

C Inventory of MS4 Outfalls

| Watershed | Road Intersection 1 | Road Intersection 2 | Easting | Northing |
|------------------|----------------------------|----------------------------------|----------------|-----------------|
| Potomac River | W - 15th Street | Freeway | 397021.7200 | 135199.0000 |
| Potomac River | I-295 | SOUTH CAPITOL | 398044.6810 | 126471.3950 |
| Potomac River | I-295 | SOUTH CAPITOL | 398019.4890 | 126876.2380 |
| Potomac River | I-295 | Potomac River | 397994.0770 | 126887.6640 |
| Potomac River | Ohio | Railway | 396817.3960 | 134365.4800 |
| Potomac River | Ohio | US -1N | 396754.1400 | 134423.7700 |
| Potomac River | T Roosevelt Bridge | Potomac Parkway | 395110.9200 | 136243.6300 |
| Potomac River | Potomac Parkway | F Street | 395084.3450 | 136623.4640 |
| Potomac River | Potomac Parkway | | 395087.0310 | 136719.6890 |
| Potomac River | 34th | Water Street | 394119.9000 | 137290.2900 |
| Potomac River | Canal Road | M Street | 393137.7336 | 137496.9499 |
| Potomac River | Arizona | Clara Barton Parkway/ Canal Road | 390667.2740 | 139613.0730 |
| Potomac River | Joliet | 1st Street; SE | 399566.4060 | 128218.1580 |
| Potomac River | South Captiol St., SE | 1st St., SE | 399591.0300 | 128364.8240 |
| Potomac River | South Capitol St., SE | Livingston Rd., SE | 399611.4720 | 128366.1890 |
| Potomac River | South Capitol St | 1st St. | 399621.3060 | 128564.7450 |
| Potomac River | South Capitol St | 1st St. | 399621.1940 | 128560.8540 |
| Potomac River | Elmira St. | 1st St. | 399598.8430 | 128704.1920 |
| Potomac River | First | Elmira | 399603.2400 | 128729.8590 |
| Potomac River | 1st | Livingston | 399567.9850 | 128801.9570 |
| Potomac River | 1st St. | Danbury | 399528.3300 | 128891.0500 |
| Potomac River | 1st St | Chesapeake St. | 399536.4800 | 129024.5100 |
| Potomac River | Atlantic Ave. | 1st St. | 399571.9630 | 129112.6460 |
| Potomac River | Yuma | Valley St. | 399752.6620 | 129450.7120 |
| Potomac River | Atlantic Ave. | | 399651.5860 | 129239.1080 |
| Potomac River | Atlantic Ave | | 399668.7870 | 129230.7920 |
| Potomac River | End of Yuma | North of Atlantic | 399720.4980 | 129356.6280 |
| Potomac River | Atlantic Ave., SE | Valley Ave., SE | 399715.8950 | 129310.2930 |
| Potomac River | Wayne Place, SE | 2nd St., SE | 399791.1450 | 129509.1250 |
| Potomac River | 4th St., SE | Wayne Place, SE | 399924.4420 | 129584.1890 |
| Potomac River | 4th | Wayne Place | 399940.9300 | 129565.8600 |
| Potomac River | Parallel to Valley | | 400185.6370 | 129721.6680 |
| Potomac River | Valley | 6th St. | 400215.1160 | 129791.8130 |
| Potomac River | Mississippi Ave SE | 6th St SE | 400235.7787 | 129822.4162 |
| Potomac River | Wheeler Rd. | 7th St. | 400345.2070 | 129916.5330 |
| Potomac River | Valley Ave., SE | 9th St., SE | 400288.7750 | 129850.4520 |
| Potomac River | Valley Ave., SE | Wheeler Rd., SE | 400576.9067 | 129959.2590 |
| Potomac River | Mississippi Ave., SE | Wheeler Ave., SE | 400505.3560 | 129976.5890 |
| Potomac River | Wheeler Road | | 400539.7120 | 129958.6120 |
| Potomac River | Mississippi St. | Wheeler | 400938.8640 | 130066.7460 |
| Potomac River | Mississippi St. | | 400737.7660 | 130024.5110 |
| Potomac River | Mississippi St. | | 400756.4620 | 130047.3700 |
| Potomac River | Mississippi St. | 13th | 400986.0600 | 130093.4230 |
| Potomac River | Mississippi | +/- Mildred Green ES | 401423.9140 | 130310.1400 |

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|------------------|----------------------------|---------------------------------|----------------|-----------------|
| Potomac River | Mississippi | Mildred Green ES | 401397.1440 | 130314.3150 |
| Potomac River | Mississippi Ave., SE | Stanton Rd., SE | 401846.9650 | 130504.1290 |
| Potomac River | Mississippi Ave. | Stanton Road | 401909.0950 | 130448.2040 |
| Potomac River | Mississippi Ave. | 19th street | 402052.8780 | 130538.2010 |
| Potomac River | Mississippi Ave. | 19th St. | 402202.9822 | 130562.0592 |
| Potomac River | | | 402263.5016 | 130606.4910 |
| Potomac River | Mississippi Ave | SOUTH CAPITOL | 402330.3520 | 130618.7100 |
| Potomac River | Southern Ave. | | 402327.2270 | 130623.0983 |
| Anacostia River | FD Bridge | Bus Station | 399594.0334 | 133186.6284 |
| Anacostia River | FD Bridge | Bust Station | 399597.0148 | 133191.7915 |
| Anacostia River | Access Road | 11th street Bridge | 400026.4200 | 133522.6500 |
| Anacostia River | Anacostia Drive SE | 6 St. Bridge SE | 400257.2680 | 133444.7590 |
| Anacostia River | Good Hope | Fairlarn | 400787.1000 | 133532.4400 |
| Anacostia River | Access Road | Anacostia Bridge | 401275.4190 | 133892.9920 |
| Anacostia River | Anacostia Drive, NE | Pennsylvania Ave. | 401609.1110 | 134085.0780 |
| Anacostia River | Nicholsen | Anacostia Drive | 401975.2820 | 134237.7880 |
| Anacostia River | Nicholsen | Anacostia Drive | 402365.7140 | 134403.9830 |
| Anacostia River | Access Road | Boat launch ramp 300' | 402224.9700 | 134334.8150 |
| Anacostia River | Access Road | Boat launch ramp 200' | 402414.5800 | 134445.9260 |
| Anacostia River | Park Access Road | Boat launch ramp +/- 110' south | 402514.5510 | 134612.9360 |
| Anacostia River | C Street | 295 | 403144.6000 | 135385.2100 |
| Anacostia River | Anacostia Ave NE | East Capitol Street SE | 403245.5170 | 135709.3690 |
| Anacostia River | E. Capitol Bridge | 295 | 403248.8100 | 135726.8900 |
| Anacostia River | Anacostia Road | East Capitol | 403268.2320 | 135797.2660 |
| Anacostia River | Anacostia Road | | 403360.7090 | 136207.8780 |
| Anacostia River | Anacostia Avenue | Benning Road | 403374.2150 | 136472.2520 |
| Anacostia River | Hayes St., SE | Anacostia Ave., SE | 404179.0900 | 137397.8800 |
| Anacostia River | 2ND ST SW | V ST SW | 398815.0254 | 132856.1944 |
| Anacostia River | Half Street | W Street | 399152.5570 | 133129.9960 |
| Anacostia River | Half Street | T Street | 399206.5400 | 133230.6970 |

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|------------------|-----------------------------|---------------------------------------|----------------|-----------------|
| Anacostia River | Potomac Avenue | First Street | 399493.7650 | 133739.5860 |
| Anacostia River | 12th St., SE | Water St., SE | 401433.0000 | 134277.2500 |
| Anacostia River | Barnie Circle Eastbound, SE | G St., SE | 402407.6700 | 134839.9400 |
| Anacostia River | RFK Statdium | E. Capitol St. Bridge | 402742.1840 | 135965.4400 |
| Anacostia River | Benning Road, NE | Oklahoma Ave., NE | 402710.9290 | 136139.8560 |
| Anacostia River | Langston Golf Course | Driving range | 403000.8500 | 136711.1430 |
| Anacostia River | Langston Golf Course | | 402744.1600 | 137417.5260 |
| Anacostia River | 36th Place | Service Road of Arboretum | 403841.4640 | 138716.6330 |
| Anacostia River | New York Ave | East Bound Ramp | 404116.1450 | 138862.9504 |
| Anacostia River | New York Ave | East Bound Ramp | 404118.4954 | 138863.0309 |
| Anacostia River | New York Ave | South Dakota | 404070.3020 | 138937.3070 |
| Anacostia River | Fort Lincoln Dr. | 34th St. | 404529.0380 | 139437.7110 |
| Anacostia River | New York Ave | National Arboretum N.Y. Ave Entrance | 402679.1870 | 138798.8010 |
| Anacostia River | Hickey Lane Crossing | In National Arboretum | 402867.9514 | 138524.9284 |
| Anacostia River | Hickey Lane Crossing | In National Arboretum | 402875.1140 | 138540.9990 |
| Anacostia River | New York Ave | Spring House Rd in National Arboretum | 403299.8119 | 138748.7937 |
| Anacostia River | End of Dean Ave. | | 404049.6800 | 137620.7100 |
| Anacostia River | Mayfair | Anacostia | 404407.3100 | 137666.8920 |
| Anacostia River | Mayfair | Anacostia | 404410.5180 | 137625.4740 |
| Anacostia River | Mayfair | Anacostia | 404558.6920 | 137435.6730 |
| Anacostia River | | | 404734.5421 | 137217.7291 |
| Anacostia River | Kennilworth Terr. | Mayfair | 404739.3330 | 137177.7030 |
| Anacostia River | Kennilworth Ave | Jay | 404784.1140 | 137094.8160 |
| Anacostia River | Kennilworth Ave., NE | Jay Street., NE | 404827.5670 | 137079.8724 |
| Anacostia River | Minnesota Ave., SE | RR Bridge | 404889.2360 | 137048.0080 |
| Anacostia River | Nannie Helen Burroughs Ave | Pedestrian Bridge | 404978.7720 | 137039.1780 |
| Anacostia | Nannie Helen Burroughs Ave | | 404997.5670 | 137044.7480 |

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|------------------|----------------------------|----------------------------------|----------------|-----------------|
| River | | | | |
| Anacostia River | Hunt Place Overpass | | 405039.1840 | 136972.5440 |
| Anacostia River | Paralled to Hunt Place | | 405091.4984 | 136914.7859 |
| Anacostia River | Parallel to Helen Place | | 405130.2850 | 136880.4510 |
| Anacostia River | | | 405131.8060 | 136857.5210 |
| Anacostia River | Under Gault St Bridge | | 405193.0540 | 136799.9000 |
| Anacostia River | 44th Street Bridge, NW | Grant St., NW | 405271.0050 | 136752.6950 |
| Anacostia River | 44th | Grant | 405323.9030 | 136737.5240 |
| Anacostia River | 46th | Gualt | 405499.3960 | 136764.1200 |
| Anacostia River | Below 48th Street Bridge | | 405721.7070 | 136654.0520 |
| Anacostia River | 49th Street, NE | Nannie Hellen Burroughs Road, NE | 405931.3100 | 136774.3100 |
| Anacostia River | 49th | | 405877.7646 | 136692.1101 |
| Anacostia River | 50th Street | Nannie Hellen Burroughs | 406090.7000 | 136707.1700 |
| Anacostia River | 49th Street | Nannie Hellen Burroughs | 406011.6900 | 136710.3300 |
| Anacostia River | 49 Place | Nannie Hellen Burroughs | 406017.0500 | 136748.9600 |
| Anacostia River | | | 406152.2528 | 136725.5944 |
| Anacostia River | 54th | | 406538.2840 | 136436.4870 |
| Anacostia River | Division St. | | 406371.6590 | 136532.2930 |
| Anacostia River | Divison Ave Bridge | East Side | 406405.8280 | 136523.6110 |
| Anacostia River | | | 406592.5300 | 136427.0700 |
| Anacostia River | 55th | EADS | 406741.7030 | 136346.7340 |
| Anacostia River | Below 55th Brdg | Dix | 406778.4850 | 136337.1980 |
| Anacostia River | 56th | | 406878.5230 | 136303.4500 |
| Anacostia River | 57th | Clay Place | 406991.3200 | 136267.7680 |
| Anacostia River | 57th | Clay Place as described | 407003.2800 | 136259.3800 |
| Anacostia River | East of Pedestrian Brdg | | 407082.3900 | 136221.0700 |
| Anacostia | 58th | | 407111.1774 | 136146.6907 |

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|------------------|--------------------------------|----------------------------|----------------|-----------------|
| River | | | | |
| Anacostia River | 58th St., NW | Clay St., NW | 407156.8800 | 136123.0800 |
| Anacostia River | Under 58th St. Brdg | Clay | 407135.1300 | 136133.0310 |
| Anacostia River | 60th St., NE | Clay St., NE | 407360.0028 | 135987.6850 |
| Anacostia River | Under 61st St Brdg/Culvert | | 407479.2100 | 135968.7300 |
| Anacostia River | Under 61st St Brdg/Culvert | | 407484.3490 | 135962.6310 |
| Anacostia River | Bank | 61st | 407569.1600 | 135985.2800 |
| Anacostia River | 63rd | | 407631.1900 | 135945.1000 |
| Anacostia River | Southern Ave., SE | Bank Place, SE | 407650.6230 | 135906.8470 |
| Anacostia River | E. Capital St. | Southern Ave. | 407471.0209 | 135794.4478 |
| Potomac River | 17th Street | Independence | 396640.4100 | 135551.7500 |
| Potomac River | W - 15th Street | Freeway | 397034.6500 | 135187.3700 |
| Potomac River | W - 15th Street | Freeway | 397050.5100 | 135169.4000 |
| Potomac River | 15th Street | SW Freeway | 397093.3700 | 135107.5900 |
| Potomac River | Raoul Wallenberg Pl. | Maine Ave. SW | 397109.9100 | 135067.9000 |
| Potomac River | 15th Street | Ohio | 397024.9900 | 134925.1700 |
| Potomac River | Water Street | Under Ramp F | 397466.6300 | 134917.0700 |
| Potomac River | Water Street | | 397573.6500 | 134840.5700 |
| Potomac River | 9th Street | Water Street | 397702.9300 | 134698.8000 |
| Potomac River | 9th Street | Water Street | 397760.9900 | 134641.8300 |
| Potomac River | 7th Street | Water Street | 397923.5000 | 134476.9200 |
| Potomac River | 7th Street | Water Street | 397947.8300 | 134452.8700 |
| Potomac River | East of 7th Street | Water Street | 398006.7500 | 134394.5800 |
| Potomac River | Water Street | 6th Street | 398200.9900 | 134068.1100 |
| Potomac River | 4th Street | O Street | 398257.1190 | 133930.8510 |
| Potomac River | 4th Street | O Street | 398281.8620 | 133871.8170 |
| Potomac River | 4th Street | P Street | 398316.7100 | 133797.1700 |
| Potomac River | Ohio | Washington Channel Drive | 397278.5400 | 134736.7300 |
| Potomac River | SW - Express Freeway Main Ave. | | 397299.4800 | 134975.6200 |
| Rock Creek | Virginia Ave | Rock Creek Parkway | 394994.1400 | 136980.0100 |
| Rock Creek | Potomac | Whitehurst Rd. Bridge | 394987.2300 | 137147.1100 |
| Rock Creek | Rock Creek Parkway | K ST. | 394986.4417 | 137160.4204 |
| Rock Creek | Rock Creek Parkway | K-street Bridge | 395008.4625 | 137198.6884 |
| Rock Creek | Rock Creek Parkway | C & O Canal | 395108.2220 | 137339.7390 |
| Rock Creek | Rock Creek Parkway | P Street | 395662.7813 | 137943.4967 |
| Rock Creek | Massachusetts Ave | California Ave | 395078.5167 | 138484.1841 |
| Rock Creek | Massachusetts Ave | Belmont | 394988.9808 | 138556.4821 |

| Watershed | Road Intersection 1 | Road Intersection 2 | Easting | Northing |
|------------------|-----------------------------|-------------------------------------|----------------|-----------------|
| Rock Creek | Massachusetts Ave | Belmont | 394902.1719 | 138722.4668 |
| Rock Creek | Rock Creek Pkwy | Massachusetts Ave (under bridge) | 395046.0492 | 138963.2751 |
| Rock Creek | Waterside | Rock Creek & Potomac Parkway | 395183.3606 | 139021.6763 |
| Rock Creek | Rock Creek Parkway | U.S. PP Horse Center | 395664.1468 | 139314.9600 |
| Rock Creek | Porter St., NW | Kling Road, NW | 395578.1400 | 140592.9200 |
| Rock Creek | | | 395584.2200 | 140595.3000 |
| Rock Creek | Porter St. | Beech St. | 395705.1500 | 140640.2200 |
| Rock Creek | Beach Drive | Tilden | 395517.3400 | 141302.2390 |
| Rock Creek | Beach Drive | Tilden Drive | 395527.2280 | 141327.1350 |
| Rock Creek | Morrow Drive, NW | Madison St. NW | 396565.8200 | 143461.2200 |
| Rock Creek | Morrow Drive, NW | Montague St. NW | 396643.6200 | 143507.7400 |
| Rock Creek | Joyce Road, NW | Beach Dr., NW | 396264.5020 | 143671.8640 |
| Rock Creek | Under Military Rd Bridge | | 396211.0540 | 143740.8730 |
| Rock Creek | Oregon Ave, NW | Nebraska Ave, NW | 395385.9005 | 144716.8294 |
| Rock Creek | 16th | Whittier | 396796.5600 | 144843.2500 |
| Rock Creek | 16th St., NW | Alaska Ave., NW | 396810.9200 | 145113.4500 |
| Rock Creek | 16th St. | Alaska Ave | 396822.3100 | 145236.8400 |
| Rock Creek | Daniel Lane | Oregon | 395479.9000 | 145967.3200 |
| Rock Creek | | | 396655.6700 | 145852.5200 |
| Rock Creek | Holly | 17th | 396740.3500 | 145869.5600 |
| Rock Creek | 17th | Jonquil | 396547.9710 | 146040.7320 |
| Rock Creek | End Juniper cul-de-sac | | 396514.9500 | 146180.4200 |
| Rock Creek | End of Juniper; cul-de-sac | | 396515.4500 | 146171.9800 |
| Rock Creek | West Beach Dr., NW | | 396388.2000 | 146222.5210 |
| Rock Creek | 29th Street | C&O Canal | 395071.7000 | 137329.7800 |
| Potomac River | Canal Road, NW | Whitehurst Pkw, NW | 393772.5900 | 137470.3000 |
| Potomac River | 37TH | Canal Road | 393731.2600 | 137481.9100 |
| Potomac River | Reservoir Road | V St. | 391423.5700 | 138796.6200 |
| Rock Creek | 32nd | S Street | 394426.5600 | 138670.2300 |
| Rock Creek | End of Whitehaven St | | 394222.9200 | 138871.6000 |
| Rock Creek | Rock Creek Drive | Normanstone | 395129.1569 | 139093.8324 |
| Rock Creek | Normanstone | Edgevale | 395124.6567 | 139099.8648 |
| Rock Creek | Normanstone Dr. | Rock Creek Dr. | 395100.3547 | 139124.0546 |
| Rock Creek | Normanstone Dr. NW (2800's) | Rock Creek Dr. NW(2600's) | 395081.5000 | 139150.8100 |
| Rock Creek | Rock Creek Dr. NW (2600's) | Normanstone Dr. NW (2800's) | 395049.3100 | 139172.0200 |
| Rock Creek | Normanstone Lane | Normanstone Drive | 394924.6972 | 139254.0267 |
| Rock Creek | 30th Street | Normanstone | 394765.8263 | 139354.2431 |
| Rock Creek | 33rd Place | Garfield | 394314.7000 | 139885.4000 |
| Rock Creek | Military Road | Kling | 395291.4000 | 140557.3000 |
| Rock Creek | Connecticut Ave | McComb | 395169.3570 | 140517.9970 |
| Rock Creek | Devonshire Place | Connecticut Ave | 395121.0072 | 140505.5413 |
| Rock Creek | Connecticut Ave | McComb | 395118.2716 | 140502.0186 |
| Rock Creek | Connecticut Ave | McComb | 395068.7600 | 140502.8900 |

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|------------------|----------------------------|----------------------------|----------------|-----------------|
| Rock Creek | Cortland | Klinge | 394857.2700 | 140301.7900 |
| Rock Creek | Beach | Piney Branch | 395941.1765 | 140840.8535 |
| Rock Creek | Piney Branch | Park Road Bridge | 396060.6464 | 140907.5969 |
| Rock Creek | Piney Branch | 17th Street | 396273.9975 | 140911.1777 |
| Rock Creek | Piney Branch | Park Road Bridge | 396180.5592 | 140907.3008 |
| Rock Creek | Piney Branch | 17th Street | 396415.1864 | 140927.8598 |
| Rock Creek | Piney Branch | 17th Street | 396473.0200 | 140964.4000 |
| Rock Creek | Piney Branch | 17th Street | 396496.6100 | 141010.6200 |
| Rock Creek | Piney Branch | 17th Street | 396546.1000 | 141010.3900 |
| Rock Creek | Piney Branch Pkwy. NW | 17th St. NW | 396611.2100 | 141027.7600 |
| Rock Creek | Rodman | Quebec | 394424.5490 | 141338.6890 |
| Rock Creek | Rodman | Quebec | 394285.0000 | 141339.7700 |
| Rock Creek | Rodman | Quebec | 394524.3530 | 141280.9660 |
| Rock Creek | Tilden St., NW | Reno St., NW | 394194.3900 | 141357.7600 |
| Rock Creek | Blagden Ave., NW | Mathewson Drive, NW | 395930.0500 | 141623.4100 |
| Rock Creek | Albemerle | Broad Branch | 395301.8200 | 142048.5400 |
| Rock Creek | Albemerle | Broad Branch | 395123.8012 | 142078.5483 |
| Rock Creek | Audobon Terrace | 29th St | 394903.5139 | 142011.1103 |
| Rock Creek | Connecticut Ave NW | Albermarle | 394455.7628 | 142074.1254 |
| Rock Creek | Albemarle | 32nd St. | 394447.4700 | 142181.4000 |
| Rock Creek | Broad Branch | Albemarled | 395532.6800 | 142369.8600 |
| Rock Creek | Broad Branch | Brandywine | 395428.6855 | 142480.5739 |
| Rock Creek | | | 395298.6300 | 142676.4700 |
| Rock Creek | Broad Branch | Chesterfield Pl. | 395187.3300 | 142832.2700 |
| Rock Creek | | | 395032.4100 | 142749.7100 |
| Rock Creek | | | 395040.4400 | 142759.5900 |
| Rock Creek | | | 395022.6800 | 142960.9500 |
| Rock Creek | 27th ST NW | Broadway | 394945.0200 | 143126.3500 |
| Rock Creek | 30th St., NW | Military Rd., NW | 394815.4200 | 143660.1700 |
| Rock Creek | Newlands Road, NW | Kanawha St., NW | 394950.1164 | 143890.1610 |
| Rock Creek | Broad Branch Road, NW | 27th St., NW | 394805.7985 | 143325.1541 |
| Rock Creek | Fessenden St. | Broad Branch Terrace | 394358.9500 | 143010.9700 |
| Rock Creek | Joyce Road | Military | 396393.9000 | 143773.0600 |
| Rock Creek | Joyce Rd | Military Rd Bridge | 396572.6900 | 143874.8400 |
| Rock Creek | Joyce Rd | Military Rd Bridge | 396612.8148 | 143947.0924 |
| Rock Creek | Fort Stevens St., NW | 16th Street, NW | 396811.5000 | 144102.2000 |
| Rock Creek | Oregon Ave | Beach | 395449.0400 | 145392.1000 |
| Rock Creek | Beech Road, NW | Oregon Ave., NW | 395429.4100 | 145407.8100 |
| Rock Creek | Beech | | 395342.1100 | 145472.2600 |
| Rock Creek | 31st | Aberfoyle | 395291.3500 | 145463.6300 |
| Rock Creek | Beech | | 395251.7800 | 145558.1800 |
| Rock Creek | Beech Street | 32nd Street | 395095.9500 | 145578.4400 |
| Rock Creek | | | 395064.5459 | 145607.9554 |
| Rock Creek | Barnaby NW | Aberfoyle | 394858.5100 | 145564.5300 |
| Rock Creek | Western Ave | Aberfoyle | 394694.4700 | 145589.7400 |

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| Rock Creek | Western Ave | Beech | 394602.1100 | 145611.2000 |
| Rock Creek | Western Ave | Beech | 394547.7800 | 145612.0000 |
| Rock Creek | W. Beach | Parkside Dr. | 396341.3760 | 146295.1370 |
| Rock Creek | West Beach Road, NW | Parkside Drive, NW | 396350.9360 | 146395.4840 |
| Rock Creek | Kalimia | West Beach | 396321.7600 | 146472.5400 |
| Rock Creek | Kalmia | West Beach | 396320.9100 | 146514.0800 |
| Rock Creek | West Beech Drive | Sudsbury Lane | 396251.9736 | 146658.3857 |
| Rock Creek | North Portal Drive | | 396288.7070 | 146656.7580 |
| Rock Creek | Yorktown | West Beach | 396254.6529 | 146731.8187 |
| Rock Creek | West Beach | | 396155.0562 | 147270.1286 |
| Rock Creek | Red-wood Terrace | East Beach | 396254.8812 | 146754.9913 |
| Rock Creek | Sycamore | East Beach | 396201.0360 | 146897.5810 |
| Rock Creek | West Beach | Primrose Drive | 396148.3020 | 146946.6700 |
| Rock Creek | West Beech Terrace | Primrose | 396141.4269 | 147028.5705 |
| Rock Creek | W. Beach | | 396148.8430 | 147117.2600 |
| Rock Creek | | | 396314.6877 | 146631.4214 |
| Rock Creek | | | 396424.4526 | 146701.0465 |
| Rock Creek | Portal | Primrose | 396500.3519 | 146780.5013 |
| Rock Creek | | | 396551.8810 | 146836.5480 |
| Rock Creek | | | 396575.1100 | 146847.7300 |
| Rock Creek | | | 396638.0090 | 146913.4960 |
| Rock Creek | | | 396737.7000 | 146979.9000 |
| Rock Creek | 16th St., NW | North Portal, NW | 396808.5100 | 147045.3100 |
| Potomac River | 44th Street | W Street | 392650.4100 | 139026.7600 |
| Potomac River | 44th Street | Dexter | 392468.7900 | 139450.1900 |
| Potomac River | 42nd Street | Edmundson Street | 392900.5380 | 139647.1990 |
| Potomac River | New Mexico Avenue, NW | Garfield Street, NW | 392836.9550 | 139932.9180 |
| Potomac River | New Mexico Ave. NW | Garfield Street, NW | 392837.0135 | 139931.8521 |
| Potomac River | 39th | Langley | 393076.3600 | 140829.8300 |
| Potomac River | Langely Circle | unnamed road | 393111.6620 | 141034.8520 |
| Potomac River | 39th Street | Langley near Rodman | 393117.8500 | 141074.3300 |
| Potomac River | 40th Street | Hospital | 393119.0500 | 141488.6200 |
| Potomac River | 44th Street | Edmundson Street | 392531.4710 | 139773.5010 |
| Potomac River | Canal Road | Reservoir | 391198.9413 | 139156.6443 |
| Potomac River | 49th NW | Calvert | 391643.8500 | 139477.8300 |
| Potomac River | 49th St NW | Calvert | 391726.0300 | 139707.4200 |
| Potomac River | 49th Street | Fulton Street | 391794.9800 | 139807.3800 |
| Potomac River | Foxhall Road, NW | Fulton Street, NW | 392162.2100 | 139834.0100 |
| Potomac River | 49th St NW | Garfield | 391857.5140 | 139955.9880 |
| Potomac River | 49th St. | Hawthorne | 391850.8500 | 140089.9100 |
| Potomac River | Nebraska Avenue | Foxhall Road | 392023.9420 | 140426.4650 |
| Potomac River | Nebraska Avenue | Foxhall Road | 392072.5200 | 140494.1640 |
| Anacostia River | Chestnut | Elm | 403468.8110 | 140331.7060 |
| Anacostia River | 34th in MD | Otis in MD | 403386.5340 | 140714.9090 |

| Watershed | Road Intersection 1 | Road Intersection 2 | Easting | Northing |
|------------------|----------------------------|---------------------------------|----------------|-----------------|
| Anacostia River | 22nd St., SE | Varnum., SE | 402245.5250 | 141662.6550 |
| Anacostia River | Gallatin | 14th St. NE | 401259.8840 | 142596.6170 |
| Anacostia River | Kennedy | Eastern Ave | 400759.7490 | 143241.0570 |
| Anacostia River | Eastern | Quakenbos | 400001.4440 | 143996.7580 |
| Anacostia River | Eastern | Rittenhouse | 399904.7130 | 144124.6810 |
| Anacostia River | Eastern | Kansas | 399472.7820 | 144497.9760 |
| Anacostia River | Eastern | 2nd in MD | 399346.0900 | 144659.6260 |
| Anacostia River | Eastern (MD & DC) | Walnut | 399069.4930 | 144949.6590 |
| Anacostia River | Cedar Street | Eastern Ave | 398541.3500 | 145445.4600 |
| Rock Creek | | | 396439.7130 | 146745.7350 |
| Rock Creek | Western Ave | Between Wyndale NW | 395117.2900 | 146233.4500 |
| Rock Creek | Western Ave | Pinehurst PKWY NW | 394820.1200 | 145919.3300 |
| Potomac River | Western Ave | McKinley | 393024.7800 | 144121.2900 |
| Potomac River | Jenifer | 44th | 392469.7400 | 143545.2200 |
| Potomac River | Western Ave | 45th St. | 392304.4300 | 143372.5000 |
| Potomac River | NW Western Ave | Harrison Street (Maryland Side) | 392143.8100 | 143244.8500 |
| Potomac River | Western Ave | Ellicot | 391787.2600 | 142881.3300 |
| Potomac River | Dalecarlia Parkway | Warren Place | 391033.6270 | 141977.5870 |
| Potomac River | 50th Street, NW | 50th Place, NW | 391413.9060 | 141962.9070 |
| Potomac River | Dalecarlia Parkway | Warren Place | 390982.3400 | 141727.7400 |
| Potomac River | Rockwood Parkway | Dalecarlia | 390978.5600 | 141222.0100 |
| Potomac River | Clara Barton Pkw, nW | Chain Bridge Rd. NW | 390294.0611 | 140402.1690 |
| Potomac River | Chain Bridge Road | Sherrier | 391022.1600 | 139627.9630 |
| Potomac River | Sherrier Pl | Chain Bridge Road | 391050.9771 | 139494.2750 |
| Potomac River | Sherrier Pl | Chain Bridge Road | 391099.2100 | 139492.9800 |
| Anacostia River | Central | Vista | 403102.9360 | 140069.0900 |
| Anacostia River | Douglas St., NE | Kenilworth Ave., NE | 405444.1420 | 137944.0030 |
| Anacostia River | Polk Street, NE | 44th St., NE | 405185.2160 | 137986.7620 |
| Anacostia River | Polk St NE | Douglas Street NE | 405034.7358 | 138067.0634 |
| Anacostia River | Torque Street | Southern Avenue | 405502.1200 | 133753.9800 |
| Potomac River | Ft. Dupont | Southern Ave. | 404700.8980 | 132991.8640 |
| Potomac River | Southern Ave., SE | Suitland Rd., SE | 404259.6380 | 132529.6680 |
| Potomac River | Southern Ave. | 36 Pl/ Oxen Run Pl. | 404010.7820 | 132287.5180 |

| Watershed | Road Intersection 1 | Road Intersection 2 | Easting | Northing |
|------------------|----------------------------|----------------------------|----------------|-----------------|
| Potomac River | Fairhill Drive | Southern Ave. | 403734.8320 | 131988.2400 |
| Potomac River | Branch Ave. | Gainsville St. | 403575.6710 | 131958.7080 |
| Potomac River | Frankford St. | Branch Ave. | 403549.2860 | 132072.1250 |
| Potomac River | Southern | 30th | 403202.4465 | 131446.1235 |
| Potomac River | Savanah Road; SE | | 402857.1703 | 131231.0935 |
| Anacostia River | 24th | Alabama | 402339.4000 | 131557.4100 |
| Potomac River | Southern Ave. | Galveston | 400160.4190 | 128423.7560 |
| Potomac River | Galveston | Southern Ave. | 400141.6827 | 128399.2619 |
| Potomac River | Southern Ave. | 6th St. | 400070.4773 | 128328.7661 |
| Potomac River | Southern Ave. | South Capitol | 400000.3260 | 128245.9670 |
| Potomac River | Southern Ave. | South Capitol | 399888.5757 | 128158.4255 |
| Anacostia River | D St. | Burns Ave. | 404814.5160 | 135233.2501 |
| Anacostia River | Douglas Street NE | Polk Street NE | 405036.3330 | 138075.6200 |
| Anacostia River | C Street | Burbank Street | 404764.3000 | 135412.0500 |
| Anacostia River | Burbank Street | C Street | 404687.1900 | 135412.2000 |
| Anacostia River | Ridge | ""E"" St." | 404639.5980 | 134988.7080 |
| Anacostia River | E Street SE | 32nd st alley | 403222.6400 | 134936.1500 |
| Anacostia River | G Street | Minnesota | 403535.7100 | 134803.0700 |
| Anacostia River | Minnesota | G St.; Randall Circle | 403522.5170 | 134806.6760 |
| Anacostia River | F Street | Minnesota | 403579.3422 | 134867.1421 |
| Anacostia River | G Street | Minnesota | 403532.3100 | 134709.4500 |
| Anacostia River | Branch | ""M"" Anacostia" | 403302.3625 | 134206.7174 |
| Anacostia River | 34th Place | Mass. Ave | 403819.3670 | 134252.3960 |
| Anacostia River | 33rd | ""N"" St." | 403527.6590 | 134056.1310 |
| Anacostia River | Ridge Road | Burns Road | 405027.2200 | 134221.2800 |
| Anacostia River | Burns Rd., SE | Ridge Rd., SE | 405272.6900 | 134117.8860 |
| Anacostia River | 34th | Nash/Hawes | 403731.6810 | 133905.5860 |
| Anacostia River | 37th | Nash | 403806.7930 | 133891.1190 |
| Anacostia River | Texas Ave | | 404144.9230 | 133889.3650 |
| Anacostia River | Texas Ave | | 404116.1520 | 133862.4960 |
| Anacostia River | Texas Ave. | 38th St. | 403915.6547 | 133206.7688 |

| Watershed | Road Intersection 1 | Road Intersection 2 | Easting | Northing |
|------------------|----------------------------|----------------------------|----------------|-----------------|
| Anacostia River | Pennsylvania | Alabama | 404042.7710 | 133153.2460 |
| Anacostia River | Texas | Pennsylvania | 403776.2530 | 133258.5320 |
| Anacostia River | 33rd St., NE | T St., NE | 403623.5545 | 133211.4897 |
| Anacostia River | Branch Ave., NE | 33rd. St., NE | 403451.1406 | 133172.4945 |
| Anacostia River | Branch | Park Dr. | 403454.0340 | 133136.7220 |
| Anacostia River | Branch | Park | 403458.6070 | 133130.0160 |
| Anacostia River | 30th | Park Dr. | 403033.6430 | 133119.7160 |
| Anacostia River | | | 402773.5700 | 133300.6400 |
| Anacostia River | Hillcrest | | 403127.0550 | 132869.5910 |
| Anacostia River | Hillcrest | | 403161.4700 | 132817.7370 |
| Anacostia River | Hillcrest Drive | W Street | 403094.6910 | 132894.5680 |
| Anacostia River | Hillcrest | | 403031.8620 | 132952.3420 |
| Anacostia River | Hillcrest | | 402907.7863 | 133001.0292 |
| Anacostia River | Hillcrest Drive | Park Drive | 402869.5800 | 133048.6900 |
| Anacostia River | 28th St. | Hillcrest | 402766.8210 | 133244.8044 |
| Anacostia River | Ainger | Bruco | 402196.2900 | 132358.0200 |
| Anacostia River | Raynolds | Erie | 402002.3900 | 132178.7500 |
| Anacostia River | 22nd Street | Hartford | 402144.1595 | 131798.1633 |
| Anacostia River | Douglass | Sayles | 400748.4100 | 132161.7800 |
| Potomac River | 20th St. | Jasper St. | 402224.1615 | 131542.9591 |
| Anacostia River | Gainesville | 16th | 401620.2900 | 131862.7100 |
| Potomac River | MacArthur | | 391438.8500 | 139277.1500 |
| Rock Creek | Military Road bridge | Klinge | 395232.3078 | 140552.7411 |
| Rock Creek | Piney Branch | 17th | 396640.0600 | 141046.0400 |
| Anacostia River | New York Ave | Anacostia River | 404830.8867 | 138894.1522 |
| Anacostia River | Langston Golf Course | | 402741.8130 | 137414.7790 |
| Rock Creek | JOYCE RD NW | 16TH ST NW | 396821.7051 | 144130.3287 |
| Anacostia River | | | 404634.0158 | 138850.6076 |
| Anacostia River | | | 403159.2561 | 134927.5984 |

| Watershed | Road Intersection 1 | Road Intersection 2 | Easting | Northing |
|------------------|-----------------------------------|-------------------------------|----------------|-----------------|
| Rock Creek | BEACH DR NW | SHERRILL DR NW | 396545.2156 | 145333.4047 |
| Rock Creek | Joyce Rd NW | 16th St NW | 396822.3376 | 144132.8770 |
| Rock Creek | Joyce Rd NW | 16th St NW | 396819.0676 | 144134.0473 |
| Anacostia River | | | 403895.5633 | 133205.6348 |
| Anacostia River | EASTERN AVE NE | KENILWORTH AVE NE | 405774.0121 | 138353.1839 |
| Potomac River | 50TH PL NW | 50TH ST NW | 391374.3698 | 141965.7198 |
| Potomac River | YUMA ST NW | YUMA PL NW | 391180.3660 | 142004.7843 |
| Potomac River | YUMA CT NW | YUMA ST NW | 391377.0373 | 141974.2861 |
| Rock Creek | Bingham Dr NW | Oregon Ave NW | 395385.0037 | 144713.8002 |
| Anacostia River | ANACOSTIA RD SE | BRANCH AVE SE | 403303.4790 | 134204.1173 |
| Anacostia River | 49TH ST NE | NANNIE HELEN BURROUGHS AVE NE | 405877.7619 | 136693.3419 |
| Rock Creek | Bingham Dr NW | Oregon Ave NW | 395386.6368 | 144718.4440 |
| Potomac River | 23RD ST SE | SAVANNAH TER SE | 402377.2472 | 131399.4296 |
| Anacostia River | SOUTH DAKOTA AVE NE | NEW YORK AVE NE | 404064.9314 | 138932.4353 |
| Anacostia River | GRANT ST NE | 46TH ST NE | 405494.7221 | 136729.4207 |
| Potomac River | 1st St SE | Forrester St SE | 399609.4202 | 128592.6984 |
| Anacostia River | FORT LINCOLN DR NE | 33RD DR NE | 404653.8588 | 139088.2090 |
| Potomac River | CANAL RD NW | | 391478.8569 | 138520.2992 |
| Potomac River | Southern Ave SE | Mississippi Ave SE | 402288.9703 | 130591.1571 |
| Potomac River | SUITLAND PKWY SE | | 402732.0099 | 131236.9753 |
| Anacostia River | Dix St NE | 53rd st NE | 406539.9244 | 136426.8722 |
| Anacostia River | CUITLAND PKWY SE | | 401976.0219 | 131832.3153 |
| Anacostia River | CUITLAND PKWY SE | | 402097.0295 | 131797.7674 |
| Anacostia River | SUITLAND PKWY SE | IRVING ST SE | 402115.9300 | 131768.4700 |
| Anacostia River | 48th Pl NE | Foote St NE | 405721.2461 | 136660.2209 |
| Anacostia River | ANACOSTIA AVE NE | DOUGLAS ST NE | 405032.4974 | 138089.2380 |
| Anacostia River | TEXAS AVE SE | BURNS ST SE | 404839.5235 | 134911.6814 |
| Potomac River | SOUTHERN AVE SE | | 402176.5695 | 130514.3534 |
| Rock Creek | MACOMB ST NW | ROSS PL NW | 394690.5714 | 140582.5307 |
| Rock Creek | KLINGLE RD NW | | 394971.4883 | 140531.3015 |
| Rock Creek | CONNECTICUT AVE NW | RODMAN ST NW | 394843.7828 | 141226.8290 |
| Rock Creek | KLINGLE RD NW | DEVONSHIRE PL NW | 394940.2791 | 140402.9763 |
| Rock Creek | Van Ness St NW east side dead end | Connecticut Ave NW | 394780.1026 | 141718.8454 |

| Watershed | Road Intersection 1 | Road Intersection 2 | Easting | Northing |
|------------------|----------------------------|----------------------------|----------------|-----------------|
| Rock Creek | Piney Branch Pkwy NW | | 396350.9475 | 140923.1660 |
| Rock Creek | Piney Branch Pkwy NW | | 396139.1049 | 140914.4553 |
| Potomac River | 44TH ST NW | | 392564.5435 | 139190.4742 |
| Potomac River | FOXHALL RD NW | W ST NW | 392406.6517 | 139131.1803 |
| Rock Creek | Oregon Knolls Dr NW | Oregon Ave NW | 395269.7871 | 145364.3561 |
| Potomac River | WARREN PL NW | | 391223.7234 | 141985.3872 |
| Anacostia River | TEXAS AVE SE | 28TH PL SE | 402874.7589 | 133303.5786 |
| Anacostia River | PARK RD SE | 32ND ST SE | 403341.8231 | 133098.4427 |
| Potomac River | OHIO DR SW | 14TH ST SW | 396654.4023 | 134501.3928 |
| Potomac River | MAINE AVE SW | INDEPENDENCE AVE SW | 396723.2997 | 135503.3166 |
| Potomac River | MAINE AVE SW | | 397421.9095 | 134937.9024 |
| Anacostia River | BENNING RD NE | | 402935.7590 | 136691.7278 |
| Anacostia River | 26TH ST NE | | 402934.5741 | 137028.4016 |
| Anacostia River | South Capitol St SW | T St SW | 399223.5090 | 133263.8990 |
| Potomac River | | | 397809.5872 | 134591.6181 |
| Rock Creek | JOYCE RD NW | BEACH DR NW | 396350.4358 | 143595.8977 |
| Rock Creek | Joyce Rd NW | Military Road NW | 396596.6174 | 143903.8853 |
| Rock Creek | Blagden Ave NW | Mathewson Dr NW | 395930.4137 | 141624.3137 |
| Rock Creek | Blagden Ave NW | Mathewson Dr NW | 395863.4556 | 141662.9957 |
| Rock Creek | Blagden Ave NW | Beach Dr NW | 395775.1197 | 141704.9864 |
| Rock Creek | Blagden Ave NW | Beach Dr NW | 395717.6810 | 141707.7781 |
| Rock Creek | Beach Dr NW | Blagden Rd NW | 395688.4791 | 141711.1146 |
| Rock Creek | BEACH DR NW | | 395639.5619 | 141647.8827 |
| Rock Creek | BEACH DR NW | | 395613.4948 | 141609.3054 |
| Rock Creek | BEACH DR NW | | 395569.3268 | 141517.2180 |
| Rock Creek | Beach Dr NW | Park Rd Nw | 395562.4778 | 141431.9791 |
| Rock Creek | PIERCE MILL RD NW | | 395971.7734 | 140736.3103 |
| Rock Creek | PINEY BRANCH PKWY NW | BEACH DR NW | 395895.2842 | 140821.8407 |
| Rock Creek | Klingde Rd NW | Beach Dr NW | 395627.7387 | 140611.4578 |
| Rock Creek | KLINGLE RD NW | BEACH DR NW | 395730.4882 | 140679.8136 |
| Rock Creek | BEACH DR NW | | 395627.9825 | 140509.5487 |
| Anacostia River | ANACOSTIA AVE NE | BLAINE ST NE | 403303.4366 | 135979.2001 |
| Anacostia River | D ST SE | Burns St SE | 404809.6922 | 135235.3827 |
| Anacostia River | BEHIND SCHOOL DRAINS ALLEY | | 404541.6566 | 133698.5532 |
| Anacostia River | MINNESOTA AVE SE | M ST SE | 403095.0997 | 134340.8406 |
| Anacostia River | PENNSYLVANIA AVE SE | 33RD PL SE | 403694.2003 | 133318.6455 |
| Anacostia River | ALABAMA AVE SE | 37TH ST SE | 403965.1424 | 133032.7610 |
| Anacostia | BRANCH AVE SE | T ST SE | 403425.6276 | 133291.5478 |

