



CERTIFICATE OF AUTHENTICITY

THIS IS TO CERTIFY THAT THE FOLLOWING ELECTRONIC RECORDS ARE TRUE AND ACCURATE REPRODUCTIONS OF THE ORIGINAL RECORDS OF JAMES CITY COUNTY GENERAL SERVICES DEPARTMENT- STORMWATER DIVISION; WERE SCANNED IN THE REGULAR COURSE OF BUSINESS PURSUANT TO GUIDELINES ESTABLISHED BY THE LIBRARY OF VIRGINIA AND ARCHIVES; AND HAVE BEEN VERIFIED IN THE CUSTODY OF THE INDIVIDUAL LISTED BELOW.

BMP NUMBER: CC024

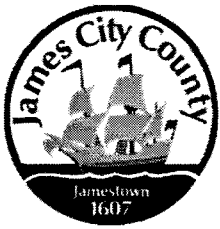
DATE VERIFIED: May 17, 2012

QUALITY ASSURANCE TECHNICIAN:

Leah Hardenbergh

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA



Stormwater Division

MEMORANDUM

DATE: March 10, 2010
TO: Michael J. Gillis, Virginia Correctional Enterprises Document Management Services
FROM: Jo Anna Ripley, Stormwater
PO: 270712
RE: Files Approved for Scanning

General File ID or BMP ID: CC024

PIN: 4820100005A

Subdivision, Tract, Business or Owner

Name (if known):

Williamsburg Jamestown Airport

Property Description:

Airport

Site Address:

100 Marclay Road

(For internal use only)

Box 10

Drawer: 6

Agreements: (in file as of scan date)

Y

Book or Doc#:

70002412

Page:

165

262

640

457-458

Comments

CC-024

Contents for Stormwater Management Facilities As-built Files

Each file is to contain:

- ① As-built plan
- ② Completed construction certification
3. Construction Plan
- ④ Design Calculations
- ⑤ Watershed Map
- ⑥ Maintenance Agreement
7. Correspondence with owners
8. Inspection Records
9. Enforcement Actions

COUNTY OF JAMES CITY, VIRGINIA

COPY

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF DRAINAGE SYSTEM

THIS DECLARATION, made this 12 day of JANUARY, 20 07,
between LARRY & JEAN WALTRIP, and
all successors in interest, ("COVENANTOR(S),") owner(s) of the following property:

Parcel Identification Number: 4820100005A

Legal Description: Pt Shortneck (100 Marclay Road)

Project or Subdivision Name: WILLIAMSBURG-JAMESTOWN AIRPORT-T HANGAR & PARKING LOT
Document No. EXPANSION

OR Deed Book 165, Page No. 262,
and the County of James City, Virginia ("COUNTY.")

WITNESSETH:

We, the COVENANTOR(S), with full authority to execute deeds, mortgages, other covenants, and all rights, titles and interests in the property described above, do hereby covenant with the COUNTY as follows:

1. The COVENANTOR(S) shall provide maintenance for the drainage system including any runoff control facilities, conveyance systems and associated easements, hereinafter referred to as the "SYSTEM," located on and serving the above-described property to ensure that the SYSTEM is and remains in proper working condition in accordance with approved design standards, and with the law and applicable executive regulations. The SYSTEM shall not include any elements located within any Virginia Department of Transportation rights-of-way.

2. If necessary, the COVENANTOR(S) shall levy regular or special assessments against all present or subsequent owners of property served by the SYSTEM to ensure that the SYSTEM is properly maintained.

3. The COVENANTOR(S) shall provide and maintain perpetual access from public right-of-ways to the SYSTEM for the COUNTY, its agent and its contractor.

4. The COVENANTOR(S) shall grant the COUNTY, its agent and its contractor a right of entry to the SYSTEM for the purpose of inspecting, monitoring, operating, installing, constructing, reconstructing, maintaining or repairing the SYSTEM.

5. If, after reasonable notice by the COUNTY, the COVENANTOR(S) shall fail to maintain the SYSTEM in accordance with the approved design standards and with the law and applicable executive regulations, the COUNTY may perform all necessary repair or maintenance

Instrument # 070002412

Recorded on Jan. 25, 2007 Page 1

Revised 05/06

work, and the COUNTY may assess the COVENANTOR(S) and/or all property served by the SYSTEM for the cost of the work and any applicable penalties.

6. The COVENANTOR(S) shall indemnify and save the COUNTY harmless from any and all claims for damages to persons or property arising from the installation, construction, maintenance, repair, operation or use of the SYSTEM.

7. The COVENANTOR(s) shall promptly notify the COUNTY when the COVENANTOR(S) legally transfers any of the COVENANTOR(S)' responsibilities for the SYSTEM. The COVENANTOR(S)' shall supply the COUNTY with a copy of any document of transfer, executed by both parties.

8. The covenants contained herein shall run with the land and shall bind the COVENANTOR(S) and the COVENANTOR(S)' heirs, executors, administrators, successors and assignees, and shall bind all present and subsequent owners of property served by the SYSTEM.

9. This COVENANT shall be recorded in the County Land Records.

IN WITNESS WHEREOF, the COVENANTOR(S) have executed this DECLARATION OF COVENANTS as of the date first above written.

COVENANTOR(S)

Ray Z. Waltrip

Print Name/Title *President*

ATTEST:

COVENANTOR(S)

Jean J. Waltrip

Print Name/Title *Secretary*

ATTEST:

William H. Gayle

COMMONWEALTH OF VIRGINIA

CITY/COUNTY OF James City County

I hereby certify that on this 12th day of January, 2007, before the subscribed, a Notary Public for the Commonwealth of Virginia, personally appeared Larry T. Waltrip and Jean T. Waltrip and did acknowledge the foregoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 12th day of January, 2007.

Beverly De Lee
Notary Public

My Commission expires: 10/31/08

Approved as to form:

AST. Jennifer C. Kuyt
County Attorney

This Declaration of Covenants prepared by:

LARRY T. WALTRIP
(Print Name)

PRESIDENT
(Title)

100 Marday Rd.
(Address)

Williamsburg VA - 23185
(City) (State) (Zip)

757-229-0434
(Phone Number)

drainage1.pre

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF RUNOFF CONTROL FACILITY

THIS DECLARATION, made this 29th day of JULY, 1993, between Larry T. Waltrip and Jean *, and all successors in interest, hereinafter referred to as the "COVENANTOR(S)," owner(s) of the following property: 19.015 acres ±, as shown on a plat dated February 16, 1988 entitled "PLAT OF BOUNDARY ADJUSTMENT BETWEEN THE PROPERTIES OF: LINWOOD WALTRIP, ET ALS: AND WILLIAMSBURG-JAMESTOWN** and James City County, Virginia, hereinafter referred to as the "COUNTY."

