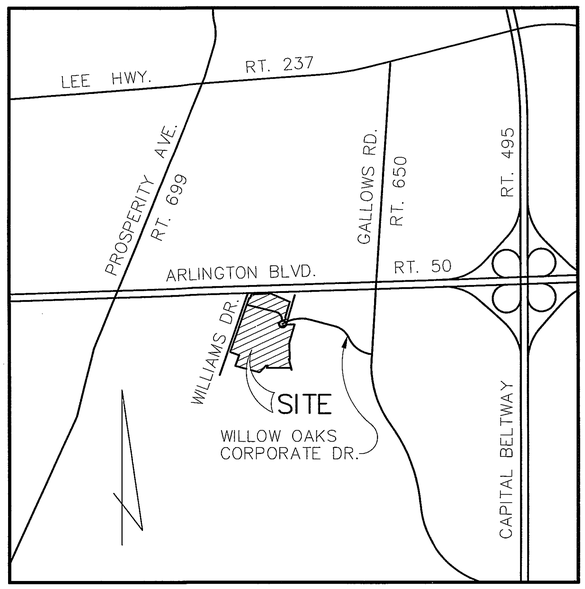
INOVA WILLOW OAKS

Providence District Fairfax County, Virginia

Partial Generalized Development Plan Amendment - PCA 87-P-038-04



VICINITY MAP
SCALE : 1"= 1,000'

Applicant:
Inova Health Care Services
3300 Gallows Road
Falls Church, VA 22042

Application No PCA-87-P-038-04 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 7/6/2009
Date of (BOS) (PC) Approval 7/13/2009
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Inova Willow Oaks
Partial Generalized Development
Plan Amendment
PCA 87-P-038-04

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SEAL

COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLEITON
Lic. No. 20112
6-10-09
PROFESSIONAL ENGINEER

Revised June 10, 2009
Revised June 5, 2009
Revised May 20, 2009
Revised April 20, 2009
Revised March 26, 2009
Revised February 19, 2009
Revised January 23, 2009
Revised October 9, 2008
Revised August 28, 2008
Revised July 31, 2008
April 14, 2008

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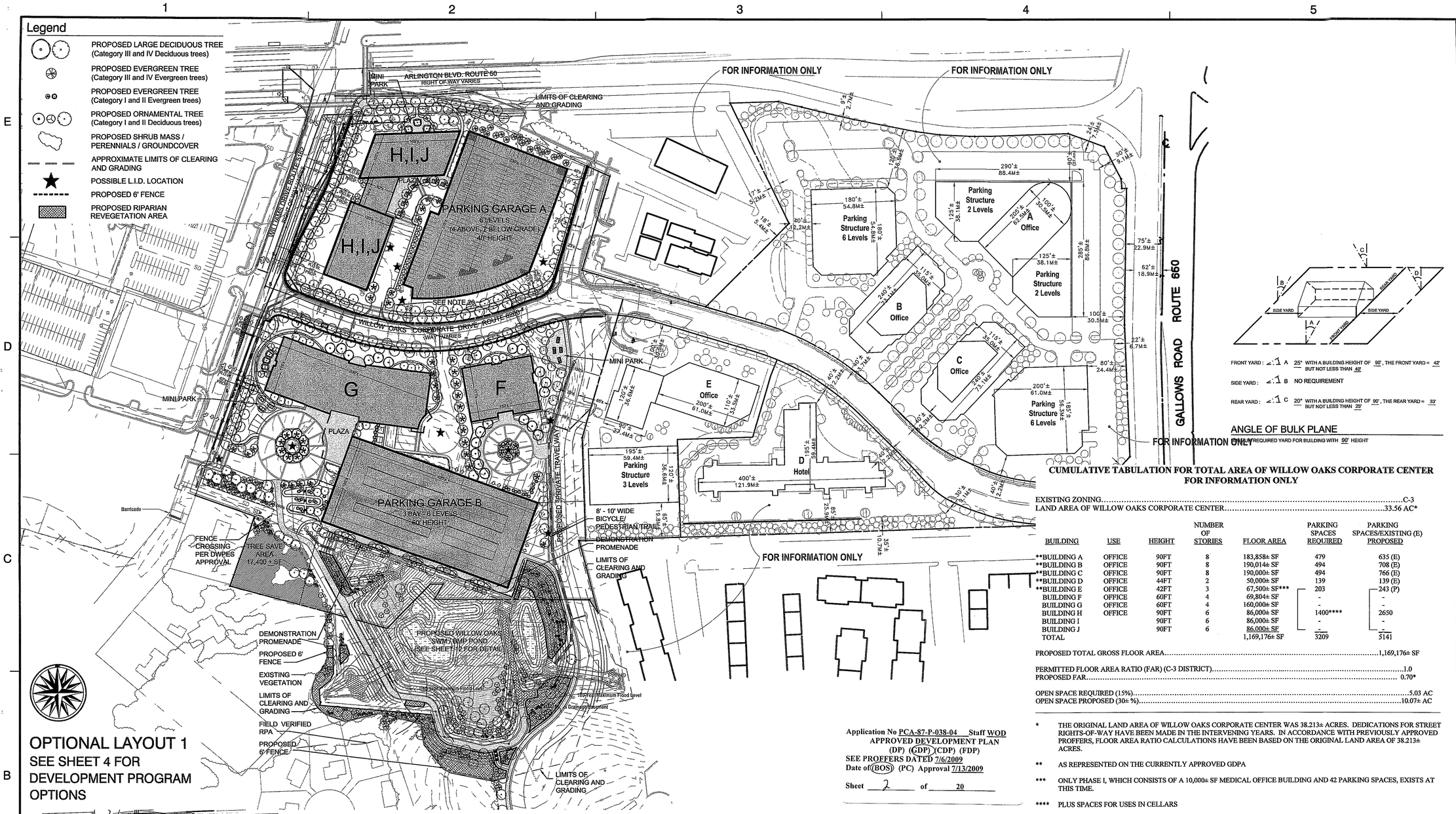

FRONT YARD : 1:1 A 25' WITH A BUILDING HEIGHT OF 90', THE FRONT YARD = 42' BUT NOT LESS THAN 40'

SIDE YARD : 1:1 B NO REQUIREMENT

REAR YARD : 1:1 C 20' WITH A BUILDING HEIGHT OF 90', THE REAR YARD = 33' BUT NOT LESS THAN 25'

ANGLE OF BULK PLANE

ONLY REQUIRED YARD FOR BUILDING WITH 90' HEIGHT

CUMULATIVE TABULATION FOR TOTAL AREA OF WILLOW OAKS CORPORATE CENTER FOR INFORMATION ONLY

EXISTING ZONING.....C-3
LAND AREA OF WILLOW OAKS CORPORATE CENTER.....33.56 AC*

BUILDING	USE	HEIGHT	NUMBER OF STORIES	FLOOR AREA	PARKING SPACES REQUIRED	PARKING SPACES/EXISTING (E) PROPOSED
**BUILDING A	OFFICE	90FT	8	183,858± SF	479	635 (E)
**BUILDING B	OFFICE	90FT	8	190,014± SF	494	708 (E)
**BUILDING C	OFFICE	90FT	8	190,000± SF	494	766 (E)
**BUILDING D	OFFICE	44FT	2	50,000± SF	139	139 (E)
**BUILDING E	OFFICE	42FT	3	67,500± SF***	203	243 (P)
BUILDING F	OFFICE	60FT	4	69,804± SF	-	-
BUILDING G	OFFICE	60FT	4	160,000± SF	-	-
BUILDING H	OFFICE	90FT	6	86,000± SF	1400****	2650
BUILDING I		90FT	6	86,000± SF	-	-
BUILDING J		90FT	6	86,000± SF	-	-
TOTAL				1,169,176± SF	3209	5141

PROPOSED TOTAL GROSS FLOOR AREA.....1,169,176± SF

PERMITTED FLOOR AREA RATIO (FAR) (C-3 DISTRICT).....1.0
PROPOSED FAR.....0.70*

OPEN SPACE REQUIRED (15%).....5.03 AC
OPEN SPACE PROPOSED (30± %).....10.07± AC

* THE ORIGINAL LAND AREA OF WILLOW OAKS CORPORATE CENTER WAS 38.213± ACRES. DEDICATIONS FOR STREET RIGHTS-OF-WAY HAVE BEEN MADE IN THE INTERVENING YEARS. IN ACCORDANCE WITH PREVIOUSLY APPROVED PROFFERS, FLOOR AREA RATIO CALCULATIONS HAVE BEEN BASED ON THE ORIGINAL LAND AREA OF 38.213± ACRES.

** AS REPRESENTED ON THE CURRENTLY APPROVED GDPA

*** ONLY PHASE I, WHICH CONSISTS OF A 10,000± SF MEDICAL OFFICE BUILDING AND 42 PARKING SPACES, EXISTS AT THIS TIME.

**** PLUS SPACES FOR USES IN CELLARS

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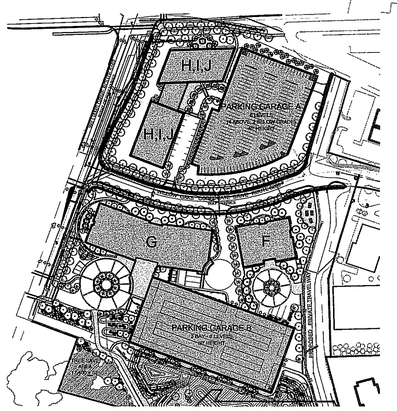
OPTIONAL LAYOUT 1

SEE SHEET 4 FOR DEVELOPMENT PROGRAM OPTIONS



Interior Parking Lot Landscaping Graphic
Not to Scale

Parking Lot Landscaping Tabulation

PARKING LOT AREA .....173,635 SF±
PARKING LOT LANDSCAPING REQUIRED (5%) ..... 8,682 SF±
PARKING LOT LANDSCAPING PROPOSED (5.2%) .....9,100 SF±
(52 PROPOSED TREES @ AVG. 175 SF EA)

TREE COUNTED TOWARD PARKING LOT LANDSCAPING REQUIREMENT

Tree Canopy Tabulation

SITE AREA.....703,058 SF±
POND WATER SURFACE ELEVATION (ON WILLOW OAKS SITE).....18,849 SF±
ADJUSTED SITE AREA.....684,209 SF±
TREE CANOPY REQUIRED (10%).....68,421 SF±
AREA OF EXISTING TREES (17,400 x1.25).....21,750 SF±
AREA OF TREES PLANTED ON SITE:
163 TREES @ AVG. 175 SF EA = 28,525;
34 TREES @ AVG. 125 SF EA = 4,250;
101 TREES @ AVG. 75 SF EA = 7,575;
109 TREES @ AVG. 60 SF EA = 6,540
AREA OF PROPOSED LANDSCAPING.....46,890 SF±
TOTAL TREE CANOPY PROVIDED (10%).....68,640 SF±

NOTE:

THE PARKING LOT LANDSCAPING AND TREE CANOPY TABULATIONS ARE PRELIMINARY. THE TABULATIONS ARE INTENDED TO REFLECT THE MINIMUM LANDSCAPE AND CANOPY REQUIREMENTS FOR THE PROPOSED DEVELOPMENT PROGRAM. FINAL CALCULATIONS WILL BE PROVIDED WITH THE BENEFIT OF SURVEYS AND FINAL ENGINEERING AT TIME OF SITE PLAN PREPARATION. AT TIME OF SITE PLAN, INDIVIDUAL TREES IDENTIFIED MAY VARY AND/OR ADDITIONAL TREES MAY BE IDENTIFIED AS CONTRIBUTING TOWARDS MEETING THE LANDSCAPE REQUIREMENT AND/OR ADDITIONAL TREE CANOPY MAY BE CLAIMED FOR EXISTING TREES WITH LARGER CALIPER/TREE COVERAGE.

RPA Revegetation

DISTURBED RPA AREA.....34,472.53 SF± (.79 ACRES)

REQUIRED DENSITY OF DECIDUOUS TREES.....100 PER ACRE
REQUIRED DENSITY OF UNDERSTORY TREES.....200 PER ACRE
REQUIRED DENSITY OF SHRUBS.....1089 PER ACRE

PROPOSED DENSITY OF DECIDUOUS TREES AT SITE PLAN: 79
PROPOSED DENSITY OF UNDERSTORY TREES AT SITE PLAN: 158
PROPOSED DENSITY OF SHRUBS AT SITE PLAN: 860

TABLE 12.3 TREE PRESERVATION TARGET CALCULATION

	REQUIREMENTS	RESULTS
A	PRE-DEVELOPMENT AREA OF EXISTING TREE CANOPY (FROM EXISTING VEGETATION MAP) =	378,186.13 SF OR 8.68 AC
B	PERCENTAGE OF GROSS SITE AREA COVERED BY EXISTING TREE CANOPY =	53.79%
C	PERCENTAGE OF 10-YEAR TREE CANOPY REQUIRED FOR SITE (SEE LEFT) =	10% OF 626,842 SF = 62,684 SF
D	PERCENTAGE OF THE 10-YEAR CANOPY REQUIREMENT THAT SHOULD BE MET THROUGH TREE PRESERVATION =	53.79% = 33,718 SF
E	PROPOSED PERCENTAGE OF CANOPY REQUIREMENT THAT WILL BE MET THROUGH TREE PRESERVATION (SEE LEFT) =	27.76% = 17,400 SF
F	HAS THE TREE PRESERVATION TARGET MINIMUM BEEN MET?	NO
G	IF NO FOR LINE F, THEN REQUEST A DEVIATE FROM THE TREE PRESERVATION TARGET SHALL BE PROVIDED ON THE PLAN THAT STATES ONE OF MORE OF THE JUSTIFICATIONS LISTING IN 12-0507.3 ALONG WITH A NARRATIVE THAT PROVIDES A SITE-SPECIFIC EXPLANATION OF WHY THE TREE PRESERVATION TARGET CANNOT BE MET. PROVIDE A SHEET NUMBER WHERE THE DEVIATION REQUEST IS LOCATED.	
H	IF STEP G REQUIRES A NARRATIVE, IT SHALL BE PREPARED IN ACCORDANCE WITH 12-0507.4	
I	PLACE THIS INFORMATION PRIOR TO THE 10-YEAR TREE CANOPY CALCULATIONS AS PER INSTRUCTIONS IN TABLE 12.12	

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INOVA
WILLOW OAKS

PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT
PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES COLLETTONE
Lic. No. 20112
6/10/09
PROFESSIONAL ENGINEER

KEY PLAN

SCALE
0' 100' 200'

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE

Inova
Willow Oaks

Partial Generalized Development Plan Amendment
Overall

PROJECT NO.

2

SHEET NO. 2 OF 20

M-10690

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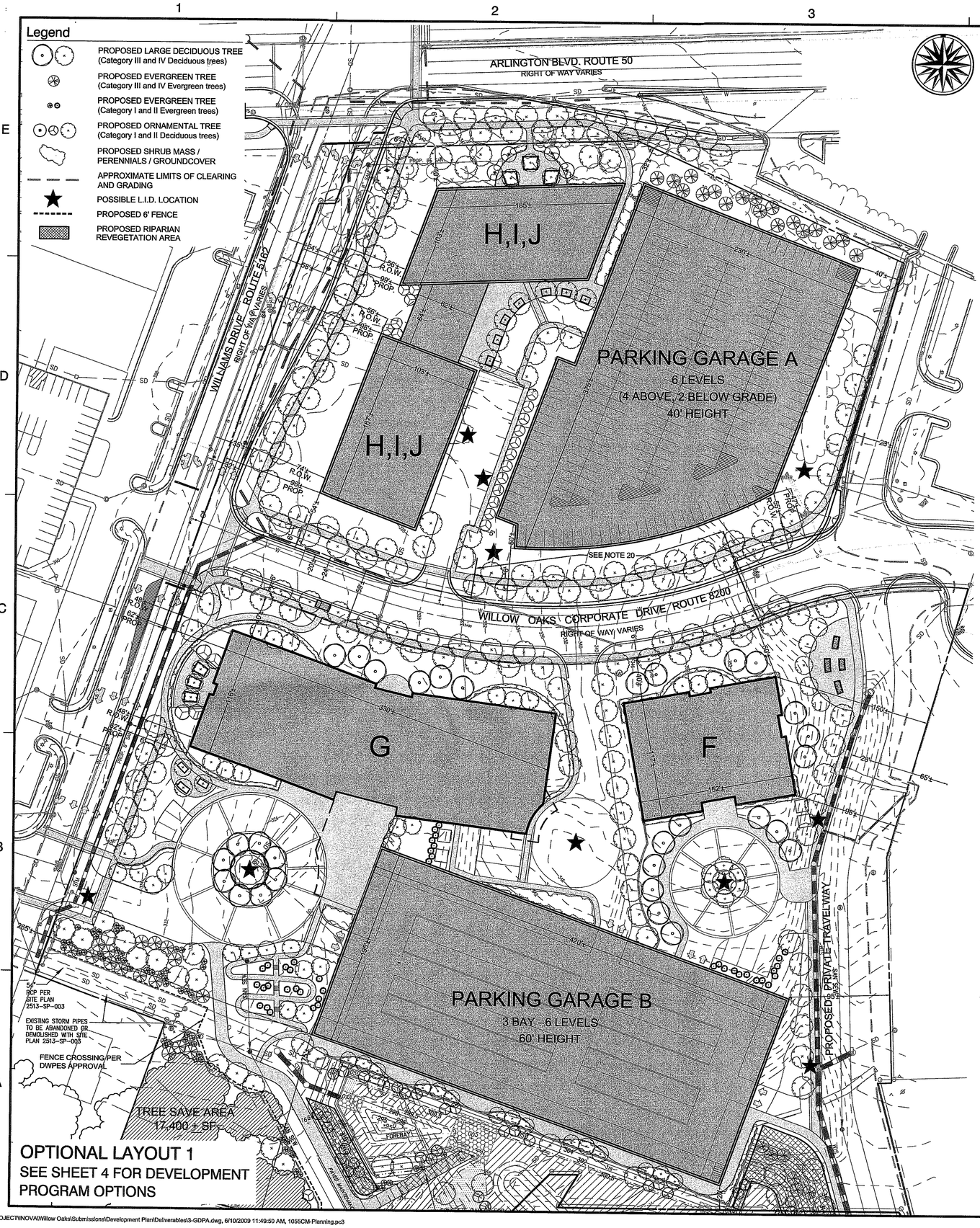

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NOTES:

1. THE PROPERTY THAT IS THE SUBJECT OF THIS PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT (GDPA) IS IDENTIFIED ON THE FAIRFAX COUNTY ZONING MAP AS 49-3 001 141. THE LAND AREA IS APPROXIMATELY 16.14 ACRES. IT IS ZONED TO THE C-3 DISTRICT. IT IS PART OF THE WILLOW OAKS CORPORATE CENTER PROPERTY THAT WAS THE SUBJECT OF REZONING APPLICATION RZ 87-P-038 THAT WAS PROFFERED AND APPROVED BY THE BOARD OF SUPERVISORS ON MAY 1, 1989. RZ-87-P-038 WAS THE SUBJECT OF A PROFFERED CONDITION AMENDMENT (PCA) THAT WAS APPROVED ON AUGUST 5, 1996; A SECOND PCA (PCA 87-P-038-02) THAT WAS APPROVED ON AUGUST 2, 1999; AND A THIRD PCA (PCA 87-P-038-03) THAT WAS APPROVED ON OCTOBER 25, 1999.
2. THIS PARTIAL GDPA ACCOMPANIES A PARTIAL PCA THAT HAS BEEN FILED TO AMEND THE CURRENTLY APPROVED DEVELOPMENT PROGRAM FOR PARCEL 141, WHICH PARCEL IS OWNED BY INOVA HEALTH SYSTEM.

   THE CURRENTLY APPROVED DEVELOPMENT PROGRAM FOR PARCEL 141 CONSISTS OF THREE (3) PROPOSED OFFICE BUILDINGS (BLDGS F, G AND H) AND ONE (1) PROPOSED ASSISTED LIVING FACILITY (MEDICAL CARE FACILITY) IN BUILDING I. THE TOTAL APPROVED GROSS FLOOR AREA FOR THESE FOUR (4) BUILDINGS IS 487,804 SQUARE FEET - WHICH APPROXIMATES A 0.69 FAR FOR THE SUBJECT PARCEL.

   THE PROPOSED REVISED DEVELOPMENT PROGRAM FOR THE SUBJECT PROPERTY WILL BE FOUR (4) BUILDINGS (BUILDINGS F, H, I, J) THAT MAY BE USED FOR OFFICES, MEDICAL OFFICES, EDUCATIONAL FACILITY (SCHOOL OF SPECIAL EDUCATION) AND/OR A CANCER CENTER (OFFICE). A FIFTH (5) PROPOSED BUILDING (BUILDING G), CONSISTING OF UP TO 160,000 SQUARE FEET OF GROSS FLOOR AREA, MAY BE USED FOR A PUBLIC USE AND RELATED ACCESSORY SERVICE USES AS DESCRIBED IN THE PROFFERS.

   IF BUILDING G IS NOT USED FOR A MID-COUNTY COMMUNITY SERVICES CENTER, IT IS TO BE UNDERSTOOD BUILDING G MAY BE USED FOR THE SAME USES AS IDENTIFIED ABOVE FOR BUILDING F, H, I, AND J.

   IT IS TO BE NOTED THERE WILL BE NO ASSISTED LIVING FACILITY AND THERE WILL BE NO INCREASE IN THE CURRENTLY APPROVED GROSS FLOOR AREA (GFA) FOR THE SUBJECT PARCEL. THE COMBINED TOTAL GFA WILL REMAIN AT 487,804 SQUARE FEET.

   AS REPRESENTED ON SHEETS 3 AND 4, THERE ARE THREE (3) OPTIONAL DEVELOPMENT PROGRAMS PROPOSED FOR THE NORTHERN LANDBAY OF THE SUBJECT PROPERTY, AND THERE ARE TWO (2) OPTIONAL DEVELOPMENT PROGRAMS PROPOSED FOR THE SOUTHERN LANDBAY. EACH OPTIONAL DEVELOPMENT PROGRAM WILL BE LIMITED TO THE TOTAL 487,804 SQUARE FEET OF GROSS FLOOR AREA. IT IS TO BE UNDERSTOOD THAT THE OPTION 4 DEVELOPMENT PROGRAM COULD BE DEVELOPED WITH EITHER OF THE OPTION 1, 2, OR 3 DEVELOPMENT PROGRAMS FOR THE NORTHERN LANDBAY.

   LASTLY THE APPLICANT RESERVES THE RIGHT TO RELOCATE ABOVE GRADE PARKING SHOWN ON THE GDPA TO A SUBSURFACE LOCATION PROVIDED THAT THE BUILDING HEIGHTS AND FOOTPRINTS OF BUILDING F, G, H, I AND J REMAIN IN SUBSTANTIAL CONFORMANCE WITH THOSE REPRESENTED ON THE GDPA.
3. THE GDPA GRAPHIC FOR THE REMAINDER OF THE WILLOW OAKS CORPORATE CENTER LAND AREA THAT WAS ORIGINALLY APPROVED WITH RZ 87-P-038 IS A REPRESENTATION OF THE CURRENTLY APPROVED DEVELOPMENT PLANS FOR THE REMAINDER OF THE WILLOW OAKS CORPORATE CENTER SITE. THERE IS NO CHANGE PROPOSED FOR THE REMAINDER OF THE SITE.
4. AS NOTED ABOVE, THE PRINCIPAL USE OF BUILDINGS F, H, I AND J AS REPRESENTED ON THE GRAPHIC WILL BE OFFICE/MEDICAL OFFICE/EDUCATIONAL/CANCER CENTER, AND THE PRINCIPAL USE OF BUILDING G MAY BE EITHER ONE OR A COMBINATION OF THESE USES OR PUBLIC USE. IT IS TO BE UNDERSTOOD THAT ACCESSORY SERVICE USES AS PRESCRIBED BY THE PROVISIONS SET FORTH IN PART 2 OF ARTICLE 10 OF THE ZONING ORDINANCE MAY ALSO BE ESTABLISHED IN THE PROPOSED BUILDINGS, AND THAT SPECIAL EXCEPTION AND SPECIAL PERMIT USES ALLOWED IN THE C-3 DISTRICT MAY ALSO BE ESTABLISHED SUBJECT TO APPROPRIATE APPROVALS WITHOUT THE NECESSITY OF FILING FOR A RELATED PROFFERED CONDITION AMENDMENT.
5. THE BOUNDARY INFORMATION SHOWN ON THE GRAPHIC FOR THE LIMITED AREA OF THE GDPA IS FROM A SURVEY PREPARED BY DEWBERRY AND DAVIS.
6. THE TOPOGRAPHIC INFORMATION SHOWN ON THE GRAPHIC FOR THE LIMITED AREA OF THE GDPA IS AT A CONTOUR INTERVAL OF TWO (2) FEET FROM BOTH AERIAL AND FIELD SURVEY.
7. TO THE BEST OF OUR KNOWLEDGE, WITHIN THE AREA OF THE PARTIAL GDPA, THERE ARE NO EXISTING UTILITY EASEMENTS HAVING A WIDTH OF TWENTY-FIVE (25) FEET OR MORE OR NO MAJOR UNDERGROUND UTILITY EASEMENTS REGARDLESS OF WIDTH.

   IT IS TO BE NOTED THERE IS A TEMPORARY CONSERVATION EASEMENT THAT HAS BEEN RECORDED ON THE SUBJECT PROPERTY FOR THE PURPOSE OF PROVIDING AN INTERIM BEST MANAGEMENT PRACTICE (BMP) FOR THE ADJACENT LIFE WITH CANCER DEVELOPMENT PROGRAM TO THE WEST. THIS CONSERVATION EASEMENT WILL BE VACATED WITH THE APPROVAL OF THE COUNTY WHEN IT CAN BE DEMONSTRATED THAT THE BMP REQUIREMENT IS OTHERWISE ACCOMMODATED.
8. THE SUBJECT PROPERTY IS SERVED BY PUBLIC WATER AND SEWER.
9. THE MINIMUM YARD REQUIREMENTS SET FORTH IN THE ZONING ORDINANCE FOR THE C-3 DISTRICT ARE AS FOLLOWS (IT IS TO BE NOTED THAT THERE IS NO MINIMUM YARD REQUIREMENT ADJACENT TO THE PROPOSED CONNECTOR TRAVELWAY):

   FRONT YARD: CONTROLLED BY A 25° ANGLE OF BULK PLANE, BUT NOT LESS THAN 40 FEET.

