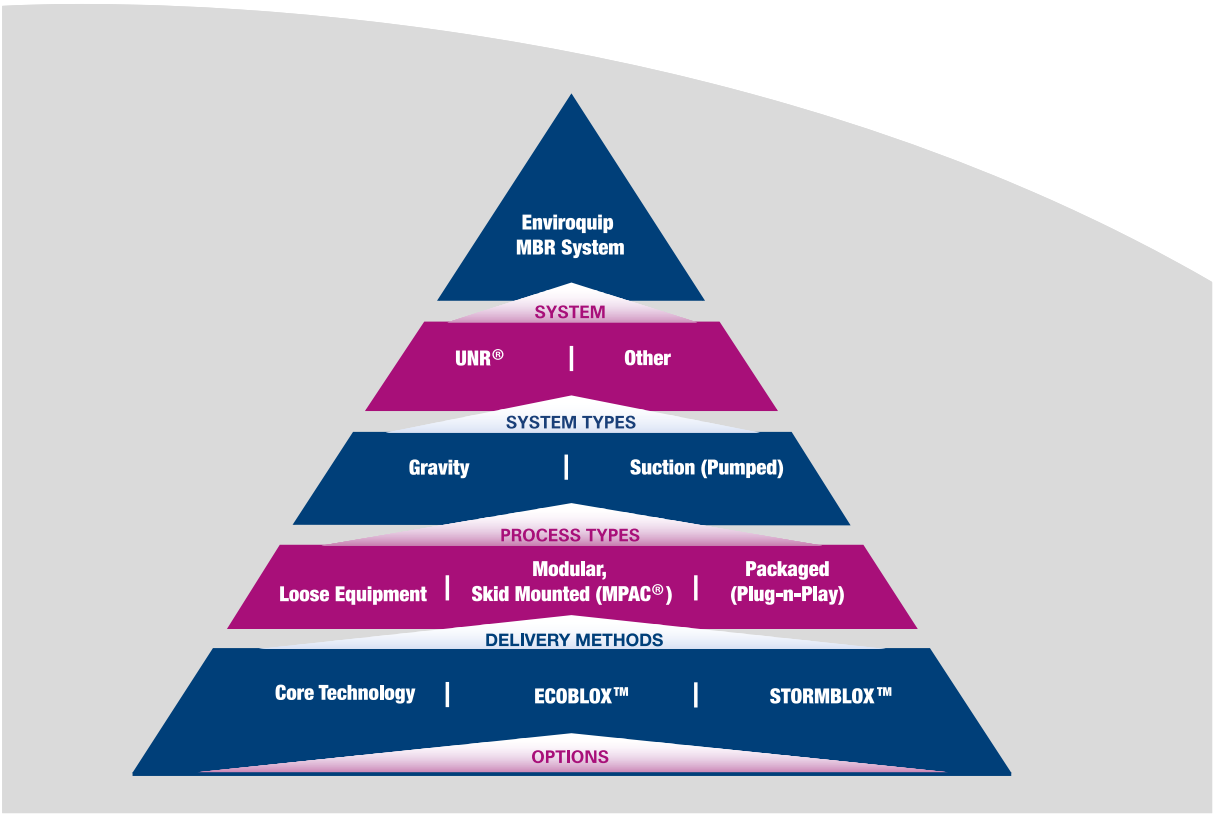
Starting with proven, reliable headworks technologies and ending with membrane-based solids handling systems, Ovivo can provide Single Source Responsibility (SSR) for your MBR system. SSR ensures the prompt, comprehensive support you need as part of the industry's best warranty plan.

Support and Aftermarket Care
We realize that our continued success depends on customer satisfaction and ultimately, plant performance. We take great pride in delivering superior design support during the engineering and construction phases of a project and in maintaining reliable after sales support.

Using advanced remote monitoring technologies, we stay in constant contact with our plant operators. We offer ongoing technical training through workshops and site visits, keeping our customers up-to-date and informed of the latest technical information.

Simple in design and easy to operate, an Enviroquip MBR System offers all the benefits of membrane technology without the usual complications. From point-of-use package plants (see the MPAC brochure) to custom municipal installations, our experienced, professional staff has supported the design and or commissioning of more than 250 MBR Systems.

Equipped to handle your specific requirements, we can help you to customize your plant using an array of different options as shown in the diagram below.



Enviroquip® MBR Installations and Customer Testimonials

"There's just not a lot of moving parts on an Enviroquip® MBR System. It's a lot more forgiving than my SBR and [conventional] activated sludge systems."
Charlie Evans, Operator
Environmental Management Services

"It's amazing how easy it is to start up and operate one of these [MBR] plants."
Warren Felton, Superintendent
The Bandon Dunes WRF, Oregon

"During the snow melt, my MBR system handled higher than design flows at lower than expected temperatures for over a month. When it counted, the system performed."
Kevin Maughan, Lead Operator/Assistant Fire Chief
The Hyrum WRF, Utah

Fort Flaggler WWTP, WA
Maximum Month Flow: 25,000 GPD
Operating Mode: Pumped (Suction)
Commissioning Date: 06-01-2009
Engineer: Parametrix

Rio Del Oro WWTP, NM
Maximum Month Flow: 200,000 GPD
Operating Mode: Pumped (Suction)
Commissioning Date: 01-26-2006
Engineer: J. Samora & Associates; B. Crockett, Inc

Coppermine WRF, GA
Maximum Month Flow: 1.0 MGD
Operating Mode: Gravity
Commissioning Date: 01-19-2009
Engineer: ARCADIS

Leoni WWTP, MI
Maximum Month Flow: 3.6 MGD
Operating Mode: Gravity
Commissioning Date: 06-08-2010
Engineer: OMM

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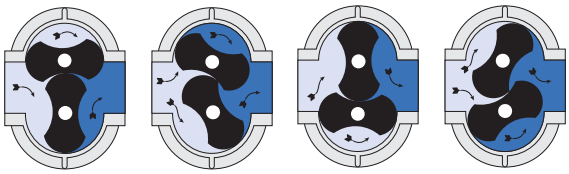
GE Oil & Gas

Roots* Rotary Lobe Positive Displacement Blowers

Universal RAI* Series | RAM* Series | RCS* Series | DVJ and DPJ Series

Operating Principles



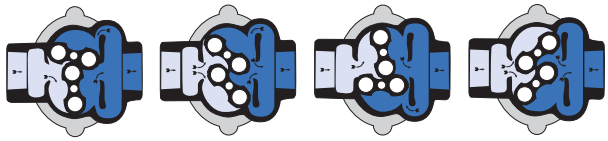
Bi-Lobe Principle

URAI, URAI-DSL, URAI-G, RAM, RCS Series

Two figure-eight lobe impellers mounted on parallel shafts rotate in opposite directions. As each impeller passes the blower inlet, it traps a finite volume of air and carries it around the case to the blower outlet, where the air is discharged. With constant speed operation, the displaced volume is essentially the same regardless of pressure, temperature or barometric pressure. Timing gears control the relative position of the impellers to each other and maintain small but finite clearances. This allows operation without lubrication being required inside the lobe cavity.

Warranty

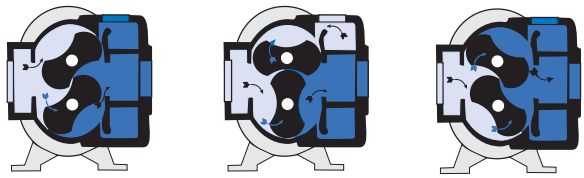
Proven designs, manufacturing and material provide assurance for superior operation. Local, factory trained, service centers offer timely response to your unique needs. Roots products are sold subject to GE's general terms of sale and warranty policy; contact your nearest GE office for more information.



WHISPAIR* Principle

URAI-J, URAI-J DSL, RAM-J, RAM-GJ, RAM-VJ, RCS-J

Incoming air is trapped by the impellers. Simultaneously, pressurized air (right) is being discharged. As the impeller passes the wrap-around flange, the Whispair jet equalizes pressure between trapped air and discharge area, aiding impeller movement and reducing power. Impellers move air into the discharge area. Backflow is controlled, resulting in reduction of noise and pulsation relative to conventional blowers.



DVJ/DPJ Principle

2504 DVJ, RAM DVJ, 721 DVJ, 406 DPJ

Incoming air is trapped between the impellers. Simultaneously, pressurized air is being discharged. As the impeller passes the jet plenum, cooled, pressurized air flows into the space between the impeller and cylinder. This cools the trapped air, helps control thermal growth and allows higher pressure ratios. The trapped air is then moved into the discharge flange. Backflow is reduced, resulting in lower operating noise level and reduced shock loading on the equipment.

Universal RAI Series Rotary Positive Displacement Blowers

All Universal RAI (URAI) series blowers are heavy duty rotary blowers in a compact, sturdy design engineered for continuous duty and maximum reliability. These blowers have a time tested lubrication system. GE's exclusive "figure-8" gearbox design improves oil distribution to the timing gears and lengthens bearing life.

This series features a grey iron casing, carburized and ground alloy steel spur timing gears secured to steel shafts with a taper fit and locknut, and grey iron involute impellers. Oversized anti-friction bearings are used, with a heavy duty cylindrical roller bearing at the drive shaft to withstand V-belt pull. Viton™ lip seals maintain proper lubricant at the bearings

Universal RAI Blower

Frame Sizes 22 thru 718

The standard URAI blower features convenient grease lubrication on the drive end. The feet permit easy in-field adaptation to either vertical or horizontal installation requirements and any of four drive shaft positions – top, bottom, right or left hand. All frame sizes are center-timed to allow for rotation in either direction.

Universal RAI DSL Blower

Frame Sizes 32 thru 615

This URAI blower features Dual Splash Lubrication (DSL). There is splash lubrication at the gear end and the drive end. The drive end has two shaft-mounted slingers and the gear end features GE's exclusive "figure-eight" gearbox design that work together to improve oil distribution and to maximize gear and bearing life. The oil reservoirs feature sight glasses for accurate oil level confirmation.

Universal RAI-G Gas Blower

Frame Sizes 32GJ thru 615GJ

URAI gas blowers feature mechanical seals and Viton™ o-rings. The seal system is designed to meet or exceed gas industry safety standards, including provisions for purge gas in the headplates. The URAI gas blower uses detachable steel mounting feet for adaptation of drive shaft position to meet vertical or horizontal installation requirements.

Universal RAI-J WHISPAIR Blower

Frame Sizes 33J thru 56J

GE refined the standard URAI line using computer-aided design techniques to incorporate the Roots exclusive WHISPAIR jet. The WHISPAIR jet uses shock suppression techniques for noise and pulsation reduction. This exclusive WHISPAIR feature can reduce noise 3-5 dB on typical installations. Like the standard URAI blower, the URAI-J features universal detachable steel mounting feet to permit easy in-field adaptation to any of four positions and grease lubrication on the drive end.

Universal RAI-J DSL Blower

Frame Sizes 33J thru 56J

This URAI blower combines the WHISPAIR design with the dual splash lubrication feature to offer the longest life and quietest performance of the URAI series.

Universal RAI Blower Performance Table

Frame Size	Speed RPM	1 psi		6 psi		7 psi		10 psi		12 psi		13 psi		14 psi		15 psi		Max Vacuum		
		CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	"HGV	CFM	BHP
	1160	10	0.1															4	6	0.2
22	3600	49	0.3	38	1.6	36	1.8	32	2.6	29	3.1							14	28	1.8
	5275	76	0.5	64	2.4	63	2.7	59	3.8	56	4.6							15	53	2.8
	1160	24	0.2															6	12	0.5
24	3600	102	0.6	83	3.1	81	3.6											14	69	3.5
	5275	156	0.9	137	4.6	135	5.4											15	119	5.5
	1160	40	0.2	21	1.4	19	1.6											10	18	1.1
32[3,5]	2800	113	0.6	95	3.4	93	3.9	86	5.6	82	6.7	81	7.2	79	7.8	77	8.3	15	78	4.1
	3600	149	0.9	131	4.4	129	5.2	122	7.3	118	8.7	117	9.4	115	10.1	113	10.8	16	110	5.3
	1160	55	0.3	31	1.9	28	2.2											10	27	1.5
33[3,4,5]	2800	156	0.9	132	4.6	129	5.4	120	7.7	116	9.2							14	113	5.2
	3600	205	1.2	181	6.1	178	7	170	9.9	165	11.9							15	159	7.3
	1160	95	0.5	61	3.1	57	3.6											10	55	2.5
36[3,4,5]	2800	262	1.5	229	7.7	224	8.9											12	213	7.5
	3600	344	2.1	310	10.1	306	11.7											15	278	12.1
	860	38	0.2	18	1.4	15	1.6											8	19	0.9
42[3,5]	1760	92	0.5	72	2.8	69	3.3	62	4.7	58	5.6							14	56	3.2
	3600	204	1.4	183	6.1	181	7.1	173	9.9	169	11.8	167	12.8	165	13.7	163	14.7	16	160	7.7
	860	79	0.5	42	2.7	37	3.2											8	46	1.8
45[3,4,5]	1760	188	1	151	5.7	146	6.6	133	9.4									12	134	5.5
	3600	410	2.7	374	12.2	369	14.1	356	19.8									16	332	15.4
	860	105	0.6	59	3.6	53	4.2											8	63	2.4
47[3,4,5]	1760	249	1.3	203	7.5	196	8.7											12	181	7.3
	3600	542	3.5	496	16.1	490	18.6											15	452	19.1
	700	72	0.4	42	2.4	38	2.8											10	36	2
53[3,5]	1760	211	1.2	181	6.3	177	7.3	167	10.3	160	12.3	157	13.3	155	14.4			14	158	7.1
	2850	355	2.5	325	10.7	321	12.3	310	17.2	304	20.5	301	22.1	298	23.8	295	25.4	16	291	13.4
	700	123	0.7	78	4.1	72	4.7											10	70	3.3
56[3,4,5]	1760	358	2	312	10.5	306	12.2	290	17.3	280	20.6	276	22.3					14	276	11.8
	2850	598	4	553	17.7	547	20.5	531	28.7	521	34.2	517	37					16	501	22.4
	700	187	1	130	5.9													8	135	3.9
59[3,5]	1760	529	2.9	472	15.3	464	17.8											12	445	14.9
	2850	881	5.9	824	26	816	30											15	770	30.8
	700	140	0.8	93	4.5	86	5.3	70	7.5									12	71	4.4
65[3,5]	1760	400	2.4	353	11.9	347	13.8	330	19.4	320	23.2	316	25.1	311	27	307	28.9	16	300	15.2
	2350	546	3.8	499	16.4	492	19	475	26.5	466	31.6	461	34.1	457	36.6	452	39.1	16	445	25.6
	700	224	1.2	149	7.3	139	8.5											10	135	5.9
68[3,5]	1760	643	3.7	567	18.9	557	21.9	530	31	515	37	507	40.1	500	43.1			15	495	22.7
	2350	876	5.6	801	25.9	790	29.9	763	42.1	748	50.2	740	54.2	733	58.3			16	715	32.8
	700	420	2.3	279	13.6	260	15.9											8	292	8.9
615[3,5]	1760	1205	6.6	1063	34.9	1044	40.6											12	997	33.9
	2350	1641	9.7	1500	47.6	1481	55.2											14	1389	53.4
	575	192	1.1	134	6.1	126	7.1	105	10.2									12	117	6
76	1400	527	3	468	15.4	460	17.8	439	25.3	427	30.2	421	32.7	415	35.1	410	37.6	16	413	19.7
	2050	790	5.3	731	23.4	723	27	702	37.9	690	45.1	684	48.7	679	52.4	673	56	16	674	29.5
	575	362	1.9	271	11.1	258	13	226	18.6									12	228	10.9
711	1400	970	5.2	880	27.7	867	32.2	835	45.7									15	793	33.5
	2050	1450	8.8	1359	41.8	1347	48.4	1315	68.2									16	1256	53.1
	575	600	3.1	470	18.1													10	446	14.8
718	1400	1590	8.1	1460	44.8													12	1398	43.6
	2050	2370	13.3	2240	66.9													12	2178	64.7

Existing Sludge Tanks & Pre-Eq

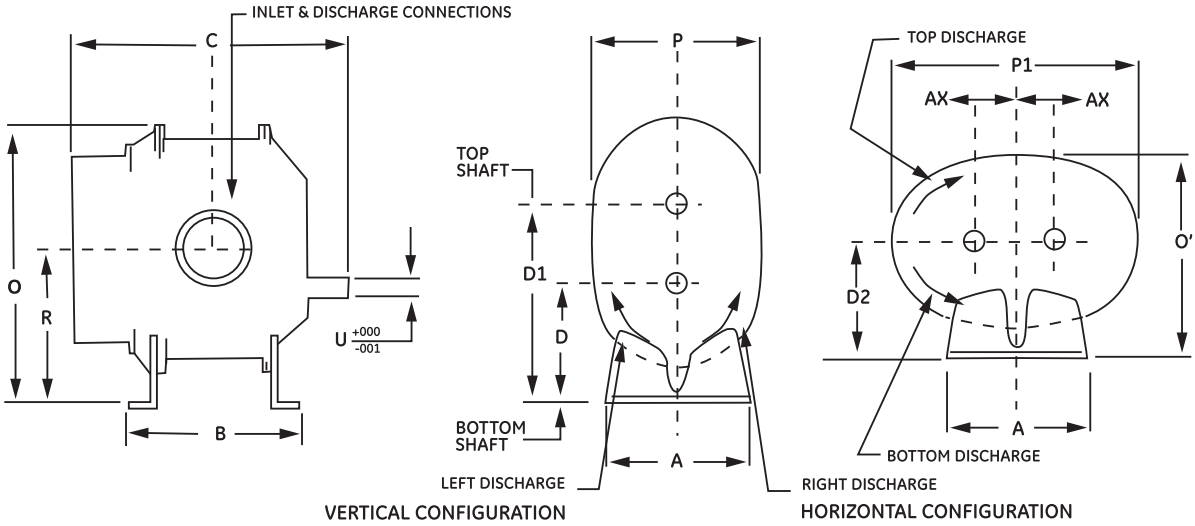
Notes:

1. Pressure ratings based on inlet air at standard pressure of 14.7 psia, standard temperature of 68° F, and specific gravity of 1.0.
2. Vacuum ratings based on inlet air at standard temperature of 68° F, discharge of 30" Hg and specific gravity of 1.0.
3. Available with Dual Splash Lube (DSL) feature.
4. Available with Whispair Jet (URAI-J) feature.
5. Available with mechanical seals (see performance for URAI-G).