*T. Waltrip, husband and wife

**AIRPORT, INC., JAMES CITY COUNTY, VIRGINIA" and recorded in Plat Book 49, Page 24.

WITNESSETH:

We, the COVENANTOR(S), with full authority to execute deeds, mortgages, other covenants, and all rights, titles and interests in the property described above, do hereby covenant with the COUNTY as follows:

1. The COVENANTOR(S) shall provide maintenance for the runoff control facility, hereinafter referred to as the "FACILITY," located on and serving the above-described property to ensure that the FACILITY is and remains in proper working condition in accordance with approved design standards, and with the law and applicable executive regulations.
2. If necessary, the COVENANTOR(S) shall levy regular or special assessments against all present or subsequent owners of property served by the FACILITY to ensure that the FACILITY is properly maintained.
3. The COVENANTOR(S) shall provide and maintain perpetual access from public right-of-ways to the FACILITY for the COUNTY, its agent and its contractor.
4. The COVENANTOR(S) shall grant the COUNTY, its agent and its contractor a right of entry to the FACILITY for the purpose of inspecting, operating, installing, constructing, reconstructing, maintaining or repairing the FACILITY.
5. If, after reasonable notice by the COUNTY, the COVENANTOR(S) shall fail to maintain the FACILITY in accordance with the approved design standards and with the law and applicable executive regulations, the COUNTY may perform all necessary repair or maintenance work, and the COUNTY may assess the COVENANTOR(S) and/or all property served by the FACILITY for the cost of the work and any applicable penalties.
6. The COVENANTOR(S) shall indemnify and save the COUNTY harmless from any and all claims for damages to persons or property arising from the installation, construction, maintenance, repair, operation or use of the FACILITY.
7. The COVENANTOR(s) shall promptly notify the COUNTY when the COVENANTOR(S) legally transfers any of the COVENANTOR(S)' responsibilities for the FACILITY. The COVENANTOR(S)' shall supply the COUNTY with a copy of any document of transfer, executed by both parties.
8. The covenants contained herein shall run with the land and shall bind the COVENANTOR(S) and the COVENANTOR(S)' heirs, executors, administrators, successors and assignees, and shall bind all present and subsequent owners of property served by the FACILITY.
9. This DECLARATION shall be recorded in the County Land Records.

IN WITNESS WHEREOF, the COVENANTOR(S) have executed this DECLARATION OF COVENANTS as of this 29th day of July, 1993.

COVENANTOR(S)

Larry T. Waltrip
Larry T. Waltrip

~~ATTEST~~

Jean T. Waltrip
Jean T. Waltrip

COVENANTOR(S)

ATTEST:

COMMONWEALTH OF VIRGINIA
CITY/COUNTY OF James City

I, the undersigned Notary Public, in and for the jurisdiction aforesaid, do certify that Larry T. Waltrip, ~~husband~~ *, whose name is signed as such to the foregoing writing bearing date 29th day of July, 1993, this day sworn the same before me in my jurisdiction aforesaid.
* and Jean T. Waltrip, husband - wife
GIVEN under my hand this 29th day of July of 1993.

Theresa L. Williams
Notary Public

My Commission expires: My Commission Expires March 31, 1997

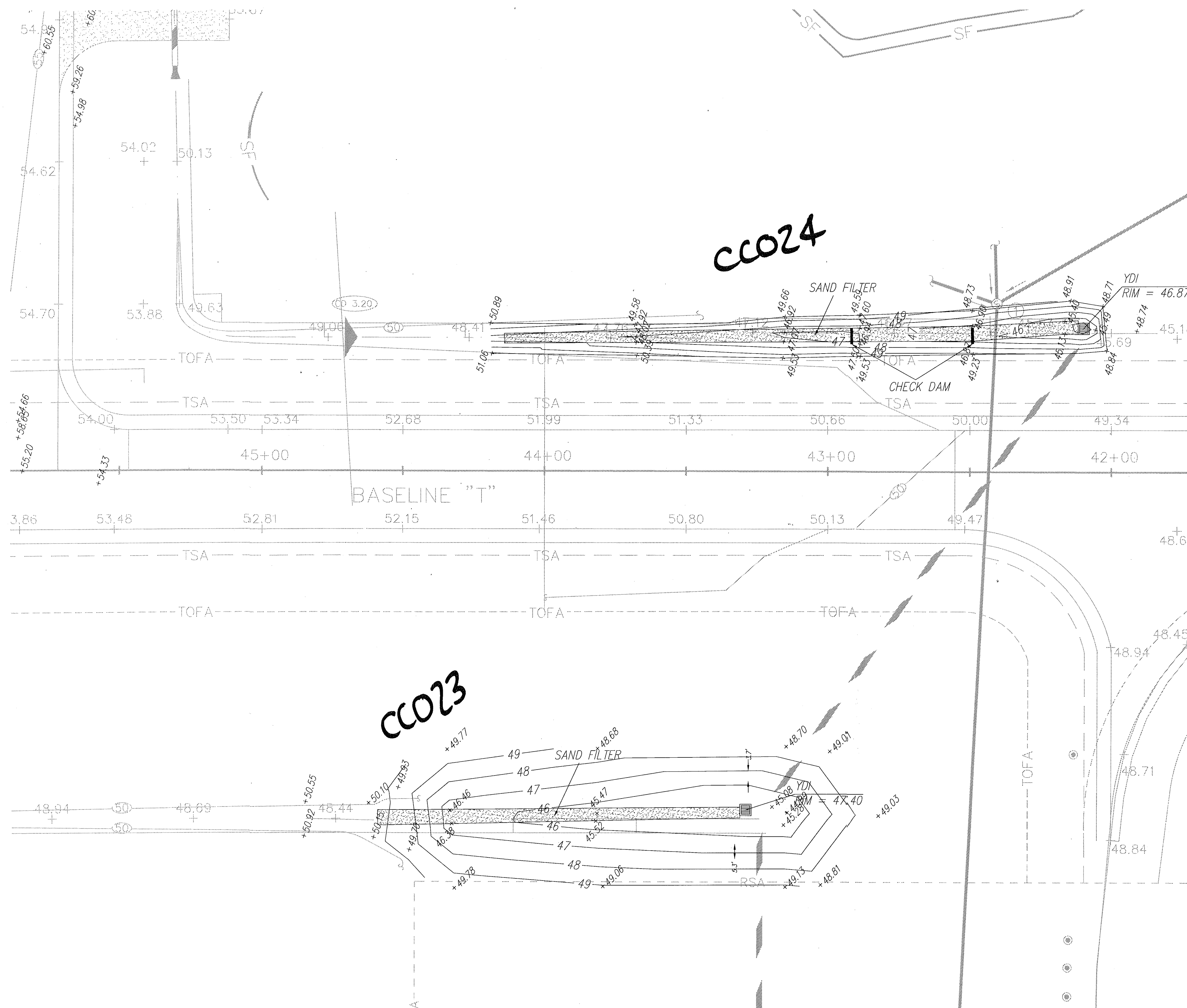
Approved as to form:

Lee P. Rogers

0261U.Wpf
Revised 9/92

VIRGINIA: City of Williamsburg and County of James City, to Wit:
In the Clerk's Office of the Circuit Court of the City of Williamsburg, County of James City the 14th day of Sept, 1993 This Covenant was presented with certificate annexed and admitted to record at 3:52 o'clock
Teste: Helen Ward, Clerk
by Theresa L. Williams
Deputy Clerk

File: P:\2005\05-430\as-built\as-built\jamestown APD, Plotted: 5-20-08 at 9:03, By: lchaney



OWNER

NAME: WIAMSBURG-JAMESTOWN AIRPORT
MAILING ADDRESS: 100 MARCLAY ROAD
WIAMSBURG, VA 23188
BUSINESS PHONE: 757-229-9256
BUSINESS FAX: 757-229-3085
CONTACT PERSON: JEAN WALTRIP
TITLE: OWNER

DESIGN ENGINEER

NAME: TALBERT & BRIGHT
MAILING ADDRESS: 10105 KRAUSE ROAD SUITE 100
CHESTERFIELD, VA 23832
BUSINESS PHONE: 804-768-6878
BUSINESS FAX: 804-768-6871
RESPONSIBLE PLAN PREPARER: JOHN M. ROBINSON, PE
TITLE: PROFESSIONAL ENGINEER
FIRM'S PROJECT NO: 4205-0101
PLAN DATE: 6/29/04
SHEET NO.'S APPLICABLE TO SWM/BMP FACILITY: 6 OF 17

CONTRACTOR

NAME: BASIC CONSTRUCTION COMPANY
MAILING ADDRESS: 538 OYSTER POINT ROAD
NEWPORT NEWS, VA 23602
BUSINESS PHONE: 757-249-3789
BUSINESS FAX: 757-249-2229
CONTACT PERSON: JOE LINK
TITLE: PROJECT MANAGER

RECORD DRAWING CERTIFICATION

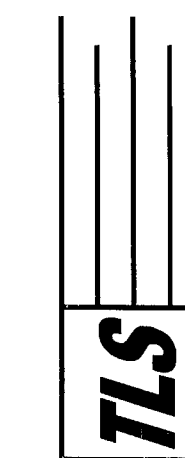
FIRM NAME: TLS SURVEYING-GPS-MAPPING INC.
MAILING ADDRESS: 11830-A CANON BLVD
NEWPORT NEWS, VA 23606
BUSINESS PHONE: 757-873-2770
BUSINESS FAX: 757-873-2772
NAME: THOMAS C. CHENEY, II, LS
TITLE: LAND SURVEYOR

I HEREBY CERTIFY TO THE BEST OF MY KNOWLEDGE AND BELIEF THAT THIS RECORD DRAWING REPRESENTS THE ACTUAL CONDITION OF THE STORMWATER MANAGEMENT / BMP FACILITY. THE FACILITY APPEARS TO CONFORM WITH THE PROVISIONS OF THE APPROVED DESIGN PLAN, SPECIFICATIONS AND STORMWATER MANAGEMENT PLAN, EXCEPT AS SPECIFICALLY NOTED.

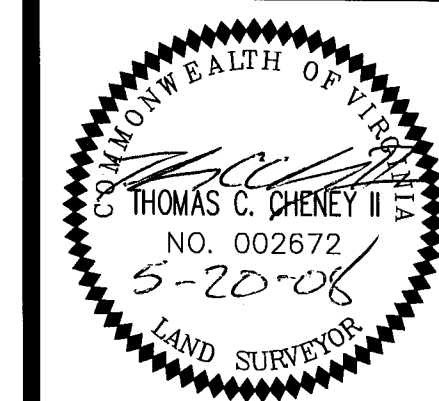
SIGNATURE: Thomas C. Cheney II DATE: 5-20-08

INFORMATION SHOWN IN BOLD ARE PER FIELD RUN AS-BUILT SURVEY BY THIS OFFICE UNLESS NOTED AS "PER CONTRACTOR"

SURVEYING-GPS-MAPPING INC.
11830-A CANON BLVD.
NEWPORT NEWS, VA 23606
(757) 873-2770 / FAX: (757) 873-2772



AS-BUILT SURVEY OF
SAND FILTERS
T-HANGER SITE (PHASE I) &
PARKING LOT EXPANSION
WIAMSBURG-JAMESTOWN AIRPORT
WIAMSBURG, VIRGINIA



SCALE: 1"=20'

DATE: 5/16/08

DRAWN: TCC

CHECKED: TCC

PROJECT NO. 05-430

SHEET NO. 2 OF 2

SP-050-03 CC023/CC024

SAND FILTER VOLUME COMPS

REF: VIRGINIA STORMWATER MANAGEMENT HANDBOOK
 CHAPTER 3, SUBSECTION 3.12.C
 AUSTIN SURFACE SAND FILTER SYSTEM

IMPERVIOUS AREA (I_a)

EXISTING IMPERVIOUS AREA = 1.9 AC (EXIST T/W $\frac{1}{2}$ APRON)

NEW IMPERVIOUS AREA = 3.1 AC (APRON)

FUTURE IMPERVIOUS AREA = 0.7 AC (HAULAGE $\frac{1}{2}$ PARKING)
 5.7 AC

$$I_a = 5.7 \text{ AC}$$

MINIMUM AREA OF SAND FILTER (A_{fm})

SAND DEPTH (d_f) = 1.5'