   SIDE YARD:NO REQUIREMENT

   REAR YARD: CONTROLLED BY A 20° ANGLE OF BULK PLANE, BUT NOT LESS THAN 25 FEET.
10. TO THE BEST OF OUR KNOWLEDGE, THERE ARE NO GRAVES LOCATED ON THE SUBJECT PROPERTY.
11. THERE IS NO FLOODPLAIN DESIGNATED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY OR UNITED STATES GEOLOGICAL SURVEY LOCATED ON THE SUBJECT PROPERTY. FAIRFAX COUNTY DOES DESIGNATE A MINOR FLOODPLAIN AND RESOURCE PROTECTION AREA (RPA) ON THE SUBJECT PROPERTY IN THE LOCATION OF THE PROPOSED SWM/BMP POND (SEE NOTE 17). A WATER QUALITY IMPACT ASSESSMENT WILL BE FILED AT SITE PLAN TO ADDRESS PROPOSED IMPROVEMENTS IN THE RPA. IN ADDITION, A FLOODPLAIN STUDY WILL BE FILED AT SITE PLAN TO ADDRESS THE PROPOSED IMPROVEMENTS IN THE MINOR FLOODPLAIN.

    IT IS TO BE NOTED THAT THE RPA REPRESENTED ON THE GRAPHIC IS THE FIELD VERIFIED RPA. IT IS BASED ON AN RPA DELINEATION STUDY BEING PREPARED AND PROCESSED UNDER SEPARATE COVER.
12. OTHER THAN THE EXISTING VEGETATION, THERE ARE NO SCENIC ASSETS OR NATURAL FEATURES DESERVING OF PROTECTION OR PRESERVATION ON THE SUBJECT PROPERTY.
13. THERE ARE NO EXISTING BUILDINGS LOCATED IN THE AREA OF THE PARTIAL GDPA (SUBJECT PROPERTY). THERE ARE FIVE (5) EXISTING BUILDINGS IN THE REMAINING AREA OF THE WILLOW OAKS CORPORATE CENTER THAT IS OUTSIDE THE LIMITS OF THE PARTIAL GDPA. THEY ARE BUILDINGS A, B, C, D AND E. THEY WERE CONSTRUCTED IN 2001, 1986, 1988, 1998 AND 1995, RESPECTIVELY. THEY WILL BE RETAINED.
14. A STATEMENT CONFIRMING THE OWNERSHIP OF THE SUBJECT PROPERTY AND THE APPLICANT'S INTEREST IN SAME IS PROVIDED IN A SEPARATE DOCUMENT.
15. THE SUBJECT PROPERTY IS LOCATED IN SUB-UNIT L5 OF THE MERRIFIELD SUBURBAN CENTER COMPONENT OF THE FAIRFAX COUNTY COMPREHENSIVE PLAN. THE PROPOSED DEVELOPMENT PROGRAM IS IN ACCORDANCE WITH THE LAND USE RECOMMENDATIONS SET FORTH FOR SUB-UNIT L5. AS SUCH, THERE SHOULD BE NO ADVERSE EFFECTS ON ADJACENT OR NEIGHBORING PROPERTIES FROM THE PROPOSED DEVELOPMENT PROGRAM.
16. TO THE BEST OF OUR KNOWLEDGE, THE PROPOSED USE(S) WILL NOT GENERATE, UTILIZE, STORE, TREAT OR DISPOSE OF HAZARDOUS AND TOXIC SUBSTANCES AS SET FORTH IN TITLE 40, CODE OF FEDERAL REGULATIONS PARTS 116.4, 302.4 AND 355; HAZARDOUS WASTE AS SET FORTH IN VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY HAZARDOUS WASTE MANAGEMENT REGULATIONS; AND/OR PETROLEUM PRODUCTS AS DEFINED IN TITLE 40, CODE OF FEDERAL REGULATIONS PART 280. TO THE BEST OF OUR KNOWLEDGE AND UNDERSTANDING, HOWEVER, ANY SUCH SUBSTANCE THAT MAY BE UTILIZED, STORED AND/OR DISPOSED OF IN CONJUNCTION WITH THE USE(S) AND THE MAINTENANCE OF THE PROPOSED BUILDINGS AND GROUNDS WILL BE IN ACCORDANCE WITH SAID REGULATIONS.
17. STORMWATER MANAGEMENT (SWM) AND BEST MANAGEMENT PRACTICES (BMPS) FOR THE PROPOSED DEVELOPMENT PROGRAM WILL BE PROVIDED IN THE PROPOSED WILLOW OAKS SWM/BMP POND LOCATED IN PART ON THE SOUTHERN EDGE OF THE SUBJECT PROPERTY. THE PROPOSED WILLOW OAKS SWM/BMP POND WILL BE THE SUBJECT OF A MAJOR ENLARGEMENT/ENHANCEMENT PROJECT THAT IS PLANNED IN CONCERT WITH THE PROPOSED DEVELOPMENT PROGRAM. A MORE DETAILED STATEMENT AND ANALYSIS OF THE SWM/BMP PLAN IS PRESENTED ON SHEETS 10 THROUGH 18.

    THE APPLICANT WILL INSTALL FAIRFAX COUNTY ACCEPTED 'LOW IMPACT DEVELOPMENT (LID) FACILITIES ON THE APPLICATION PROPERTY IN AT LEAST ONE OF THE POSSIBLE LOCATIONS AS REPRESENTED ON THE GRAPHIC. THE LID FACILITIES (PERVIOUS PAVEMENT OR OTHER) WILL TREAT A TOTAL OF 20,000 SQUARE FEET OF IMPERVIOUS SURFACE AND WILL HAVE A MINIMUM PHOSPHORUS REMOVAL EFFICIENCY OF 40 PERCENT. THE LID FACILITIES WILL BE DESIGNED IN ACCORDANCE WITH THE PFM. THESE LID FACILITIES ARE INTENDED AS DEMONSTRATION FACILITIES AND WILL NOT FACTOR INTO THE REQUISITE CALCULATIONS FOR STORMWATER MANAGEMENT AND BMPS.
18. PARKING AND LOADING SPACES WILL BE PROVIDED ON SITE IN ACCORDANCE WITH THE APPLICABLE PROVISIONS IN THE ZONING ORDINANCE.

    IT IS TO BE UNDERSTOOD THAT THE TOTAL NUMBER OF PARKING SPACES PROVIDED MAY BE ADJUSTED IN ACCORDANCE WITH THE FINAL DEVELOPMENT PROGRAM AS LONG AS THE MINIMUM NUMBER OF PARKING SPACES PROVIDED IS IN ACCORDANCE WITH THE PROVISIONS SET FORTH IN ARTICLE 11 OF THE ZONING ORDINANCE AND THE OPEN SPACE PROVIDED AS SET FORTH IN THE TABULATION AND THE MINIMUM DIMENSIONS TO THE PERIPHERAL LOT LINES ARE NOT DIMINISHED.

    IT IS TO BE FURTHER UNDERSTOOD THAT, IN ACCORDANCE WITH THE PROVISION SET FORTH IN PAR 1 OF SECT. 11-102 OF THE ZONING ORDINANCE, EIGHT (8) PARKING SPACES WILL BE PROVIDED ON THE SUBJECT PROPERTY TO SERVE THE EXISTING OFFICE BUILDING LOCATED ON PARCEL 49-3 001 128.

    GIVEN THAT THE PROPOSED NUMBER OF PARKING SPACES ON THE SITE EXCEEDS THE NUMBER OF SPACES REQUIRED BY THE PROVISIONS OF THE ZONING ORDINANCE, THE APPLICANT RESERVES THE RIGHT TO REDUCE THE NUMBER OF PARKING SPACES ON THE SITE WITHOUT A PCA OR ADMINISTRATIVE INTERPRETATION TO ALLOW FOR MINOR ENGINEERING ISSUES SUCH AS, BUT NOT LIMITED TO, RESTRIPING PARKING LOTS, STORAGE, CONSTRUCTION EQUIPMENT/TRAILERS, INTERIM STORMWATER MANAGEMENT PONDS, ETC. IN NO EVENT, HOWEVER, WILL THE TOTAL NUMBER OF PARKING SPACES ON THE ENTIRE SITE BE REDUCED BELOW THAT REQUIRED BY THE PROVISIONS OF THE ZONING ORDINANCE. FURTHERMORE, IT IS TO BE UNDERSTOOD THAT THE NUMBER OF PARKING SPACES MAY BE REDUCED IN NUMBER TO ACCOMMODATE FUTURE EXPANSIONS/ADDITIONS TO THE BUILDINGS, AS MAY BE APPROVED WITH FUTURE PCA APPLICATIONS, AS LONG AS IT CAN BE DEMONSTRATED THAT ADEQUATE PARKING IS PROVIDED.

    EXPERIENCE HAS INDICATED THAT THE LOADING SPACE REQUIREMENT SET FORTH IN ARTICLE 11 OF THE ZONING ORDINANCE IS EXCESSIVE FOR OFFICE USES. GIVEN THIS EXPERIENCE FACTOR, A REQUEST IS HEREBY MADE TO MODIFY THE REQUIREMENTS TO PROVIDE A MAXIMUM OF THREE (3) LOADING SPACES FOR EACH BUILDING ON EACH OF THE OPTIONAL DEVELOPMENT PROGRAMS.
19. IT IS TO BE UNDERSTOOD THAT THE PROPOSED PARKING GARAGE AND BUILDING SITES REPRESENTED ON THE GRAPHIC MAY BE USED AS INTERIM SURFACE PARKING LOTS TO SERVE THE PROPOSED USES ON THE SITE AND FOR CONSTRUCTION ON THE ADJACENT INOVA FAIRFAX HOSPITAL CAMPUS SITE.
20. LANDSCAPING AND SCREENING WILL BE PROVIDED IN ACCORDANCE WITH THAT REPRESENTED ON THE GRAPHIC; IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF ARTICLE 13 OF THE ZONING ORDINANCE; IN ACCORDANCE WITH CHAPTER 122, TREE CONSERVATION ORDINANCE; AND IN ACCORDANCE WITH THE STREETSCAPE GUIDELINES THAT ARE SET FORTH IN THE MERRIFIELD SUBURBAN CENTER COMPONENT OF THE COMPREHENSIVE PLAN. THE INTERIOR PARKING LOT LANDSCAPING, PERIPHERAL PARKING LOT LANDSCAPING, TRANSITIONAL SCREENING AND TREE CANOPY CALCULATIONS THAT ARE PRESCRIBED BY THE PROVISIONS OF CHAPTER 122 AND ARTICLE 13 OF THE ZONING ORDINANCE WILL BE PROVIDED WITH THE SUBMISSION OF THE SITE PLAN(S) FOR THE SUBJECT DEVELOPMENT PROGRAM.

    THE LANDSCAPING REPRESENTED ON THE GRAPHIC IS ILLUSTRATIVE ONLY AND REPRESENTS THE LEVEL OF QUANTITY AND QUALITY OF LANDSCAPING THAT IS PROPOSED. THE ACTUAL LOCATION, LAYOUT, TYPE AND AMOUNT OF LANDSCAPE MATERIAL WILL BE DETERMINED PURSUANT TO MORE DETAILED LANDSCAPE PLANS TO BE PREPARED AND SUBMITTED IN CONJUNCTION WITH THE SITE PLAN(S). AS IDENTIFIED ON SHEETS 2, 3, AND 4, THERE IS A SECTION ALONG THE NORTH SIDE OF THE PROPOSED WILLOW OAKS CORPORATE DRIVE WHERE THE PROPOSED STREETSCAPE MAY BE SUBJECT TO ADJUSTMENT IN ORDER TO SATISFY ADEQUATE SIGHT DISTANCE STANDARDS. ANY NEEDED ADJUSTMENT WILL BE ADDRESSED AT TIME OF SITE PLAN WHEN MORE DETAILED INFORMATION IS AVAILABLE.

    IN ACCORDANCE WITH THE PRIOR APPROVALS, IN THAT AREA OF WILLOW OAKS CORPORATE CENTER THAT IS OUTSIDE OF THE SUBJECT PARTIAL GDPA, A WAIVER OF THE TRANSITIONAL SCREENING YARD AND BARRIER THAT IS REQUIRED ALONG THAT SECTION OF THE SOUTHERN PROPERTY LINE EAST OF BUILDING D WHERE WILLOW OAKS CORPORATE DRIVE IS ADJACENT AND PARALLEL TO THE SOUTHERN PROPERTY BOUNDARY IS REAFFIRMED.

    TO THE WEST OF BUILDING G, WITHIN THE AREA OF THE PARTIAL GDPA, THERE IS A TRANSITIONAL SCREENING YARD 2 AND BARRIER REQUIRED ALONG THE SOUTHERN PROPERTY LINE. GIVEN THE EXISTING AND PROPOSED UTILITY EASEMENTS IN THE VICINITY OF THIS PROPERTY LINE, REQUEST IS HEREBY MADE FOR A MODIFICATION OF THE TRANSITIONAL SCREENING YARD 2 PLANTING SCHEDULE TO ALLOW THE REQUISITE NUMBER OF PLANT MATERIAL TO BE LOCATED OUTSIDE OF THE EXISTING/PROPOSED UTILITY EASEMENT(S).

    THERE ARE NO TRANSITIONAL SCREENING OR BARRIER REQUIREMENTS FOR THE WESTERN, NORTHERN OR EASTERN BOUNDARIES OF THE SUBJECT PROPERTY.

    PRELIMINARY CALCULATIONS SUGGEST THAT IT MAY NOT BE POSSIBLE TO SATISFY THE PRESCRIBED TREE PRESERVATION TARGET COMPONENT OF THE TREE CANOPY REQUIREMENT SET FORTH IN CHAPTER 122 OF THE CODE WITH THE PROPOSED DEVELOPMENT PROGRAM. A DEVIATION FROM THE TREE PRESERVATION TARGET MAY BE REQUESTED FROM THE DIRECTOR OF DPW&ES AT TIME OF SITE PLAN IN ACCORDANCE WITH THE PROVISION SET FORTH IN SECT. 122-2-3 OF CHAPTER 122.
21. A WAIVER OF THE SERVICE DRIVE ALONG THE FRONTAGE OF ROUTE 50 IS HEREBY REQUESTED PURSUANT TO THE PREVIOUS APPROVAL OF SUCH WAIVER.
22. THE FAIRFAX COUNTY COUNTYWIDE TRAILS PLAN RECOMMENDS A MINOR PAVED TRAIL ON THE SOUTH SIDE OF ARLINGTON BOULEVARD, ROUTE 50. SUCH A TRAIL WOULD TRAVERSE THE NORTHERN EDGE OF THE SUBJECT PROPERTY. IT IS THE ONLY TRAIL RECOMMENDED WITHIN THE IMMEDIATE VICINITY OF THE SUBJECT PROPERTY.
23. IN ACCORDANCE WITH PRIOR APPROVALS, THE FLOOR AREA RATIO FOR THE TOTAL WILLOW OAKS CORPORATE PARK IS BASED ON THE ORIGINAL LAND AREA OF 38.213± ACRES. THE FLOOR AREA RATIO RELATED TO ALL FUTURE DEDICATIONS IS RESERVED FOR DEVELOPMENT OF THE SUBJECT PROPERTY IN ACCORDANCE WITH THE PROVISIONS SET FORTH IN PAR. 4 OF SECT. 2-308 OF THE ZONING ORDINANCE.
24. THE FLOOR AREAS REPRESENTED IN THE TABULATION ARE GROSS FLOOR AREAS AS DEFINED IN THE FAIRFAX COUNTY ZONING ORDINANCE. IT IS UNDERSTOOD THAT THE BUILDINGS MAY HAVE CELLAR SPACES WHICH SPACES WILL BE CALCULATED FOR OFF-STREET PARKING REQUIREMENTS IN ACCORDANCE WITH THE PROVISIONS SET FORTH IN PAR. 25 OF SECT. 11-102 OF THE ZONING ORDINANCE.
25. THE PROPOSED DEVELOPMENT PROGRAM WILL OCCUR IN PHASES WITH NO CURRENTLY ESTABLISHED BEGINNING OR ENDING DATES. AS NOTED ABOVE, IT IS TO BE UNDERSTOOD THAT DURING THE PHASED CONSTRUCTION, PROPOSED PARKING GARAGE AND BUILDING SITES MAY BE USED FOR INTERIM SURFACE PARKING AREAS FOR THE ADJACENT USES/BUILDINGS ON SITE AND FOR CONSTRUCTION ON THE ADJACENT INOVA FAIRFAX HOSPITAL CAMPUS SITE.
26. THE FOOTPRINTS OF THE BUILDING SHOWN ON THE GRAPHIC MAY BE INCREASED UP TO FIVE (5) PERCENT AS LONG AS THE OPEN SPACE PRESENTED IN THE TABULATION AND THE MINIMUM DISTANCES TO THE PERIPHERAL LOT LINES AS PRESENTED ON THE GRAPHIC ARE NOT DIMINISHED AND AS LONG AS THE RESULTANT PROPOSED DEVELOPMENT IS IN SUBSTANTIAL CONFORMANCE WITH THAT REPRESENTED ON THE GRAPHIC. THE SIZES AND SHAPES AND LOCATIONS OF THE PROPOSED BUILDINGS, STRUCTURES AND IMPROVEMENTS ARE PRELIMINARY AND SUBJECT TO MINOR MODIFICATION WITH FINAL ENGINEERING AND ARCHITECTURAL DESIGN IN ACCORDANCE WITH THE PROVISION SET FORTH IN SECT. 18-204 OF THE ZONING ORDINANCE.

    THE TOTAL GROSS FLOOR AREA AND MAXIMUM BUILDING HEIGHTS PRESENTED IN THE TABULATION ARE TO BE CONSIDERED MAXIMUM AND THE DIMENSIONS TO THE PERIPHERAL LOT LINES PRESENTED ON THE GRAPHIC ARE TO BE DEEMED MINIMUMS WITH THE UNDERSTANDING THAT ALL DIMENSIONS SHOWN ON THE GRAPHIC AND IN THE TABULATION ARE SUBJECT TO MINOR MODIFICATION IN ACCORDANCE WITH THE PROVISION SET FORTH IN SECT. 18-204 OF THE ZONING ORDINANCE. THE FLOOR AREAS OF THE INDIVIDUAL BUILDINGS AS PRESENTED IN THE TABULATION MAY VARY WITH FINAL ARCHITECTURAL DESIGN; HOWEVER, THE TOTAL COMBINED GROSS FLOOR AREA AS PRESENTED IN THE TABULATION WILL NOT BE EXCEEDED. GROSS FLOOR AREAS AND MAXIMUM BUILDING HEIGHTS WILL BE CALCULATED IN ACCORDANCE WITH THE APPLICABLE PROVISIONS IN THE ZONING ORDINANCE.

    LASTLY, THE APPLICANT RESERVES THE RIGHT TO SHIFT GROSS FLOOR AREA THAT IS REPRESENTED ON THE TABULATION FROM ONE BUILDING TO ANOTHER WITH THE UNDERSTANDING THAT THE RESULTANT BUILDING FOOTPRINTS WILL BE IN SUBSTANTIAL CONFORMANCE WITH THE FOOTPRINTS REPRESENTED ON THE GRAPHIC AND THE MAXIMUM TOTAL GROSS FLOOR AREA REPRESENTED IN THE TABULATION WILL NOT BE EXCEEDED.
27. IS TO BE UNDERSTOOD THAT ADDITIONAL SITE FEATURES SUCH AS GAZEBOS, TRELLISES, SIGNS, FLAGPOLES, SIDEWALKS/TRAILS, LIGHT STANDARDS, PASSIVE AND ACTIVE RECREATIONS FACILITIES, WALLS, FENCES, AND /OR UTILITY AND MAINTENANCE STRUCTURES NOT REPRESENTED ON THE GRAPHIC MAY BE PROVIDED AS LONG AS THE RESULTANT PROPOSED DEVELOPMENT IS IN SUBSTANTIAL CONFORMANCE WITH THAT REPRESENTED ON THE GRAPHIC.

    ALL SIGNS WILL BE PROVIDED IN ACCORDANCE WITH THE PROVISIONS SET FORTH IN ARTICLE 12 OF THE ZONING ORDINANCE AND IN ACCORDANCE WITH PRIOR APPROVALS. IT IS ALSO UNDERSTOOD THAT MOBILE AND LAND BASED TELECOMMUNICATION FACILITIES MAY BE PROVIDED ON SITE IN ACCORDANCE WITH THE PROVISIONS SET FORTH IN SECT. 2-514 OF THE ZONING ORDINANCE.
28. TO THE BEST OF OUR KNOWLEDGE, EXCEPT AS QUALIFIED ABOVE, THE PROPOSED DEVELOPMENT OF THE SUBJECT PROPERTY CONFORMS TO ALL CURRENT APPLICABLE LAND DEVELOPMENT ORDINANCES, REGULATIONS AND ADOPTED STANDARDS.

TABULATION FOR AREA OF PARTIAL GDPA OPTION 1

EXISTING/PROPOSED ZONING C-3
LAND AREA OF PARTIAL GDPA ..... 16.14 AC

PROPOSED USE ..... OFFICE/EDUCATIONAL/PUBLIC

PROPOSED GROSS FLOOR AREA (GFA) ..... 487,804+SF

- BUILDING F ..... 69,804± SF
- BUILDING G ..... 160,000± SF
- BUILDING H, I, J ..... 258,000± SF

PROPOSED FLOOR AREA RATIO (FAR) 0.69

MAXIMUM HEIGHT OF BUILDINGS

- BUILDING F ..... 4 STORIES ..... 60 FT
- BUILDING G ..... 4 STORIES ..... 60 FT
- BUILDING H, I, J ..... 6 STORIES ..... 90 FT

PARKING SPACES REQUIRED 1297*

- BUILDING F ..... @ 3.0 SPACES / 1000 SF GFA = 210
- BUILDING G ..... @ 2.6 SPACES / 1000 SF GFA = 416
- BUILDING H, I, J ..... @ 2.6 SPACES / 1000 SF GFA = 671

PARKING SPACES PROPOSED 2430

- PARKING GARAGE A 1,280
  6 LEVELS
- PARKING GARAGE B 1150
  6 LEVELS

OPEN SPACE REQUIRED ..... 2.20 AC
(15% OF NET LAND AREA)

OPEN SPACE PROPOSED ..... 6.42 AC
(43% OF NET LAND AREA)

* PLUS SPACES FOR USES IN CELLAR. SEE NOTE 24.

Application No PCA-87-P-038-04 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 7/6/2009
Date of (BOS) (PC) Approval 7/13/2009
Sheet 3 of 20

Dewberry

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INOVA
WILLOW OAKS
PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT
PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLETON
Lic. No. 20112
6.10.09
PROFESSIONAL ENGINEER

KEY PLAN

SCALE
0' 50' 100'

No.	DATE	BY	Description
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7	04.20.09	ARW	
6	03.26.09	ARW	
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4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE

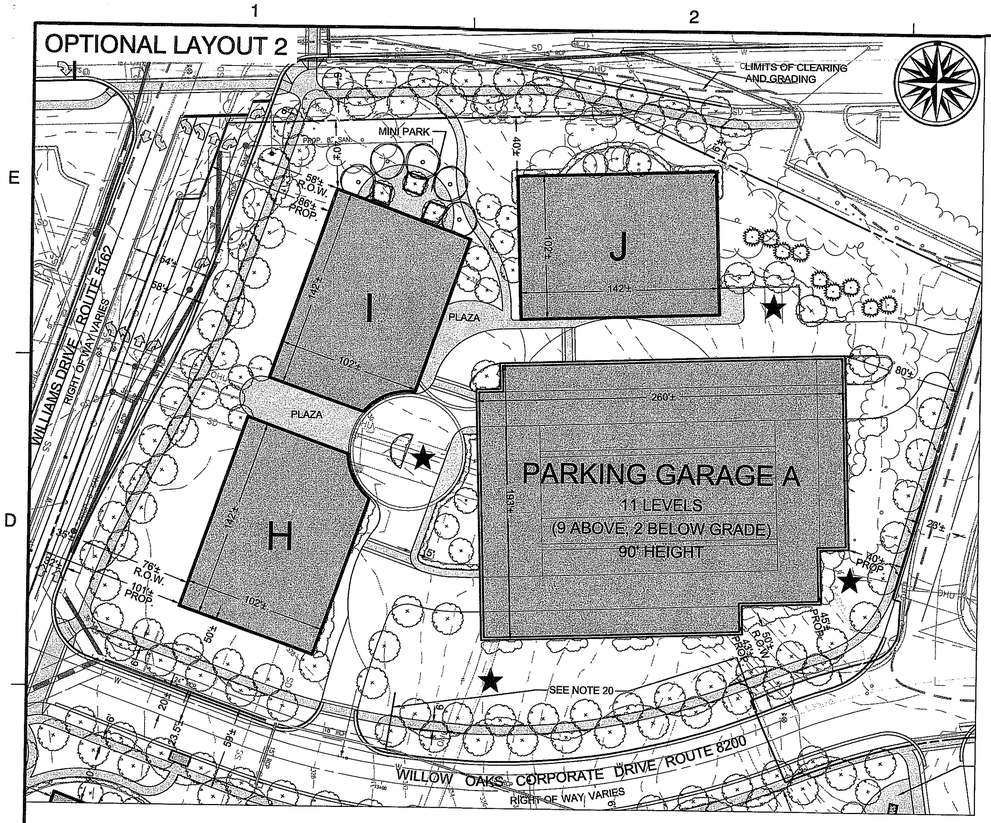
Inova
Willow Oaks
Partial Generalized Development Plan Amendment

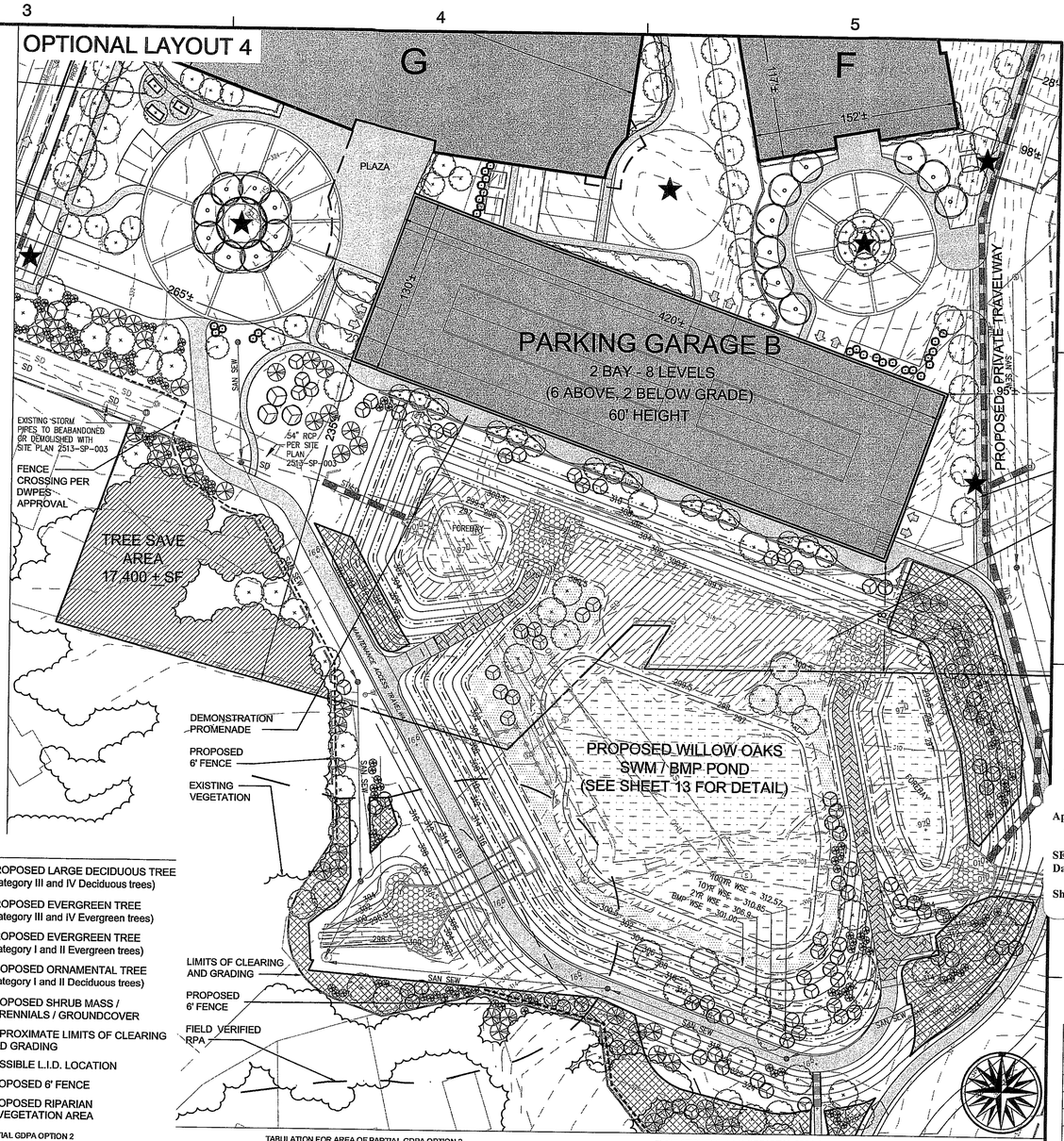
PROJECT NO.