Universal RAI-G Blower Performance Table

Frame Size	Speed RPM	1 psi		3 psi		5 psi		7 psi		11 psi		13 psi		14 psi		15 psi		Max Vacuum		
		CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	"HGV	CFM	BHP
32	1200	37	0.2	25	0.7	16	1.2											8	15	0.9
	1800	64	0.4	52	1.1	43	1.8	36	2.5									10	35	1.7
	2500	96	0.6	83	1.5	75	2.5	68	3.5	56	5.5	51	6.4	49	6.9			13	56	3.2
	3600	145	0.9	133	2.3	124	3.7	117	5.2	106	8	101	9.4	99	10.1	96	10.8	16	93	5.7
33	1200	52	0.3	36	1	24	1.6											8	23	1.3
	1800	89	0.5	73	1.5	61	2.5	52	3.4									10	51	2.4
	2500	132	0.8	116	2.1	105	3.5	96	4.8	81	7.5							13	80	5.3
	3600	200	1.2	183	3.2	172	5.1	163	7	148	10.9							15	137	7.3
36	1200	91	0.6	68	1.6	53	2.7	40	3.8									8	50	2.1
	1800	152	0.9	129	2.5	114	4.1	101	5.7									10	99	4
	2500	224	1.3	201	3.5	185	5.7	172	7.9									13	150	7.2
	3600	336	2.1	313	5.3	297	8.5	285	11.7									15	248	12.1
42	1200	54	0.3	40	1	30	1.6	22	2.2									8	29	1.3
	1800	90	0.5	76	1.5	67	2.4	59	3.4	46	5.3							10	58	2.4
	2500	132	0.8	118	2.1	109	3.4	101	4.8	88	7.4	83	8.7	80	9.4	78	10	13	88	4.3
	3600	199	1.4	185	3.3	175	5.2	168	7.1	155	10.9	149	12.8	147	13.7	144	14.7	16	140	7.7
45	1200	111	0.7	86	1.9	69	3.2	55	4.5									8	67	2.5
	1800	184	1	159	2.9	142	4.8	128	6.7									10	126	4.7
	2500	269	1.6	244	4.2	227	6.9	213	9.5									13	189	8.6
	3600	402	2.7	377	6.5	360	10.3	346	14.1									16	297	15.4
47	1200	149	0.9	117	2.5	96	4.2	78	5.9									8	92	3.3
	1800	244	1.4	213	3.9	191	6.4	174	8.9									10	171	6.2
	2500	356	2.1	325	5.6	303	9	285	12.5									13	255	11.3
	3600	531	3.5	500	8.5	478	13.6	461	18.6									15	410	19.1
53	800	78	0.5	57	1.4	43	2.3	32	3.2									8	41	1.8
	1400	157	0.9	136	2.5	122	4.1	111	5.7	92	9							10	109	4
	1800	209	1.2	189	3.3	175	5.4	164	7.5	145	11.6	137	13.7	133	14.7			13	144	6.7
	2850	348	2.5	327	5.8	313	9	302	12.3	283	18.9	275	22.1	272	23.8	268	25.4	16	262	13.4
56	800	135	0.8	104	2.3	83	3.9	65	5.4									8	79	3
	1400	267	1.5	236	4.2	215	6.9	198	9.6	170	15	157	17.7					10	195	6.7
	1800	356	2.1	325	5.5	304	9	286	12.5	258	19.4	246	22.9					13	257	11.2
	2850	588	4	557	9.5	536	15	518	20.5	490	31.5	478	37					15	468	21
59	800	205	1.2	167	3.4	140	5.7	118	7.9									8	136	4.4
	1400	399	2.2	360	6.1	334	10.1	312	14									10	309	9.8
	1800	528	3	490	8.1	463	13.2	441	18.2									13	404	16.5
	2850	868	5.9	829	13.9	802	22	780	30									15	718	30.8
65	700	129	0.8	97	2.3	75	3.8	57	5.3									8	71	3
	1400	301	1.8	269	4.8	247	7.8	229	10.8	200	16.8	187	19.8	181	21.3	175	22.8	10	226	7.5
	1800	399	2.5	367	6.4	345	10.2	327	14.1	298	21.8	285	25.7	280	27.6	274	29.5	13	297	12.7
	2350	534	3.8	503	8.9	481	13.9	463	19	433	29	421	34.1	415	36.6	409	39.1	16	400	20.6
68	700	206	1.2	155	3.7	120	6.1	91	8.5									8	115	4.8
	1400	483	2.7	432	7.6	396	12.4	368	17.2	321	26.9	300	31.7	291	34.1			10	363	12
	1800	641	3.8	590	10	554	16.2	526	22.4	479	34.8	458	41	449	44.1			13	477	20.2
	2350	858	5.6	807	13.7	772	21.8	743	29.9	696	46.1	676	54.2	666	58.3			16	642	32.8
615	700	387	2.3	291	6.8	224	11.3											8	215	8.9
	1400	905	5	809	14	742	23	689	32.1									10	681	22.4
	1800	1201	6.7	1104	18.4	1038	30	985	41.6									12	922	34.7
	2350	1608	9.7	1512	24.8	1445	40	1392	55.2									13	1300	49.7

Notes: **1. Performance based on METHANE at standard pressure of 14.7 psia, standard temperature of 68° F, and specific gravity of 0.55.**
2. For vacuum service consult factory or nearest Roots sales office.



Universal RAI Dimensions

Frame Size	A	B	C	Drive Shaft Locations			O	O[1]	P	P[1]	R	U	Keyway	Inlet & Disch. Dia.	AX	Approx. Net Wt. (lbs.)
				D	D1	D2										
22	5.13	5.00	9.75	3.75	6.25	3.75	9.63	6.88	6.25	9.25	5.00	.625	.188 x .094	1.0 NPT	1.25	32
24	5.13	7.00	11.75	3.75	6.25	3.75	9.63	6.88	6.25	9.25	5.00	.625	.188 x .094	2.0 NPT	1.25	43
32	7.25	6.75	11.25	5.00	8.50	5.00	12.81	8.88	7.75	12.13	6.75	.750	.188 x .094	1.25 NPT	1.75	69
33	7.25	7.63	12.13	5.00	8.50	5.00	12.81	8.88	7.75	12.13	6.75	.750	.188 x .094	2.0 NPT	1.75	74
36	7.25	10.00	14.63	5.00	8.50	5.00	12.81	8.88	7.75	12.13	6.75	.750	.188 x .094	2.5 NPT	1.75	102
42	8.00	7.25	13.00	6.25	10.25	6.25	15.06	10.63	8.75	13.63	8.25	.875	.188 x .094	1.5 NPT	2.00	88
45	8.00	10.00	15.50	6.25	10.25	6.25	15.06	10.63	8.75	13.63	8.25	.875	.188 x .094	2.5 NPT	2.00	109
47	8.00	11.75	17.63	6.25	10.25	6.25	15.06	10.50	8.50	13.63	8.25	.875	.188 x .094	3.0 NPT	2.00	128
53	10.50	8.38	15.38	6.25	11.25	6.75	17.38	11.88	10.25	17.25	8.75	1.125	.250 x .125	2.5 NPT	2.50	143
56	10.50	11.00	18.00	6.25	11.25	6.75	17.38	12.25	11.00	17.25	8.75	1.125	.250 x .125	4.0 NPT	2.50	170
59	10.50	14.00	21.18	6.25	11.25	6.75	17.38	12.25	11.00	17.25	8.75	1.125	.250 x .125	4.0 NPT	2.50	204
65	11.00[1]	10.00	18.38	8.75	14.75	8.75	21.63	15.13	12.75	19.75	11.75	1.375	.312 x .156	3.0 NPT	3.00	245
68	11.00[1]	13.00	21.38	8.75	14.75	8.75	21.63	15.13	12.75	19.75	11.75	1.375	.312 x .156	5.0 NPT	3.00	285
615	11.00[1]	20.00	28.38	8.75	14.75	8.75	21.63	16.25	15.00	19.75	11.75	1.375	.312 x .156	6.0 FLG	3.00	425
76	14.00[2]	11.75	19.94	11.00	18.00	11.00	26.13	20.69	19.38	23.25	14.50	1.562	.375 x .188	4.0 NPT	3.50	400
711	14.00[2]	16.75	25.19	11.00	18.00	11.00	26.13	19.50	17.00	23.25	14.50	1.562	.375 x .188	6.0 FLG	3.50	530
718	14.00[2]	23.75	32.19	11.00	18.00	11.00	26.13	19.50	17.00	23.25	14.50	1.562	.375 x .188	8.0 FLG	3.50	650

[1]17.00 in horizontal configuration [2]21.00 in horizontal configuration

NOTE: This dimensional table is for the Universal RAI Blower model and is provided for example purposes. Not suitable for construction purposes. Please inquire for detailed dimensions of the other URAI models.

RAM Series Rotary Positive Displacement Blowers

Roots RAM series units are recognized by many as the most volumetrically efficient blowers in the industry. Unless otherwise noted, RAM series equipment may operate under either vacuum or pressure application with no equipment modification, and can provide simultaneous vacuum and pressure for a system with a single unit.

RAM series units feature integral-shaft ductile iron impellers with involute profiles. Headplates and the rigid casing are cast grey iron, while the drive end and gear covers are aluminum. Carburized and ground alloy steel spur timing gears are securely mounted on tapered shafts. All units in the RAM series feature cylindrical roller bearings and splash lubrication for maximum life.

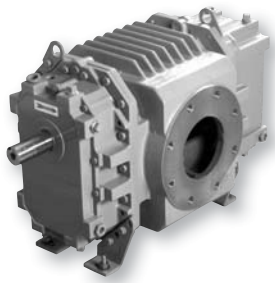
Detachable steel mounting feet permit adaptability to either vertical or horizontal installation requirements.

Piston-ring shaft seals reduce gas leakage through the headplates, while lip-type oil seals maintain lubrication in the bearings. RAM units are splash lubricated on both sides with high volume oil reservoirs and convenient sight glasses.

RAM Blower

Frame Sizes 404 thru 624

All standard units are center-timed to allow rotation in either direction.



RAM-J WHISPAIR Blower

Frame Sizes 404J thru 624J

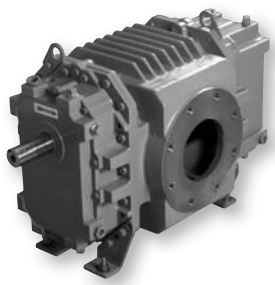
RAM-J units feature the original WHISPAIR jets to control pressure equalization by feeding backflow in the direction of impeller movement. The Whispair feature results in uni-directional flow and drive shaft rotation.

RAM-GJ Gas WHISPAIR Blower

Available on all RAM Frame Sizes

RAM standard blowers feature a piston ring system between the compression chamber and vent cavities. This models' vent cavities are plugged for purge or drain. Special long-life mechanical seals with Viton™ O-rings are installed at each bearing to control gas and oil leakage. The seal incorporates a proprietary geometry that promotes enhanced cooling and extended life.

RAM gas units are suitable for both vacuum or pressure service. Alternate materials and optional O-ring material are available for these machines. Please contact the factory for more information.



RAM-VJ Water Sealed WHISPAIR Vacuum Blower

Frame Sizes 406J thru 624J

These units are equipped with an inlet spray nozzle and seal water flow meter for water injection. This feature cools the unit enabling deeper vacuum levels than possible with conventional rotary vacuum blowers.

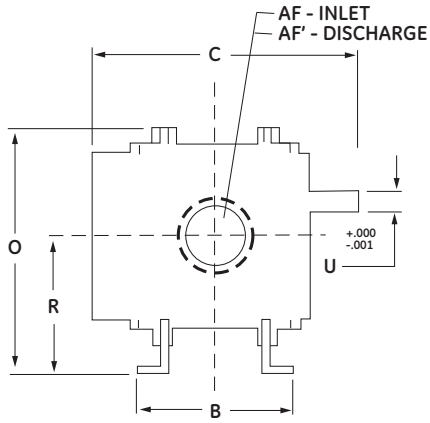
RAM, RAM-J and RAM-GJ Blower Performance Table

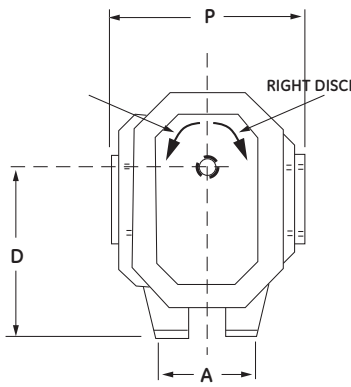
Frame Size	Speed RPM	4 psi		6 psi		8 psi		10 psi		12 psi		15 psi		18 psi		Max Vacuum		
		CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	"HGV	CFM	BHP
	1750	148	3.6	139	5.3	130	6.9	123	8.6	116	10.3					14.0	114	5.8
404	2950	280	6.9	271	9.6	262	12.4	255	15.2	248	18.0		22.2			15	240	10.8
	4000	396	11.1	386	14.4	378	18.1	370	21.9	364	25.7	239	31.3	347	36.9	16	350	15.8
	1750	225	5.5	210	7.9	198	10.5	187	13.0	177	15.6	355				14	173	8.8
406	2950	426	10.2	411	14.3	398	18.6	387	22.9	377	27.1		33.4			15	365	16.2
	4000	601	16.1	586	21.1	574	26.8	562	32.5	552	38.3	363	46.8	526	55.4	16	531	23.7
	1750	338	8.2	315	11.8	296	15.6	279	19.4	264	23.2	539				14	259	13.2
409	2950	638	15	615	21.1	586	27.5	579	33.9	564	40.2		49.8			15	546	24.2
	4000	900	23.3	878	30.8	859	39.4	842	48.0	827	56.5	544	69.3	788	82.1	16	796	35.2
	1750	450	10.8	420	15.7	394	20.8	372	25.8	352	30.9	806				14	344	17.6
412	2950	849	19.9	819	28.0	794	36.5	772	44.9	752	53.4		66.1			15	728	32.1
	4000	1199	30.6	1169	40.6	1144	52.0	1121	63.4	1101	74.9	724	91.8			16	1060	46.6
	1750	675	16.2	630	23.6	592	31.2	559	38.8			1074				14	517	26.4
418	2950	1275	29.7	1230	41.8	1192	54.6	1159	67.3							15	1092	48.1
	4000	1800	45.6	1755	60.6	1717	77.7	1684	94.8							16	1591	69.8
	1170	671	16.6	614	24.6	566	32.6	524	40.6	486	48.6					13	501	25.7
616	1750	1128	25.6	1072	37.5	1024	49.4	982	61.3	943	73.2					14	929	41.7
	3000	2115	49	2058	68.8	2010	88.6	1968	108.4	1930	128.2		157.9			16	1851	81.8
	1170	1006	25.1	921	37.1	849	49.1	786	61.1			1878				13	751	38.8
624	1750	1693	39.3	1608	57.2	1536	75.0	1473	92.8							14	1394	63.0
	3000	3173	77.6	3088	107.3	3016	137.1	2953	166.8							16	2777	124.8