AVG DEPTH OF WATER ABOVE SURFACE (h) 3' = .25'

$$A_{fm} = \frac{545(I_a)(d_f)}{(h + d_f)} = \frac{545(5.7 \text{ AC})(1.5')}{(.25' + 1.5')} = 2662.7 \text{ SF}$$

$$\text{FILTER LENGTH} = 2662.7 \text{ SF} / 5' = 532' \quad \underline{\underline{\text{USE } 535'}}$$

Wmby Tmstum Airport Expansion

SP-63-01

1. BMP used is a sand filter

$$WQ_v = 1" / 1 \text{ mp Ac.}$$

2. New Imp Area = 3.1 ac

$$1" \times 3.1 \text{ ac} \times \frac{1"}{12"} \times 43,560 \frac{\text{ft}^2}{\text{ac}} = 11,253 \text{ ft}^3$$

$$3. \quad \frac{A_f (WQ_v) (d_f)}{k (h_f + d_f) t_f} = \frac{(11,253 \text{ ft}^3) (1.5)}{(3.5 \text{ /day}) (0.5 + 1.5) 1.67} = 1444 \text{ ft}^2$$

$$\text{or} \quad A_f = \frac{545 (I_a) d_f}{h + d_f} = \frac{545 \times 3.1}{0.5 + 1.5} = 845 \text{ ft}^2$$

4. Dimensions Provided

10' wide \Rightarrow Filter needs to be 144 ft long.

5. To provide for future imp area of 0.7 ac and 1.9 ac existing

$$I_a = 3.1 + 0.7 + 1.9 = 5.7 \text{ ac}$$

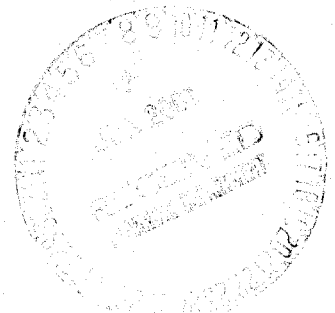
$$A_f = \frac{545 (5.7)}{h + d_f} = \frac{545 (5.7)}{0.33 + 1.5} = 1695 \text{ ft}^2 (\times d_f)$$

$$L = \frac{1695 \text{ ft}^2}{10 \text{ ft}} = 170 \text{ ft}' (1.5) = 255 \text{ ft}'$$

6. Sand Filter = 8 pt BMP

$$\frac{1.9 \text{ (existing)}}{3.8 \text{ (new proj)}} = 50\%$$

$$8 \text{ pt BMP} \times (100\% \text{ site} + 50\% \text{ exist}) = 12 \text{ pts.}$$



PREF-DATA 220 Q TO PT. B

$$22.4 \text{ AC}, C_w = .33, T_c = 18.5 \text{ min}, I_{10} = 4.65$$

$$C_w = \frac{1.2 \text{ AC } C = .9}{21.2 \text{ AC } C = .3} = \frac{1.08}{6.36}$$
$$\frac{7.44}{22.4} = .33$$

$$T_c = 200 \text{ LF OLF @ } 3\% \quad T_c = 13.5 \text{ min}$$

$$600 \text{ LF CHF, } H = 14', \quad T_c = 5 \text{ min}$$

$$T_c = 18.5 \text{ min}$$

$$I_{10} = 4.65$$

$$Q_{10} = (22.4)(.33)(4.65) = 34.4 \text{ CFS}$$

POST DEVELOPED Q TO PT. B

$$16.3ac, C = .3, T_c = 18.5min, I_p = 4.65$$

$$C_w = 16.3ac \quad C = .3$$

$$T_c = 200 \text{ LF OUF @ } 3\% \quad T_c = 13.5min$$

$$600 \text{ LF LHF, H} = 14', T_c = 5min$$

$$T_c = 18.5min$$

$$I_p = 4.65$$

$$Q_p = (16.3ac)(.3)(4.65) = \boxed{22.7 \text{ cfs}}$$

what about 9.5ac @ I=60%

VOLUME OF RUNOFF TO EXFILTRATE

$$V_e = 2 V_r$$

$$V_r = (0.5)(R_v)(A)(3630)$$

$$R_v = 0.05 + [(0.009)(I)]$$

V_r = VOLUME OF RUNOFF GENERATED BY THE MEAN STORM

1" / Imp Ac req'd to be infiltrated for a 10 pt facility

$$V_r = (0.5)[0.05 + ((0.009)(I))](A)(3630) \quad 1" \times 3.8 \text{ ac} \times \frac{1'}{12"} \times 43,560 \frac{\text{ft}^2}{\text{ac}} = 1149.5 \text{ ft}^3$$

$$V_r = (0.5)[0.05 + ((0.009)(60))](9.5)(3630) \quad \text{Void Ratio} = .4 \Rightarrow 2873.75 \text{ ft}^3$$

$$1" \times 1.9 \text{ ac ex.} = \Rightarrow 1436.9 \text{ ft}^3$$

$$4310 \text{ ft}^3$$

$$V_r = 465.5 \text{ cu. ft.}$$

$$V_e = 2(V_r) = 931 \text{ cu. ft.}$$

$$\text{Size of filter} = 1150 \text{ ft}^3$$

$$A_f = \frac{(WQ_v)(d_f)}{K(h_f + d_f)t_f} = \frac{(1150 \text{ ft}^3)(1.5)}{(3.5 \frac{1}{\text{day}})(1.0 + 1.5)(1.67)} = 118 \text{ ft}^2$$

$$h_f = 0.5$$

$$\text{SAND FILTER DIMENSION} = 110' \times 10' \times 3' = 3300 \text{ cu. ft.}$$

$$A_f = \frac{545(I_a)}{h + d_f} = \frac{545(5.7)}{0.5 + 1.5} = 1553$$

$$\downarrow$$

$$1.0 \rightarrow 1242$$

$$\boxed{110 \times 11 \times 2'}$$

$$\text{TOTAL AREA} = 9.5 \text{ AC}$$

$$\text{EXIST IMP. AREA} = 1.9 \text{ AC (EXIST T/W + APRON)}$$

$$\text{NEW IMP. AREA} = 3.1 \text{ AC (APRON)}$$

$$\text{FUTURE IMP. AREA} = .7 \text{ AC (HANGARS + PARKING)}$$

$$A_f = 1553 \text{ ft}^2$$

$$W = 10'$$

$$L = 155'$$

$$\text{Provided} = 510'$$

$$\text{TOTAL IMP. AREA} = 5.7 \text{ AC}$$

$$\text{Percent IMP. COVER} = 5.7 \text{ AC} / 9.5 \text{ AC} = .60$$

$$I = 60$$

$$A = 9.5 \text{ AC}$$

Table 2

Worksheet for BMP Point System

A. STRUCTURAL BMP POINT ALLOCATION

<u>BMP</u>	<u>BMP Points</u>		<u>Fraction of Site Served by BMP</u>		<u>Weighted BMP Points</u>
<u>INF. TRENCH (C2)</u>	<u>10</u>	x	<u>100%</u>	=	<u>10</u>
<u> </u>	<u> </u>	x	<u> </u>	=	<u> </u>
<u> </u>	<u> </u>	x	<u> </u>	=	<u> </u>
<u> </u>	<u> </u>	x	<u> </u>	=	<u> </u>