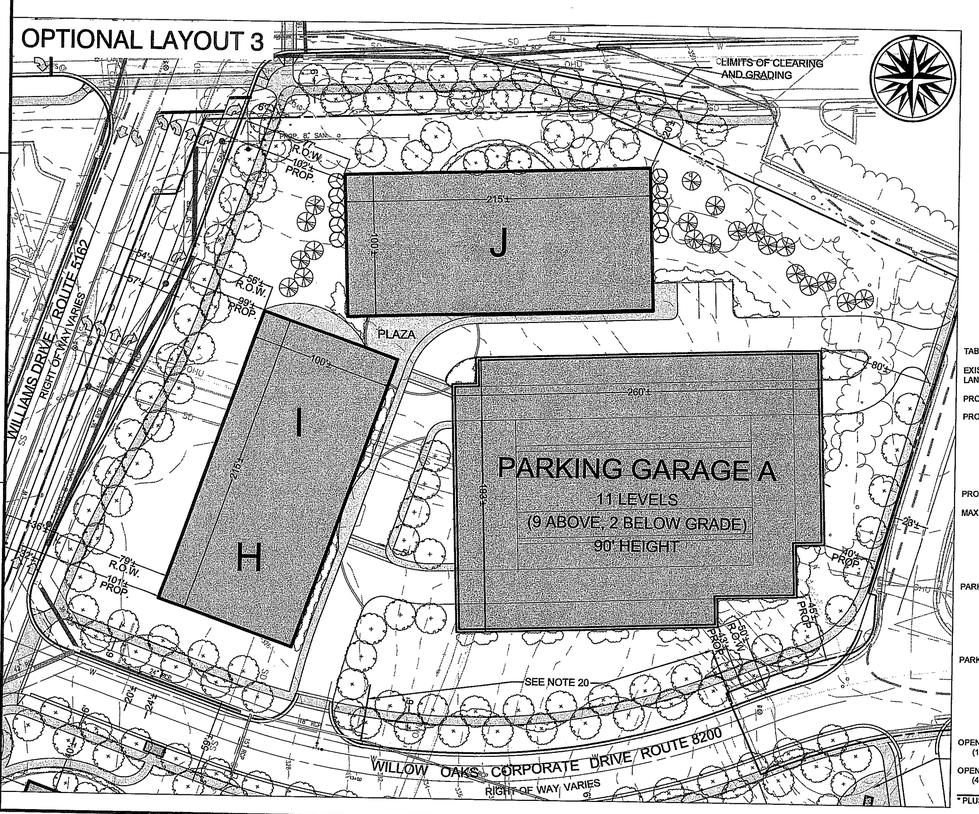
3

SHEET NO. 3 OF 20

M-10690







Legend

- PROPOSED LARGE DECIDUOUS TREE (Category III and IV Deciduous trees)
- PROPOSED EVERGREEN TREE (Category III and IV Evergreen trees)
- PROPOSED EVERGREEN TREE (Category I and II Evergreen trees)
- PROPOSED ORNAMENTAL TREE (Category I and II Deciduous trees)
- PROPOSED SHRUB MASS / PERENNIALS / GROUNDCOVER
- APPROXIMATE LIMITS OF CLEARING AND GRADING
- POSSIBLE L.I.D. LOCATION
- PROPOSED 6' FENCE
- PROPOSED RIPARIAN REVEGETATION AREA

TABULATION FOR AREA OF PARTIAL GDPA OPTION 2

EXISTING/PROPOSED ZONING C-3
LAND AREA OF PARTIAL GDPA ..... 16.14 AC

PROPOSED USE ..... OFFICE/EDUCATIONAL/PUBLIC

PROPOSED GROSS FLOOR AREA (GFA) ..... 487,804+SF

- BUILDING F ..... 69,804± SF
- BUILDING G ..... 160,000± SF
- BUILDING H ..... 86,000± SF
- BUILDING I ..... 86,000 ± SF
- BUILDING J ..... 86,000 ± SF

PROPOSED FLOOR AREA RATIO (FAR) 0.69

MAXIMUM HEIGHT OF BUILDINGS

- BUILDING F ..... 4 STORIES ..... 60 FT
- BUILDING G ..... 4 STORIES ..... 60 FT
- BUILDING H ..... 7 STORIES ..... 90 FT
- BUILDING I ..... 7 STORIES ..... 90 FT
- BUILDING J ..... 7 STORIES ..... 90 FT

PARKING SPACES REQUIRED 1400*

- BUILDING F ..... @ 3.0 SPACES / 1000 SF GFA = 210
- BUILDING G ..... @ 2.6 SPACES / 1000 SF GFA = 416
- BUILDING H ..... @ 3.0 SPACES / 1000 SF GFA = 258
- BUILDING I ..... @ 3.0 SPACES / 1000 SF GFA = 258
- BUILDING J ..... @ 3.0 SPACES / 1000 SF GFA = 258

PARKING SPACES PROPOSED 2650

- PARKING GARAGE A 1500
  9 LEVELS ABOVE GRADE
  2 LEVELS BELOW GRADE = TOTAL 11 LEVELS
- PARKING GARAGE B 1150
  6 LEVELS

OPEN SPACE REQUIRED ..... 2.20 AC
(15% OF NET LAND AREA)

OPEN SPACE PROPOSED ..... 6.77 AC
(46% OF NET LAND AREA)

* PLUS SPACES FOR USES IN CELLAR. SEE NOTE 24.

TABULATION FOR AREA OF PARTIAL GDPA OPTION 3

EXISTING/PROPOSED ZONING C-3
LAND AREA OF PARTIAL GDPA ..... 16.14 AC

PROPOSED USE ..... OFFICE/EDUCATIONAL/PUBLIC

PROPOSED GROSS FLOOR AREA (GFA) ..... 487,804+SF

- BUILDING F ..... 69,804± SF
- BUILDING G ..... 160,000± SF
- BUILDING H & I ..... 129,000± SF
- BUILDING J ..... 129,000± SF

PROPOSED FLOOR AREA RATIO (FAR) 0.69

MAXIMUM HEIGHT OF BUILDINGS

- BUILDING F ..... 4 STORIES ..... 60 FT
- BUILDING G ..... 4 STORIES ..... 60 FT
- BUILDING H & I ..... 6 STORIES ..... 90 FT
- BUILDING J ..... 6 STORIES ..... 90 FT

PARKING SPACES REQUIRED 1298*

- BUILDING F ..... @ 3.0 SPACES / 1000 SF GFA = 210
- BUILDING G ..... @ 2.6 SPACES / 1000 SF GFA = 416
- BUILDING H & I @ 2.6 SPACES / 1000 SF GFA = 336
- BUILDING J ..... @ 2.6 SPACES / 1000 SF GFA = 336

PARKING SPACES PROPOSED 2650

- PARKING GARAGE A 1500
  9 LEVELS ABOVE GRADE
  2 LEVELS BELOW GRADE = TOTAL 11 LEVELS
- PARKING GARAGE B 1150
  6 LEVELS

OPEN SPACE REQUIRED ..... 2.20 AC
(15% OF NET LAND AREA)

OPEN SPACE PROPOSED ..... 6.78 AC
(46% OF NET LAND AREA)

* PLUS SPACES FOR USES IN CELLAR. SEE NOTE 24.

TABULATION FOR AREA OF PARTIAL GDPA OPTION 4

EXISTING/PROPOSED ZONING C-3
LAND AREA OF PARTIAL GDPA ..... 16.14 AC

PROPOSED USE ..... OFFICE/EDUCATIONAL/PUBLIC

PROPOSED GROSS FLOOR AREA (GFA) ..... 487,804+SF

- BUILDING F ..... 69,804± SF
- BUILDING G ..... 160,000± SF
- BUILDING H ..... 86,000± SF
- BUILDING I ..... 86,000± SF
- BUILDING J ..... 86,000± SF

PROPOSED FLOOR AREA RATIO (FAR) 0.69

MAXIMUM HEIGHT OF BUILDINGS

- BUILDING F ..... 4 STORIES ..... 60 FT
- BUILDING G ..... 4 STORIES ..... 60 FT
- BUILDING H ..... 6 STORIES ..... 90 FT
- BUILDING I ..... 6 STORIES ..... 90 FT
- BUILDING J ..... 6 STORIES ..... 90 FT

PARKING SPACES REQUIRED 1400*

- BUILDING F ..... @ 3.0 SPACES / 1000 SF GFA = 210
- BUILDING G ..... @ 2.6 SPACES / 1000 SF GFA = 416
- BUILDING H ..... @ 3.0 SPACES / 1000 SF GFA = 258
- BUILDING I ..... @ 3.0 SPACES / 1000 SF GFA = 258
- BUILDING J ..... @ 3.0 SPACES / 1000 SF GFA = 258

PARKING SPACES PROPOSED 2650

- PARKING GARAGE A (OPTION 2) 1500
  9 LEVELS ABOVE GRADE,
  2 LEVELS BELOW GRADE = TOTAL 11 LEVELS
- PARKING GARAGE B 1150
  6 LEVELS ABOVE GRADE
  2 LEVELS BELOW GRADE = TOTAL 8 LEVELS

OPEN SPACE REQUIRED ..... 2.20 AC
(15% OF NET LAND AREA)

OPEN SPACE PROPOSED ..... 7.34 AC
(50% OF NET LAND AREA)

* PLUS SPACES FOR USES IN CELLAR. SEE NOTE 24.

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INOVA
WILLOW OAKS

PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT
PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLETON
Lic. No. 20112
6.10.09
PROFESSIONAL ENGINEER

Application No PCA-87-P-038-04 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 7/6/2009
Date of (BOS) (PC) Approval 7/13/2009
Sheet 4 of 20

SCALE
0' 50' 100'

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
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4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE

Inova
Willow Oaks
Partial Generalized Development Plan Amendment
Optional Layouts

PROJECT NO.

4

SHEET NO. 4 OF 20

M-10690

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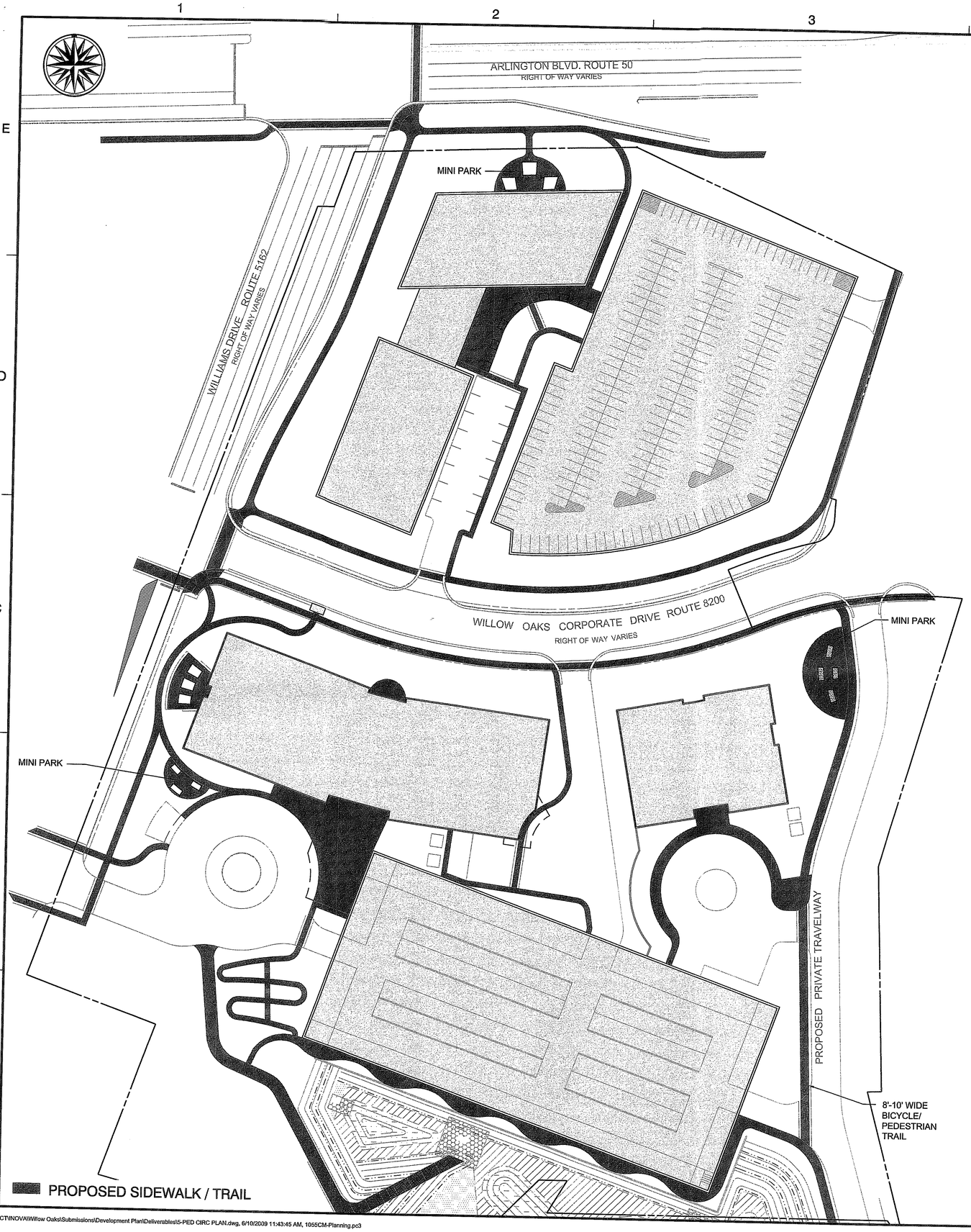
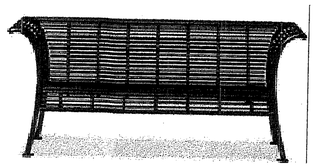
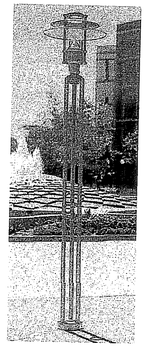


NOTE: The typical site furniture presented on this sheet are shown to illustrate the general theme and character of the proposed development. They are subject to minor modification with final engineering and architectural design.



TYPICAL BENCH



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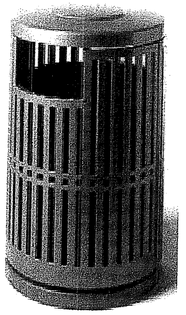

TYPICAL TRASH RECEPTACLE

Application No PCA-87-P-038-04 Staff WOD
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SEE PROFFERS DATED 7/6/2009
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Sheet 5 of 20

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TIMOTHY CHARLES CULLETON
Lic. No. 20112
6.10.09
PROFESSIONAL ENGINEER

KEY PLAN

SCALE
0' 50' 100'

No.	DATE	BY	Description
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3	10.09.08	ARW	
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1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE

Inova
Willow Oaks

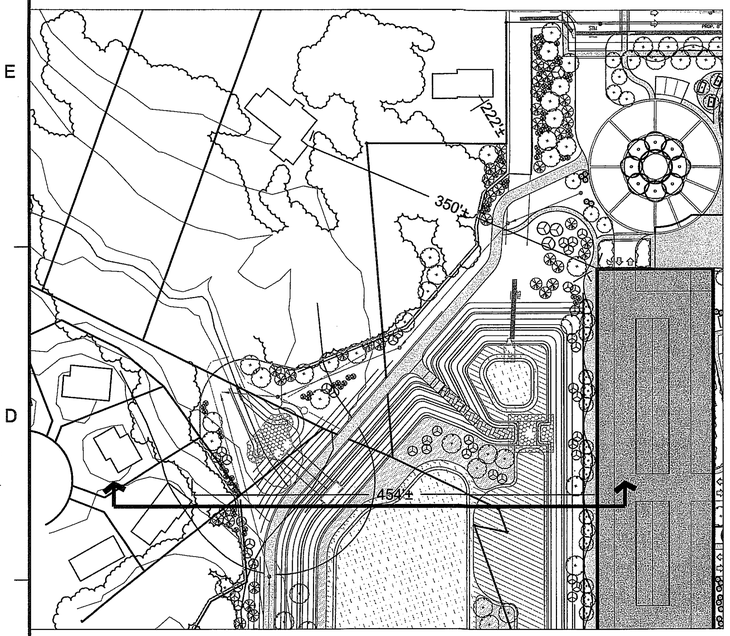
Partial Generalized Development Pedestrian Circulation Plan / Site Furniture Details

PROJECT NO.

5

SHEET NO. 5 OF 20

M-10690



SECTION A-A'

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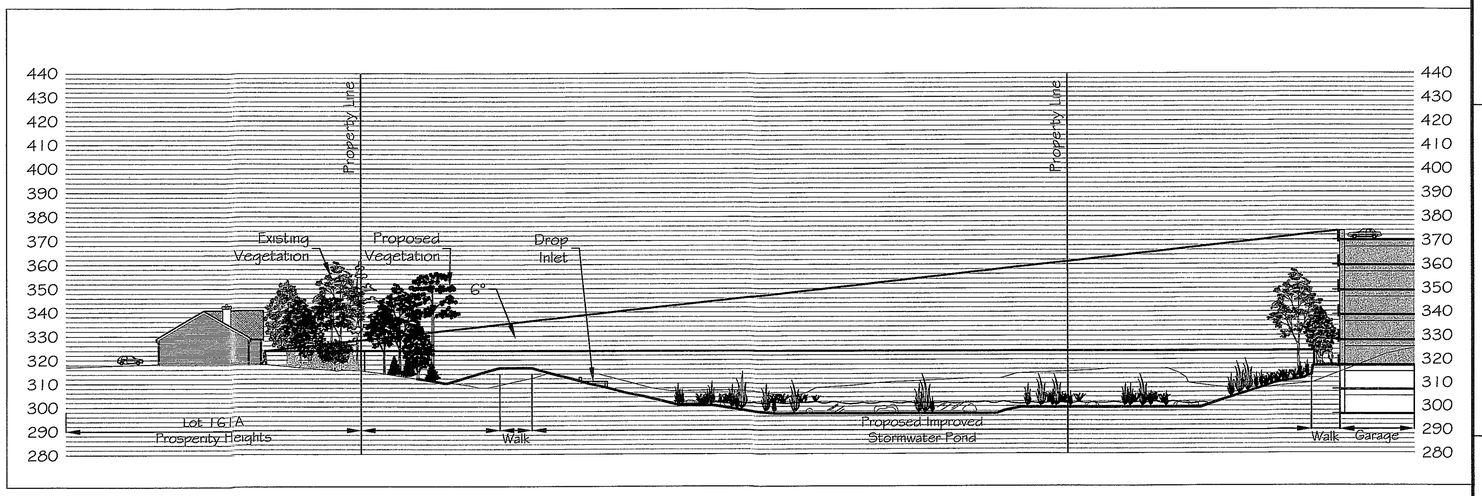
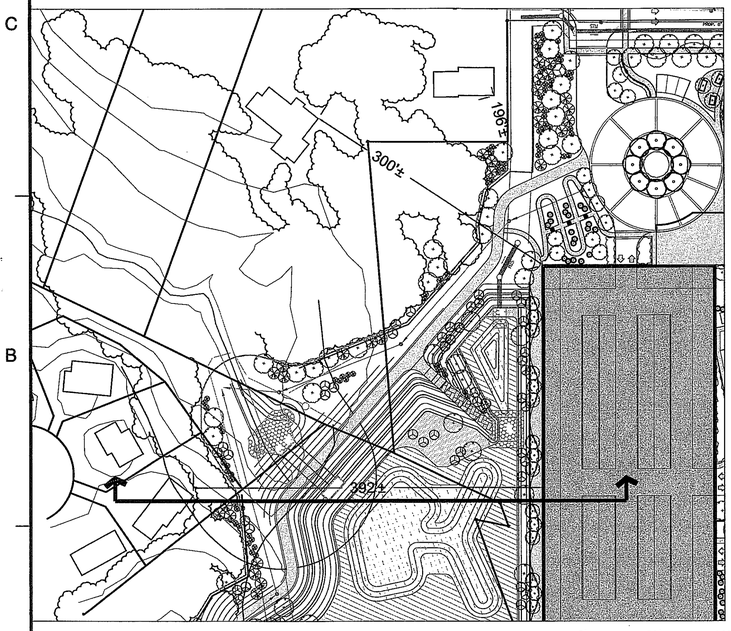


A 2 BAY GARAGE A'



SECTION B-B'

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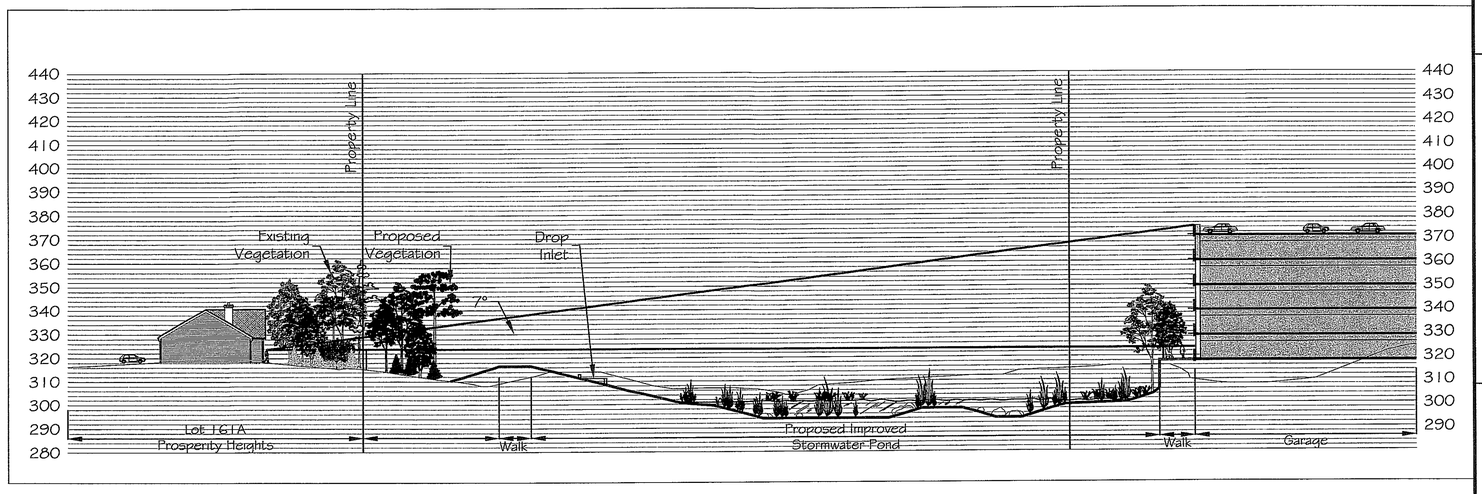

B 3 BAY GARAGE B'

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KEY PLAN

SCALE

0' 30' 60'

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5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE

Inova
Willow Oaks

Partial Generalized Development Plan Amendment
Cross Sections

PROJECT NO.