RAM-VJ Water Sealed Vacuum Blower Performance Table

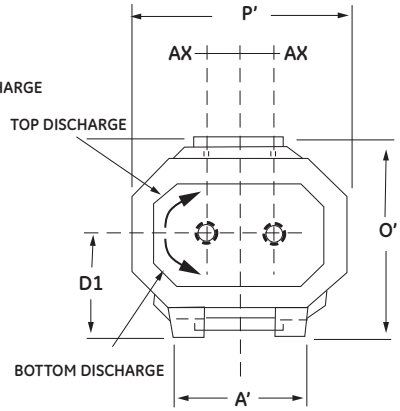
Frame Size	Speed RPM	10" HGV		15" HGV		16" HGV		20" HGV		22" HGV		24" HGV	
		CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
	1530	181	6.1	160	8.8	154	9.3	119	11.5	87	12.5	33	13.6
406	2325	301	10.4	277	14.4	270	15.2	228	18.3	191	19.9	128	21.5
	3200	436	16.5	408	21.7	400	22.7	353	26.9	312	29.0	240	31.1
	1530	284	8.9	257	12.9	249	13.7	202	16.9	160	18.5	89	20.1
409	2325	458	14.6	423	20.6	413	21.8	354	26.5	302	28.9	312	31.3
	3200	653	22.4	611	30.3	599	31.9	529	38.2	467	41.3	359	44.5
	1530	379	11.6	342	16.9	331	18.0	269	22.3	214	24.4	118	26.5
412	2325	610	18.9	563	26.8	550	28.4	471	34.7	402	37.9	282	41.1
	3200	869	28.4	814	38.9	798	41.0	704	49.5	622	53.7	479	57.9
	1530	569	17.1	513	25.1	498	26.7						
418	2325	815	27.4	846	39.3	826	41.7						
	3200	1305	40.5	1222	56.3	1199	59.5						
	1160	748	20.3	708	29.9	696	31.9	616	39.5	541	43.4	424	47.2
616	1750	1170	32.0	1121	46.3	1106	49.1	1005	60.5	911	66.2	765	71.9
	2400	1643	46.6	1585	65.5	1567	69.3	1447	84.4	1335	92.0	1161	99.5
	1160	1122	30.4	1063	44.8	1045	47.6						
624	1750	1756	47.8	1683	69.0	1660	73.2						
	2400	2466	69.3	2379	97.3	2351	102.9						

Notes:
1. Pressure ratings based on inlet air at standard pressure of 14.7 psia, standard temperature of 68° F, and specific gravity of 1.0.
2. Vacuum ratings based on inlet air at standard temperature of 68° F, discharge of 30" Hg and specific gravity of 1.0.





VERTICAL CONFIGURATION
(Horizontal Air Flow)



HORIZONTAL CONFIGURATION
(Vertical Air Flow)

RAM Blowers Dimensions

Frame Size	A	A'	B	C	Drive Shaft Location		O	O'	P	P'	R	U	Keyway	AF Inlet Dia.	AF' Dsch. Dia.	AX	Approx. Net Wt (lbs)
					D	D1											
404	8.00	11.00	8.75	18.50	11.25	7.50	16.63	13.50	12.00	15.25	9.00	1.50	.375 x.188	3.0 NPT	3.0 NPT	2.25	200
406	8.00	11.00	10.75	20.50	11.25	7.50	16.63	13.50	12.00	15.25	9.00	1.50	.375 x.188	4.0 NPT	4.0 NPT	2.25	230
409	8.00	11.00	13.75	23.50	11.25	7.50	16.63	13.00	11.00	15.25	9.00	1.50	.375 x.188	4.0 NPT	4.0 NPT	2.25	270
412	8.00	11.00	16.75	26.50	11.25	7.50	16.63	13.00	11.00	15.25	9.00	1.50	.375 x.188	6.0 FLG	6.0 FLG	2.25	330
418	8.00	11.00	22.75	32.50	11.25	7.50	16.63	13.00	11.00	15.25	9.00	1.50	.375 x.188	8.0 FLG	8.0 FLG	2.25	410
616	10.00	16.00	20.75	32.44	15.00	9.00	22.00	16.25	14.50	20.00	12.00	2.00	.500 x.250	8.0 FLG	8.0 FLG	3.00	650
624	10.00	16.00	28.75	40.44	15.00	9.00	22.00	16.25	14.50	20.00	12.00	2.00	.500 x.250	10.0 FLG	10.0 FLG	3.00	775

RAM-J, RAM-GJ and RAM-VJ Blowers Dimensions

Frame Size	A	A'	B	C	Drive Shaft Location		O	O'	P	P'	R	U	Keyway	AF Inlet Dia.	AF' Dsch. Dia.	AX	Approx. Net Wt (lbs)
					D	D1											
404J	8.00	11.00	8.75	18.5	11.25	7.50	16.63	14.75	14.50	15.25	9.00	1.50	.375 x .188	3.0 NPT	3.0 NPT	2.25	270
406J	8.00	11.00	10.75	20.5	11.25	7.50	16.63	14.75	14.50	15.25	9.00	1.50	.375 x .188	4.0 NPT	4.0 NPT	2.25	300
409J	8.00	11.00	13.75	23.5	11.25	7.50	16.63	14.75	14.50	15.25	9.00	1.50	.375 x .188	5.0 NPT	5.0 NPT	2.25	350
412J	8.00	11.00	16.75	26.5	11.25	7.50	16.63	13.50	13.00	15.25	9.00	1.50	.375 x .188	6.0 FLG	5.0 FLG	2.25	400
418J	8.00	11.00	22.75	32.5	11.25	7.50	16.63	14.50	14.00	15.25	9.00	1.50	.375 x .188	8.0 FLG	6.0 FLG	2.25	500
616J	9.00	15.00	20.75	32.19	15.00	9.00	22.00	16.50	16.25	20.00	12.00	2.00	.500 x .250	8.0 FLG	6.0 FLG	3.00	700
624J	9.00	15.00	28.75	40.19	15.00	9.00	22.00	17.75	17.50	20.00	12.00	2.00	.500 x .250	10.0 FLG	8.0 FLG	3.00	910

Notes: 1. All dimensions are in inches. 2. Weights are in pounds, and are approximate. 3. Do not use for construction.

RCS Series Rotary Positive Displacement Blowers

Roots RCS series units are heavy-duty units with integral-shaft ductile iron impellers in an involute profile. The headplates, gear cover, drive end cover and rigid, one-piece casing are grey iron. Carburized and ground alloy steel spur timing gears are taper mounted on the shafts and secured with a locknut. Cylindrical roller bearings combined with high volume oil reserves offer low maintenance and trouble free operation.

Piston rings reduce air leakage through the headplate shaft openings, while lip-type oil seals maintain lubricant in the roller bearings.

All RCS series blowers are equipped with splash oil lubrication at both ends of the blower.

RCS Blower

Frame Sizes 817 thru 827

All standard units are center-timed to allow rotation in either direction. RCS series units incorporate detachable steel mounting feet to permit adaptability to either vertical or horizontal installation.

RCS-J WHISPAIR Blower

Frame Sizes 715J thru 832J

RCS WHISPAIR units reduce noise and power loss by utilizing a wrap-around plenum and proprietary WHISPAIR jet ports to control pressure equalization. The WHISPAIR jets meter discharge pressure in the direction of impeller movement, thereby aiding rotation. Discharge pulsation is reduced by the pre-pressurization of the blower chamber. This reduced pulsation results in lower noise, and reduced shock loading on the system components.

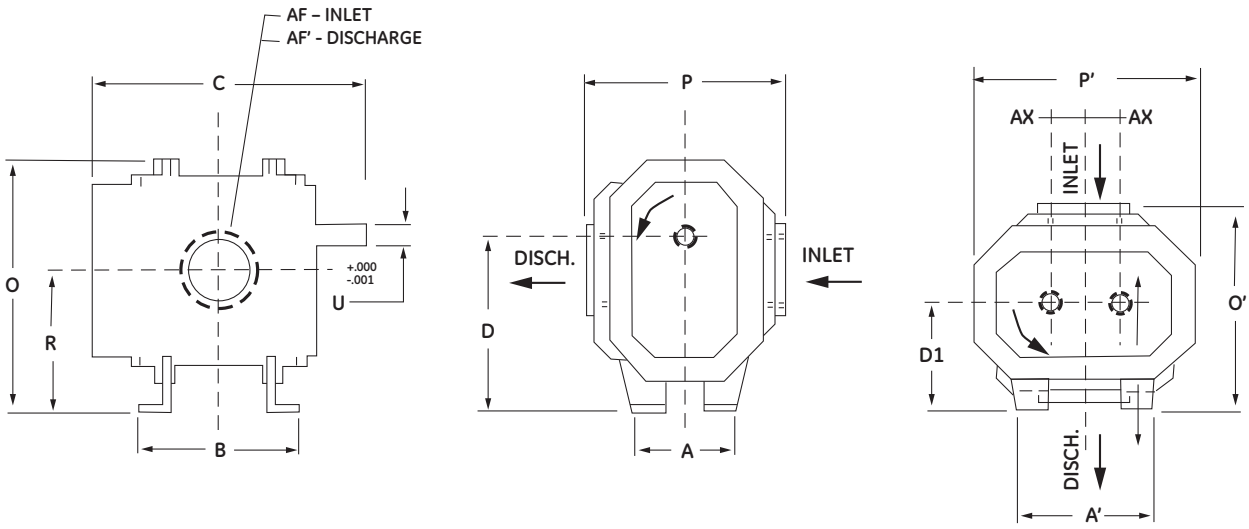
RCS WHISPAIR units frames 817J thru 832J have feet integral to the headplates.

RCS Series Blower Performance Table

Frame Size	Speed RPM	4 psi		6 psi		8 psi		10 psi		12 psi		15 psi		Max Vacuum		
		CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	"HGV	CFM	BHP
	880	982	24.8	894	36.7	820	48.6	755	60.5					12.0	762	35.5
817	1770	2368	55.7	2281	79.2	2207	102.7	2142	126.2	2083	149.6	2003	184.9	16	1961	96.0
	2250	3116	76.6	3028	106.0	2955	135.3	2890	164.6	2831	194.0	2751	238.0	16	2709	123.1
	880	1326	33.5	1207	49.6	1108	65.6	1020	81.7					12	1030	47.9
824	1770	3198	75.0	3080	106.7	2980	138.5	2892	170.2	2813	201.9	2705	249.4	16	2648	129.5
	2250	4208	103.1	4090	142.7	3990	182.3	3902	221.9	3823	261.5	3715	320.9	16	3658	166.1
	880	1519	38.3	1383	56.7	1269	75.1	1169	93.5					12	1180	54.9
827	1770	3665	85.0	3529	121.3	3415	157.6	3314	194.0	3223	230.3			16	3035	147.9
	2250	4822	116.0	4687	161.4	4572	206.8	4472	252.2	4381	297.6			16	4192	189.4

RCS-J Series Blower Performance Table

Frame Size	Speed RPM	4 psi		6 psi		8 psi		10 psi		12 psi		15 psi		18 psi		Max Vacuum		
		CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	"HGV	CFM	BHP
	1180	935	22.7	869	33.4	814	44.0	765	54.6	721	65.2	662	81.1			14.0	704	37.1
715	1770	1548	36.6	1482	52.4	1427	68.1	1378	83.9	1334	99.6	1275	123.3			15	1281	60.3
	2600	2410	61.4	2345	84.0	2289	106.5	2241	129.1	2197	151.7	2137	185.5			15	2143	90.9
	1180	1266	30.6	1177	45.0	1102	59.4	1036	73.7	977	88.1	896	109.7			14	953	50.2
721	1770	2096	49.0	2007	70.3	1932	91.6	1867	113.0	1807	134.3	1726	166.3			15	1734	81.4
	2600	3264	81.1	3175	111.7	3100	142.3	3034	172.8	2975	203.4	2894	249.3			15	2902	122.1
	800	981	24.7	893	36.6	819	48.5	754	60.4							14	1141	55.6
817	1770	2368	54.6	2280	78.1	2206	101.6	2141	125.1	2082	148.5	2002	183.8	1930	219	16	1958	95.4
	2250	3115	74.4	3028	103.7	2954	133.0	2889	162.4	2830	191.7	2750	235.7	2678	279.7	16	2706	122.1
	880	1177	29.7	1072	43.9	983	58.2	905	72.5							14	1370	66.7
821	1770	2842	65.8	2736	94.0	2648	122.2	2570	150.3	2499	178.5	2403	220.8			16	2351	114.6
	2250	3740	89.8	3635	125.0	3546	160.2	3468	195.4	3398	230.6	3302	283.4			16	3248	146.7
	880	1472	37.0	1340	54.8	1230	72.7	1132	90.5							14	1713	83.3
826	1770	3553	81.3	3421	116.5	3310	151.7	3213	187.0	3124	222.2					16	2939	142.9
	2250	4675	110.2	4544	154.2	4433	198.2	4335	242.2	4247	286.2					16	4061	182.5
	880	1766	44.4	1608	65.8	1475	87.2	1358	108.5							14	2055	99.9
832	1770	4263	97.3	4105	139.6	3972	181.9	3854	224.1							16	3526	171.3
	2550	5610	131.9	5452	184.7	5320	237.5	5202	290.3							16	4872	218.8

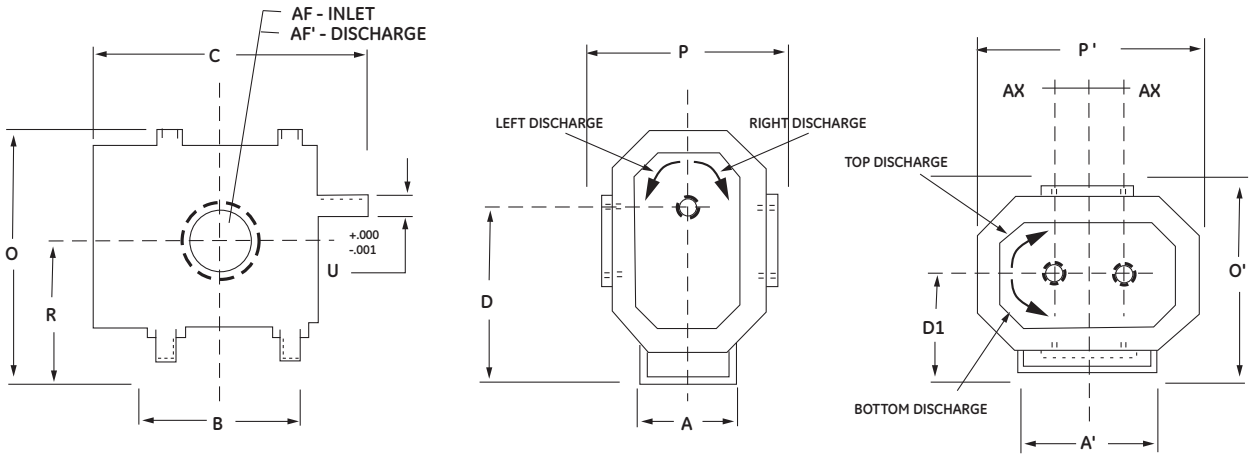


VERTICAL CONFIGURATION
(Horizontal Air Flow)