| Watershed | Road Intersection 1 | Road Intersection 2 | Easting | Northing |
|-----------------|-------------------------------|--|-------------|-------------|
| River | | | | |
| Anacostia River | | | 402909.5209 | 135151.3420 |
| Anacostia River | ANACOSTIA FWY SE | | 403336.4561 | 135508.0051 |
| Potomac River | SOUTHERN AVE SE | 30TH ST SE | 403204.5474 | 131446.3057 |
| Anacostia River | 23RD ST SE | SKYLAND TER SE | 402227.3336 | 132612.8427 |
| Anacostia River | GOOD HOPE CT SE | | 402287.2634 | 132676.6888 |
| Anacostia River | KENILWORTH AVE NE | JAY ST NE | 404808.4866 | 137070.1639 |
| Anacostia River | ANACOSTIA AVE NE | GRANT PL NE | 404181.1234 | 137183.1145 |
| Anacostia River | HAYES ST NE | | 404247.1983 | 137812.0273 |
| Anacostia River | JAY ST NE | | 404559.5740 | 137408.0612 |
| Anacostia River | JAY ST NE | | 404641.5678 | 137313.6789 |
| Anacostia River | LEE ST NE | KENILWORTH AVE NE | 404734.0454 | 137220.0804 |
| Potomac River | WESTERN AVE NW | RIVER RD NW | 392082.5471 | 143193.9873 |
| Potomac River | MCGUIRE AVE SE | CHANUTE PL SE | 397787.6611 | 129231.5245 |
| Potomac River | MURRAY LA SW | ROBINS RD SW | 398384.3540 | 131470.9216 |
| Rock Creek | Beech St NW | 32nd St NW | 394947.9821 | 145653.5592 |
| Rock Creek | Oregon Ave NW | Beech St NW | 395443.6106 | 145399.3426 |
| Potomac River | SOUTHERN AVE SE | | 401684.0620 | 130006.0539 |
| Anacostia River | S ST SW | SOUTH CAPITOL ST SW | 399304.7277 | 133383.5803 |
| Anacostia River | V ST SW | HALF ST SW | 399062.5255 | 132964.4739 |
| Rock Creek | | | 396001.3499 | 140878.2726 |
| Potomac River | WATER ST SW | | 398123.4285 | 134245.8502 |
| Potomac River | WATER ST SW | | 398080.0621 | 134318.1007 |
| Potomac River | Rock Creek & Potomac Pkway SW | Ohio Drive SW | 395171.6173 | 136078.3578 |
| Potomac River | | | 394047.3367 | 137410.4036 |
| Potomac River | 30TH ST NW | | 394881.0759 | 136989.5714 |
| Potomac River | CANAL RD NW | | 391253.2685 | 139101.1040 |
| Potomac River | | | 390601.1132 | 139758.8989 |
| Potomac River | | | 391138.5620 | 139208.5982 |
| Potomac River | | | 390963.1447 | 139451.5717 |
| Potomac River | Canal Rd NW | east of Arizona Ave nw and south of Chain Bridge Rd NW | 390918.9007 | 139494.8466 |
| Potomac River | | | 390786.5828 | 139596.4476 |
| Potomac River | | | 390438.0033 | 139968.0798 |
| Potomac River | | | 390390.7689 | 140065.9995 |

| Watershed | Road Intersection 1 | Road Intersection 2 | Easting | Northing |
|------------------|------------------------------|----------------------------|----------------|-----------------|
| Potomac River | | | 390343.8722 | 140176.8135 |
| Rock Creek | CATHEDRAL AVE NW | WOODLEY RD NW | 395741.1719 | 139666.4549 |
| Potomac River | INDEPENDENCE AVE SW | HOME FRONT DR SW | 396429.2011 | 135494.9946 |
| Potomac River | INDEPENDENCE AVE SW | | 396257.4649 | 135389.7180 |
| Rock Creek | ROCK CREEK & POTOMAC PKWY NW | | 394935.7160 | 138613.0487 |
| Anacostia River | ISAAC HULL AVE SE | SICARD ST SE | 400169.8066 | 133860.2043 |
| Anacostia River | ANACOSTIA DR SE | ENTRANCE TO US PARK POLICE | 400432.3041 | 133399.5056 |
| Anacostia River | | | 402390.0979 | 134812.2970 |
| Anacostia River | | | 402382.4731 | 134795.3777 |
| Rock Creek | MASSACHUSETTS AVE NW | WHITEHAVEN ST NW | 394907.6980 | 138811.2929 |
| Rock Creek | NORMANSTONE DR NW | 30TH ST NW | 394762.2900 | 139324.9421 |
| Anacostia River | 22ND ST SE | HARTFORD ST SE | 402231.2104 | 131804.4038 |
| Potomac River | CANAL RD NW | CLARK PL NW | 392465.2455 | 137651.1793 |
| Potomac River | CANAL RD NW | CLARK PL NW | 392457.6448 | 137654.0227 |
| Potomac River | CANAL RD NW | | 392329.5816 | 137704.3905 |
| Potomac River | CANAL RD NW | | 392264.3146 | 137729.3789 |
| Potomac River | CANAL RD NW | | 392207.1674 | 137755.1378 |
| Potomac River | CANAL RD NW | | 392058.7480 | 137839.2321 |
| Potomac River | CANAL RD NW | | 392040.6924 | 137849.4469 |
| Potomac River | CANAL RD NW | | 391977.5297 | 137895.5835 |
| Potomac River | CANAL RD NW | | 391954.7169 | 137913.7976 |
| Potomac River | CANAL RD NW | | 391894.4828 | 137964.7465 |
| Potomac River | CANAL RD NW | | 391821.2072 | 138037.0689 |
| Potomac River | CANAL RD NW | | 391784.3124 | 138074.3155 |
| Potomac River | CANAL RD NW | | 391694.4428 | 138171.5329 |
| Potomac River | CANAL RD NW | | 391679.3883 | 138191.1386 |
| Potomac River | CANAL RD NW | | 391640.7774 | 138243.3499 |
| Potomac River | CANAL RD NW | | 391581.8285 | 138328.2966 |
| Potomac River | CANAL RD NW | | 391547.8243 | 138393.4807 |
| Potomac River | CANAL RD NW | | 391464.5859 | 138560.0129 |
| Potomac River | CANAL RD NW | | 391423.8826 | 138655.5234 |
| Potomac River | RESERVOIR RD NW | V ST NW | 391424.6374 | 138797.5411 |
| Potomac River | CANAL RD NW | RESERVOIR RD NW | 391364.7619 | 138793.2729 |
| Potomac River | CANAL RD NW | CLARK PL NW | 392483.8371 | 137643.9067 |
| Potomac River | CANAL RD NW | | 392752.1742 | 137522.7680 |
| Potomac River | CANAL RD NW | | 392797.2928 | 137503.1652 |
| Potomac River | CANAL RD | FOXHALL RD | 392986.7380 | 137497.2546 |
| Potomac River | | | 393108.6182 | 137541.0591 |
| Potomac River | CHESTNUT LN NW | DUNMORE LN | 392479.2442 | 138820.0339 |

| Watershed | Road Intersection 1 | Road Intersection 2 | Easting | Northing |
|------------------|--|---|----------------|-----------------|
| | | NW | | |
| Potomac River | DUNMORE LN NW | | 392532.2092 | 138824.0193 |
| Potomac River | CANAL RD | FOXHALL RD | 393249.7799 | 137555.9870 |
| Potomac River | Ohio Drive SW | North of Arlington Memorial Bridge overpass | 395431.9113 | 135631.6930 |
| Potomac River | Rock Creek & Potomac Pkwy SW | Ohio Drive SW Underpass | 395425.0542 | 135776.1922 |
| Potomac River | Ohio Drive SW | South of Arlington Memorial Bridge overpass | 395467.5925 | 135572.0983 |
| Potomac River | Ohio Drive SW | Lincoln Memorial Cir NW "exit" to Ohio Drive SW | 395493.8891 | 135536.7458 |
| Potomac River | Ohio Drive SW | Lincoln Memorial Cir NW "exit" to Ohio Drive SW | 395497.0676 | 135532.1187 |
| Potomac River | Ohio Drive SW | 23rd St SW | 395545.4778 | 135478.2525 |
| Potomac River | Ohio Drive SW | 23rd St SW | 395619.9036 | 135400.8757 |
| Potomac River | OHIO DR SW | WEST BASIN DR SW | 395936.0341 | 135093.4008 |
| Rock Creek | Oregon Ave NW | Moreland Pl NW | 395297.3539 | 144198.6975 |
| Rock Creek | Oregon Ave NW behind St Johns College Football field | Military Road NW | 395374.7049 | 144008.9369 |
| Potomac River | | | 398942.5011 | 127219.4250 |
| Potomac River | | | 398580.4678 | 126842.7734 |
| Potomac River | | | 398800.8218 | 126802.9277 |
| Rock Creek | | | 396298.6110 | 140916.6085 |
| Potomac River | | | 399064.4051 | 126953.9024 |
| Potomac River | BLUE PLAINS DR SW | | 398718.2160 | 127779.8796 |
| Potomac River | BLUE PLAINS DR SW | | 398812.0934 | 127951.2448 |
| Potomac River | BLUE PLAINS DR SWQ | | 398882.3396 | 128122.3127 |
| Anacostia River | RFK PARKING LOT | | 402776.5717 | 136428.4812 |
| Anacostia River | RFK PARKING LOT | | 402713.6315 | 136176.5999 |
| Anacostia River | RFK PARKING LOT | | 402702.3755 | 136091.6578 |
| Anacostia River | RFK PARKING LOT | | 402730.2230 | 135987.2688 |
| Rock Creek | NORMANSTONE RD NW | NORMANSTONE DR NW | 395073.3316 | 139149.9515 |
| Rock Creek | BEACH DR NW | CONNECTICUT AVE NW | 395666.4690 | 139277.7201 |
| Anacostia River | ANACOSTIA DR SE | GOOD HOPE RD SE | 400834.5146 | 133583.8951 |
| Rock Creek | PENNSYLVANIA AVE NW | ROCK CREEK & POTOMAC PKWY NW | 395141.7317 | 137396.3535 |
| Rock Creek | Rock Creek & Potomac Pkwy NW | Waterside Dr NW | 395210.7817 | 139017.7089 |

| Watershed | Road Intersection 1 | Road Intersection 2 | Easting | Northing |
|------------------|----------------------------|--|----------------|-----------------|
| Rock Creek | Q ST NW | ROCK CREEK & POTOMAC PKWY NW | 395556.2906 | 138096.0989 |
| Rock Creek | BEACH DR NW | CONNECTICUT AVE NW | 395655.5779 | 139289.6054 |
| Rock Creek | BEACH DR NW | | 395715.3506 | 139350.9824 |
| Potomac River | CANAL RD NW | | 391375.7054 | 138767.5518 |
| Anacostia River | 36TH PL NE | NEW YORK AVE NE | 403910.8571 | 138754.5582 |
| Anacostia River | North Fort Lincoln Dr NE | Commodore Joshua Barney Dr NE | 404425.7778 | 139495.3066 |
| Potomac River | CANAL RD NW | FOXHALL RD NW | 393087.7135 | 137534.3431 |
| Potomac River | Canal Rd NW | east of Arizona Ave nw and south of Chain Bridge Rd NW | 390918.9739 | 139493.9394 |
| Rock Creek | PHINEY BRANCH PKWY NW | 17TH ST NW | 396676.1038 | 141098.1166 |
| Anacostia River | ALABAMA AVE SE | 37TH ST SE | 403930.6979 | 133092.2816 |
| Anacostia River | BLADENSBURG RD NE | EASTER AVE NE | 403673.7924 | 140324.5014 |
| Potomac River | SOTHERN AVE SE | 6TH ST SE | 399996.0914 | 128255.1155 |
| Potomac River | SOTHERN AVE SE | 6TH ST SE | 400079.6535 | 128339.1284 |
| Rock Creek | INGLESIDE TER NW | ALLEY | 396289.3773 | 140867.8828 |
| Rock Creek | 34th St NW | Fulton St NW | 394296.6661 | 139820.2133 |
| Rock Creek | 34th St NW | Garfield St NW | 394313.5865 | 139884.9746 |
| Rock Creek | JOYCE RD NW | 16TH ST NW | 396817.8337 | 144131.7563 |
| Potomac River | South Capitol SW | 1st St SE | 399611.3262 | 128380.0857 |
| Rock Creek | Audubon Ter NW | Linnean Ave NW | 395074.7379 | 142030.6904 |
| Anacostia River | ANACOSTIA DR SE | ENTRANCE TO US PARK POLICE | 400433.3687 | 133399.0639 |
| Rock Creek | Connecticut Ave NW | Yuma Street NW | 394455.3860 | 142069.9668 |
| Rock Creek | Connecticut Ave NW | Yuma Street NW | 394458.0611 | 142067.2154 |
| Potomac River | RODMAN ST NW | 39TH ST NW | 393139.3127 | 141366.3284 |

D MS4 Facilitates Database

| Facility Type | Facility Name | Facility Address |
|---------------|------------------------------------|----------------------------|
| Auto Repair | Congress Auto Body & Repair Shop | 1299 Kenilworth Ave NE |
| | SW Liberty Station | 3900 MLK Ave SE |
| | Good Hope Auto Center | 2300 Pennsylvania Ave SE |
| | Citi Auto | 1420 Rhode Island Ave NE |
| | Airport Express Automotive service | 6000 Sligo Mill Rd NE |
| | Brookland Exxon | 1020 Michigan Ave NE |
| | Fort Davis Exxon | 3825 Alabama Ave SE |
| | Murphy's Auto Body | 1708 Good Hope RdSE |
| | Ghuman Inc. (AR) | 39 Q St SW |
| | Singh Transmission | 1501 S. Capitol St. SW |
| | Giovani Auto Repair, Inc | 4604 Nash Street NE |
| | USA Motors | 45 Q Street SW |
| | Otis Auto Repair | 2215 Fairlawn SE |
| | KJ Auto Care | 3426 18th Street NE |
| | All Make Auto Inc | 1800 Adams Street NE |
| | J&J Towing | 1801 Adams Street NE |
| | Georgetown Auto Service | 2145 Queens Chappel Rd, NE |
| | All Star Autobody | 2405 22nd Street NE |
| | W & J ASSOCIATES, INC. | 4812 MACARTHUR Blvd NW |
| | Precision Truck Repair, INC. | 1075 Kenilworth Ave NE |
| | Earls Auto Body | 2600 28th Street NE |
| | Narico, In. World Service Center | 2417 Evarts Street NE |
| | Union Cab Corp | 2711 26th Street NE |
| | Dial-A-Cab Company | 2838 Bladensburg Rd NE |
| | C&S Auto Repair | 2912 Bladensburg Rd NE |
| | Romulus Garage | 3003 Earl Place NE |
| | Transco Inc | 3399 Benning Rd NE |
| | Northeast Auto Body | 3188 Bladensburg Rd NE |

| Facility Type | Facility Name | Facility Address |
|---------------|------------------------------------|-------------------------------------|
| | DYNAMIC AUTO CENTER | 1830 Rhode Island Ave NE |
| | SYSTEMS ENGINEERING/R.I. INC. | 1620 Rhode Island Ave NW |
| | BT & T AUTO SERVICE INC | 3010 Rhode Island Ave NE |
| | Capital Certified Collision Center | 934 Michigan Ave NW |
| | FC Auto Motor | 301 Kennedy Street NE |
| | Airport Express Shuttle | 6000 Sligo Mill Rd NE |
| | EASTERN AUTO REPAIR | 6129 Kansas Ave NE |
| | M.Mat Auto Body, Inc | 1851 Adams St NE |
| | D & T AUTO REPAIR | 1325 KENILWORTH Ave NE |
| | Imperial Auto Body | 6420 Chillum Place NW |
| | | 6400 Chillum Place NW |
| | Julios Auto Repair Shop | 7053 Spring Place NW |
| | Exxon | 7605 Georgia Ave, NW |
| | TenleyTown Exxon | 4244 Wisconsin Ave NW |
| | Tiger Auto Repair | 1850 ADAMS ST NE |
| | Spring Valley Exxon | 4861 MASSACHUSETTS Ave NW |
| | Connecticut Ave. Amoco. Inc. | 5001 Connecticut Ave NW |
| | WASHINGTON TRANSMISSION SPECIALIST | 4451 Naannie Helen Burroughs Ave NE |
| | Kiran Auto Repairs | 1900-B Bladensburg Rd NE |
| | District Line Auto Service | 7825 Georgia Ave NW |
| | E & E Auto Repair | 2626 Evarts St NE |
| | Twin Rivers Auto Service Inc. | 2507 Bladensburg Rd SE |
| | Right Hour Auto Sales Inc | 2201 Channing St NE |
| | T & W Auto Repair and Body Work | 1736 Rhode Island Ave NE |
| | Dynasty Auto Body & Transmission | 3621 Benning Rd NE |
| | Super Salvage Inc. | 1711 1st St SW |
| | SA AUTO REPAIR CORPORATION | 3011 Martin Luther King Jr. Ave SE |
| | International Limo Service | 2300 T Street NE |
| | Auto Repair | 2206 Lawrence Ave NE |

| Facility Type | Facility Name | Facility Address |
|---------------|------------------------------------|-----------------------------------|
| | East Auto Body | 2310 18th Pl NE |
| | National Auto Parts | 1810 Edwin St NE |
| | Mr. WAMS Auto Body & Paint | 7053 Spring Place NW |
| | AIRPORT EXPRESS SHUTTLE | 6000 Sligo Mill Rd NE |
| | STAR AUTO CENTER INC | 1911 New York Ave NE |
| | PAN-AM TAXI CAB | 2204 Lawrence Ave NE |
| | AYT Advantage Auto Repair | 2121 W. Virginia Ave NE |
| | J & T Auto Service Center | 2040 W. Virginia Ave SW |
| | Tony Auto Repair and Body Shop | 2040 W. Virginia Ave NE |
| | West Virginia Body Shop | 2040 W. Virginia Ave NE |
| | Sangare's auto repair | 2040 W. Virginia Ave NE |
| | Circle Exxon | 5521 Connecticut Ave NW |
| | Connecticut Ave Amoco | 5001 Connecticut Ave NW |
| | DP AUTO SERVICE LLC | 4940 Connecticut Ave NW |
| | South Capitol Street Exxon LLC | 3900 Martin Luther King Jr Ave SW |
| | Ronnie's Transmission | 1800 Rhode Island Ave NE |
| | T & A Used Auto Part | 1215 Kenilworth Ave NE |
| | W & J ASSOCIATES, INC | 4812 MacArthur Blvd NW |
| | FT DAVIS SERVICE CENTER INC | 3825 Alabama Ave SE |
| | FORT DUPONT INC | 4101 Alabama Ave SE |
| | CAPITAL AUTO SERVICE | 4900 Wisconsin Ave NW |
| | ABC Towing | 2715 Pennsylvania Ave NW |
| | Minnesota Avenue Exxon | 4100 Hunt Pl NE |
| | Audvance Auto Service | 1850 Adams St NE |
| | C & E Auto Services Inc. | 1729 Bladensburg Rd NE |
| | GOODYEAR AUTO SERVICE CENTER #0223 | 3156 BLADENSBURG Rd NE |
| | SAM'S AUTOCARE INC | 3621 Benning RD NE |
| | New Horizon Auto Body Repair | 3621 Benning RD NE |
| | Meineke Car Care Center | 3190 Bladensburg Rd NE |
| | Bills Garage | 3012 Martin Luther King Jr SE |
| | Singh Transmission | 1505 S. Capitol St SW |

| Facility Type | Facility Name | Facility Address |
|---------------|-----------------------------|------------------------------------|
| | Auto Ward Inc. | 129 Q St SW |
| | AUTO DOCTOR, INC. (THE) | 4251 MINNESOTA Ave NE |
| | Custom Towing & Auto Repair | 1345 S. Capitol St SW |
| Dry Cleaner | Palace Cleaners | 3232 Wisconsin Ave NW |
| | Rex Cleaners | 7346 Georgia Ave NW |
| | Chevy Chase Circle Cleaners | 5708 Connecticut Ave NW |
| | ZIPS Dry Cleaners | 4418 Connecticut Ave NW |
| | Regal Custom Cleaners | 5021 Connecticut Ave NW |
| | uptown Cleaners | 3333 Connecticut Ave NW |
| | American Valet Inc | 5511 Connecticut Ave NW |
| | Naylor Rd Valet Cleaners | 3031 Naylor Rd SE |
| | American Valet | 4519 Wisconsin Ave NW |
| | Betty Brite Cleaners | 5123 Nannie Helen Burroughs Ave NE |
| | Super Clean | 4415 Bowen Rd SE |
| | Global Cleaners | 3700 ML King Jr. Ave SE |
| | Service Cleaners | 2841 Alabama Ave SE |
| | Long Brothers Cleaners | 655 LeBaum SE |
| | Dean Ave. Cleaners | 4309 Nannie Helen Burroughs Ave NE |
| | EMBASSY CLEANERS | 4215 Connecticut Ave., NW |
| | PRESIDENT VALET II | 4837 Wisconsin Ave NW |
| | PRESIDENT VALET, INC | 5514 Connecticut Ave NW |
| | PALACE CLEANERS | 5019 Wisconsin Ave NW |
| | COMFY LAUNDROMAT,LLC | 333 Hawaii Ave NE |
| Laundromat | Jet Cleaners (L) | 3507 Wheeler Rd SE |
| | Pan American Laundry | 3715 Newark St NW |
| | Han Cleaner | 4425 Wisconsin Ave NW |
| | Park Laundromat | 7723 Georgia Ave NW |
| | Metro Laundromat | 1400 Rhode Island Ave NE |
| | Congressional Auto | 1910 Bladensburg Rd NE |
| | Clean All | 2149 Queens Chapel Rd NE |

| Facility Type | Facility Name | Facility Address |
|---------------|--|---|
| | Laundromat | 3915 Dix St NE |
| | Good Wash Laundromat | 1603 Good Hope Rd SE |
| | Spincycle Coin Laundry | 3250 Pennsylvania Ave SE |
| | Sheriff Road Laundromat | 4338 Sheriff Rd NE |
| | Quality Wash | 2626 Naylor Rd SE |
| | MAMA'S LAUDROMAT INC | 4528 Benning Rd SE |
| | EDDIE'S LAUNDRYMAT | 2107 Alabama Ave SE |
| Car Wash | Kenilworth Citgo | 1329 Kenilworth Ave NE |
| | NEW YORK AVE HESS | 1801 New York Ave NE |
| | Montana Double Wash | 2327 18th St NE |
| | Best Car Wash | 2334 L' Enfant Sq SE |
| | Flagship Car Wash | 4432 Connecticut Ave NW |
| | WASH & SHINE CAR WASH | 5020 Wisconsin Ave., NW |
| | Dr. King Brushless Car Wash | 2735 Martin Luther King Jr. Ave SE |
| HWG-SQG | CLARK KIEWIT CONSTRUCTION (EAST POTOMAC MAINTENANCE YARD) | 1100 OHIO DRIVE SW |
| | ST ELIZABETH'S WEST CAMPUS (GSA OWNED W CAMPUS ONLY) | 2700 MARTIN LUTHER KING JR AVENUE SE |
| | TRANSCO INC | 3399 BENNING ROAD NE |
| | METROPOLITAN POLICE DEPT - V STREET | 3521 V STREET NE |
| | AMERICAN UNIVERSITY | 4400 MASSACHUSETTS AVENUE NW |
| | KM INC EXXON SERVICE STATION #25488 | 5521 CONNECTICUT AVENUE NW |
| | TITO CONTRACTORS INC | 7308 GEORGIA AVENUE NW |
| | WMATA BLADENSBURG | 2250 26TH STREET NE |
| | FORT LESLIE J MCNAIR MDW US ARMY | 4TH STREET SW AND P STREET SW |
| | MINNESOTA AVENUE EXXON | 4100 HUNT PLACE NE |
| | EXXON CO USA #27582 | 1020 MICHIGAN AVENUE NE |
| | GEORGETOWN AMOCO | 2715 PENNSYLVANIA AVENUE NW |
| | C & S AUTO REPAIR | 2912 BLADENSBURG ROAD NE |
| HWG-CESQG | METROPOLITAN POLICE | 550 WATER STREET SW |

| Facility Type | Facility Name | Facility Address |
|---------------|--|-------------------------------|
| | DEPT - WATER STREET | |
| | WASHINGTON INFORMATION CENTER | 401 M STREET SW |
| | US PARK POLICE AVIATION SECTION | 1900 ANACOSTIA DRIVE SE |
| | GWU MOUNT VERNON COLLEGE | 2100 FOXHALL ROAD NW |
| | US NATIONAL ARBORETUM | 3501 NEW YORK AVENUE NE |
| | METROPOLITAN POLICE DEPT - BLUE PLAINS DRIVE | 4665 BLUE PLAINS DRIVE SW |
| | US BOTANIC GARDEN PRODUCTION FACILITY | 4700 SHEPHERD PARKWAY SW |
| | CARNEGIE INSTITUTE OF WASHINGTON GEOPHYS LAB | 5251 BROAD BRANCH ROAD NW |
| | ROCK CREEK PARK | 5000 GLOVER ROAD NW |
| | NATIONAL PARK SERVICE - PRESIDENTS PARK | 1000 OHIO DRIVE SW |
| | VERIZON DC BARRY ROAD SOC GLC 12234 | 2600 BARRY ROAD SE |
| | PATRIOTS PLAZA I | 395 E STREET SW |
| | CAPITOL VIEW | 425 3RD STREET SW |
| | MAGNOLIA PLUMBING INC | 600 GALLATIN STREET NE |
| | US BRENTWOOD MAINTENANCE FACILITY | 900 OHIO DRIVE SW |
| | EAST POTOMAC GOLF COURSE | 970 OHIO DRIVE SW |
| | LANDMARK SERVICES TOURMOBILE INC | 1000 OHIO DRIVE SW |
| | CAPITAL PAVING OF DC | 1525 W STREET NE |
| | TAYLOR JAMES L TRASH REMOVAL | 5201 HAYES STREET NE |
| | STAR ENTERPRISES | 1765 NEW YORK AVENUE NE |
| | CRESTWOOD ENTERPRISE 1983 INC | 6201 NEW HAMPSHIRE AVENUE NE |
| | First Transit | 1710 17TH STREET NE |
| | PEPCO BUZZARD POINT FACILITY (PPR BUZZARD POINT) | 1ST STREET SW AND V STREET SW |
| | BRAKE SERVICE COMPANY | 1318 HALF STREET SW |
| | PAK-AMERICAN CORPORATION | 1625 SOUTH CAPITOL STREET SW |

| Facility Type | Facility Name | Facility Address |
|---------------|---|--|
| | P & P AUTO BODY | 822 HOWARD ROAD SE |
| | T J AUTO REPAIR | 1810 BLADENSBURG ROAD NE |
| | F&A AUTO SERVICE | 2325 18TH STREET NE |
| | STADIUM EXXON II | 2651 BENNING ROAD NE |
| | WATERGATE EXXON | 2708 VIRGINIA AVENUE NW |
| | HILLCREST AMOCO | 2801 ALABAMA AVENUE SE |
| | EXXONMOBIL OIL CORP 22815 | 3201 PENNSYLVANIA AVENUE SE |
| | KM INC EXXON SERVICE STATION | 3535 CONNECTICUT AVENUE NW |
| | VAN NESS TEXACO | 4225 CONNECTICUT AVENUE NW |
| | AMERICAN VALET INC | 4519 WISCONSIN AVENUE NW |
| | WINDSOR VALET | 4938 WISCONSIN AVENUE NW |
| | KM INC EXXON SERVICE STATION | 5030 CONNECTICUT AVENUE NW |
| | A1 ENGINE AND DIESEL REPAIR | 1515 KENILWORTH AVENUE NE |
| | SONNYS AMOCO | 5207 NANNIE HELEN BURROUGHS AVENUE NE |
| | HILLTOP CLEANER | 2712 GOOD HOPE ROAD SE |
| | CHU CLEANERS | 5443 MACARTHUR BOULEVARD NW |
| | RIGGS DRY CLEANERS | 5585 SOUTH DAKOTA AVENUE NE |
| | New Town Cleaners | 3174 1/2 BLADENSBURG ROAD NE |
| | PARKLANE CLEANERS | 4304 CONNECTICUT AVENUE NW |
| | PREMIUM DISTRIBUTORS OF WASHINGTON DC | 3500 FORT LINCOLN DRIVE NE |
| | PETER AND H ENTERPRISES INC. | 4650 SOUTH CAPITOL STREET SE |
| | BETTY BRITE CLEANERS | 2223 MINNESOTA AVENUE SE |
| | MICHIGAN PARK CLEANERS | 3923 12TH STREET NE |
| HWG-LQG | WASHINGTON GAS EAST STATION | 1240 12TH STREET SE |
| | NAVAL SUPPORT FACILITY ANACOSTIA | 2701 SOUTH CAPITOL STREET SW |
| | UNIVERSITY OF THE DISTRICT OF COLUMBIA | 4200 CONNECTICUT AVENUE NW |
| | NAVAL RESEARCH LABORATORY | 4555 OVERLOOK AVENUE SW |

| Facility Type | Facility Name | Facility Address |
|----------------------|--------------------------------------|--------------------------------|
| | SPRING VALLEY FUDS | 5225 LITTLE FALLS ROAD NW |
| | US BUREAU OF ENGRAVING AND PRINTING | 14TH STREET SW AND C STREET SW |
| Bus and Truck Towing | FARCO TOWING | 1923 NEW YORK AVE NE |
| | CAPITAL POST TOWING INC | 200 RIGGS RD NE |
| | HAM'S TOWING INC. | 1239 KENILWORTH AVE NE |
| | A.N.A. INC | 1620 2ND ST SW |
| Federal facility (H) | Automobile Maint Fac | 2800 V STREET NE |
| | Vehicle Main Facility | 2702 SOUTH CAPITOL STREET SE |
| | United Industrial District Warehouse | 3360 V STREET NE |
| | 1933 Montana Avenue | 1933 MONTANA AVENUE NE |
| | Shepherd Park Plaza | 7820 EASTERN AVENUE NW |
| | Remote Delivery Site | 2701 SOUTH CAPITOL STREET SE |
| | US NATIONAL PARK SERVICE | 3842 ALABAMA AV SE |
| | Rds/Vmf Guardhouse | 2701 SOUTH CAPITOL ST |
| DC Gov. facility (H) | DEPARTMENT OF TRANSPORTATION | 4240 MASSACHUSETTS AV SE |
| | DEPARTMENT OF PUBLIC WORKS | 4501 FORT TOTTEN DR NE |
| | DEPARTMENT OF PUBLIC WORKS | 1801 MINNESOTA AV SE |
| | DEPARTMENT OF PUBLIC WORKS | 2049 WEST VIRGINIA AV NE |
| | DEPARTMENT OF TRANSPORTATION | 2600 SOUTH CAPITOL ST SE |
| | DEPARTMENT OF PUBLIC WORKS | 4501 FORT TOTTEN DR NE |
| | DEPARTMENT OF PUBLIC WORKS | 1801 MINNESOTA AV SE |
| | DEPARTMENT OF PUBLIC WORKS | 2049 WEST VIRGINIA AV NE |
| | DEPARTMENT OF TRANSPORTATION | 4240 MASSACHUSETTS AV SE |
| | BLADENSBURG BUS GARAGE | 2250 26TH ST, NE |
| | Western Metro Bus Garage | 5230 WISCONSIN AVE NW |
| | DEPARTMENT OF TRANSPORTATION | GOOD HOPE RD SE |

| Facility Type | Facility Name | Facility Address |
|-------------------|----------------------------|---------------------------|
| DC Water facility | DC WATER & SEWER AUTHORITY | 2637 BARRY RD SE |
| Restaurant | Tara Thai | 4849 MASSACHUSETTS AVE NW |
| | Dominos Pizza | 4539 WISCONSIN AVE NW |
| | Chicken Out Rotisserie | 4866 MASSACHUSETTS AVE NW |
| | Le Chat Noir | 4907 WISCONSIN AVE NW |
| | House of Philly | 2311 CALVERT ST NW |


E Quality Assurance Project Plans

**QUALITY CONTROL WORK PLAN AND
QUALITY ASSURANCE PROJECT PLAN
FOR
THE DISTRICT OF COLUMBIA STORMWATER
COLLECTION & ANALYSIS PROJECT**

Contract No. CW18061

**Prepared by
Apex Companies, LLC
8854 Rixlew Lane
Manassas, VA 20109**

**Prepared for
District Department of the Environment
1200 First Street NE, 5th Floor
Washington, DC 20002**



Project Manager Date: 12/04/2012



QA Officer Date: 12/04/2012

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| Appendix 1 | Laboratory Quality Assurance Manual |
| Appendix 2 | Sample Field Collection Sheet |
| Appendix 3 | Sample Chain of Custody Form |

A. PROJECT MANAGEMENT

A3. Distribution List

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A4. Project/Task Organization

Key Corporate Quality Assurance (QA) /Quality Control (QC) personnel for each specific task are as follows:

- Project Manager, Andrea Owen; Apex Companies, LLC
- QA/QC Manager, Ignatius Mutoti; Retaw Engineering
- Health and Safety Manager, Harold Heckman; Apex Companies, LLC
- Task Manager/Key Personnel, Amanda Hren and Nan Lin; Apex Companies, LLC
- Site Safety and Health Officer, James Naples; Apex Companies, LLC
- Field Sampling Team, Apex and Microbac Team (Multiple Individuals)
- Data Quality Reviewer, Michael Arbaugh; Microbac Laboratories, Inc.

Project Manager (PM). The Project Manager is accountable for the organization, coordination, and implementation throughout the duration of the project and utilizes the Task Leaders/Key Personnel for any technical assistance. The Project Manager may delegate authority to expedite and facilitate the implementation of the project plan. The Project Manager is responsible for:

- Coordination with client
- Budget control
- Subcontractor performance
- Project coordination to implement work plan
- Allocation of resources and staffing to implement the QA/QC program
- Allocation of resources and staffing to implement the Health and Safety Plan (HASP)
- Review of engineering and interim reports

QA/QC Manager. The QA/QC Manager is accountable to the Project Manager throughout the duration of the project and is responsible for validation of analytical data reports on all sampling and analysis data conducted under the storm water sampling project. The QA/QC Manager is also responsible for project-specific supervision and monitoring of the QA/QC Program.

- Will ensure that field personnel use proper sample procedures, field measurement techniques, sample identification, and chain-of-custody procedures.
- Coordinate with the analytical laboratory for the receipt of samples, the reporting of analytical results, and recommending corrective actions to correct deficiencies in the analytical or sampling protocol.
- Will audit field activities.
- Provide QA/QC reports to management.
- Will provide QA/QC technical assistance to the field sampling team.

Health and Safety Manager. The Health and Safety Manager serves as the administrator of the Apex Team's Corporate Health and Safety Program. He is accountable directly to the Project Manager for project health and safety concerns and is responsible for:

- Proper training for the Apex Team field personnel
- Medical clearance of the Apex Team field personnel

- Field personnel having adequate experience with personal protective equipment
- Providing guidance on Health and Safety Plan (HASP) data interpretation
- Determining levels of worker protection
- Evaluating compliance with the HASP through regular audits of field activities

Task Managers/Key Personnel. Task Managers/Key Personnel provide technical support to the Project Manager for implementation of the Work Plan relative to their respective tasks and have the following responsibilities:

- Prepare task reports and outlining field investigation requirements
- Review daily reports and field notebooks
- Task scheduling
- Task budget management
- Task work plan coordination
- Review of field and laboratory analysis data
- Coordinate field activities
- Schedule sampling and other field activities

Site Safety and Health Officer. The Site Safety and Health Officer (SSHO) is responsible for ensuring that field activities are carried out in accordance with the HASP. The SSHO provides technical assistance to the Project Manager and field personnel to help assure site safety. In addition, the SSHO performs the following duties:

- Monitor field activities
- Monitor personal exposure to chemical toxins
- Establish emergency response procedures
- Monitor for temperature stress
- Establish personnel and equipment decontamination procedures
- Stops work in the event unsafe work conditions are encountered

Field Sampling Team. Project personnel are drawn from the Apex Team irrespective of group or geographic assignment. The project personnel are selected on the basis of appropriate skills, experience, and availability. Tasks and subtasks are assigned to Task Managers. Personnel working on specific tasks report on a daily basis to their respective Task Managers. Task Managers, in turn, work under the daily direction of the Project Manager. Personnel follow the procedures described in the following sections to assure consistency in sample collection and handling. Other duties may include:

- Inspect and replace equipment
- Prepare daily and interim reports
- Prepare samples for shipment

Data Quality Reviewer. A qualified laboratory, which is responsible for performing chemical analyses of environmental samples collected at hazardous substance sites. The laboratory is local and is able to receive and prep samples 24/7. The laboratory is capable of providing complete environmental analytical services consistent with U.S. EPA protocols and site-related DQOs. The Laboratory Quality Assurance Manual (LQAM), provided by the approved laboratory, will supply details on laboratory operations, certifications, and personnel qualifications. The Data Quality Reviewer reviews all laboratory reports for quality and completeness before sending them to Apex and Microbac.

Apex has selected Retaw Engineering (Retaw) to provide QA/QC Support, additional technical, sampling and laboratory support.

RETAW ENGINEERING

2903 Sagecreek Circle
Midlothian, Virginia 23112
(804) 744-1792

Ignatius.mutoti@retaweng.com

Retaw and Apex have selected Microbac Laboratories, Inc. (Microbac) which is responsible for performing chemical analyses of stormwater samples. The laboratory will be capable of providing complete environmental analytical services consistent with 40 CFR part 136 U.S. EPA protocols and site-related DQOs. The Laboratory Quality Assurance Manual (LQAM), provided by the approved laboratory, will supply details on laboratory operations, certifications, and personnel qualifications. The LQAM is attached in Appendix 1.

Microbac Laboratories, inc.

Gascoyne Division
2101 Van Deman Street,
Holabird Business Park
Baltimore MD 21224
(410) 633-1800

Apex has worked extensively with both Retaw and Microbac on other projects and has assembled the Team to meet all of the anticipated projects outlined in the Solicitation.

A5. Problem Definition/Background

The DC Office of Contracting and Procurement have contracted Apex Companies, LLC (Apex) to perform storm water sample collection for the District of Columbia Municipal Separate Storm Sewer System (MS4) permit DC0000221. The project is designed to supply the DC Department of the Environment (DDOE) with the data necessary to show compliance with the National Pollutant Discharge Elimination System (NPDES) Permit issued in October of 2011.

In fulfillment of C.5.5 and C.5.6 of the Storm Water Collection and Analysis contract number Doc77984, the Work Plan (WP) and Quality Assurance Project Plan (QAPP) have been incorporated into this document. This document provides procedures for the sample collection,

analysis, and evaluation of data. The DC stormwater collection project will require close coordination with the client and the laboratory to ensure the viability of the samples and the integrity of the holding times.

Apex recognizes that analytical data quality management at all levels and phases of environmental work is critical to the ultimate success of any environmental project. Quality Assurance (QA) starts with the field crews taking the environmental samples in accordance with approved sampling methods, proper sample handling, preservation, sample shipment, and clear and accurate chain-of-custody forms. The process continues to the laboratory, where the samples are analyzed in accordance with 40 CFR Part 136 - approved analytical methods following good laboratory practices to ensure the precision, accuracy, representativeness, comparability, and completeness of the chemical analytical results. To achieve these goals, the laboratory chemists must properly and routinely maintain analytical instruments, and non-laboratory chemists must periodically audit laboratory operations and procedures.

The following sections describe Apex's approach to ensure that these QA goals are met for any environmental program conducted or managed by Apex. This approach applies to all environmental media samples, i.e., air, soils, storm water, surface water, groundwater, and sediments, etc.

A6. Project/Task Description and Schedule

The objective for the storm water sampling is to determine if the Separate Storm Sewer System is compliant with the NPDES Permit. The DDOE has identified six locations that storm water samples will be collected from by Apex. The six locations consist of two locations within the Anacostia River Watershed, two locations within the Potomac River Watershed, and two locations within the Rock Creek Watershed. These locations are described in the table below:

| Table 1 – Watershed & Sampling Locations | |
|---|---|
| Watershed & Sample Location | |
| A. Anacostia River Subwatershed Sampling Sites | |
| A1 | Anacostia High School/Anacostia Recreation Center – corner of 17th St. and Minnesota Ave. SE (Site 1) |
| A2 | Gallatin & 14th St., NE-across from the intersection of 14 th St. and Gallatin St. in a large outfall (Site 2) |
| B. Rock Creek Subwatershed Sampling Sites | |
| B1 | Walter Reed (Fort Stevens Drive) (Site 3) |
| B2 | Soapstone Creek (Connecticut Avenue and Ablemarle Street) (Site 4) |
| C. Potomac River Subwatershed Sampling Sites | |
| C1 | Battery Kemble Creek-49th and Hawthorne Streets, NW (Site 5) |
| C2 | Oxon Run-Mississippi Avenue and 15th Street, SE (Site 6) |

The flow characteristics for each location will be defined in advance of a storm event. The geometry of the outfall or storm water structure will be evaluated and a method of determining flow will be determined in advance of the sampling event. The flow will be determined by the cross sectional geometry of the outfall, depth of flow and the velocity of the water passing through the structure. The velocity of the flow will be estimated and recorded and the estimated flow rate will be recorded using a digital flow meter reading or other acceptable industry methods.

Sampling will occur during both wet and dry weather events. A wet weather sampling event will occur when rainfall amounts to 0.10 inches or more. A wet weather sampling event must occur 72 hours from previous 0.10 inches of recorded rain and the site must not have been previously sampled within a 30 day period. Samples will be collected using both grab and composite techniques. Samples will be collected at outfalls and manholes in each of the prospective watersheds as directed by the Permit. A dry weather event will commence on scheduled days following periods of dry weather (72 hours of no precipitation). Samples will be collected using only grab techniques and will be collected at outfalls and manholes in each of the prospective watersheds as directed by the Permit.