6

SHEET NO. 6 OF 20

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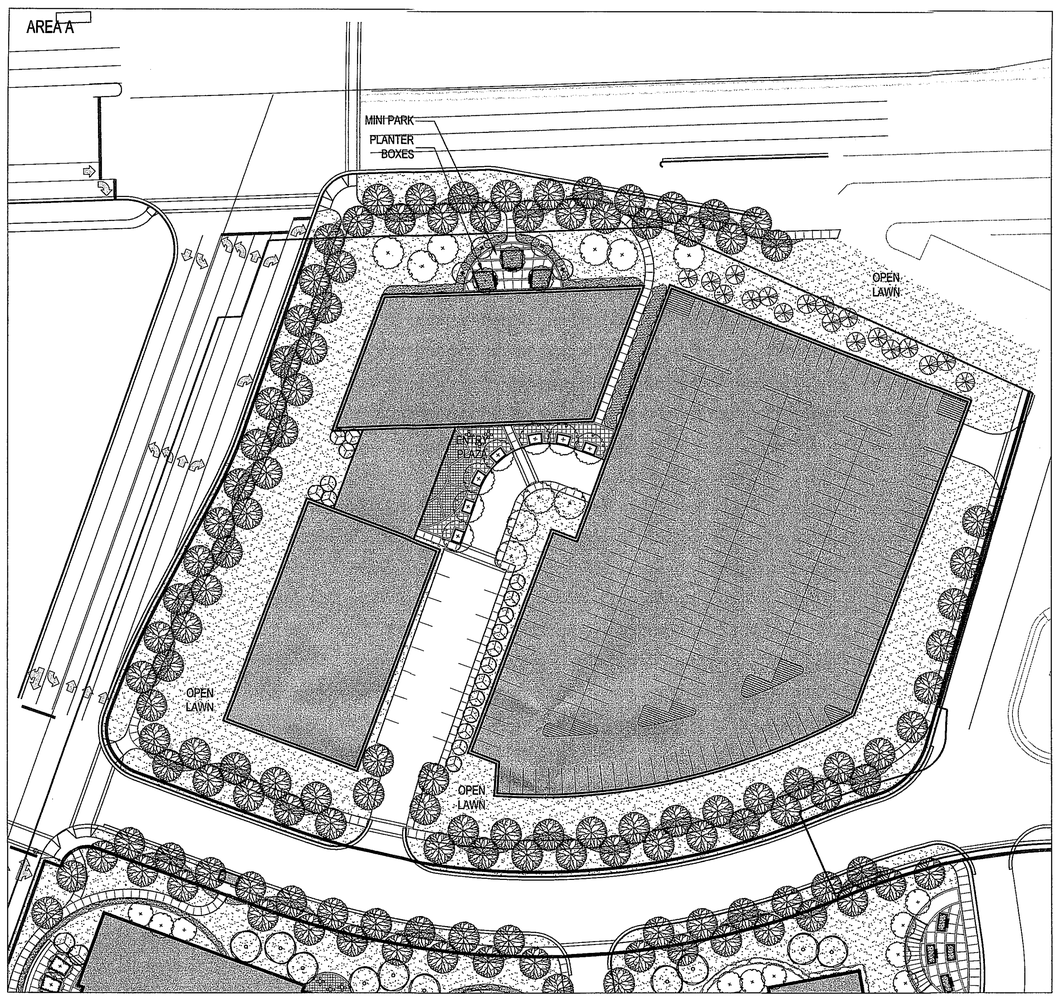
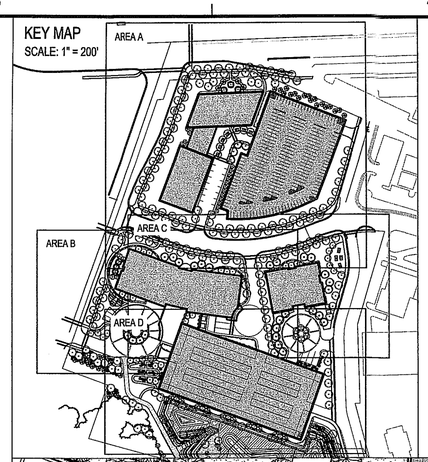
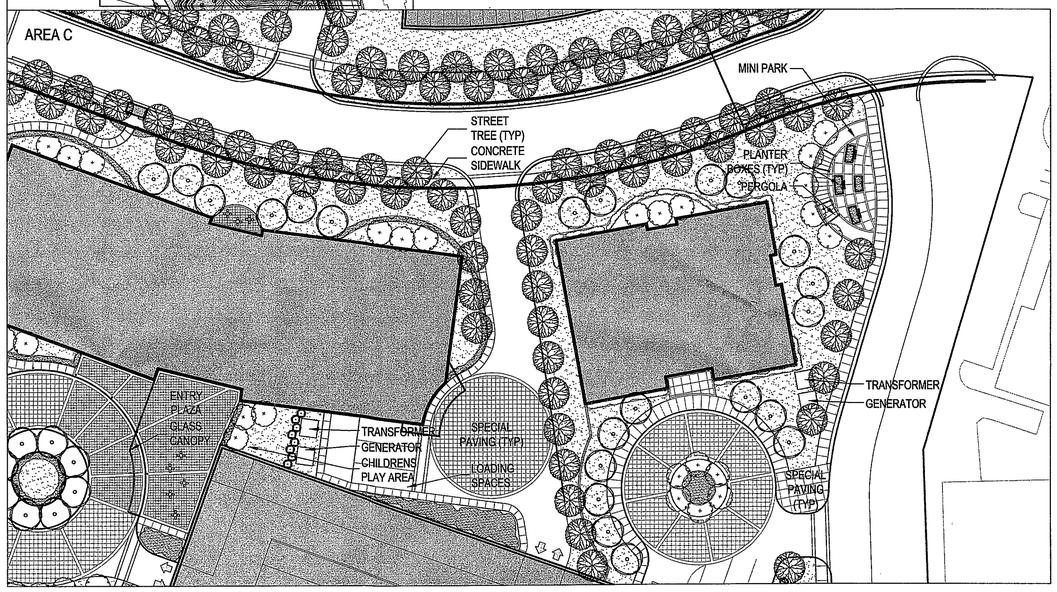


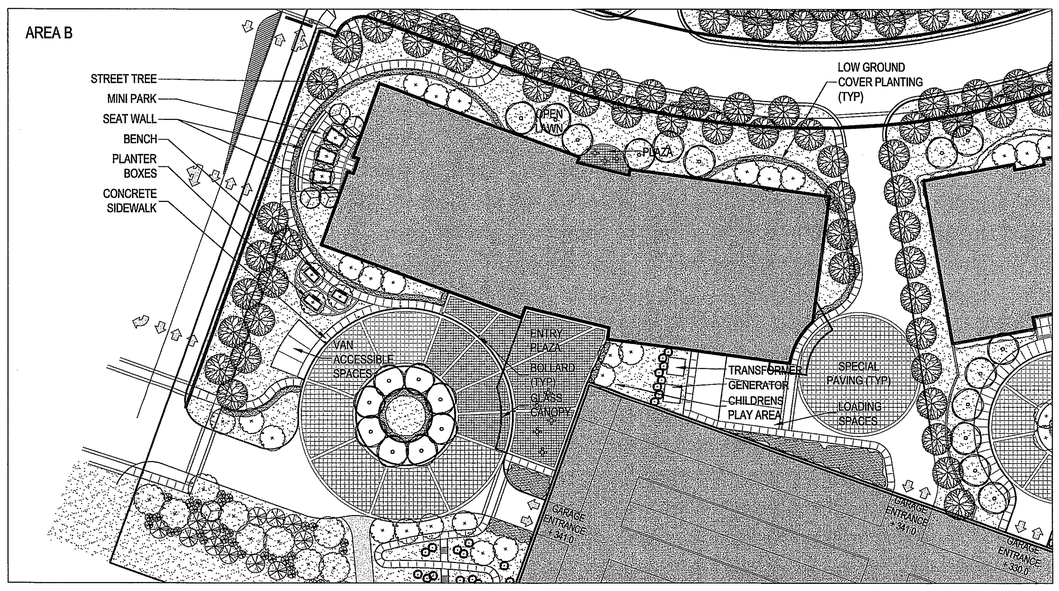


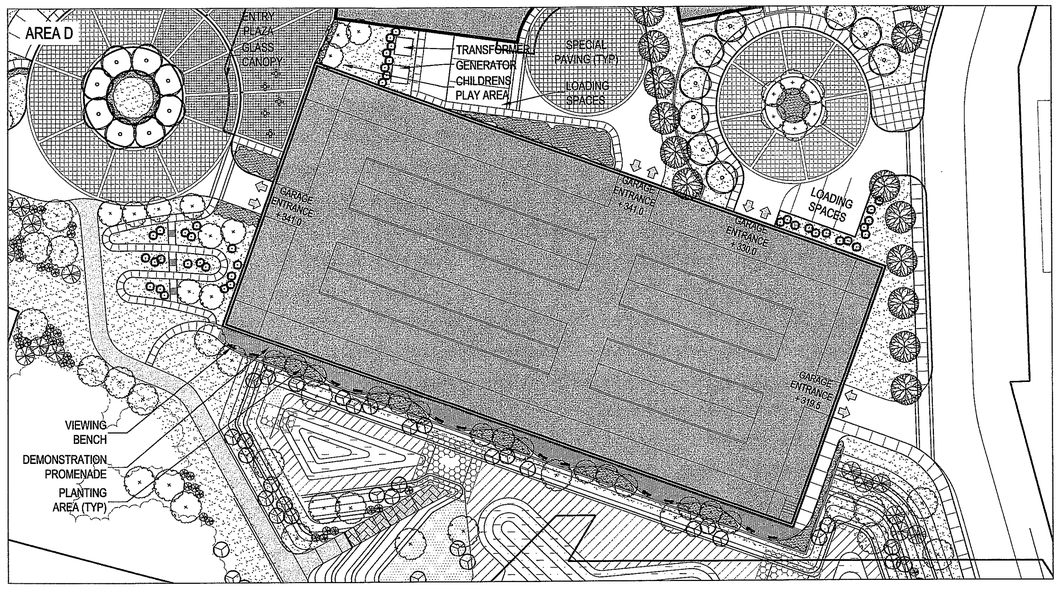
Legend

- PROPOSED LARGE DECIDUOUS TREE (Category III and IV Deciduous trees)
- PROPOSED EVERGREEN TREE (Category III and IV Evergreen trees)
- PROPOSED EVERGREEN TREE (Category I and II Evergreen trees)
- PROPOSED ORNAMENTAL TREE (Category I and II Deciduous trees)
- PROPOSED SHRUB MASS / PERENNIALS / GROUNDCOVER
- PROPOSED SITE FURNITURE
- PROPOSED LAWN/SOD
- PROPOSED SPECIAL PAVING

NOTE:
THE DETAILS PROVIDED HEREON REPRESENT THE PROPOSED HARDSCAPE AND LANDSCAPE PLANS FOR THE INDIVIDUAL OPEN SPACE AREAS. MINOR DESIGN CHANGES MAY BE MADE WITH FINAL DESIGN AND ENGINEERING.







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INOVA
WILLOW OAKS

PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLETON
Lic. No. 20112
6-10-09
PROFESSIONAL ENGINEER

Application No PCA-87-P-038-04 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 7/6/2009
Date of (BOS) (PC) Approval 7/13/2009

Sheet 7 of 20

SCALE
0' 50' 100'

No.	DATE	BY	Description
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9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE

Inova
Willow Oaks

Partial Generalized Development Plan Amendment
Detail Enlargements

PROJECT NO.

7

SHEET NO. 7 OF 20

M-10690

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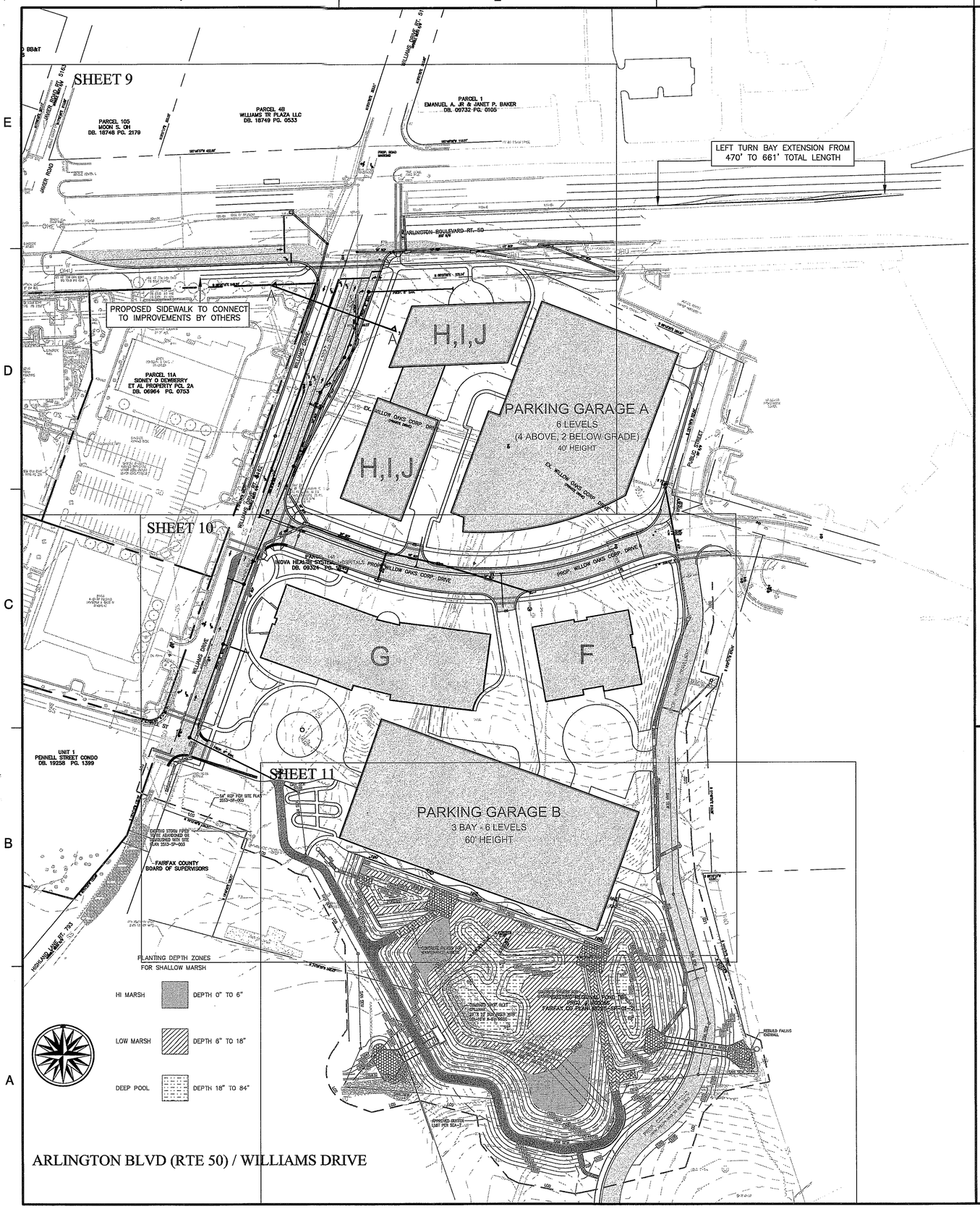


GENERAL NOTES

SHEET 8

THIS SHEET PROVIDES AND OVERALL VIEW OF THE PROPOSED IMPROVEMENTS AND ALL GENERAL NOTES

AN EXTENDED LEFT TURN BAY ON ROUTE 50 TO SOUTHBOUND WILLIAMS DRIVE IS SHOWN WITH AN INCREASE IN TURNBAY LENGTH FROM 470' TO 661' WITH TAPER. BASED ON COUNTY MAPPED INFORMATION, THERE IS NO CONFLICT WITH THE EXISTING STRUCTURES IN THE MEDIAN.

SHEET 9

THE IMPROVEMENTS SHOWN ON THIS SHEET INCLUDE:

IMPROVEMENTS TO WILLIAMS DRIVE NORTHBOUND INCLUDE TWO SEPARATE NORTHBOUND LEFTS, A SINGLE THROUGH, AND TWO RIGHT TURN LANES, AS WELL AS TRAFFIC SIGNAL IMPROVEMENTS.

IMPROVEMENTS TO EASTBOUND ROUTE 50, AFTER JAVIER ROAD INTERSECTION, INCLUDE AN ADDITIONAL THROUGH LANE EXTENDING TO THE GALLOWS ROAD OFF RAMP, AND A RIGHT TURN LANE ONTO SOUTHBOUND WILLIAMS DRIVE.

THE EXISTING RT. 50 WESTBOUND LEFT TURN LANE ONTO SOUTHBOUND WILLIAMS WILL BE EXTENDED BY 200'. GRAPHIC SHOWN ON SHEET 8

SOUTHBOUND WILLIAMS DRIVE, NORTH OF ROUTE 50, WILL BE RESTRIPED TO HAVE A THROUGH–RIGHT TURN LANE, AND A LEFT TURN LANE.

SHEET 10

THE IMPROVEMENTS SHOWN ON THIS SHEET INCLUDE:

WILLIAMS DRIVE TO PENNELL STREET, PROVIDE AN ADDITIONAL SOUTHBOUND LANE, AND AN ADDITIONAL NORTHBOUND LANE TO WILLIAMS DRIVE, WHICH EXTENDS FROM THE ROUTE 50 INTERSECTION, TO ITS TERMINATION AT PENNELL STREET. THE EASTERN MOST NORTHBOUND LANE WILL SERVE AS A TURN LANE FOR PROPOSED WILLOW OAKS CORPORATE DRIVE.

SHEET 11

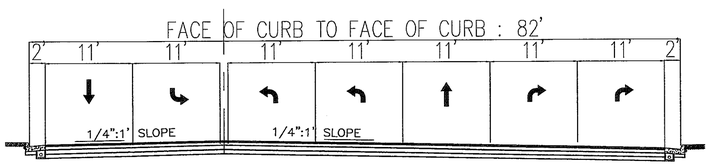
THE IMPROVEMENTS SHOWN ON THIS SHEET INCLUDE:

RELOCATE AND RESIZE THE REGIONAL POND TO PROVIDE STORMWATER MANAGEMENT FOR FUTURE DEVELOPMENT.

PROPOSED CONNECTOR ROAD TO TIE INTO EXISTING HOSPITAL FACILITY

NOTE:

SHEETS 8–11 WERE CREATED FOR VISUALIZING THE PROPOSED TRAFFIC IMPROVEMENTS SET FORTH IN THE PROFFERS. THE STORM SEWER SYSTEMS SHOWN WITH THE ROADWAY IMPROVEMENTS ARE APPROXIMATE AND ARE SUBJECT TO CHANGE UPON FINAL ENGINEERING. THE "EXISTING CONDITIONS" ARE SHOWN WITH TWO–FOOT CONTOURS AND WERE COMPILED THROUGH MULTIPLE SOURCES, INCLUDING FIELD SURVEYS, AIR FLOWN SURVEYS, COUNTY GIS, PROPOSED ROAD IMPROVEMENT PLANS BY OTHERS, AND DRAFTED LAYOUTS BASED ON AERIAL PHOTOGRAPHY. THESE DOCUMENTS ARE NOT FOR CONSTRUCTION PURPOSES



PROP. WILLIAMS DR. (NB)
TYPICAL SECTION A–A'

Application No PCA-87-P-038-04 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
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Sheet 8 of 20

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INOVA
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PARTIAL GENERALIZED
DEVELOPMENT PLAN AMENDMENT
PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLETON
Lic. No. 20112
6·10·09
PROFESSIONAL ENGINEER

KEY PLAN

SCALE
0' 80' 160'

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	CAP	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE

Inova
Willow Oaks

Partial Generalized Development Plan Amendment
Road Improvements Detail

PROJECT NO.

8

SHEET NO. 8 OF 20

M-10690

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PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

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TIMOTHY CHARLES CULLEITON
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Application No PCA-87-P-038-04 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) ((GDP) (CDP) (FDP)
SEE PROFFERS DATED 7/6/2009
Date of (BOS) (PC) Approval 7/13/2009

Sheet 9 of 20

SCALE
0' 30' 60'

No.	DATE	BY	Description
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6	06.05.09	ARW	
5	05.20.09	ARW	
4	04.20.09	ARW	
3	03.26.09	ARW	
2	02.19.09	ARW	
1	01.23.09	ARW	New Sheet

REVISIONS

DRAWN BY JMC
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TITLE

Inova
Willow Oaks

Partial Generalized Development Plan Amendment
Road Improvements Detail

PROJECT NO.

9

SHEET NO. 9 OF 20

M-10690

MATCH LINE SHEET 9

MATCH LINE SHEET 11

PARCEL 141
INOVA HEALTH SYSTEM, HOSPITALS
DB. 09324 PG. 1942

PROP. WILLOW OAKS CORP. DRIVE

PROP. PRIVATE DRIVEWAY

WILLIAMS DRIVE

PENNEL ST

G

F

PARKING GARAGE B
3 BAY - 6 LEVELS
60' HEIGHT

FAIRFAX COUNTY
BOARD OF SUPERVISORS

TIE INTO EX. W/M APPROX. LOCATION

PROP. INLET TO TIE INTO EX. STORM PIPE

POSSIBLE LOCATION FUTURE CG-11

FUTURE WATER CONNECTION

INSTALL CG-6 VDOT STANDARD

PROP. 6" CONC. S/W

PROP. 12" DIP W/M

PROP. 8" DIP W/M

STREET LIGHT TO BE RELOCATED

PROP. STOP SIGN

POSSIBLE 8" SAN. CONNECTION/ABANDON EX. 8" SAN. CONNECTION

FUTURE SAN. LAT. CONNECTION

EX. 8" SAN. TO BE REMOVED

EX. RIP-RAP TO BE REMOVED

REMOVE EX. STORM SEWER

REMOVE EX. END WALL AND INSTALL MH-2

PROP. 8" SAN.

PROP. 6" CONC. S/W

START GRAVEL ACCESS ROAD

WOOD POSTS W/ CABLE

54" RCP PER SITE PLAN 2513-SP-003

EXISTING STORM PIPES TO BE ABANDONED OR REMOLISHED WITH SITE PLAN 2513-SP-003

LCG

TOP STONE WALL

CONCRETE PAVERS FOR MAINTENANCE ACCESS

CONCRETE CURB

RIPRAP

CONC. V-DITCH 0.5' DEEP 4' WIDE

RIP RAP CONC. V-DITCH 0.5' DEEP 4' WIDE

FOREBAY

OLD FOUNDATION

RPA

LANTING DEPTH ZONES

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INOVA WILLOW OAKS

PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLETON
Lic. No. 20112
6-10-09
PROFESSIONAL ENGINEER

Application No PCA-87-P-038-04 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) (CDP) (CDP) (FDP)
SEE PROFFERS DATED 7/6/2009
Date of (BOS) (PC) Approval 7/13/2009

Sheet 10 of 20

SCALE
0' 30' 60'

No.	DATE	BY	Description
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5	06.05.09	ARW	
4	05.20.09	ARW	
3	04.20.09	ARW	
2	03.26.09	ARW	
1	02.19.09	ARW	New Sheet

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE

Inova
Willow Oaks

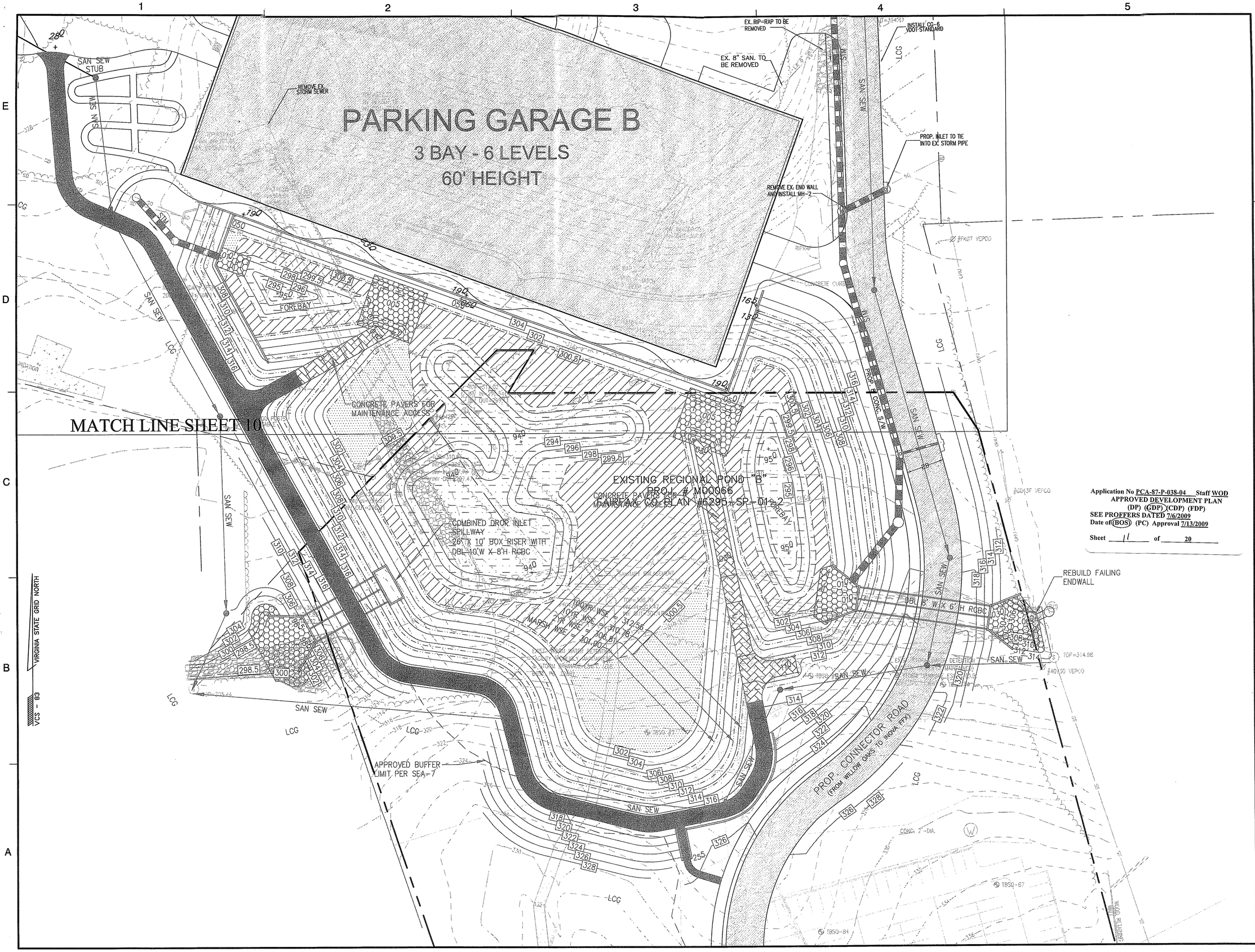
Partial Generalized Development Plan Amendment
Road Improvements Detail

PROJECT NO.

10

SHEET NO. 10 OF 20

M-10690



Application No PCA-87-P-038-04 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) (CDP) (CDP) (FDP)
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Sheet 11 of 20

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KEY PLAN

SCALE
0' 30' 60'

No.	DATE	BY	Description
6	06.10.09	ARW	
5	06.05.09	ARW	
4	05.20.09	ARW	
3	04.20.09	ARW	
2	03.26.09	ARW	
1	02.19.09	ARW	New Sheet

REVISIONS

DRAWN BY JMC
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CHECKED BY PGY
DATE April 14, 2008

TITLE

Inova
Willow Oaks

Partial Generalized Development Plan Amendment
Road Improvements Detail

PROJECT NO.