HORIZONTAL CONFIGURATION
(Vertical Air Flow)

RCS Blowers Dimensions

Frame Size	A	A'	B	C	Drive Shaft Location		O	O'	P	P'	R	U	Keyway	AF Inlet Dia.	AF' Dsch. Dia.	AX	Approx. Net Wt (lbs)
					D	D1											
817	19.00	27.00	24.25	38.44	18.00	10.00	28.38	20.38	19.00	25.25	14.00	2.75	.625 x.313	10.0 FLG	10.0 FLG	4.00	1200
824	19.00	27.00	30.50	44.69	18.00	10.00	28.38	20.38	19.00	25.25	14.00	2.75	.625 x.313	12.0 FLG	12.0 FLG	4.00	1330
827	19.00	27.00	34.00	48.19	18.00	10.00	28.38	20.38	19.00	25.25	14.00	2.75	.625 x.313	14.0 FLG	14.0 FLG	4.00	1600



VERTICAL CONFIGURATION
(Horizontal Air Flow)

HORIZONTAL CONFIGURATION
(Vertical Air Flow)

RCS-J Blowers Dimensions

Frame Size	A	A'	B	C	Drive Shaft Location		O	O'	P	P'	R	U	Keyway	AF Inlet Dia.	AF' Dsch. Dia.	AX	Approx. Net Wt (lbs)
					D	D1											
715J	19.00	26.00	21.50	33.38	17.00	10.00	25.13	19.00	18.00	23.25	13.5	2.375	.625 x.313	10.0 FLG	8.0 FLG	3.50	1100
721J	19.00	26.00	27.00	39.38	17.00	10.00	25.13	19.00	18.00	23.25	13.5	2.375	.625 x.313	12.0 FLG	10.0 FLG	3.50	1200
817J	13.75	22.00	24.25	38.63	21.00	13.00	30.00	25.75	25.50	25.00	17.00	2.750	.625 x.313	10.0 FLG	10.0 FLG	4.00	1620
821J	13.75	22.00	27.88	42.25	21.00	13.00	30.00	25.75	25.50	25.00	17.00	2.750	.625 x.313	12.0 FLG	10.0 FLG	4.00	1800
826J	13.75	22.00	33.13	47.50	21.00	13.00	30.00	25.75	25.50	25.00	17.00	2.750	.625 x.313	12.0 FLG	12.0 FLG	4.00	2075
832J	13.75	22.00	38.50	52.88	21.00	13.00	30	25.75	25.50	25.00	17.00	2.750	.625 x.313	14.0 FLG	12.0 FLG	4.00	2325

Notes: 1. All dimensions are in inches. 2. Weights are in pounds, and are approximate. 3. Do not use for construction.

DVJ and DPJ Rotary Positive Displacement Blowers

These units feature an integral discharge jet plenum design, allowing cool, atmospheric air to flow into the casing. This unique design permits continuous operation at high vacuum levels (up to blank-off) with a single stage unit. In the case of Roots DPJ blowers, high pressure discharge air is cooled before injecting into the jet plenum.

Headplates and the rigid casing are cast from grey iron, with aluminum drive end and gear covers. Carburized ground alloy steel spur timing gears are securely mounted on taper end shafts. These units are designed with detachable steel mounting feet to permit adaptability to high pressure discharge left, right or vertically upwards.

2504 DVJ WHISPAIR Vacuum Blower

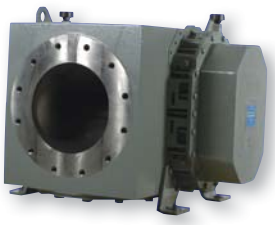
Frame Size 2504 DVJ

This unit features ball bearings, lip seals, splash lubrication at the gear end and grease lubrication at the drive end.

RAM DVJ Vacuum Blower

Frame Sizes 406 DVJ, 412 DVJ and 616DVJ

RAM DVJ units feature integral-shaft ductile iron impellers with involute profiles. The top shaft is extended for side outlet blowers, and either left or right shaft can be extended for top or bottom outlet blowers. RAM DVJ units feature cylindrical roller bearings for maximum life. Piston ring shaft seals reduce gas leakage through the headplates, while lip-type oil seals maintain proper oil levels in the bearings. The units are splash lubricated on both sides with high volume oil reservoirs. They can be equipped with mechanical seals for gas applications. Please contact us for more information on gas applications.



721 DVJ WHISPAIR Vacuum Blower

Frame Size 721 DVJ

This unit has the same durable features as the RAM DVJ blowers. However, is not currently configured for gas applications.

RAM 406 DPJ Dry High-Pressure Blower

Frame Size 406 DPJ

In this unit, the WHISPAIR jets control pressure equalization by feeding cooled discharge air in the direction of impeller movement, thereby aiding rotation. Cooled discharge air is mixed with incoming air to control temperature rise. This design permits continuous operation with discharge pressures up to 30 PSIG in a single stage unit. RAM DPJ units feature cylindrical roller bearings and is splash lubricated at both the gear and drive ends. Piston rings are used to reduce air leakage through the headplate shaft openings, while lip-type oil seals maintain proper oil levels in the bearings. The top shaft is extended for side outlet blowers, and either left or right shaft can be extended for top outlet blowers. RAM DPJ units can be equipped with mechanical seals for gas application. Please contact us for more information on gas applications.

2504 DVJ Blower Performance Table

Frame Size	Speed RPM	Max. Free Air CFM	12" HGV		16" HGV		20" HGV	
			CFM	BHP	CFM	BHP	CFM	BHP
2504J	2400	170	47	2.1	36	2.8	21	3.5
	2655		56	2.3	44	3.1	30	3.9
	2990		67	2.6	56	3.5	41	4.4
	3540		86	3.1	75	4.2	60	5.2
	3985		101	3.6	90	4.7	75	5.9
	4515		119	4.1	108	5.4	93	6.7
	4970		135	4.6	124	6.0	109	7.4

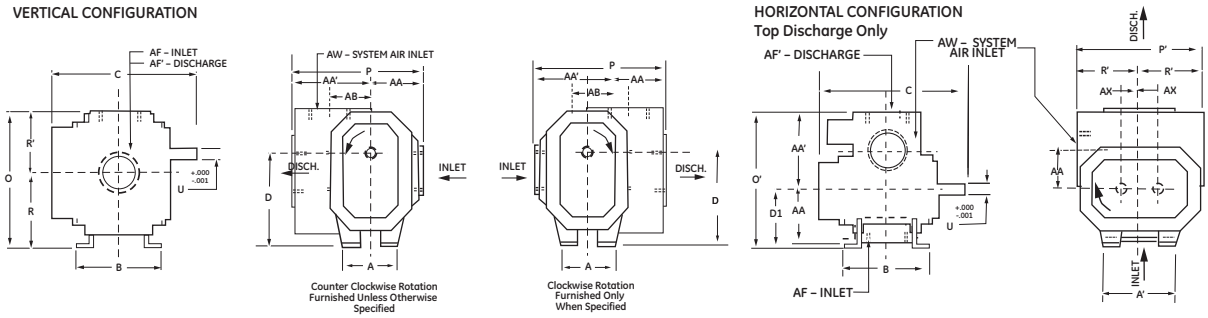
RAM DVJ and 721 DVJ Blower Performance Table

Frame Size	Speed RPM	Max Free Air CFM	12" HGV		16" HGV		20" HGV		24" HGV		27" HGV	
			CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
406	2320	668	266	10.3	229	13.5	178	16.7	80	20.0		22.4
	2695		329	12.2	292	15.9	241	19.6	143	23.2		26.0
	3564		474	16.7	437	21.5	386	26.2	288	31.0	47	34.5
	4000		547	19.2	510	24.4	459	29.7	361	34.9	120	38.8
412	2320	1332	531	20.2	457	26.7	335	33.2	160	39.7		44.5
	2695		656	23.7	581	31.2	480	38.7	285	46.2		51.8
	3564		945	32.0	871	41.7	769	51.5	574	61.3	94	68.6
	4000		1091	36.3	1016	47.2	914	58.1	719	68.9	239	77.1
616	1750	2367	1016	35.8	903	47.5	750	59.1	455	70.8		79.6
	2124		1311	43.7	1198	57.8	1045	71.9	750	86.0	24	96.6
	2437		1558	50.5	1445	66.6	1292	82.7	997	98.8	271	110.9
	2860		1892	59.8	1779	78.6	1625	97.4	1331	116.2	605	130.3
	3000		2002	63.0	1889	82.6	1736	102.3	1441	121.9	715	136.7
721	1180	3658	1173	43.3	975	57.2	755	71.2	333	85.2		95.7
	1770		1967	66.4	1806	87.0	1585	107.7	1163	128.3	122	143.8
	2200		2572	84.3	2411	109.6	2190	134.8	1768	160.1	727	179.1
	2600		3135	102.0	2973	131.4	2753	160.7	2331	190.0	1290	212.0

DPJ Blower Performance Table

Frame Size	Speed RPM	15" psi		20" psi		25" psi		30" psi	
		CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
406	1750	142	19.4	119	25.8	99	32.1	80	38.5
	2320	237	26.0	214	34.5	194	42.9	175	51.4
	3070	363	35.1	339	46.3	319	57.5	300	68.6
	4000	518	47.2	495	61.8	474	76.3	456	90.9

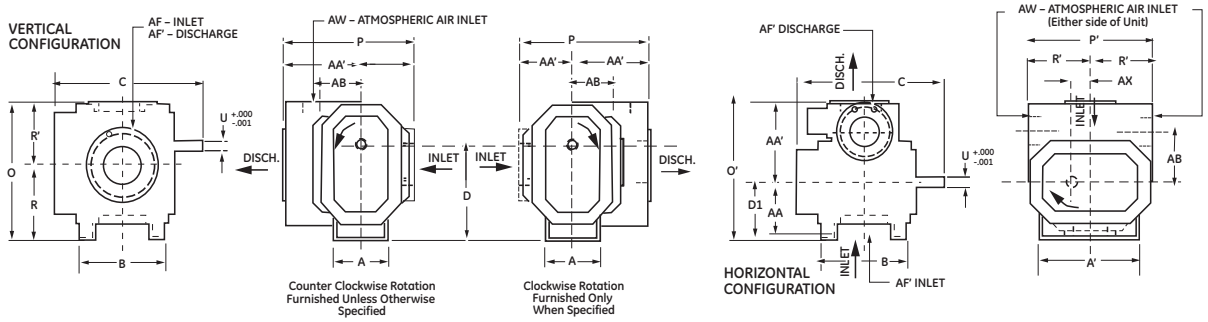
Notes:
1. Vacuum ratings based on inlet air and jet air standard pressure and standard temperature of 68° F, discharge and jet pressures of 30" Hg and specific gravity of 1.0.
2. Refer to factory for performance guarantee above 24" HgV.
3. DPJ ratings based on inlet air at standard pressure of 14.7 psia, standard temperature of 68° F, and specific gravity of 1.0.



RAM DVJ Blower Dimensions

Frame Size	A	A'	B	C	Drive Shaft Location		O	O'	P	P'	R	R'	U	Keyway	AA	AA'	AB	AF	AF'	AW	AX	Approx. Net Wt. (lbs.)
					D	D1																
406J	8	11	10.75	20.50	11.25	7.50	16.38	18.00	17.75	14.75	9.00	7.38	1.5000	.375 x .188	7.25	10.50	6.75	4 NPT	5 NPT	4 NPT	2.25	365
412J	8	11	16.75	26.50	11.25	7.50	16.38	19.25	17.75	15.25	9.00	7.63	1.5000	.375 x .188	6.00	11.75	6.50	6 FLG	6 FLG	5 FLG	2.25	575
616J	10	16	21.44	32.50	15.00	9.00	21.63	22.75	21.25	19.25	12.00	9.63	2.000	.500 x .250	7.50	13.75	6.75	8 FLG	10 FLG	8 FLG	3.00	975

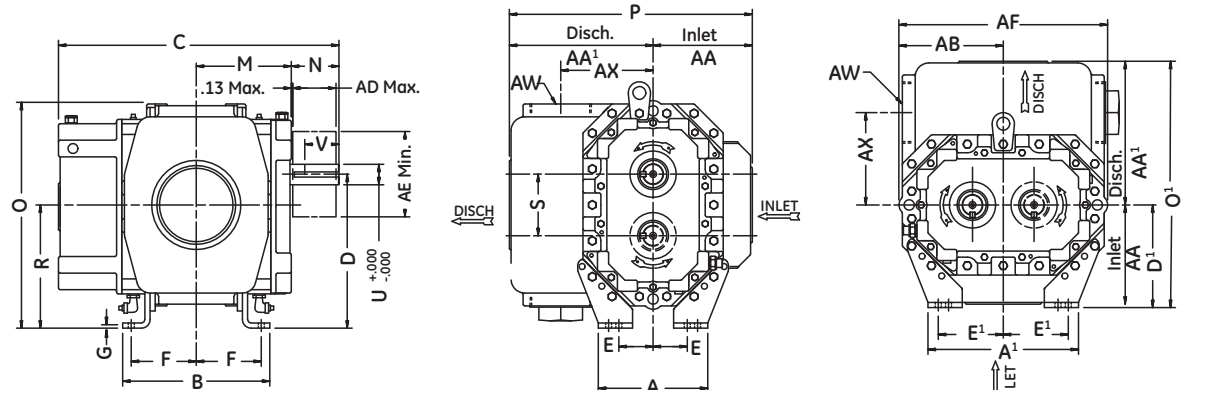
Notes: 1. All dimensions are in inches. 2. Weights are in pounds, and are approximate. 3. Do not use for construction.



721 DVJ Blower Dimensions

Frame Size	A	B	C	Drive Shaft Location		O	O'	P	P'	R	U	Keyway	AA	AA'	AB	AF	AF'	AW	AX	Approx. Net Wt. (lbs.)
				D	D1															
721J	6.50	7.50	11.38	4.00	4.00	9.88	11.63	12.38	8.75	5.25	.7500	.188 x .094	4.75	7.63	4.75	2.5 NPT	2.5 NPT	2 NPT	1.25G	65

Notes: 1. All dimensions are in inches. 2. Weights are in pounds, and are approximate. 3. Do not use for construction.



DPJ Blower Dimensions

Frame Size	A	A'	B	C	D	D1	E	E'	F	G	M	N	O	O1	R	S	P	V	Keyway	AA	AA1	AB
406 DPJ	8.00	11.00	10.75	20.50	11.25	7.50	2.50	4.75	4.75	.38	6.95	3.48	16.38	18.00	9.00	4.50	17.75	2.75	.375 x .188	7.25	10.50	7.63

Frame Size	AD	AE	AF	AW	AX	Weight
406 DPJ	3.06	7.10	15.25	4" NPT	6.75	365

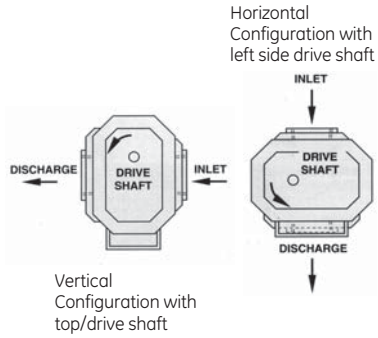
Notes: 1. All dimensions are in inches. 2. Weights are in pounds, and are approximate. 3. Do not use for construction.

Configurations

Roots blowers are available in two basic configurations to meet nearly any piping arrangement or installation requirement. Orientation for inlet and discharge connections is determined from the drive end:

Vertical Configuration:

For vertical configuration, one impeller is mounted above the other, unless otherwise noted the blower drive end located opposite the timing gears. Inlet and discharge connection flanges are positioned to provide horizontal air/gas flow. Specify blower driver for either top or bottom shaft.



Horizontal Configuration with left side drive shaft

Vertical Configuration with top/drive shaft

Horizontal Configuration:

For horizontal configuration, impellers are located side-by-side. Unless otherwise noted, the blower drive end is located opposite the timing gears. Inlet and discharge connection flanges provide a vertical air/gas flow. Specify blower driver for either left or right hand shaft.