TOTAL WEIGHTED STRUCTURAL BMP POINTS: 10

B. NATURAL OPEN SPACE CREDIT

<u>Fraction of Site</u>		<u>Natural Open Space Credit</u>		<u>Points for Natural Open Space</u>
<u> </u>	x	<u> </u>	=	<u> </u>
		(0.1 per 1%)		
<u> </u>	x	<u> </u>	=	<u> </u>
		(0.15 per 1%)		

TOTAL NATURAL OPEN SPACE CREDIT:

C. TOTAL WEIGHTED POINTS

<u>10</u>	+	<u>0</u>	=	<u>10</u>
Structural BMP Points		Natural Open Space Points		Total

Apron Expansion
 Williamsburg-Jamestown Airport
 TBI Project No. 4205-0001

Sediment Trap # 1

Drainage Area (AC.)= 1.50

Wet Volume Required (CY) = 100.5

Dry Volume Required (CY) = 100.5

ELEV	LENGTH (ft)	WIDTH (ft)	CF	SUM CF	SUM CY
39	26	20	0	0	0.00
40	28	22	616	616	22.81
41	30	24	720	1336	49.48
42	32	26	832	2168	80.30
43	34	28	952	3120	115.56
44	38	32	1216	4336	160.59
45	42	36	1512	5848	216.59
46	0	0	0	5848	216.59

Apron Expansion
 Williamsburg-Jamestown Airport
 TBI Project No. 4205-0001

Sediment Trap # 2

Drainage Area (AC.)= 1.50

Wet Volume Required (CY) = 100.5

Dry Volume Required (CY) = 100.5

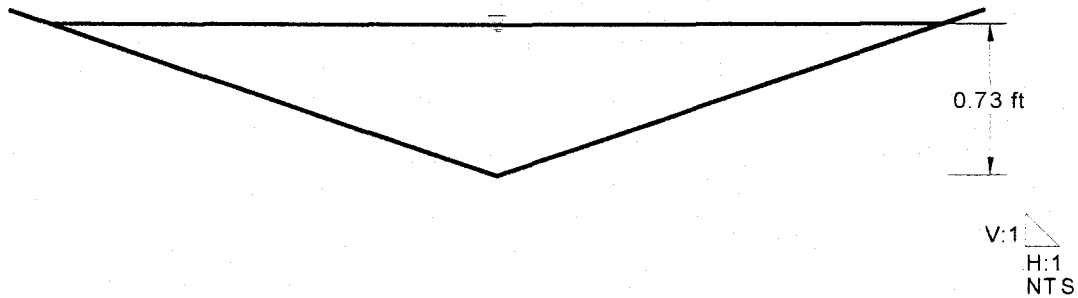
ELEV	LENGTH (ft)	WIDTH (ft)	CF	SUM CF	SUM CY
39	26	20	0	0	0.00
40	28	22	616	616	22.81
41	30	24	720	1336	49.48
42	32	26	832	2168	80.30
43	34	28	952	3120	115.56
44	38	32	1216	4336	160.59
45	42	36	1512	5848	216.59
46	0	0	0	5848	216.59

Cross Section

Cross Section for Triangular Channel

Project Description	
Worksheet	Proposed Ditch
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.030
Slope	0.005200 ft/ft
Depth	0.73 ft
Left Side Slope	3.00 H : V
Right Side Slope	3.00 H : V
Discharge	2.80 cfs



Williamsburg-Jamestown Airport - Apron Expansion

Worksheet for Triangular Channel

Project Description	
Worksheet	Proposed Ditch
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.030
Slope	0.005200 ft/ft
Left Side Slope	3.00 H : V
Right Side Slope	3.00 H : V
Discharge	2.80 cfs

Results	
Depth	0.73 ft
Flow Area	1.6 ft²
Wetted Perimeter	4.61 ft
Top Width	4.37 ft
Critical Depth	0.56 ft
Critical Slope	0.021529 ft/ft
Velocity	1.76 ft/s
Velocity Head	0.05 ft
Specific Energy	0.78 ft
Froude Number	0.51
Flow Type	Subcritical

(E)

Worksheet 2: Runoff curve number and runoff

Project _____ By _____ Date _____

Location _____ Checked _____ Date _____

Circle one: Present Developed

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{1/}			Area <input checked="" type="checkbox"/> acres <input type="checkbox"/> mi ² <input type="checkbox"/> %	Product of CN x area
		Table 2-2	Fig. 2-3	Fig. 2-4		
C	OPEN SPACE	79			49.7	3926.3
C	ASPHALT (R/W, T/W, APRON)	98			5.6	548.8
Totals =					55.3	4475.1

^{1/} Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{4475.1}{55.3} = 80.9$$

Use CN =

81

2. Runoff

Frequency yr
Rainfall, P (24-hour) in
Runoff, Q in
(Use P and CN with table 2-1, fig. 2-1,
or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
1	10	100
2.8	5.8	8.0
1.10	3.6	5.8

Same

Location _____ Checked _____ Date _____

Circle one: T_c T_t through subarea

Include a map, schematic, or description of flow segments.