11

SHEET NO. 11 OF 20

M-10690

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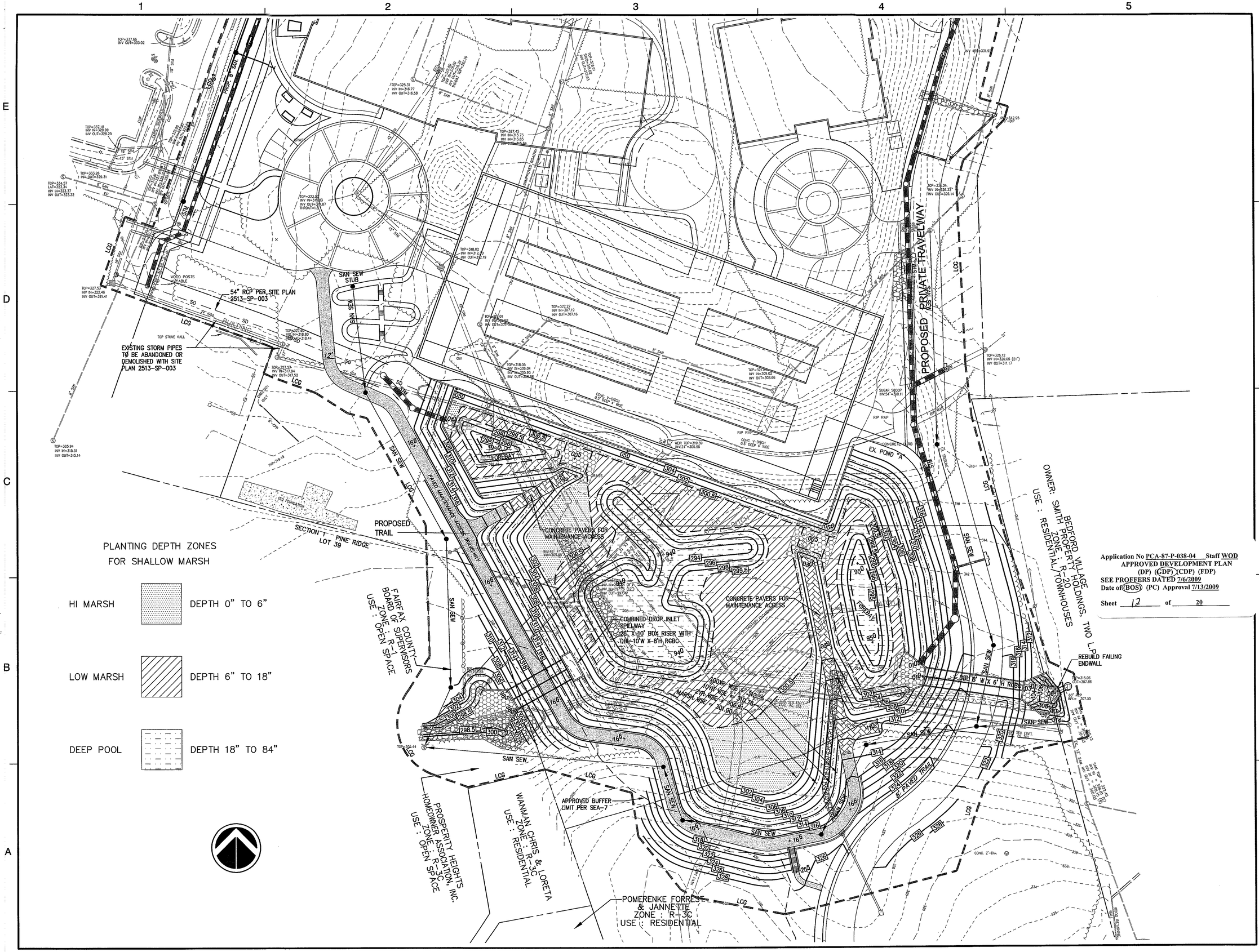

Application No PCA-87-P-038-04 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 7/6/2009
Date of (BOS) (PC) Approval 7/13/2009
Sheet 12 of 20

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PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

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6.10.09
PROFESSIONAL ENGINEER

KEY PLAN

SCALE
0' 40' 80'

No.	DATE	BY	Description
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9	06.05.09	ARW	
8	05.20.09	ARW	
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4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY SCC
APPROVED BY PGY
CHECKED BY TCC
DATE April 14, 2008

TITLE

Inova
Willow Oaks

Partial Generalized Development
Stormwater Management
Grading Plan - Pond Options 1,2,3

PROJECT NO.

12

SHEET NO. 12 OF 20

M-10690

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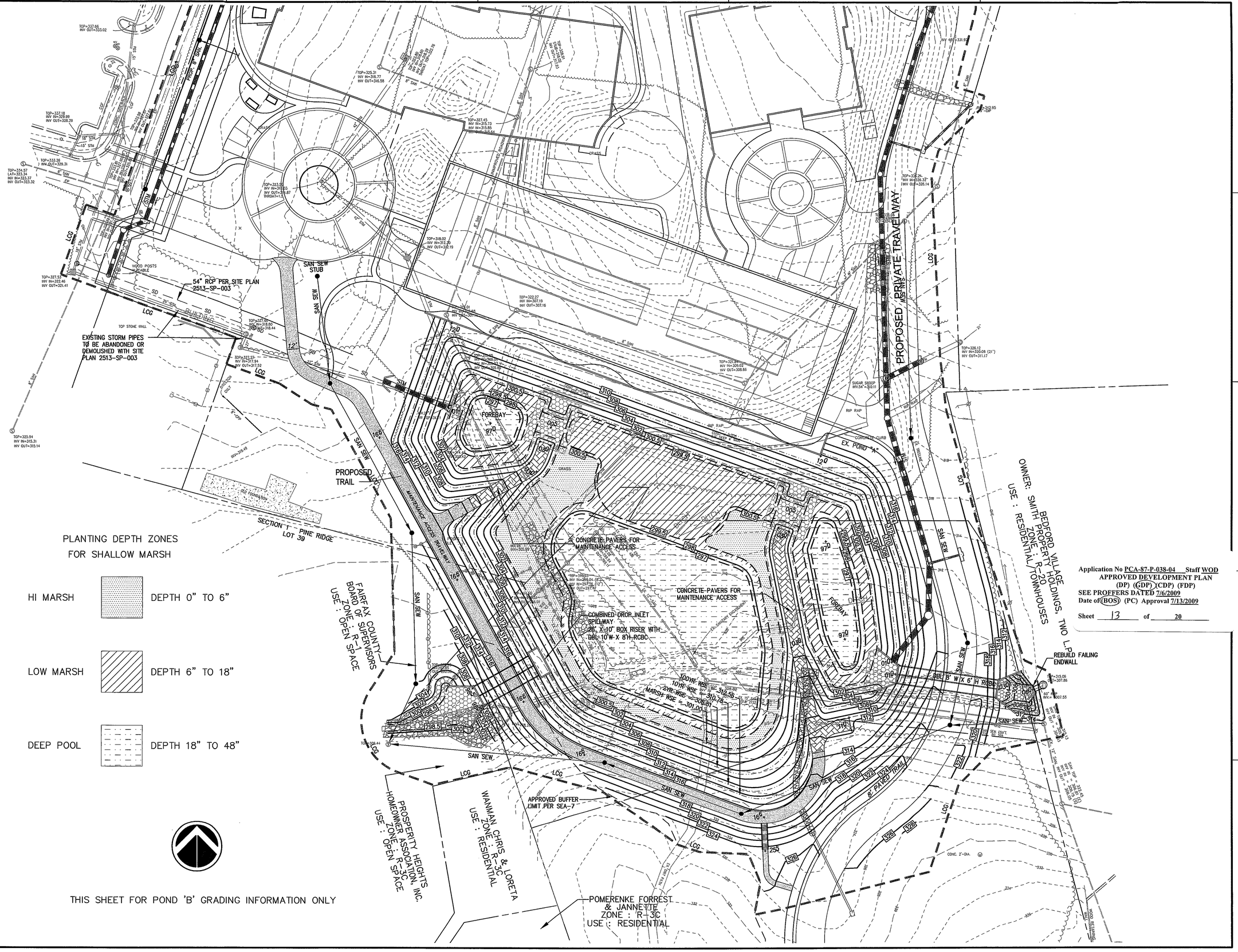

Application No PCA-87-P-038-04 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
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Sheet 13 of 20

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INOVA WILLOW OAKS

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6-10-09
PROFESSIONAL ENGINEER

KEY PLAN

SCALE
0' 40' 80'

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
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6	03.26.09	ARW	
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4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

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CHECKED BY TCC
DATE April 14, 2008

TITLE
Inova
Willow Oaks
Partial Generalized Development
Stormwater Management
Grading Plan - Pond Option 4

PROJECT NO.

13

SHEET NO. 13 OF 20

M-10690

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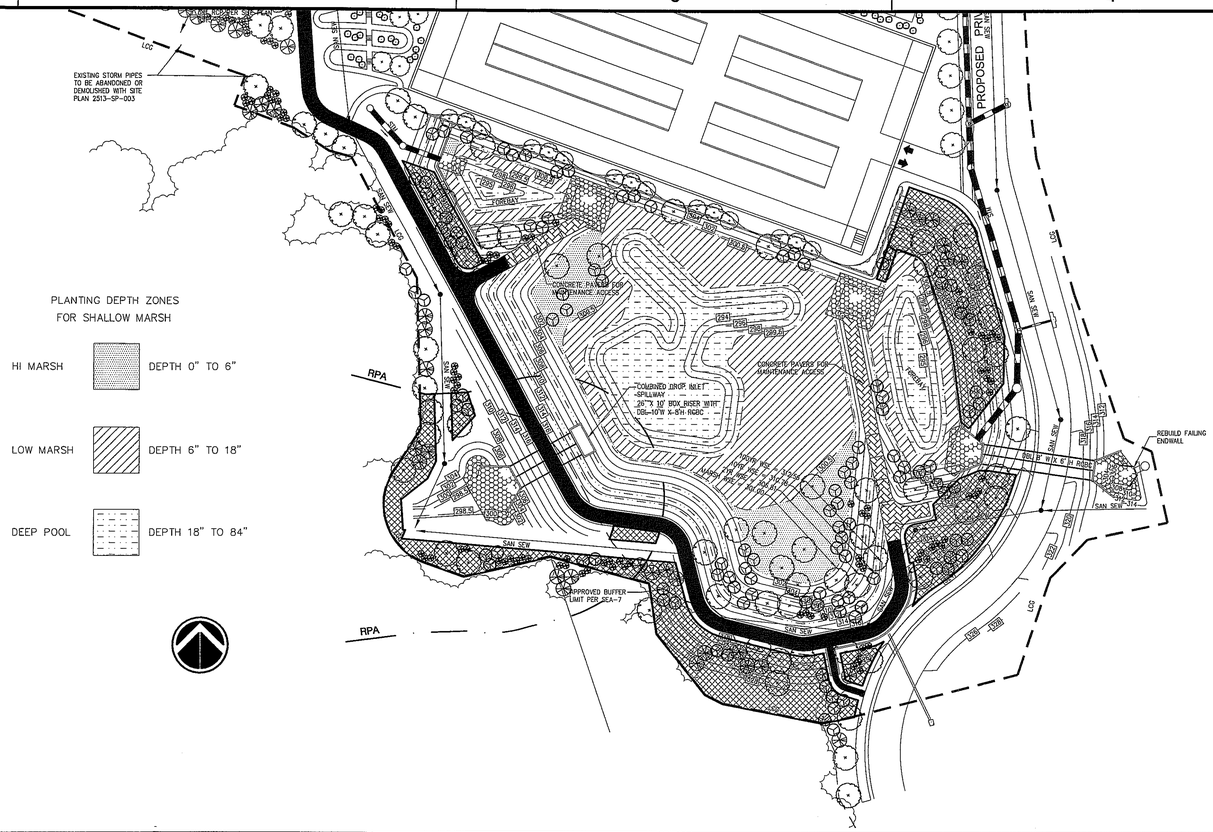
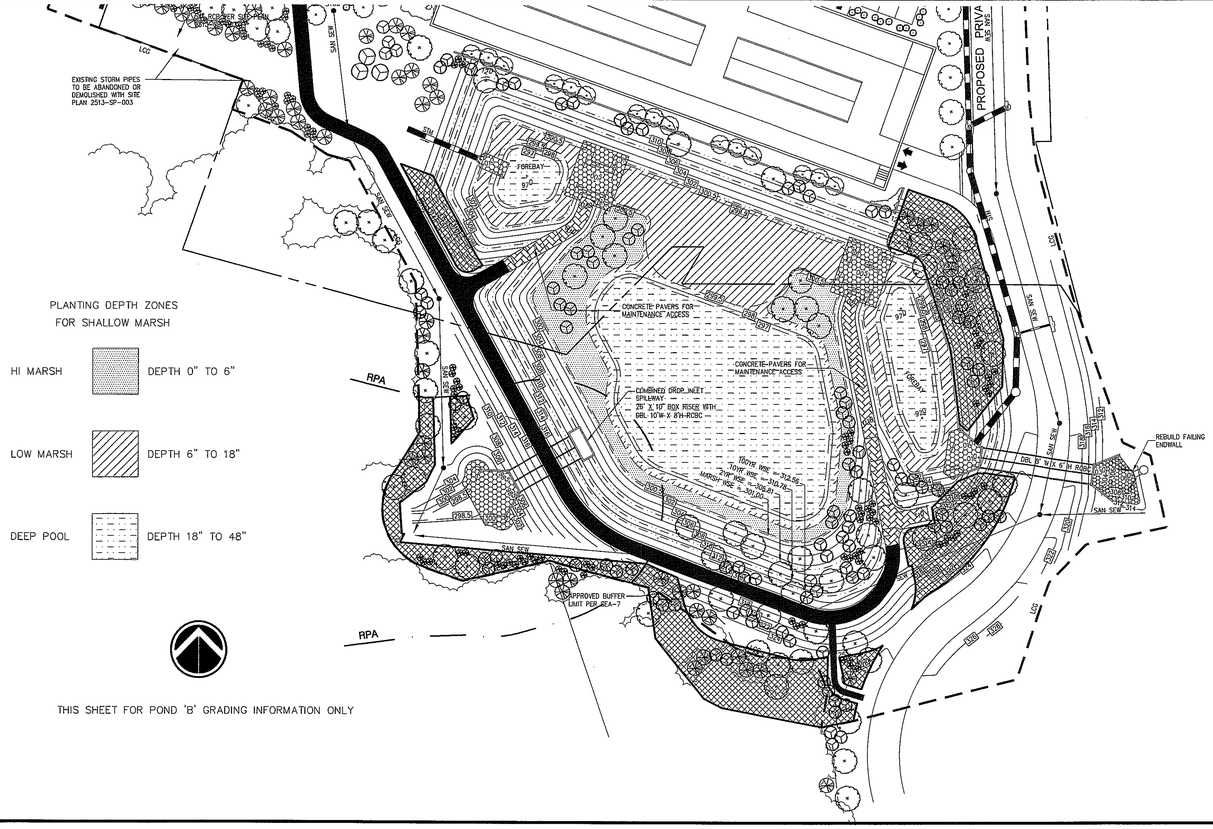
Option 1,2,3 - 3 Bay Garage
Legend

- PROPOSED LARGE DECIDUOUS TREE (Category III and IV Deciduous trees)
- PROPOSED EVERGREEN TREE (Category III and IV Evergreen trees)
- PROPOSED EVERGREEN TREE (Category I and II Evergreen trees)
- PROPOSED ORNAMENTAL TREE (Category I and II Deciduous trees)
- APPROXIMATE LIMITS OF CLEARING AND GRADING
- PROPOSED RIPARIAN REVEGETATION AREA



Option 4 - 2 Bay Garage
Legend

- PROPOSED LARGE DECIDUOUS TREE (Category III and IV Deciduous trees)
- PROPOSED EVERGREEN TREE (Category III and IV Evergreen trees)
- PROPOSED EVERGREEN TREE (Category I and II Evergreen trees)
- PROPOSED ORNAMENTAL TREE (Category I and II Deciduous trees)
- APPROXIMATE LIMITS OF CLEARING AND GRADING
- PROPOSED RIPARIAN REVEGETATION AREA



THIS SHEET FOR POND 'B' GRADING INFORMATION ONLY

Application No PCA-87-P-038-04 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
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Sheet 14 of 20

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INOVA
WILLOW OAKS

PARTIAL GENERALIZED
DEVELOPMENT PLAN AMENDMENT

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLETON
Lic. No. 20112
6-10-09
PROFESSIONAL ENGINEER

KEY PLAN

SCALE
0' 60' 120'

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
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6	03.26.09	ARW	
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4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY SCC
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CHECKED BY TCC
DATE April 14, 2008

TITLE

Inova Willow Oaks

Partial Generalized Development Landscape Plan - Pond Option 1,2,3,4

PROJECT NO.

14

SHEET NO. 14 OF 20

M-10690

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INOVA WILLOW OAKS

STORMWATER MANAGEMENT NARRATIVE

The INOVA Willow Oaks site is located in the Accotink Creek watershed. The existing site is mostly undeveloped woods. There are two existing dry ponds on the site: Pond A and Pond B, a quasi-regional pond. This plan proposes the development of the Willow Oaks. SWM is required for the proposed improvements in the form of quality and quantity control. Runoff from the site will be conveyed to an enhanced extended detention dry pond hereinafter referred to as the Willow Oaks SWM/BMP Pond.

Existing Conditions – Pond A and Pond B

Existing Pond B is located on the site east of Williams Drive and south of Willow Oaks Corporate Center Drive. This pond was designed by Rinker-Detwiler and Associates, P.C. in 1986 (Plan #6295-SP-01-2) and is one of the first "regional" facilities constructed in the County. It was designed as a detention only dry pond and currently does not provide BMP. New development in the watershed of Pond B is currently covered for detention, but BMP must be provided by other means (i.e. sand filters, dedicated conservation easements, etc.). In comparison to today's PFM requirements for pond facilities, criteria used in designing Pond B are outdated. For example, the hydrology used to size the outlet works, emergency spillway and set the top of dam are all based on 2-hour storm durations. Under current PFM criteria this is acceptable for drainage areas less than 20 acres but Pond B has a drainage area of approximately 130.1 acres. The outlet works of Pond B consists of a riser with outlet conduit and an emergency spillway placed in the fill section of the dam, which is armored by riprap covered by approximately 1'-2' of earth.

Immediately north and adjacent to existing Pond B is Pond A. Pond A, which drains into Pond B, is also a detention only dry pond. Pond A was designed in accordance with current PFM criteria by Dewberry in 1993 (Plan # 5544-SP-04). The outlet works of Pond A consists of a combined drop inlet principle/emergency spillway including a riser and outlet conduit. Willow Oaks, Bedford Village, north end of INOVA Fairfax Hospital Campus, and some businesses along Williams Drive as well as parts of VA Route 50 all drain to existing Pond A and/or Regional Pond B.

Proposed Willow Oaks SWM/BMP Pond

As part of this development application, it is proposed that existing Pond A and Pond B be combined into one SWM/BMP facility that consists of an enhanced extended detention dry pond that meets current PFM design criteria. The proposed facility will be privately owned and maintained. The proposed facility will include sediment forebays at major inflow points and a shallow marsh area consisting of a micro pool as well as high and low marshes. The outlet works will consist of a combined drop inlet principle/emergency spillway in the form of a riser and outlet conduit. The proposed dam embankment will be approximately 18' high with less than 50 ac-ft of storage to the top of the dam and will not be State regulated. Concept grading plans of the proposed facility are provided in this application.

The proposed facility is designed to provide peak flow reduction for the 2- and 10-year storms from developed conditions to good forested conditions for the entire 130.1 acre watershed it serves. Further, the proposed facility is designed to exceed the minimum phosphorous removal requirement for the 130.1 acre watershed it serves by providing 50 % phosphorous removal efficiency - the minimum required is 40 % for this particular location in the County. As demonstrated by the phosphorous removal computations provided, the proposed facility provides enough BMP to cover the entire 130.1 acre watershed it serves (including the INOVA Willow Oaks site) plus the INOVA Fairfax Hospital site. Though the southern portion of the INOVA Fairfax Hospital site along Woodburn Road does not drain to the proposed facility, BMP credit is requested as part of the INOVA Fairfax Hospital development application in lieu of having to design, build and maintain large sand filter systems.

Willow Oaks SWM/BMP Detention Summary

	Drainage Area (acres)	Peak Flow (cfs) 2-year	10-year
Good Forested Conditions	130.1	39	173
Ultimate Conditions	130.1		
• Into proposed facility		345	636
• Out of proposed facility		34	106
Over-detention provided		5	67

Willow Oaks SWM/BMP Water-Surface Elevation Summary

	Combined PSW/ESW PSW Top	ESW Top	Dam Top	WSE	Freeboard
Marsh pool	307.00 ft	310.75 ft	316.62 ft	301.00 ft	15.62 ft
BMP pool	307.00 ft	310.75 ft	316.62 ft	304.50 ft	12.12 ft
2-year pool	307.00 ft	310.75 ft	316.62 ft	306.81 ft	9.81 ft
10-year pool	307.00 ft	310.75 ft	316.62 ft	310.78 ft	5.84 ft
100-year pool	307.00 ft	310.75 ft	316.62 ft	312.56 ft	4.06 ft
1.5 x 100-year pool (S.D.F.)	307.00 ft	310.75 ft	316.62 ft	314.60 ft	2.02 ft
2.5 x 100-year pool (F.B.H)	307.00 ft	310.75 ft	316.62 ft	316.19 ft	0.43 ft

Where: PSW = Principal Spillway ESW = Emergency Spillway WSE = Water-surface elevation

Floodplain

There is a regulated minor floodplain onsite at the proposed Willow Oaks SWM/BMP Pond. Accordingly, a Floodplain Study will be prepared and submitted at Site Plan. The proposed Willow Oaks SWM/BMP Pond will reflect a decrease in its 100-year flood elevation when compared to existing conditions and will not impact adjacent properties. This decrease is a result of increased storage and spillway capacity associated with the proposed facility. A summary of the 100-year water-surface elevations is provided as follows:

100-Year Water-Surface Elevation Summary

Existing Pond A	316.28 ft	See Existing Conditions HEC-1 Model
Existing Regional Pond B	313.69 ft	See Existing Conditions HEC-1 Model
Proposed Willow Oaks SWM/BMP Pond	312.56 ft	See Ultimate Conditions HEC-1 Model

Low Impact Development

The Applicant shall install Fairfax County accepted Low Impact Development (LID) facilities on the Application Property in at least one of the potential locations shown on this development plan. The LID facilities (pervious pavement or other) shall treat a combined total of 20,000 square feet of impervious surface and shall have a minimum phosphorous removal efficiency of 40 percent. The LID facilities will be designed in accordance with the PFM. These LID facilities are intended as demonstration facilities and shall not factor into the requisite calculations for stormwater management and BMPs.

INOVA WILLOW OAKS

STORMWATER OUTFALL NARRATIVE

Description of Existing Outfall

The Willow Oaks development has one outfall The outfall channel begins at the proposed Willow Oaks SWM/BMP pond and proceeds in a southerly direction approximately 4,500 feet where it confluences with Accotink Creek. At Accotink Creek the drainage area is approximately 15 square miles. Based on field observations, the channel is predominantly natural channel, lightly meandering, 10'-15' wide bottom width, varying 3'-4' deep, and steep side slopes (1:1) Approximately 1500' of the outfall channel located just upstream of the Highland Lane culvert crossing was improved to reflect riprap and gabions to create an engineered rectangular channel. In addition, the Highland Lane culvert was upgraded to a triple 6' x 6' box culvert as part of that project. There are no signs of erosion at either the inlet or outlet of this culvert. These channel and culvert improvements were implemented by the County as recommended in the Parsons Brinckerhoff, Quade & Douglas report entitled, "Accotink Creek Watershed Immediate Action Plan", dated April 1978. Downstream of Highland Lane, the channel is natural and ends at Accotink Creek.

Description of Outfall Adequacy Requirements

In an effort to exceed minimum PFM requirements, NRCS Hydrology was used with a 24-hour duration storm for the 2-, 10- and 100-year events. This exceeds the minimum 2-hour duration storm as given under PFM section 6-1301.5. Using NRCS Hydrology, a rainfall-runoff model was developed using HEC-1 to determine 2-, 10- and 100-year peak flows at multiple points along the site outfall. Cross section computations for permissible velocity and channel capacity assuming normal depth were performed and the Highland Road culvert was checked for capacity and freeboard. In addition, the 100-year flood elevation was determined for each cross section and the resulting 100-year floodplain was mapped. The limits of the site outfall studied, cross section locations, and developed 100-year floodplain limits are provided in this Application. Under developed conditions (i.e. proposed Willow Oaks SWM/BMP facility with fully developed watershed), the outfall analysis reflects 5 key points:

1. All representative cross sections are adequate in terms of permissible velocity for the 2-yr storm.
2. All representative cross sections are adequate in terms of channel capacity with the exception of cross section 4 that represents the existing gabion-lined channel located just upstream of Highland Road. Here the 10-year storm is determined to be out of bank while the 2-year storm is contained.
3. All representative cross sections are adequate in terms of 100-year flooding with the exception of cross section 4 that represents the existing gabion-lined channel located just upstream of Highland Road. Here the 100-year floodplain encroaches on a single home.
4. The Highland Road culvert crossing is adequate for 10-year capacity and freeboard.
5. Even if the proposed Willow Oaks SWM/BMP facility could be designed to have infinite capacity, analysis confirms that the 10-year storm would still remain out of bank as described under point 2, and the home identified under point 3 would still flood at cross section 4. The analysis shows that this condition exists because the drainage that accumulates downstream of the Willow Oaks SWM/BMP facility is sufficient enough for the 10-year storm to exceed the capacity of the gabion-lined channel and also cause 100-year flooding of the home.

Given point 5 above, it can be concluded that increasing storage capacity at the proposed Willow Oaks SWM/BMP facility will not solve the existing 10-year capacity and 100-year flooding issues at the gabion-lined channel reflected by cross section 4. For these reasons it is appropriate to apply the concept of "no adverse impact and proportional improvement". That said the channel capacity method (PFM section 6-0203.4B) and 100-year flooding method (PFM section 6-0203.5) were used to evaluate proportional improvements. The proportional improvement computations for cross section 4 are found on this sheet.