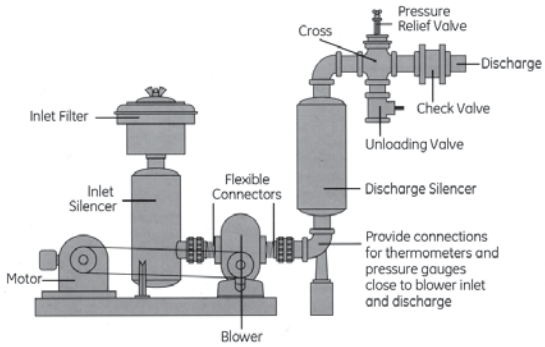
Special Note:

URAI-J, URAI-J DSL, RAM-J, RAM GJ, RAM-VJ and RCS-J models are designed to operate with only one shaft rotation direction to take full advantage of the WHISPAIR feature. Therefore, "J" blower should be operated in the following combinations only:

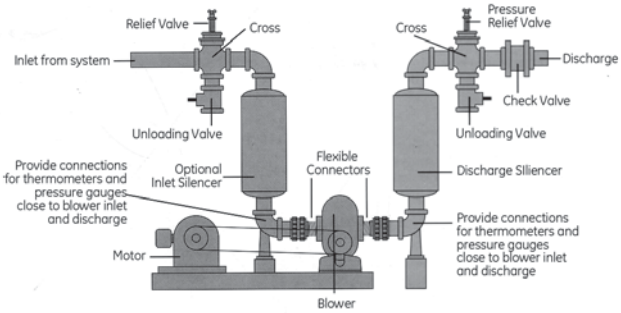
- CCW Rotation facing blower drive shaft: Bottom Shaft; Right side discharge or a Left Shaft; Bottom discharge.
- CCW Rotation facing blower drive shaft: Top Shaft; Left side discharge or a Right Shaft; Top discharge.
- CW Rotation facing blower drive shaft: Bottom Shaft; Left side discharge or a Right Shaft; Bottom discharge.
- CW Rotation facing blower drive shaft: Top Shaft; Right side discharge or a Left Shaft; Top discharge.

Typical Application Packages

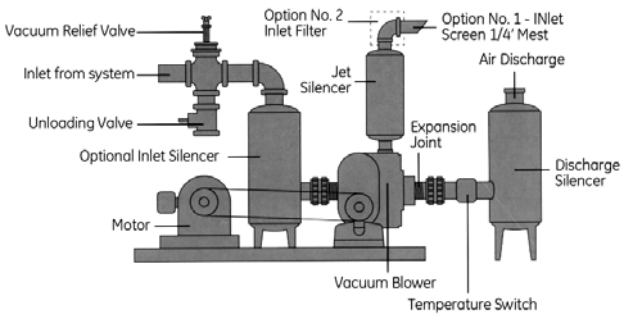
Pressure Application - Inlet open to atmosphere



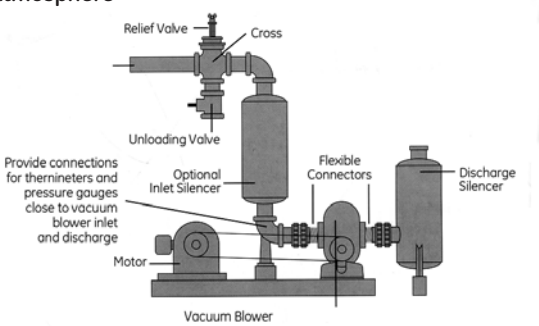
Gas Application - Closed Loop Piping



High-Vacuum Application - w/DVJ Vacuum Blower



Vacuum Blower Application - Discharge open to Atmosphere



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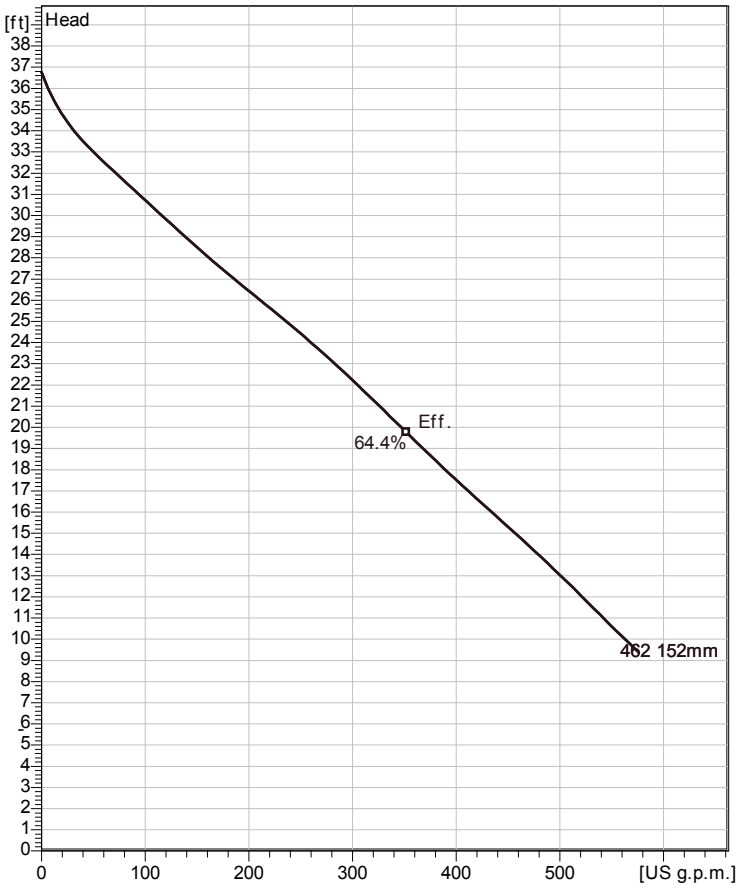
NP 3085 MT 3~ Adaptive 462

Technical specification



Water, pure

Curve according to: ISO 9906 grade 2 annex 1 or 2

Note: Picture might not correspond to the current configuration.

General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

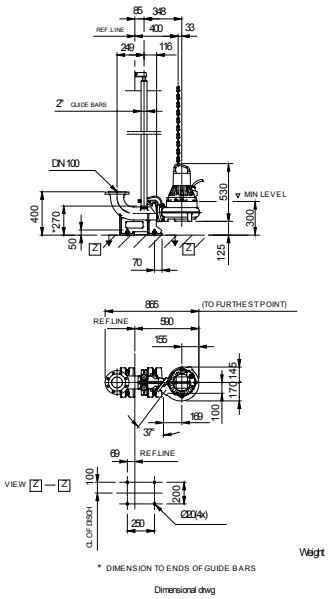
Impeller material	Grey cast iron
Discharge Flange Diameter	80 mm
Suction Flange Diameter	80 mm
Impeller diameter	152 mm
Number of blades	2

Motor

Motor #	N3085.160 15-10-4AL-W 3hp
Stator variant	61
Frequency	60 Hz
Rated voltage	460 V
Number of poles	4
Phases	3~
Rated power	3 hp
Rated current	4.5 A
Starting current	25 A
Rated speed	1705 rpm
Power factor	
1/1 Load	0.81
3/4 Load	0.74
1/2 Load	0.62
Efficiency	
1/1 Load	77.5 %
3/4 Load	78.0 %
1/2 Load	76.0 %

Configuration

Installation: P - Semi permanent, Wet



Dimensional drwg
NP 3085 MT

Project	Project ID	Created by	Created on	Last update
			2015-04-21	

NP 3085 MT 3~ Adaptive 462

Performance curve

Pump

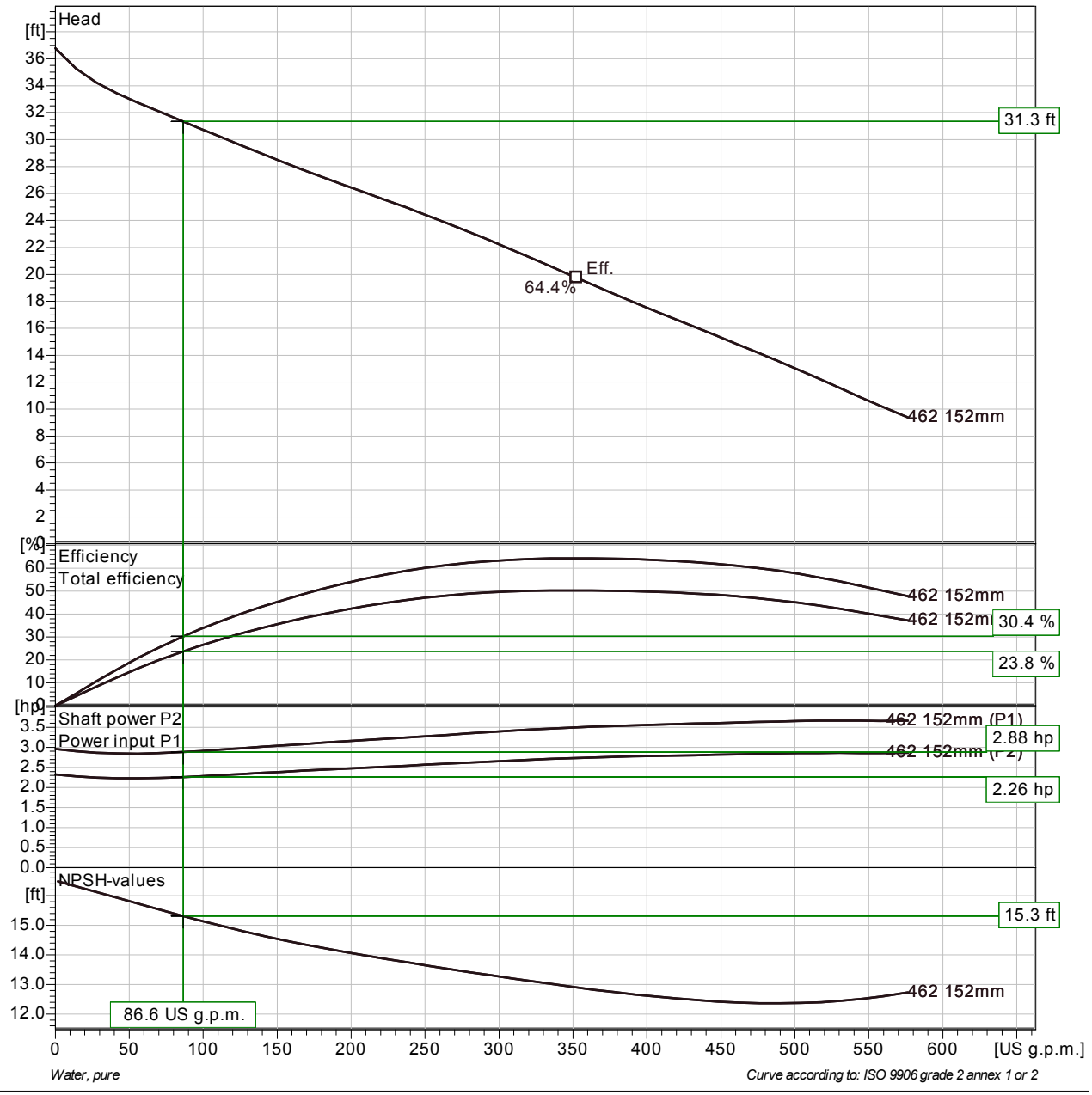
Discharge Flange Diameter	80 mm
Suction Flange Diameter	80 mm
Impeller diameter	152 mm
Number of blades	2

Motor

Motor #	N3085.160 15-10-4AL-W 3hp
Stator variant	61
Frequency	60 Hz
Rated voltage	460 V
Number of poles	4
Phases	3~
Rated power	3 hp
Rated current	4.5 A
Starting current	25 A
Rated speed	1705 rpm

Power factor	
1/1 Load	0.81
3/4 Load	0.74
1/2 Load	0.62

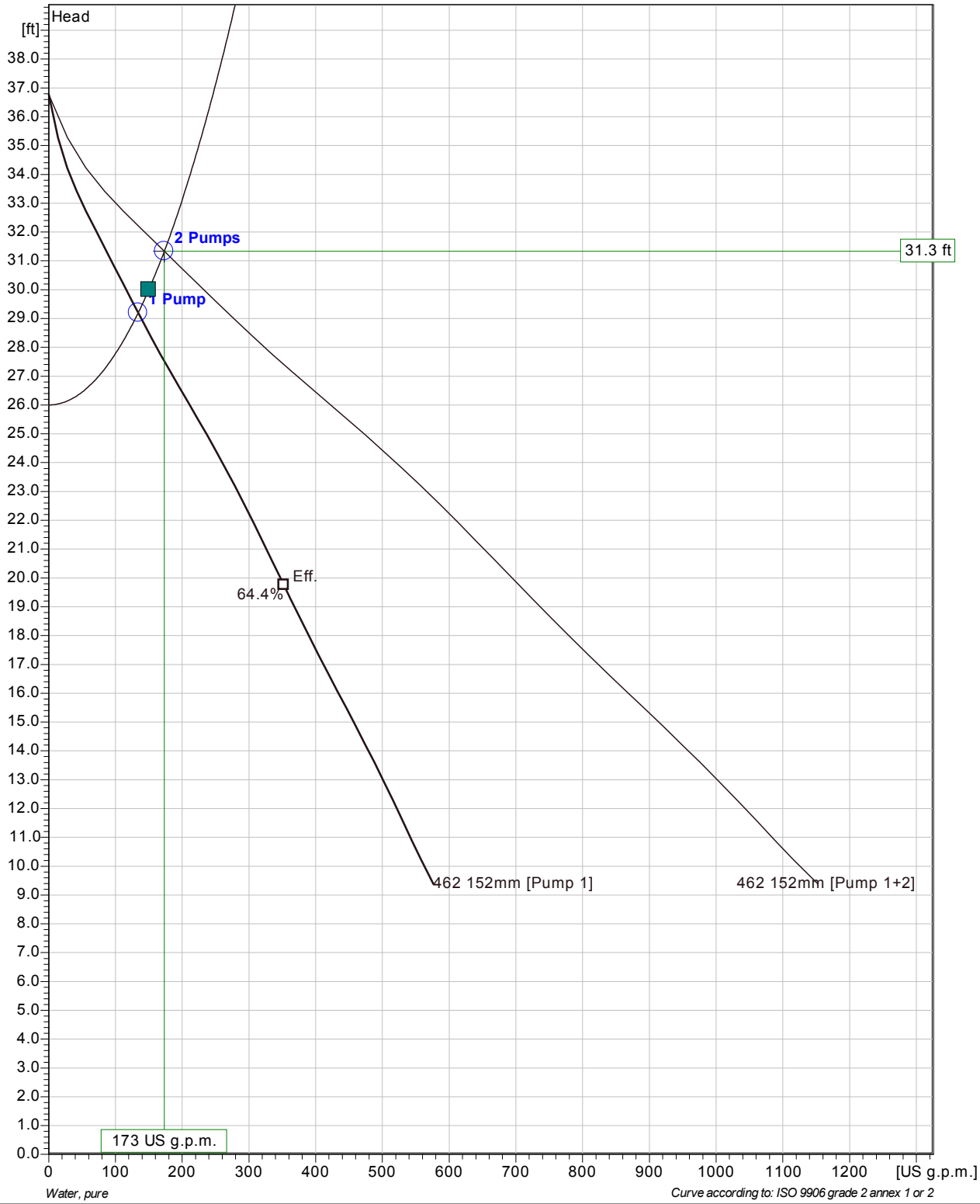
Efficiency	
1/1 Load	77.5 %
3/4 Load	78.0 %
1/2 Load	76.0 %