Samples from both dry and wet weather events will be delivered under the Chains of Custody to Microbac. Sample event reports will be produced within 30 days of the sampling event.

A7. Data Quality Objectives for Measurement Data

A7.1. Data Quality Objectives

Data Quality Objectives (DQOs) are developed to achieve the level of data quality required for the anticipated data use and are implemented so that for each task, the data is legally and scientifically defensible. The development of DQOs for a specific site and measurement takes into account project needs, data uses and needs, and data collection. These factors help in determining the appropriate quality assurance objectives necessary to ensure the quality and quantity of data are adequate for the end use of the data.

DQOs are attained through sound chemical quality management and achieved through the implementation of this plan. This QAPP is in accordance with applicable U.S. EPA and District Department of Transportation (DDOT) standards and regulations.

A7.2. Analytical Data Quality Assurance

The objective of the Analytical Quality Control Program is to provide sampling and analysis data of acceptable quality.

- Accuracy (Bias) is a measure of confidence that describes how close a measurement is to its “true” value. Accuracy for field and laboratory tests shall be determined using various approaches including: instrument calibrations, various types of QC checks – e.g. sample split measurements, sample spike recoveries, matrix spike duplicates, continuing calibration verification checks, internal standards, sample blank measurements (field and lab blanks), external standards), and performance audit samples (DMRQA). Accuracy shall be assessed using the following formula:

$$Accuracy = \frac{MeasuredValue}{TrueValue} \times 100$$

Precision. Measure of mutual agreement among repeated measurements of the same parameter, and provides information about the consistency of methods usually under

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prescribed conditions. Precision is expressed in terms of the relative percent difference between two measurements (A and B). The objective for precision is to equal or exceed the precision demonstrated for similar samples, and should be within the established control limits for the methods. Precision shall be determined as follows:

For field measurements, precision shall be assessed by measuring duplicate samples at the same *locations* and as soon as possible to limit temporal variance in sample results. Field and laboratory precision shall be measured by collecting blind (to the laboratory) field duplicate samples. For paired and small data sets project precision is calculated using the following formula:

$$Precision = \frac{(A - B)}{((A + B) / 2)} \times 100$$

For larger sets of paired precision data sets (e.g. overall project precision) or multiple replicate precision data, use the following formula:

$$RSD = 100 * (\text{standard deviation} / \text{mean})$$

- Completeness. Measure of the amount of valid data obtained from a measurement system compared to the amount expected under normal conditions. The objective is to generate a sufficient database with which to make informed decisions with statistical confidence. Project completeness is determined for each pollutant parameter using the following formula:

$$\frac{T - (I + NC)}{T} \times (100\%) = \text{Completeness}$$

Where T = Total number of expected sample measurements.

I = Number of invalid sample measured results.

NC = Number of sample measurements not produced (e.g. spilled sample, etc).

- Representativeness. Expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness includes what parameters to sample for, where to sample, type of sample (grab, continuous, composite, etc.) and frequency of sample collection and shall be in accordance with the DC 0000221 NPDES Permit. To meet the objective of obtaining representativeness of samples, a Work Plan is developed.

- **Comparability.** The confidence with which one data set can be compared to another collected by using standardized methods of sampling and analysis. Comparability shall be shown by referencing the appropriate measurement method approved by as specified in 40 CFR Part 136 or other approved methods for the parameter(s) to be sampled and measured (e.g., ASTM, Standard Methods). For each parameter to be analyzed, the method to be used and the measurement quality objective shall be listed to meet the overall data quality objectives. This applies to both direct field measurements (e.g., field pH meters, DO meters, etc.) as well as samples collected for subsequent laboratory analyses. This objective is met by using 40 CFR Part 136 and standard methods for sampling procedures and analyses, and by following techniques and methods set forth in the Work Plan.
- **Sensitivity.** Measure of a method's detection limits and ability to distinguish between two values. The sensitivity and detection limits of a method will be reviewed to determine a method based on the method's detection limit (MDL) and practical quantification limit (PQL).

A8. Special Training Requirements/Certification

Apex team leaders and full time staff are OSHA 40 Hour HAZWOPER trained. All staff members working on this project receive in house sampling and safety training. Microbac will be capable of providing complete environmental analytical services consistent with 40 CFR part 136 U.S. EPA protocols and site-related DQOs. The Laboratory Quality Assurance Manual (LQAM), provided by Microbac, will supply details on laboratory operations, certifications, and personnel qualifications. Laboratory certifications are presented in Appendix 1

Under the National Pollutant Discharge Elimination System (NPDES) program, the laboratory is required to participate in the annual Discharge Monitoring Report–Quality Assurance (DMR-QA) study program. DMR-QA evaluates the analytical ability of the laboratories that routinely perform self-monitoring analyses required by the NPDES permit. Microbac Laboratory will participate in this annual study.

The quality assurance (QA) laboratory will deliver the sample results and data package, which will be reviewed by the QA/QC Manager. The data reviewed will include all blank, sample, and internal quality control results such as spike and surrogate recoveries and replicate analyses. Any significant differences or problems discovered will be addressed; corrective action, such as reanalysis and/or resampling, may result at the Project Manager's discretion.

A9. Documents and Records

The records for this project will include field logs, field data worksheets, laboratory data reports, and sample event report. Field logs will include observations about weather conditions at the site when samples are collected and field analyses conducted. Any other pertinent observations or deviations from the procedures in this QAPP, deemed noteworthy by any member of the field team will also be recorded in the field log book. Field data worksheets (Appendix 2) will be used to record all field measurements. Each page of the field logs and field data worksheets will be dated and signed by the person making the entries.

The sample event report will be submitted within approximately 30 days of the actual sampling event and based on actual analytical results receipts from the Microbac laboratory. The results of the field parameters tested during the sampling event, field data collection sheet, site narrative report of the event and sampling locations where the actual storm water samples collected, site photographs and meteorological data predicting the storm-water event, flow monitoring, precipitation data including rainfall hydrograph, signed chain-of-custody forms and the laboratory analytical results of analyzed samples will be included in the sample event report. Two hard copies of the report and an electronic report copy will be submitted for each event report to the DDOE.

Data packages generated from analyses shall include the following:

1. Pertinent physical data presented in concise, easy to follow formats (i.e., sample number, client, date of sample preparation, date analyzed, percent moisture, etc.).
2. Data from each discrete sample reported using cross referencing between normal samples and quality control samples.
3. Reported data to include associated quality control samples such as blanks, spikes and spike duplicates, laboratory duplicates, field duplicates, and appropriate check standards.
4. Copies of chain of custody sheets.

Data reduction is the process that raw analytical data generated from laboratory instrument systems is converted into usable concentrations. The raw data, which may take the form of area counts, instrument responses or observations, is processed by the laboratory and converted into concentrations expressed in the part per million or part per billion range. Raw data from these systems include compound identifications, concentrations, retention times, and data system printouts. Raw data is usually reported in graphic form, bar-graph form or tabular form. Data reduction procedures will be discussed in greater detail in the LQAM (Appendix 1).

B. DATA GENERATION AND ACQUISITION

B1. Sampling Process Design

The storm water sample collection and analyses will supply the DDOE with the data necessary to show compliance with the NPDES Permit issued in October of 2011. The samples will be collected at the locations designated (1 manhole and 5 outfalls).

This project is specifically for the collection and analysis of storm water. A list of typical field equipment and devices used for sample collection are presented below. A description of the standard equipment decontamination procedure and solutions are also given.

Sampling Equipment:

- Personal Protective Equipment (Reflective Vests) & Rain Gear
- Mobile Phones
- Work, Safety and Traffic Control Plan
- Permits- DDOE, National Park Services (NPS), and DC Water.
- pH, dissolved oxygen, temperature, and specific conductivity meter
- Flow-meter
- Stainless Steel Buckets
- Auto-sampler
- Coolers
- Flashlights – Various Types
- Manhole Removal Tool
- Digital Camera
- Small Hand Tools
- Gloves

Field analytical equipment:

- Dissolved Oxygen Meter
- Combustible Gas Detector and Photoionization Analyzer
- pH meter
- Specific Conductivity Meter
- Chlorine Meter/Test
- Temperature Probe - YSI 3510

Field Sample Collection Devices:

- PVC/teflon bailers for groundwater/storm water samples
- Glass/plastic beaker or dipper for surface water samples
- Stainless steel buckets
- ISCO auto samplers

For each sampling location, the field sampling team will record estimated flow velocity, odor, pH, dissolved oxygen content, temperature, specific conductivity, and approximate water depth. The

field sampling team will complete a sample data collection form to document the event. Digital photography will be collected if necessary to further document conditions during the event.

B1.1. Dry Weather Sampling

Mobilization and preparing the sampling equipment starts with coordination and notification. Communication will come from the PM who then will notify the integral field sampling team. The field sampling team will begin by organizing and preparing all necessary sampling and sample transportation equipment for the scheduled sampling event approximately 24 hours in advance.

Dry weather sampling will commence on scheduled days following periods of dry weather (seventy-two (72) hours of no precipitation).

Once the sampling event has been completed, the field sampling team will meet with the designated lab or courier to deliver the event samples with their respective Chains of Custodies.

B1.1.1. Collection Procedures, Sampling Handling, and Transportation of Samples for Dry Weather Sampling

Collection Methods for Dry Weather Sampling:

GRAB SAMPLES

- Chloroform
- 1,1,2-Trichloroethylene
- 1,1,2,2-Tetrachloroethylene
- Tetrachloroethene
- Trichloroethylene(trichloroethene)
- Bis(2-ethylhexyl)phthalate
- Gamma-BHC
- Dieldrin
- Total PCBs
- Arsenic, Total
- Cadmium, Total
- Chromium, Total
- Copper, Total
- Lead, Total
- Nickel, Total
- Zinc, Total
- Cyanide, Total
- Phenols, Total
- Total suspended solids
- Total dissolved solids
- COD
- BOD5
- Oil and Grease
- E. Coli
- Fecal coliform

- Fecal streptococcus
- Dissolved phosphorous
- Total phosphorous (TP)
- Chlorophyll (a)
- Hardness
- Total nitrogen

FIELD ANALYSIS

- pH
 - Temperature
1. The storm water samples shall be collected at the locations designated in the contract. Samples will be collected using only grab techniques using stainless steel grab samplers. Samples will be collected at outfalls and manholes in each of the prospective watersheds as directed by the Permit.
 2. Data quality depends, in part, on proper collection and preservation to guarantee representativeness of the sample. Sample containers will be labeled with the following information: unique sample numbers, location identification, date, parameter(s) to be analyzed, time of collection, collector, and type of preservative. Once collected, samples will be immediately placed in a cooler filled with ice and held at 4°C. Disposable gloves and other appropriate Personal Protective Equipment (PPE) will be worn by the sampling personnel and changed between sampling points to avoid cross contamination. Personnel will also be equipped with appropriate safety gear. The information collected in the field shall be recorded in a dedicated field logbook and on the sample collection form at the time of sampling.
 3. All samples will be collected and preserved in laboratory supplied containers.
 4. The field sampling team will perform the required analytical field tests (Residual Chlorine, Dissolved Oxygen, pH, Temperature, and Flow) using direct reading equipment in accordance with manufacturers written procedures. These readings will be noted in the field data sheets.
 5. It is the policy of Apex to calibrate required equipment, properly collect samples and to ensure that they maintain the characteristics of the sample source by the use of appropriate sampling and preservation techniques. It is critical that the sampling be performed correctly and documented thoroughly, following protocols. The techniques used are based on EPA-National Field Manual for the Collection of Water-Quality Data (USGS updated 2008), the NPDES Permit DC0000221, and the "NPDES Storm Water Sampling Guidance Document" (EPA 833-B-92-001).
 6. When sampling an outfall, the field sampling team will stand downstream of the sampling location and work upstream to collect samples.
 7. The field sampling team will complete the sample collection data forms, chain of custody forms and field logbook prior to moving to next site. The

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team will perform a QC check to ensure that all required data has been captured prior to locating to the next location.

8. The team will meet at a predetermined location and the coolers for each location will be inspected for quality control, completeness and then packaged for transport to the laboratory. The samples will be transferred under chain of custody to one vehicle or to a courier service for transportation to the laboratory. This effort is expected to take approximately 30 minutes.
9. The proposed laboratory for this project is located Baltimore, MD and is approximately one hour from Washington, DC. This laboratory is equipped to receive samples on a 24 hour 7-days a week basis. Based on the above scenario and time frames, this will leave approximately 90 minutes at the lab to prepare the micro-biological samples and meet the six hour holding time for the micro-biological parameters.
10. All used field equipment will be properly decontaminated after each event.

B1.2. Wet Weather Sampling

Mobilization and preparing the samplers starts with coordination and notification. Communication will come from the PM who then will notify the integral field sampling team. The field sampling team will begin by organizing and preparing all necessary sampling and sample transportation equipment for the event approximately 24 hours in advance, so the equipment is charged and available when the storm reaches the monitoring area. Any in-situ autosamplers being used for the rain event are reviewed to ensure required bottleware, power sources, and sample preservation materials are in place. For direct sampling of sites, the field sampling team will mobilize to sampling site locations approximately 1-2 hours prior to the predicted beginning of a storm event.

Once the sampling event (3 hours for composite samples) has been completed, the field sampling team will meet with the designated lab or courier to deliver the event samples with their respective Chains of Custodies.

B1.2.1. Collection Procedures, Sampling Handling, and Transportation of Samples for Wet Weather Sampling

Collection Methods for Wet Weather Sampling:

GRAB SAMPLES

- E. coli
- Fecal coliform
- Chlorophyll a

COMPOSITE SAMPLES

- Total nitrogen
- Total phosphorus
- Total Suspended Solids

- Hardness
- Cadmium
- Copper
- Lead
- Zinc

FIELD ANALYSIS

- pH
 - Temperature
 - Dissolved oxygen
1. The storm water samples shall be collected at the locations designated in the contract and at a minimum of four (4) sites for each wet weather event. Samples will be collected using both grab and composite techniques. Samples will be collected at outfalls and manholes in each of the prospective watersheds as directed by the Permit. When a qualifying event (storms with at least 0.1 inch of precipitation, 72 hours, and one month since the last collection at a specific site) is anticipated based on the available meteorology, the auto-samplers will be charged and set up in advance using all appropriate safety precautions. The suction stub of the auto-sampler will be positioned upstream of the grab sample locations and field parameter test points.
 2. The auto-samplers will be equipped with a pre-cleaned 2 1/2 gallon lab supplied glass container to collect composite samples. The auto-sampler will be packed with ice to ensure the composite sample is kept adequately preserved during sample collection.
 3. When it is determined that a qualifying event is highly likely to occur, the field teams will mobilize to the site, don any required Personal Protective Equipment (PPE), and exercise appropriate safety precautions. Apex is experienced in after-hours sampling and minimizes safety concerns by working in teams, using reflective clothing and equipment, utilizing flashlights and headlamps, and following the Site Specific Traffic Control Plan (required by the DOT permit).
 4. Data quality depends, in part, on proper collection and preservation to guarantee representativeness of the sample. Sample containers will be labeled in such a manner as shown in Section B3.2.2 and B3.2.3. Once collected, samples will be immediately placed in a cooler filled with ice and held at 4°C. Disposable gloves and other appropriate PPE will be worn by the sampling personnel and changed between sampling points to avoid cross contamination. Personnel will also be equipped with appropriate rain gear. The information collected in the field shall be recorded in a dedicated field logbook and on the sample collection form at the time of sampling.

5. The field sampling team will perform the required analytical field tests (Residual Chlorine, Dissolved Oxygen, pH, Temperature, and Flow) using direct reading equipment in accordance with manufacturers written procedures. These readings will be noted in the field data sheets.
6. It is the policy of Apex to calibrate required equipment, collect samples properly and to ensure that they maintain the characteristics of the sample source by the use of appropriate sampling and preservation techniques. It is critical that the sampling be performed correctly and documented thoroughly, following protocols. The techniques used are based on EPA-National Field Manual for the Collection of Water-Quality Data (USGS updated 2008), the NPDES Permit DC0000221, and the "NPDES Storm Water Sampling Guidance Document" (EPA 833-B-92-001).
7. When sampling an outfall, the field sampling team will stand downstream of the sampling location and work upstream to collect samples.
8. Grab samples will be collected for the required parameters and these will be placed in pre-cleaned containers prepared with the appropriate preservatives and properly labeled. The samples will be placed in a cooler charged with ice in preparation for delivery to the laboratory.
9. The auto-samplers will be checked and if they have completed the collection routine and the composite sampling is complete, the container will be removed from the unit and included in the shipment to the lab. The auto-samplers will be set to take samples as a time weighted average (TWA) at a minimum of every 15 minutes. The full composite sampling container will be transported to the laboratory for division into appropriate sample containers and will be preserved in accordance with the requirements of the specific analytical procedures.
10. The field sampling team will complete the sample collection data forms, chain of custody forms and field logbook prior to moving to next site. The team will perform a QC check to ensure that all required data has been captured prior to moving on to the next location.
11. The field sampling team will communicate via company supplied mobile phones to ensure that all scheduled sites can be completed within the 3 hour window for the event. These phones allow the sampling crews to check weather patterns and forecasts from the field as well as keep in contact with the PM via text messaging, emails, or phone. Sampling will be completed within the first three hours of a qualifying event.
12. The team will meet at a predetermined location and the coolers for each location will be inspected for quality control, completeness and then packaged for transport to the laboratory. The samples will be transferred under chain of custody to one vehicle or to a courier service for transportation to the laboratory. This effort is expected to take approximately 30 minutes.

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13. The proposed laboratory for this project is located Baltimore, MD and is approximately one hour from Washington, DC. This laboratory is equipped to receive samples on a 24 hour seven day a week basis. Based on the above scenario and time frames, this will leave approximately 90 minutes at the lab to prepare the micro-biological samples and meet the six hour holding time for the micro-biological parameters.

14. All used field equipment will be properly decontaminated after each event.

B1.3. Field Documentation

The following information will be recorded in a field notebook and on the sample data collection form at the time of sampling:

- Sample location
- Name of field technicians present during sampling
- Method of sample collection utilized
- Time/date of sampling
- PID readings (if applicable)
- Type of sample
- Analyses required and sample container types
- Field measurements and calibration (if applicable)
- Observed conditions that may impact the chemistry of the sample
- Observations and remarks: A bound field logbook will be maintained in which to record the daily activities. All entries will be made in indelible ink. Incorrect entries will be corrected by a single stroke through the error and will be verified with the recorder's initials. Entries to the log book, in addition to the required sampling entries, will include:
 - Date
 - Start and finish times
 - Summary of work performed (including samples collected)
 - Names of personnel present
 - Weather observations
 - Calibration of equipment
 - Observations and remarks
 - Field measurements

B1.4. Decontamination of Sampling Equipment

To avoid cross-contamination of samples, equipment used in sampling must be clean and free from the residue of previous samples. To the greatest extent possible, Apex will utilize dedicated pre-cleaned and disposable equipment to minimize the potential for cross contamination. Non-dedicated sampling equipment must be cleaned initially and prior to being reused and will be appropriately packaged to prevent contamination. The following is the procedure for decontamination and does not apply to heavy equipment or drilling equipment.

- Wash and scrub with low phosphate, laboratory grade detergent (bucket 1)
- Tap water rinse

- Wash and scrub with low phosphate, laboratory grade detergent (bucket 2)
- Thorough rinse with distilled water
- Wash and scrub with low phosphate, laboratory grade detergent (bucket 3)
- Thorough rinse with distilled water
- Air dry
- Wrap appropriate equipment in aluminum foil, plastic sheets, plastic bags or place in clean ziplock bag

Note: A variation of the above decontamination procedure may be used depending on the DQO level and parameters to be sampled.

Field instrumentation shall be cleaned and calibrated per manufacturer's instructions. Probes, such as those used in pH and conductivity meters, and thermometers must be decontaminated and rinsed prior to and after use with deionized water and shall be properly calibrated.

B1.5. Decontamination Solutions

- Deionized demonstrated analyte-free water
- Low phosphate laboratory grade detergent
- Concentrated nitric acid (HNO₃)
- Concentrated hydrochloric acid (HCl)
- Distilled Water

Note: Decontamination fluids are highly specific to the type of sample being collected and the analysis being performed. To the greatest extent possible Apex will use dedicated disposable equipment to minimize equipment decontamination.

B1.6. Meteorological Event Planning Procedures

Accurate prediction, evaluation and documentation of qualifying weather events are necessary to determine when to engage each sampling team to the necessary locations. Accuracy in these matters also ensures close coordination with the client and the laboratories to ensure the viability of the samples and the integrity of the holding times.

Although meteorological and storm events can be unpredictable, they can be forecasted using various resources including electronic and broadcast media, historical weather trends, newspapers, and visual observation. Tools such as thermometers, barometers, electronic weather stations, and rain gauges accessed with staff smartphones will also be on-hand to aid in predicting a qualifying storm event. The project manager will use this data to produce weekly in-house weather forecasts each week and to alert field managers and sampling teams of pending storm events.

B1.7. Qualifying Storm Event Criteria

According to the EPA's guidelines, the storm water discharge permit requires that each qualifying rain event have the following criteria:

- The depth of the storm must be greater than 0.10 inch accumulation;
- The storm must be preceded by at least 72 hours of dry weather;
- The depth of rain and duration should not vary by more than 50 percent from the average depth and duration for each location.
- The same site is not to be sampled more than once in a 30 day period.

This specific criterion ensures that:

- Adequate flow would be discharged from each location;
- Some build-up of pollutants during dry weather intervals occurs;
- The storm would be typical for the area (i.e. intensity, depth, and duration).

Data on local weather patterns is provided by the National Weather Service's (NWS) website at www.weather.gov and includes historic, future, and current weather conditions. National Oceanic and Atmospheric Administration (NOAA) supplies average rain and duration figures for the immediate and surrounding areas based on normal data records collected since 1971. This information will be analyzed to determine if the range of the storm is within the duration, intensity, and depth typical of the representative area and time of year.

A variety of sources will be used to retrieve and verify weather data. Numerous sources have been investigated and deemed acceptable meteorological sources to predict upcoming weather patterns. Electronic resources will be the primary source of weather prediction; however, secondary sources such as newsprint, radio, and television will assist in forecasting.

NOAA's National Weather Service (NWS) website will serve as Apex's principal daily forecast source. The National Weather Service (NWS) provides weather, hydrologic, and climate forecasts and warnings for the United States up to 10 days in advance. They also provide forecast maps that display anticipated amounts of precipitation to occur within the upcoming 72 hours. These interactive maps loop instantly in 6-hour increments to show expected depths of precipitation in this 72 hour window.

- National Oceanic and Atmospheric Administration's National Weather Service <http://www.weather.gov/>

- Reagan National Airport (Washington, DC)
<http://weather.noaa.gov/weather/current/KDCA.html>
- Radio/Television
- FM radio channel: 88.5 WAMU or 103.5 WTOP
- The Weather Channel on various cable outlets
- Newsprint
- The Washington Times
- The Washington Post
- Electronic Tools
- Smartphones to access specific online tools

B1.8. Daily Weather Logs

The project manager or qualified representative will maintain a daily weather log using information from NOAA.gov

1. Time & Date of report- as 24-hour day, as day month year (1730 01/11/2006)
2. High and Low Daily Temperature in degrees Fahrenheit (Hi-85° F/Lo-35° F)
3. High and Low Record Temperature in degrees Fahrenheit (1905-Hi-85°F/1945-Lo-35°F)
4. Conditions- Categorized as
 - CLEAR- little to no clouds
 - CLOUDY- fifty percent or greater sky cover
 - NON-QUALIFYING EVENT- less than one tenth of an inch (<00.1")
 - QUALIFYING EVENT- greater than one tenth of an inch (>00.1")
 - SEVERE STORM- severe winds and storms that create unsafe work environments
5. Wind Speed & Direction- at the time log is written in miles per hour (15.0mph)

The field sampling team will maintain a weather log for every qualifying weather event. They will record the following information;

1. Time & Date of report
2. Author's name
3. Current Weather alerts and warnings
4. Temperature in degrees Fahrenheit
5. Site locations expected to be sampled
6. Site locations actually sampled
 - Time arrived on site
 - Number and size of samples taken
 - Time samples were taken
 - Time left site
 - Time Chain of Custody was completed

The QA/QC Manager will review these logs on a weekly basis.

B1.9. Coordination of Events for Storm Sampling

Apex's project manager will manage the notification of all involved parties in the event of a pending qualifying weather 24 hours in advance. Apex personnel are equipped with cell phones to facilitate efficient mobilization. The project manager will notify each member of the sampling teams to ensure proper dissemination of information regarding locations to be sampled and other vital information. An e-mail will be sent to the Contract Administrator or its designee notifying the DC government that a qualifying event will likely occur in the next 24 hours. Phone notifications will also be made and a follow up email, after demobilization, will be sent stating the locations and quantity of samples, if any, were collected and sent to the laboratory.

B2. Sampling Methods Requirements

Samples will be collected using the containers and preservatives specified in Appendix 3. Unless otherwise stated, the order of sample collection will be:

1. In-situ measurements
2. Volatile organic compounds (VOCs)
3. Microbiological
4. Extractable organics: semivolatiles, pesticides/PCBs, herbicides, etc.
5. Total metals, other parameters, etc.

Sample containers will be labeled with the following information: location identification, date, parameter(s) to be analyzed, and type of preservative (see B3.2.2). Samples will then be immediately placed in a cooler and held at 4°C. Disposable gloves will be worn by the sampling personnel and changed between sampling points. The field data collected shall be recorded in the field logbook and on the sample collection form at the time of sampling.

While performing any equipment decontamination, phthalate-free gloves (neoprene or natural rubber) will be worn in order to prevent phthalate contamination of the sampling equipment by interaction between the gloves and the organic solvent(s). To the greatest extent possible disposable sample collection equipment will be used and will be disposed of in accordance with applicable Federal, state and local regulation.

At the end of each sampling event, the sampling team shall report any problems requiring corrective action that were encountered during the event. Corrective action will be undertaken when a nonconforming condition is identified. A nonconforming condition occurs when QA/QC objectives for precision, accuracy, completeness, representativeness, or comparability are not met, or when procedural practices or other conditions are not acceptable. The report shall be filed with the Project Manager which documents the problems encountered and the corrective action implemented.

A table of parameters, holdings times and methods are listed in Table 2 and Table 3.

B3. Sample Handling and Custody Requirements

The samples will be packaged, preserved and handled in a manner to ensure the integrity of the sample. The laboratory may preserve sample containers before sending them to the field sampling team or they may be preserved in the field before or after sample collection depending on the analytical parameter and project specifications. All required preservatives would be specified by the particular analytical method to be used. The samples will be packaged and shipped in a manner to minimize the potential for breakage and ensure the holding time for all parameters is not exceeded.

1. Samples requiring pH adjustment in the sample jar shall be obtained with the appropriate preservative pre-measured in the sample container by the laboratory. If preservation of the sample causes effervescence, the sample will be submitted without pH adjustment and all samples will be cooled to $\pm 4^{\circ}\text{C}$. Appropriate safety precautions when handling sample containers preserved with acids, or caustics.
2. Each cooler shall be prepared to contain the exact number and type of sample containers required for one suite of parameters for each outfall/location. The sample containers will be pre-labeled and preserved and all required sample packaging material will be prepared and included in the cooler.
3. After collection the samples will be placed in lined cooler using a large plastic bag. Each cooler will have the correct number of sample containers inside and the containers will be pre-labeled. Waterproof labels will be used.
4. The field sampling team will double check to ensure that all sample containers have been filled properly and are properly protected against breakage and will then secure the bag.
5. The field sampling team will complete the chain of custody for each cooler and will seal it in a ziplock bag. Chain of custody will filled-out to the greatest extent possible prior to mobilizing to the field and will be completed in the field. The bag will be taped to the interior lid of the cooler. The cooler will then be sealed with clear packaging tape and equipped with tamper proof seals and labeled for shipment to the Lab.
6. The sample coolers will be shipped to the lab using the most expedient method. This may include courier, commercial transporter or hand delivery.

B3.1. Overview

Sample custody during the field investigations will be performed in three phases. The first phase encompasses sample collection, pre-laboratory treatment procedures (preservation), packaging, and field custody shipping procedures. The second custody phase involves sample shipment, where mode of shipment, airbill numbers, dates, and times are documented. The third phase involves the custody procedures employed by the laboratory.

All three phases of sample custody will be performed to provide that:

- All samples are uniquely identified
- The correct samples are tested and are traceable to their source
- Important sample characteristics are preserved

- Samples are protected from loss or damage
- A record of sample integrity is established and maintained through the entire custody process

Custody and shipping procedures are modeled after standard U.S. EPA procedures.

B3.2. Field Custody Procedures

B3.2.1 Sample Identification

All samples collected must be identified with a sample label in addition to an entry on a chain-of-custody record. Indelible ink will be used to complete sample labels, then labels will be covered with clear plastic waterproof tape.

B3.2.2. Sample Labels

Sample labels will require the field team to complete the following information for each sample bottle:

1. Site Name
2. Sample Number
3. Sample Matrix
4. Parameters to be analyzed
5. Date of Collection
6. Time of Collection
7. Preservation Technique Employed
8. Sampler's Name

Sample labels will be attached to the sample bottles and covered with clear plastic waterproof tape.

B3.2.3. Sample Numbering

Samples shall be numbered in such a manner that the site, location, type of sample, and depth of sample or date of sample is evident. Below are suggested examples of sample numbering.

Stormwater samples will be labeled as follows:

SWXX - MMDDYY

| | |
|---------|--|
| SW: | Storm-water sample |
| XX: | Identifies site location (Per Table 2) |
| MMDDYY: | Date of sampling round |

Field blanks will be labeled by adding FB to the end of the sample number.

Trip blanks will be labeled by adding TB to the end of the sample number.

B3.3. Chain-of-Custody Record

The chain-of-custody guidelines create an accurate written record that can be used to trace the possession and handling of the sample from the moment of its collection through analysis. Chain-of-custody forms will be completed for each sample at the time of collection and will be maintained while shipping the sample to the laboratory. A person is in custody of a sample if the sample is:

- Sample is in that person's physical possession.
- Sample is visible after being in that person's physical possession.
- Sample placed in a locked repository by that person.
- Placed in a secure restricted area by that person.

Prior to the sampling event or soon as practical after sample collection, preferably after decontamination, the following information must be entered on the chain-of-custody form. All information is to be recorded in ink.

1. Project number. Enter the alphanumeric designation that uniquely identifies the project site.
2. Project name. Enter the site name.
3. Samplers. Sign the name(s) of the sampler(s).
4. Sample number(s). Enter the sample number for each sample in the shipment. This number appears on the sample identification label.
5. Date. Enter a 6-digit number indicating the day, month, and year (MMDDYY) that each sample was collected.
6. Time. Enter a 4-digit number indicating the time of collection of each sample based on the 24-hour clock: for example, 1354.
7. Sample matrix. Enter the matrix (e.g., soil, aqueous, drum waste, etc.) of the sample.
8. Parameters for analysis. Enter the analyses to be performed for each sample.
9. Number of containers. For each sample number, enter the number of sample bottles that are contained in the shipment by parameter for analysis.
10. Remarks. Enter any appropriate remarks.

B3.4. Sample Shipment

Custody of samples must be maintained through the shipment of samples to the selected laboratory. All samples will be packaged and delivered so that the samples are not held at the site more than 6 hours. Samples will be delivered directly to the laboratory by sampling personnel or courier to ensure the 6-hour holding time for micro-biological samples is complied with. The samples will be packaged using the following procedures.

- Use waterproof high-strength plastic ice chests or coolers only.
- After filling out the pertinent information on the sample label and tag, put the sample in the bottle or vial and screw on the lid.
- Tape cooler drain shut.
- Place inert cushioning material such as bubble wrap will be placed in the bottom of the cooler. Styrofoam packing cannot be used when sampling for volatile organics.
- Enclose the bottles in clear plastic bags through which sample labels are visible, and seal the bag. Bottles are to be placed upright in the cooler in such a way that they do not touch and will not touch during shipment. Place cushioning material around the bottles.
- Enclose temperature blank in each cooler.
- Additional inert packing material will be put in to partially cover sample bottles (more than halfway). Place bags of ice or ice-gel packs around, among, and on top of the sample bottles in a separate plastic bag
- Custody seals will be applied to the front and back of the cooler.
- Tape will be used to secure lids. Wrap the cooler completely with strapping tape at a minimum of two locations. Do not cover any labels.
- Attach completed shipping label to top of the cooler. The shipping label shall have a return address.
- The cooler will be delivered/shipped via courier or directly delivered by Apex personnel to the respective laboratory or laboratory personnel.

Custody forms will be placed in a "ziplock" bag and taped to the inside cover of the shipping cooler.

B3.5. Laboratory Custody Procedures

When the sample arrives at the laboratory following shipment, the custodian receives the sample. The label will be identified upon receipt by the laboratory and cross-referenced to the chain-of-custody record. Any inconsistencies will be noted on the custody record.

Laboratory personnel will notify the Project Manager immediately if any inconsistencies exist in the paper work associated with the samples.

Laboratory personnel, following laboratory protocols, will maintain custody of the samples throughout analysis. The laboratory custody procedures are detailed in the LQAM.

B3.6. Documentation and Tracking Deficiencies

Complete documentation of sample custody and shipment will be performed. Copies of chain-of-custody forms and field documentation notes are to be kept on file by the Project Manager. Mode of shipment, airbill numbers, dates and times of all sample shipments will also be documented. Any deficiencies (including coolers lost by the shipper) requiring corrective actions will be reported to the Project Manager, who will document the problem and respond with corrective action after consultation with the QA/QC Manager. Corrective action may include resampling where the tracking deficiency resulted in exceeding sample holding times, etc. Additional information regarding nonconformance is presented in Section C2.1. Laboratory procedures for responding to deficiencies and the resultant corrective actions are discussed in further detail in the LQAM.

B4. Analytical Methods Requirements

Retaw and Apex have selected Microbac Laboratories, Inc. to be responsible for sample analysis. Analytical methods and parameters will be determined on a project-specific basis. A copy of the laboratory's standard operating procedures (SOPs) for common analytical methods will be included in the LQAM. The SOPs will include target analytes, practical quantitation limits, spiking conditions, and precision and accuracy criteria for all matrices.

The contract requires a specific set of analysis be performed on a highly specific schedule. Sample collection container and preservative requirements are depicted in Table 2 and Table 3 below:

Table 2 – Dry Weather Parameters

| Parameter | Container Type | Preservation | Sample Type | Method | Holding Times |
|-------------------------------------|--|---------------------|--------------------|---------------|----------------------|
| Chloroform | 40 ml glass teflon lined VOA | Hydrochloric Acid | Grab | EPA 8260 | 14 days |
| 1,1,2-Trichloroethylene | 40 ml glass teflon lined VOA | Hydrochloric Acid | Grab | EPA 8260 | 14 days |
| 1,1,2,2-Tetrachloroethylene | 40 ml glass teflon lined VOA | Hydrochloric Acid | Grab | EPA 8260 | 14 days |
| Tetrachloroethene | 40 ml glass teflon lined VOA | Hydrochloric Acid | Grab | EPA 8260 | 4 days |
| Trichloroethylene(tri chloroethene) | 40 ml glass teflon lined VOA | Hydrochloric Acid | Grab | EPA 8260 | 14 days |
| Bis(2-ethylhexyl)phthalate | 40 ml glass teflon lined VOA | Hydrochloric Acid | Grab | EPA 8260 | 14 days |
| Gamma-BHC | 1000 ml glass amber narrow w/ Teflon liner | Unpreserved | Grab | EPA 608 | 7 days |

| | | | | | |
|------------------------|--|--------------------------------|----------|-------------------|----------|
| Dieldrin | 1000 ml glass amber narrow w/ Teflon liner | Unpreserved | Grab | EPA 608 | 7 days |
| Total PCBs | 1000 ml glass amber narrow w/ Teflon liner | Unpreserved | Grab | EPA 608 | 7 days |
| Arsenic, Total | 500 ml plastic wide-mouth | Nitric Acid | Grab | EPA 200.7 | 180 days |
| Cadmium, Total | 500 ml plastic wide-mouth | Nitric Acid | Grab | EPA 200.7 | 180 days |
| Chromium, Total | 500 ml plastic wide-mouth | Nitric Acid | Grab | EPA 200.7 | 180 days |
| Copper, Total | 500 ml plastic wide-mouth | Nitric Acid | Grab | EPA 200.7 | 180 days |
| Lead, Total | 500 ml plastic wide-mouth | Nitric Acid | Grab | EPA 200.7 | 180 days |
| Nickel, Total | 500 ml plastic wide-mouth | Nitric Acid | Grab | EPA 200.7 | 180 days |
| Zinc, Total | 500 ml plastic wide-mouth | Nitric Acid | Grab | EPA 200.7 | 180 days |
| Cyanide, Total | 250 ml plastic wide mouth | Ascorbic Acid/Sodium Hydroxide | Grab | EPA 335.4 | 14 days |
| Phenols, Total | 1000 ml glass amber narrow w/ Teflon liner | Sulfuric Acid | Grab | EPA 420.1 | 28 days |
| Total suspended solids | 950 ml plastic | Unpreserved | Grab | SM 2540 D | 7days |
| Total dissolved solids | 950 ml plastic | Unpreserved | Grab | SM 2540 C | 7days |
| COD | 950 ml plastic | Sulfuric Acid | Grab | EPA 410.4 | 28 days |
| BOD ₅ | 950 ml plastic | Unpreserved | Grab | SM 5210 B | 2 days |
| Oil and Grease | 1000 ml glass wide w/ Teflon liner | Hydrochloric Acid | Grab | EPA 1664 A | 28 days |
| E. Coli | 4 oz sterile polypropylene | Sodium Thiosulfate | Grab | SM 9221 F | 6 hours |
| Fecal coliform | 4 oz sterile polypropylene | Sodium Thiosulfate | Grab | SM 9221 E | 6 hours |
| Fecal streptococcus | 4 oz sterile polypropylene | Sodium Thiosulfate | Grab | SM 9230 B | 6 hours |
| Dissolved phosphorous | 500 ml plastic wide-mouth | Unpreserved | Grab | EPA 365.1 | 28 days |
| Total phosphorous (TP) | 950 ml plastic | Sulfuric Acid | Grab | EPA 365.1 | 28 days |
| Chlorophyll (a) | 4 oz glass amber narrow w/Teflon liner | Unpreserved | Grab | SM 10200 H | 2 days |
| Hardness | 950 ml plastic | Unpreserved | Grab | SM 2340 C | 28 days |
| pH | N/A | N/A | In Field | N/A | N/A |
| Temperature | N/A | N/A | In Field | N/A | N/A |
| Total nitrogen | 950 ml plastic | Sulfuric Acid | Grab | SM 4500N-org/NH3G | 28 days |

Table 3 – Wet Weather Parameters

| Parameter | Container Type | Preservation | Sample Type | Method | Holding Times |
|------------------|----------------------------|--------------------|-------------|-------------------|---------------|
| <i>E. coli</i> | 4 oz sterile polypropylene | Sodium Thiosulfate | Grab | SM 9221 F | 6 hours |
| Total nitrogen | 2.5 gallon glass jar | Unpreserved | Composite | SM 4500N-org/NH3G | 28 days |
| Total phosphorus | 2.5 gallon glass jar | Unpreserved | Composite | EPA 365.1 | 28 days |

| | | | | | |
|------------------------|---|--------------------|-----------|-------------|------------|
| Total Suspended Solids | 2.5 gallon glass jar | Unpreserved | Composite | SM 2540 D | 7 days |
| Cadmium | 2.5 gallon glass jar | Unpreserved | Composite | EPA 200.7 | 180 days |
| Copper | 2.5 gallon glass jar | Unpreserved | Composite | EPA 200.7 | 180 days |
| Lead | 2.5 gallon glass jar | Unpreserved | Composite | EPA 200.7 | 180 days |
| Zinc | 2.5 gallon glass jar | Unpreserved | Composite | EPA 200.7 | 180 days |
| pH | N/A | N/A | In Field | SM 4500 H B | 15 minutes |
| Fecal coliform | 4oz sterile polypropylene | Sodium Thiosulfate | Grab | SM 9221 E | 6 hours |
| Dissolved Oxygen | N/A | N/A | In Field | N/A | N/A |
| Hardness | 2.5 gallon glass jar | Unpreserved | Composite | SM 2340 C | 28 days |
| Chlorophyll a | 4 oz glass amber narrow w/ Teflon liner | Unpreserved | Grab | SM 10200 H | 2 days |
| Temperature | N/A | N/A | In Field | N/A | N/A |

B5. Quality Control Requirements

Apex will ensure that Microbac participates in the annual U.S. Environmental Protection Agency's Discharge Monitoring Report-Quality Assurance Study Program (<http://www.epa.gov/compliance/monitoring/programs/cwa/dmr/>) and submit testing results for all parameters. All analytical laboratory instruments should have initial and subsequent daily calibration verified after every set of samples. Quantitative limits should be defined for individual parameters and should be expressed as the lowest calibration standard employed. Values below the quantitative limit should be reported as estimated values. Values below the laboratory method detection limit should be reported as less than the method detection limit. The method detection limit studies, analytical data and results should be on file at the laboratory.

| QC Parameter | QC Limit | Frequency |
|-------------------------------------|------------------------|--|
| Initial Calibration | (Intentionally blank) | A minimum of 3 concentration levels (or as specified by the method) and after the laboratory control sample, continuing calibration verification or method blank failure |
| Method blank | Method detection limit | One per set of sample |
| Lab control sample | 85-115% | 1 per batch |
| Continuing Calibration Verification | 85-115% | at daily start up, 1 after each 10 determinations, and at the end of the batch |
| Laboratory Duplicate | 20% relative percent | One per set of sample |

| | | |
|--------------|------------|-----------------------|
| | difference | |
| Matrix Spike | 75-125% | One per set of sample |

Definitions:

- Initial calibration curve: calibration is needed for all analytes for example, calibration standards for ion chromatography, turbidimetric and spectrophotometric tests (correlation coefficient $\geq .995$). Initial calibration criteria must be met prior to analysis of samples.
- Continuing calibration verification (CCV): a verification of calibration is to be performed at the beginning of each analytical batch using a mid-range reference/ standard (as appropriate for method) from a source different from the initial calibration. If CCV is outside of QC limits, recalibrate instrument and rerun samples analyzed since the last compliant continuing calibration check.
- Laboratory control sample (LCS); a mid-level standard/reference (as appropriate for method) carried through the entire analytical procedure as for a sample. If QC criteria are not met for the LCS, determine the source of contamination, and repeat the analysis of the samples, method blank and LCS. The limits must be set for analysis to be acceptable.
- Method Blank: if the method blank is outside of QC limits, determine the source of contamination, and prepare a new blank and re-prepare all samples. Repeat until criteria are met.
Duplicate: if the relative percent difference is outside of QC limits, flag the data results and report results in the narrative.
- Matrix Spike: If the percent recovery is outside of QC limits, flag the results and report. Spike levels are based on 2 x CRQL

B5.1. Field Quality Control

The QC checks employed for field instruments include the following:

| Table 4 – Field Quality Control | | |
|--|--|------------------|
| QC Method | Purpose | Frequency |
| Calibration Check | Insures proper working order of field instruments. Measures accuracy and sensitivity. | Daily |
| Field Duplicate Sample | Measures instrument precision. | 5 percent |
| Field Rinsate Blanks | Measures cross-contamination. | Daily |

B5.2. Laboratory Quality Control

The analyses shall include the following QC procedures, when applicable:

| Table 5 – Laboratory Quality Control | |
|---|------------------|
| Procedure | Frequency |
| Calibration | As required |
| Standards | Daily |
| Method Blanks | Daily |
| Duplicates | 5 percent |
| Matrix Spikes | 5 percent |
| Surrogates | Each sample |

Duplicate samples, rinsate blanks, and trip blanks will be collected in the field at the rate required for each particular project. Laboratory blanks, standards, and check samples will be run at the rate specified in the appropriate analytical method. Matrix spikes and matrix spike duplicates will be run at the rate of one per 20 samples or one per batch, whichever is more frequent. Performance evaluation samples will be run at a rate of once per calendar quarter or at a frequency determined by the Project Manager. Internal performance evaluation samples will be run at a frequency determined by the internal laboratory QC staff.