Compute T_r hr

Compute T_i hr

Compute r ft

Compute V ft/s

Compute T_r hr

89

Worksheet 4: Graphical Peak Discharge method

Project T-HANGAR SITE PREP By SP Date 12-27-02

Location WILLIAMSBURG - JAMESTOWN AIRPORT Checked _____ Date _____

Circle one: Present ~~Developed~~

1. Data:

Drainage area $A_m = .10$ mi^2 (acres/640)
 Runoff curve number CN = 81 (From worksheet 2)
 Time of concentration .. $T_c = .89$ hr (From worksheet 3)
 Rainfall distribution type = II (I, IA, II, III)
 Pond and swamp areas spread throughout watershed = 1.0 percent of A_m (— acres or mi^2 covered)

2. Frequency yr

3. Rainfall, P (24-hour) in

4. Initial abstraction, I_a in
 (Use CN with table 4-1.)

5. Compute I_a/P

6. Unit peak discharge, q_u csm/in
 (Use T_c and I_a/P with exhibit 4-11)

7. Runoff, Q in
 (From worksheet 2).

8. Pond and swamp adjustment factor, F_p
 (Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)

9. Peak discharge, q_p cfs
 (Where $q_p = q_u A_m Q F_p$)

Storm #1	Storm #2	Storm #3
1	10	100
2.8	5.8	8.0

.469	.469	.469
------	------	------

.168	.081	.059
------	------	------

375	425	475
-----	-----	-----

1.10	3.6	5.8
------	-----	-----

1.0	1.0	1.0
-----	-----	-----

41.3	153.0	275.5
------	-------	-------

Worksheet 2: Runoff curve number and runoff

27.9

Project _____ By _____ Date _____

Location _____ Checked _____ Date _____

Circle one: Present Developed _____

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{1/}			Area <input checked="" type="checkbox"/> acres <input type="checkbox"/> mi ² <input type="checkbox"/> %	Product of CN x area
		Table 2-2	Fig. 2-3	Fig. 2-4		
C	GRAVEL PARKING, ROOFS	98			2.8	274.4
C	OPEN SPACE	79			33.4	2638.6
C	PAVEMENT (T/W, R/W)	98			3.0	294
C	OPEN SPACE	79			24.9	1967.1
Totals =					64.1	5174.1

^{1/} Use only one CN source per line.

Totals =

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{5174.1}{64.1} = 80.7; \text{ Use CN} = \boxed{81}$$

2. Runoff

Frequency yr
 Rainfall, P (24-hour) in
 Runoff, Q in
 (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
1	10	100
2.8	5.8	8.0
1.10	3.6	5.8

Worksheet 3: Time of concentration (T_c) or travel time (T_t)

Project _____ By _____ Date _____

Location _____ Checked _____ Date _____

Circle one: Present Developed _____

Circle one: T_c T_t through subarea _____

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (table 3-1)
2. Manning's roughness coeff., n (table 3-1) ..
3. Flow length, L (total $L \leq 300$ ft) ft
4. Two-yr 24-hr rainfall, P_2 in
5. Land slope, s ft/ft
6. $T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$ Compute T_t hr

1	
woods	
.80	
300	
3.5	
.10	
.75	+ — = .75

Shallow concentrated flow

Segment ID

7. Surface description (paved or unpaved)
8. Flow length, L ft
9. Watercourse slope, s ft/ft
10. Average velocity, V (figure 3-1) ft/s
11. $T_t = \frac{L}{3600 V}$ Compute T_t hr

2	
unpaved	
350	
.125	
6.5	
.015	+ — = .02

Channel flow

Segment ID

12. Cross sectional flow area, a ft²
13. Wetted perimeter, p_w ft
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ft
15. Channel slope, s ft/ft
16. Manning's roughness coeff., n
17. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V ft/s
18. Flow length, L ft
19. $T_t = \frac{L}{3600 V}$ Compute T_t hr
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) hr

3	
1187.5	
4750	
.25	
.03	
.06	
1.7	
750	
.12	+ — = .12
	.89

Worksheet 4: Graphical Peak Discharge method

Project T-HANGAR SIDE PREP By SNP Date 12-27-02

Location WILLIAMSBURG - JAMESTOWN AIRPORT Checked _____ Date _____

Circle one: Present Developed

1. Data:

Drainage area $A_m = .086$ mi² (acres/640)
 Runoff curve number CN = 81 (From worksheet 2)
 Time of concentration .. $T_c = .89$ hr (From worksheet 3)
 Rainfall distribution type = II (I, IA, II, III)
 Pond and swamp areas spread throughout watershed = 1.0 percent of A_m (____ acres or mi² covered)

		Storm #1	Storm #2	Storm #3
2. Frequency	yr	1	10	100
3. Rainfall, P (24-hour)	in	2.8	5.8	8.0
4. Initial abstraction, I_a	in	.469	.469	.469
(Use CN with table 4-1.)				
5. Compute I_a/P168	.081	.059
6. Unit peak discharge, q_u	csn/in	375	425	475
(Use T_c and I_a/P with exhibit 4-____)				
7. Runoff, Q	in	1.10	3.6	5.8
(From worksheet 2).				
8. Pond and swamp adjustment factor, F_p		1.0	1.0	1.0
(Use percent pond and swamp area with table 4-2. Factor is 1.0 for zero percent pond and swamp area.)				
9. Peak discharge, q_p	cfs	35.48	131.58	236.9
(Where $q_p = q_u A_m QF_p$)				

Worksheet for BMP Point System

<u>BMP</u>	<u>BMP Points</u>		Fraction of Site Served by BMP	=	Weighted BMP Points
SAND FILTER	8	x	100%	=	8
EXCESS POINTS From APRON PROJECT		x	SP-63-01 (SEE ATTACHED)	=	2
		x		=	
		x		=	
TOTAL WEIGHTED STRUCTURAL BMP POINTS:					<u>10</u>

<u>Fraction of Site</u>		<u>Natural Open Space Credit</u>		<u>Points for Natural Open Space</u>
_____	X	_____	=	_____
		(0.1 per 1%)		
_____	X	_____	=	_____
		(0.15 per 1%)		

TOTAL NATURAL OPEN SPACE CREDIT: _____

Structural BMP Points	+	Natural Open Space Points	=	Total
-----------------------	---	---------------------------	---	-------

Table 2

Worksheet for BMP Point System

A. STRUCTURAL BMP POINT ALLOCATION

<u>BMP</u>	<u>BMP Points</u>		<u>Fraction of Site Served by BMP</u>		<u>Weighted BMP Points</u>
<u>SAND FILTER</u>	<u>8</u>	x	<u>100%</u>	=	<u>8</u>
<u>SAND FILTER</u>	<u>8</u>	x	<u>50% EX. IMP. COVER</u>	=	<u>4</u>
<u> </u>	<u> </u>	x	<u> </u>	=	<u> </u>
<u> </u>	<u> </u>	x	<u> </u>	=	<u> </u>