Project	Project ID	Created by	Created on	Last update
			2015-04-21	

NP 3085 MT 3~ Adaptive 462

Duty Analysis

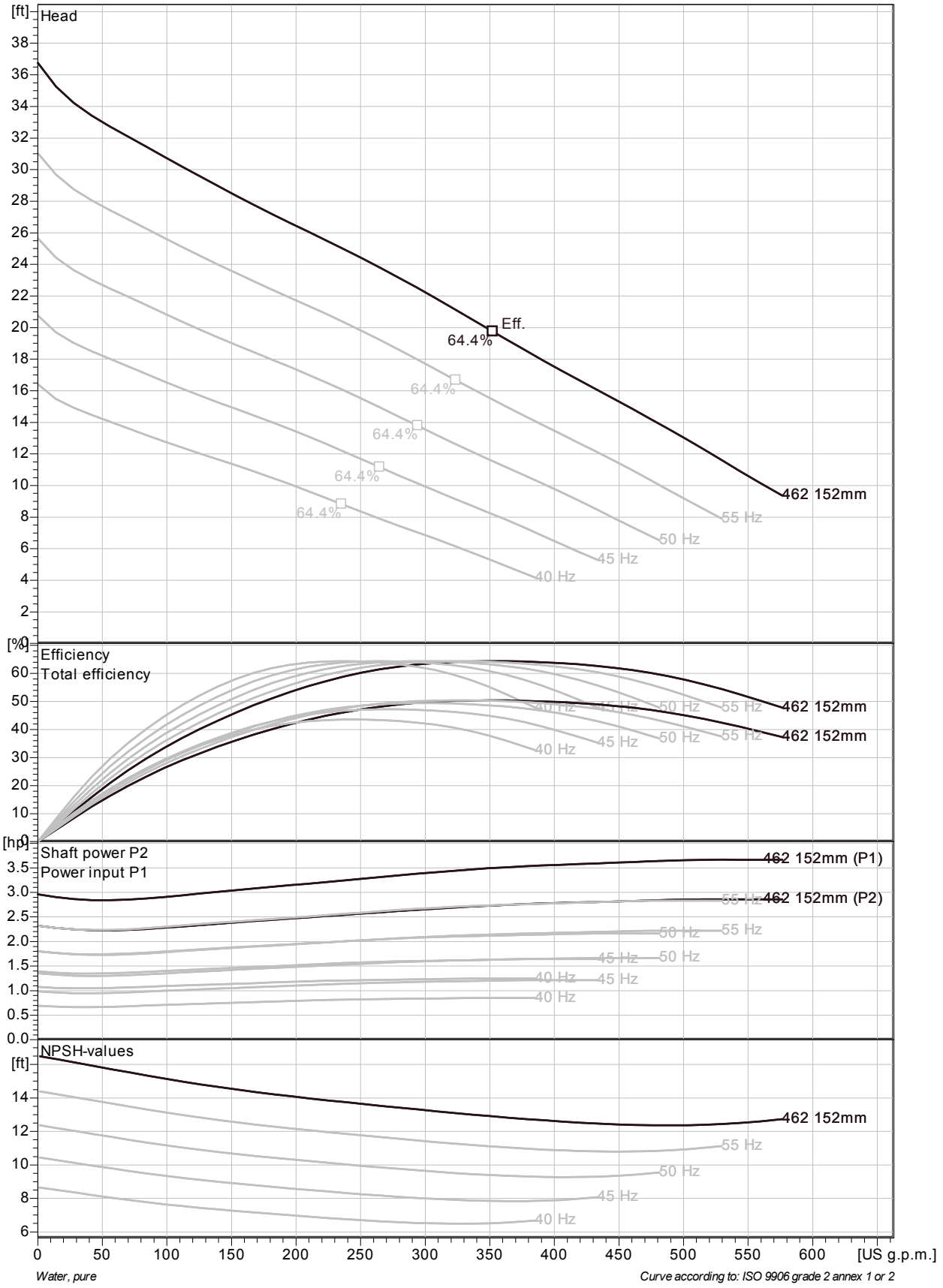


Pumps running /System	Individual pump Flow	Head	Shaft power	Total Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
2	86.6 US g.p.m.	31.3 ft	2.26 hp	173 US g.p.m.	31.3 ft	4.52 hp	30.4 %	0.109 kWh/m³	15.3 ft
1	134 US g.p.m.	29.2 ft	2.35 hp	134 US g.p.m.	29.2 ft	2.35 hp	42.1 %	0.0734 kWh/m³	14.7 ft

Project	Project ID	Created by	Created on	Last update
			2015-04-21	

NP 3085 MT 3~ Adaptive 462

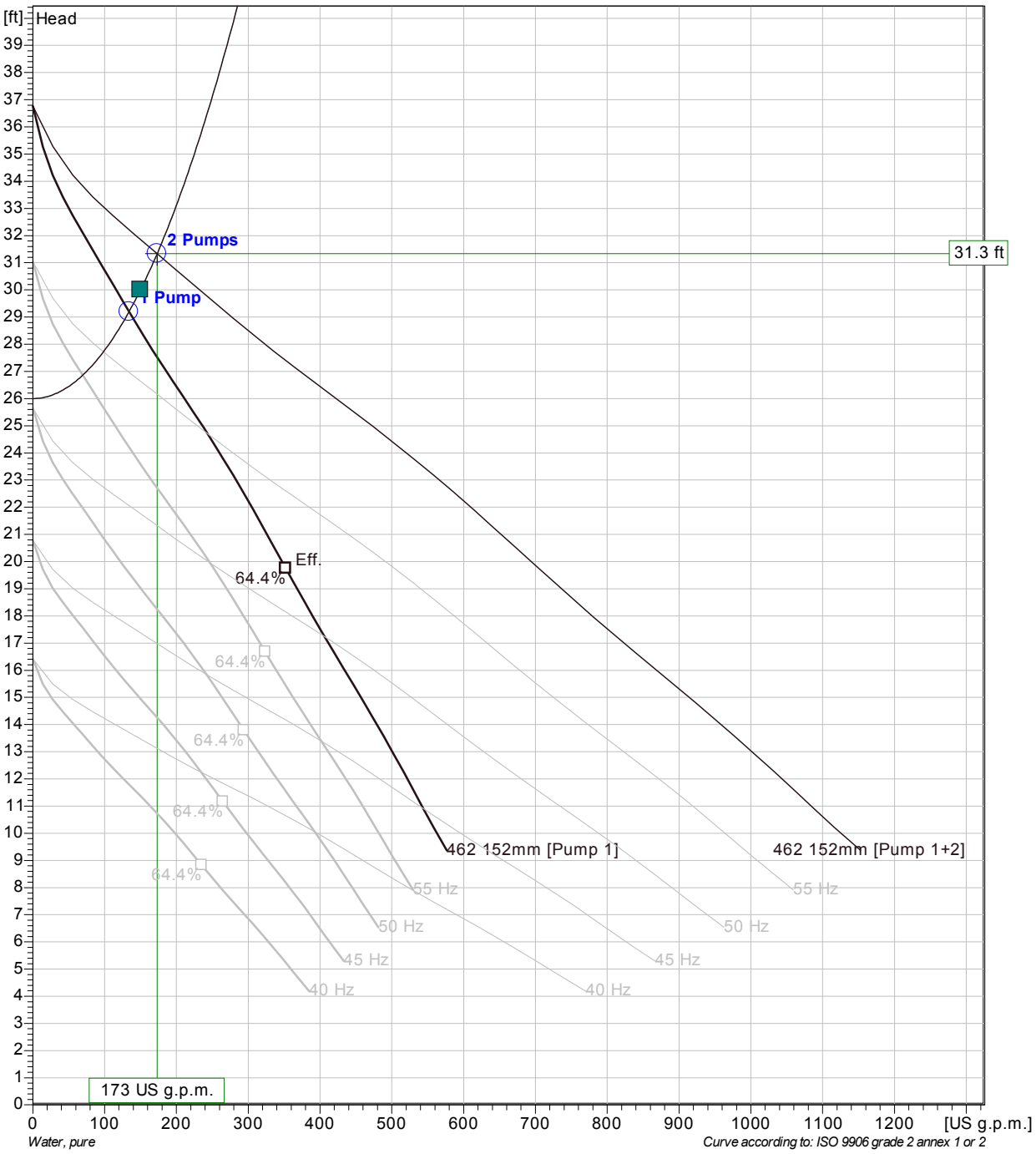
VFD Curve



Project	Project ID	Created by	Created on	Last update
			2015-04-21	

NP 3085 MT 3~ Adaptive 462

VFD Analysis

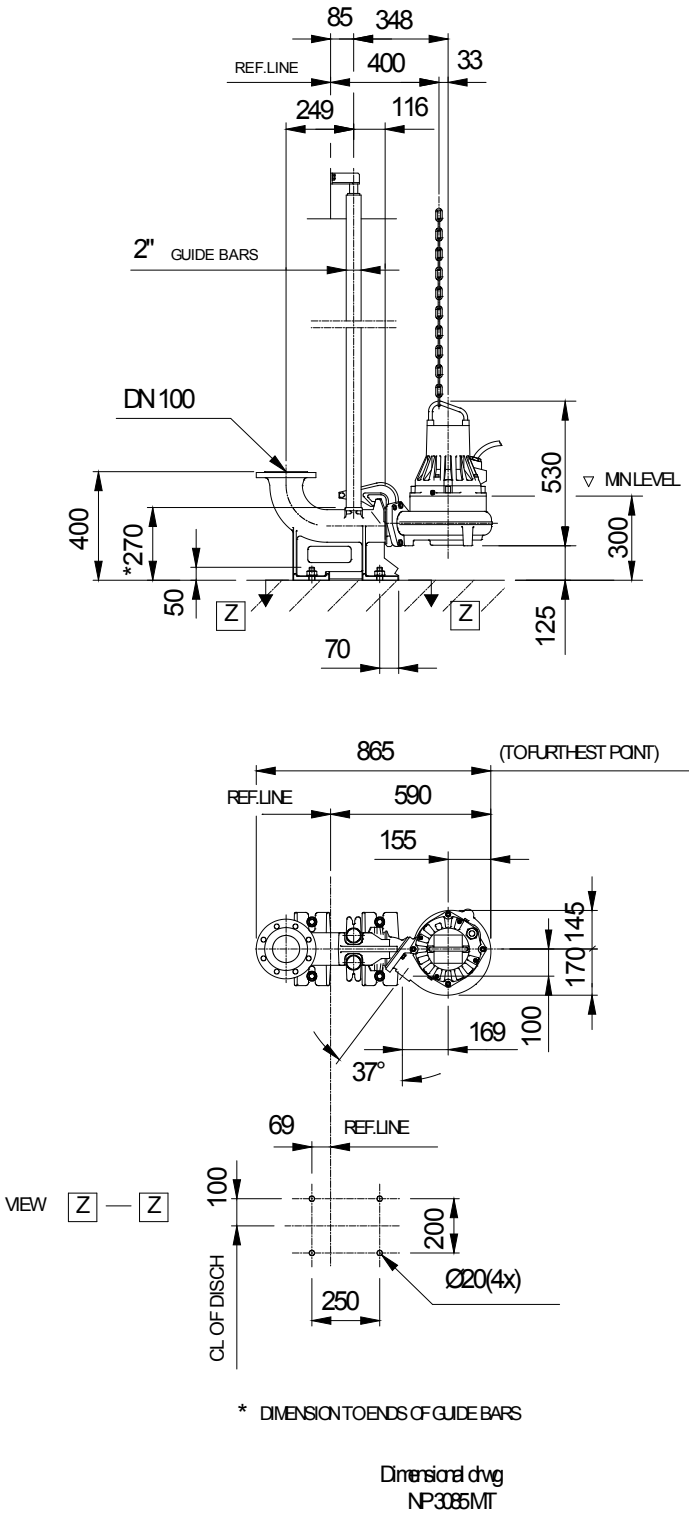


Pumps running /System	Individual pump Frequency	Flow	Head	Shaft power	Total Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
2	60 Hz	86.6 US g.p.m.	31.3 ft	2.26 hp	173 US g.p.m.	31.3 ft	4.52 hp	30.4 %	0.109 kWh/m³	15.3 ft
2	55 Hz	49.2 US g.p.m.	27.7 ft	1.73 hp	98.4 US g.p.m.	27.7 ft	3.45 hp	20.1 %	0.149 kWh/m³	13.8 ft
2	50 Hz									
2	45 Hz									
2	40 Hz									
1	60 Hz	134 US g.p.m.	29.2 ft	2.35 hp	134 US g.p.m.	29.2 ft	2.35 hp	42.1 %	0.0734 kWh/m³	14.7 ft
1	55 Hz	69.6 US g.p.m.	26.9 ft	1.74 hp	69.6 US g.p.m.	26.9 ft	1.74 hp	27.2 %	0.106 kWh/m³	13.5 ft
1	50 Hz									
1	45 Hz									
1	40 Hz									

Project	Project ID	Created by	Created on	Last update
			2015-04-21	

NP 3085 MT 3~ Adaptive 462

Dimensional drawing



Weight

* DIMENSION TO ENDS OF GUIDE BARS

Dimensional drwg
NP3085MT

Project	Project ID	Created by	Created on	Last update
			2015-04-21	

H2M architects + engineers
538 Broad Hollow Rd, 4th Floor East, Melville, NY 11747
tel 631.756.8000 fax 631.694.4122
www.h2m.com

Appendix C

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Permits, Region 1
SUNY @ Stony Brook, 50 Circle Road, Stony Brook, NY 11790
P: (631) 444-0365 I F: (631) 444-0360
www.dec.ny.gov

September 6, 2019

Town of Riverhead
200 Howell Avenue
Riverhead, NY 11901
Attn: Michael Reichel, Superintendent

Re: NYSDEC SPDES Permit Number: 1-4730-01057/00001
SPDES Number: NY0025453

NYSDEC WSR Permit Number: 1-4730-01057/00006
Calverton Sewer District & WWTF, 200 Burman Blvd., Calverton
SPDES Permit Modification, WSR Permit – Transition to Groundwater Discharge

Dear Permittee:

Enclosed is your State Pollutant Discharge Elimination System (SPDES) permit and Wild, Scenic, and Recreational Rivers (WSR) permit.

Please read all permit conditions carefully. All permit documents must be available upon request by the Department staff and must be distributed to and understood by personnel responsible for the proper operation of the facility and compliance with the discharge limits. The Department maintains authority regarding the terms of this permit in accordance with 6 NYCRR 750. Any violations of these permit conditions constitutes a violation of the Environmental Conservation Law.

Pursuant to 621.10(2), if a permit is issued with objectionable conditions the applicant may request a hearing. This must be done within 30 days of the postmark on this letter. To request a hearing, contact the Regional Permit Administrator at the above address.

If you have any other questions regarding this permit, you may contact the Division of Environmental Permits at the above address. Please refer to the above referenced numbers when you are corresponding with this office or when you are applying to renew or modify this permit.

Any questions regarding the annual pollutant discharge elimination fee should be addressed directly to the Regulatory Fee Determination Unit at 1-518-402-9343

Sincerely,

Kevin Kispert
Environmental Analyst II

Enclosures
KAK/File
CC: NYSDEC BoEH
SPDES Permit – Distribution List

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

State Pollutant Discharge Elimination System (SPDES) DISCHARGE PERMIT

Industrial Code:	**4952**	SPDES Number:	**NY0025453**
Discharge Class (CL):	**07**	DEC Number:	**1-4730-01057/00001**
Toxic Class (TX):	**N**	Effective Date (EDP):	**October 1, 2019**
Major Drainage Basin:	**17**	Expiration Date (ExDP):	**September 30, 2029**
Sub Drainage Basin:	**02**	Modification Dates: (EDPM)	
Water Index Number:	**GW**		
Compact Area:			

This SPDES permit is issued in compliance with Title 8 of Article 17 of the Environmental Conservation Law of New York State and in compliance with the Clean Water Act, as amended, (33 U.S.C. '1251 et.seq.)(hereinafter referred to as "the Act").

PERMITTEE NAME AND ADDRESS

Name:	**Town of Riverhead**	Attention:	**Michael Reichel, Superintendent**		
Street:	**200 Howell Avenue**				
City:	**Riverhead**	State:	**NY**	Zip Code:	**11901**
Email:	**reichel@townofriverheadny.gov**	Phone:	**631-727-3069**		

is authorized to discharge from the facility described below:

FACILITY NAME AND ADDRESS

Name:	**Calverton Sewer District and WWTF**															
Location (C, T, V):	**Riverhead**								County:	**Suffolk**						
Facility Address:	**200 Burman Boulevard**															
City:	**Calverton**			State:				**NY**	Zip Code:	**11933**						
Facility Location:		Latitude:	**40**	°	**54**	'	**31**	" N	& Longitude:	**72**	°	**47**	'	**32**	" W	
From Outfall No.:	**023**	at Latitude:	**40**	°	**55**	'	**11**	" N	& Longitude:	**72**	°	**46**	'	**22**	" W	
into receiving waters known as:	**Long Island Groundwater**								Class:	**GA**						

and the outfalls listed on page 2 of this permit in accordance with: effluent limitations; monitoring and reporting requirements; other provisions and conditions set forth in this permit; and 6 NYCRR Part 750-1 and 750-2.