The analytical method performance will be evaluated by an examination of precision, accuracy, and completeness. Analytical data quality assurance objectives are presented in Section A7.2.

Precision is the ability to replicate a value. Precision is determined by measuring the agreement among individual measurements of the same property, under similar conditions. The degree of agreement, expressed as the relative percent difference (RPD), is calculated using the formula below.

Precision:

$$RPD = \frac{|V_1 - V_2| \times 100}{\frac{(V_1 + V_2)}{2}}$$

Where:

V₁=value 1

V₂=value 2

Accuracy is a measure of the closeness of an individual measurement to the true or expected value. To determine accuracy, a reference material of known concentration is analyzed or a sample that has been spiked with a known concentration is reanalyzed. Accuracy is expressed as a percent recovery and is calculated using the following formula.

Accuracy:

$$\% recovery = \frac{\text{measured value}}{\text{true value}} \times 100$$

Completeness is a measure of the quantity of valid data acquired from a measurement process compared to the amount expected under the measurement conditions. Completeness is usually expressed as a percentage.

Data reduction is the process by which raw analytical data generated from laboratory instrument systems is converted into usable concentrations. The raw data, which may take the form of area counts, instrument responses or observations, is processed by the laboratory and converted into concentrations expressed in the part per million or part per billion range. Raw data from these systems include compound identifications, concentrations, retention times, and data system printouts. Raw data is usually reported in graphic form, bar-graph form or tabular form. Data reduction procedures will be explained in greater detail in the LQAM.

Laboratory audit procedures are presented in the LQAM.

B5.3. Field Audits

Field audits are performed by the QA/QC Manager or his designate on a periodic basis (based on project-specific needs) throughout the duration of the field program. The field audits will include an evaluation of sampling methods; sample handling and packaging; equipment use; equipment decontamination, maintenance, and calibration procedures; and chain-of-custody (COC) procedures. In addition, all records and documentation procedures will be reviewed to ensure compliance with the project requirements. Any deviations from the Work Plan (WP) or Quality Assurance Project Plan (QAPP) will be recorded in the field notebook by the person conducting the audit, which will then inform the personnel involved in the activity of the problem and notify the Project Manager for initiation of any necessary corrective action procedures.

B6. Instrument/Equipment Testing, Inspection, & Maintenance Requirements

B6.1. Preventive Maintenance

A preventive maintenance program is necessary to help prevent delays in project schedules, poor output performance, or erroneous results in investigative and/or remedial operations. Qualified personnel will perform preventive maintenance on laboratory analytical equipment used in this program. Maintenance of field equipment will be performed routinely for sampling events. More extensive maintenance will be performed, based on hours of use, by a qualified servicing organization. Repairs, adjustments, and calibrations will be recorded. Records will be available for inspection by the Project Manager on request.

B6.2. Field Equipment

The three elements of the field equipment maintenance program include normal upkeep of equipment, service and repair (when required), and formalized recordkeeping of all work performed on each piece of equipment. This section addresses the normal equipment upkeep element of the maintenance program. For most of the equipment, normal maintenance will consist of cleaning outside surfaces, lubrication of all moving parts, and, if applicable, a battery level check and recharge or replacement as necessary. This program will include the maintenance of all monitoring, measuring, and test equipment returning from field use or any equipment used on a daily basis. The frequency of maintenance checks will be dependent on the individual needs and use of each piece of equipment. Details regarding the required maintenance and operational procedures for the field equipment can be found in the associated manufacturer's handbook or instruction manual. Maintenance procedures will be only those necessary for keeping an instrument in service or to prepare for everyday use. Repair problems will be referred to the manufacturer or other qualified servicing organizations.

The QA/QC Manager or the designated task leader will be responsible for keeping all maintenance records, making sure all equipment used is maintained properly, informing field team members of any specific maintenance requirements for equipment used at the site, and shipping any instrument in need of repair to the correct source.

The field personnel responsibilities include maintaining each piece of equipment located at the site and the maintenance of equipment after use. A record of equipment maintenance and repair will be kept in the field logbook.

B6.3. Rental Equipment

Rental equipment used on the project will be obtained only from a reliable rental supplier. The equipment will require an equipment test sheet to verify accuracy, maintenance, and upkeep of the equipment. A receipt indicating that the equipment has been checked upon return will be required as well.

B6.4. Laboratory Equipment

An important factor in maintaining accuracy and precision, achieving required holding times, and addressing contract schedule is preventive maintenance. As part of the laboratory's standard operating procedures, service contracts will be held on critical analytical instruments.

B7. Instrument Calibration & Frequency

B7.1. Field Calibration Procedures

Measuring and test equipment shall have an initial calibration and shall be recalibrated at scheduled intervals against certified standards that have known and valid traceability to recognized national standards. Calibration intervals for each item shall be, at a minimum, in accordance with manufacturer's recommendations as defined in the equipment manual. Test equipment used for calibration of sensors shall be recalibrated at least once a year or when maintenance or damage indicates a need for recalibration.

Calibration standards shall be maintained and used in an environment with temperature, humidity, and cleanliness controls that are compatible with the accuracy and operating characteristics of the standards. An inspection will be made during the equipment calibration to evaluate the physical condition of the equipment. The purpose of the inspection is to detect any abnormal wear or damage that may affect the operation of the equipment before the next calibration. Equipment found to be out of calibration or in need of maintenance or repair will be identified and removed from service.

The QA/QC Manager shall be notified if the test equipment is found to be out of tolerance during inspection and calibration. The corrective actions to be taken include evaluating the validity of previous inspection or test results; evaluating the acceptability of the items inspected or tested since the last calibration check; and repeating the original inspections or tests using calibrated equipment when it is necessary to establish the acceptability of previous inspections or tests.

Each item of measuring or testing equipment in the calibration program shall be identified in such a way as to show its calibration status and calibration expiration date. Equipment history records for measurement and test equipment shall be used to indicate calibration status and conditions, corrections to be applied, results of in-service checks, and repair history. This will provide a basis for establishing calibration frequencies and for remedial action if the instrument is found to be out of calibration.

Calibration frequency and procedures for each piece of equipment can be found in the manufacturer's manual. Calibration documentation requirements are specified in Section 6.4.

B7.2. Laboratory Calibration Procedures

Laboratory instrumentation calibration procedures, frequency, and standards will be consistent with the requirements of the applicable analytical method. Additional information on instrumentation calibration procedures and frequency are presented in the LQAM.

B8. Inspection/Acceptance Requirements for Supplies and Consumables

The task manager will be responsible for inspecting sample containers before leaving for a dry or wet weather sampling event. The sample containers will be supplied by Microbac and will be inspected for cracks, ill-fitting lids, and other obvious defects before use and will be discarded if defects are found to be present.

The Microbac laboratory analyst assigned to conduct the analysis will be responsible for inspecting equipment and supplies upon receipt.

B9. Data Acquisition Requirements for Non-direct Measurements

No existing data was obtained or provided for this project.

B10. Data Management**B10.1. Data Management Locations**

Data for this project will be produced in two locations: in the field and in the laboratory. The field data collection will be recorded on the field data sheets and in the field notebooks. The field data sheets and field notebooks will be submitted to the task manager when field activities are complete and will become part of the project file.

Field book entries will be completed for each day of field activities by the field sampling team and forwarded to the Project Manager. The report includes the weather during sampling, samples taken, instrument maintenance and calibration, and any field changes, problems, or corrective actions. The field books will document the enforcement of the Quality Control program through the field audit program.

All field books, laboratory data reports, and reports will be stored in one central location at Apex's office in Manassas, VA.

C. ASSESSMENT AND OVERSIGHT

C1. Assessment and Response Actions

Planned assessments include routine monitoring of field activities and the verification and validation of all reported data (conducted in accordance with sections D1 and D2). The monitoring of field activities will be conducted by the Project Manager or QA/QC Manager, on-site, at the time(s) when samples are being collected for both field and laboratory analysis and when field analyses are conducted. The purpose of this audit will be to identify any performance deficiencies and to verify conformance with the procedures discussed and referenced in this QAPP. The findings from this audit will be used to plan any follow-up actions needed to ensure resolution of performance deficiencies. The Project Manager or QA/QC Manager will have the authority to stop work on-site if he deems the findings from the audit to justify such actions. The Task Manager/Key Personel, in consultation with the Project Manager, will be responsible for corrective actions relating to field activities.

The narrative report included with each laboratory data report will include a discussion of the quality of the reported laboratory data, which will result from the Microbac Laboratory Director's audit of data quality according to SOP No. QM-001-020 Issue No. 001, "Quality Assurance Manual- Baltimore Division". The Microbac Laboratory Director will be responsible for corrective actions at the laboratory. The Project Manager or QA/QC Manager will review the results from all reported data to verify that it is useable for the purposes of this project, and that it is reasonable when taken with other facts known about the site. Sections D1 and D2 of this QAPP discuss the verification and validation process in detail.

If a particular analysis is deemed "out-of control," corrective action will be taken to ensure continued data quality. Actions that may be taken include, but are not limited to:

- Rechecking calculations
- Checking QC data on other samples
- Auditing laboratory procedures
- Reanalyzing the sample if the holding time requirements have not been exceeded
- Accepting data with the acknowledged level of uncertainty
- Discarding data

The coordinator of the laboratory's analytical section will be responsible for initiating laboratory corrective action when necessary. The laboratory Data Quality Reviewer will make recommendations for corrective actions outside the laboratory to the Apex Project Manager or QA/QC Manager.

C2. Reports to Management

Reports to management will include a DDOE Notifications and a Sampling Report following each successfully sampled qualifying rain event (greater than 0.1" of rain).

Apex will notify the DDOE by email of all attempts (successful or not successful) within 48-hours of the first business day following each attempt to collect samples.

12/04/2012

Following successfully sampled rain events, Sampling Reports will be generated by the Project Manager for inclusion in DDOE's project file upon receipt of analytical results. Reports will be submitted no later than 30 days following each sampling event. These reports will include a summary description of sampling activities, field analysis results, a summary of analytical data, and a discussion of any problems encountered and associated corrective actions. Attachments will include field data sheets, Chain-of-Custody documents, precipitation data including hydrographs, and a full copy of the laboratory analytical report.

Field activity reports will be generated by Project Manager within two weeks of the sampling event. Laboratory analytical reports will be generated by Microbac laboratory staff and submitted to the Project Manager after receipt of the samples. Apex will then include the analytical information, in conjunction with the field information, in a Sampling Report to DDOE. Any significant QA problems encountered in the laboratory or in the field, as deemed by Microbac or the QA/QC Manager will be reported immediately to the Project Manager via telephone.

C2.1. Nonconformance Reporting

A nonconformance is defined as an identified or suspected deficiency in an approved document (e.g., technical report, analysis, calculation, computer program); or a deficiency in an item where the quality of the end item itself or subsequent activities using the document or item would be affected by the deficiency; or an activity that is not conducted in accordance with the established plans or procedures.

Any team member (including laboratory team members) engaged in project work that discovers or suspects a nonconformance is responsible for initiating a nonconformance report. This team member shall obtain a nonconformance report number from the QA/QC Manager. The QA/QC Manager shall evaluate each nonconformance report and shall provide a disposition that describes the actions to be taken.

The Project Manager shall ensure that no further project work dependent on the nonconforming item or activity is performed until approval is obtained and the nonconformance report is closed out. If the nonconformance is related to material, the Project Manager shall be responsible for marking or identifying, with the nonconformance report number, the nonconforming item (if practical), and indicating that it is nonconforming and is not to be used.

A copy of each closed nonconformance report shall be included in the quality assurance file. The QA/QC Manager shall maintain copies of all nonconformances.

D. DATA REVIEW AND USABILITY

D1. Data Validation and Usability

Data will be accepted if they meet the following criteria:

1. Field data sheets are complete and signed.
2. Field data and laboratory data were validated.
3. Actual sample locations and collection procedures match the proposed sample locations and collection procedures identified in sections A5 and B2, respectively.
4. Sample handling procedures are documented on COC forms.
5. Field book narrative matches the proposed sample handling procedures identified in sections B2 and B3 (e.g., samples properly preserved, microbiological holding time of six hours not exceeded).
6. Field QC was conducted as outlined and meets the acceptance criteria in section B5 (field equipment was calibrated daily, field duplicate sample results within 5%, field rinsate blank indicated no cross-contamination).

Any deviations from the QAPP must be reported in the field book or analytical data report. The analytical data report will include the information described in section A9. The EPA Project Manager will verify the content of these reports.

If the data fails to meet the criteria, they will be flagged by the Project Manager as estimated values. Any flagged data will be discussed with the project team and DDOE Water Quality Division to determine if the data point will be rejected and re-sampling done.

D2. Data Validation and Verification

The Project Manager will validate the field data and any problems identified during this process will be reported to the Project Manager in field book activity reports.

The Microbac Laboratory Director will validate the laboratory data according to SOP No. QM-001-020 Issue No. 001, "Quality Assurance Manual- Baltimore Division". Any problems identified during this process will be reported to Apex Companies, LLC Project Manager in the analytical data report.

The Project Manager or QA/QC Manager will review and verify the field sheets, field book activity reports, and the analytical data report. Any problems or deviations identified will be discussed with the project team.

D3. Reconciliation with Data Quality Objectives

The laboratory shall review data prior to its release. Objectives for review are in accordance with the QA/QC objectives stated earlier in this document. The laboratory is required to evaluate their ability to meet these objectives. Outlying data shall be flagged in accordance with laboratory SOPs and corrective action shall take place to rectify the problem. Laboratory review SOPs will be found in the LQAM.

Under the National Pollutant Discharge Elimination System ([NPDES](#)) program, the laboratory is required to participate in the annual Discharge Monitoring Report–Quality Assurance (DMR-QA) study program. DMR-QA evaluates the analytical ability of the laboratories that routinely perform self-monitoring analyses required by their NPDES permit. Microbac Laboratory will participate in this annual study.

The quality assurance (QA) laboratory will deliver the sample results and data package, which will be reviewed by the QA/QC Manager. The data reviewed will include all blank, sample, and internal quality control results such as spike and surrogate recoveries and replicate analyses. Any significant differences or problems discovered will be addressed; corrective action, such as reanalysis and/or resampling, may result at the Project Manager's discretion.

The sample event report will be submitted within approximately 30 days of the actual sampling event and based on actual analytical results receipts from the Microbac laboratory. The results of the field parameters tested during the sampling event, field data collection sheet, site narrative report of the event and sampling locations where the actual storm water samples collected, site photographs and meteorological data predicting the storm-water event, signed chain-of-custody forms and the laboratory analytical results of analyzed samples will be included in the sample event report. Two hard copies of the report and an electronic report copy will be submitted for each event report to DC DOE.

Appendix 1
(Laboratory Quality Assurance Manual)

Microbac Laboratories, Inc., Baltimore Division
2101 Van Deman St.
Baltimore, MD 21224
Tel: (410) 633-1800

Microbac Laboratories, Inc., Richmond Division
2028 Dabney Road, Suite E-17
Richmond, VA 23230
Tel: (804) 353-1999

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QUALITY ASSURANCE MANUAL MICROBAC LABORATORIES, INC., BALTIMORE DIVISION

This Microbac Laboratories, Inc., Baltimore Division Quality Assurance Manual governs all testing performed by Microbac Laboratories, Inc., Baltimore and Richmond locations (hereafter jointly referred to as Microbac Laboratories, Inc.). The addresses and phone numbers above will allow you to reach all parties responsible for the laboratories.

The reference source for this Quality Assurance Manual is ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories". The laboratory management is committed to compliance with the NELAC and ISO/IEC 17025 standard and in following the requirements and guidelines stated in this standard for testing performed by the laboratory.


Quality Assurance Manual, *Issue 01 – Revision 020 and later revisions* is effective from 08/22/2012. It supersedes and replaces the Microbac Laboratories, Inc., Baltimore Division QA Manual Revision *Issue 01 - Revision 19*.

This manual is approved by:


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Mark Horan
Laboratory Director / Division Manager

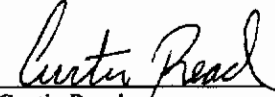
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Kelly
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Peter Kelly
Lead Technical Director

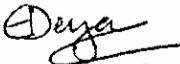
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Date


Curtis Read
Technical Manager

8/1/2012

Date


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Emily Deya
Quality Assurance Manager

08/01/2012

Date

Changes to this manual must be approved by the Division Manager or Technical Personnel and Quality Assurance Manager.

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1. QUALITY POLICIES

To meet the quality mission previously set forth, Microbac Laboratories, Inc., Baltimore Division, conforms to the following policies:

- 1.1 To maintain an organization of well-qualified and properly trained personnel who are knowledgeable in and follow Microbac Laboratories, Inc. prescribed procedures and policies. Personnel are trained and qualified in order to perform specific tests.
- 1.2 In order to provide quality analytical data, it is essential to have qualified, well-trained personnel. In-house training of technical personnel is performed according to a written Standard Operating Procedure Gen-010 "Training Protocol" and ensuring that all personnel familiarize themselves with laboratory quality system documentation in order to implement the policy and procedures in their work.
- 1.3 In all Field Sampling procedures - to collect samples properly and to ensure that they maintain the characteristics of the sample source by the use of appropriate sampling and preservation techniques.
- 1.4 To collect and receive samples under chain-of-custody procedures adhering to proper sample preservation and collection techniques.
- 1.5 To maintain adequate facilities (physical plant and instrumentation) to allow personnel to perform chemical tests properly in a safe environment.
- 1.6 To obtain, maintain, and calibrate equipment and instrumentation as required to accurately and efficiently perform chemical tests as prescribed in the test methods.
- 1.7 To use, adapt, or develop "rugged" analytical methods. Whenever available, written methods from organizations such as USEPA, APHA/AWWA/WPCF (Standard Methods), ASTM, NIOSH, AOAC, FDA, USP or other recognized organizations are used.
- 1.8 To use suitable reagents and standards. These are purchased or prepared as appropriate. When required, calibration standards are traceable to NIST reference materials or traceable to some other certifying agency.
- 1.9 To maintain complete and accurate written documents that are created by, purchased, or obtained by this laboratory.
- 1.10 To maintain a clear, complete and accurate account of all laboratory data and supporting records.

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- 1.11 To perform routine procedures for validation of the data generated in the laboratory to ensure correctness and to produce clear, concise, and complete reports for customers or their designated representative.
- 1.12 To perform quality control checks on instruments, methods and analysts in order to rapidly detect errors and prevent recurrence. This is accomplished through the use of standards, blanks, duplicates, and spiked samples to check accuracy, precision and matrix effects.
- 1.13 To conduct routine internal audits of both the laboratory departments and the support / quality system operations of the laboratory, to cooperate with outside auditors, and to take necessary preventive and corrective actions when and where needed.
- 1.14 To submit a monthly Quality Assurance Report to management.
- 1.15 To obtain and maintain certifications and accreditations to demonstrate Microbac Laboratories, Inc. competence and allows the laboratories to perform tests covered by these programs
- 1.16 To maintain an Advertising Policy that describes the laboratory's accredited status in a manner that does not imply accreditation in areas that are outside the laboratory's actual scope of accreditation.
- 1.17 To maintain an environment free of undue stress of both internal and external parties and improper influence that would compromise the independence or integrity of the laboratory's quality of work. The laboratory will work to ensure that there are no conflicts of interest between the laboratory and its customers or between the laboratory and government agencies or regulators.
 - Customer inquiries concerning analytical testing are directed to Project Management personnel, Division Manager, Technical Directors and Quality Assurance personnel. This insulates the employees from external bias.
 - Employees who receive undue internal pressure shall notify the appropriate manager and shall be fully investigated. The laboratory is operated under an Open Door Policy that enables every employee to have free access to senior management. This policy is intended to foster two-way communication and encourages employees to carefully consider their duty and responsibility to report inappropriate data production and reporting practices to the corporate leadership.
 - Any information brought forward by an employee shall be handled with strictest confidence and respect for such information and for the employee consistent with the fair enforcement of the code of ethics and business conduct standards.

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- 1.18 To maintain an environment in which all levels of personnel are able to voice any concerns or helpful suggestions through the monthly departmental team meetings.
- 1.19 To ensure that information about customers and proprietary rights are treated confidentially as outlined in Microbac Laboratories, Inc. Business Conduct Policy and Confidential Information Agreement.
- 1.20 To maintain a purchasing procedure that ensures that all goods and services purchased are of known and documented quality and meet the technical requirements and acceptance criteria of Microbac Laboratories, Inc..
- 1.21 To comply consistently with NELAC, ISO 17025 and AOAC to ensure quality testing and to continually improve the effectiveness of the Quality Management System.
- 1.22 To make the Quality Assurance Manual available to all employees and laboratory auditors. The Quality Assurance Manual is available to customers upon request. Any Quality Assurance Manual distributed to customers or agencies apart from Microbac Laboratories, Inc., Baltimore Division is considered an uncontrolled copy of the Quality Assurance Manual.
- 1.23 The policies stated herein may be amended, or departed from in those rare situations that may occur from time to time. A departure or amendment must be approved in writing by the President, Division Manager / Laboratory Director and / or Regional Director / Vice-President.
- 1.24 Through the authorization of the Division Manager/Lab Director or Regional Director/Vice-President, adequate resources are provided to fulfill the Quality Mission. He has assigned authority to the Quality Assurance Manager to implement this Quality Assurance Plan. The Division Manager/Laboratory Manager has given the authority to all members of management and all company workers to stop any unsafe work or any work that is deemed of inadequate quality.
- 1.25 Requirements in quality policies are documented and incorporated into an updated version of the QA Manual. All appropriate personnel are notified of the change, and the updated portion of the QA Manual is distributed.

Approved by: Mark Horan (Division Manager)

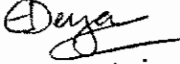
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QM-002-020
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2. ORGANIZATION AND MANAGEMENT STRUCTURE

Microbac Laboratories, Inc. is a national network of testing laboratories, staffed with well-qualified and properly trained personnel who are knowledgeable in and follow prescribed procedures and policies. All personnel are trained and qualified in order to perform specific tests. The corporate organization of Microbac Laboratories, Inc. is shown on the Division Organization Chart (APPENDIX B) included at the end of this Quality Assurance Manual. The structure of the Baltimore Division incorporates the Richmond location and is shown in the organization chart included in this section of the Quality Assurance Manual.

Any reference to the Baltimore Division hereafter also incorporates the Richmond location.

2.1 ANALYTICAL QUALIFICATION OF PERSONNEL

Microbac Laboratories, Inc., has established written preferred qualifications for all positions at the division level. These qualification requirements are maintained by Human Resources and are used to qualify prospective new employees and to establish guidelines for current employee advancement to positions of greater responsibility. These qualifications are periodically reviewed by the management staff and updated accordingly. The President and/or Division Manager can amend the job requirement qualifications and special considerations may be applied on a case by case basis.

The analyst has the primary responsibility for the quality of the data being produced. The responsibilities of the various positions as they relate to the quality of the analyses performed are as follows:

2.1.1 President

As owner of the company, the President is ultimately responsible for all operations. He has assigned the management duty of overseeing daily operations of the Baltimore Division to the Division Manager.

Other related duties of the President include:

1. Approval of increasing the total number of staff
2. Approval of all capital expenditures
3. Approval of physical enhancements made to the facility structure

2.1.2 Regional Director

Directs all operation of independent commercial laboratory that provides a wide range of analytical testing and research support services. Also, oversees secondary division(s) and division manager(s). Minimum requirements include a BS, MS or PhD in Analytical chemistry, biology, or closely related science. Additional experience is preferred and will be taken into consideration. Reports directly to the CEO and COO.

2.1.3 Division Manager / Responsible Official

The Division Manager / *Responsible Official* is responsible for authorization of the quality objectives and policies of Microbac Laboratories, Inc., Baltimore Division and for overseeing the progress of the quality assurance program as reported to him in the monthly QA Officer's Report. The Division Manager / *Responsible Official* is the agent in charge of all laboratory activities.

The Division Manager / *Responsible Official* has final responsibility for all test results and other related information reported in the Certificates of Analysis. The reports are reviewed and signed by the Division Manager, and at his discretion he may also authorize this responsibility to the Technical Director, Quality Assurance Officer, and/or staff managers.

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Other related duties of the Division Manager / *Responsible Official* include:

1. Overall supervision of the production areas of the company which includes the laboratory departments, field services and customer services.
2. Authorization of proposals, bids and quotes.
3. Approval of new equipment purchases.
4. Approval of hiring of new personnel.
5. Maintaining an approved list of subcontractor laboratories, with QA Officer and Customer Services Manager.
6. Overseeing the annual review of the quality system.
7. Assuming the critical duties of the Quality Assurance Officer in his/her absence.

Division Manager / *Responsible Official* preferred job qualifications are: BS/BA in Chemistry or related science (must include 4 semesters college chemistry), 10 years related experience or AA degree plus 15 years related experience, with 2 years project management experience, computer knowledge and excellent communication skills.

In the case of an extended absence of the Division Manager, the Regional Director will cover these duties.

2.1.4 Technical Director

Technical Directors at Microbac Laboratories, Inc., have primary responsibility for the overall quality of the data produced in their section. In the extended absence (15 consecutive calendar days) of a Technical Director another qualified Technical Director or the Division Manager shall oversee their duties. Their responsibilities include:

1. Supervising the section personnel in the daily production of laboratory test results.
2. Ensuring that all relevant SOPs are being followed.
3. Approving analytical data produced by their section and approving completed jobs in the LIMS.
4. Reviewing and maintaining records for completeness and accuracy.
5. Hiring and training qualified personnel for their department (including cross-training personnel).
6. Selecting and maintaining the equipment, calibration standards and reagents necessary to produce quality data according to the methods selected.
7. Documenting and reporting incidents of nonconformance and corrective actions to the QA Officer
8. Performing analyses when necessary or performing non-routine testing.
9. Conducting periodic team meetings.
10. Developing and approving the use of department specific SOPs.
11. Working with other Technical Directors/Managers in order to share personnel resources.
12. Selecting, testing and validating all new software programs to ensure data integrity.
13. Approving all computer and computer related supplies purchases.
14. Supervising the training of all laboratory personnel on the proper use of the laboratory information management software (LIMS).
15. Developing utilities to aid management in their assessment of LIMS information.
16. Developing and approving the use of department specific SOPs.
17. Maintaining the local area network and computer hardware.
18. Ensuring the security of the LAN.
19. Configuring computers in the laboratory that are connected to the LAN

The Technical Director Job qualifications are: BS/BA in Chemical, Biological or Physical Sciences, Environmental or Engineering (must include 24 college semester credit hours in chemistry) plus 5 years related laboratory experience and 2 years supervisory experience.

The Manager preferred job qualifications are: BS/BA in Chemistry or related science (must include 4 semesters college chemistry) plus 3 years related experience.

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2.1.5 Technical Manager

The Technical Manager at Microbac Laboratories, Inc., has primary responsibility for the overall quality of the data produced in their section. In the extended absence (15 consecutive calendar days) of a Technical Manager another qualified Technical Manager / Technical Director or the Division Manager shall oversee their duties. Their responsibilities include:

1. *Supervising the section personnel in the daily production of laboratory microbiology test results.*
2. *Ensuring that all relevant SOPs are being followed.*
3. *Approving analytical data produced by their section and approving completed jobs in the LIMS.*
4. *Reviewing and maintaining records for completeness and accuracy.*
5. *Training personnel for their department (including cross-training personnel).*
6. *Selecting and maintaining the equipment, calibration standards and reagents necessary to produce quality data according to the methods selected.*
7. *Documenting and reporting incidents of nonconformance and corrective actions to the QA Officer*
8. *Performing analyses when necessary or performing non-routine testing.*
9. *Developing and approving the use of department specific SOPs.*
10. *Working with other Technical Directors/Managers in order to share personnel resources.*
11. *Supervising the training of all laboratory personnel on the proper use of the laboratory information management software (LIMS).*
12. *Developing and approving the use of department specific SOPs.*

The Technical Manager Job qualifications are: BS/BA in Chemical, Biological or Physical Sciences, Environmental or Engineering (must include 16 college semester credit hours in Biology / Microbiology) plus 1 years related laboratory experience.

The Technical Manager preferred job qualifications are: BS/BA in Chemistry or related science (must include 4 semesters college chemistry) plus 1 years related experience.

2.1.6 Quality Assurance Manager / Officer

The Quality Assurance Officer reports directly to the Division Manager and acts independently from the production aspect of the laboratory. In the absence of Quality Assurance Officer, the Division Manager or Technical Director shall oversee the critical duties of the QA Officer.

QA Officer's responsibilities include:

1. The implementation of the quality program.
2. Developing, approving, maintaining, and distributing the QA Manual and other quality procedures documentation.
3. Arranging internal audits of lab activities according to schedule and/or management requests.
4. Responsible for security of master SOPs and archived SOPs and the control and distribution of SOPs.
5. Ensuring company compliance with the QA Manual via analysis of performance samples, approval of corrective action reports, and conducting training to communicate to employees the policies and procedures of the QA Manual.
6. Stopping production when situations occur that may produce incorrect data.
7. Obtaining and maintaining certifications and accreditations required to demonstrate capabilities and competence to meet regulatory guidelines and customer specifications.
8. Arranging audits of the laboratory by customers, state regulatory agencies or third party accrediting organizations; responding to these audits and verifying any required changes.
9. Investigating and responding to customer inquiries concerning data quality.

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10. Preparing monthly Quality Assurance report that is given to the Division Manager and the corporate Quality Assurance Director.
11. Compiling special quality assurance packages for customers
12. Maintaining an approved list of subcontractor laboratories, with Division Manager and Customer Services Manager and IT Manager in LIMS

QA Officer preferred job qualifications are: BS/BA in Chemistry or related science (must include 4 semesters of college chemistry and training in statistics) plus 5 years related experience.

2.1.7 Administrative

The Office Manager is responsible for:

1. Maintaining an up-to-date Personnel Manual and a Corporate Procedures Manual that describes internal and company-wide policies in sufficient detail to ensure that all personnel have a clear understanding of the policies.
2. Maintaining all personnel records to include qualifications, payroll, performance evaluations, health and safety, and archived training records.
3. Maintaining security system.
4. Overseeing hiring process by use of pre- and post-hire checklists.
5. Overseeing benefits program.
6. Developing and verifying the use of Administrative area SOPs.
7. Maintaining an updated list of laboratory personnel that includes signatures and written initials

2.1.8 Business Development Manager

The Business Development Manager is responsible for:

1. Initiating new customer contacts
2. Reviewing and approving new customer bids
3. Generating sales
4. Representing Microbac Laboratories, Baltimore Division at trade shows, conferences, symposiums, etc.
5. Reviewing Requests for Proposals

The Business Development Manager preferred job qualifications are: BS/BA in Marketing plus 2 years laboratory experience.

2.1.9 Chemical Hygiene Officer (CHO)

Chemical Hygiene Officer is responsible for:

1. Developing policies for approval by senior management, updating and implementing the policies upon approval.
2. Maintaining the Health and Safety Manual.
3. Monitoring regulations to assure compliance.
4. Assuring the effectiveness of the program through audits, surveys and inspections.
5. Reinforcing the commitment of management to the policies and program.
6. Providing advice and guidance to the various Managers, drawing on his knowledge of safety and industrial hygiene.
7. Serving as liaison between management, employees and various regulatory agencies.
8. Designing, overseeing and participating in the safety and health training programs.

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9. Investigating and reporting on accidents, injuries and incidents (near misses) and report to Human Resources.
10. Maintaining records, catalogs and books related to safety hygiene considerations.
11. Reviewing construction plans for safety and hygiene considerations.
12. Immediately stopping potentially hazardous work practices.

2.1.10 Analyst III

Analyst III are responsible for:

1. Performing complex and routine analyses using specified analytical methods as outlined in the Division SOPs. The individual performing the test has the primary responsibility for the quality of the data being produced.
2. Troubleshooting and method development.
3. Training and supervision of subordinates.
4. Assuming the administrative duties of the Manager when assigned.
5. Developing department specific SOPs.

The Analyst III preferred job qualifications are: BS/BA in Chemistry or related science (must include 4 semesters college chemistry) plus 2 years related experience. Experience may be substituted for formal education.

2.1.11 Analysts I and II

Analysts are responsible for:

1. Conducting analyses as trained using specified analytical methods as outlined in the Division SOPs. The individual performing the test has the primary responsibility for the quality of the data being produced.
2. Completing all documentation (worksheets, logbooks, notebooks, QC charts) required for the analyses performed.
3. Entering data into the LIMS system and verifying those entries are correct and ready for Manager approval.
4. Noting and reporting any deviations or nonconformance conditions to the Manager or Senior Analyst.

The Analyst II preferred job qualifications are: 2 semesters of college chemistry plus 3 years related experience.
The Analyst I preferred job qualifications are: High School Diploma plus High School Chemistry

2.1.12 Laboratory Technician

Technicians are responsible for:

1. Conducting analyses as trained using specified analytical methods as outlined in the Division SOPs. The individual performing the test has the primary responsibility for the quality of the data being produced.
2. Completing all documentation (worksheets, logbooks, notebooks, QC charts) required for the analyses performed.
3. Entering data into the LIMS system and verifying those entries are correct and ready for Manager approval.
4. Noting and reporting any deviations or nonconformance conditions to the Manager or Senior Analyst.

The Laboratory Technician preferred job qualifications are: High School Diploma

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2.1.13 Customer Services / Field Operations Department

Customer Services Manager is responsible for:

1. Supervising the department personnel.
2. Ensuring that all relevant SOPs are being followed.
3. Approving analytical data produced by their section and approving completed jobs in the LIMS.
4. Reviewing and maintaining records for completeness and accuracy.
5. Hiring and training qualified personnel.
6. Selecting and maintaining the equipment, calibration standards and reagents necessary to produce quality data according to the methods selected.
7. Documenting and reporting incidents of nonconformance and corrective actions to the QA Officer.
8. Conducting periodic team meetings.
9. Developing and approving the use of department specific SOPs.
10. Maintaining an approved list of subcontractor laboratories, with Division Manager and Quality Assurance Officer.

The Customer Services Manager preferred job qualifications are: 4 semesters of college chemistry plus 3 years' experience and 1 year supervisory experience.

Field Operations Manager is responsible for:

1. Supervising the department personnel.
2. Ensuring that all relevant SOPs are being followed.
3. Approving analytical data produced by their section and approving completed jobs in the LIMS.
4. Reviewing and maintaining records for completeness and accuracy.
5. Hiring and training qualified personnel.
6. Selecting and maintaining the equipment, calibration standards and reagents necessary to produce quality data according to the methods selected.
7. Documenting and reporting incidents of nonconformance and corrective actions to the QA Officer.
8. Performing analyses when necessary or performing non-routine testing.
9. Conducting periodic team meetings.
10. Developing and approving the use of department specific SOPs.
11. Maintaining an approved list of subcontractor laboratories, with Division Manager and Quality Assurance Officer.

Field Operations Manager preferred job qualifications are: 4 semesters college chemistry plus 3 years' experience and 1 year supervisory experience.

Senior Field Operations Technician is responsible for:

1. Collecting samples according to specified procedures.
2. Performing field tests as necessary.
3. Documenting sampling operations using the proper forms.
4. Assuming the administrative duties of the Field Operations Manager when assigned.
5. Developing department specific SOPs.

The Senior Field Operations Technician preferred job qualifications are: 2 semester's college chemistry or equivalent plus some supervisory skills.

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QM-002-020
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Field Technicians are responsible for:

1. Collecting samples according to specified procedures.
2. Performing field tests as necessary.
3. Properly labeling all containers.
4. Ensuring proper sample preservation.
5. Transporting the samples to the laboratory ensuring Chain-of-Custody protocol.
6. Documenting sampling operations using the proper forms.

Sample Receiving Technician is responsible for:

1. Receiving and distributing samples according to Chain-of-Custody protocol.
2. Logging samples into the LIMS.
3. Consulting with project managers regarding sample anomalies.
4. Maintaining proper sample storage conditions in sample receiving area (refrigerators, etc.).
5. Shipping samples to subcontractor laboratories.

The Senior Field Technician preferred job qualifications are: 2 semesters of college chemistry or equivalent plus some supervisory skills.

The Field Technician / Sample Receiving Technician preferred job qualifications are: High School Diploma.

All Customer Services / Field Operations Personnel that drive company vehicles to pick-up and transport samples are required to have a good driving record and must be able to lift one hundred pounds.

2.1.14 Project Manager:

Project Managers are responsible for:

1. Acting as liaison between customer and laboratory.
2. Communicating with customers to ensure that their quality and analytical needs and data turn-around times are met.
3. Assuring that customer projects are set-up and logged in correctly.
4. Performing final review of reports for completeness.
5. Handling customer inquiries and complaints according to established protocol.
6. Maintaining/updating all project related information either in customer files or LIMS.

Project Manager's preferred job qualifications are: 4 semesters college chemistry plus 1 year related experience; or 3 semesters college chemistry plus 2 years related experience; or 1 semester college chemistry plus 4 years related experience

Approved by:

Mark Horan (Division Manager)

Emily Deya (Quality Manager)

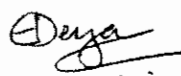
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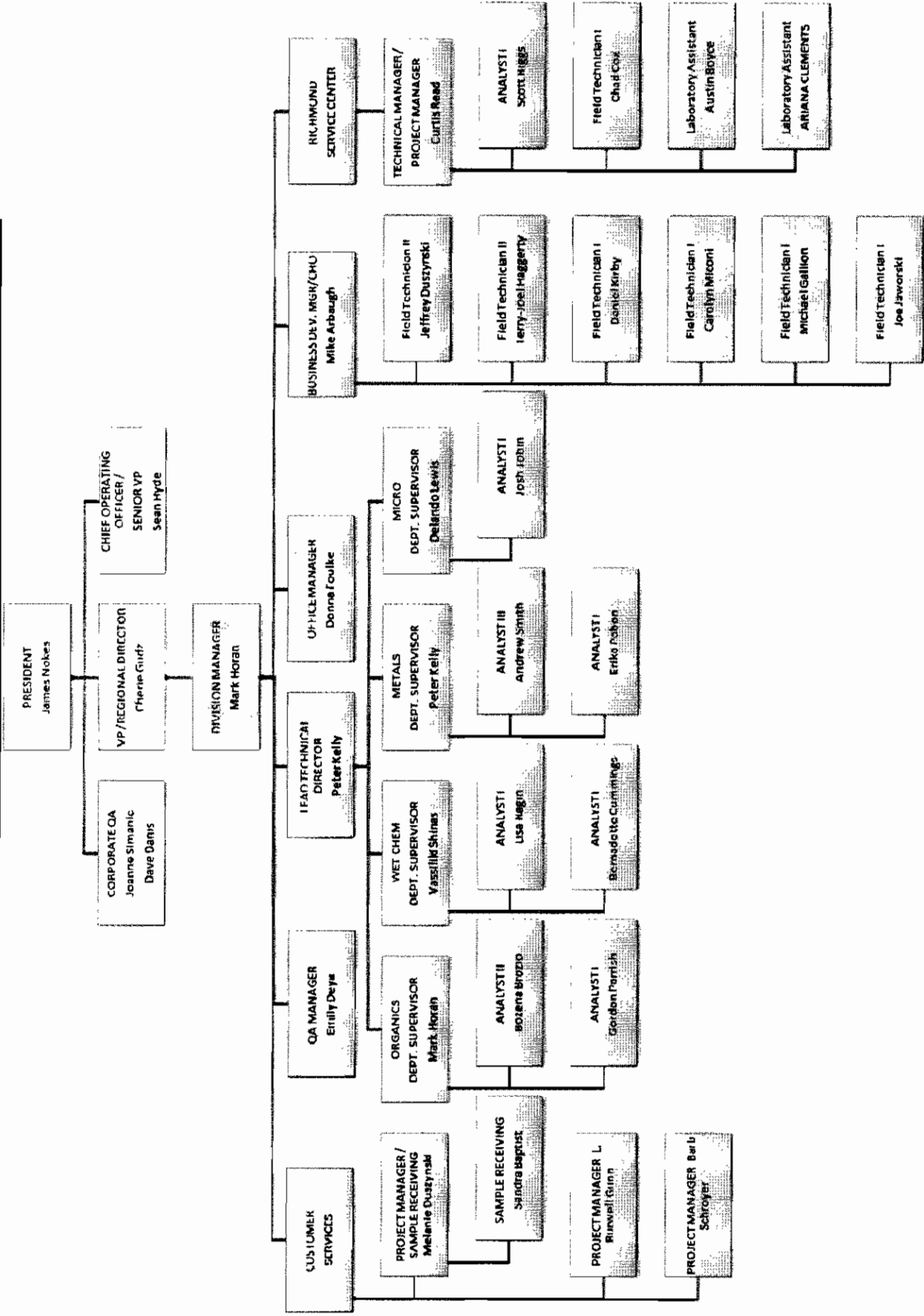
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QUALITY ASSURANCE MANUAL

QM-002-020
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Effective Date: 08/22/2012

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3. DOCUMENT CONTROL

3.1 It is the policy of Microbac Laboratories, Inc. to maintain complete and accurate written documents that are created by, purchased, or obtained by the laboratories. These documents are the property of Microbac Laboratories, Inc., Baltimore Division

3.2 Microbac Laboratories, Inc., tracks the distribution of controlled documents as listed below. Tracking the distribution means the documents are numbered and tracked specifically to individuals. Outdated controlled copies are retrieved and destroyed; only the master is retained. Other documents have a control number but are not tracked to individuals. There is no signature for receipt and no retention of change. Once updated, the outdated copies of this type of documents are retrieved and destroyed.

3.3 Procedures for controlled document revision are described in SOPs GEN-001 "Preparation and Control of Work Instruction SOPs" and GEN-016 "Document Control".

The documents of concern are as follows:

1. Quality Assurance Manual*
2. Standard Operating Procedures (SOPs)*
3. Analytical Test Methods, References, and Field Sampling Procedures*
4. Computer Software Library
5. Certificates of Laboratory Certifications and Accreditations
6. Health and Safety Manual*
7. Team Manual
8. Worksheets and Forms

* Denotes controlled distribution

3.3.1 **Quality Assurance Manual** - The Quality Assurance Manual is the document that defines the laboratory's quality assurance program. The manual outlines the laboratory's plan and procedures to ensure that the data produced from the laboratory's testing is valid.