TOTAL WEIGHTED STRUCTURAL BMP POINTS: 12

B. NATURAL OPEN SPACE CREDIT

<u>Fraction of Site</u>		<u>Natural Open Space Credit</u>		<u>Points for Natural Open Space</u>
<u> </u>	x	<u> </u>	=	<u> </u>
		(0.1 per 1%)		
<u> </u>	x	<u> </u>	=	<u> </u>
		(0.15 per 1%)		

TOTAL NATURAL OPEN SPACE CREDIT:

C. TOTAL WEIGHTED POINTS

<u>12</u>	+	<u>0</u>	=	<u>12</u>
Structural BMP Points		Natural Open Space Points		Total

Williamsburg-Jamestown Airport - Existing Channel

Worksheet for Irregular Channel

Project Description	
Worksheet	Existing Channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Slope	0.030000 ft/ft
Water Surface Elevation	12.00 ft

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Method	Improved Lotter's Method
Closed Channel Weighting Method	Horton's Method

Results	
Mannings Coefficient	0.060
Elevation Range	11.50 to 60.00
Discharge	2,021.46 cfs
Flow Area	1,187.5 ft ²
Wetted Perimeter	4,750.00 ft
Top Width	4,750.00 ft
Actual Depth	0.50 ft
Critical Elevation	11.91 ft
Critical Slope	0.089138 ft/ft
Velocity	1.70 ft/s
Velocity Head	0.05 ft
Specific Energy	12.05 ft
Froude Number	0.60
Flow Type	Subcritical

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	680+00	0.060

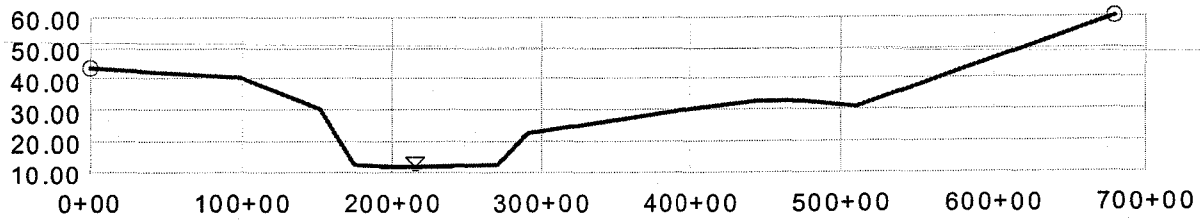
Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	43.50
100+00	40.00
140+00	32.50
152+00	30.00
175+00	12.50
210+00	11.50
270+00	12.50
290+00	22.50
400+00	30.00
445+00	32.50
475+00	32.50
510+00	31.00
580+00	42.50
680+00	60.00

Cross Section

Cross Section for Irregular Channel

Project Description	
Worksheet	Existing Channel
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

Section Data	
Mannings Coefficient	0.060
Slope	0.030000 ft/ft
Water Surface Elevation	12.00 ft
Elevation Range	11.50 to 60.00
Discharge	2,021.46 cfs



V:200.0
H:1
NTS

STORM SEWER DESIGN COMPUTATIONS

PROJECT Williamsburg-Jamestown Airport - T-Hangar Site Preparation

[illegible]

HYDRAULIC GRADE LINE

PROJECT Williamsburg-Jamestown Airport T-Hangar Site Prep.

[illegible]