This permit and the authorization to discharge shall expire on midnight of the expiration date shown above. The permittee shall not discharge after the expiration date unless this permit has been renewed or extended pursuant to law. To be authorized to discharge beyond the expiration date, the permittee shall apply for permit renewal not less than 180 days prior to the expiration date shown above.

DISTRIBUTION:
CO BWP - Permit Coordinator
RWE
RPA
EPA Region II
NYSEFC (Class 05 & 07 only)

Permit Administrator:	Kevin Kispert, Deputy Permit Administrator		
Address:	50 Circle Road, Stony Brook, NY 11790-2356		
Signature:		Date:	09/06/2019

OUTFALL SUMMARY

Outfall	Type of Discharge	Monitoring	
001	**Treated Municipal Wastewater**	**See page 4 of this permit**	
into receiving waters known as:	**McKay Lake**		Class: **C**
Outfall	Type of Discharge	Monitoring	
023	**Treated Municipal Wastewater**	**See page 5 of this permit**	
into receiving waters known as:	**Groundwater**		Class: **GA**

PERMIT LIMITS, LEVELS AND MONITORING DEFINITIONS

OUTFALL	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
	This cell describes the type of wastewater authorized for discharge. Examples include process or sanitary wastewater, storm water, non-contact cooling water.	This cell lists classified waters of the state to which the listed outfall discharges.	The date this page starts in effect. (e.g. EDP or EDPM)	The date this page is no longer in effect. (e.g. ExDP)

PARAMETER	MINIMUM	MAXIMUM	UNITS	SAMPLE FREQ.	SAMPLE TYPE
e.g. pH, TRC, Temperature, D.O.	The minimum level that must be maintained at all instants in time.	The maximum level that may not be exceeded at any instant in time.	SU, °F, mg/l, etc.	See below	See below

PARAMETER	EFFLUENT LIMIT or CALCULATED LEVEL	COMPLIANCE LEVEL / MINIMUM LEVEL (ML)	ACTION LEVEL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE
	Limit types are defined below in Note 1. The effluent limit is developed based on the more stringent of technology-based limits, required under the Clean Water Act, or New York State water quality standards. The limit has been derived based on existing assumptions and rules. These assumptions include receiving water hardness, pH and temperature; rates of this and other discharges to the receiving stream; etc. If assumptions or rules change the limit may, after due process and modification of this permit, change.	For the purposes of compliance assessment, the permittee shall use the approved EPA analytical method with the lowest possible detection limit as promulgated under 40CFR Part 136 for the determination of the concentrations of parameters present in the sample unless otherwise specified. If a sample result is below the detection limit of the most sensitive method, compliance with the permit limit for that parameter was achieved. Monitoring results that are lower than this level must be reported, but shall not be used to determine compliance with the calculated limit. This Minimum Level (ML) can be neither lowered nor raised without a modification of this permit.	Action Levels are monitoring requirements, as defined below in Note 2, which trigger additional monitoring and permit review when exceeded.	This can include units of flow, pH, mass, temperature, or concentration. Examples include µg/l, lbs/d, etc.	Examples include Daily, 3/week, weekly, 2/month, monthly, quarterly, 2/yr and yearly. All monitoring periods (quarterly, semiannual, annual, etc.) are based upon the calendar year unless otherwise specified in this Permit.	Examples include grab, 24 hour composite and 3 grab samples collected over a 6 hour period.

Notes:

1. EFFLUENT LIMIT TYPES:
   a. DAILY DISCHARGE: The discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for the purposes of sampling. For pollutants expressed in units of mass, the 'daily discharge' is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the 'daily discharge' is calculated as the average measurement of the pollutant over the day.
   b. DAILY MAX: The highest allowable daily discharge.
   c. DAILY MIN: The lowest allowable daily discharge.
   d. MONTHLY AVG: The highest allowable average of daily discharges over a calendar month, calculated as the sum of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.
   e. 7 DAY ARITHMETIC MEAN (7 day average): The highest allowable average of daily discharges over a calendar week.
   f. 30 DAY GEOMETRIC MEAN: The highest allowable geometric mean of daily discharges over a calendar month, calculated as the antilog of: the sum of the log of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.
   g. 7 DAY GEOMETRIC MEAN: The highest allowable geometric mean of daily discharges over a calendar week.
   h. 12 MONTH ROLLING AVERAGE: The current monthly value of a parameter, plus the sum of the monthly values over the previous 11 months for that parameter, divided by 12.
   i. RANGE: The minimum and maximum instantaneous measurements for the reporting period must remain between the two values shown.

2. ACTION LEVELS: Routine Action Level monitoring results, if not provided for on the Discharge Monitoring Report (DMR) form, shall be appended to the DMR for the period during which the sampling was conducted. If the additional monitoring requirement is triggered as noted below, the permittee shall undertake a short-term, high-intensity monitoring program for the parameter(s). Samples identical to those required for routine monitoring purposes shall be taken on each of at least three consecutive operating and discharging days and analyzed. Results shall be expressed in terms of both concentration and mass, and shall be submitted no later than the end of the third month following the month when the additional monitoring requirement was triggered. Results may be appended to the DMR or transmitted under separate cover to the same address. If levels higher than the Action Levels are confirmed, the permit may be reopened by the Department for consideration of revised Action Levels or effluent limits. The permittee is not authorized to discharge any of the listed parameters at levels which may cause or contribute to a violation of water quality standards.

PERMIT LIMITS, LEVELS AND MONITORING

OUTFALL	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	All year unless otherwise noted	McKay Lake	October 1, 2019	Completion of Construction[1]

PARAMETER	EFFLUENT LIMIT					MONITORING REQUIREMENTS				FN
								Location		
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Inf.	Eff.	
Flow	Monthly Average	0.062	MGD			Continuous	Recorder		X	3
BOD_5	Monthly Average	30	mg/l	15.5	lbs/d	2/Month	24-hr. Comp.	X	X	2,3
BOD_5	7-Day Average	45	mg/l	23.3	lbs/d	2/Month	24-hr. Comp.	X	X	3
Solids, Suspended	Monthly Average	30	mg/l	15.5	lbs/d	2/Month	24-hr. Comp.	X	X	2,3
Solids, Suspended	7-Day Average	45	mg/l	23.3	lbs/d	2/Month	24-hr. Comp.	X	X	3
Solids, Settleable	Monthly Average	Monitor	ml/l			Daily	Grab		X	3
Solids, Settleable	Daily Maximum	0.3	ml/l			Daily	Grab		X	3
pH	Range	6.0 – 9.0	SU			Daily	Grab		X	3
Temperature	Monthly Average	Monitor	Deg F			Daily	Grab		X	3
Temperature	Daily Maximum	Monitor	Deg F			Daily	Grab		X	3
Effluent Disinfection required		[X] All Year		[ ] Seasonal from **May 1** to **Oct 31**						
Coliform, Fecal	30-Day Geometric Mean	200	No./ 100 ml			Weekly	Grab		X	3
Coliform, Fecal	7 Day Geometric Mean	400	No./ 100 ml			Weekly	Grab		X	3
Chlorine, Total Residual	Daily Maximum	0.25	mg/l			Daily	Grab		X	3,4

FOOTNOTES:

(1) The limitations on this page shall expire upon start-up of the 0.10 MGD facility. The start-up date for the 0.100 MGD facility will be identified in a letter from the permittee to the Regional Water Engineer at 50 Circle Road, Stony Brook, NY 11790. Start-up shall commence only after the Department's receipt of certification from a New York State Professional Engineer that the treatment plant was constructed in accordance with the approved Engineering Reports, Plans, and Specifications.
(2) and effluent shall not exceed 15 % and 15 % of influent concentration values for BOD5 & TSS respectively.
(3) Monitoring locations are shown on Page 10.
(4) See Schedule of Compliance on Page 7.

PERMIT LIMITS, LEVELS AND MONITORING

OUTFALL	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
023	All year unless otherwise noted	Groundwater	Completion of Construction[1]	September 30, 2029

PARAMETER	EFFLUENT LIMIT					MONITORING REQUIREMENTS				FN
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Location Inf.	Location Eff.	
Flow	Monthly Average	0.10	MGD			Continuous	Meter		X	2,3
pH	Range	6.5-8.5	SU			Daily	Grab		X	2,3,4
Temperature	Daily Maximum	Monitor	Deg F			Daily	Grab		X	2,3,4
Nitrogen, Total (as N)	Daily Maximum	10	mg/L			Monthly	Grab		X	2,3,4
Kjeldahl Nitrogen, Total	Daily Maximum	Monitor	mg/L			Monthly	Grab		X	2,3,4
Dissolved Solids, Total	Daily Maximum	1,000	mg/L			1/month	Grab		X	2,3,4
Effluent Disinfection required		[ ] All Year		[X] See SPECIAL CONDITIONS						
Chlorine, Total Residual	Daily Maximum	2.0	mg/L			Daily	Grab		X	2,3,4,5

FOOTNOTES:

(1) The limitations on this page shall become effective upon start-up of the 0.10 MGD facility. The start-up date for the 0.100 MGD facility will be identified in a letter from the permittee to the Regional Water Engineer at 50 Circle Road, Stony Brook, NY 11790. Start-up shall commence only after the Department's receipt of certification from a New York State Professional Engineer that the treatment plant was constructed in accordance with the approved Engineering Reports, Plans, and Specifications.
(2) Monitoring locations are shown on Page 11.
(3) See Special Conditions for additional conditions that apply.
(4) Grab samples shall be taken during periods of normally high flow.
(5) Chlorine monitoring is only required during the period when disinfection is underway.

SPECIAL CONDITIONS

1. No Sewer extensions (connections outside the approved district) without prior DEC approval.
2. Additional Process Control and Groundwater Monitoring required, results shall be retained by permittee for three years.
3. In addition to the above requirements for Outfall 023, wastewater disinfection will be required if determined by Department of Health Services acting as the agent of NYSDEC, to be necessary for control of odors or other health purposes. Accordingly, supplies and equipment necessary to assure proper disinfection shall be kept available and operable at all times by the permittee, and tested in manner and frequency as directed by the Department of Health Services. When chlorine is used, daily monitoring of Total Residual Chlorine is required, and the daily maximum effluent limit is 2.0 mg/l.

Process Control Monitoring to be recorded on Wastewater Facility Operation Report (Form 92-15-7) and retained for a period of three years:

PARAMETER	UNITS	FREQUENCY	SAMPLE TYPE	SAMPLE LOCATION	FOOT NOTE
Total Flow	MGD	Continuous	Meter	Effluent	1
Turbidity	mg/l	1/month	Grab	MBR Tank	1
Ammonia, as NH3 – Hach	mg/l	2/Week	Grab	Influent, Effluent	1,2
Dissolved Oxygen-probe	mg/l	Daily	Grab	MBR during aeration, anoxic and aerobic tank	1
pH	SU	Daily	Grab	See Note 3	1,3
Temperature-probe	Deg. C	Daily	Grab	Influent, Effluent	1
Visual Observation	----------	Daily	----------	Influent, Effluent, MBR Tankage	1
Nitrate & Nitrite as N – Hach	mg/l	2/Week	Grab	Influent, Effluent	1,2

Groundwater Monitoring to be reported on Discharge Monitoring Report starting at completion of construction and every third month after:

PARAMETER	UNITS	FREQUENCY	SAMPLE TYPE	SAMPLE LOCATION	FOOT NOTE
Water level above MSL	Feet	Quarterly	Measure	MW-1,-2,-3	1,4,5
Total Kjeldahl Nitrogen	mg/l	Quarterly	Grab (Bailed)	MW-1,-2,-3	1,4,5
Ammonia	mg/l	Quarterly	Grab (Bailed)	MW-1,-2,-3	1,4,5
Nitrate	mg/l	Quarterly	Grab (Bailed)	MW-1,-2,-3	1, 4, 5
Nitrite	mg/l	Quarterly	Grab (Bailed)	MW-1,-2,-3	1,4,5
Total Nitrogen	mg/l	Quarterly	Grab (Bailed)	MW-1,-2,-3	1,4,5
Total Dissolved Solids	mg/l	Quarterly	Grab (Bailed)	MW-1,-2,-3	1,4,5

FOOTNOTES:

(1) Process control monitoring locations are shown on Page 11.
(2) Take one sample for Hach Kit analysis at the same time as monthly laboratory sample to enable comparison.
(3) Influent, effluent, and MBR tank.
(4) Three well casings volumes must be evacuated prior to sampling all parameters except water level.
(5) Groundwater sampling locations are shown on Page 12; MW-1: Upgradient, MW-2 & MW-3: Downgradient

SCHEDULE OF COMPLIANCE

a) The permittee shall comply with the following schedule:

<table>
<tr><th>Outfall(s)</th><th>Compliance Action</th><th>Due Date</th></tr>
<tr><td>001</td><td>Monitor and study disinfection treatment to optimize chlorine dosage to comply with Fecal Coliform limits, on Page 4 of this permit, as well as minimize Total Residual Chlorine. Submit this data to the Department. An interim Total Residual Chlorine limit will be determined and applied in a permit modification. This interim limit will be for a two-year monitoring period following the EDPM. If that period elapses and the facility is not discharging to Outfall 023, the facility will be required to comply with the final 0.25 mg/L water quality based effluent limit.
<table>
<tr><th>Parameter Affected</th><th>Interim Effluent Limit</th><th>Final Effluent Limit</th><th>Effective Date of final effluent limit</th></tr>
<tr><td>Total Residual Chlorine</td><td>Monitor Only</td><td>0.25 mg/l</td><td>EDPM + 2 Years</td></tr>
</table></td><td>EDP + 2 months</td></tr>
<tr><td>023</td><td>The permittee shall install 3 monitoring wells; one upgradient (MW-1), and two downgradient (MW-2 and MW-3). These monitoring wells are to be used for groundwater monitoring as outlined on Page 6 of this permit.

An updated process control monitoring location map, Page 12 of this permit, must be submitted to the Department showing the locations of the 3 monitoring wells after installation.</td><td>Completion of Construction</td></tr>
</table>

b) Unless noted otherwise, the above actions are one-time requirements. The permittee shall comply with the above compliance actions to the Department's satisfaction once. When this permit is administratively renewed by NYSDEC letter entitled "SPDES NOTICE/RENEWAL APPLICATION/PERMIT," the permittee is not required to repeat the submission(s) noted above. The above due dates are independent from the effective date of the permit stated in the "SPDES NOTICE/RENEWAL APPLICATION/PERMIT" letter.

c) The permittee shall submit a written notice of compliance or non-compliance with each of the above schedule dates no later than 14 days following each elapsed date, unless conditions require more immediate notice as prescribed in 6 NYCRR Part 750-1.2(a) and 750-2. All such compliance or non-compliance notification shall be sent to the locations listed under the section of this permit entitled RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS. Each notice of non-compliance shall include the following information:
   a. A short description of the non-compliance;
   b. A description of any actions taken or proposed by the permittee to comply with the elapsed schedule requirements without further delay and to limit environmental impact associated with the non-compliance;
   c. Any details which tend to explain or mitigate an instance of non-compliance; and
   d. An estimate of the date the permittee will comply with the elapsed schedule requirement and an assessment of the probability that the permittee will meet the next scheduled requirement on time.

d) The permittee shall submit copies of any document required by the above schedule of compliance to the NYSDEC Regional Water Engineer and to the Bureau of Water Permits.