QA Manual Review – The Quality Assurance Manager is responsible for the preparation, maintenance and updating of this manual, with input from the Division Manager and Staff Managers. The master copy of the manual is maintained by the Quality Assurance Officer. The QA Manual is reviewed on an annual basis by the staff managers to ensure continuing suitability and to make any necessary updates. Each section of the QA Manual is reviewed for accuracy and completeness. Any updates that may have occurred from the previous revision are incorporated. Changes and improvements are made with the approval of the Division Manager, *Technical Director(s)* and the *Quality Assurance Officer(s)*. The updated section revision is sequentially numbered and replaces the previous version. Controlled copies are numbered and are made available in each analytical laboratory, Field Operations, the Project Management Area, and the offices of the QA Officer and the Division Manager. The signature of an individual laboratory employee who receives the QA Manual is kept on a master list by the QA Officer. Outdated copies are retrieved from all areas of the company and replaced with the latest revision. The retrieved copies of the outdated revision of the QA Manual are discarded by the QA Officer. The master copy of the outdated revision is archived by the QA Officer.

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Changes in the contents of the quality assurance program due to changes in Microbac Laboratories, Inc. policies or procedures are made as they occur in order to ensure that the contents of the controlled copies of the manual accurately reflect the quality assurance program currently in effect at the laboratories. Upon request, uncontrolled copies of the manual are generated for distribution to prospective customers, regulatory agencies and accrediting bodies. No effort is made to keep uncontrolled customer copies of the QA Manual current. In addition, no effort is made to retrieve outdated uncontrolled copies.

3.3.2 Standard Operating Procedures (SOPs) - Standard Operating Procedures are documented protocols to be followed by all laboratory personnel to ensure that a test method, a sample collection, a customer service procedure, or a day to day quality operation of the laboratory is routinely performed correctly and consistently, independent of the person performing the function. SOPs are prepared, controlled, revised and archived according to written instruction in SOP GEN-001, "Preparation and Control of Work Instruction SOPs". Copies of the original SOPs are controlled documents that are assigned to laboratory personnel. The master document of each SOP is kept in a restricted access area and outdated master documents are archived. These archived master documents are under the control of the QA Officer. The SOPs are archived for a minimum of five years. For drinking water testing and industrial hygiene analyses, the SOPs are archived for a minimum of twelve years.

3.3.3 Analytical Test Methods, References and Field Sampling Procedures References - Procedures that are used by Microbac Laboratories, Inc. field personnel for the purpose of collecting and evaluating samples are published methods that have been widely tested, used and accepted. Whenever possible, the methods should be from a recognized reference source, promulgated by a regulatory agency or traceable to a standards setting organization (e.g., EPA, ASTM, etc.).

3.3.4 Computer Software Library - This includes purchased computer software programs that are not modified and are verified by the vendor. Other software programs are used to create forms for secondary applications (i.e. spreadsheet applications). These secondary applications are validated according to the latest version of a Computer Services Department SOP. The procedure for storage of computer software is documented in this SOP. Control is under the Computer Services Department and computer software is retained for a minimum of five years, except (drinking water testing and industrial hygiene analyses) where the laboratory retains information for a period of twelve years.

3.3.5 Certificates of Laboratory Certifications and Accreditations - These certificates are documents that are issued by State Government, Federal Government, or third party accrediting bodies. These documents detail the time frame and scope of approval of laboratory testing. The original certificates are posted in the lobby of the laboratory as specified by the provider of the certificate. Copies of these certificates are made available upon request to customers.

3.3.6 Health and Safety Manual - The health, safety and well-being of each employee at Microbac Laboratories, Inc. is of the utmost importance. To comply with the OSHA regulation, "Occupational Exposure to Hazardous Chemicals in Laboratories", 29 CFR 1910.1450, Microbac Laboratories, Inc. has developed its Health and Safety Manual. At the start of employment, each employee is made aware that the entire plan is readily available for his or her use. The plan defines the company's policies and establishes a program for working safely, whether in the laboratory or collecting samples in the field. The plan is designed to educate all employees concerning workplace hazards and to instruct them of the procedures to be followed to ensure a safe workplace.

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The plan is reviewed by management on an annual basis. Document control is under the Chemical Hygiene Officer. Upon request, uncontrolled copies of the plan are generated for distribution to prospective customers or regulatory agencies. No effort is made to keep uncontrolled customer copies of the Health and Safety Manual current. In addition, no effort is made to retrieve outdated uncontrolled copies.

3.3.7 Team Manual – Microbac Laboratories, Inc., Baltimore Division Personnel Manual is designed to acquaint all personnel with company policies and the benefits available to them.


3.3.8 Notebooks, Logbooks, Worksheets and Forms – Uniquely coded laboratory notebooks, logbooks (sequentially numbered pages), worksheets and forms are used to record observations, raw data, calculations, etc. The procedure for recording information in these Notebooks, Logbooks, Worksheets and Forms is documented in GEN-008, "Daily Laboratory Recordkeeping for Analysts".

The Notebooks, Logbooks, Worksheets and Forms are kept in the individual laboratories. Completed notebooks and logbooks are stored in the laboratories for several months for reference purposes and then archived. Laboratory notebooks, logbooks, worksheets and forms are kept for a minimum of five years, environmental lead program ten years after completion (except for those pertaining to drinking water testing and industrial hygiene analyses or other legal requirements) where the laboratory retains information for a period of twelve and are under control of the laboratory department. Original worksheets and forms are periodically reviewed and updated under the control of Production Manager.

Approved by: Mark Horan (Division Manager)

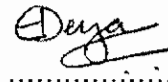
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QUALITY ASSURANCE MANUAL, BALTIMORE DIVISION

QM-004-020
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4. REVIEW OF REQUEST, TENDERS AND CONTRACTS

4.1 Approval of Receipt of Samples for Testing (New Work)

4.1.1 Project Managers perform the review of incoming work and document the review via the use of a Checklist. If this review reveals areas of concern that cannot meet the quality needs and expectations of the customer, then the appropriate management person is consulted.

4.1.2 This procedure is outlined in PM-001, "Project Manager Duties". The review of incoming work is also discussed at production meetings. The authorization of all proposals, bids and quotes is made by the Division Manager or his designee. SOP PM-003, "Procedure for Review of Request, Bids and Contracts" describes this procedure.

4.1.3 Periodically, customer projects are either non-routine or of sufficient complexity or importance that they need special attention in order to ensure successfully meeting the customer's needs. For these situations, a Project Plan may be prepared.

4.2 Approval of New Test Procedures

4.2.1 If work is requested that does not have a corresponding test code in LIMS the Project Managers will request a review. Prior to quoting new test procedures, a review is conducted and approved by the Division Manager with input from the appropriate management staff.

4.2.2 The approval is documented on the "New / Change Customer Information" form. New test procedures are those not currently listed in the Customer Reference Guide or a current test procedure that is to be performed on a sample of a different type of matrix. This review may encompass the following criteria:

- a) The customer's Data Quality Objective(s)
- b) Availability of a published method
- c) Method to be used
- d) Laboratory's ability to obtain necessary equipment
- e) Laboratory's ability to obtain reagents for the method
- f) Adequate laboratory environment to safely and effectively conduct the procedure
- g) Sufficiently trained personnel to satisfactorily perform the analysis.


4.2.3 If the above criteria are satisfied, a quote is issued and approved by the customer prior to the commencement of a new test procedure. The authorization of all proposals, bids and quotes is conducted by the Division Manager or his designee. The new test procedure may be performed subject to on-going review to ensure that the objective of the procedure is achieved.


4.2.4 Development and approval of a new test method is a planned activity that follows the procedure in the latest revision of SOP Gen-017.

Approved by: Mark Horan (Division Manager)

Emily Deya (Quality Manager)

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QUALITY ASSURANCE MANUAL, BALTIMORE DIVISION

QM-005-020
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Effective Date: 08/22/2012

5. SUBCONTRACTING OF TESTS

5.1 Microbac Laboratories, Inc. assumes responsibility for all subcontracted work.

5.2 The Laboratories shall normally perform tests for which they hold accreditation and shall only sub-contract testing in exceptional circumstances, namely:

- a) The laboratory is unable to perform certain tests required by the client
- b) Where the volume of testing required exceeds the capacity of the laboratory to such an extent that the quality of work or reporting requirements would be compromised
- c) When equipment is out of service

5.3 The laboratory shall notify the customer in advance that their samples are being subcontracted.

5.4 Project Managers are responsible for work that is sub-contracted to ensure that the correct samples are sent out to an approved laboratory.

5.5 When it is necessary to subcontract testing that is on this laboratory's A2LA, and NELAC scope of accreditation, only A2LA, and NELAC accredited laboratories shall be used.

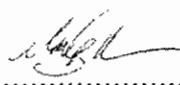
5.6 The subcontract laboratory shall report the result to Microbac and all original subcontract reports are provided to the customer as part of the final report. A copy of all the subcontract information is retained with the file copy of the Report of Analysis.

5.7 For information concerning subcontract, refer to SOP PM-001 "Project Manager Duties" and GEN-032 "Outside Testing Subcontracting Policy".

Approved by: Mark Horan (Division Manager)

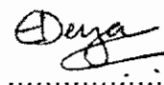
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QUALITY ASSURANCE MANUAL, BALTIMORE DIVISION

QM-006-020
Issue No.: 001
Effective Date: 08/22/2012

6. PURCHASING SERVICES AND SUPPLIES

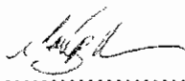
6.1 Microbac Laboratories, Inc. maintains a purchasing policy that ensures that all goods and services are of known and documented quality and meet the technical requirements and acceptance criteria of Microbac Laboratories, Inc.

6.2 This policy is detailed in SOP IT-010, "Purchasing Policy".

Approved by: Mark Horan (Division Manager)

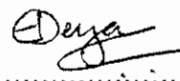
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QUALITY ASSURANCE MANUAL, BALTIMORE DIVISION

QM-007-020
Issue No.: 001
Effective Date: 08/22/2012

7. COMPLAINTS

7.1 Procedures for dealing with customer inquiries / complaints

In the event of customer or regulatory question of data, a customer inquiry / corrective action report is initiated in LIMS and the appropriate department is notified that an inquiry has been initiated.

The procedure for reviewing customer inquiries concerning test sample data or Certificates of Analysis is documented in PM-001, "Project Manager Duties".

The validation checks may include, but are not limited to:

- 7.1.1 Transcription Errors - check data for correct transcription, sample mislabeling, etc.
- 7.1.2 Calculations - check all calculations for data in question, verify quality control data acceptability
- 7.1.3 Sample Condition - check for proper container, holding times, preservation and physical description.
- 7.1.4 Instruments - check instrument function and calibration data.
- 7.1.5 Standards and Titrants - were expiration dates exceeded or standards contaminated or prepared improperly?
- 7.1.6 Method - was method appropriate and performed properly?
- 7.1.7 Repeat Analysis - if the above investigation fails to identify any problems, the customer is notified that the data remains unchanged. If the investigation results in a question of the original data, it may be necessary, where possible, to repeat the analysis in question.

7.2 When a revision of the original report is necessary, a revised Certificate of Analysis is issued indicating the change made from the original report.

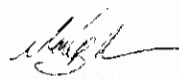
7.3 The revised Certificate of Analysis includes the same report number as the original, but has the date of reissue recorded on the revised report. The correction is made and the reason for the correction is added as a footnote to the revised report.

Any complaint about the quality of reported results may be referred to the accrediting body if such complaints cannot be resolved directly with the customer.

Approved by: Mark Horan (Division Manager)

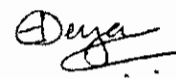
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QUALITY ASSURANCE MANUAL, BALTIMORE DIVISION

QM-008-020
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8. CONTROL OF NONCONFORMING TESTING

8.1 In the event that testing that is being performed did not comply with any aspect of quality control requirements or the results of the work do not conform to the agreed upon specification required by the customer, a decision will be made regarding the impact of the situation.

8.2 It is the responsibility of the Quality Assurance Manager or designee to stop the work and the release of test result, when non-conformances occur.

8.3 Customers are notified by the Customer Services Manager / Project Manager when work does not conform to the requirements. Resumption of work is authorized by the Quality Assurance Manager or designee after the course of action is decided and implemented.

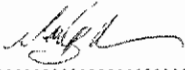
8.4 The steps describing the identification and evaluation of the non-conformance, the need for corrective action, the decision of the acceptability of the non-conforming work, the impact to the customer, and the responsibility for resuming work are defined in SOP GEN-023 "Procedure for Non-Conforming Testing"

Approved by:

Mark Horan (Division Manager)

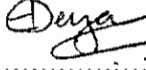
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QUALITY ASSURANCE MANUAL, BALTIMORE DIVISION

QM-009-020
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Effective Date: 08/22/2012

9. CORRECTIVE ACTION

9.1 Corrective action is necessary when nonconforming work or departures from the policies and procedures in the quality system or technical operations have been identified. Microbac Laboratories, Inc. has established and maintains SOP GEN-024, "Procedure for Corrective Action", which describes the process with which managers and staff identify and address corrective actions.

9.2 Upon discovery of any significant incidence of noncompliance or nonconformance with Microbac Laboratories, Inc., quality policies and procedures, an electronic Corrective Action Report (CAR) form must be completed. Routine maintenance problems and their correction (such as failure of an instrument or a calibration) require no documentation (other than in appropriate logbooks) if corrected by minor maintenance or recalibration. All personnel have the responsibility for reporting any observed non-conformances to the appropriate management level.

9.3 Non-conformances are investigated by the appropriate Manager of the laboratory department or his / her designated senior analyst. Non-conformances may also be investigated by the Division Manager or Quality Assurance personnel as appropriate.

9.4 The Corrective Action Report (CAR) form must identify the person initiating the form and the date, the person(s) that investigate the problem, and a description of the problem (including who was involved, what happened, when did the problem first appear, where did the problem occur, why did the problem happen, how many other systems are affected by the current problem). Documentation should consist of objective evidence, including dates, times, frequencies, results, etc. (e.g. historical data, quality control recoveries, customer-related correspondence, etc.). The investigation must then address the root cause of the problem. There must be documentation to identify the underlying cause in order to remove it so the problem does not recur.


9.5 Once the root cause(s) is determined, corrective actions must be proposed and documented. The CAR Form is then approved by the Manager and submitted to the Quality Assurance Manager. The course of action is then decided and implemented. If the scope of the corrective action plan is singular in nature to that department, involving testing techniques, equipment, etc. the plan is discussed and finalized by the Quality Assurance Manager and the Manager. The Quality Assurance Manager provides final approval of the form. All Corrective Action Report forms are maintained within the laboratory's LIMS.

9.6 If the scope of the corrective action plan is broad in nature, pertains to more than one department, or affects aspects of the quality system, the plan is discussed, decided upon and finalized by the Quality Assurance Manager, Division Manager and all appropriate Managers. The Quality Assurance Manager verifies that the corrective action plan is in place during the internal audit process. The verification is indicated by approval documented on the CAR.

Approved by: Mark Horan (Division Manager)

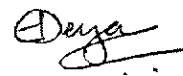
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QUALITY ASSURANCE MANUAL, BALTIMORE DIVISION

QM-010-020
Issue No.: 001
Effective Date: 08/22/2012

10. PREVENTIVE ACTION

10.1 SOP GEN-019 Preventive Action procedure is used to gather and review information concerning potential problems and to take appropriate and effective action to prevent or minimize their occurrence.

10.2 The procedure is also used to implement needed improvements to the quality system. This proactive approach requires anticipation of problems by all employees. Preventive Action forms are maintained within the laboratory's LIMS.

10.3 Preventive action reports may be initiated from the results of audit findings (internal and external), employee suggestions, weekly management meetings, management review of the quality system, data review, etc.

10.4 A preventive action report form is initiated by any employee. Documentation of the management review and discussion is made on the form.

10.5 Any final action that is taken is also recorded on the form. The approval of the action plan is documented by way of approval on the form within LIMS by the appropriate Manager or Division Manager.

10.6 The person or department that initiated the form is notified of the action plan. The plan is implemented and all appropriate employees are notified of any procedural changes, if applicable.

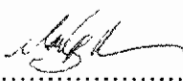
10.7 The topics are reported during quarterly company meetings. Preventive actions that were implemented during the year are evaluated during the annual management review to determine if the actions taken were appropriate to prevent occurrence of nonconformities.

Approved by:

Mark Horan (Division Manager)

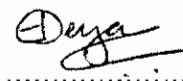
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QUALITY ASSURANCE MANUAL, BALTIMORE DIVISION

QM-011-020
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11. CONTROL OF RECORDS

- 11.1 It is the policy of Microbac Laboratories, Inc. to maintain a clear, complete and accurate account of all laboratory quality and technical records.
- 11.2 Microbac Laboratories, Inc. Performs sampling and analysis of a large variety of materials in order to provide accurate and reliable measurement information for its customers and regulators to make cost effective decisions. The data generated from these operations and the reports thereof are Microbac Laboratories, Inc. only product. It is important that integrity and confidentiality be maintained.

The records of concern are as follows:

- 11.2.1 Certificates of Analysis
 - 11.2.2 Chain-of-Custody Forms
 - 11.2.3 Laboratory Notebooks / Logbooks
 - 11.2.4 Electronic Information
 - 11.2.5 Hardcopy Instrument Output
 - 11.2.6 Equipment Maintenance Logs
 - 11.2.7 QC Control Charts and Records
 - 11.2.8 Field Reports
 - 11.2.9 Customer Communication
 - 11.2.10 Electronic Communications (define as LIMS only)
 - 11.2.11 Training Records
 - 11.2.12 Assessment Records from Audits
 - 11.2.13 Subcontractor Reports
 - 11.2.14 Employee Confidentiality Agreement
 - 11.2.15 Employee Ethics Agreement
 - 11.2.16 Customer Reference Guide (CRG)
 - 11.2.17 Approved Sub-Contractor Laboratories List
- 11.3 Records must be stored and retained in a way that they are readily retrievable. Handwritten records are written in ink. The person responsible for the generation of the record is identified either by their signature or initials. Sufficient information is recorded to ensure that the entire process or sample analysis can be recreated at a later date. All changes are accomplished by drawing a single line through the error and writing the correct information nearby. The change is initialed and dated. If the change is a major alteration of the data, the reason for the change should also be documented. The procedures to be followed for record maintenance are described in GEN-008, "Daily Laboratory Recordkeeping for Analysts". The procedure for making changes to Certificates of Analysis is described in IT-009, "Project Management, Sample Login and Reporting Using Element LIMS".
 - 11.4 All records will be retained by Microbac Laboratories, Inc. in accordance with the current revision of SOP GEN-022, Control of Technical and Quality Records. In the event that a facility closes, responsibility for records will be transferred to the President of Microbac Laboratories, Inc as detailed in the current revision of SOP GEN-030. The records will be retained at another division of Microbac Laboratories, Inc. or at a corporate-designated storage facility for a minimum of five (5) years. Drinking water testing and industrial hygiene analyses records are archived for a minimum of twelve years from the generation of the records. Records will be made available for inspection as needed.

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Appropriate regulatory and state legal requirements concerning laboratory records will be followed in the unlikely event of bankruptcy. In the event that the ownership of Microbac Laboratories, Inc., is transferred to another party, this policy will be amended to reflect the policy of the new owner.

At Microbac Laboratories, Inc., after the retention time for records has elapsed, the records are discarded.

- 11.4.1 **Certificates of Analysis-** Test results are reported to the customer on a certificate issued by Microbac Laboratories, Inc. The certificate is titled "Certificate of Analysis", with the laboratories' name and address and telephone number printed at the top of each page. The certificates have the laboratory header information printed in colored ink in order to make it easily identifiable as the original document.
- 11.4.2 Reports are assembled and processed by the Customer Services Department, and reviewed for completeness by the Technical Director or his designee. A minimum of five percent of the reports are reviewed by the QA Officer. The final report is signed by the Technical Director, or other designated party. Electronic copies of reports are kept in Network or archived in a secure area. These are under the control of IT Manager or designee. Copies of reports and supporting documentation are kept for a minimum of five years and then destroyed except for those pertaining to drinking water testing, special customer requests, government consent orders or other legal requirements to keep the records longer. If it becomes necessary to remove Certificates of Analysis from the premises for legal proceedings, duplicates are prepared and placed in the files pending return of the original records. A record of the removal of the original copy of the Certificate of Analysis is maintained by Office Administration.
- 11.4.3 All Microbac Laboratories, Inc., personnel are aware that Certificates of Analysis and all supporting documentation associated with the test items are confidential customer information. Supporting documentation includes any information concerning the test sample that is provided by the customer (i.e. proprietary rights or formulations of a customer product or specific proprietary test procedure) and any information concerning the test sample generated in the laboratory (i.e. Chain-of-Custody, phone logs, raw test data, calculations, results, etc.). The contents of reports and other customer data are not divulged except upon written request by the customer, subpoena, or during state certification inspections that make certain data available for review under statute (e.g., drinking water data). Reports do not leave the premises except for intended purposes. However, in rare circumstances when it is necessary for a report to be removed for other than legal reasons, written permission must be given by Office Administration before an employee is allowed to remove a Certificate of Analysis from laboratory property. The employee is made aware that he or she is fully responsible for protecting the confidentiality of the information contained in the report.
- 11.4.4 **Chain-of-Custody Forms** - Chain of Custody (C-O-C) forms are used to record the source and transfer of samples between the customer and the laboratory (sample tracking). The original C-O-C forms are retained by the Office Manager and kept in the file. C-O-C electronic copies are attached to the LIMS work order and are associated with the electronic copies of the Certificates of Analysis (final report). A copy of the C-O-C form is sent to the customer with the final report.
- 11.4.5 **Laboratory Notebooks/Worksheets** - Uniquely coded laboratory notebooks or method specific pre-printed worksheets are used to record observations, raw data, calculations, etc.

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The procedure for recording all analytical information is documented in GEN-008, "Daily Laboratory Recordkeeping for Analysts". The notebooks are kept in the individual laboratories. Completed notebooks are stored in the laboratories for several months for reference purposes and then archived. Laboratory notebooks are kept a minimum of five years after completion (except for those pertaining to the drinking water program, or other legal requirements) and are under control of the laboratory department. Worksheets are either pre-printed laboratory controlled documents, or are produced through the LIMS. Completed worksheets are scanned into the LIMS as pdf documents that are attached to the analytical batch, and are subject to the same electronic storage policies listed below.

- 11.4.6 **Electronic Information-** Chromatographic data, e.g., GC/MS data, which is stored electronically, is kept for a minimum of five years. LIMS data is kept on-line for a minimum of one year. Data archived from the LIMS system is retained for a minimum of five years (except for data pertaining to the drinking water program, or for other legal requirements). The procedure for storage of electronic information from the LIMS is documented in the use, security and maintenance SOPs for the LIMS system.
- 11.4.7 **Hardcopy Instrument Output-** Records are archived for a minimum of five years (except for those pertaining to the drinking water program, or other legal requirements) and are under the control of each laboratory department. In some circumstances, selected records i.e. chromatograms, AA data, etc. are archived with the Certificates of Analysis under Office Administration.
- 11.4.8 **Equipment Maintenance Logs -** Equipment logs are kept to record instrument condition and maintenance. Each department in Microbac keeps instrument logs to track the performance and maintenance history of all major pieces of equipment. Analysts, making in-house repairs and manufacturer's service representatives will record their actions in the instrument's logbook or maintenance log. A manufacturer's service representative may reference a service order number that can be used to track the service call in the event that no hard-copy service record is provided. Logs are kept in each department and then archived. These records are kept for a period of five years (except for those pertaining to the drinking water program, or other legal requirements) and are under the control of the laboratory department.
- 11.4.9 **QC Control Charts and Records -** Control charts are maintained in the LIMS. Method detection limit (MDL) data, precision and accuracy (P&A) statements, calibration data, records of spikes, duplicates, etc. are retained in the laboratories where it is accessible for determining whether the laboratory procedures are performing as prescribed in the analytical methods in use. Copies of MDL and P&A data are kept in Element LIMS. QC records are stored in the laboratories for reference purposes and then archived. QC records are kept a minimum of five years except for those analyses where record retention is extended (e.g. drinking water, etc.). Record control is under the laboratory department and QA Officer.
- 11.4.10 **Field Reports** – Field reports are generated by the Microbac Field Operations Department at the time of sampling. These are used to record field test data, observations and conditions of the sampling site, etc. Field reports are provided to the customer in the final Certificate of Analysis. Copies of field reports are retained with the copies of the final reports.
- 11.4.11 **Customer Communication** – All customer correspondence related to a specific job is retained within QA Department, Customer Services and Field Operations or with the Certificate of Analysis. Telephone logs are kept by all Customer Services personnel.

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The procedure for reporting test results or divulging information concerning test samples via telephone or fax transmission is documented in, PM-001, "Project Manager Duties".

- 11.4.12 **Electronic Communications** - Microbac Laboratories, Inc., cannot guarantee that the confidentiality of electronically transmitted information is secure once transmission has started.

- 11.4.12.1 The following statement appears on all fax transmission cover sheets:

"This information is privileged and confidential, and is intended solely for the use of the individual named above. If the reader of this message is not the intended recipient, you are hereby notified that any dissemination, distribution or copy of this communication is strictly prohibited. If you have received this communication in error, please notify us immediately at (410) 633-1800 and destroy the original message. Thank you."

- 11.4.12.2 When test results are being faxed, the following statement is also included on the fax cover sheet:

"This data does not contain all required items of a complete and official hard-copy Certificate of Analysis (e.g.: signature, issue date, total number of pages, etc.)."

After a fax has been sent, a transaction report will print out with a copy of the first page of the fax. The transaction report is kept with the copy of the Certificate of Analysis and is used for verification purposes. If a printed report is not available from the fax machine, then the faxed information is initialed and dated.

- 11.4.12.3 The following statement appears on all email transmissions:

"The information contained in this e-mail message and any attachments is confidential information intended only for the use of the individual or entities named above. If the reader of this message is not the intended recipient you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify us immediately by e-mail at the originating address and delete the original message."

When test results are being emailed, the following statement is also included on all email transmissions:

"This data does not contain all required items of a complete and official hard-copy Certificate of Analysis (e.g.: signature, issue date, total number of pages, etc.)."

- 11.4.13 **Training Records** - At the start of employment, a training form is initiated for each employee. In-house training of technical personnel is performed according to SOP GEN-010 "Training Protocol". These records are under the control of each Manager. When an employee leaves the company, the training record is transferred to the employee's personnel file that is kept for five years after the employee's completion of employment and is under the control of the Office Manager.

- 11.4.14 **Assessment Records from Audits** - These records can be from external audits (i.e. third party) or internal audits of the laboratory. The records and the responses to these records are under the control of the Quality Assurance Officer and are retained for a minimum of five years.

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- 11.4.15 **Subcontractor Reports** - Any testing that is subcontracted is so noted on the Certificate of Analysis and any data or information received from the sub-contractor is submitted to the customer. A copy is retained in Microbac Laboratories, Inc., records following the same procedure as the Certificates of Analysis.
- 11.4.16 **Employee Confidentiality Agreement** - At the start of employment and renewed annually each employee must sign a company confidentiality agreement. This agreement informs the employee that all information concerning services performed for customers by this laboratory is confidential and private. Information provided by the customer, such as supporting documentation, proprietary rights or test procedures or proprietary formulations of customer products is also considered confidential. By reviewing and signing this document, the employee is instructed that all information is confidential and is not to be divulged except upon written consent of the customer, subpoena, or during state certification inspections which make certain data available for review under statute. This document is retained in the employee's personnel file that is kept for five years after the employee's completion of employment and is under the control of the Office Manager.
- 11.4.17 **Employee Ethics Agreement** - Ethics training is conducted for all new hires by the Office Manager and the Quality Assurance Officer within one week of employment with an annual refresher every year. The training is conducted in accordance with the latest revision of the Microbac Laboratories, Inc. Ethics and Data Integrity Policy. Employees are required to sign an Ethics and Data Integrity Agreement upon initial training and after each annual refresher. This is placed in their personnel file that is kept for five years after the employee's completion of employment and is under the control of the Office Manager.
- 11.4.18 **Customer Reference Guide (CRG)** - Microbac Laboratories, Inc., Customer Reference Guide is a book of information detailing all aspects of doing business with Microbac Laboratories, Inc.,. It lists: statement of qualifications, sample requirements, lists of test performed at, on-site services provided by, information on regulatory lists and requirements, test groups and other useful information for our customers. This guide is periodically reviewed and updated as needed. This document is stored in LIMS.
- 11.4.19 **Approved Sub-Contractors** - Microbac Laboratories, Inc., limits subcontracted work as much as possible. The amount of work subcontracted is a small fraction of our customer requests. The subcontract work is highly specialized and requires particular instrumentation and/or a dedicated laboratory environment. Sub-contractor laboratories are selected and qualified based upon their suitable qualifications, appropriate accreditations and certifications. This information is kept on file and is under control of the Client Services Manager.

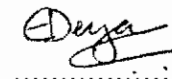
Approval of subcontract laboratories is carried out in the same manner as for other vendors of supplies and services.

Approved by: Mark Horan (Division Manager)

Emily Deya (Quality Manager)

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12. AUDITS

12.1 Audits are conducted to verify compliance by Microbac Laboratories, Inc., with the policies and procedures specified in this manual. Non-conformances are documented, addressed and corrected to prevent recurrence.

12.2 The laboratory is subject to several different kinds of audits. These include:

12.2.1 **Internal Audits** - The quality assurance department performs or oversees internal audits of laboratory activities and operations according to SOP GEN-005, "Quality Assurance Department Duties and Responsibilities", in accordance with a predetermined schedule. The audits are to verify that operations comply with the requirements set forth in the laboratory's Quality Assurance Manual and ISO 17025. A final report summarizing the audit findings is prepared by the person performing the audit. This report is addressed to the management staff. A copy of this report is included in the monthly quality report addressed to the division manager and corporate Quality Assurance. The report includes all findings for the areas reviewed, deficiencies found with associated CARs and any observations or suggestions for improvement.

12.2.2 **Customer Audits** - Microbac Laboratories, Inc. cooperates fully with customers who wish to inspect the laboratory or to conduct audits of the data generated during the analysis of their samples.

12.2.3 **Certifying / Accrediting Agencies** - The various organizations that certify or accredit Microbac Laboratories, Inc. conduct laboratory audits and on-site inspections on either a periodic or random basis to verify that the laboratory is complying with the inspecting organizations' requirements and standards.

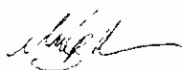
12.2.4 **Quality System Audit** - The audit of the quality system at Microbac Laboratories, Inc., is a two-part process:

- (1) the annual staff management review of the system, and
- (2) the review of the QA Manual on an annual basis, with updates when necessary.

Approved by: Mark Horan (Division Manager)

Emily Deya (Quality Manager)

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13. MANAGEMENT REVIEW

13.1 The review of the laboratory's policies, processes, facilities and equipment (present and future needs) is conducted annually by the Division Manager, Quality Assurance Officer, Technical Directors and Production Managers per GEN-020, Management Review.

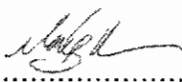
13.2 The items that are taken into account as requirements of NELAC, ISO/IEC 17025 and AOAC are:

- a. Matters from previous management review
- b. Suitability of policies and procedures
- c. Reports from managerial and supervisory personnel
- d. Outcome of internal audits
- e. Corrective and preventive actions
- f. Assessments by External audit
- g. Assessments by External audit
- h. The results of inter-laboratory comparisons or proficiency tests
- i. Changes in volume and type of the work
- j. Customer feedback
- k. Complaints and Recommendations for improvement

Approved by: Mark Horan (Division Manager)

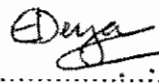
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14. TRAINING

14.1 In order to provide quality analytical data, it is essential to have qualified, well-trained personnel.

14.2 In-house training of technical personnel is performed according to SOP GEN-010, "Training Protocol". During training, analysts and technicians may perform tests on customer samples under the supervision of a qualified individual. Prior to performing these analyses alone, the employee is required to demonstrate his or her competence to the Supervisor by successfully analyzing a series of performance samples. Managers maintain a record of methods and procedures that a particular analyst is qualified to perform. This is recorded on a Training Form specifically designed to document this information.

14.3 Microbac Laboratories, Inc. accomplishes its goals of demonstrating capability in various jobs with:

14.3.1 Written / oral test.

14.3.2 Review of work assigned (data review).

14.3.3 Successful analysis of PT samples or P&A statement.

14.3.4 Observation of task performance.

14.4 Analyst training is considered up-to-date if the training file contains an initial demonstration of capability (DOC) statement for each method performed and documentation of continued proficiency.

14.4.1 Acceptable performance of a blind sample (single blind to the analyst)

NOTE: Successful analysis of a blind performance sample on similar test method using the same technology, for example, GC/MS volatiles by purge and trap for 524.2, 624, or 5035/8260 would only require documentation for one of the test methods.

14.4.2 At least four consecutive laboratory control samples with acceptable levels of precision and accuracy. Another demonstration of method performance - the analysis of authentic samples that have been analyzed by another trained analyst with statistically identical results.

14.5 Microbac Laboratories, Inc. funds and encourages employee participation in seminars, technical meetings and professional societies. All employees may request additional training in any area that they deem such additional training is necessary for them to perform the task in a quality manner.

14.6 Training needs are identified according to analyst's discipline. The individual and management together are responsible for setting and pursuit of the training as well as educational goals. The annual performance evaluation process can be used by the individual and management to discuss training possibilities. This process will enable the individual and management the opportunity to identify areas of training and discuss towards achieving the goals.

14.7 All appropriate laboratory personnel are instructed on the quality policies and objectives contained in this Quality Assurance Manual by the QA Officer. This instruction is then documented on the employee's training form.


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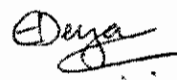
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15. FACILITIES AND EQUIPMENT

15.1 It is the policy of Microbac Laboratories, Inc., Baltimore Division to maintain adequate facilities (physical plant and instrumentation) to allow personnel to perform chemical tests properly in a safe environment.

15.2 The **Baltimore Division** is a 20,500 square foot laboratory facility. All lab departments are air conditioned and ventilated separately. This reduces mixing of air between laboratories resulting in reduced opportunity for cross-contamination.

The laboratory has adequate services in the following areas:

- 15.2.1 Electrical services to allow major instrumentation to be kept on dedicated or limited use circuits
- 15.2.2 A reverse osmosis - deionized water system to meet the needs of the laboratories
- 15.2.3 UV/filtration system for preparing water suitable for use in microbiological analyses
- 15.2.4 Appropriate facilities for handling compressed gases
- 15.2.5 Ample refrigeration capacity for proper sample storage

15.3 A forty-plus node network supplies computer needs for the Laboratory Information Management System (LIMS), word processing, and other network applications.

15.4 Laboratory fume hoods are placed strategically throughout the building. These are maintained and monitored in accordance with Microbac Laboratories, Inc., Health & Safety Manual.

15.5 The importance of good housekeeping, i.e., clean workbenches, clutter-free environment, is emphasized to each employee as a preventive measure to protect against contamination of test samples. It is also a safety issue. Laboratory housekeeping procedures are outlined in the Health & Safety Manual.

15.6 *The following is a description of the Baltimore Location laboratory layout (Figure 1) and major instrumentation.*

15.6.1 Organics Analysis Laboratory

Volatiles Instrument Laboratory – 18' x 24' laboratory space, approximately 36 linear feet of bench space

Semi-Volatiles Instrument Laboratory- 27' x 50' laboratory space, approximately 64 linear feet of bench space

Preparation Laboratory- 27' x 50' laboratory space, approximately 85 linear feet of bench space, three 8-ft wide exhaust hoods vented outside the building.

15.6.2 Metals Analysis Laboratory

Instrument Laboratory - 27' x 50' laboratory space, approximately 100 linear feet of bench space, two exhaust hoods (6 ft., and 4 ft. wide) vented outside of the building. Local exhaust systems eliminate fumes from the instruments.

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15.6.3 Metals Prep/General Chemistry Laboratory

27' x 50' laboratory space, approximately 150 linear feet of bench space, two 4 foot and two 8 foot hoods which vent outside of the building..

15.6.4 Microbiology Laboratory

Microbiology Media Prep Area - 6' x 12' laboratory space, approximately 12 linear feet of bench space also 12' x 15' of additional microbiology laboratory space with approximately 14 linear feet of bench space.

Microbiology Laboratory - 21' x 21' laboratory space, approximately 20 linear feet of bench space, 9 feet of desk space, with incubators, refrigeration units and a 6-ft laminar flow hood.

15.6.5 Sample receiving Area

24' x 24' serves as the sample receiving area. The area contains an 8' x 8' walk-in refrigerator, small refrigerators for volatile samples and 8 linear feet of bench space, with exhaust hood.

10' x 40' serves as the reporting storage area.

15.6.6 Field Operations Area

2400 square feet of space adjacent to the main building with deionized water service, walk-in refrigerator, and freezer for ice storage and drive-up ramp for ease in loading vehicles and boats.

15.6.7 Water Chemistry

Water Chemistry Laboratory - 24' x 50' laboratory space, approximately 102 linear feet of bench space one 6-ft wide exhaust hood vented to outside the building

15.6.7 Major Instrumentation

- Gas Chromatography (GC)
- Gas Chromatography - Mass Spectrometry (GC/MS)
- Axial Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES)
- Inductively Coupled Plasma - Mass Spectrometry (ICP/MS)
- Atomic Absorption Spectroscopy - Flame
- Mercury Analysis System - FIMS-100
- Horizon Technology Oil & Grease Analyzer
- Ion Chromatograph - Dionex
- Total Organic Carbon Analyzer
- UV/Visible Spectrophotometer
- Auto Analyzer – SEAL discrete analyzer
- Available Cyanide Auto Analyzer

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15.7 *Figure 2 describes the Richmond Location laboratory layout. Detailed below are the major instrumentation held at the Richmond laboratory.*

15.7.1 General Analytics

| | |
|-------------------------------|--------------------------|
| <i>Spectrophotometers</i> | <i>HACH DR/2000</i> |
| <i>Turbidimeter</i> | <i>HACH 2100A</i> |
| <i>Dissolved Oxygen Meter</i> | <i>YSI 58</i> |
| <i>pH Meter</i> | <i>Thermo Orion Star</i> |

15.7.2 Microbiology

| | |
|--------------------------|-----------------------|
| <i>Autoclave</i> | <i>VWR AS12</i> |
| <i>Quantitray Sealer</i> | <i>IDEXX Model 2X</i> |

Reference Thermometer: Ertco, Serial # 1404; range -1 to 201°C
Reference Weights: Permas (Fisher); Class S, Serial #A303

15.8 Other Instrumentation

Other equipment such as balances, pH and DO meters, equipment for the extractions required for TCLP and sonication apparatus, mixers, stirrers, continuous liquid-liquid extraction apparatus, automatic sample concentrators, incubators for microbiology and BOD analysis, ovens, programmable ashing oven, autoclaves, flash point testers, automatic titrators, automatic Karl Fischer titrator, microwave, bomb calorimeter, composite samplers, flow-proportional compositing samplers, pumps, etc.

The laboratory maintains multiple pieces of major instrumentation. A complete list of laboratory and office equipment with model and serial numbers is available. The records of condition upon purchase are located in the accounting office. A copy of the manufacturers' operating instructions is readily available to all analysts using that particular piece of equipment.

It is Microbac Laboratories, Inc., policy to purchase equipment from well-known and respected companies that specialize in laboratory testing equipment

15.9 Instrument Maintenance

In order to provide quality data, it is important for all equipment to be in satisfactory operating condition. Microbac Laboratories, Inc., performs preventive maintenance as recommended by the manufacturers of the equipment used in the laboratories and field operations. Performing preventive maintenance and cleaning as required helps to ensure that equipment will perform to specifications and is in operation when needed to perform analyses in a timely manner.

Each department keeps instrument logs to track the performance and maintenance history of all major pieces of equipment.

The procedure for documenting equipment maintenance and repairs is outlined in GEN-008, "Daily Laboratory Recordkeeping for Analysts". Preventive maintenance schedules are included in the individual maintenance logs or in the specific laboratory SOPs.

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Spare parts are usually kept in inventory to allow for minor maintenance. Service contracts are maintained for some of the major instruments, balances, and critical equipment. Some service contracts provide for loaner equipment while the original piece of equipment is sent for repair. Copies of service contracts are kept in the each appropriate lab department and/or in the accounting office.