The outfall analysis demonstrates that the proposed Willow Oaks SWM/BMP facility provides the required detention to demonstrate no adverse impact and proportional improvement for channel capacity and 100-year flooding at cross section 4. For these reasons, it is our judgment that the site outfall downstream of the development site together with the proposed Willow Oaks SWM/BMP facility function as an acceptable drainage system in accordance with criteria set forth in the PFM.

A summary of the natural and manmade channel adequacy along the study reach is given in Tables 1, 2 and 3 below.

Table 1 – Channel Capacity Check (Developed Conditions)

Section	Channel n-value	Max Capacity (cfs)	Flow (cfs)	Comments
1 (natural)	0.045 [A]	662	49 (2-yr)	capacity is adequate
2 (natural)	0.045 [A]	374	98 (2-yr)	capacity is adequate
3 (natural)	0.045 [A]	226	187 (2-yr)	capacity is adequate
4 (gabions)	**0.037** [B]	**307**	**499 (10-yr)**	**capacity not adequate** [D]
5 (natural)	0.058 [C]	246	216 (2-yr)	capacity is adequate
6 (natural)	0.058 [C]	269	216 (2-yr)	capacity is adequate

Table 2 – Channel Velocity Check (Developed Conditions)

Section	Permissible Velocity (fps)	Velocity (fps)	Comments
1 (natural)	5.5 [E]	2.8 (2-yr)	velocity is adequate
2 (natural)	5.5 [E]	3.6 (2-yr)	velocity is adequate
3 (natural)	5.5 [E]	4.0 (2-yr)	velocity is adequate
4 (gabions)	>8.0	6.2 (2-yr)	velocity is adequate
5 (natural)	5.5 [E]	4.0 (2-yr)	velocity is adequate
6 (natural)	5.5 [E]	3.7 (2-yr)	velocity is adequate

Table 3 – 100-Year Water-Surface Elevation at Outfall Sections

Section	WSEL (ft)	Section	WSEL (ft)
1	299.36	**4**	**284.92** [F] **(100-year floods single home at Sec. 4)**
2	293.49	5	274.86
3	289.54	6	269.08

Where:

A : n = n1 + n2 + n3 + n4 + n5 + n6 = 0.02 + 0.010 + 0.00 + 0.01 + 0.005 + 0.00 = 0.045 (per Tables 5-16 - 5-21 of VA E&S Control Handbook)
B : n = 0.037 = weighted average of gabion sides (n=0.030) and stone bottom (n=0.045)
C : n = n1 + n2 + n3 + n4 + n5 + n6 = 0.02 + 0.010 + 0.005 + 0.01 + 0.005 + 0.0075 = 0.058 (per Tables 5-16 - 5-21 of VA E&S Control Handbook)
D : See computations for demonstration of no adverse impact and proportional improvement for channel capacity.
E : Per Table 5-22 of VA E&S Control Handbook for field verified soil type of Graded, Silt to Cobbles (noncolloidal).
F : See computations for demonstration of no adverse impact and proportional improvement for 100-year flooding.

Opinion of Outfall Adequacy

Based on these computation and field observations of the outfall, it is the opinion of the engineer that:

1. Cross sections shown are reflective of the stream reach analyzed.
2. Adequacy of the downstream drainage system is met within the extent of review and the proposed Willow Oaks SWM/BMP facility provides the required detention to demonstrate no adverse impact and proportional improvement for 10-year channel capacity and 100-year flooding at cross section 4 where the 10-year storm is out of bank and a single home is flooded by the 100-year storm.
3. There will be no flooding of existing downstream dwellings, or buildings constructed under an approved building permit by the 100-year storm event with the exception of the home described under point 2 above.

WILLOW OAKS OUTFALL ANALYSIS FOR PROPOSED SWM/BMP POND
PROPORTIONAL IMPROVEMENT
CHANNEL CAPACITY METHOD

INADEQUATE CAPACITY SECTION 4

GIVEN:

Ad	=	Contributing drainage area of site	=	21.55 acres
Acs	=	Contributing drainage area to section	=	267.4 acres
CNd	=	Post run-off curve number for site	=	89
CNcs	=	Existing runoff curve number to section	=	83

THE CORRESPONDING PROPORTIONAL IMPROVEMENT IS CALCULATED AS:

$$Pi = \frac{Cd\ Ad}{Ccs\ Acs} \times 100$$

Johnson and Meadows (1980) had developed and equation for converting CN values to C value:

$$C = 1 - \frac{S\,[1.2 - S/(P+0.8S)]}{P}$$

where: $S = (1000/CN) - 10$

STORM EVENT	2-YR	OVERTOPPING	10-YR
P (inches)	3.20	3.30	5.20
CNd	89	89	89
Sd (inches)	1.236	1.236	1.236
Cd	0.65	0.66	0.76
CNcs	83	83	83
Scs	2.0482	2.0482	2.0482
Ccs	0.50	0.51	0.65
Ad (acres)	21.55	21.55	21.55
Acs (acres)	267.40	267.40	267.40
Existing peak flow at section (cfs)	234.00	250.00	568.00
Pi (%)	10.48	10.43	9.42
Allowable peak flow at section (cfs)	209	224	514
Provided peak flow at section (cfs)	187	202	499

WILLOW OAKS OUTFALL ANALYSIS FOR PROPOSED SWM/BMP POND
PROPORTIONAL IMPROVEMENT

100-YR FLOODING AT SECTION 4

GIVEN:

Ad	=	Contributing drainage area of site	=	21.55 acres
Acs	=	Contributing drainage area to section	=	267.4 acres
CNd	=	Post run-off curve number for site	=	89
CNcs	=	Existing runoff curve number to section	=	83

THE CORRESPONDING PROPORTIONAL IMPROVEMENT IS CALCULATED AS:

$$Pi = \frac{Cd\ Ad}{Ccs\ Acs} \times 100$$

Johnson and Meadows (1980) had developed and equation for converting CN values to C value:

$$C = 1 - \frac{S\,[1.2 - S/(P+0.8S)]}{P}$$

where: $S = (1000/CN) - 10$

STORM EVENT	100-YR
P (inches)	7.30
CNd	89
Sd (inches)	1.236
Cd	0.82
CNcs	83
Scs	2.0482
Ccs	0.73
Ad (acres)	21.55
Acs (acres)	267.40
Existing peak flow leaving pond (cfs)	594.00
Pi (%)	9.05
Allowable peak flow leaving pond (cfs)	540
Provided peak flow leaving pond (cfs)	532
Pre-dev. peak flow at section 4 (cfs)	1165
Post-dev. peak flow at section 4 (cfs)	1078

MINIMUM STORMWATER INFORMATION FOR REZONING, SPECIAL EXCEPTION, SPECIAL PERMIT AND DEVELOPMENT PLAN APPLICATIONS

The following information is required to be shown or provided in all zoning applications, or a waiver request of the submission requirement with justification shall be attached. Note: Waivers will be acted upon separately. Failure to adequately address the required submission information may result in a delay in processing this application.

This information is required under the following Zoning Ordinance paragraphs:

Special Permits (9-011 2J & 2L)	Special Exceptions (9-011 2J & 2L)
Cluster Subdivision (9-615 1G & 1N)	Commercial Revitalization Districts (9-622 2A (12) & 14))
Development Plans PRC District (16-302 3 & 4L)	PRC Plan (16-303 1E & 1O)
PDP P Districts (except PRC) (16-502 1F & 1Q)	Amendments (18-202 10F & 10I)

☒ 1. Plat is at a minimum scale of 1" – 50' (unless it is depicted on one sheet with a minimum scale of 1" – 100'.

☒ 2. A graphic depicting the stormwater management facility(ies) and limits of clearing and grading accommodate the stormwater management facility(ies), storm drainage pipe systems and outlet protection, pond spillways, access roads, site outfalls, energy dissipation devices, and stream stabilization measures as shown on Sheet 4.

☒ 3. Provide:

Facility Name/ Type & No.	On-site area served (acres)	Off-site area served (acres)	Drainage area (acres)	Footprint area (sf)	Storage Volume (cf)	If pond, dam height (ft)
Dry Pond (e.g. dry pond A, infil, trench, underground, vault, etc.)	16.13	113.97	130.1	206,200	1,879,800	18'
Totals	16.13	113.97	130.1	206,200	1,879,800	18'

☒ 4. Onsite drainage channels, outfalls and pipe systems are shown on Sheet 3, 4. Pond inlet and outlet pipe systems are shown on Sheet 10.

☒ 5. Maintenance access (road) to stormwater management facility(ies) are shown on Sheet 10. Type of maintenance access road surface noted on the plat is 10 (e.g. asphalt, geoblock, gravel, etc.).

☒ 6. Landscaping and tree preservation shown in and near the stormwater management facility is shown on Sheet 12.

☒ 7. A stormwater management narrative which contains a description of how detention and best management practice requirements will be met is provided on Sheet 13.

☒ 8. A description of the existing conditions of each numbered site outfall extended downstream from the site to a point which is at least 100 times the site area or which has a drainage area of at least one square mile (640 acres) is provided on Sheet 13.

☒ 9. A description of how the outfall requirements, including contributing drainage areas of the Public Facilities Manual will be satisfied is provided on Sheet 13.

☒ 10. Existing topography with maximum contour intervals of two (2) feet and a note as to whether it is an air survey or field run is provided on Sheets 3.

☒ 11. A submission waiver is requested for N/A.

☒ 12. Stormwater management is not required because N/A.

Industry Letter 05-03 dated 02/02/05

Application No PCA-87-P-038-04 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 7/6/2009
Date of (BOS) (PC) Approval 7/13/2009

Sheet 15 of 20

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INOVA WILLOW OAKS

PARTIAL GENERALIZED DEVELOPMENT PLAN AMENDMENT

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLETON
Lic. No. 20112
6-10-09
PROFESSIONAL ENGINEER

KEY PLAN

SCALE

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY SCC
APPROVED BY PGY
CHECKED BY TCC
DATE April 14, 2008

TITLE

Inova
Willow Oaks

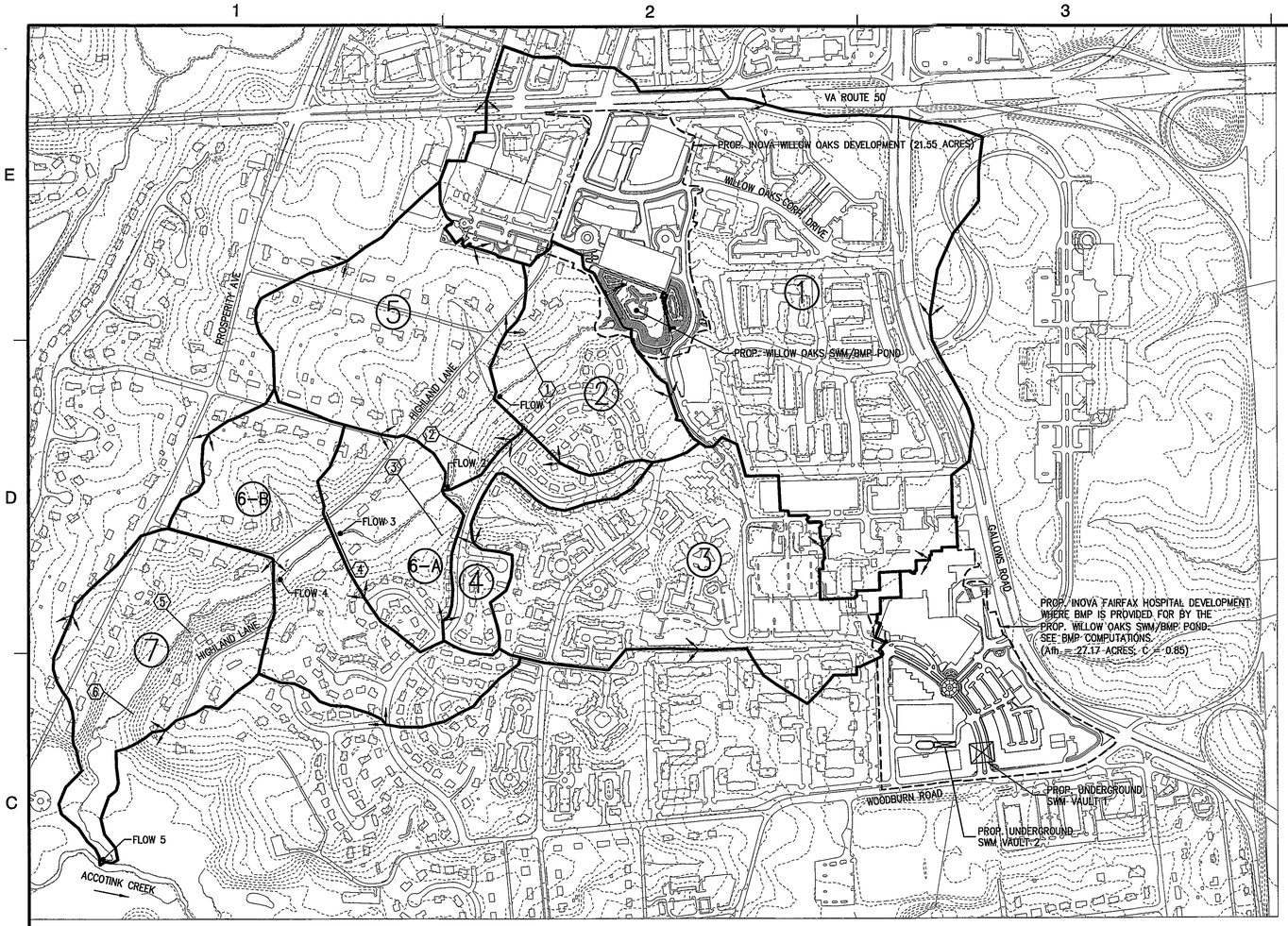
Partial Generalized Development Stormwater Management and Outfall Narratives

PROJECT NO.

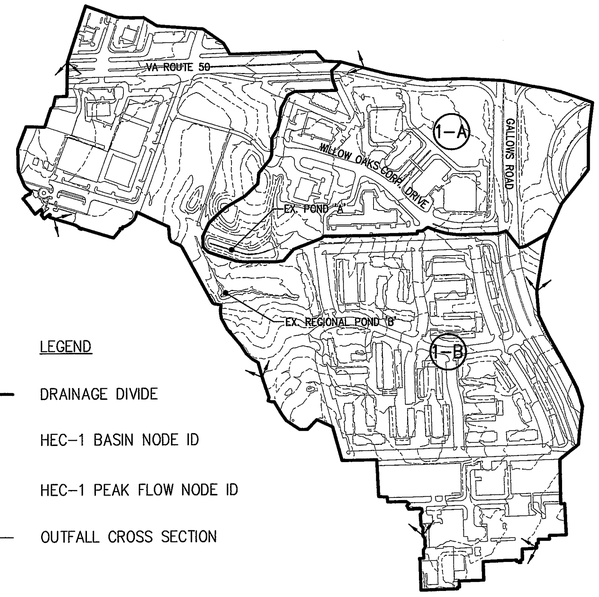
15

SHEET NO. 15 OF 20

M-10690



DEVELOPED CONDITIONS TO PROPOSED WILLOW OAKS SWM/BMP POND AND OUTFALL TO ACCOTINK CREEK
SCALE: 1" = 400'



LEGEND

- DRAINAGE DIVIDE
- (1) HEC-1 BASIN NODE ID
- FLOW 3 • HEC-1 PEAK FLOW NODE ID
- (3) OUTFALL CROSS SECTION

EXISTING CONDITIONS TO EXISTING REGIONAL POND 'B'
SCALE: 1" = 400'

HYDROLOGIC DATA

HEC-1 BASIN NODE ID	ACRES	RCN	Tc (min)
1-A	37.1	84	10
1-B	93.0	87	10
1 (FORESTED)	130.1	62	25
1 (DEVELOPED)	130.1	89	10
2	21.7	75	10
3	51.1	82	10
4	10.2	73	10
5	37.3	77	15
6-A	17.0	77	10
6-B	33.6	71	15
7	30.7	73	10

NRCS 24-HOUR PEAK FLOW SUMMARY ALONG WILLOW OAKS OUTFALL TO ACCOTINK CREEK

LOCATION **	2-YEAR		10-YEAR		100-YEAR	
	PRE-DEV	POST-DEV	PRE-DEV	POST-DEV	PRE-DEV	POST-DEV
FLOW-1	96	49	278	136	689	600
FLOW-2	145	98	362	251	877	789
FLOW-3	234	187	568	499	1165	1078
FLOW-4	257	209	624	564	1255	1165
FLOW-5	263	216	628	558	1230	1145

** LOCATIONS SHOWN ON MAP THIS SHEET. ALSO REFER TO EXISTING AND ULTIMATE CONDITIONS HEC-1 MODELS PROVIDED IN THIS APPLICATION.

DEVELOPED CONDITIONS C-FACTOR TO PROP. WILLOW OAKS SWM/BMP POND

LAND USE	IMP (%)	ACRES	IMP x ACRES
COMMERCIAL	85	70.40	5984.0
OPEN SPACE	15	14.96	224.4
TOWNHOMES	70	34.57	2419.9
MAJOR ROADS	100	10.17	1017.0
		130.1	9645.3 IMP = 74 %

C = 0.05 + 0.009 (IMP) = 0.05 + 0.009 (74) = 0.72

Application No PCA-87-P-038-04 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 7/6/2009
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Sheet 16 of 20

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6.10.09
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KEY PLAN

SCALE

AS SHOWN

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9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.26.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY LNR
APPROVED BY PGY
CHECKED BY TCC
DATE April 14, 2008

TITLE

Inova
Willow Oaks

Partial Generalized Development
Drainage Divides
and Hydrologic Data

PROJECT NO.

16

SHEET NO. 16 OF 20

M-10690

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WILLOW OAKS OUTFALL ANALYSIS – CROSS SECTION COMPUTATION SUMMARY

Label	Discharge (ft^3/s)	Channel Slope (ft/ft)	Roughness Coefficient	Normal Depth (ft)	Water Surface Elevation (ft)	Velocity (ft/s)
Cross Section 1: MAX Q	662.45	0.01000	0.045	4.18	297.83	6.72
Cross Section 1: 2YR	49.00	0.01000	0.045	1.11	294.76	2.80
Cross Section 1: 100YR	600.00	0.01000	0.087	5.71	299.36	2.64
Cross Section 2: MAX Q	373.55	0.00770	0.045	4.10	291.73	5.49
Cross Section 2: 2YR	98.00	0.00770	0.045	2.10	289.73	3.64
Cross Section 2: 100YR	789.00	0.00770	0.075	5.86	293.49	3.41
Cross Section 3: MAX Q	225.69	0.00650	0.045	3.12	287.15	4.20
Cross Section 3: 2YR	187.00	0.00650	0.045	2.85	286.88	3.98
Cross Section 3: 100YR	1078.00	0.00650	0.053	5.51	289.54	3.51
Cross Section 4: MAX Q	307.44	0.01040	0.037	3.95	282.60	7.28
Cross Section 4: 2YR	187.00	0.01040	0.038	3.01	281.66	6.21
Cross Section 4: 10YR	499.00	0.01040	0.030	5.09	283.74	5.40
Cross Section 4: 100YR	1078.00	0.01040	0.046	6.27	284.92	4.39
Cross Section 5: MAX Q	246.33	0.00800	0.058	3.50	273.01	4.22
Cross Section 5: 2YR	216.00	0.00800	0.058	3.26	272.77	4.05
Cross Section 5: 100YR	1145.00	0.00800	0.078	5.35	274.86	3.39
Cross Section 6: MAX Q	268.73	0.00800	0.058	3.35	267.12	3.98
Cross Section 6: 2YR	216.00	0.00800	0.058	3.01	266.78	3.69
Cross Section 6: 100YR	1145.00	0.00800	0.067	5.31	269.08	3.41

HY-8 Culvert Analysis Report for Highland Lane

Site Data - 3-6X6 BOX AT HIGHLAND LANE

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 274.71 ft
Outlet Station: 42.00 ft
Outlet Elevation: 274.50 ft
Number of Barrels: 3

Culvert Data Summary - 3-6X6 BOX AT HIGHLAND LANE

Barrel Shape: Concrete Box
Barrel Span: 6.00 ft
Barrel Rise: 6.00 ft
Barrel Material: Concrete
Barrel Manning's n: 0.0130
Inlet Type: Conventional
Inlet Edge Condition: 1:1 Bevel (45° flare) Wingwall
Inlet Depression: None

Roadway Data for Crossing: EX HIGHLAND LANE

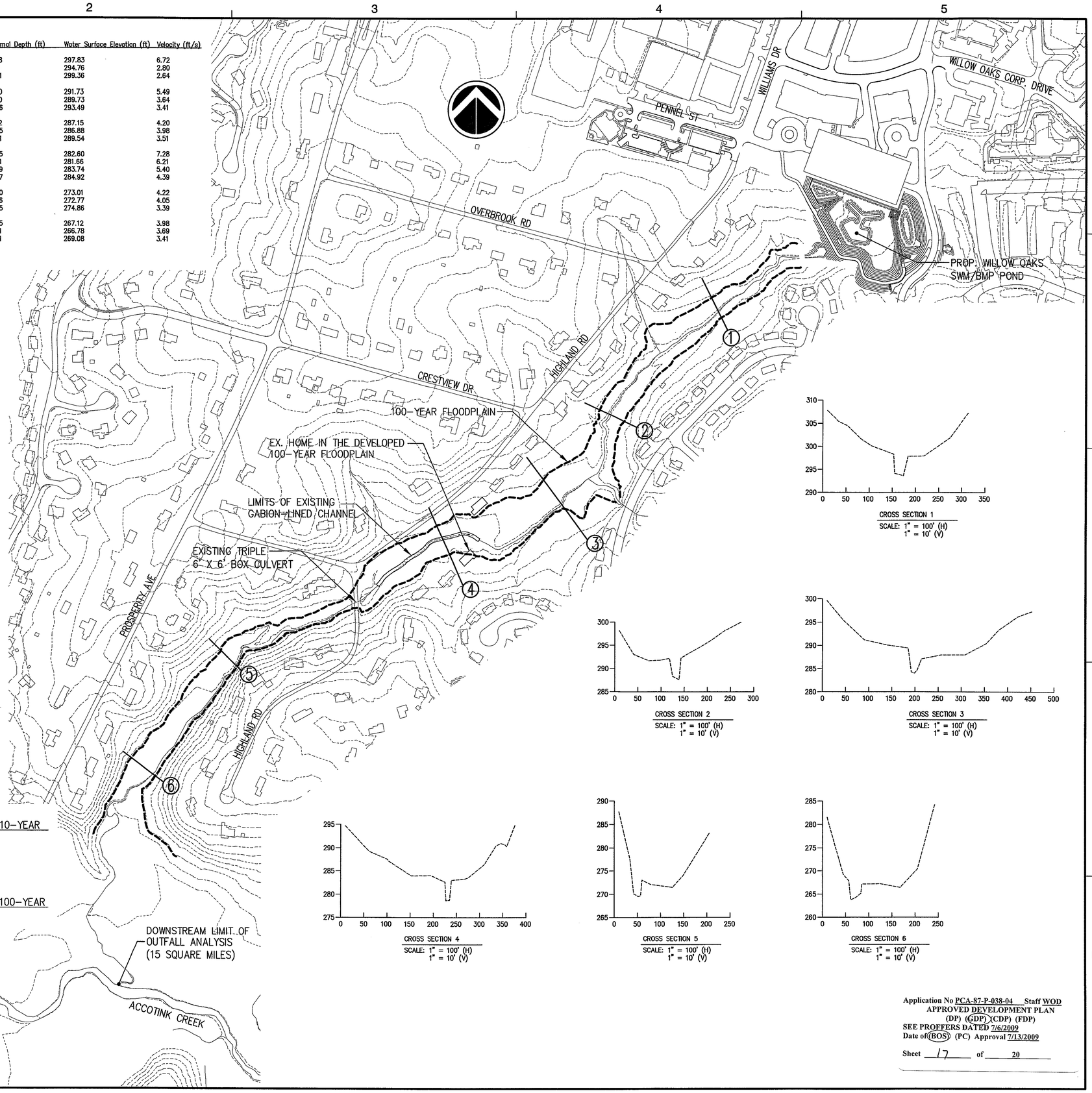
Roadway Profile Shape: Irregular Roadway Shape (coordinates)
Irregular Roadway Cross-Section:

Coord No.	Station (ft)	Elevation (ft)
1	0.00	295.61
2	7.00	294.56
3	45.00	290.31
4	84.00	286.22
5	124.00	283.64
6	164.00	282.51
7	203.00	282.78
8	240.00	283.85
9	277.00	285.06
10	287.00	285.52
11	321.00	287.63
12	357.00	290.10
13	394.00	293.12
14	429.00	296.75

Roadway Surface: Paved
Roadway Top Width: 15.00 ft

Culvert Summary Table: 3-6X6 BOX AT HIGHLAND LANE

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)	
0.00	0.00	274.71	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000	
116.50	116.50	276.60	1.624	1.693	1-S1t	0.959	1.094	1.808	1.798	3.580	3.066	
233.00	233.00	277.65	2.578	2.938	1-S1t	1.558	1.737	2.620	2.610	4.940	3.870	
349.50	349.50	278.50	3.404	3.793	1-S1t	2.081	2.276	3.251	3.241	5.973	4.409	
466.00	466.00	279.25	4.177	4.544	1-S1t	2.569	2.757	3.777	3.767	6.855	4.770	
564.00	564.00	279.83	4.790	5.121	1-S1t	2.963	3.131	4.160	4.150	7.532	4.924	10-YEAR
699.00	699.00	280.57	5.604	5.857	1-S1t	3.485	3.612	4.622	4.612	8.402	5.036	
815.50	815.50	281.16	6.301	6.454	5-S1t	3.924	4.003	4.974	4.964	9.109	5.091	
932.00	932.00	281.73	7.009	7.023	5-S1t	4.357	4.376	5.292	5.282	9.784	5.130	
1048.50	1048.50	282.45	7.745	7.571	7-M1t	4.783	4.733	5.582	5.572	10.435	5.163	
1165.00	1132.10	283.01	8.285	7.966	7-M1t	5.085	4.982	5.842	5.832	10.766	5.208	100-YEAR



CROSS SECTION 1
SCALE: 1" = 100' (H)
1" = 10' (V)

CROSS SECTION 2
SCALE: 1" = 100' (H)
1" = 10' (V)

CROSS SECTION 3
SCALE: 1" = 100' (H)
1" = 10' (V)

CROSS SECTION 4
SCALE: 1" = 100' (H)
1" = 10' (V)

CROSS SECTION 5
SCALE: 1" = 100' (H)
1" = 10' (V)

CROSS SECTION 6
SCALE: 1" = 100' (H)
1" = 10' (V)

Application No PCA-87-P-038-04 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 7/6/2009
Date of (BOS) (PC) Approval 7/13/2009

Sheet 17 of 20

Dewberry

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INOVA
WILLOW OAKS

PARTIAL GENERALIZED
DEVELOPMENT PLAN AMENDMENT
PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL
COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLETON
Lic. No. 20112
6.10.09
PROFESSIONAL ENGINEER

KEY PLAN

SCALE
0' 200' 400'

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE

Inova
Willow Oaks

Partial Generalized Development Plan Amendment
Outfall Plan and Cross Sections

PROJECT NO.