Mercury Minimization Program for Low Priority POTWs

The permittee shall inspect each tributary dental facility at least once every five years to verify compliance with the wastewater treatment operation, maintenance, and notification elements of 6NYCRR Part 374.4. In lieu of an inspection, the permittee can accept a certification from the dental facility owner that the treatment system was properly installed and the facility complies with the wastewater treatment operation, maintenance, and notification elements of 6NYCRR Part 374.4. Prior to acceptance of new or increased tributary discharges that are industrial in nature, including hauled wastes, sample data shall be provided to the permittee for mercury content. Discharges which may exceed 500 ng/L, must receive approval from the Department prior to acceptance. A file shall be maintained containing inspection results, certifications, and other information submitted by dental offices and all other potential dischargers of mercury. This file shall be available for review by NYSDEC representatives and copies shall be provided upon request.

Note: the mercury-related requirements in this permit conform to the mercury Multiple Discharge Variance specified in NYSDEC policy *DOW 1.3.10*.

DISCHARGE NOTIFICATION REQUIREMENTS

(a) Except as provided in (c) and (g) of these Discharge Notification Act requirements, the permittee shall install and maintain identification signs at all outfalls to surface waters listed in this permit. Such signs shall be installed before initiation of any discharge.

(b) Subsequent modifications to or renewal of this permit does not reset or revise the deadline set forth in (a) above, unless a new deadline is set explicitly by such permit modification or renewal.

(c) The Discharge Notification Requirements described herein do not apply to outfalls from which the discharge is composed exclusively of storm water, or discharges to ground water.

(d) The sign(s) shall be conspicuous, legible and in as close proximity to the point of discharge as is reasonably possible while ensuring the maximum visibility from the surface water and shore. The signs shall be installed in such a manner to pose minimal hazard to navigation, bathing or other water related activities. If the public has access to the water from the land in the vicinity of the outfall, an identical sign shall be posted to be visible from the direction approaching the surface water.

The signs shall have **minimum** dimensions of eighteen inches by twenty four inches (18" x 24") and shall have white letters on a green background and contain the following information:

N.Y.S. PERMITTED DISCHARGE POINT

SPDES PERMIT No.: NY_____

OUTFALL No. :____

For information about this permitted discharge contact:

Permittee Name: _____

Permittee Contact: _____

Permittee Phone: ( ) - ### - ####

OR:

NYSDEC Division of Water Regional Office Address:

NYSDEC Division of Water Regional Phone: ( ) - ### -####

(e) For each discharge required to have a sign in accordance with a), the permittee shall, concurrent with the installation of the sign, provide a repository of copies of the Discharge Monitoring Reports (DMRs), as required by the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of this permit. This repository shall be open to the public, at a minimum, during normal daytime business hours. The repository may be at the business office repository of the permittee or at an off-premises location of its choice (such location shall be the village, town, city or county clerk's office, the local library or other location as approved by the Department). In accordance with the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of your permit, each DMR shall be maintained on record for a period of five years

(f) The permittee shall periodically inspect the outfall identification sign(s) in order to ensure they are maintained, are still visible, and contain information that is current and factually correct. Signs that are damaged or incorrect shall be replaced within 3 months of inspection.

DISCHARGE NOTIFICATION REQUIREMENTS (continued)

(g) All requirements of the Discharge Notification Act, including public repository requirements, are waived for any outfall meeting any of the following circumstances, provided Department notification is made in accordance with (h) below:

(i) such sign would be inconsistent with any other state or federal statute;

(ii) the Discharge Notification Requirements contained herein would require that such sign could only be located in an area that is damaged by ice or flooding due to a one-year storm or storms of less severity;

(iii) instances in which the outfall to the receiving water is located on private or government property which is restricted to the public through fencing, patrolling, or other control mechanisms. Property which is posted only, without additional control mechanisms, does not qualify for this provision;

(iv) instances where the outfall pipe or channel discharges to another outfall pipe or channel, before discharge to a receiving water; or

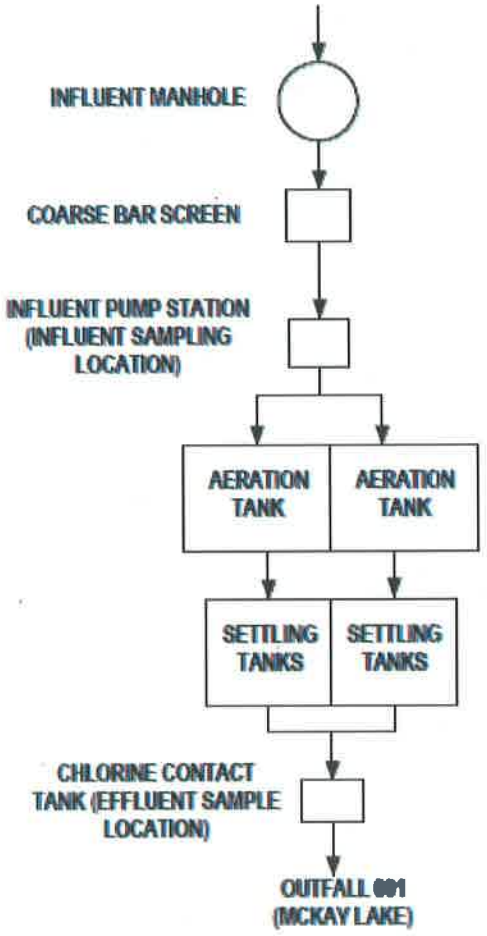
(v) instances in which the discharge from the outfall is located in the receiving water, two-hundred or more feet from the shoreline of the receiving water.

(h) If the permittee believes that any outfall which discharges wastewater from the permitted facility meets any of the waiver criteria listed in (g) above, notification (form enclosed) must be made to the Department's Bureau of Water Permits, 625 Broadway, Albany, N.Y. 12233-3505, of such fact, and, provided there is no objection by the Department, a sign and DMR repository for the involved outfall(s) are not required. This notification must include the facility's name, address, telephone number, contact, permit number, outfall number(s), and reason why such outfall(s) is waived from the requirements of discharge notification. The Department may evaluate the applicability of a waiver at any time, and take appropriate measures to assure that the ECL and associated regulations are complied with.

MONITORING LOCATIONS – Surface Water

The permittee shall take samples and measurements, to comply with the monitoring requirements specified in this permit, at the locations(s) specified below:

FROM SEWAGE COLLECTION SYSTEM



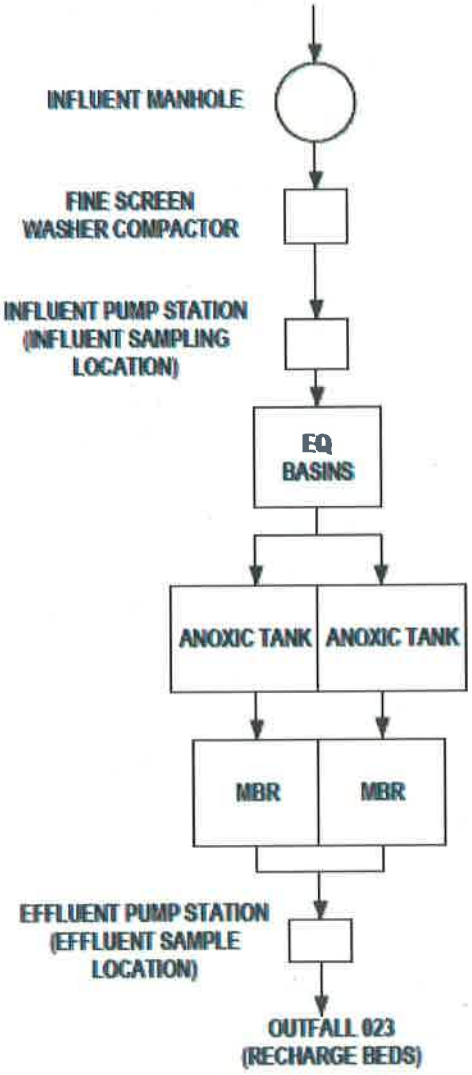
EFFLUENT SAMPLING POINTS:
LOCATED AT THE END OF THE CHLORINE CONTACT TANK

INFLUENT SAMPLING POINT:
LOCATED WITHIN THE WET WELL OF INFLUENT PUMP STATION

MONITORING LOCATIONS – Groundwater

The permittee shall take samples and measurements, to comply with the monitoring requirements specified in this permit, at the locations(s) specified below:

FROM SEWAGE COLLECTION SYSTEM



EFFLUENT SAMPLING POINTS:

LOCATED WITHIN THE WET WELL OF EFFLUENT PUMP STATION

INFLUENT SAMPLING POINT:

LOCATED WITHIN THE WET WELL OF INFLUENT PUMP STATION

PROCESS CONTROL MONITORING LOCATIONS

The permittee shall take samples and measurements, to comply with the monitoring requirements specified in this permit, at the locations(s) specified below:

GENERAL REQUIREMENTS

A. The regulations in 6 NYCRR Part 750 are hereby incorporated by reference and the conditions are enforceable requirements under this permit. The permittee shall comply with all requirements set forth in this permit and with all the applicable requirements of 6 NYCRR Part 750 incorporated into this permit by reference, including but not limited to the regulations in the following paragraphs:

B. General Conditions

1.	Duty to comply	6NYCRR 750-2.1(e) & 2.4
2.	Duty to reapply	6NYCRR 750-1.16(a)
3.	Need to halt or reduce activity not a defense	6NYCRR 750-2.1(g)
4.	Duty to mitigate	6NYCRR 750-2.7(f)
5.	Permit actions	6NYCRR 750-1.1(c), 1.18, 1.20 & 2.1(h)
6.	Property rights	6NYCRR 750-2.2(b)
7.	Duty to provide information	6NYCRR 750-2.1(i)
8.	Inspection and entry	6NYCRR 750-2.1(a) & 2.3

C. Operation and Maintenance

1.	Proper Operation & Maintenance	6NYCRR 750-2.8
2.	Bypass	6NYCRR 750-1.2(a)(17), 2.8(b) & 2.7
3.	Upset	6NYCRR 750-1.2(a)(94) & 2.8(c)

D. Monitoring and Records

1.	Monitoring and records	6NYCRR 750-2.5(a)(2), 2.5(a)(6), 2.5(c)(1), 2.5(c)(2), & 2.5(d)
2.	Signatory requirements	6NYCRR 750-1.8 & 2.5(b)

E. Reporting Requirements

1.	Reporting requirements for POTWs	6NYCRR 750-2.5, 2.7 & 1.17
2.	Anticipated noncompliance	6NYCRR 750-2.7(a)
3.	Transfers	6NYCRR 750-1.17
4.	Monitoring reports	6NYCRR 750-2.5(e)
5.	Compliance schedules	6NYCRR 750-1.14(d)
6.	24-hour reporting	6NYCRR 750-2.7(c) & (d)
7.	Other noncompliance	6NYCRR 750-2.7(e)
8.	Other information	6NYCRR 750-2.1(f)
9.	Additional conditions applicable to a POTW	6NYCRR 750-2.9

F. Planned Changes

1. The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

   a. The alteration or addition to the permitted facility may meet of the criteria for determining whether facility is a new source in 40 CFR §122.29(b); or
   b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, or to notification requirements under 40 CFR §122.42(a)(1); or
   c. The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

In addition to the Department, the permittee shall submit a copy of this notice to the United States Environmental Protection Agency at the following address: U.S. EPA Region 2, Clean Water Regulatory Branch, 290 Broadway, 24th Floor, New York, NY 10007-1866.

GENERAL REQUIREMENTS (continued)

G. Notification Requirement for POTWs

1. All POTWs shall provide adequate notice to the Department and the USEPA of the following:
   a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of CWA if it were directly discharging those pollutants; or
   b. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
   c. For the purposes of this paragraph, adequate notice shall include information on:
      i. the quality and quantity of effluent introduced into the POTW, and
      ii. any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

POTWs shall submit a copy of this notice to the United States Environmental Protection Agency, at the following address:
U.S. EPA Region 2, Clean Water Regulatory Branch, 290 Broadway, 24th Floor, New York, NY 10007-1866

H. Sludge Management

The permittee shall comply with all applicable requirements of 6 NYCRR Part 360.

I. SPDES Permit Program Fee

The permittee shall pay to the Department an annual SPDES permit program fee within 30 days of the date of the first invoice, unless otherwise directed by the Department, and shall comply with all applicable requirements of ECL 72-0602 and 6 NYCRR Parts 480, 481 and 485. Note that if there is inconsistency between the fees specified in ECL 72-0602 and 6 NYCRR Part 485, the ECL 72-0602 fees govern.

J. Water Treatment Chemicals (WTCs)

New or increased use and discharge of a WTC requires prior Department review and authorization. At a minimum, the permittee must notify the Department in writing of its intent to change WTC use by submitting a completed *WTC Notification Form* for each proposed WTC. The Department will review that submittal and determine if a SPDES permit modification is necessary or whether WTC review and authorization may proceed outside of the formal permit administrative process. The majority of WTC authorizations do not require SPDES permit modification. In any event, use and discharge of a WTC shall not proceed without prior authorization from the Department. Examples of WTCs include biocides, coagulants, conditioners, corrosion inhibitors, defoamers, deposit control agents, flocculants, scale inhibitors, sequestrants, and settling aids.

1. WTC use shall not exceed the rate explicitly authorized by this permit or otherwise authorized in writing by the Department.
2. The permittee shall maintain a logbook of all WTC use, noting for each WTC the date, time, exact location, and amount of each dosage, and, the name of the individual applying or measuring the chemical. The logbook must also document that adequate process controls are in place to ensure that excessive levels of WTCs are not used.
3. The permittee shall submit a completed WTC Annual Report Form each year that they use and discharge WTCs. This form shall be attached to either the December DMR or the annual monitoring report required below.

The *WTC Notification Form and WTC Annual Report Form* are available from the Department's website at:
http://www.dec.ny.gov/permits/93245.html

RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS

A. The monitoring information required by this permit shall be retained for a period of at least five years from the date of the sampling for subsequent inspection by the Department or its designated agent.

B. The monitoring information required by this permit shall be summarized and reported by submitting:

1. Discharge Monitoring Reports (DMRs): Completed DMR forms shall be submitted for each month reporting period in accordance with the DMR Manual available on Department's website.

DMRs must be submitted electronically using the electronic reporting tool (NetDMR) specified by NYSDEC. Instructions on the use of NetDMR are available in the DMR Manual. Attach the monthly "Wastewater Facility Operation Report" (form 92-15-7) and any required DMR attachments electronically to the DMR.

To submit via hard copy: **Hard copy paper DMRs will only be accepted by the Department if a waiver from the electronic submittal requirements has been granted by DEC to the facility**. Attach a hard copy of the monthly "Wastewater Facility Operation Report" (form 92-15-7) to the DMR. The Facility Operation report and DMRs shall be sent to:

Department of Environmental Conservation
Division of Water, Bureau of Water Compliance
625 Broadway, Albany, New York 12233-3506
Phone: (518) 402-8177

The first monitoring period begins on the effective date of this permit, and, unless otherwise required, the reports are due no later than the 28th day of the month following the end of each monitoring period.

C. Bypass and Sewage Pollutant Right to Know Reporting: In accordance with the Sewage Pollutant Right to Know Act (ECL § 17-0826-a), Publicly Owned Treatment Works (POTWs) are required to notify DEC and Department of Health within two hours of discovery of an untreated or partially treated sewage discharge and to notify the public and adjoining municipalities within four hours of discovery. Information regarding reporting and other requirements of this program may be found on the Department's website. In addition, POTWs are required to provide a five-day incident report and supplemental information to the DEC in accordance with Part 750-2.7(d) by utilizing the Department's Non-Compliance Report Form unless waived by DEC on a case-by-case basis.

D. Monitoring and analysis shall be conducted using sufficiently sensitive test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

E. More frequent monitoring of the discharge(s), monitoring point(s), or waters of the State than required by the permit, where analysis is performed by a certified laboratory or where such analysis is not required to be performed by a certified laboratory, shall be included in the calculations and recording of the data on the corresponding DMRs.

F. Calculations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this permit.

G. Unless otherwise specified, all information recorded on the DMRs shall be based upon measurements and sampling carried out during the most recently completed reporting period.

H. Any laboratory test or sample analysis required by this permit for which the State Commissioner of Health issues certificates of approval pursuant to section 502 of the Public Health Law shall be conducted by a laboratory which has been issued a certificate of approval. Inquiries regarding laboratory certification should be directed to the New York State Department of Health, Environmental Laboratory Accreditation Program.

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