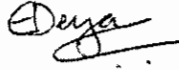
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FIGURE 1: LABORATORY LAYOUT – BALTIMORE LOCATION

Microbac Laboratories, Inc., Baltimore Division
Baltimore, MD 21224
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**Microbac Laboratories Inc.
Baltimore, MD. Floor Plan**

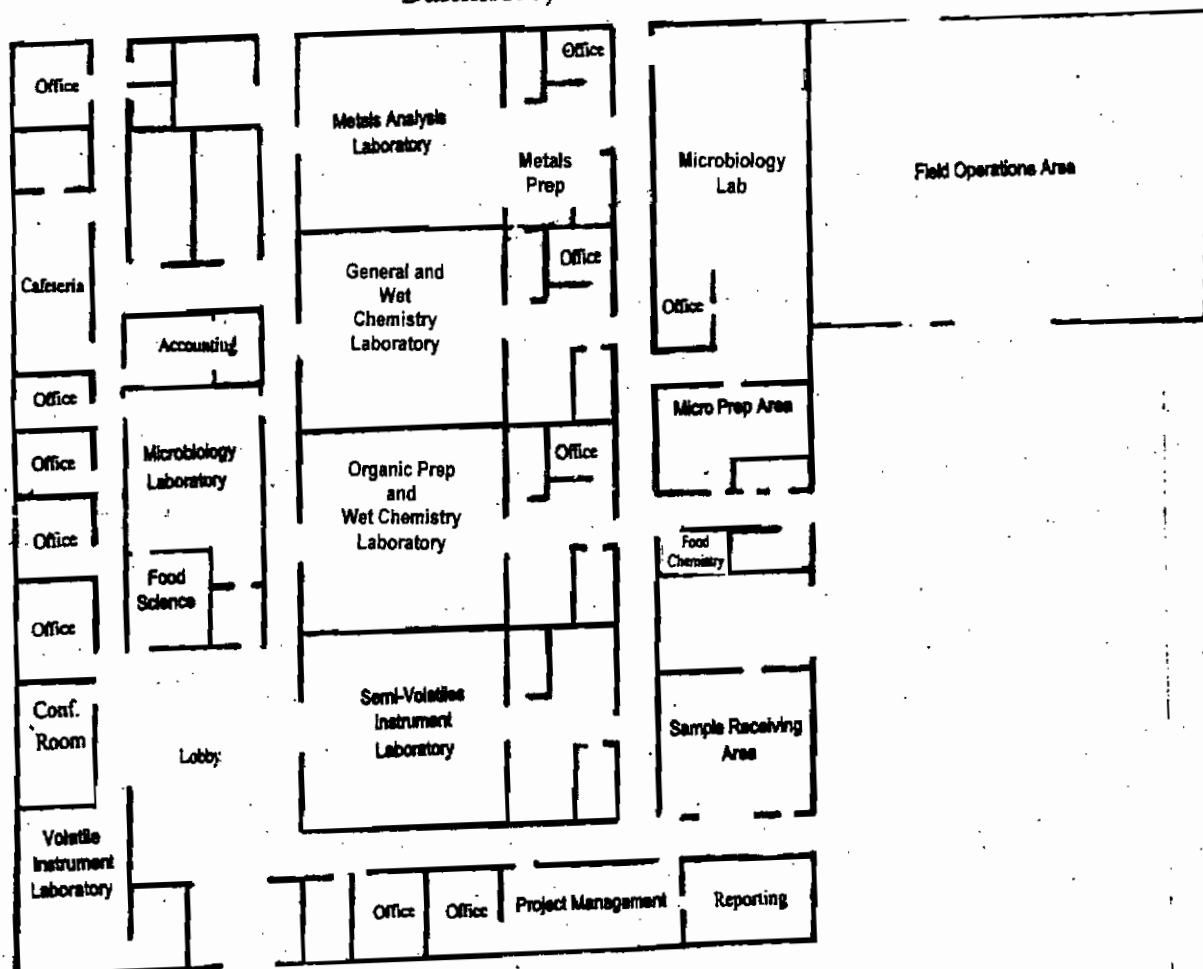
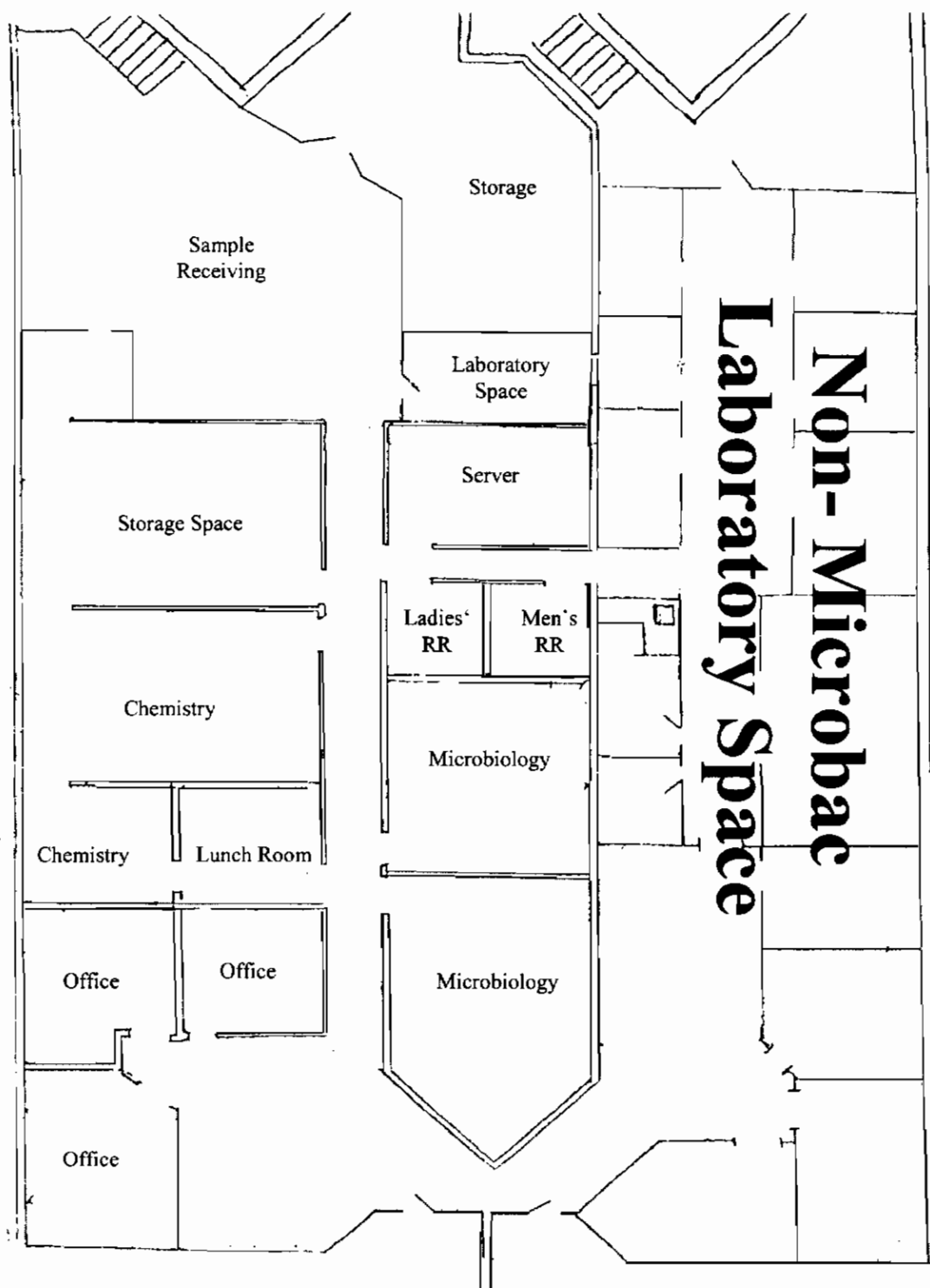


FIGURE 2: LABORATORY LAYOUT - RICHMOND LOCATION



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16. ANALYTICAL METHODS AND METHOD VALIDATION

16.1 It is the policy of Microbac Laboratories, Inc., Baltimore Division to use, adapt, or develop "rugged" analytical methods. Whenever available, the latest written valid edition of a standard method from organizations such as USEPA, APHA / AWWA / WPCF (Standard Methods), ASTM, NIOSH, AOAC, USP, FDA, BAM, CFR 21 or other recognized organizations are used.

16.2 This is accomplished through laboratory periodic review of organizations' websites and reviews of the most recent revision dates for the method in use. The Corporate office of Quality Improvement also provides notification of updates on standards on a regular basis via email.

16.3 Approval of Analytical Methods

16.3.1 Methods that are used for analyses are approved by the Division Manager and / or the Technical Director, or the QA Officer for use in the analysis of customer samples. Approval is documented by appropriate signatures on the cover page of the standard operating procedure (SOP).

16.3.2 Under some circumstances (e.g. due to matrix interferences, or when required by the customer's data quality objectives) deviations from work instruction SOPs are allowed. These deviations may only be done with approval of the Technical Director and must be thoroughly documented on the data review checklist. This is a unique occasion and may require that the Certificate of Analysis be flagged.

16.4 A complete list of available test parameters and analytical methods, sample quantity, preservation requirements and holding times are found in the Customer Reference Guide and in ELEMENT LIMS.

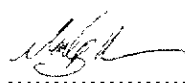
16.5 Where laboratory designed methods, non-standard analytical methods, or standard methods are used outside the current scope, validation of the method is required. This method creation and validation is a planned activity that follows the procedure in the latest revision of SOP GEN-017 (Method Validation).

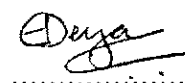
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17. EQUIPMENT CALIBRATION

17.1 It is the policy of Microbac Laboratories, Inc., to obtain, maintain, and calibrate equipment and instrumentation as required to accurately and to efficiently perform chemical tests as prescribed in the test methods. Microbac Laboratories, Inc has established and maintains SOP GEN-002, Calibration of Laboratory Thermometers, Bottle-Top Dispensers and Fixed Volume Pipettes, SOP GEN-028, Calibration of Balances and SOP MICRO-016-1.08, Equipment and Supply Quality Control (for Microbiology) as procedures for calibrating laboratory equipment.

17.2 All equipment must be properly calibrated before collecting data or analyzing samples. Without acceptable calibration data, it is impossible to demonstrate that the data produced by the analytical procedure is valid.

17.3 After initial calibration, the equipment may be used after performing a calibration check. Many methods allow analysis of samples after demonstrating that the calibration check sample is within the required limits of the last calibration curve. The acceptance criteria for calibration are found in the latest revision of each work instruction SOP. If the acceptance criteria are not met, the action to be taken is also stated in that SOP.

17.4 All calibration data is recorded in laboratory notebooks, calibration logs, or if the equipment produces hard copy, the output is stored in a file or loose-leaf binder.

17.5 Recognized calibration procedures are referenced from a specific method, SOP, or from manufacturer's instructions. Calibration standards should be NIST SRMs or traceable to NIST materials whenever possible. This may not always be possible due to lack of availability. The laboratory endeavors to obtain certificates of traceability from manufacturers accredited to ISO 17025 or by an accredited testing laboratory that issues an accredited test report containing statements of measurement results, measurement of uncertainty, traceability and endorsed by accreditation body's logo or accreditation certificate number, where applicable.

17.5.1 **Balances** - Balances are checked daily against Class 1 equivalent weights (NIST traceable), and must be recorded. These weights are calibrated every five years by a calibration laboratory accredited to ISO 17025 or by an accredited testing laboratory that issues an accredited test report containing statements of measurement results, measurement of uncertainty and traceability against an NIST traceable weights, or new NIST traceable Class 1 weights are purchased. The test certificate must state measurement of uncertainty and endorsed by accreditation body's logo or accreditation certificate number. The QA Officer keeps the certificate on file.

17.5.2 **Thermometers** - Mercury thermometers are calibrated annually and other types of thermometers are calibrated quarterly against a NIST traceable thermometer. Each thermometer is tagged after calibration with the correction factor, date and analyst's initials. Accurate thermometers are critical for monitoring refrigerated sample storage and certain analytical procedures (ovens, incubators, etc.). Daily temperatures are recorded in appropriate logs. The NIST traceable thermometer is calibrated annually by a calibration laboratory accredited to ISO 17025 or by an accredited testing laboratory that issues an accredited test report containing statements of measurement results, measurement of uncertainty and traceability against an NIST traceable thermometer. The test certificate must state measurement of uncertainty and endorsed by accreditation body's logo or accreditation certificate number. The QA Officer keeps the certificate on file.

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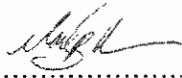
17.5.3 **Analytical Instrumentation** - is calibrated according to procedures described in appropriate work instruction SOPs.


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18. TRACEABILITY OF MEASUREMENTS

18.1 Handling of Standards and Reagents

Microbac Laboratories, Inc., ensures traceability of measurements by complying with A2LA's Policy on Measurement Traceability. It is the policy of Microbac Laboratories, Inc., to use suitable reagents and standards when performing analyses. These are purchased or prepared as appropriate. When required, and if available, calibration standards are traceable to NIST reference materials or traceable to some other certifying agency.

18.2 Materials (calibration standards, chemical reagents, solvents, gases, etc.) are available in many grades of purity. In order to produce quality reproducible data, it is necessary to obtain materials of the appropriate quality required for the analyses to be performed. It is also important to ensure that the quality of reagents used for specific procedures is consistent from purchase to purchase.

18.3 Microbac Laboratories, Inc., purchasing procedure is designed to ensure that all goods and services purchased are of known and documented quality and meet the technical requirements and acceptance criteria of the laboratory.

All standards, chemicals, reagents and consumables that may affect the quality of the analytical process are logged into the LIMS system for tracking. All traceability information (receipt date, expiration date, manufacturer, lot information, purity and concentration) is recorded in LIMS. A unique ID number is generated by LIMS and is used for traceability with all analytical batches for which the item is used.

18.3.1 **Reagent Labeling** - To ensure that reagents used are of satisfactory quality, analytical reagent grade, ACS grade, or better, materials are used. The labels on all materials are inspected upon receipt to determine whether the reagent quality meets the specifications for the analytical method of use and to determine whether the material has an extended shelf life. All reagent containers are marked showing the date of receipt, expiration date, and date of opening and analysts' initials.

18.3.2 **Deionized Water** - The deionized water system extends to all of the laboratories and is serviced by a commercial supplier. The DI water is prepared from tap water using an activated carbon-reverse osmosis process. The water is then held in a storage tank and is continuously recirculated through activated carbon, deionization tanks, an ultraviolet sterilization lamp and a 0.2 μm filter. The DI water is adequate for all laboratory applications and is monitored according to SOP GEN-013, Laboratory Deionized Water System.

18.3.3 **Standards** - Calibration standards and Quality Control Verification Standards are prepared from high quality materials. Standards should be NIST SRMs or traceable to NIST materials whenever possible. Other sources of standards are commercial suppliers. The laboratory endeavors to obtain certificates of traceability where applicable. This may not always be possible due to lack of availability. Standard storage and use limitations are outlined in each specific test method work instruction SOP.

18.3.4 **General Inorganic Analyses** - Analytical reagent grade chemicals and solvents are sufficient for this application according to EPA, AOAC, USP, and other cited reference methods. Analytical procedures are checked for special chemical grade requirements and storage conditions.

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18.3.5 Metals Analyses - All calibration standards are NIST SRM or traceable to SRMs. In order to have satisfactory blanks without significant background contamination, high purity acids or equivalent are used.

18.3.6 Organics Analyses - Solvents used for sample preparation are of sufficient purity so as not to interfere with target analyte determination. Acceptable solvent grades are specified in the SOP for each method. Calibration standards should be reference grade and whenever possible traceable to NIST SRMs or equivalent. Compressed gases used for gas chromatography are of high purity and may be filtered prior to use.

18.3.7 Microbiological Analyses - Dehydrated media are purchased from commercial vendors and are of a quality that meet specification as required by EPA, AOAC, FDA, and other cited reference methods.

18.3.8 Storage of Reagents - Reagents, standards and solvents are stored in accordance with manufacturer's instructions. Microbac Laboratories, Inc. Health and Safety Manual or the individual Technical Directors are consulted whenever storage or handling procedures are not clear. Reagent storage and use limitations are outlined in each specific test method work instruction SOP.

18.3.9 Verification of Standards - Before use of a new source or lot of a reference/calibration standard, the protocol for verifying the acceptability of the standard is followed and documented. This procedure is specified in GEN-008, "Daily Laboratory Recordkeeping for Analysts".

18.3.10 Verification of Reagents - Before use of a new source or lot of a reagent, the protocol for verifying the acceptability of the reagent is followed and documented. This procedure is specified in GEN-008, "

18.4 It is the policy of Microbac Laboratories, Inc., to obtain, maintain, and calibrate equipment and instrumentation as required to accurately and to efficiently perform chemical tests as prescribed in the test methods.

18.5 All equipment must be properly calibrated before collecting data or analyzing samples. Without acceptable calibration data, it is impossible to demonstrate that the data produced by the analytical procedure is valid.

18.6 After initial calibration, the equipment may be used after performing a calibration check. Many methods allow analysis of samples after demonstrating that the calibration check sample is within the required limits of the last calibration curve. The acceptance criteria for calibration are found in the latest revision of each work instruction SOP. If the acceptance criteria are not met, the action to be taken is also stated in that SOP.

All calibration data is recorded in laboratory notebooks, calibration logs, or if the equipment produces hard copy, the output is stored in a file or loose-leaf binder or electronically

18.7 Recognized calibration procedures are referenced from a specific method, SOP, or from manufacturer's instructions. Calibration standards should be NIST SRMs or traceable to NIST materials whenever possible. This may not always be possible due to lack of availability.

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The laboratory endeavors to obtain certificates of traceability from manufacturers accredited to ISO 17025 or by an accredited testing laboratory that issues an accredited test report containing statements of measurement results, measurement of uncertainty, traceability and endorsed by accreditation body's logo or accreditation certificate number, where applicable.

18.8 Reference Standards Handling, Use, Storage and Transport:

The laboratory has a selection of thermometers for everyday use. These must be traceable to NIST by means of calibration against a suitable reference device whose purpose is only for calibration (NIST traceable thermometer). NIST Traceable thermometers are sent to an accredited calibration service annually. Before calibration, the referenced thermometer is inspected for damage. Cracks or breaks in the glass are considered to be damaged. Only if the reference thermometer is undamaged, should the calibration proceed. Reference thermometer is packed in box adequate to prevent breakage during storage, handling, and transportation. It is sealed securely by taping around the box opening. The box is marked with the reference thermometer number assigned by the laboratory. Any correction factors for these thermometers are entered in the Thermometer Calibration Log and are used to determine the true value. Certificates are kept on file by QA and the NIST reference thermometers are kept in the QA office when not in use.


18.9 Reference NIST Traceable balance weights are sent to an accredited calibration service every 5 years or replaced. In order to keep balance weights in optimum condition, weights are kept in a dedicated storage case to keep them clean, dry and away from chemical contamination. Weights are kept in this case whenever they are not in use. Weights must not be handled with bare hands. A lint-free cotton gloves should be worn. Weights that are small are handled with tweezers. Care must be taken to avoid knocking weights together. Surfaces on which weights are placed such as the weighing pan of the balance must be clean and dry. Weight Certificates that show appropriate traceability are kept on file by QA.


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19. FIELD SAMPLING

19.1 It is the policy of Microbac Laboratories, Inc. to collect samples properly and to ensure that they maintain the characteristics of the sample source by the use of appropriate sampling and preservation techniques.

19.2 It is critical that the sampling be performed correctly and documented thoroughly. For environmental samples, the techniques used are based on Environmental Protection Agency guidelines, described in the Handbook for Sampling and Sample Preservation of Water and Wastewater, (EPA-600-4-82-029), Test Methods for Evaluating Solid Wastes (EPA SW-846, Third Edition, Volume II) and Field Sampling Procedures Manual, New Jersey Department of Environmental Protection and Energy, May 1992. All SWDA compliance samples collected for the state of Maryland must be collected by a certified sampler and the sampler's certification number documented on the associated Chain of Custody.

19.3 Food sample collections are conducted using guidelines from customer HACCP plans (Hazard Analysis and Critical Control Points), the FDA Food Code, 2001, U.S. Public Health Service, US Department of Health and Human Services, Washington DC 20204; Official Methods of Analysis, Kenneth Helrich, ed., Association of Official Analytical Chemists, Arlington, VA; Compendium of Methods for the Microbiological Examination of Foods, Frances Pouch Downes, Keith Ito, editors, American Public Health Assoc., 4th Edition, 2001.

19.4 Microbac Laboratories, Inc., Baltimore Division maintains a well-equipped, full-time, experienced and certified Field Operations Department.

19.5 The following criteria are observed during all sampling events:

19.5.1 **Containers:** Sample bottles are either new or pre-cleaned according to a written SOP.

19.5.2 **Equipment:** Equipment used to obtain the sample is either new or pre-cleaned according to standard protocol to ensure that external contamination of the sample is avoided.

19.5.3 **Sample Integrity:** Trip blanks, field blanks, filter blanks and equipment rinsate blanks may be taken to test for cross contamination during sampling and transport.

19.5.4 **Documentation:** Field reports include site location and conditions; field tests; sample collection, preservation, and proper labeling; date and time of collection; and field operations personnel present at time of sampling. The report must be completed in order to ensure the validity of the sample. A chain-of-custody form is initiated at this point.

19.6 Sampling Procedures (refer to Field Sampling SOPs) for the following types of matrices are available through Microbac Laboratories, Inc. Field Operations Department:

- Groundwater Sampling
- Wastewater Sampling
- Aqueous Surface and Sub-surface Sampling
- Drinking Water Sampling

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- Soil Sampling
- Sludge and Sediment Sampling
- Drum Sampling
- Wipe Sampling
- Food Sampling

19.7 Other services provided by the Field Operations Department include:

19.7.1 Field Testing: Trained personnel for those parameters that require immediate determination conduct Field testing. Examples of these tests are pH, Residual Chlorine, Specific Conductance, Dissolved Oxygen and Temperature.

19.7.2 Sample Containers and Coolers: The Field Operations Department is responsible for maintaining and distributing sample containers that are appropriate to the required testing. Sample coolers, if needed to maintain required temperature conditions, are distributed to customers. Upon request, sample containers are prepared with proper preservatives. Distribution of sampling instructions and hazard warnings is also the responsibility of the Field Operations Department.

19.7.3 Sample Pick-Up: The Field Operations Department is responsible for scheduling pickups and deliveries.

19.7.4 Site Plans and Information Manuals: Site monitoring information manuals are created for sites as needed or upon request. These manuals will contain information regarding past sampling history, special QA/QC requirements and maps of the site. The Field Operations Manager keeps these manuals.

19.7.5 Sampling Plans: When appropriate, site specific sampling plans are prepared in accordance with chapter 9 of the EPA manual Test Methods for Evaluating Solid Waste SW-846, Third Edition, Volume II.

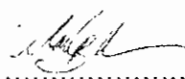
19.7.6 Sanitation Inspections: Providing inspection services for the food industry to meet the needs of their HACCP plans (Hazard Analysis and Critical Control Points) in accordance with guidelines from the ServSafe Certification program of the National Restaurant Association Educational Foundation.

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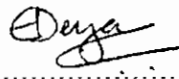
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20. SAMPLE HANDLING

20.1 It is the policy of Microbac Laboratories, Inc., to receive samples under chain-of-custody procedures adhering to proper sample preservation and collection techniques.

20.2 **Sample Delivery** - Samples are delivered to the laboratory by Microbac Laboratories, Inc., personnel, direct customer delivery, or commercial delivery services.

20.2.1 If samples are collected by Microbac Laboratories, Inc., Baltimore Division field personnel, it is done according to the latest revision of Field Operations SOPs, depending upon the type of sample matrix and required testing.

20.2.2 Samples are labeled with information as available, including: sample ID, customer name, sampling site, date and time of collection, preservatives used, tests to be performed, and the name or initials of the person collecting the sample.

20.2.3 Upon delivery to the laboratory, Chain-of-Custody protocol is followed to complete the transfer of custody of the samples to laboratory personnel.

20.3 **Chain-Of-Custody** - The Sample Submittal / Chain of Custody form is designed to track and document the generation and transfer of a sample or group of samples from sample collection to delivery at the laboratory. This is a two-part form. The yellow bottom copy is the customer sample submittal receipt that is retained after the form is completed by the individual submitting the sample. The white original is the lab record that is retained with the permanent laboratory files.

20.3.1 For selected routine monitoring performed by Microbac Laboratories, Inc. and for food analyses customized chains-of-custody forms may be used. A copy of the form stays in the laboratory file and a copy is provided with the final report. Customers' chain-of-custody forms are used when submitted.

20.4 **Sample Custody** - A sample is considered to be in custody if it is:

1. In the possession of authorized individual
2. In a secure area or locked vehicle
3. In the Baltimore lab facility in one of the secure areas (a lab department or sample receiving)

20.4.1 Once the Chain-of-Custody form for a sample is signed at the sample receiving area in the main laboratory building, the sample is considered to be in custody throughout the secure area of the building. Sample containers that are transferred between laboratory departments do not require a signature record of the transfer unless this is required by the customer.

20.4.2 Customer Services personnel determine the viability of the sample and the distribution of the sample throughout different departments of the laboratory. Sample receipt and distribution procedures are documented in the latest revision of SOP SIM-001, "Sample Receipt and Handling".

20.5 **Sample Rejection Policy** - If there is any uncertainty as to requested testing, sample condition (container, preservation, holding time), amount of sample, or turn-around time, the customer is called to resolve the issue. This procedure is described in the latest revision of SOP PM-001, "Project Manager Duties".

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After the customer has been informed of an improper sample condition and the customer decides to proceed with the testing, the data on the final report is footnoted with appropriate statements indicating the improper sample condition.

20.5.1 If samples are rejected or analyses are cancelled, the samples are logged into the LIMS for tracking purposes, with the status set to cancelled. Details of the cancellation are recorded in LIMS.

20.6 **Sample Login** - After the sample is received, the sample log-in procedure is initiated. This procedure is described in SOP IT-009 "Project Management and Reporting using Element LIMS".

20.6.1 A unique work order number is automatically generated by the LIMS system. This documents the arrival of the job at the laboratory. Information is used to track the samples from sample receipt through the laboratory process to the final reporting of data. The information entered into the LIMS includes:

- a) A unique work order number.
- b) Customer Name and Customer Code
- c) Number of samples (each container is assigned a unique number)
- d) Date and time of sample collection
- e) Date and time of receipt at the laboratory
- f) Tests to be performed (test codes)
- g) Appropriate comments

20.6.2 After the samples are logged into the LIMS, they are delivered to the appropriate department with the associated paperwork. This procedure is outlined in GEN-008, "Daily Laboratory Recordkeeping for Analysts".

20.7 **Sample Storage** - Prior to, during, and after completion of testing, test samples are properly stored under specific storage conditions according to required testing protocol. NOTE: After completion of testing, some samples may not be stored according to proper storage requirements.

20.7.1 If retesting is performed on a sample that has not been properly maintained, the reanalysis data, if reported, is flagged as estimated.

20.7.2 If samples are refrigerated, the refrigerator temperatures are monitored daily and the temperatures are documented. The test samples are stored in the laboratory in various departments or in the sample receiving area. These areas have restricted access to help ensure sample integrity. Each specific department has the responsibility of storing its' particular samples or sub-samples under its' departmental storage conditions.

20.8 **Sample Disposal** - After completion of testing, non-food samples are retained for approximately three weeks after the analysis is complete. The disposal of all laboratory waste will be performed in compliance with all applicable regulations enforced by U.S. Environmental protection Agency (EPA), the Maryland Department of the Environment (MDE) and the City of Baltimore. For specific information refer to CHO-001 "Laboratory Waste Management".

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20.8.1 Food samples that are composited for microbiological or chemical testing are disposed immediately after compositing; only the composite is retained. All food for microbiological testing (composites and samples that are not composited) are discarded a week after testing.

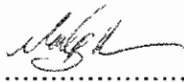
20.8.2 Food samples that are submitted for chemical analyses (composites and samples that are not composited) are discarded two weeks after testing.

20.8.3 FDA detention samples are held until FDA has approved shipment. Provisions may be made for a longer sample retention period upon customer request. Assigned laboratory personnel are given the responsibility for removing samples from storage and ensuring of their proper disposal. Samples may also be returned to the customer. If the samples are returned to the customer, this action is documented on the work order receipt form.

Approved by: Mark Horan (Division Manager)

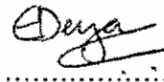
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21. QUALITY CONTROL

21.1 It is the policy of Microbac Laboratories, Inc., to perform quality control checks on instruments, methods and analysts in order to rapidly detect errors and prevent recurrence. This is accomplished through the use of standards, blanks, duplicates, and spiked samples to check accuracy, precision and matrix effects. Results are monitored for rapid detection. Corrective action must be taken and documented whenever a process is outside of the specified control limits.

21.2 There are a number of quality control tools that are used in order to determine whether data being generated is of satisfactory quality and within prescribed requirements for accuracy and precision. These tools are described below. The frequency of use, and acceptance criteria are outlined in each specific test method work instruction SOP. All of the quality control tools listed below may not be applicable to every test procedure conducted by Microbac Laboratories, Inc.

21.2.1 Blanks - Blanks are artificial samples that are used to determine whether there has been contamination of samples, equipment or reagents. There are several types of blank samples that may be analyzed. The types of blank samples to be analyzed for a particular job or analytical method may vary.

21.2.1.1 Method Blank (MB) – Also known as a Laboratory Reagent Blank (LRB) – Usually an organic or aqueous solution that is carried through the complete sample preparation procedure and contains the same reagent concentrations in the final solution as in the sample solution used for analysis.

21.2.1.2 Field Blank – Serves as a check on reagent and environmental contamination at the time of sample collection. Field blanks may be collected according to either the professional judgement of the sampler, the requirement of a project data quality objective, or a regulatory requirement.

21.2.1.3 Trip Blank – Serves as a check on sample contamination originating from sample transport, shipping, and from the site conditions. Additional blanks may be collected according to a project data quality objective or a regulatory requirement. Customers are encouraged to submit trip blanks per job site. Trip blanks are normally used only when volatile organic samples are being shipped.

21.2.1.4 Rinsate, Filter or Equipment Blanks – Serves as a check on sampling device cleanliness. Rinsate, filter or equipment blanks may be collected according to either the professional judgement of the sampler, the requirement of a project data quality objective, or a regulatory requirement.

21.2.2 CALIBRATION – All equipment is calibrated prior to conducting analyses. Calibration polices are described in Section 17 of this document. The number of calibration standards and the required frequency of instrument calibration is method dependent and is defined in the method specific SOP.

21.2.2.1 Calibration Blank - is used to give the null reading for the instrument response.

21.2.2.2 Calibration Standard - A solution containing a known quantity of analyte that is used in conjunction with standards of other known concentrations to determine instrument response (a standard curve).

21.2.2.3 Calibration Curve is the plot of concentrations of known analyte standards versus the instrument response to the analyte.

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21.2.2.4 Calibration Check Standard (Initial Calibration Verification ICV) - A solution containing a known quantity of analyte that has been purchased or prepared from a different source than the stock reference standard solution used to calibrate the equipment. This is used to verify instrument calibration.

21.2.3 SPIKED SAMPLES - Spiked samples are those having a predetermined amount of solution, containing certain analytes of interest, added to a sample prior to sample extraction/digestion and analysis. The spiking material is from an independent source or lot as compared to the reference calibration standard used in the initial or daily calibration of test equipment. Spiked samples are analyzed to determine the performance of a method or analyst, or the stability of the analyte in the sample matrix. The spiked sample is carried through the entire analytical procedure to demonstrate the accuracy of the method.

21.2.3.1 Matrix Spike (MS) - is employed to provide a measure the effect of the matrix on the accuracy. Failure to achieve the recovery specified in the method being used may indicate an analytical problem or a matrix interference or incompatibility. In the event of unacceptable spike recovery data, the analysis may be repeated to confirm the original result. The analytical result is flagged as suspect if an unacceptable spike recovery is obtained.

21.2.3.2 Laboratory Control Sample (LCS) - Is a method blank containing a known amount of analyte that is analyzed exactly like the samples. Results should be within limits specified by the method or by the manufacturer for purchased check samples. The purpose of the LCS is to ensure that the entire analytical process is in control on a day to day (batch to batch) basis. It can also be used to determine if the laboratory is capable of making accurate and precise measurements and may be used to determine the accuracy of measurement at the method detection limit. In some methods LCS is identified as QCS.

21.2.4 DUPLICATE SAMPLES - Samples are analyzed in duplicate to verify the precision of the analytical procedure. Both analytical results are compared to each other to determine if the relative percent difference (RPD) is within the limits specified for the method. A Field Duplicate is two separate samples taken from the same source, in separate containers. This measures the precision of both the sampling process and the analytical method.

Matrix spike duplicates are analyzed for those test methods that usually result in non-detects for the analyte of interest. This requires the analysis of three samples: the native sample, a matrix spike sample, and a second matrix spike sample (matrix spike duplicate). This gives two checks: the accuracy (percent recovery of analyte) and the precision (relative percent difference between the two percent recoveries of the spiked samples) of the method for the particular matrix.

21.2.5 SURROGATE COMPOUNDS - Surrogates are organic compounds that are similar to analytes of interest in chemical composition, extraction, and chromatography, but which are not normally found in environmental samples. These compounds are added to all blanks, standards, samples and spiked samples and are carried through sample preparation and analysis. Satisfactory recoveries of these compounds demonstrate that the analytical process is in control.

21.3 CONFIRMATIONAL TESTING

In those instances where doubt exists to the presence or absence of a specific target analyte, confirmational testing may be employed. Examples would be:

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- 21.3.1 Use of multiple but dissimilar Gas Chromatography columns or detectors.
- 21.3.2 Use of Gas Chromatography/Mass Spectroscopy to supplement the initial Gas Chromatography testing.
- 21.3.3 Use of Atomic Absorption Spectroscopy to supplement initial ICP Spectroscopy testing.
- 21.3.4 Use of a different but related testing technology to confirm the initial test result.
- 21.3.5 The use of a different test technology to obtain additional information about the test sample.

21.4 METHOD DETECTION LIMIT

The Method Detection Limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. MDLs are statistically determined from the analysis of a sample set in a given matrix type containing the analyte. The procedure for determining MDLs is found in the latest revision of SOP Gen-015 based on the Federal Register 40 CFR 136 Appendix B or EPA SW-846 Chapter 1 - QA/QC July 1992. MDLs serve to demonstrate the ability of the laboratory to perform the method to a degree of precision that may be compared to the limit listed in the method or between laboratories performing the same test.

MDL studies are performed on an annual basis for all analytes for which a spike solution exists. MDL studies are required for analytes that may be reported with estimated concentrations below the reporting limit.

21.5 LIMIT OF DETECTION

The Limit of Detection (LOD) is the minimum concentration of a substance that can be detected above three times the noise level or average blank level for the analytical method. The LOD is at or below the level of the Reporting Limit/Limit of Quantitation.

The LOD is verified analytically on an annual basis for all analytes for which a spike solution exists. The LOD applies only to analytes that may be reported with estimated concentrations below the reporting limit.

21.6 LABORATORY REPORTING LIMIT (RL) OR LIMIT OF QUANTITATION (LOQ)

The laboratory-reporting limit or LOQ is the lowest concentration that can be reliably quantitated within specified limits of precision and accuracy during routine laboratory operating conditions. The reporting limit is generally 5 to 10 times the Method Detection Limit (MDL) and may be nominally chosen within these guidelines to simplify data reporting. The reporting limit may be based upon the lowest non-zero concentration in the calibration curve and/or the value cited by the reference method.

Determining the reporting limit/LOQ for a specific analyte is method, technique and instrument dependent. The RL/LOQ is also highly matrix-dependent; each sample is unique in nature and composition, and may vary over a broad range for many sample types.

Reporting limits/LOQs must be at least three times the MDL concentration, or three times the "background noise" level or average blank concentration. LOQs must be verified annually for each analyte on each instrument used to perform the analysis.

Details of the procedures for determining and verifying MDL, LOD and LOQs are provided in the latest revision of SOP GEN-015.

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21.7 PRECISION AND ACCURACY STATEMENTS

Demonstration of capability (DOC) is performed using known spiked samples (e.g., the LCS) which are analyzed several times by the analyst to qualify the analyst to perform the analytical procedure.

21.8 MEASUREMENT UNCERTAINTY

Reporting of measurement uncertainty is required under ISO 17025 when the uncertainty is "relevant to the validity or application of the test results, when a customer's instruction so requires, or when the uncertainty affects compliance to a specification limit". Evaluation of the aspects of a test procedure that contribute to the uncertainty of the result enables the laboratory to verify that the procedure is capable of generating valid data. Errors in measurements can be either random or systematic. Random effects from a variety of sources affect the result each time the measurement is made. Systematic errors remain unchanged under the same conditions of measurement and may be reduced when recognized.

Uncertainties are classified into two categories based on their method of evaluation: Type A, which is statistically determined from repeated observations, and Type B which is evaluated by alternate means, for example by judgment from previous measurements, or manufacturer's specifications.

Components of uncertainty are evaluated and expressed as standard deviation and each is referred to as a **standard uncertainty**. The standard uncertainties are combined to yield an overall value of uncertainty which is referred to as the **combined standard uncertainty**.

Expanded uncertainty is used to provide a greater confidence interval about the measured result. In this laboratory the standard uncertainty is expanded by a factor $k=2$, to express the uncertainty at the confidence level of approximately 95%.

Alternatively, the measurement uncertainty may be taken directly from the chemical and biological published regulatory or consensus methods (EPA, ASTM, APHA/AWWA, etc.) when the uncertainty is stated and when that method procedure and reporting instructions are followed as written.

21.9 INTER-LABORATORY TESTING PROGRAMS

In order to demonstrate laboratory competence, qualify new analytical methods, and maintain certifications it is often necessary to analyze samples submitted to the laboratory by outside organizations or other laboratories. Microbac Laboratories, Inc. participates in many such programs. These include:

21.9.1 Potable Water, Non-Potable Water and Solids Proficiency Testing Samples – These series supplied by Wibby Environmental, a third-party proficiency testing supplier are used by many states and the NELAP program to obtain or maintain certification to analyze wastewater, drinking water and solid matrix samples for chemistry and microbiology parameters. The laboratory routinely analyzes samples of each matrix on a semi-annual basis.

21.9.2 AIHA - ELPAT - the American Industrial Hygiene Association conducts the Environmental Lead Proficiency Analytical Testing or ELPAT program. The samples submitted to the participating laboratories are used to assess competence in the analysis of environmental samples for lead contamination. These samples are submitted to the laboratory on a quarterly basis.

21.9.3 Microbac Check Sample Program – Samples for a variety of tests are periodically provided by the corporate office to all divisions. These samples are used to demonstrate proficiency and determine areas that need improvement within the corporate structure. Samples are also made available for divisions that are adding new testing capabilities.

21.9.4 American Proficiency Institute (API) – Food samples for a variety of microbiological and chemical tests are periodically analyzed for verification of laboratory proficiency.

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Results for performance samples are tabulated for the various departments. Results of performance samples are considered during department performance reviews.

21.10 CONTROL CHARTS

Control charts are very useful for determining whether an analytical process is in control. There are two types of charts in use at Microbac Laboratories, Inc. These charts are generated in the LIMS from batch quality control data that is entered along with sample data.

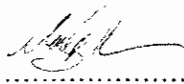
21.10.1 Charts for Accuracy / Recovery - these charts plot the recoveries of laboratory control samples, matrix spikes, and surrogate compounds. Results should fall within control limits specified by the supplier of commercial check samples, limits specified by the method, or those determined in-house from the analysis of a minimum of twenty samples. The value of charts is the ability to see trends and bias in the results before the problem becomes severe enough to force the results beyond the control limits.

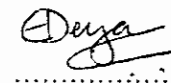
21.10.2 Charts for Precision - these charts plot the relative percent difference for duplicate or matrix spike duplicate sample results. The results should fall within control limits determined in-house from the analysis of a minimum of twenty duplicates (either duplicate sample analysis or matrix spike / matrix spike duplicate analysis).

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22. DATA EVALUATION & REPORTING

22.1 It is the policy of Microbac Laboratories, Inc., to ensure that the information about customers and proprietary rights are treated confidentially as outlined in Microbac Laboratories, Inc. Business Conduct Policy and Confidential Information Agreement. It is the policy to perform routine procedures for evaluation of the data generated in the laboratory to ensure correctness and to produce clear, concise, and complete reports. The reports will only be released to the named contact person or customer in the submittal form or contract, or their designated representative. A written approval must be submitted by the customer to release data to an outside firm or contact.

22.1 ANALYST REVIEW - Conducted by the analyst performing the test procedure

Data are generated and processed by the analyst. The data can be instrument readings, calibration data, calculations, observations, etc. **The analyst has the primary responsibility for the quality of the data being produced.** The first level review of all data is performed by the analyst and is documented by a data review checklist. If a discrepancy is found, corrective action is taken prior to approval of sample data. The completed data is entered into the LIMS system so that it is available for Manager or assigned personnel's approval and reporting. In certain circumstances preliminary test results are provided to the customer after only the analysts' review and this is noted as "Preliminary Data".

22.2 SUPERVISOR REVIEW / APPROVAL - Conducted by the Supervisor or Assigned Personnel

All analytical data undergo a second review at the department level. The second review process is a check of the test data that includes initial and continuing calibration data, quality control data (as appropriate), and a review of the sample results. This review is performed and documented according to IT-008, "Batch Preparation, Data Entry and Review in Element LIMS".

The Manager has the responsibility for overall quality of the data being produced by the laboratory. When the Manager is satisfied that the work is acceptable for reporting, they approve the job in the LIMS system, thus releasing the data for reporting to the customer. The authority to review and release data may be delegated by the Manager to a senior analyst or other qualified analyst on a case-by-case basis. This authorization, if assigned to other than a senior analyst, is documented on the work order receipt form. If a discrepancy is found during the review process, corrective action is taken prior to approval of sample data in the LIMS.

22.3 CUSTOMER SERVICES REVIEW - Conducted by the Project Manager

After the data has been approved by the Manager or assigned personnel, the paperwork is submitted to the Project Manager who prints the final report. A review of the final report is conducted by the Project Manager and is essentially a sanity check to make sure that the analysis is complete and that the customer's data quality objectives (DQOs) are met, if known. The Project Manager has the authority to release test results to the customer.

22.4 QUALITY ASSURANCE REVIEW - Conducted by Quality Assurance

At a minimum ten percent of all laboratory data is reviewed by QA. The review includes an examination of the chain-of-custody form submitted with the samples, the sample condition, testing performed as per request, completion of internal paper-work, and review of any sample or testing nonconformance.

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This review may also include a check of the results in terms of data calculations, results of quality control data, comparison of results to any previous testing and/or applicable regulatory standards, consistency and/or confirmation of data between departments when complementary testing is performed on the same sample. The data that is in the LIMS system may also be checked for transcription errors. If any discrepancies are noted, a request is forwarded to the appropriate department to rectify or confirm the test result or sample information in question. If necessary, the QA Officer will inspect the original samples and confirm the preparation and analysis with the analyst. Once the review process is deemed satisfactory and any updated information is incorporated in the final report, the job is then approved in the LIMS system by the QA Officer.

Monthly the control charts for LCS/LCS duplicate is observed for bias or trends for selected analytes. If bias is observed, the QA officer notifies section manager to start the investigation and plan for action. Corrective action is initiated for any failures identified.

22.5 FINAL REVIEW - Conducted by the Technical Director or other designated signatory

The final report is generated by the Project Manager and is then reviewed and signed by the Technical Director or other designated party.

22.6 STANDARD LABORATORY CERTIFICATES OF ANALYSIS CONTAIN:

1. Laboratory name and address
2. Title (e.g. "Certificate of Analysis")
3. Report number
4. Customer name and address
5. Page number and total number of pages in report
6. Sample identification including date and time of sample collection
7. Date of receipt at the laboratory
8. Unique laboratory sample identification number
9. Parameter(s) measured or test(s) performed
10. Test result(s)
11. Units for each parameter* (including identifying if results are on a dry weight basis)
12. Reporting Limit*
13. Analytical method used
14. Initials of prep analyst*
15. Extraction or prep method*
16. Date and time the extraction or prep was started*
17. Date and time the analysis was started
18. Initials of analyst(s) performing the test
19. Statement of sample condition and that the test results conform to NELAC standards unless otherwise noted
20. Statement of laboratory or method non-conformance or quality control failure*
21. Signature of Technical Director or other designated party
22. Date of issue
23. A copy of the Chain-of-Custody or Sample Submission form
24. A Field Sampling Report, if sample was collected by personnel, referencing collection method(s)*
25. A statement saying that the reported information represents only the samples analyzed and is not to be reproduced in part, without written approval of the laboratory.

* Where applicable per testing procedure

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22.7 QUALITY CONTROL DATA PACKAGES


Quality control data reported includes various levels of supporting documentation depending upon customer request and the type of analyses performed. Microbac offers but is not limited to the following:

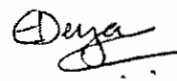
Method Blanks, Matrix Spike/Matrix Spike Duplicate Recoveries, Laboratory Control Sample Recovery, Surrogate Recovery Data (if applicable), Laboratory Duplicate Results (if applicable), Sample Raw Data, Calibration Summary (GC/MS tuning summary), Raw Standards Data, Raw Quality Control Data, Tentatively Identified Compounds (TICs), Laboratory Chronicle, Methods Summary and References.

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23. QUALITY ASSURANCE REPORTS TO MANAGEMENT

23.1 It is the policy of Microbac Laboratories, Inc., Baltimore Division to present a monthly Quality Assurance Report to management.

23.2 Each month, the QA Officer provides a report to the Division Manager, Technical Director(s) and the corporate Quality Assurance Director. The report contains the following information:

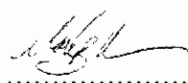
- a) Audits
 - External – attached report
 - Internal – performed during the month with outcome summarized
- b) PT Studies
 - Scheduled / In-house
- c) Corrective Action Closure – attach CAR log
- d) Changes in Certification / Accreditation
- e) Test methods covered by accreditation, certification or customer approval: _____%
- f) Training Received or Conducted
- g) Customer Feedback
- h) Personnel Changes
- i) Other: QA Activities, Changes in volume and type of work, etc.

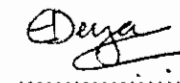
23.3 The report is provided to management so that actions may be taken to address or correct situations that may compromise the quality of the data produced by the laboratory. Copies of these monthly reports are kept on file by the QA Officer.

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24. CERTIFICATIONS AND ACCREDITATIONS


24.1 It is the policy of Microbac Laboratories, Inc. to obtain and maintain certifications and accreditations to demonstrate competence and allow Microbac Laboratories, Inc., to perform tests covered by these programs.