$$H_i = 0.35 \frac{V_i^2}{2g}$$

$$H_0 = 0.25 \frac{V_0^2}{2g}$$

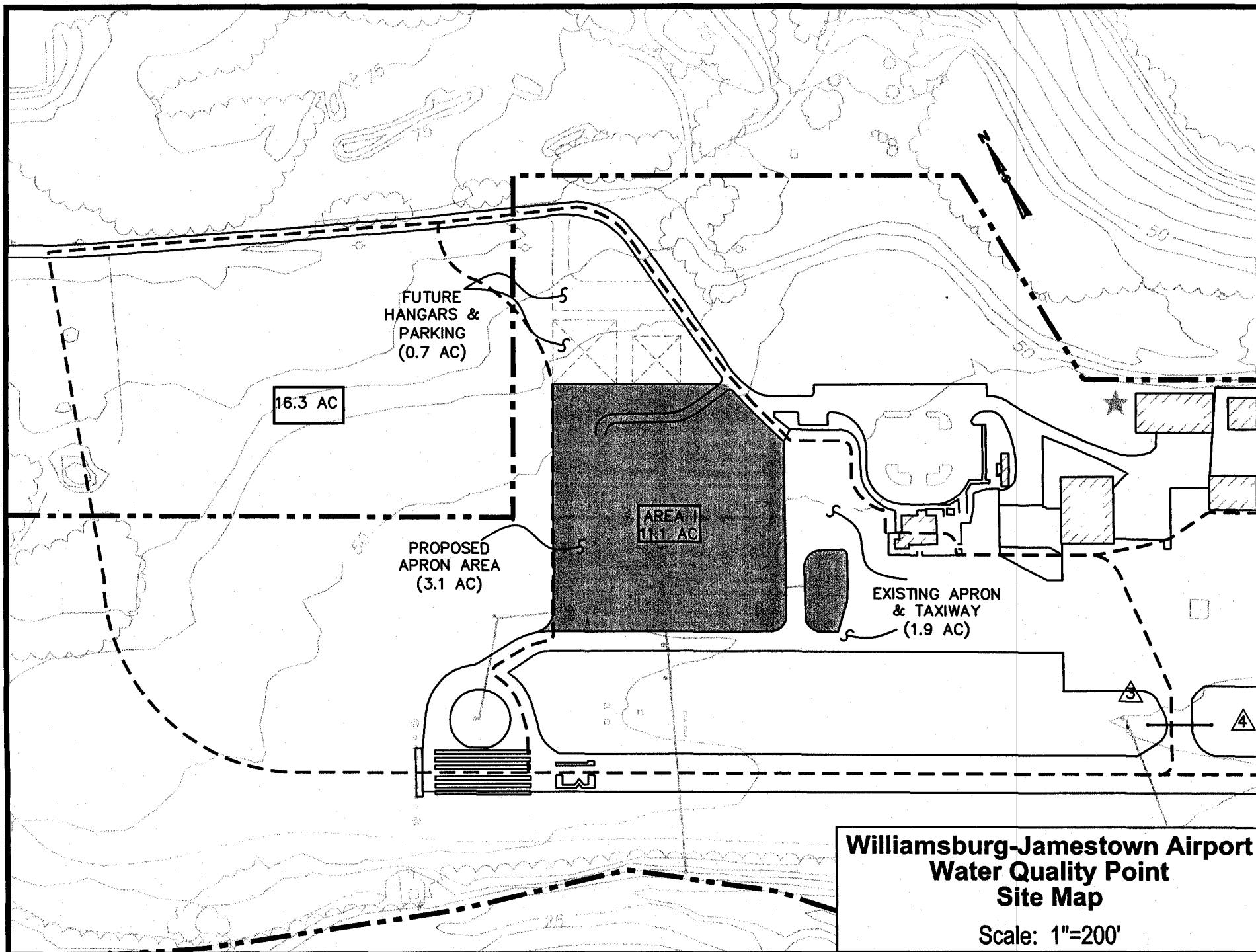
$$H_{\Delta} = K \frac{V_i^2}{2g}$$

$$\begin{aligned} \text{FINAL } H &= H_f + H_t \\ H_t &= H_0 + H_i + H_{\Delta} \\ g &= 32.2 \end{aligned}$$

90° K = 0.70
80° K = 0.66
70° K = 0.61
60° K = 0.55

50° K = 0.47
40° K = 0.38
30° K = 0.28
25° K = 0.22

$$20^\circ \text{ K} = 0.16$$
$$15^\circ \text{ K} = 0.10$$



Label	Length	Size	Discharge	Hydraulic Grade	
				Upstream	Downstream
P-1	56.00	18 inch	4.43	39.01	37.92
P-2	123.00	24 inch	5.67	37.92	37.91
P-3	12.00	24 inch	5.51	37.91	37.90
P-5	44.00	36.25 x 22	8.16	38.42	38.19
P-6	227.00	36.25 x 22	8.97	38.19	37.90
P-7	20.00	15 inch	1.50	37.99	37.92
P-9	196.00	24 inch	17.99	37.90	36.66
P-11	9.00	15 inch	4.51	36.70	36.66
P-12	164.00	24 inch	21.98	35.09	33.54
P-13	172.00	24 inch	23.87	33.54	31.60
P-14	11.00	24 inch	30.92	31.60	30.77
P-15	177.00	24 inch	21.28	36.66	35.09
P-17	10.00	15 inch	3.69	37.78	35.37

Label	Discharge	Ground	Elevations	
			Upstream HGL	Downstream HGL
I-1	4.43	39.70	39.01	39.01
J-1	5.67	41.00	37.92	37.92
J-2	5.51	40.00	37.91	37.91
I-2	17.99	39.87	37.90	37.90
I-3	21.98	39.62	35.09	35.09
I-4	8.16	40.50	38.42	38.42
I-5	8.97	39.63	38.19	38.19
I-6	1.50	39.00	37.99	37.99
I-8	4.51	39.74	36.70	36.70
J-3	21.28	39.75	36.66	36.66
I-9	23.87	39.40	33.54	33.54
I-10	30.92	37.69	31.60	31.60
Outlet	30.90	31.23	30.40	30.40
I-12	3.69	38.25	37.78	37.78

Elapsed: 0 minute(s) 8 second(s)

WATERSHEDCC

BMP ID NO024

PLAN NOSP-050-2003

TAX PARCEL(48-2)(1-5A)

PIN NO4820100005A

CONSTRUCTION DATE

PROJECT NAMEWilliamsburg-Jamestown Airport

FACILITY LOCATION100 Marclay Rd

CITY-STATEWilliamsburg VA

CURRENT OWNERWilliamsburg-Jamestown Airport

OWNER ADDRESS100 Marclay Rd

OWNER ADDRESS 2

CITY-STATE-ZIP CODEWilliamsburg, VA 23185

OWNER PHONE

MAINT AGREEMENTNo

EMERG ACTION PLANNo

PRINTED ON

Wednesday, March 10, 201

2:32:59 PM

MAINTENANCE PLANNo

SITE AREA acre119

LAND USEAirport

old BMP TYP

JCC BMP CODE

POINT VALUE

SVC DRAIN AREA acres5.7

SERVICE AREA DESCRI

IMPERV AREA acres0.00

RECV STREAM

EXT DET-WQ-CTRLNo

WTR QUAL VOL acre-ft

CHAN PROT CTRLNo

CHAN PROT VOL acre-ft

SW/FLOOD CONTROLNo

GEOTECH REPORTNo

CTRL STRUC DESC

CTRL STRUC SIZE inches

OTLT BARRL DESC

OTLT BARRL SIZE inch

EMERG SPILLWAYNo

DESIGN HW ELEV

PERM POOL ELEV

2-YR OUTFLOW cfs0.00

10-YR OUTFLOW cfs0.00

REC DRAWINGNo

CONSTR CERTIFNo

LAST INSP DATE

Inspected by:

INTERNAL RATING

MISC/COMMENTS

Also see CC023 - same type of BMP - both on same site plan

Get Last BMP No

Return to Menu

Additional Comments:

Williamsburg-Jamestown Airport
Apron Expansion
Phase I

April 19, 2002

BMP Water Quality Point Justification



The area being supported by the sand filter is a combination of the proposed apron area, the existing apron and taxiway, and the future hangars proposed to the north of the apron expansion (See attached exhibit). Runoff from these areas will sheet flow to the infield (the area between the taxiway and the runway) where the sand filter is proposed. To help aid in the infiltration process, check dams will be installed every 100 feet.

The existing apron and taxiway make up approximately 1.9 acres of impervious area. The proposed apron expansion will add an additional 3.1 acres of imperviousness to the site. In order to properly size this sand filter for future development, two corporate hangars and associated parking have been added to the total impervious area used to size the facility. The future development is approximately 0.7 acres. The total impervious area used to size this facility was 5.7 acres.

In order to meet the non-point source pollution requirements of James City County, the sand filter was the best use considering the drainage patterns, site constraints and site limitations. James City County required 10 BMP Points be obtained based on the BMP Point System. The sand filter provided only 8 points. In order to achieve the required 10 points, credit was taken for providing filtration for the existing impervious area. This area is the 1.9 acres of existing taxiway and runway previously discussed. Based on the fact that the existing area was at least 50% of the proposed development, 4 BMP were obtained ($0.50 \times 8 \text{ points} = 4 \text{ points}$). This brought the total BMP points to 12 meeting the county requirements.

?