17

SHEET NO. 17 OF 20

M-10690

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Watershed Description

Part 1: List all of the Subareas and "C" Factors used in the BMP Computaions

	Subarea Designation and Description (1)	"C" (2)	Acres (3)
Awo	DEVELOPED WATERSHED TO PROPOSED WILLOW OAKS SWM/BMP POND (GDPA)	0.72	130.10
Afh	UNCONTROLLED FAIRFAX HOSPITAL DEVELOPMENT (SEA)	0.85	27.17

Phosphorus Removal Calculations (Part 2 - 4)

Part 2: Compute the Weighted Average "C" Factor for the Site:

(A) Area of the site (a) 157.27 ac

	Subarea Designation and Description (1)	"C" (2)		Acres (3)		Product (4)
Awo	DEVELOPED WATERSHED TO PROPOSED WILLOW OAKS SWM/BMP POND (GDPA)	0.72	x	130.10	=	93.67
Afh	UNCONTROLLED FAIRFAX HOSPITAL DEVELOPMENT (SEA)	0.85	x	27.17	=	23.09
			(b)	Total	=	116.76

(C) Weigthed average "C" factor (b) / (a) = 0.74

Part 3: Compute the Total Phoshorus Removal for the Site

Subarea	BMP Type	Removal Eff (%)	"C"	Acres	Area Ratio	C-factor Ratio	Product (%)
Awo	SWM/BMP POND	50	0.72	130.10	0.827	0.973	40.23
Afh	NONE	0	0.85	27.17	0.173	1.149	0.00
				(a)	Total	=	40.23

Part 4: Determine Compliance with Phosphorus Removal

Select Requirement:

Water Supply Overlay District (Occoquan Watershed) = 50% (Fairfax County and Prince William County)

Chesapeake Bay Preservation Area (New Development) = 40% (Fairfax County) 50% (Prince William County)

Chesapeake Bay Preservation Area (Redevelopment) = [1-0.9x("I"pre/"I"post)]x100 = _____ %

Requirement (a) 40.00 %

If Line 3(a) 40.23 >=Line 4(a) 40.00 then Phosphorus removal requirement is satisfied

BMP Storage Calculations (Part 7 - 8)

Part 7: Compute the Weighted Average "C" Factor for the Proposed BMP Facility

	Subarea Designation and Description (1)	"C" (2)		Acres (3)		Product (4)
Awo	DEVELOPED WATERSHED TO PROPOSED WILLOW OAKS SWM/BMP POND (GDPA)	0.72	x	130.10	=	93.67
			(a)	130.10	(b)	93.67

(C) Weigthed average "C" factor (b) / (a)=(c) = 0.72

BMP Outlet Computations

Part 9: Determine the Required Orifice Size for the Proposed BMP Facility

(A) BMP storage requirement from Part 8. (a) 295978 cf

(B) Maximum head (h) at the required BMP storage from the Stage-Storage curve for the facility. (b) 3.5 ft

(C) Peak Outflow Rate (Qp) at the maximum head for a drawdown time of 48 hrs [Qp=S/(0.5x3600x48)]

0.0000116xLine 9(a) 295978 = (c) 3.4257 cfs

(D) Required Orifice Area (A) [A=Qp/(0.6x(64.4xh)$^{0.5}$]

Line 9(c) 3.4257 / [0.6x(64.4xLine 9(b) 3.5)$^{0.5}$] = (d) 0.3803 sf

(E) Diameter of a circular orifice

2.0 x (Line 9(d) 0.3803 /3.1415927)$^{0.5}$ = (e) 0.696 ft

8.352 in

USE 8.0 in

Part 8: Determine the Storage Required for the Proposed BMP Facility

C = 0.72 (weighted "C" for area draining to Pond)

Chart A6-40 value (Appendix 4-3) for BMP storage per acre:

(4375 x C) - 875 = 2275.0 cf/ac

Design 1 (48hr Drawdown)

Effective Drainage Area to Pond = 130.10 ac

Storage Volume Required = 295,978 cf

6.80 ac-ft

Storage Volume Provided = 483,952 cf - 181,863 cf = 302,089 cf

2.21 ac-ft

At Stage Elevation = 304.50 ft

WILLOW OAKS SWM/BMP POND STAGE STORAGE

	Elev. (ft)	Acres	Volume (ac-ft) Incremental	Cummulative	
	294.0	0.19	0.0000	0.0000	
	295.0	0.28	0.2350	0.2350	
	296.0	0.35	0.3150	0.5500	
	298.0	0.53	0.8800	1.4300	
	299.5	0.67	0.9000	2.3300	
	300.5	1.43	1.0500	3.3800	
(Marsh WSE)	301.0	1.75	0.7950	4.1750	181,863 cf
	302.0	1.88	1.8150	5.9900	
	304.0	2.15	4.0300	10.0200	
(BMP WSE)	304.5	2.21	1.0900	11.1100	483,952 cf
	306.0	2.33	3.4050	14.5150	
	308.0	2.49	4.8200	19.3350	
	310.0	2.6	5.0900	24.4250	
	312.0	2.77	5.3700	29.7950	
	314.0	2.95	5.7200	35.5150	
	316.0	3.12	6.0700	41.5850	
	316.5	3.16	1.5700	43.1550	

WILLOW OAKS SWM/BMP POND SPILLWAY RATING CURVE (UNCLOGGED CONDITION)

RISER ORIFICE FLOW

ORIFICE NO.	CENTROID ELEV.	AREA	C	DESCRIPTION
1	301.33	0.349	0.6	8" EXT'D DETENTION INV=301.00
2	305	4.5	0.6	4.5' X 1' ORIFICE INV=304.50
3 (top)	310.75	260	0.6	TOP OF 26' X 10' RISER

RISER WEIR FLOW

WEIR NO.	CREST ELEV.	LENGTH	C
1	307	2	3
2 (top)	310.75	44	3
3 (headwall)	312.5	26	3

EMER. SPILLWAY FLOW

CREST ELEV. =
WIDTH =
Z =
C =

CULVERT RATING CURVE SIZE: DBL 10' X 8' RCBC

ELEV.	DISCHARGE
299	0
302.75	40
302.90	80
303.04	120
303.16	160
303.28	200
304.13	500
308.66	1500
311.48	2000
317.46	2800

ELEV.	ORIFICES Q1	Q2	Q3	WEIRS Q1	Q2	Q3	RISER FLOW	CULVERT CAPACITY	Q P.S.W. (Control)	Q E.S.W.	TOTAL FLOW	COMMENTS
301	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.3	0.0	0.0	0.0	
302	1.4	0.0	0.0	0.0	0.0	0.0	1.4	32.0	1.4	0.0	1.4	
306	3.6	21.7	0.0	0.0	0.0	0.0	25.3	913.2	25.3	0.0	25.3	
308	4.3	37.5	0.0	6.0	0.0	0.0	47.9	1354.3	47.9	0.0	47.9	
310.75	5.2	52.0	0.0	43.6	0.0	0.0	100.7	1871.0	100.7	0.0	100.7	
312	5.5	57.3	1399.7	67.1	184.5	0.0	314.4	2070.0	314.4	0.0	314.4	
314	6.0	65.0	2256.9	111.1	773.4	143.3	1098.8	2337.4	1098.8	0.0	1098.8	
316	6.4	71.9	2868.4	162.0	1587.9	510.7	2338.9	2604.8	2338.9	0.0	2338.9	
316.5	6.5	73.5	3001.9	175.7	1820.0	624.0	2699.7	2671.6	2671.6	0.0	2671.6	culvert control

WILLOW OAKS SWM/BMP POND SPILLWAY RATING CURVE (CLOGGED CONDITION)

RISER ORIFICE FLOW

ORIFICE NO.	CENTROID ELEV.	AREA	C	DESCRIPTION
1	301.33	0	0.6	8" EXT'D DETENTION INV=301.00
2	305	0	0.6	4.5' X 1' ORIFICE INV=304.50
3 (top)	310.75	260	0.6	TOP OF 26' X 10' RISER

RISER WEIR FLOW

WEIR NO.	CREST ELEV.	LENGTH	C
1	307	0	3
2 (top)	310.75	44	3
3 (headwall)	312.5	26	3

EMER. SPILLWAY FLOW

CREST ELEV. =
WIDTH =
Z =
C =

CULVERT RATING CURVE SIZE: DBL 10' X 8' RCBC

ELEV.	DISCHARGE
299	0
302.75	40
302.90	80
303.04	120
303.16	160
303.28	200
304.13	500
308.66	1500
311.48	2000
317.46	2800

ELEV.	ORIFICES Q1	Q2	Q3	WEIRS Q1	Q2	Q3	RISER FLOW	CULVERT CAPACITY	Q P.S.W. (Control)	Q E.S.W.	TOTAL FLOW	COMMENTS
301	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.3	0.0	0.0	0.0	
302	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.0	0.0	0.0	0.0	
306	0.0	0.0	0.0	0.0	0.0	0.0	0.0	913.2	0.0	0.0	0.0	
308	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1354.3	0.0	0.0	0.0	
310.75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1871.0	0.0	0.0	0.0	
312	0.0	0.0	1399.7	0.0	184.5	0.0	184.5	2070.0	184.5	0.0	184.5	
314	0.0	0.0	2256.9	0.0	773.4	143.3	916.7	2337.4	916.7	0.0	916.7	
316	0.0	0.0	2868.4	0.0	1587.9	510.7	2098.6	2604.8	2098.6	0.0	2098.6	
316.5	0.0	0.0	3001.9	0.0	1820.0	624.0	2444.0	2671.6	2444.0	0.0	2444.0	

EXISTING POND 'A' SPILLWAY RATING CURVE

ORIFICE FLOW

ORIFICE NO.	CENTROID ELEV.	AREA	C	DESCRIPTION
1	307.96	3.142	0.6	24" ORIFICE AT INV=306.96
2				
3 (riser top)	316	28.274	0.6	5' DIA RISER AT TOP = 316.00

WEIR FLOW

WEIR NO.	CREST ELEV.	LENGTH	C
1			
2			
3 (riser top)	316	18.85	3

EMER. SPILLWAY FLOW

CREST ELEV. = 316.5
WIDTH = 170
Z =
C = 2.6

CULVERT RATING CURVE SIZE: 48" RCP

ELEV.	DISCHARGE
306.96	0
310.59	30
313.67	60
314.90	90
316.54	120
318.57	150
320.99	180
323.78	210
326.97	240

ELEV.	ORIFICES Q1	Q2	Q3	WEIRS Q1	Q2	Q3	RISER FLOW	CULVERT CAPACITY	Q P.S.W. (Control)	Q E.S.W.	TOTAL FLOW	COMMENTS
306.96	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
309	15.4	0.0	0.0	0.0	0.0	0.0	15.4	16.8	15.4	0.0	15.4	
310	21.6	0.0	0.0	0.0	0.0	0.0	21.6	25.1	21.6	0.0	21.6	
312	30.4	0.0	0.0	0.0	0.0	0.0	30.4	43.7	30.4	0.0	30.4	
314	37.2	0.0	0.0	0.0	0.0	0.0	37.2	68.0	37.2	0.0	37.2	
316	42.9	0.0	0.0	0.0	0.0	0.0	42.9	110.1	42.9	0.0	42.9	
318	47.9	0.0	192.5	0.0	0.0	159.9	207.9	141.6	141.6	812.0	953.6	culvert control

EXISTING REGIONAL POND 'B' SPILLWAY RATING CURVE

ORIFICE FLOW

ORIFICE NO.	CENTROID ELEV.	AREA	C	DESCRIPTION
1	300.47	4.909	0.6	30" ORIFICE AT INV=299.22
2				
3 (riser top)	311.02	19.635	0.6	5' DIA RISER AT TOP = 311.02

WEIR FLOW

WEIR NO.	CREST ELEV.	LENGTH	C
1			
2			
3 (riser top)	311.02	15.708	3

EMER. SPILLWAY FLOW

CREST ELEV. = 312.5
WIDTH = 95
Z =
C = 2.6

CULVERT RATING CURVE SIZE: 60" RCP

ELEV.	DISCHARGE
299.22	0
303.52	100
306.67	200
311.83	300
319.05	400
328.58	500
343.49	600
372.54	700
432.86	800
552.75	900

ELEV.	ORIFICES Q1	Q2	Q3	WEIRS Q1	Q2	Q3	RISER FLOW	CULVERT CAPACITY	Q P.S.W. (Control)	Q E.S.W.	TOTAL FLOW	COMMENTS
299.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
303	37.6	0.0	0.0	0.0	0.0	0.0	37.6	88.0	37.6	0.0	37.6	
304	44.4	0.0	0.0	0.0	0.0	0.0	44.4	115.3	44.4	0.0	44.4	
306	55.6	0.0	0.0	0.0	0.0	0.0	55.6	178.7	55.6	0.0	55.6	
308	64.9	0.0	0.0	0.0	0.0	0.0	64.9	225.8	64.9	0.0	64.9	
310	73.0	0.0	0.0	0.0	0.0	0.0	73.0	264.6	73.0	0.0	73.0	
312	80.3	0.0	93.6	0.0	0.0	45.7	126.0	302.4	126.0	0.0	126.0	
312.5	82.0	0.0	115.0	0.0	0.0	84.8	166.8	309.3	166.8	0.0	166.8	
314	86.9	0.0	163.2	0.0	0.0	242.4	250.1	330.1	250.1	453.8	703.9	riser orifice control
315	90.1	0.0	188.6	0.0	0.0	374.2	278.7	343.9	278.7	976.4	1255.1	riser orifice control

EXISTING POND 'A' STAGE STORAGE

Elev. (ft)	Acres	Volume (ac-ft) Incremental	Cummulative
306.96	0	0.0000	0.0000
308.0	0.03	0.0156	0.0156
310.0	0.46	0.4900	0.5056
312.0	0.58	1.0400	1.5456
314.0	0.69	1.2700	2.8156
316.0	0.81	1.5000	4.3156
318.0	0.81	1.6200	5.9356

EXISTING REGIONAL POND 'B' STAGE STORAGE

Elev. (ft)	Acres	Volume (ac-ft) Incremental	Cummulative
299.22	0	0.0000	0.0000
302.0	0.03	0.0417	0.0417
304.0	0.13	0.1600	0.2017
306.0	0.63	0.7600	0.9617
308.0	0.83	1.4600	2.4217
310.0	1.31	2.1400	4.5617
312.0	1.82	3.1300	7.6917
314.0	2.44	4.2600	11.9517
315.0	2.44	2.4400	14.3917

Application No PCA-87-P-038-04 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 7/6/2009
Date of (BOS) (PC) Approval 7/13/2009

Sheet 16 of 20

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INOVA
WILLOW OAKS

PARTIAL GENERALIZED
DEVELOPMENT PLAN AMENDMENT

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL

COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLETON
Lic. No. 20112
6-10-09
PROFESSIONAL ENGINEER

KEY PLAN

SCALE

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE

Inova
Willow Oaks

Partial Generalized Development
BMP Computations and
Rating Curves

PROJECT NO.

18

SHEET NO. 18 OF 20

M-10690

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X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X       XXXXX   X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                          HEC-1 INPUT                                                  PAGE  1

 LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1         ID        WILLOW OAKS PROPOSED BMP/SWM POND AND OUTFALL
   2         ID        FAIRFAX COUNTY, VIRGINIA
   3         ID        SCS TYPE II, 24-HOUR RAINFALL DISTRIBUTION
   4         ID        FAIRFAX COUNTY PFM RAINFALL DEPTHS
   5         ID        EXISTING CONDITIONS DEVELOPMENT
             *DIAGRAM
   6         IT      5               300
   7         IO      5
             *          2-YR     10-YR     100-YR  OVERTOP
   8         JR    PREC    3.2      5.2      7.3     3.3
             *

   9         KK     1-A
  10         KM  BASIN 1-A RUNOFF HYDROGRAPH TO EX POND A
  11         BA   0.058
  12         PB      1
             * SCS TypeII Rainfall Distribution Pattern
  13         IN      6
  14         PC     0.0  .00101  .00202  .00305  .00408  .00513  .00618  .00725  .00832  .00941
  15         PC  .01050  .01161  .01272  .01385  .01498  .01613  .01728  .01845  .01962  .02081
  16         PC    .022  .02321  .02442  .02565  .02688  .02813  .02938  .03065  .03192  .03321
  17         PC  .03450  .03581  .03712  .03845  .03978  .04113  .04248  .04385  .04522  .04661
  18         PC    .048  .04941  .05084  .05229  .05376  .05525  .05676  .05829  .05984  .06141
  19         PC    .063  .06461  .06624  .06789  .06956  .07125  .07296  .07469  .07644  .07821
  20         PC     .08  .08181  .08364  .08549  .08736  .08925  .09116  .09309  .09504  .09701
  21         PC    .099  .10101  .10304  .10509  .10716  .10925  .11136  .11349  .11564  .11781
  22         PC     .12  .12225  .12460  .12705  .12960  .13225    .135  .13785  .14080  .14385
  23         PC    .147   .1502  .15340   .1566   .1598    .163  .16628  .16972  .17332  .17708
  24         PC    .181  .18512  .18948  .19408  .19892    .204   .2094   .2152   .2214    .228
  25         PC    .235  .24268  .25132  .26092  .27148    .283  .30684  .35436  .43079  .56786
  26         PC    .663  .68196  .69864  .71304  .72516    .735  .74344  .75136  .75876  .76564
  27         PC    .772  .77796  .78364  .78904  .79416    .799   .8036    .808   .8122   .8162
  28         PC     .82  .82367  .82726  .83079  .83424  .83763  .84094  .84419  .84736  .85047
  29         PC  .85350  .85647  .85936  .86219  .86494  .86763  .87024  .87279  .87526  .87767
  30         PC     .88  .88229  .88455  .88679    .889  .89119  .89335  .89549   .8976  .89969
  31         PC  .90175  .90379   .9058  .90779  .90975  .91169   .9136  .91549  .91735  .91919
  32         PC    .921  .92279  .92455  .92629    .928  .92969  .93135  .93299   .9346  .93619
  33         PC  .93775  .93929   .9408  .94229  .94375  .94519   .9466  .94799  .94935  .95069
  34         PC    .952   .9533  .95459  .95588  .95716  .95844  .95971  .96098  .96224   .9635
  35         PC  .96475    .966  .96724  .96848  .96971  .97094  .97216  .97338  .97459   .9758
  36         PC    .977   .9782  .97939  .98058  .98176  .98294  .98411  .98528  .98644  .98760
  37         PC  .98875   .9899  .99104  .99218  .99331  .99444  .99556  .99668  .99779   .9989
  38         PC     1.0
  39         LS             84
  40         UD     0.1
             *

  41         KK      PA
  42         KM  ROUTE THROUGH EXISTING POND A
  43         RS       1    ELEV  306.96
  44         SA       0    0.03    0.46    0.58    0.69    0.81    0.81
  45         SE  306.96     308     310     312     314     316     318
  46         SQ       0    15.4    21.6    30.4    37.2    42.9   953.6
  47         SE  306.96     309     310     312     314     316     318
             *
1                                          HEC-1 INPUT                                                  PAGE  2

 LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  48         KK     1-B
  49         KM  BASIN 1-B RUNOFF HYDROGRAPH TO EX POND B
  50         BA   0.145
  51         LS             87
  52         UD     0.1
             *

  53         KK    TO B
  54         KM  COMBINE PA HYDROGRAPH TO BASIN 1-B HYDROGRAPH
  55         HC       2
             *

  56         KK      PB
  57         KM  ROUTE "TO B" HYDROGRAPH THROUGH EXISTING REGIONAL POND B
  58         RS       1    ELEV  299.22
  59         SA       0    0.03    0.13    0.63    0.83    1.31    1.82    2.44    2.44
  60         SE  299.22     302     304     306     308     310     312     314     315
  61         SQ       0    37.6    44.4    55.6    64.9      73     126   166.8   703.9  1255.1
  62         SE  299.22     303     304     306     308     310     312   312.5     314     315
             *

  63         KK       2
  64         KM  BASIN 2 EXISTING RUNOFF HYDROGRAPH
  65         BA   0.034
  66         LS             75
  67         UD    0.10
             *

  68         KK  FLOW-1
  69         KM  COMBINE BASIN 2 HYDROGRAPH TO PB HYDROGRAPH
  70         HC       2
             *

  71         KK       5
  72         KM  BASIN 5 EXISTING RUNOFF HYDROGRAPH
  73         BA   0.058
  74         LS             77
  75         UD    0.15
             *

  76         KK  FLOW-2
  77         KM  COMBINE BASIN 5 HYDROGRAPH TO FLOW-1 HYDROGRAPH
  78         HC       2
             *

  79         KK       3
  80         KM  BASIN 3 EXISTING RUNOFF HYDROGRAPH
  81         BA    0.08
  82         LS             82
  83         UD    0.10
             *
1                                          HEC-1 INPUT                                                  PAGE  3

 LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  84         KK  X-POND
  85         KM  ROUTE BASIN 3 EXISTING RUNOFF HYDROGRAPH THROUGH EX POND AT MONARCH RD
  86         RS       1    ELEV     290
  87         SA       0    0.22    0.24    0.56     1.8
  88         SE     290     292     295     300     305
  89         SQ       0     9.3    14.1    17.7   134.7   329.1   368.4  1197.7
  90         SE     290     292     294     296     298     300     302     304
             *

  91         KK       4
  92         KM  BASIN 4 EXISTING RUNOFF HYDROGRAPH
  93         BA   0.016
  94         LS             73
  95         UD    0.10
             *

  96         KK   COMB1
  97         KM  COMBINE X-POND HYDROGRAPH TO BASIN 4 HYDROGRAPH
  98         HC       2
             *

  99         KK   COMB2
 100         KM  COMBINE FLOW-2 HYDROGRAPH TO COMB1 HYDROGRAPH
 101         HC       2
             *

 102         KK    CR-1
 103         KM  CHANNEL ROUTE COMB2 HYDROGRAPH TO FLOW-3 NODE
 104         RD
 105         RC     0.1   0.045     0.1     600  0.0065
 106         RX       0     129     175     182     189     203     344     443
 107         RY  299.58  290.12  289.47  284.27  284.77  287.15  290.44  297.29
             *

 108         KK     6-A
 109         KM  BASIN 6-A EXISTING RUNOFF HYDROGRAPH
 110         BA   0.027
 111         LS             77
 112         UD     0.1
             *

 113         KK  FLOW-3
 114         KM  COMBINE BASIN 6-A HYDROGRAPH TO CR-1 HYDROGRAPH
 115         HC       2
             *

 116         KK    CR-2
 117         KM  CHANNEL ROUTE FLOW 3 HYDROGRAPH TO FLOW-4 NODE
 118         RD
 119         RC     0.1   0.045     0.1     435  0.0104
 120         RX       0     142     215     217     225     229     266  366.07
 121         RY   294.7  283.95   282.6  278.65  278.73     283  283.59  294.78
             *
1                                          HEC-1 INPUT                                                  PAGE  4

 LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 122         KK     6-B
 123         KM  BASIN 6-B EXISTING RUNOFF HYDROGRAPH
 124         BA   0.053
 125         LS             71
 126         UD    0.15
             *

 127         KK  FLOW-4
 128         KM  COMBINE BASIN 6-B HYDROGRAPH TO CR-2 HYDROGRAPH
 129         HC       2
             *

 130         KK    CR-3
 131         KM  CHANNEL ROUTE FLOW-4 HYDROGRAPH TO FLOW-5 NODE
 132         RD
 133         RC     0.1  0.0575     0.1    2550   0.008
 134         RX       0      32      66      75      85      89     161   220.2
 135         RY  285.54  278.13  272.61  265.49  266.48  268.98  272.76   286.5
             *

 136         KK       7
 137         KM  BASIN 7 EXISTING RUNOFF HYDROGRAPH
 138         BA   0.048
 139         LS             73
 140         UD     0.1
             *

 141         KK  FLOW-5
 142         KM  COMBINE BASIN 7 HYDROGRAPH TO CR-3 HYDROGRAPH
 143         HC       2
             *
 144         ZZ

1
          SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
 LINE    (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.    (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   9       1-A
            V
            V
  41       PA
            .
            .
  48        .          1-B
            .           .
            .           .
  53      TO B...........
            V
            V
  56       PB
            .
            .
  63        .           2
            .           .
            .           .
  68    FLOW-1...........
            .
            .
  71        .           5
            .           .
            .           .
  76    FLOW-2...........
            .
            .
  79        .           3
            .           V
            .           V
  84        .        X-POND
            .           .
            .           .
  91        .           .           4
            .           .           .
            .           .           .
  96        .         COMB1...........
            .           .
            .           .
  99    COMB2............
            V
            V
 102      CR-1
            .
            .
 108        .          6-A
            .           .
            .           .
 113    FLOW-3...........
            V
            V
 116      CR-2
            .
            .
 122        .          6-B
            .           .
            .           .
 127    FLOW-4...........
            V
            V
 130      CR-3
            .
            .
 136        .           7
            .           .
            .           .
 141    FLOW-5...........


     PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                       FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                     TIME TO PEAK IN HOURS


                                                         RATIOS APPLIED TO PRECIPITATION
OPERATION        STATION     AREA    PLAN            RATIO 1  RATIO 2  RATIO 3  RATIO 4
                                                       3.20     5.20     7.30     3.30

HYDROGRAPH AT
+                    1-A      .06      1   FLOW         81.     163.     250.      85.
                                           TIME       12.00    12.00    12.00    12.00

ROUTED TO
+                     PA      .06      1   FLOW         29.      40.     170.      29.
                                           TIME       12.25    12.25    12.08    12.25

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE     311.59   314.83   316.28   311.77
                                           TIME       12.25    12.25    12.08    12.25

HYDROGRAPH AT
+                    1-B      .14      1   FLOW        229.     436.     654.     239.
                                           TIME       12.00    12.00    12.00    12.00

 2 COMBINED AT
+                   TO B      .20      1   FLOW        253.     470.     695.     264.
                                           TIME       12.00    12.00    12.00    12.00

ROUTED TO
+                     PB      .20      1   FLOW         77.     246.     594.      81.
                                           TIME       12.33    12.17    12.08    12.33

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE     310.16   312.72   313.69   310.32
                                           TIME       12.33    12.17    12.08    12.33

HYDROGRAPH AT
+                      2      .03      1   FLOW         30.      74.     123.      32.
                                           TIME       12.00    12.00    12.00    12.00

 2 COMBINED AT
+                 FLOW-1      .24      1   FLOW         96.     278.     689.      99.
                                           TIME       12.00    12.17    12.08    12.00

HYDROGRAPH AT
+                      5      .06      1   FLOW         50.     115.     190.      53.
                                           TIME       12.08    12.08    12.00    12.08

 2 COMBINED AT
+                 FLOW-2      .29      1   FLOW        145.     362.     877.     150.
                                           TIME       12.08    12.17    12.08    12.08

HYDROGRAPH AT
+                      3      .08      1   FLOW        102.     214.     334.     107.
                                           TIME       12.00    12.00    12.00    12.00

ROUTED TO
+                 X-POND      .08      1   FLOW         76.     187.     294.      82.
                                           TIME       12.08    12.08    12.08    12.08

                                       ** PEAK STAGES IN FEET **
                                       1   STAGE     297.00   298.54   299.64   297.10
                                           TIME       12.08    12.08    12.08    12.08

HYDROGRAPH AT
+                      4      .02      1   FLOW         13.      32.      55.      13.
                                           TIME       12.00    12.00    12.00    12.00

 2 COMBINED AT
+                  COMB1      .10      1   FLOW         86.     213.     349.      93.
                                           TIME       12.08    12.08    12.00    12.08

 2 COMBINED AT
+                  COMB2      .39      1   FLOW        231.     545.    1213.     243.
                                           TIME       12.08    12.08    12.08    12.08

ROUTED TO
+                   CR-1      .39      1   FLOW        212.     528.    1094.     227.
                                           TIME       12.08    12.17    12.17    12.08

HYDROGRAPH AT
+                    6-A      .03      1   FLOW         27.      62.     102.      28.
                                           TIME       12.00    12.00    12.00    12.00

 2 COMBINED AT
+                 FLOW-3      .42      1   FLOW        234.     568.    1165.     250.
                                           TIME       12.08    12.08    12.08    12.08

ROUTED TO
+                   CR-2      .42      1   FLOW        226.     560.    1146.     241.
                                           TIME       12.17    12.17    12.17    12.08

HYDROGRAPH AT
+                    6-B      .05      1   FLOW         32.      86.     150.      34.
                                           TIME       12.08    12.08    12.08    12.08

 2 COMBINED AT
+                 FLOW-4      .47      1   FLOW        257.     624.    1255.     275.
                                           TIME       12.08    12.17    12.17    12.08

ROUTED TO
+                   CR-3      .47      1   FLOW        251.     607.    1196.     269.
                                           TIME       12.25    12.33    12.33    12.25

HYDROGRAPH AT
+                      7      .05      1   FLOW         38.      97.     166.      40.
                                           TIME       12.00    12.00    12.00    12.00

 2 COMBINED AT
+                 FLOW-5      .52      1   FLOW        263.     628.    1230.     282.
                                           TIME       12.25    12.33    12.33    12.25
1

 *** NORMAL END OF HEC-1 ***
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X       XXXXX   X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

```
THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                          HEC-1 INPUT                                                  PAGE  1

 LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1         ID        WILLOW OAKS PROPOSED BMP/SWM POND AND OUTFALL
   2         ID        FAIRFAX COUNTY, VIRGINIA
   3         ID        SCS TYPE II, 24-HOUR RAINFALL DISTRIBUTION
   4         ID        FAIRFAX COUNTY PFM RAINFALL DEPTHS
   5         ID        2-YR AND 10-YR STORMS
   6         ID        FORESTED WATERSHED CONDITION
             *DIAGRAM
   7         IT      5               300
   8         IO      5
             *          2-YR     10-YR
   9         JR    PREC    3.2      5.2
             *

  10         KK       1
  11         KM  BASIN 1 RUNOFF HYDROGRAPH - ASSUME 130.1 ACRE WATERSHED IS COMPLETELY FORESTED
  12         BA   0.203
  13         PB       1
             * SCS TypeII Rainfall Distribution Pattern
  14         IN      6
  15         PC     0.0  .00101  .00202  .00305  .00408  .00513  .00618  .00725  .00832  .00941
  16         PC  .01050  .01161  .01272  .01385  .01498  .01613  .01728  .01845  .01962  .02081
  17         PC    .022  .02321  .02442  .02565  .02688  .02813  .02938  .03065  .03192  .03321
  18         PC  .03450  .03581  .03712  .03845  .03978  .04113  .04248  .04385  .04522  .04661
  19         PC    .048  .04941  .05084  .05229  .05376  .05525  .05676  .05829  .05984  .06141
  20         PC    .063  .06461  .06624  .06789  .06956  .07125  .07296  .07469  .07644  .07821
  21         PC     .08  .08181  .08364  .08549  .08736  .08925  .09116  .09309  .09504  .09701
  22         PC    .099  .10101  .10304  .10509  .10716  .10925  .11136  .11349  .11564  .11781
  23         PC     .12  .12225  .12460  .12705  .12960  .13225    .135  .13785  .14080  .14385
  24         PC    .147   .1502  .15340   .1566   .1598    .163  .16628  .16972  .17332  .17708
  25         PC    .181  .18512  .18948  .19408  .19892    .204   .2094   .2152   .2214    .228
  26         PC    .235  .24268  .25132  .26092  .27148    .283  .30684  .35436  .43079  .56786
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  28         PC    .772  .77796  .78364  .78904  .79416    .799   .8036    .808   .8122   .8162
  29         PC     .82  .82367  .82726  .83079  .83424  .83763  .84094  .84419  .84736  .85047
  30         PC  .85350  .85647  .85936  .86219  .86494  .86763  .87024  .87279  .87526  .87767
  31         PC     .88  .88229  .88455  .88679    .889  .89119  .89335  .89549   .8976  .89969
  32         PC  .90175  .90379   .9058  .90779  .90975  .91169   .9136  .91549  .91735  .91919
  33         PC    .921  .92279  .92455  .92629    .928  .92969  .93135  .93299   .9346  .93619
  34         PC  .93775  .93929   .9408  .94229  .94375  .94519   .9466  .94799  .94935  .95069
  35         PC    .952   .9533  .95459  .95588  .95716  .95844  .95971  .96098  .96224   .9635
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  37         PC    .977   .9782  .97939  .98058  .98176  .98294  .98411  .98528  .98644  .98760
  38         PC  .98875   .9899  .99104  .99218  .99331  .99444  .99556  .99668  .99779   .9989
  39         PC     1.0
  40         LS             62
  41         UD    0.25
             *
  42         ZZ
     PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                       FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                     TIME TO PEAK IN HOURS


                                                RATIOS APPLIED TO PRECIPITATION
OPERATION        STATION     AREA    PLAN            RATIO 1  RATIO 2
                                                       3.20     5.20

HYDROGRAPH AT
+                      1      .20      1   FLOW         39.     173.
                                           TIME       12.17    12.17

 *** NORMAL END OF HEC-1 ***
```

Application No PCA-87-P-038-04 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 7/6/2009
Date of (BOS) (PC) Approval 7/13/2009

Sheet 19 of 20

Dewberry®

Dewberry & Davis LLC
8403 ARLINGTON BLVD.
FAIRFAX, VA 22031
PHONE: 703.849.0100
FAX: 703.849.0519
www.dewberry.com

INOVA
WILLOW OAKS

PARTIAL GENERALIZED
DEVELOPMENT PLAN AMENDMENT

PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL
COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLEITON
Lic. No. 20112
6-10-09
PROFESSIONAL ENGINEER

KEY PLAN

SCALE

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE
Inova
Willow Oaks
Partial Generalized Development
Plan Amendment
HEC-1 Models

PROJECT NO.

19

SHEET NO. 19 OF 20

M-10690

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

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KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                  HEC-1 INPUT                                              PAGE  1

     LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

       1         ID        WILLOW OAKS PROPOSED BMP/SWM POND AND OUTFALL
       2         ID        FAIRFAX COUNTY, VIRGINIA
       3         ID        SCS TYPE II, 24-HOUR RAINFALL DISTRIBUTION
       4         ID        FAIRFAX COUNTY PFM RAINFALL DEPTHS
       5         ID        ULTIMATE CONDITIONS DEVELOPMENT
                 *DIAGRAM
       6         IT       5                    300
       7         IO       5
                 *           2-YR      10-YR     100-YR      OVERTOP
       8         JR    PREC     3.2       5.2      7.3      3.3
                 *

       9         KK       1
      10         KM  BASIN 1 RUNOFF HYDROGRAPH - ASSUME DEVELOPED SITE AREA IS BUILT OUT
      11         BA   0.203
      12         PB       1
                 * SCS TypeII Rainfall Distribution Pattern
      13         IN       6
      14         PC     0.0  .00101  .00202  .00305  .00408  .00513  .00618  .00725  .00832  .00941
      15         PC  .01050  .01161  .01272  .01385  .01498  .01613  .01728  .01845  .01962  .02081
      16         PC    .022  .02321  .02442  .02565  .02688  .02813  .02938  .03065  .03192  .03321
      17         PC  .03450  .03581  .03712  .03845  .03978  .04113  .04248  .04385  .04522  .04661
      18         PC    .048  .04941  .05084  .05229  .05376  .05525  .05676  .05829  .05984  .06141
      19         PC    .063  .06461  .06624  .06789  .06956  .07125  .07296  .07469  .07644  .07821
      20         PC     .08  .08181  .08364  .08549  .08736  .08925  .09116  .09309  .09504  .09701
      21         PC    .099  .10101  .10304  .10509  .10716  .10925  .11136  .11349  .11564  .11781
      22         PC     .12  .12225  .12460  .12705  .12960  .13225    .135  .13785  .14080  .14385
      23         PC    .147   .1502  .15340   .1566   .1598    .163  .16628  .16972  .17332  .17708
      24         PC    .181  .18512  .18948  .19408  .19892    .204   .2094   .2152   .2214    .228
      25         PC    .235  .24268  .25132  .26092  .27148    .283  .30684  .35436  .43079  .56786
      26         PC    .663  .68196  .69864  .71304  .72516    .735  .74344  .75136  .75876  .76564
      27         PC    .772  .77796  .78364  .78904  .79416    .799   .8036    .808   .8122   .8162
      28         PC     .82  .82367  .82726  .83079  .83424  .83763  .84094  .84419  .84736  .85047
      29         PC  .85350  .85647  .85936  .86219  .86494  .86763  .87024  .87279  .87526  .87767
      30         PC     .88  .88229  .88455  .88679    .889  .89119  .89335  .89549   .8976  .89969
      31         PC  .90175  .90379   .9058  .90779  .90975  .91169   .9136  .91549  .91735  .91919
      32         PC    .921  .92279  .92455  .92629    .928  .92969  .93135  .93299   .9346  .93619
      33         PC  .93775  .93929   .9408  .94229  .94375  .94519   .9466  .94799  .94935  .95069
      34         PC    .952   .9533  .95459  .95588  .95716  .95844  .95971  .96098  .96224   .9635
      35         PC  .96475    .966  .96724  .96848  .96971  .97094  .97216  .97338  .97459   .9758
      36         PC    .977   .9782  .97939  .98058  .98176  .98294  .98411  .98528  .98644  .98760
      37         PC  .98875   .9899  .99104  .99218  .99331  .99444  .99556  .99668  .99779   .9989
      38         PC     1.0
      39         LS              89
      40         UD     0.1
                 *

      41         KK    POND
      42         KM  ROUTE BASIN 1 ULTIMATE RUNOFF HYDROGRAPH THROUGH PROPOSED SWM POND
      43         RS       1    ELEV     301
      44         SA    1.75    1.88    2.15    2.33    2.49     2.6    2.77    2.95    3.12    3.16
      45         SE     301     302     304     306     308     310     312     314     316   316.5
      46         SQ       0     1.4    25.3    47.9   100.7   314.4  1098.8  2338.9  2671.6
      47         SE     301     302     306     308  310.75     312     314     316   316.5
                 *
1                                  HEC-1 INPUT                                              PAGE  2

     LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

      48         KK       2
      49         KM  BASIN 2 EXISTING RUNOFF HYDROGRAPH
      50         BA   0.034
      51         LS              75
      52         UD    0.10
                 *

      53         KK  FLOW-1
      54         KM  COMBINE BASIN 2 HYDROGRAPH TO POND HYDROGRAPH
      55         HC       2
                 *

      56         KK       5
      57         KM  BASIN 5 EXISTING RUNOFF HYDROGRAPH
      58         BA   0.058
      59         LS              77
      60         UD    0.15
                 *

      61         KK  FLOW-2
      62         KM  COMBINE BASIN 5 HYDROGRAPH TO FLOW-1 HYDROGRAPH
      63         HC       2
                 *

      64         KK       3
      65         KM  BASIN 3 EXISTING RUNOFF HYDROGRAPH
      66         BA    0.08
      67         LS              82
      68         UD    0.10
                 *

      69         KK  X-POND
      70         KM  ROUTE BASIN 3 EXISTING RUNOFF HYDROGRAPH THROUGH EX POND AT MONARCH RD
      71         RS       1    ELEV     290
      72         SA       0    0.22    0.24    0.56     1.8
      73         SE     290     292     295     300     305
      74         SQ       0     9.3    14.1    17.7   134.7   329.1   368.4  1197.7
      75         SE     290     292     294     296     298     300     302     304
                 *

      76         KK       4
      77         KM  BASIN 4 EXISTING RUNOFF HYDROGRAPH
      78         BA   0.016
      79         LS              73
      80         UD    0.10
                 *

      81         KK   COMB1
      82         KM  COMBINE X-POND HYDROGRAPH TO BASIN 4 HYDROGRAPH
      83         HC       2
                 *
1                                  HEC-1 INPUT                                              PAGE  3

     LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

      84         KK   COMB2
      85         KM  COMBINE FLOW-2 HYDROGRAPH TO COMB1 HYDROGRAPH
      86         HC       2
                 *

      87         KK    CR-1
      88         KM  CHANNEL ROUTE COMB2 HYDROGRAPH TO FLOW-3 NODE
      89         RD
      90         RC     0.1   0.045     0.1     600  0.0065
      91         RX       0     129     175     182     189     203     344     443
      92         RY  299.58  290.12  289.47  284.27  284.77  287.15  290.44  297.29
                 *

      93         KK     6-A
      94         KM  BASIN 6-A EXISTING RUNOFF HYDROGRAPH
      95         BA   0.027
      96         LS              77
      97         UD     0.1
                 *

      98         KK  FLOW-3
      99         KM  COMBINE BASIN 6-A HYDROGRAPH TO CR-1 HYDROGRAPH
     100         HC       2
                 *

     101         KK    CR-2
     102         KM  CHANNEL ROUTE FLOW-3 HYDROGRAPH TO FLOW-4 NODE
     103         RD
     104         RC     0.1   0.045     0.1     435  0.0104
     105         RX       0     142     215     217     225     229     266  366.07
     106         RY   294.7  283.95   282.6  278.65  278.73     283  283.59  294.78
                 *

     107         KK     6-B
     108         KM  BASIN 6-B EXISTING RUNOFF HYDROGRAPH
     109         BA   0.053
     110         LS              71
     111         UD    0.15
                 *

     112         KK  FLOW-4
     113         KM  COMBINE BASIN 6-B HYDROGRAPH TO CR-2 HYDROGRAPH
     114         HC       2
                 *

     115         KK    CR-3
     116         KM  CHANNEL ROUTE FLOW-4 HYDROGRAPH TO FLOW-5 NODE
     117         RD
     118         RC     0.1  0.0575     0.1    2550   0.008
     119         RX       0      32      66      75      85      89     161   220.2
     120         RY  285.54  278.13  272.61  265.49  266.48  268.98  272.76   286.5
                 *
1                                  HEC-1 INPUT                                              PAGE  4

     LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

     121         KK       7
     122         KM  BASIN 7 EXISTING RUNOFF HYDROGRAPH
     123         BA   0.048
     124         LS              73
     125         UD     0.1
                 *

     126         KK  FLOW-5
     127         KM  COMBINE BASIN 7 HYDROGRAPH TO CR-3 HYDROGRAPH
     128         HC       2
                 *
     129         ZZ
1
             SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    9          1
               V
               V
   41        POND
               .
               .
   48          .          2
               .          .
               .          .
   53     FLOW-1...........
               .
               .
   56          .          5
               .          .
               .          .
   61     FLOW-2...........
               .
               .
   64          .          3
               .          V
               .          V
   69          .       X-POND
               .          .
               .          .
   76          .          .          4
               .          .          .
               .          .          .
   81          .        COMB1...........
               .          .
               .          .
   84       COMB2...........
               V
               V
   87        CR-1
               .
               .
   93          .         6-A
               .          .
               .          .
   98     FLOW-3...........
               V
               V
  101        CR-2
               .
               .
  107          .         6-B
               .          .
               .          .
  112     FLOW-4...........
               V
               V
  115        CR-3
               .
               .
  121          .          7
               .          .
               .          .
  126     FLOW-5...........
```

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 3.20	RATIO 2 5.20	RATIO 3 7.30	RATIO 4 3.30
HYDROGRAPH AT +	1	.20	1	FLOW	345.	636.	939.	359.
				TIME	12.00	12.00	12.00	12.00
ROUTED TO +	POND	.20	1	FLOW	34.	106.	532.	37.
				TIME	12.67	12.42	12.17	12.58
			** PEAK STAGES IN FEET **					
			1	STAGE	306.81	310.78	312.56	307.02
				TIME	12.67	12.42	12.17	12.58
HYDROGRAPH AT +	2	.03	1	FLOW	30.	74.	123.	32.
				TIME	12.00	12.00	12.00	12.00
2 COMBINED AT +	FLOW-1	.24	1	FLOW	49.	136.	600.	52.
				TIME	12.00	12.08	12.08	12.00
HYDROGRAPH AT +	5	.06	1	FLOW	50.	115.	190.	53.
				TIME	12.08	12.08	12.00	12.08
2 COMBINED AT +	FLOW-2	.29	1	FLOW	98.	251.	789.	104.
				TIME	12.08	12.08	12.08	12.08
HYDROGRAPH AT +	3	.08	1	FLOW	102.	214.	334.	107.
				TIME	12.00	12.00	12.00	12.00
ROUTED TO +	X-POND	.08	1	FLOW	76.	187.	294.	82.
				TIME	12.08	12.08	12.08	12.08
			** PEAK STAGES IN FEET **					
			1	STAGE	297.00	298.54	299.64	297.10
				TIME	12.08	12.08	12.08	12.08
HYDROGRAPH AT +	4	.02	1	FLOW	13.	32.	55.	13.
				TIME	12.00	12.00	12.00	12.00
2 COMBINED AT +	COMB1	.10	1	FLOW	86.	213.	349.	93.
				TIME	12.08	12.08	12.00	12.08
2 COMBINED AT +	COMB2	.39	1	FLOW	184.	464.	1125.	197.
				TIME	12.08	12.08	12.08	12.08
ROUTED TO +	CR-1	.39	1	FLOW	168.	451.	1034.	179.
				TIME	12.17	12.08	12.17	12.08
HYDROGRAPH AT +	6-A	.03	1	FLOW	27.	62.	102.	28.
				TIME	12.00	12.00	12.00	12.00
2 COMBINED AT +	FLOW-3	.42	1	FLOW	187.	499.	1078.	202.
				TIME	12.08	12.08	12.17	12.08
ROUTED TO +	CR-2	.42	1	FLOW	181.	478.	1055.	192.
				TIME	12.17	12.08	12.17	12.08
HYDROGRAPH AT +	6-B	.05	1	FLOW	32.	86.	150.	34.
				TIME	12.08	12.08	12.08	12.08
2 COMBINED AT +	FLOW-4	.47	1	FLOW	209.	564.	1165.	226.
				TIME	12.08	12.08	12.17	12.08
ROUTED TO +	CR-3	.47	1	FLOW	204.	530.	1112.	220.
				TIME	12.25	12.25	12.33	12.25
HYDROGRAPH AT +	7	.05	1	FLOW	38.	97.	166.	40.
				TIME	12.00	12.00	12.00	12.00
2 COMBINED AT +	FLOW-5	.52	1	FLOW	216.	558.	1145.	233.
				TIME	12.25	12.25	12.33	12.25

1
*** NORMAL END OF HEC-1 ***

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
1                                  HEC-1 INPUT                                              PAGE  1

     LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

       1         ID        WILLOW OAKS PROPOSED BMP/SWM POND AND OUTFALL
       2         ID        FAIRFAX COUNTY, VIRGINIA
       3         ID        SCS TYPE II, 24-HOUR RAINFALL DISTRIBUTION
       4         ID        FAIRFAX COUNTY PFM RAINFALL DEPTHS
       5         ID        ULTIMATE CONDITIONS DEVELOPMENT
       6         ID        SPILLWAY DESIGN MODEL
       7         ID        SDF = 1.5 X 100-YR; FBH = 2.5 X 100-YR
                 *DIAGRAM
       8         IT       5                    300
       9         IO       5
                 *           SDF     FBH
      10         JR    PREC   10.95   18.25
                 *

      11         KK     ULT
      12         KM  BASIN ULTIMATE RUNOFF
      13         BA   0.203
      14         PB       1
                 * SCS TypeII Rainfall Distribution Pattern
      15         IN       6
      16         PC     0.0  .00101  .00202  .00305  .00408  .00513  .00618  .00725  .00832  .00941
      17         PC  .01050  .01161  .01272  .01385  .01498  .01613  .01728  .01845  .01962  .02081
      18         PC    .022  .02321  .02442  .02565  .02688  .02813  .02938  .03065  .03192  .03321
      19         PC  .03450  .03581  .03712  .03845  .03978  .04113  .04248  .04385  .04522  .04661
      20         PC    .048  .04941  .05084  .05229  .05376  .05525  .05676  .05829  .05984  .06141
      21         PC    .063  .06461  .06624  .06789  .06956  .07125  .07296  .07469  .07644  .07821
      22         PC     .08  .08181  .08364  .08549  .08736  .08925  .09116  .09309  .09504  .09701
      23         PC    .099  .10101  .10304  .10509  .10716  .10925  .11136  .11349  .11564  .11781
      24         PC     .12  .12225  .12460  .12705  .12960  .13225    .135  .13785  .14080  .14385
      25         PC    .147   .1502  .15340   .1566   .1598    .163  .16628  .16972  .17332  .17708
      26         PC    .181  .18512  .18948  .19408  .19892    .204   .2094   .2152   .2214    .228
      27         PC    .235  .24268  .25132  .26092  .27148    .283  .30684  .35436  .43079  .56786
      28         PC    .663  .68196  .69864  .71304  .72516    .735  .74344  .75136  .75876  .76564
      29         PC    .772  .77796  .78364  .78904  .79416    .799   .8036    .808   .8122   .8162
      30         PC     .82  .82367  .82726  .83079  .83424  .83763  .84094  .84419  .84736  .85047
      31         PC  .85350  .85647  .85936  .86219  .86494  .86763  .87024  .87279  .87526  .87767
      32         PC     .88  .88229  .88455  .88679    .889  .89119  .89335  .89549   .8976  .89969
      33         PC  .90175  .90379   .9058  .90779  .90975  .91169   .9136  .91549  .91735  .91919
      34         PC    .921  .92279  .92455  .92629    .928  .92969  .93135  .93299   .9346  .93619
      35         PC  .93775  .93929   .9408  .94229  .94375  .94519   .9466  .94799  .94935  .95069
      36         PC    .952   .9533  .95459  .95588  .95716  .95844  .95971  .96098  .96224   .9635
      37         PC  .96475    .966  .96724  .96848  .96971  .97094  .97216  .97338  .97459   .9758
      38         PC    .977   .9782  .97939  .98058  .98176  .98294  .98411  .98528  .98644  .98760
      39         PC  .98875   .9899  .99104  .99218  .99331  .99444  .99556  .99668  .99779   .9989
      40         PC     1.0
      41         LS              89
      42         UD    0.10
                 *
                 * ASSUME PROP. RISER IS CLOGGED AND START ROUTING AT TOP OF EMERGENCY SPILLWAY
1                                  HEC-1 INPUT                                              PAGE  2

     LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

      43         KK    POND
      44         KM  ROUTE BASIN ULT THROUGH PROPOSED SWM POND
      45         RS       1    ELEV  310.75
      46         SA    1.75    1.88    2.15    2.33    2.49     2.6    2.77    2.95    3.12    3.16
      47         SE     301     302     304     306     308     310     312     314     316   316.5
      48         SQ       0   184.5   916.7  2098.6    2444
      49         SE  310.75     312     314     316   316.5
                 *

      50         ZZ
```

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 10.95	RATIO 2 18.25
HYDROGRAPH AT +	ULT	.20	1	FLOW	1458.	2483.
				TIME	12.00	12.00
ROUTED TO +	POND	.20	1	FLOW	1273.	2231.
				TIME	12.08	12.00
			** PEAK STAGES IN FEET **			
			1	STAGE	314.60	316.19
				TIME	12.08	12.00

*** NORMAL END OF HEC-1 ***

Application No PCA-87-P-038-04 Staff WOD
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 7/6/2009
Date of (BOS) (PC) Approval 7/13/2009
Sheet 20 of 20

Dewberry®

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www.dewberry.com

INOVA
WILLOW OAKS
PARTIAL GENERALIZED
DEVELOPMENT PLAN AMENDMENT
PROVIDENCE DISTRICT
FAIRFAX COUNTY, VIRGINIA

SEAL
COMMONWEALTH OF VIRGINIA
TIMOTHY CHARLES CULLEITON
Lic. No. 20112
6.10.09
PROFESSIONAL ENGINEER

KEY PLAN

SCALE

No.	DATE	BY	Description
10	06.10.09	ARW	
9	06.05.09	ARW	
8	05.20.09	ARW	
7	04.20.09	ARW	
6	03.26.09	ARW	
5	02.19.09	ARW	
4	01.23.09	ARW	
3	10.09.08	ARW	
2	08.28.08	ARW	
1	07.31.08	ARW	

REVISIONS

DRAWN BY JMC
APPROVED BY
CHECKED BY PGY
DATE April 14, 2008

TITLE
Inova
Willow Oaks
Partial Generalized Development
Plan Amendment
HEC-1 Models

PROJECT NO.

20

SHEET NO. 20 OF 20

M-10690