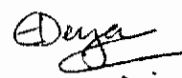
24.2 A copy of the summary of Microbac Laboratories, Inc. certifications and accreditations are found in APPENDIX C. A complete list of the scopes of accreditations that are currently held by the laboratory is available upon request.

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QUALITY ASSURANCE MANUAL, BALTIMORE DIVISION

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25. ETHICS AND DATA INTEGRITY POLICY

25.1 Microbac employees have a responsibility to conduct themselves and the business of Microbac Laboratories in a professional and ethical manner.

25.2 The success of this Quality Assurance plan is based on the ethical behavior of all employees. Microbac believes that any short-term gain as a result of unethical behavior is not worth the long-term consequence.

25.3 It is our policy that all operations of the laboratory are handled in a manner to ensure that our personnel are free from any commercial, financial or other pressures that may affect the quality of their work.

25.4 In order to ensure that employees are aware of the high standards of integrity that are expected of them as Microbac personnel, each employee is required to read and sign the Microbac Ethics and Data Integrity Policy within one week of hire or prior to reporting customer data, whichever comes first.

25.5 Annually, the data integrity procedures are reviewed and updated by Management. In addition, all employees participate in annual Ethics and Data Integrity training. Copies of the training records are kept in the Quality Assurance Officer file.

25.6 The policy includes an open door approach for confidentially reporting violations and concerns. Laboratory management are informed of Policy violation cases that may require further detailed investigations. Investigation into allegations and data impact are assessed and documented.

Policy violation cases are reviewed annually by management to look for any reoccurring root causes or trends.

25.7 Falsification of data or any unethical practice under any circumstances is a violation of the Microbac Business Conduct Policy and is subject to disciplinary action, up to and including dismissal.


25.8 These principles are discussed further in the Ethics and Data Integrity Policy SOP Q-002.

25.9 Investigation procedures and documentation requirements for ethics and data integrity questions are covered in the latest revision of SOP GEN-005.

Approved by: Mark Horan (Division Manager)

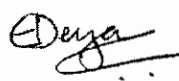
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26. ADVERTISING POLICY

26.1 Policy Memorandum for Use of the term "A2LA" and "A2LA Accredited" symbol

26.1.2 This memorandum establishes Microbac Laboratories Inc., policy and procedure for the use of term "A2LA" and "A2LA Accredited" symbol. The laboratory must be accredited in order to use the term "A2LA" and "A2LA Accredited" symbol. It is the responsibility of all laboratory management personnel to ensure that laboratory procedures comply with the requirements of the certification program as specified in ISO 17025.

26.1.3 There are tests Microbac Laboratories, Inc., performs that are not carried out within the laboratories official A2LA Scope of Accreditation. The results of these tests are reported in the certificate of analysis sent to the customer with the results from the tests within the laboratory's scope of accreditation. Because of this, the "A2LA" and "A2LA Accredited" symbol will not be used on final reports, work proposals or quotes.

26.1.4 If the laboratory is requested to provide proof of accreditation, and where both accredited and non-accredited tests are included, an annotation must be made on non-accredited tests accompanying the final reports, proposals or quotations stating "This laboratory maintains A2LA accreditation to ISO 17025 for specific tests listed in A2LA Certificate Number. However, these test results are not covered by this accreditation".

26.1.5 Included in this policy is the laboratory's responsibility that there is no misrepresentation of its accreditation status. If the laboratory's accreditation is suspended or terminated, the laboratory will no longer use the term "A2LA" and "A2LA Accredited" symbol in all its documents.

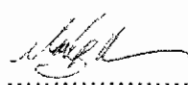
26.1.6 It is also the responsibility of the laboratory management to ensure that all personnel understand their duties in response to certifications and those analytical activities in support of accreditation meet the needs of both the customer and A2LA Certification Programs.

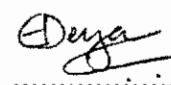
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27. REVISION HISTORY

| REV. NO. | CHANGES FROM PREVIOUS REVISION | DATE |
|----------|--|----------|
| 16 | Updated Laboratory Director and QA Officer; Identified SOP's referenced in manual; Updated Org Chart; Changed disposal of records to 'discarded' from 'destroyed'; Removed 10 year requirement for lead testing records to 5 based on latest NLLAP requirements; Added references to LIMS for record keeping; Revised third-party provider of proficiency testing in Sec. 21; Added Ethics Policy to Sec. 25; Removed references to AIHA accreditation; Removed Appendix D and replaced with this table. | 10/29/10 |
| 17 | Added description for Regional Director to Sec. 2.0; Duties of the IT Director were placed under Technical Director; Senior Analyst has been changed to Analyst III; M. Horan changed to Division Manager; B. Gunn changed to Project Manager; Regional Director added to C. Gudz's title; Added NLLAP requirements for handling complaints to Sec. 7; Added reference to A2LA's traceability policy to Sec. 18 and Appendix A; Added reference to NLLAP to Appendix A; Removed items from Appendix B that were not test methods conducted at Microbac Baltimore | 07/12/11 |
| 18 | Add deputies to key management positions to section 2; reference to new test method development to section 4; add LIMS use for traceability to section 18; add LOD and LOQ to section 21; make Appendix A glossary, revise format of Appendix B with methods; move analytical method sources to Appendix C and Certifications List to Appendix D | 11/04/11 |
| 19 | Title Page (QM-00a) and Org charts (QM-002) updated to include C. Read as Technical Manager / QAO and E. Deya as QAM. Addition of Richmond Division throughout QAM. Richmond Division QAM Rev 7 has since been retired. Addition of Richmond location laboratory lay out in QM-015. Addition of Richmond location accreditation and removal of State of North Carolina certification and USDA Soil Permit (QM-028D). Addition of Richmond Division references in QM-028C Addition of definitions in QM-028a. Update of QM-028b with current Baltimore scope and addition of Richmond accredited methods. Moved corporate organizational chart to Appendix B. Test methods available on LIMS as per QM-016. | 06/15/12 |
| 20 | <i>Title page – QAO removed for Curtis Read; QM-002 organizational charts updated. Role of technical manager included; QM-028c Addition of SM online; QM-028b Updated VELAP Cert no., removal of VA SDWP, Removal of reference to NJ drinking water certification.</i> | 08/22/12 |

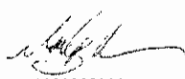
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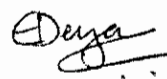
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28A. APPENDIX A: GLOSSARY

28a.1 Acceptance Criteria: specified limits placed on characteristics of an item, process, or service defined in requirement documents.

28a.2 Accreditation: the process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards.

28a.3 Accrediting Authority/ Accrediting Body: the territorial, state, or federal agency having responsibility and accountability for laboratory accreditation.

28a.4 Accuracy: the degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations. Accuracy is a data quality indicator.

28a.5 Aliquot: measured portion of a sample, or solution, taken for sample preparation and/or analysis.

28a.6 Analyst: the designated individual who performs the hands-on analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent controls to meet the required level of quality.

28a.7 Analysis Date/Time: the date (including the year) and time (military time) of the injection or start of analysis of the sample or standard.

28a.8 Analyte: the component of a system to be analyzed for.

28a.9 Analyzed Reagents (AR): Chemicals for which impurities are analyzed and where the level of impurities is reported in accordance with the specifications of the Committee on Analytical Reagents of the American Chemical Society.

28a.10 Audit: a systematic evaluation to determine the conformance to quantitative and qualitative specifications of some operational function or activity.

28a.11 Batch: environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents.

28a.11.1 A preparation batch is composed of one to twenty environmental samples of the same matrix, meeting the afore-mentioned criteria and with a maximum time between the start of processing of the first and last sample of the batch to be 24 hours.

28a.11.2 An analytical batch is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various environmental matrices and can exceed 20 samples.

28a.12 Bias: A systematic error inherent in a method or caused by some artifact or idiosyncrasy of the measurement system. Temperature effect and extraction inefficiencies are examples of the first type of bias; blanks, contamination, mechanical losses, and calibration errors are examples of the latter.

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Bias may be either positive or negative, and several kinds can exist concurrently, so net bias is all that can be evaluated except under special conditions.

28a.13 Blank: a sample of known analyte-free media, designed to assess sources of laboratory contamination.

28a.13.1 Equipment Blank – blank that has been used to rinse common sampling equipment to check the effectiveness of the decontamination process.

28a.13.2 Field Blank - blank prepared in the field by filling a clean container with laboratory grade water and appropriate preservative for the specific sampling being performed.

28a.13.3 Instrument Blank – A laboratory blank processed through the instrumental steps of the analytical process – used to determine instrument contamination.

28a.13.4 Method Blank – A sample of matrix similar to the samples, known to be free of the analytes of interest, processed along with the sample batch through all steps of the preparation and analysis.

28a.14 Blind Sample: A sub-sample for analysis with a composition known to the submitter, but not to the analyst.

28a.15 Calibration: a set of operations that establish, under specific conditions, the relationship between values to quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards.

28a.15.1 In calibration of support equipment, the values realized by standards are established through the use of reference Standards that are traceable to the International System of Units (SI)

28a.15.2 In calibration according to test methods, the values realized by standards are typically established through the use of reference materials that are either purchased by the laboratory with a certificate of analysis or purity, or prepared by the laboratory using support equipment that has been calibrated or verified to meet specifications.

28a.16 Calibration Curve: the graphical relationship between the known values, such as concentrations, and their instrument response.

28a.17 Calibration Factor (CF): a measure of the instrument response of a target analyte to the concentration injected. The calibration factor is analogous to the Relative Response Factor (RRF).

28a.18 Calibration Standard: a substance or reference material used to calibrate an instrument.

28a.19 Certified Reference Material (CRM): a substance with a property or value which is certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body.

28a.20 Chain of Custody Form: record that documents the possession of the samples from the time of collection to receipt in the laboratory.

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This record generally includes: the number and types of containers; the mode of collection; collector; time of collection; preservation; and requested analyses.

28a.21 Characterization: a determination of the approximate concentration range of compounds of interest used to choose the appropriate analytical protocol.

28a.22 Clean Surface: an experimental surface having no surface contamination observable by means of the used method.

28a.23 Coefficient: proportionality constant between two quantities of different dimension

28a.24 Confirmation: verification of the identity of a compound through the use of an approach with a different scientific principle from the original method.

28a.25 Conformance: an affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation.

28a.26 Contamination: a component of a sample or an extract that is not representative of the environmental source of the sample. Contamination may stem from other samples, sampling equipment, while in transit, from laboratory reagents, laboratory environment, or analytical instruments.

28a.27 Control Limit: The limits shown on a control chart beyond which it is highly improbable that a point could lie while the system remains in a state of statistical control.

28a.28 Corrective Action: the action taken to eliminate the causes of an existing nonconformity.

28a.29 Data Reduction: the process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collation into a more useable form.

28a.30 Deficiency: an assessment conclusion supported by objective evidence that identifies a deviation from the requirements of the standard being assessed.

28a.31 Demonstration of Capability: a procedure to establish the ability of the analyst to generate acceptably accurate data for a given procedure.

28a.32 Detection Limit: the lowest concentration or amount of the target analyte that can be identified, measured, or reported with confidence that the analyte concentration is above zero. Also Limit of Detection (LOD).

28a.33 Document Control: the act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed and controlled to ensure use of the correct version at the location where the prescribed activity is performed.

28a.34 Extractable: a compound that can be partitioned into a solvent from the sample matrix and is amenable to analysis.

28a.35 Holding Time: the maximum time that samples may be held prior to analysis and still be considered valid or not compromised.

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28a.36 Homogeneity: the degree to which a property or a constituent is uniformly distributed throughout a quantity of material. A material may be homogeneous with respect to one analyte or property but heterogeneous with respect to another. The degree of heterogeneity (the opposite of homogeneity) is the determining factor of sampling error.

28a.37 Initial Calibration (ICAL): analysis of analytical standards for a series of different specified concentrations; used to define the linearity and dynamic range of the response of the measuring instrumentation.

28a.38 Internal Standard: a known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method in the specific matrix.

28a.39 Instrument Detection Limit (IDL) the minimum concentration that can be measured by the instrument, in reagent water with 99% confidence that the concentration is greater than zero

28a.40 Insufficient Quantity: when there is not enough volume (water sample) or weight (soil/sediment) to perform any of the required operations: sample analysis or extraction, percent moisture, MS/MSD, etc.

28a.41 Laboratory Control Sample: a quality system matrix spiked with a verified known amount of the analyte(s) of interest, used to establish intra-laboratory and analyte specific precision and bias or to assess the performance of all or a portion of the measurement system. Also Fortified Blank, Spiked Blank, Quality Control Sample.

28a.42 Limit of Detection (LOD): see Detection Limit

28a.43 Limit of Quantitation (LOQ): the lowest concentration of an analyte that can be reported within a specified degree of confidence. Also Reporting Limit (RL), Quantitation Limit (QL or CRQL), Method Reporting Limit (MRL).

28a.44 Linear Range: concentration range over which the intensity of the signal obtained is directly proportional to the concentration of the species producing the signal.

28a.45 Material Safety Data Sheet (MSDS): compilation of information required under the US OSHA Hazard Communication Standard on the identity of hazardous substances, health and physical hazards, exposure limits and precautions.

28a.46 Matrix: the predominant material of which the sample to be analyzed is composed. Matrix is NOT synonymous with phase (liquid or solid). Recognized matrices are:

28a.46.1 Drinking Water – any aqueous sample that has been designated a potable or potential potable water source.

28a.46.2 Non-Potable Water – any aqueous sample excluded from the definition of Drinking Water, includes surface water, groundwater, effluents, water treatment chemicals, and extracts.

28a.46.3 Solid and Chemical Materials – includes soils, sediments, sludges, products and by-products of an industrial process that results in a matrix not previously defined.

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28a.46.4 Biological Tissue – any sample of a biological origin such as animal tissue or plant material. Such samples shall be grouped according to origin.

28a.46.5 Air and Emissions – whole gas or vapor samples including those contained

28a.47 **Matrix Effect:** the effect of a particular matrix (water or soil/sediment) on the constituents with which it contacts. Matrix effects may prevent extraction/detection of target analytes, or non-target analytes may be extracted/detected that cause interferences.

28a.48 **Matrix Spike:** aliquot of a matrix (water or soil) fortified (spiked) with known quantities of specific compounds and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery.

28a.49 **Matrix Spike Duplicate:** a second aliquot of the same matrix as the matrix spike (above) that is spiked in order to determine the precision of the method.

28a.50 **Method Detection Limit (MDL):** the minimum concentration that can be measured by the method in a matrix with 99% confidence that the concentration is greater than zero. MDLs are statistically determined.

28a.51 **Noise:** the random fluctuations occurring in a signal that are inherent in the combination of instrument and analytical method.

28a.52 **Percent Difference (%D):** a comparison between two values, the percent difference indicates both the direction and the magnitude of the comparison, i.e., the percent difference may be either negative, positive, or zero. (In contrast, see relative percent difference).

28a.53 **Percent Moisture:** an approximation of the amount of water in a soil/sediment sample made by drying an aliquot of the sample at 105°C. The percent moisture determined in this manner also includes contributions from all compounds that may volatilize at or below 105°C, including water.

28a.54 **Phase:** an entity of a material system which is uniform in chemical composition and physical state - gas, liquid and solid are common phases.

28a.55 **Precipitation:** the sedimentation of a solid material (a precipitate) from a liquid solution in which the material is present in amounts greater than its solubility in the liquid.

28a.56 **Precision:** the closeness of agreement between independent test results obtained by applying the experimental procedure under stipulated conditions. The smaller the random part of the experimental errors which affect the results, the more precise the procedure.

28a.57 **Quality Assurance:** the guarantee that the quality of a product (analytical data set, etc.) is actually what is claimed on the basis of the quality control applied in creating that product. Quality assurance is meant to protect against failures of quality control.

28a.58 **Quality Control:** the maintenance and statement of the quality of a product (data set, etc.) specifically that it meets or exceeds some minimum standard based on known, testable criteria.

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28a.59 Reagent Water: water in which a target analyte or interferent is not observed at or above the minimum quantitation limit of the parameter(s) of interest.

28a.60 Relative Percent Difference (RPD): a comparison between two values, based on the mean of the two values, and reported as an absolute value, i.e., always expressed as a positive number or zero. (In contrast, see percent difference).

28a.61 Reporting Limit: The "less than" value to which sample results are reported. The value is generally above the MDL. It is chosen based on MDL data, industry standards and convenience.

28a.62 Reproducibility: the closeness of agreement between independent results obtained with the same method on identical test material but under different conditions.

28a.63 Response: (or Instrumental Response) a measurement of the output of the detector in which the intensity of the signal is proportionate to the amount (or concentration) detected.

28a.64 Sample: a portion of material to be analyzed that is contained in single or multiple containers and identified by a unique sample number.

28a.65 Sample Handling: any action applied to the sample before the analytical procedure. Such actions include the addition of preservatives, separation procedures, storage, protection, loading, etc.

28a.66 Sediment: a highly concentrated suspension of a solid in a liquid

28a.67 Standard Operating Procedure: A written document which details the method of an operation, analysis or action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks. Also referred to as a procedure.

28a.68 Stoichiometry: the relationship between the amounts of substances that react together in a particular chemical reaction, and the amounts of products that are formed.

28a.69 Target Compound List (TCL): a list of compounds designated by the client for analysis. Also "Compounds (or Analytes) of Interest"

28a.70 Traceability: the property of a result or measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons.


28a.71 Uncertainty: The range of values within which the true value is estimated to lie. It is the best estimate of possible inaccuracy due to both random and systematic error.


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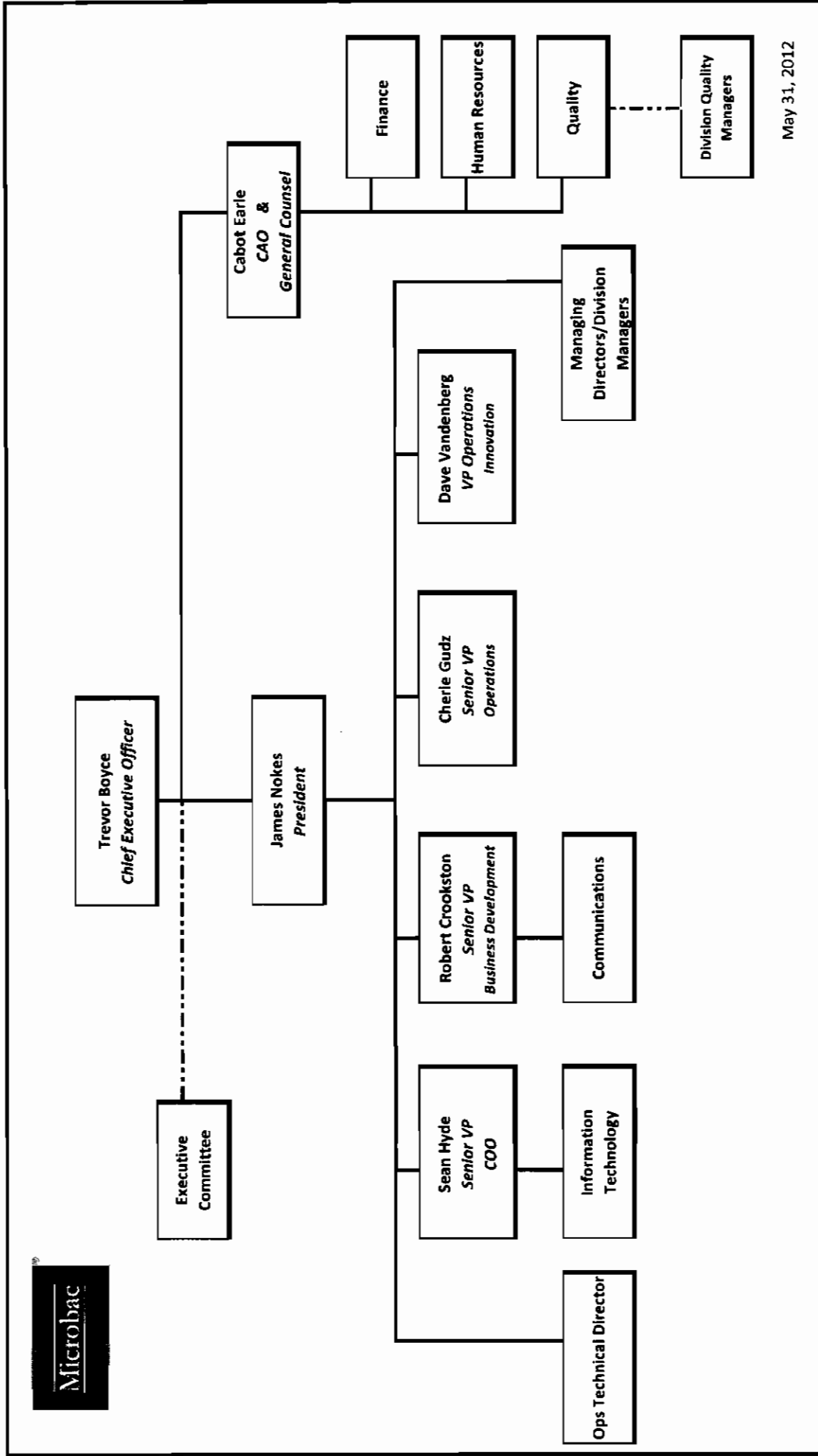

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Microbac Laboratories Inc. Corporate Organization Chart



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.28C. APPENDIX C: SOURCES OF ANALYTICAL METHODS

28c.1 Wherever possible, the methods should be published methods promulgated by a regulatory agency or traceable to a standards setting organization.

28c.2 The following is a list of the primary sources for obtaining analytical methods. This list is not all-inclusive.

28c.2.1 Methods for Chemical Analysis of Water and Wastes, J.F. Kopp and G.D. McKee, USEPA Environmental Monitoring and Support Laboratory, Cincinnati, Ohio, EPA-600/4-79-020, revised March 1983.

28c.2.2 Federal Register 40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants", Appendix A, Appendix B, Appendix C, updated annually

28c.2.3 Test Methods for Evaluating Solid Waste, SW-846, Third Edition, USEPA Office of Solid Waste and Emergency Response, Washington, DC November 1986. Also included are Final Update I July 1992, Final Update II September 1994, Update IIA August 1993, and Update IIB January, 1995, Final Update III, December 1996.

28c.2.4 Federal Register 40 CFR Part 261 et al., Vol 55, No. 61 March 29, 1990 and Vol 55, No. 126 June 29, 1990, Toxicity Characteristic Leaching Procedure (TCLP), Final Rule and Vol 57, No. 227 November 24, 1992 Revision of the TCLP.

28c.2.5 Standard Methods For The Examination of Water and Wastewater, L.S. Clesceri, et. al, editors, American Public Health Assoc., American Water Works Assoc., Water Pollution Control Federation, 20th Edition, 1995 (or earlier editions or *SM Online* at <http://www.standardmethods.org/>).

28c.2.6 Methods for Determination of Organic Compounds in Drinking Water, USEPA Environmental Monitoring Systems Laboratory, Cincinnati, OH EPA/600/4-88/039, December 1988, Supplement I EPA-600/4-90/020 July 1990, Supplement II EPA-600/R-92/129 August 1992, Supplement III EPA-600/R-95/131 August 1995.

28c.2.7 Methods for Determination of Metals in Environmental Samples, USEPA Office of Research and Development Washington, DC, EPA/600/4-91/010 June 1991, Supplement I EPA-600/R-94-111 May 1994.

28c.2.8 Methods for the Determination of Inorganic Substances in Environmental Samples, USEPA Office of Research and Development, Washington, DC, EPA/600/R-93/100, August 1993.

28c.2.9 Methods for the Determination of Nonconventional Pesticides in Municipal and Industrial Wastewater, USEPA Office of Water (WH-552) Washington, DC EPA/821/R/92/002 1992

28c.2.10 Annual Book of ASTM Standards, American Society for Testing and Materials, Philadelphia, PA, published annually.

28c.2.11 NIOSH Manual of Analytical Methods, Fourth Edition, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for

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Occupational Safety and Health, Division of Physical Sciences and Engineering, Cincinnati, OH, August 1994.

28c.2.12 OSHA Analytical Methods Manual, U.S. Department of Labor, Occupational Safety and Health Administration, Salt Lake City Analytical Laboratory, Salt Lake City, UT Part I - Organic Substances Second Edition, 1990 and Part II - Inorganic Substances 1985.

28c.2.13 Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, EPA-600/4-89/017, USEPA Atmospheric Research and Exposure Assessment Laboratory, Research Triangle Park, NC June 1988.

28c.2.14 Federal Register 40 CFR Part 60, July 1, 1992, "Standards of Performance for New Stationary Sources" Test Methods - Appendix A

28c.2.15 Official Methods of Analysis, 15 Edition, Kenneth Helrich, ed., Association of Official Analytical Chemists, Arlington, VA, 1990 (or updates)

28c.2.16 Analytical Procedures for Determining Organic Priority Pollutants in Municipal Sludges, EPA-600/2-80-030, MERL, March 1980.

28c.2.17 Test Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, J.E. Longbottom and J.L. Lichtenberg, EPA-600/4-82-057, USEPA Physical and Chemical Methods Branch EMSL, Cincinnati, Ohio, July 1982.

28c.2.18 Methods of Soil Analysis, Second Edition, Arnold Klute, Editor, American Society of Agronomy, Inc., Soil Society of America, Inc., Madison, WI, 1986.

28c.2.19 Procedure for Handling and Chemical Analysis of Sediment and Water Samples, R. H. Plumb, USEPA, EPA/CE-81-1, 1981

28c.2.20 The United States Pharmacopoeia/The National Formulary, United States Pharmacopoeial Convention, Inc., Rockville, MD.

28c.2.21 Manual for the Certification of Laboratories Analyzing Drinking Water - Criteria and Procedures Quality Assurance - Fourth Edition EPA 815-B-97-001 March 1997

28c.2.22 Field Sampling Procedures Manual, New Jersey Department of Environmental Protection and Energy, May 1992.

28c.2.23 Standard Methods For The Examination of Dairy Products, H. Michael Wehr, PhD, Joseph F. Frank, PhD, editors, American Public Health Assoc., 17th Edition, 2004.

28c.2.24 Compendium of Methods for the Microbiological Examination of Foods, Frances Pouch Downes, Keith Ito, editors, American Public Health Assoc., 4th Edition, 2001.

28c.2.25 Bacteriological Analytical Manual, US Food & Drug Administration, Center for Food Safety & Applied Nutrition, January 2001 (or updates), BAM Online @ www.cfsan.fda.gov/~ebam/bam-toc.html

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28c.2.26 FDA Food Code, 2001, U.S. Public Health Service, US Department of Health & Human Services, Washington DC 20204

28c.2.27 21 CFR; FDA CDRH on line Database @ www.accessdata.fda.gov

28c.2.28 EPA, Office of Water, Washington, DC EPA-821-R-06-013, Method 1681

28c.2.29 EPA, Office of Water, Washington, DC EPA-821-R-04-26, Method 1680

28c.2.30 AOAC International Guidelines for Laboratories Performing Microbiological and Chemical Analyses of Food and Pharmaceuticals, March 2010 Edition.

28c.2.31 AOAC International, 18th Edition

28c.2.32 EPA National Lead Laboratory Accreditation Program

28c.2.33 A2LA P-102: Policy on Measurement Traceability

28c.2.34 National Environment Laboratory Accreditation Conference, 2009 TNI Standard, EL-VI-2009, September 8, 2009

28c.2.35 National Environment Laboratory Accreditation Conference, 2003 TNI Standard, June 5, 2003

28c.2.36 Manual for the Certification of Laboratories Analyzing Drinking Water, Fifth Edition, EPA 815-R-05-004, January 2005

28c.2.37 "American National Standards Specification and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs (ANSI/ASQC E-4)", 1994

28c.2.38 ISO/IEC 17025:2005 General Requirements for the Competence of Calibration and Testing Laboratories


28c.2.39 QA/G-6: Guidance for the Preparation of Standard Operating Procedures for Quality-Related Operations EPA/600/B-07/001, April 2007


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28D. APPENDIX D: CERTIFICATIONS AND ACCREDITATIONS

| | | |
|---|---|--|
| American Association for Laboratory Accreditation (A2LA) | Non-potable Water; Solid/Haz. Waste: | Trace Metals, Inorganics, Microbiology, Semi volatile and Volatile Organics, |
| Certificate No's.: 0410.01 and 0410.02 | Potable Water: | Trace Metals, Inorganics, Microbiology, VOCs, HAAs |
| | Paint and Dust: | Environmental Lead Analysis |
| | Children's Products: | Lead Analysis |
| | | |
| State of Maryland | Drinking Water: | Trace Metals, Microbiology |
| Certification No.: 109 | | Nitrate/Nitrite/Fluoride/Cyanide |
| | | VOCs incl. THMs, HAAs |
| | | |
| Commonwealth of Pennsylvania (Primary NELAC) | Drinking Water: | Trace Metals, Select Inorganics, VOCs incl. THMs, HAAs |
| Lab ID No.: 68-00339 | Non-Potable Water: | Trace Metals, Inorganics, VOCs SVOCs, Pest/PCBs, Coliforms |
| | Solid/Haz. Waste: | Trace Metals, Select Inorganics, VOCs, SVOCs, Pest/PCBs |
| | | |
| State of New Jersey (Secondary NELAC) | Non-Potable Water: | Trace Metals, Inorganics, VOCs SVOCs, Pest/PCBs, Coliforms |
| Lab ID No.: MD008 | Solid/Haz. Waste: | Trace Metals, Select Inorganics, VOCs, SVOCs, Pest/PCBs |
| | | |
| Commonwealth of Virginia (Secondary NELAC) | Drinking Water: | Trace Metals, Select Inorganics VOCs incl. THMs |
| Baltimore VELAP ID No.: 460170 | Non-Potable Water: | Trace Metals, Inorganics, VOCs SVOCs, Pest/PCBs, Coliforms |
| Certificate No.: 1829 | Solid/Haz. Waste: | Trace Metals, Select Inorganics VOCs, SVOCs, Pest/PCBs |
| | | |
| Commonwealth of Virginia (Primary NELAC) | Drinking Water: | HPC, Coliforms |
| Richmond VELAP ID: 460022 | Non-Potable Water: | Coliforms |
| Certificate No.: 1834 | | |
| | | |
| State of West Virginia | Non-Potable Water: | Available Cyanide |
| Certificate No.: 054 | | |
| | | |
| Complete lists of certified testing methodologies or scopes of accreditations are available upon request. | | |

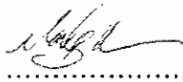
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Effective Date: 08/22/2012

Approved by: Mark Horan (Division Manager)

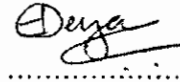
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Appendix 2
(Sample Field Collection Sheet)



8854 Rixlew Lane
 Manassas, VA 20109
 Phone: 703-396-6730
 Fax: 703-396-6743

| | | |
|--|--------------------------|---------------------------------------|
| Watershed: Outfall ID#/Name: Outfall Address: | Samplers: | Date: |
| | Signature | Time of Arrival: |
| | x | Time of Departure: |
| Outfall Weather: Temperature (F°) (C°): General Conditions: | Sampling Methods: | Composite Sample Time Started: |
| | | Composite Sample Time Ended: |
| | | Grab Sample Time: |
| Field Measurements: Temperature of Water (F°): Chlorine: pH Level: Dissolved Oxygen (mg/L) Depth of Discharge (ft): Width of Discharge (ft): Velocity (ft/min) of Discharge: Flow Rate at Outfall (GMP): | Comments/Remarks: | |

Appendix 3
(Sample Chain of Custody Form)

Microbac

Baltimore Division

Baltimore, MD 21224

Tel: 410-633-1800

Fax: 410-633-6553

www.microbac.com

Work Order Number:

Chain of Custody Record

WET WEATHER

Page 1 of 1

| | | | |
|--------------------------------------|------------------------------|------------------------------------|------------------------|
| Client Name: Apex | Project: DDOE - MS4 Sampling | Turnaround Time | QC/EDD Type (Required) |
| Address: 8854 Rixlew Lane | Location: | 7 day per quote (needed by) | [x] Level I |
| City, State, Zip: Manassas, VA 20109 | | | [] Level II |
| Contact: Andrea Owen | | | [] Level III |
| Telephone #: (703) 396-6730 | | | [] Level IV CLP-like |
| Sampled by (PRINT): | Sampler Signature: | | |

| | | | | |
|------------------------------|---|----------|---------------|-----------------|
| Send Report via | [x] e-mail (address): AOwen@apexcos.com | [] Mail | [] Telephone | [] Fax (fax #) |
| ignatius.mutoti@retaweng.com | | | | |

*Matrix Types: Surface water (S) *Preservative Types: H2SO4 - Sulfuric Acid, HCl - Hydrochloric Acid, HNO3 - Nitric Acid, NaOH - Sodium Hydroxide, Na Thio - Sodium Thiosulfate, Asc - Ascorbic Acid

| Client Sample ID | Matrix* | Grab | Composite | Filtered | Date Collected | Time Collected | Preservative | No. of Containers | | |
|------------------|---------|------|-----------|----------|----------------|----------------|--------------|-------------------|---|---|
| | | | | | | | | | Sample Type | Container |
| | S | x | | | | | Na THio | 1 | E. coli, Fecal Coliform | 4 oz sterile polypropylene |
| | S | | x | | | | Unpreserved | 1 | Total Nitrogen, Total Phosphorus TSS, Hardness Cd, Cu, Pb, Zn | 2.5 gallon glass jar |
| | S | x | | | | | Unpreserved | 1 | Chlorophyll (a) | 4 oz glass amber narrow w/ teflon liner |
| | | | | | | | | | | |
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| | | | | | | | | | | |

Possible Hazard Identification [] Hazardous [x] Non-Hazardous [] Radioactive Sample Disposition [x] Dispose as appropriate [] Return [] Archive

| | | | | | | |
|------------------------------------|-----------------------------|--------------------------|-----------|---------------------------------|-----------|--------------------------|
| Number of Containers: 3 | Relinquished By (signature) | Printed Name/Affiliation | Date/Time | Received By (signature) | Date/Time | Printed Name/Affiliation |
| Cooler Number: | | | | | | |
| Temp upon receipt(°C): | Relinquished By (signature) | Printed Name/Affiliation | Date/Time | Received By (signature) | Date/Time | Printed Name/Affiliation |
| Sample Received on Ice or | | | | | | |
| Refrigerated from Client: Yes / No | Relinquished By (signature) | Printed Name/Affiliation | Date/Time | Received for Lab By (signature) | Date/Time | Printed Name/Affiliation |
| | | | | | | |

**Baltimore Division**

Baltimore, MD 21224

Tel: 410-633-1800

Fax: 410-633-6553

www.microbac.com

Work Order Number:

Chain of Custody Record**DRY WEATHER**Page 1 of 1

| | | | |
|--------------------------------------|------------------------------|------------------------------------|---|
| Client Name: Apex | Project: DDOE - MS4 Sampling | Turnaround Time | QC/EDD Type (Required) |
| Address: 8854 Rixlew Lane | Location: | 7 day per quote (needed by) | [x] Level I [] Level II [] Level III [] Level IV CLP-like |
| City, State, Zip: Manassas, VA 20109 | | | [x] EDD Format: Excel Comments: |
| Contact: Andrea Owen | | | |
| Telephone #: (703) 396-6730 | | | |

| | |
|---------------------|--------------------|
| Sampled by (PRINT): | Sampler Signature: |
|---------------------|--------------------|

| | | | | |
|-----------------|---|----------|---------------|-----------------|
| Send Report via | [x] e-mail (address): AOWen@apexcos.com ignatius.mutoti@retaweng.com | [] Mail | [] Telephone | [] Fax (fax #) |
|-----------------|---|----------|---------------|-----------------|

*Matrix Types: Surface water (S) *Preservative Types: H2SO4 - Sulfuric Acid, HCl - Hydrochloric Acid, HNO3 - Nitric Acid, NaOH - Sodium Hydroxide, Na Thio - Sodium Thiosulfate, Asc - Ascorbic Acid

| Client Sample ID | Matrix* | Grab | Composite | Filtered | Date Collected | Time Collected | Preservative | No. of Containers | | |
|------------------|---------|------|-----------|----------|----------------|----------------|--------------|-------------------|---------------------------------------|--|
| | | | | | | | | | Sample Type | Container |
| | S | x | | | | | Na THio | 2 | E. coli, Fecal Coliform, Fecal Strep | 4 oz sterile polypropylene |
| | S | x | | | | | H2SO4 | 1 | Total Nitrogen, Total Phosphorus, COD | 950 ml plastic |
| | S | x | | | | | Unpreserved | 2 | TSS, Hardness, TDS, BOD | 950 ml plastic |
| | S | x | | | | | HNO3 | 1 | As, CD, Cr, Cu, Pb, Ni, Zn | 500 ml plastic wide-mouth |
| | S | x | | | | | Unpreserved | 1 | Chlorophyll (a) | 4 oz glass amber narrow w/ teflon liner |
| | S | x | | | | | HCl | 2 | 8260 VOCs | 40 ml glass teflon lined VOA |
| | S | x | | | | | Unpreserved | 2 | Total PCBs (608) | 1000 ml glass amber narrow w/ teflon liner |
| | S | x | | | | | ASC/NaOH | 1 | Cyanide | 250 ml plastic wide mouth |
| | S | x | | | | | H2SO4 | 1 | Phenols | 1000 ml glass amber narrow w/ teflon liner |
| | S | x | | | | | HCl | 1 | Oil & Grease | 1000 ml glass wide w/ teflon liner |
| | S | x | | | | | Unpreserved | 1 | Dissolved Phosphorus | 500 ml plastic wide-mouth |

Possible Hazard Identification [] Hazardous [x] Non-Hazardous [] Radioactive Sample Disposition [x] Dispose as appropriate [] Return [] Archive

| | | | | | | |
|------------------------------------|-----------------------------|--------------------------|-----------|---------------------------------|-----------|--------------------------|
| Number of Containers: 15 | Relinquished By (signature) | Printed Name/Affiliation | Date/Time | Received By (signature) | Date/Time | Printed Name/Affiliation |
| Cooler Number: | | | | | | |
| Temp upon receipt(°C): | Relinquished By (signature) | Printed Name/Affiliation | Date/Time | Received By (signature) | Date/Time | Printed Name/Affiliation |
| Sample Received on Ice or | | | | | | |
| Refrigerated from Client: Yes / No | Relinquished By (signature) | Printed Name/Affiliation | Date/Time | Received for Lab By (signature) | Date/Time | Printed Name/Affiliation |
| | | | | | | |

MS4 Monitoring for Trash

QUALITY ASSURANCE PROJECT PLAN
And
MONITORING PLAN

Amended on: August 21, 2013

ANACOSTIA WATERSHED SOCIETY

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Tel: 301-699-6204
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Project Manager: Masaya Maeda

Quality Assurance Plan Prepared by: Cynthia Collier

Quality Assurance Manager: Mary Abe

APPROVED  DATE Aug 21, 2013

District Department of the Environment


APPROVED BY  DATE 8/22/13

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A3 - Distribution List

James Foster - 1 copy

Mary Abe - 1 copy

Erin Castelli - 1 copy

Masaya Maeda - 1 copy

James Collier - 1 copy

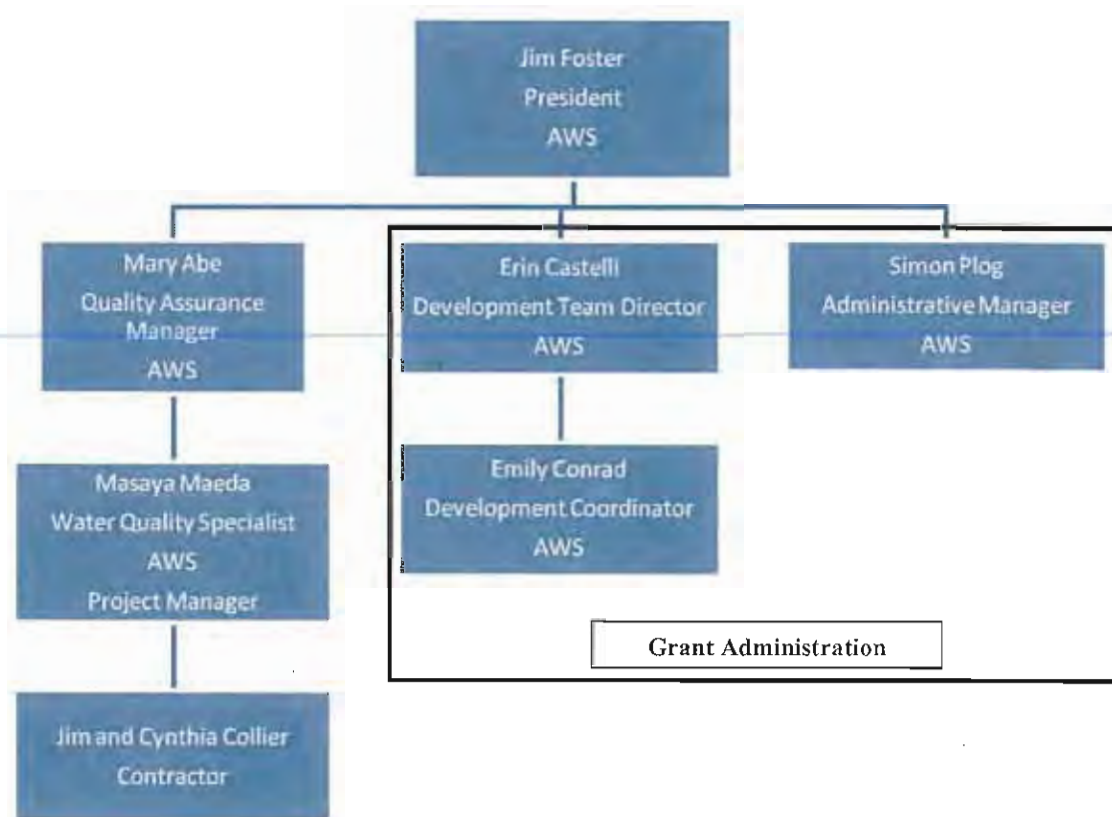
Matthew Robinson - 3 copies + electronic

A: PROJECT MANAGEMENT

A4 - Project/Task Organization

The District of Columbia Department of the Environment (DDOE) has awarded a grant to the Anacostia Watershed Society (AWS), which has the responsibility for performing the project. Mr. James Foster is the President of the AWS and will ensure staff has met all project obligations. Mr. Foster will be informed and involved in all important decisions. Ms. Mary Abe will be the official Quality Assurance Officer for the project. Masaya Maeda is the Water Quality Specialist at AWS and the project manager. AWS will contract with James and Cynthia Collier for delivery of components of the projects.

James and Cynthia Collier and AWS staff will work cooperatively to generate all data.



A5 - Problem Definition/Background

The District of Columbia, State of Maryland and EPA prepared a Total Maximum Daily Load for Trash in the Anacostia River. Allocations were made to the District of Columbia and various jurisdictions in Maryland. Consequently, EPA has issued a renewal of the District's municipal separate storm sewer system (MS4) permit with requirements to monitor the loads of trash from the storm sewers. This project will provide the District of Columbia with a quantification of trash loads being discharged from the MS4 system at six outfalls into the District's waterways for permit reporting compliance.

A6 - Project/Task Description

The District of Columbia is subject to a total maximum daily load (TMDL) for Trash in the Anacostia River. The U.S. Environmental Protection Agency (EPA) listed trash as a priority pollutant in the District's new MS4 permit. This project will monitor six MS4 outfalls to quantify the amount of trash being discharged so that the data can be provided to DDOE to be reported in the MS4 Annual Report/Discharge Monitoring Reports (DMR) to EPA.

A7 - Quality Objectives and Criteria

Six outfalls, including three locations identified in the MS4 permit, will be monitored three times a year at a minimum. Trash collection devices must capture all trash greater than 1 square inch exiting the outfall. Storms to be monitored for stations located within the piedmont physiographic province (i.e. Walter Reed and Battery Kemble) must exceed 0.1 inches of rainfall, and storms monitored for stations located within the coastal plain (i.e. all other stations) must exceed 0.25 inches of rainfall. Development of the Anacostia Trash TMDL revealed that it takes at least 0.25 inches of rain to move trash through and out the District's MS4. However, all of those stations were located within the coastal plain which possesses gentler slopes than the piedmont. In order to gain a better understanding of the conditions required to facilitate loading of trash to local waterways, a smaller volume standard is being established for monitoring stations located within the Piedmont.

All sampling events will be separated from the last rainfall event by at least 72 hours. Data on trash from a minimum of three and a maximum of six storms per station will be obtained, with a separation of 30 days between samples. Trash will be separated from vegetative material and a drained wet weight of trash and vegetation will be obtained. The trash will be inventoried according to the categories used for the Anacostia Trash TMDL outfall monitoring study inventory categories. (see: "Anacostia Outfall Trash Monitoring and TMDL Executive Summary"

at http://ddoe.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/cover_and_exec_summary.pdf). Data from the trash monitoring and a brief narrative will be provided to DDOE for the annual stormwater discharge monitoring report.

A8 - Special Training/Certification

There is no specialized training necessary for the surveying of the quantities of trash and debris. If other workers are used to assist in monitoring, at least one of the AWS

sampling team members named on page 3 will be present to ensure that proper protocols are followed.

A9 - Documents and Records

The QAPP will be developed jointly by AWS and the contractor James Collier. Upon the AWS Quality Assurance Officer approval it will be submitted to the DDOE. AWS will return a signed copy of the approved QAPP to the contractor. Any amendments to the original QAPP will be processed in the same manner with a new date and signature by the QA officer.

A sample data sheet is included in the appended Monitoring plan. The data will be transferred from the paper data sheets into an electronic database. Paper sheets will be scanned and electronic copies provided to AWS and DDOE.

The Garmin etrex legend GPS equipment will be checked against a known reference point. The scale used to weigh samples is a Pelouze digital hanging scale, model 7750, which registers a minimum graduation of one ounce and has a maximum capacity of 50 pounds. The scale will be calibrated before use using known weights. Precipitation data will be obtained from the Reagan National Airport rain gauge via the National Weather Service. Localized storm information may be obtained from other local rain gauges closer to each station via commercial weather services such as Weather Underground.

Hard copies and electronic copies will be retained by AWS as required under the terms of the grant agreement. DDOE will be provided hard copies and electronic copies for their records retention.

The report package to DDOE will include:

- Paper and electronic copies of the field data sheets
- Tables of rainfall data for the rainfall event and two days preceding the rainfall event for all sampling events
- All Excel spreadsheets with data entered
- Copies of narrative reports

AWS and DDOE will retain all data reports in perpetuity.

B: Data Generation and Acquisition Elements

B1- Sampling Process Design (Experimental Design)

The purpose of the project is monitoring for compliance with the trash reduction requirement in the DC MS4 permit DC0000221, issued October 7, 2011. The general requirements are contained in Section 5 and 6 of the permit. In addition, sampling must comply with 40 CFR S122.21(g)(7).

1. Monitor six stations distributed amongst the Rock Creek, Anacostia River, and Potomac River watersheds.
2. Collect a minimum of three wet weather samples per year.
3. Samples shall be collected a minimum of 30 days apart.
4. Events for sites sampled in the piedmont province shall be equal to or larger than 0.1 inches of precipitation. Events for sites located within the coastal plain province shall be equal to or larger than 0.25 inches of precipitation.
5. All events sampled must be separated from the last precipitation event by 72 hours.
6. Where feasible, the depth of rain and the duration of the event should not vary by more than 50 percent from the average depth and duration (to ensure that the storm would be 'representative', i.e. typical of the area in terms of intensity, depth and duration).

Three historic water quality monitoring stations have been selected from the MS4 permit as being feasible for trash monitoring.

Walter Reed-Fort Stevens Drive: 16th Street and Fort Stevens Road, N.W. at outfall

-Rock Creek Watershed; low, medium, and high density residential land use

Battery Kemble Creek: 49th and Hawthorne Streets, N.W. at outfall

-Potomac Watershed; low density residential land use

Oxon Run: Mississippi Avenue and 15th Street, S.E. into Oxon Run via outfall

-Potomac Watershed; medium density residential, institutional, commercial and open space land use

An additional three locations were selected in collaboration with DDOE. These stations will provide data on other types of land use not addressed in the three stations above required by the MS4 permit. These stations were monitored previously for the development of the Anacostia TMDL.

McDonald's: Minnesota Avenue NE and Nannie Helen Burroughs Ave NE at outfall

-Anacostia Watershed; industrial, commercial, and residential land use

Benning Road: Benning Road NE and Anacostia Avenue NE at outfall

-Anacostia Watershed; commercial and industrial land use

New York Avenue: New York Avenue NE and South Dakota Avenue NE interchange stormwater pond outfall

-Anacostia Watershed; transportation right-of-way land use

Additional information about the monitoring sites is included in the appended monitoring plan.

The method used for monitoring will be similar to the data collection methods used during the development of the Anacostia Trash TMDL (see: “Anacostia Outfall Trash Monitoring and TMDL Executive Summary” at http://ddoe.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/cover_and_exec_summary.pdf). Trash will be captured at the outfall at the stream. The trash capture devices will be constructed of metal mesh with openings compatible with the regulatory definition of trash (i.e. one square inch). The monitoring will capture at least 3 rainfall events for each station according to the storm volume requirements for each station previously noted on page six. All sampling events will be isolated from other storm events by at least 72 hours, with each sampled rainfall separated by 30 days.

B2 - Sampling Methods

In order to ensure that three acceptable samples are available for reporting, up to six samples may be collected. All sampling events will adhere to the criteria noted in section B1 above. Trash capture devices will be cleaned and serviced after rain events that do not meet the criteria. Once an acceptable sample is collected, trash capture devices may be removed from the outfalls to allow a separation of 30 days between samples. Trash capture devices will be constructed of 1 inch wire mesh over a metal frame custom made to fit each outfall so that all trash and debris over one square inch in size will be captured.

B3 - Sample Handling and Custody

Trash items that are collected within the trash capture devices are placed in clean, labeled plastic trash bags. The trash bags will be secured to assure that no loss or augmentation of material occurs during transportation and processing. The bags will be transported to an outdoor concrete pad at a residence at 3031 Oliver Street NW, Washington, DC where sample processing was done for the TMDL data collection.

To process a sample, several holes roughly ½ inch in diameter will be immediately poked or cut into the bottom and corners of the bag to allow excess water to drain out without losing any of the sample material. The bagged samples rest on a sloped concrete pad while water drains away. Bags are allowed to sit and drain until no more water seeps from the bag, which may take a few minutes or several hours depending on the initial wetness of the sample. At that point, natural material and trash will be separated and weighed. Trash will be sorted and quantified according to the categories and methodology used in establishing the Anacostia Trash (see: “Anacostia Outfall Trash Monitoring and TMDL Executive Summary” at http://ddoe.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/cover_and_exec_summary.pdf). Samples will be processed within 72 hours of collection to avoid decomposition of the organic components. After data collection is complete, the trash will be disposed of at an appropriate trash disposal facility. Most of the trash collected is too dirty for recycling to be a reasonable option. No laboratory analysis is involved. A detailed monitoring plan is appended.

B4 - Analytical Methods

The trash that is found in streams has a considerable amount of water and sediment involved. Excess water will be allowed to drain from the sample and any bottles or cans containing fluid will be emptied before weighing. The weight of the organic matter such as leaves will also be determined. Samples will be sorted and weighed within 72 hours of collection to prevent decomposition of the organic components.

B5 - Quality Control

The sampling methodology consists of one person observing the type and quantity of trash items and a second person recording the observation. Quality control checks will be performed by reversing the roles of the personnel and comparing the data sheets. Accuracy of the total should be within 5 percent and accuracy of any individual item should be within 10 percent.

B6 - Instrument/Equipment Testing, Inspection, and Maintenance

Both handheld digital scales and GPS units will be used. The GPS is a Garmin etrex legend. The scale is a Pelouze digital hanging scale, model 7750, which registers a minimum graduation of one ounce and has a maximum capacity of 50 pounds. It will be initially checked with known weights and the GPS will be checked against known locations. These instruments are easily and quickly replaceable if there is a malfunction.

B7 - Instrument/Equipment Calibration and Frequency

The scales used for weighing trash will be calibrated before and after each monitoring episode.

B8 - Inspection/Acceptance of Supplies and Consumables

The project does not require any laboratory consumables.

B9 - Non-direct Measurements

Weather observation data, including precipitation, recorded at the Reagan National Airport for the rainfall event and two days preceding the rainfall event will be obtained from the NOAA website. Localized storm information may be obtained from other rain gauges closer to each station via commercial weather services such as Weather Underground. Data obtained will be standard final data.

B10 - Data Management

The number of trash and debris items will be compiled on paper data sheets during processing. The information on the data sheets will be transferred to a Excel computer database and the paper data sheets scanned and saved in an electronic format. Data sheets will be maintained in the project file to be used in case of computer failure. Computer records will be transferred to a second computer for duplicate storage.

The primary database will be MS Excel and a sample of the data sheets is included in the appended monitoring plan. Copies of the data sheets and the MS Excel database will be provided to AWS and DDOE by the contractor at the end of the project.

C: ASSESSMENT AND OVERSIGHT

C1 - Assessments and Response Actions

Data will be collected after significant rainfall events. The data will be reviewed and inspected for any unexpected trends or findings. The quality assurance manager will arrange a briefing with DDOE, with the contractor present, for a discussion of any changes in procedures that are needed to ensure that the data meets the desired end use.

C2 - Reports to Management

Reports will be prepared quarterly and submitted to the Quality Assurance Manager. Any modification and actions will be discussed with the Project Manager and other AWS management as necessary to approve any significant modifications that may affect the grant's deliverables and/or schedule.

D: DATA VALIDATION AND USABILITY

D1 - Data Review, Verification, and Validation

The collection of scientifically valid data on trash is a new and emerging field of science. The factors that affect the levels of trash are not well documented, but data that is beyond three standard deviations would be held in abeyance until there is an understanding of the factors causing such a data point.

D2 - Verification and Validation Methods

A data collection sheet is attached. There will be no samples transported to any laboratory; therefore, there is no transfer of chain of custody form needed.

D3 - Reconciliation with User Requirements

The data collected will be presented to the DDOE on a quarterly basis, or as requested. Factors affecting the data such as weather patterns will be discussed. Results of trash collection devices and possible modifications to improve the quality of the data will be reviewed.

Attachment: Monitoring Plan

Purpose and Background

The purpose of this project is to comply with the trash monitoring provisions of the MS4 permit issued to the District of Columbia by the EPA. A Total Maximum Daily Load (TMDL) for Trash was developed for the Anacostia River and approved by EPA in 2010. The TMDL includes allocations to the DC storm sewers, and trash is listed as a priority pollutant in the MS4 permit issued to the District in 2011. As a result, DC is required to monitor for trash from the MS4 and report the monitoring data in the MS4 Permit Annual Report/ DMR to U.S. EPA Region III. The monitoring will provide baseline data on the amount of trash currently being discharged and document reductions in the amount of trash discharged. In addition to reporting for permit compliance, monitoring data will be used by the District to make more informed decisions when applying trash reduction strategies. This project will also provide experience with different forms of compliance monitoring for trash and assist in the development of a long-term compliance monitoring plan.

Objectives and Activities

In order to comply with the general requirements contained in Sections 5 and 6 of the DC MS4 permit DC0000221, issued October 7, 2011, and with 40 CFR S122.21(g)(7), the monitoring must meet the following conditions:

1. Monitor six stations distributed amongst the Rock Creek, Anacostia River, and Potomac River watersheds.
2. Collect a minimum of three wet weather samples per year.
3. Samples shall be collected a minimum of 30 days apart.
4. Events for sites sampled in the piedmont province shall be equal to or larger than 0.1 inches of precipitation. Events for sites located within the coastal plain province shall be equal to or larger than 0.25 inches of precipitation.
5. All events sampled must be separated from the last precipitation event by 72 hours.
6. Where feasible, the depth of rain and the duration of the event should not vary by more than 50 percent from the average depth and duration (to ensure that the storm would be 'representative', i.e. typical of the area in terms of intensity, depth and duration).

The outputs for the project are as follows:

1. A Quality Assurance Project Plan (QAPP) for compliance monitoring will be prepared.
2. Six trash traps will be installed under this project at designated outfalls.
3. Data on trash from a minimum of three, and a maximum of six, storms per station will be obtained and submitted to DDOE.
4. An annual report on the project will be submitted to DDOE that provides the sample data, an analysis of the data, and a brief discussion of the findings or areas needing further research or action.

The specific activities that will be undertaken are as follows:

1. Coordinate with DDOE to select monitoring sites and methods to be used at each site.
2. Submit a QAPP for DDOE approval.
3. Design and construct six trash traps that can be installed at the outfalls within 10 days of obtaining permission to monitor.
4. Collect samples from trash traps in accordance with the requirements noted on page 12.
5. Sort samples into natural vegetation and man-made components. The weight in pounds of each component will be recorded.
6. Quantify the manmade items into the same categories used in the TMDL data collection.
7. Enter the data into an Excel database and analyze for trends.
8. Identify any trash hotspots or illegal dumping in the vicinity of the monitoring stations
9. Submit reports to DDOE every four months from the date of QAPP approval, or when requested by DDOE.
10. Prepare annual reports of no more than 10 pages showing monitoring results.
11. AWS and its contractor will monitor for two years from the inception of this project.

Methods

The outfalls will be monitored using the same methods as were used to collect the data for the TMDL development. A minimum of three storms must be sampled to meet the MS4 permit requirements and up to three additional storms will be sampled to ensure that if a storm or data set becomes disqualified, additional data sets are available. Trash traps strain out all the trash over 1 square inch in size as the stormwater exits the outfall. The objective is to collect trash from at least three rainfall events in accordance with the sampling requirements noted on page 12. Official rainfall data will be obtained from the National Oceanic and Atmospheric Administration (NOAA) National Weather Service website for the Reagan National Airport rain gauge. Traps will be emptied and restored to working order after events that do not meet the criteria. When a suitable sample is obtained, all trash and natural material contained in the trash trap will be retrieved and placed in labeled plastic trash bags with holes poked in the bottom to allow excess water to drain away. The trap contents will be transported to a residence at 3031 Oliver Street NW, Washington, DC, which is the same place samples were processed during the data collection for the TMDL. The bagged samples will be set on a sloped concrete pad to allow water to drain away. No processing of the samples will take place at the outfall sites. Samples will be processed within 72 hours of collection since any organic matter and paper products tend to degrade quickly. The sample contents will be sorted into trash and natural material and each portion weighed using a calibrated scale. The trash will then be sorted into the individual components and quantified using the categories used for the TMDL, shown on the data sheet in Figure 1 on the next page. The sample material will then be disposed of at an appropriate trash disposal facility. The data will be analyzed and reported to DDOE annually for inclusion in the MS4 DMR.

Figure 1 Data Sheet

Station Name: _____

Page ____ of ____

| | | | |
|----------------|------|------------------------|------------------|
| | Date | Time | Personnel |
| Trap Deployed | | | |
| Trap Retrieved | | | |
| Processed | | | Sorter: |
| Rain Amount | Date | Time | Item Identifier: |
| | | | Data Recorder: |
| Trash Weight: | | Natural Debris Weight: | |

Trash Items

| | | |
|-----------------------------------|-------------------------------|-----------------------------|
| Plastic bags | Paper bags | Liquor bottles |
| Beer bottles | Beer cans | |
| Soda bottles | Soda cans | |
| Water bottles | Sports drinks | |
| Juice cans | Juice bottles | Juice packs |
| Styrofoam cups | Plastic cups | Paper cups |
| Food Wrappers | | |
| Take-out food packaging | | |
| Smoking related stuff, Cigarettes | | |
| Napkins, Paper towels, Tissues | | |
| Lids, straws | | |
| Beverage Rings, Cartons | Toiletries | Drugs |
| CDs, Cassettes | Toys, balls | Misc. recreation |
| Newspaper, Magazine, Book | Advertising, Signs, Cards | |
| Misc. Paper | | |
| Misc. Plastic | | |
| Misc. Metal | Organic waste | Home food packaging |
| Styrofoam plates | Foam packaging | |
| Styrofoam chunks, large | Styrofoam chunks, small | |
| Other misc. cartons | Other metal, foil packets | |
| Other fabric | Clothing | |
| Auto Products Containers | Broken Glass | |
| Vehicle parts, Small <1 sq ft | Vehicle parts, Large >1 sq ft | Tires |
| Construction Debris, Small | Construction Debris, Large | Appliances, bicycles, carts |
| Carpet | Misc. Large Debris | Misc Plastic Debris |

Field Comments

Processing Comments

Trash Trap Design

There are two main styles of trash traps that are likely to be used in this project. Traps are designed to cause little to no interference with the outfall structure and functioning, while straining out all the trash from the exiting stormwater. During heavy flows, the traps break away from the outfall before water can backup and cause flooding upstream. Cable ties with a tensile strength of no more than 120 lbs will be used to secure the metal mesh to the trap frame, which enables the mesh to break away from the frame so more water can escape. The ropes and attachment points securing the traps are also designed to allow high water pressure during heavy flows to detach the traps from the outfall relatively easily. While each trap and location is different, traps will generally break away from the outfall at intensities greater than 4 inches per hour and/or rainfall depths greater than 2 inches. Variations such as a leaf fall in the autumn may lead to early clogging and breakaway before these limits are reached. If the trap is subject to lateral forces due to installation in the stream channel, then upstream rainfall and flow velocity of the stream begins to affect the trap integrity. The rope used to secure the traps to the stakes will have a known break strength and the generally accepted reduction from knots is 35%. Because sampling will be conducted during autumn leaf fall, additional capacity will be added to the traps beyond what was needed for similar sized outfalls during the TMDL monitoring so water can still drain when the traps start filling with leaves. No attachments are made to the outfall structure itself. Traps are held in place with ropes tied or clipped to heavy-duty stakes or posts driven into the streambed or bank. To service the traps, the attachments are untied or unclipped from the stakes and the trap gently pushed/pulled away from the outfall. If the traps interfere with dry weather sampling for other pollutants, the traps can easily be unhooked and pushed aside, then reattached when the sample is obtained. Tubing from wet weather composite sampling can be threaded between the frame and the outfall or the monitoring teams can coordinate so that the trash traps are not on the outfalls when other sampling occurs.

Box Style Trash Trap

A rigid metal box frame is covered with metal mesh. The frame is pushed flush against the outfall and tied in place to stakes in the streambed or bank. Box traps can be built large enough to allow doors over outfalls to swing open unimpeded. In the event of heavy flow, the force of the water on the box will pull the box free of the stakes and push the trap away from the outfall or the mesh can tear away from the frame. The rigid frame of the box trap prohibits the development of a cinch to keep trash inside the trap after it pulls away from the outfall.

Figure 2 Box Trash Trap on Meade Outfall.



Sock Style Trash Trap

A metal hoop is slipped over the protruding outfall pipe. A long metal mesh bag is attached to the hoop, allowing a large surface area for water to escape the sock even as trash and debris accumulates at the toe of the bag. The hoop is tied to stakes in the streambed or bank, not attached directly to the outfall. In the event of heavy flow, the force on the bag will pull the ties loose and the hoop will slip off the outfall or the bag can break away from the metal hoop. A cinch will be developed to close off the opening to the trap if it pulls away from the outfall so that trash already inside the trap does not escape. Trash trapped by the cinch will be removed and disposed of at an appropriate trash disposal facility.

Figure 3 Sock style trash trap at McDonald's Outfall. Socks for monitoring will be longer to allow more room for water to escape before hitting the trash accumulating at the toe.

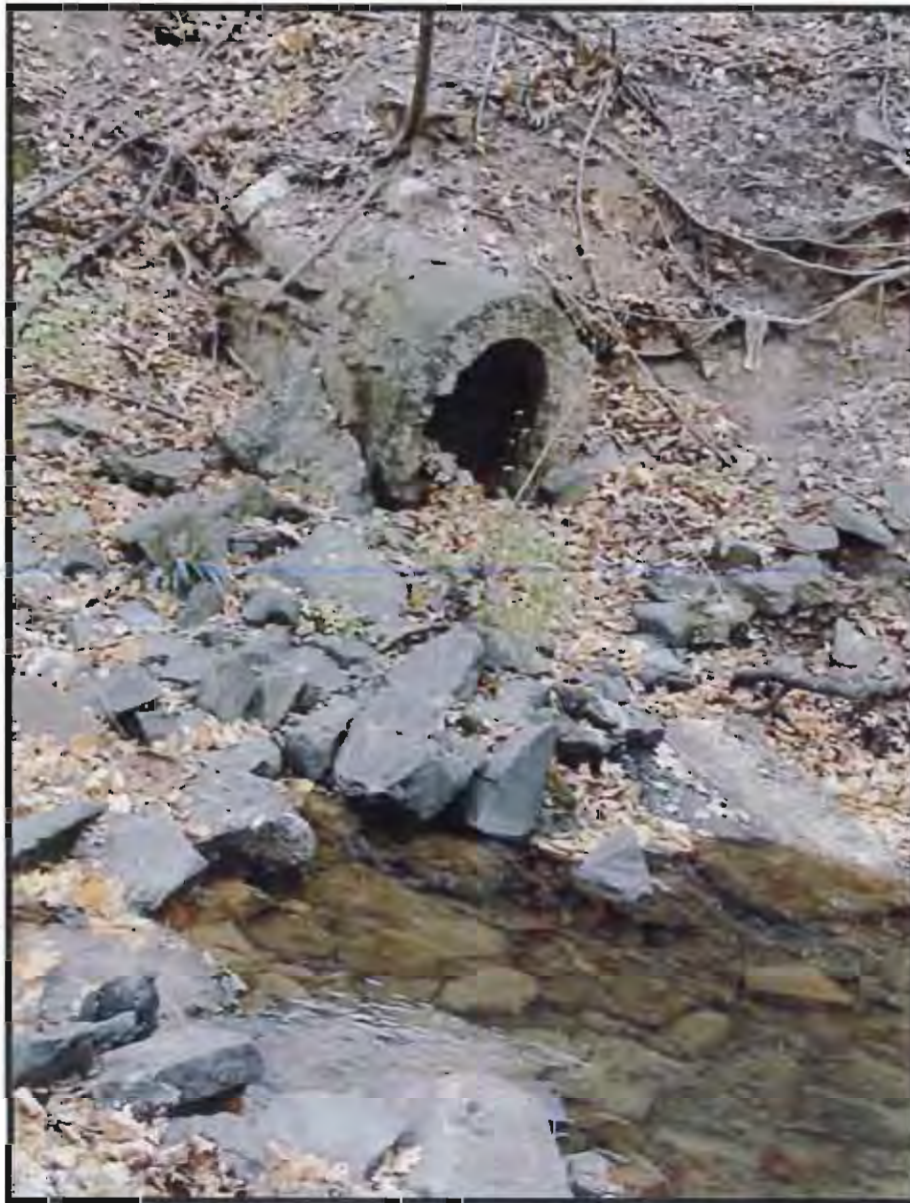


Monitoring Site Information

Walter Reed Ft Stevens Rd NW and 16th Street NW

This is an existing MS4 monitoring station in the Rock Creek Watershed that drains about 50 acres of low, medium and high density residential land. A sock style trap will be used to collect samples.

Figure 4 Walter Reed Outfall near Ft Stevens Road



Battery Kemble Creek Hawthorne Street NW and 49th Street NW

This is an existing MS4 monitoring station in the Potomac Watershed that drains a low density residential area of about 13 acres. A modified box trash trap with a sock extension will be used to capture trash.

Figure 5 Outfall to Battery Kemble Creek



Oxon Run Mississippi Avenue S.E. and 15th Street S.E.

This is an existing MS4 monitoring station in the Potomac Watershed that drains about 65 acres of medium density residential, institutional, commercial and open space land uses. A box trash trap will collect samples.

Figure 6 Oxon Run Outfall



Benning Road Benning Road NE and Anacostia Avenue NE

This is a previous TMDL monitoring station in the Anacostia Watershed that drains about 12 acres of primarily commercial and some industrial land use. A box style trap will be used to collect samples.

Figure 7 Benning Road Outfall into the Anacostia River, partially submerged at high tide



McDonald's Minnesota Avenue NE and Nannie Helen Burroughs Avenue NE

This is a previous TMDL monitoring station on Watts Branch in the Anacostia Watershed that drains about 7.4 acres of commercial, industrial and residential land use. A sock style trap will be used to collect samples.

Figure 8 McDonald's Outfall into Watt's Branch



New York Avenue New York Avenue and South Dakota Avenue interchange stormwater pond
This is a previous TMDL monitoring station in the Anacostia Watershed that drains about 1.5 acres of Transportation Right of Way land use. A box style trap will be used to collect trash.

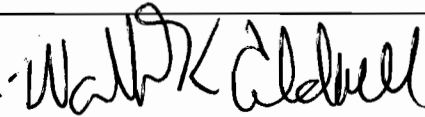
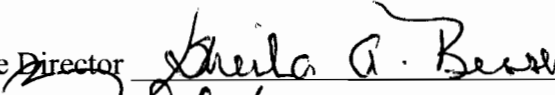
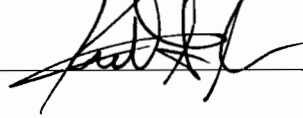
Figure 9 New York Avenue Outfall



F Summary of Pollutant Loading

^a If a sample result is below the reporting limit, one-half the reporting limit is used in the calculation of the geometric mean

G Erosion and Sediment Control Inspection and Enforcement Standard Operating Procedures

| Watershed Protection Division | DOCUMENT NUMBER SOP #WPD-320 | | | | | | | | | | | | | | | | | | |
|---|--|----------------|-------------|--|---|-----------------------------------|---|------------------------------------|---|------------------------------------|---|----------------------------------|---|--------------------------------|---|----------------------|---|------------------------------|----|
| TYPE Inspection and Enforcement Branch | REVISION 0 | | | | | | | | | | | | | | | | | | |
| TITLE Soil Erosion and Sediment Control Inspections | EFFECTIVE DATE MAY 20 2014 | | | | | | | | | | | | | | | | | | |
| PURPOSE This procedure provides instructions for conducting inspections in the District of Columbia for compliance with erosion and sedimentation control regulations. | | | | | | | | | | | | | | | | | | | |
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| REVISION SUMMARY Revision 0 is new procedure. | | | | | | | | | | | | | | | | | | | |
| APPROVED BY | | | | | | | | | | | | | | | | | | | |
| Branch Chief <u></u> | Date <u>4/3/14</u> | | | | | | | | | | | | | | | | | | |
| Associate Director <u></u> | Date <u>4/3/14</u> | | | | | | | | | | | | | | | | | | |
| Director <u></u> | Date <u>05/20/14</u> | | | | | | | | | | | | | | | | | | |

The Inspection and Enforcement Branch (IEB) of the District Department of the Environment (DDOE) Watershed Protection Division is authorized to inspect land disturbing activities in the District of Columbia for compliance with erosion and sediment control regulations set forth in Title 21 DCMR Chapter 5. As part of the requirements of the District of Columbia building permit process, IEB inspectors conduct periodic inspections to enforce compliance with approved erosion and sediment control plans and to determine whether the measures required in the plan are effective in controlling erosion and sedimentation for land disturbing activities. These procedures set forth the steps for conducting soil erosion and sediment control inspections.

1.0 Pre-Construction Meeting Requirements

1.1 After obtaining a building permit from the D.C. Department of Consumer and Regulatory Affairs (DCRA), an owner/agent must contact the Inspection and Enforcement Branch (IEB) of the Watershed Protection Division at 202-535-2977 to schedule a pre-construction meeting at least 72 hours before the start of excavation or the land disturbing activity.

1.2 The Program Specialist enters the information regarding the pre-construction meeting and inspection request into the IEB database. In the absence of the program specialist, the Branch Chief, or the Branch Chief's designee, may be contacted for processing inspection requests. The program specialist's voice mail message should provide the Branch Chief's telephone number and the scheduling email address, ieb.scheduling@dc.gov, as alternatives for scheduling pre-construction meetings and inspections.

1.3 To create an assignment, the program specialist enters the following information into the database:

- 1.3.1 Permit type and number (Building permit, raze permit, etc.);
- 1.3.2 Property address;
- 1.3.3 Name of developer;
- 1.3.4 Contractor/permittee contact information;
- 1.3.5 Date inspection request received;
- 1.3.6 Type of inspection requested (Erosion & Sediment Control or Stormwater); and
- 1.3.7 Contact information.

1.4 Once the data is entered, the system will automatically generate an e-mail informing the inspector and the Branch Chief that a request for a pre-construction meeting or inspection has been received for the inspector's attention. The email should include all information needed by the inspector to conduct the pre-construction meeting or the requested inspection.

1.5 Inspectors assigned to a specific construction site will be responsible for inspecting for both erosion and sediment control (ESC) and for construction of the Stormwater Management (SWM) best management practice(s) (BMPs) approved for the site. Thus, the assigned inspector will conduct both ESC inspections and SWM facility construction inspections, if required, for the site location.

1.6 Inspectors receiving pre-construction requests directly from permit holders or their agents should direct them to contact the program specialist at (202) 535-2977, as described on the DDOE plan approval sticker affixed to approved ESC and SWM Plans and also stipulated in the SWM and ESC Guidebooks, DDOE Website, and informational brochure.

2.0 Pre-Construction Meeting

2.1 Once the inspector receives the assignment, it is his/her responsibility to follow up with the owner/agent/contractor/permittee to arrange the pre-construction meeting. The inspector will also be responsible for arranging any subsequent inspections of the site.

2.2 Inspectors shall attend pre-construction meetings to review and discuss the implementation of the soil erosion and sediment control measures before the start of excavation. At the pre-construction meeting, the inspector should review with the owner/agent/contractor/permittee:

2.2.1 A description of all pollutant control measures (i.e., BMPs) that will be implemented as part of the construction activity to control pollutants in stormwater discharges. Each major activity in the site construction process should be clearly defined and the BMPs related to that activity should be listed;

2.2.2 A description of interim and permanent stabilization practices for the site, including a schedule of when the practices will be implemented;

2.2.3 A description of the intended construction sequencing and timing of major events, including major grading activities, when construction activities are to cease temporarily or permanently on a portion of the site and when stabilization measures are to be initiated;

2.2.4 A description of structural practices to divert flows from exposed soils, retain/detain flows or otherwise limit runoff and/or the discharge of pollutants from exposed areas of the site;

2.2.5 A description of all post-construction stormwater management measures that will be installed during the construction process to control pollutants in stormwater discharges after construction operations have been completed;

2.2.6 A description of the measures to prevent the discharge of solid or hazardous materials or any other pollutant other than sediment, including building materials, to the waters of the United States, as required by the Stormwater Pollution Prevention Plan (SWPP), where applicable; and

2.2.7 A description of the measures to minimize, to the extent practicable, off-site vehicle tracking of sediments onto paved surfaces and the generation of dust.

2.3 A pre-construction meeting with IEB is optional for minor construction activity (where less than 50 square feet of disturbance will occur, the total construction cost does not exceed \$2,500, and an ESC plan is not required).

2.4 Any inspector who enters a construction site where the contractor failed to schedule a pre-construction meeting should ask the permit holders or their agents to call (202) 535-2297, the telephone number at IEB, to schedule a pre-construction meeting. Where appropriate, the inspector may issue an enforcement notice for noncompliance with District regulations as described in the Standard Operating Procedure Enforcement Guidance for failure to schedule a pre-construction meeting.

3.0 Pre-Inspection Procedures

3.1 Prior to the inspection, the inspector should review available documents, such as permits and copies of the site plan. Check for any previous inspections, violations and enforcement actions.

3.2 Before going to the site, the inspector must have the necessary inspection materials, such as:

3.2.1 Proper DDOE credentials;

3.2.2 Copies of the permit and appropriate inspection forms;

3.2.3 Field Inspection Notebook;

3.2.4 Digital camera. Ensure that the date/time stamp is accurate, the battery is fully charged (or take extra batteries), and enough memory is available (or take extra memory cards);

3.2.5 Cellphone;

3.2.6 Computer or tablet, if assigned; and

3.2.7 Personal Protective Equipment, as necessary, such as:

3.2.7.1 Hard hat;

3.2.7.2 Steel-toed boots;

3.2.7.3 Protective goggles; and

3.2.7.4 Protective vest.

3.3 Vehicle. When using a government vehicle, complete an online reservation form. Log in and out the inspection destination and mileage in the logbook that is maintained in the vehicle. Inspectors with an assigned government vehicle must leave the keys for the vehicle with the branch chief before going on leave.

4.0 ESC Inspection Procedures

4.1 Scheduling Inspections.

4.1.1 Where applicable, after the pre-construction meeting and approval for the installation of the soil erosion and sediment BMPs has been given, the inspector shall conduct an initial inspection before grading and/or excavation may begin at the site to ensure that the ESC measures have been installed in accordance with the approved ESC plan and District Standards and Specifications for Erosion and Sediment Control. After excavation begins, the inspector shall conduct periodic inspections throughout the construction process as are deemed necessary to ensure that all control measures installed are being maintained until construction is complete.

4.1.2 Site inspections shall be conducted on a routine basis throughout the duration of the land-disturbing activity. The number of inspections shall be scheduled based on project phase. For example, during heavy grading activities, the inspections should be more frequent, while once interior building activity has begun, less frequent inspections are required. Wet-event inspections of construction sites shall be completed within 24-hours of an appreciable rainfall event.

4.1.3 The inspector should plan his or her inspection schedule to target sites that are in priority areas, such as sites discharging to water quality-impaired waters, sites near surface waters, areas undergoing rapid development, large construction sites over an acre, or sites with a history of noncompliance.

4.1.4 Inspectors shall conduct a Final Inspection for ESC of the completed earth disturbance, stabilization and landscaping as per the approved ESC plan within two (2) weeks after receiving a notice or request for Final Inspection for ESC.

4.2 Act in a courteous and professional manner. Be on time for the inspection and call the owner/agent if running late. Develop a working relationship with the construction operator or other members of the public at the site.

4.3 Take safety precautions. The inspection of construction sites always poses a certain degree of safety risk. To avoid unnecessary risks, the inspector should be familiar with all safety obligations and practices and should:

4.3.1 Use safety equipment in accordance with available guidance and labeling instructions.

4.3.2 Maintain safety equipment in good condition and proper working order.

4.3.3 Dress appropriately for the particular activity and wear appropriate protective clothing. For example, wear a hard hat when on the construction site.

4.3.4 Use any safety equipment customary in the establishment being inspected (e.g., hard hat or safety glasses).

4.3.5 Never enter confined spaces unless properly trained, equipped, and permitted (if applicable).

4.3.6 For any safety-related questions check with supervisor.

4.4 Upon entering a construction site for inspection, inspectors shall identify themselves by presenting their picture identification with badge to the owner or agent in charge of the construction activity. The following steps should be taken once an inspector arrives on-site:

4.4.1 Request to see the owner, operator or site foreman/supervisor.

4.4.2 Introduce yourself as a DDOE inspector, show credentials, and explain the authority and purpose of the inspection. The proper DDOE badge indicates that the holder is a lawful representative of the agency and is authorized to perform inspections. The badge must be presented whether or not identification is requested.

4.4.3 Establish the identity of all responsible parties, including the person you are interviewing, from the owner/contractor. Document the names, titles, addresses, telephone numbers, and email of all parties with whom you speak during the inspection. Collect business cards if possible.

4.4.4 Establish an understanding of the procedures being implemented.

4.5 The owner/agent shall be given the opportunity to accompany the inspector during the inspection.

4.6 Each inspection should be thorough, consistent, and cover all areas of the construction site and all BMPs. Throughout the life of the project, the inspector needs to ensure that erosion and sediment controls are installed and maintained properly and are in working order in accordance with the construction site plan. The inspector should:

4.6.1 Assess perimeter controls (e.g., silt fence);

4.6.2 Assess construction entrances;

4.6.3 Perform a walk-through of the site to assess stabilization practices (e.g., seeding), structural sediment control practices (e.g. sediment trap), discharge points, and housekeeping practices described on the plan (e.g., general construction site waste management); and

4.6.4 Assess off-site areas to determine if adjacent properties or receiving waters are being adversely affected by construction activities.

4.7 Document the Inspection. The inspector should document and track all findings at the construction site using inspection forms and checklists, photographs, and field notes. This documentation will aid the inspector in supporting enforcement actions, escalating enforcement, or pursuing more stringent penalties if the site is in continuous noncompliance.

4.7.1 As much as possible, the inspector should fill out inspection reports while at the construction site being inspected and have the owner/agent sign to receive a copy of the inspection report or forward a copy to the owner/agent.

4.7.2 In addition to documenting observations as part of the specific ESC Field Inspection Report, field notes may be recorded in an Inspection Notebook or secure electronic file. The notes should contain sufficient detail to allow the inspector to complete his/her inspection report and to support observed issues of compliance.

4.7.2.1 Record facts and pertinent observations. Avoid ambiguity to prevent problems when the information is reviewed at a later date.

4.7.2.2 Do not record personal feelings or terminology.

4.7.3 In addition to completing the inspection checklist, the inspector may record the following types of information that will validate evidence:

4.7.3.1 Weather conditions. Note weather conditions such as snowfalls/rain events prior to and during the inspection;

4.7.3.2 Unusual conditions and problems. Describe in detail unusual conditions and problems;

4.7.3.3 Names and Titles. List the names and titles of the construction personnel and any statements they have made;

4.7.3.4 Permit information. List information regarding the presence or absence of permits on the site; and

4.7.3.5 Samples collected.

4.7.4 When possible, photographs should be taken to document problems and to identify areas contractors will need to take corrective action to be in compliance.

4.7.4.1 Document each photograph so that its content can be identified with the site, date, who took the photograph, and a short description of the purpose of the picture (if this information is not entered into the camera).

4.7.4.2 Photograph, diagram, if necessary, and identify the location of each potential violation or regulatory concern.

4.7.4.3 Photos should be clear, well lit, and at proper range to show that the photo was taken at the inspected site and to show the violation in context.

4.8 All ESC Inspection Events are to be entered into the ESC database within 24 hours or the next business day. All documents should be retained in the soil erosion and sediment control or SWM Construction site File maintained by the inspector or Central Records. See Section 6.0, below.

5.0 Changes to the ESC Plan

5.1 Except for minor construction activity, an approved ESC plan must be on-site at the time of the inspection.

5.2 During an inspection, if it is determined by the inspector that the soil erosion and sediment control measures in the approved plan are inadequate, the inspector is authorized to request that the owner/agent install additional control measures or make minor changes (such as seed and straw for temporary ground cover, additional silt or super silt fencing, additional straw bale dikes, use of portable sediment traps or relocation of construction entrance locations and tire wash stations). A justification as to why minor changes are needed for the approved ESC are to be included in the Inspection summary of the ESC Inspection Report.

5.3 Major or substantial plan changes as described by the ESC Guidebook (structural measures including earth dike use and location, excavated sediment traps and ponds as well as grading changes) require a revised Erosion and Sediment Control plan to be submitted to Technical Services Branch (TSB) through the Department of Consumer and Regulatory Affairs (DCRA) One Stop Permit and Business Center for review and approval by the TSB.

6.0 ESC Construction File

6.1 The ESC Construction Site File should contain ESC inspection reports with the file number, site address, copy of the building permit, copy of notice of any violation/infraction (if any), event dates, and photos of the site.

6.2 Inspectors should maintain and update the Construction Site file and BMP Tracking Database within 24 hours or the next business day after inspection.

6.3 Complete an ESC Field Inspection Report for every ESC inspection event (Pre-Construction, Initial, Routine, Final).

6.3 Record the dates and times of all phone calls made or received regarding the inspections of the site. Describe any follow-up action taken (if any) in response to the calls.

6.4 If a digital camera was used to take pictures, download and authenticate your pictures immediately for the ESC Construction File. Record the following information on each picture:

6.4.1 Name and address of the site;

6.4.2 When the picture was taken – date and time;

6.4.3 Your signature.

6.5 Sign and date the inspection report.

6.6 A signed copy of each inspection report for ESC is to be given to the owner/agent and maintained in the case file for ESC, and where applicable, in the Stormwater Management Facility Construction file.

6.7 Tracking Inspections.

6.7.1 For the purpose of tracking the number of inspections, inspection of all temporary erosion and sediment control measures should be considered one inspection event.

6.7.2 Use a specific inspection form for each SWM BMP and for all inspection events during its construction.

6.7.3 Use one inspection form for each inspection event for ESC inspections.

7.0 Enforcement

7.1 If upon final inspection, or during any interim inspection, the inspector determines that the owner/agent has failed to comply with the ESC plan, the inspector shall use appropriate enforcement action(s) as described in the SOP for Enforcement of Soil Erosion and Sedimentation Control and Stormwater Management.

7.2 Re-inspection. Re-inspection of properties for which there are pending violations is imperative. Violations cannot be considered abated without re-inspection. Unabated items cannot be referred for enforcement action unless it has been verified that the violations still exist and efforts at compliance have not been made. After re-inspection of the site:

7.2.1 Indicate the item or condition on the deficiency list of the inspection report that has been abated.

7.2.2 Indicate those conditions on the deficiency list that have been partially corrected.

7.2.3 Attempt to contact by telephone and/or email the responsible person to ascertain the reason for non-compliance and/or to verify the receipt of orders. If unable to contact the responsible person during working hours, telephone in the evening, early morning, or on weekends. Record the essentials of the call and how, where and when to contact the responsible person in the future.

7.2.4 Take the following action if the responsible person is contacted:

7.2.4.1 If a valid reason is given, recommend an additional reasonable time for compliance.


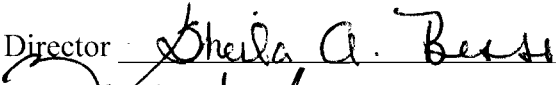
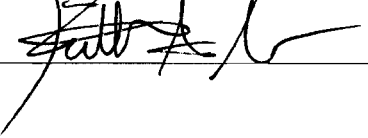
7.2.4.2 In the absence of a valid reason for non-compliance, proceed with a Corrective Action Notice (CAN), Notice of Violation (NOV), or Notice of Infraction (NOI).

7.2.5 Add the record of the re-inspection report to the case history/file.

7.3 If an inspector discovers a violation at a construction site that they have not been assigned to, he or she should perform an inspection documenting the violation (s) and contact the inspector assigned to the area and inform them of your intent to issue an Enforcement Notice for the site, and provide the assigned inspector with a copy of the Inspection Report and Enforcement Notice (for the SWM/ESC site construction file). Update the BMP tracking database with information about the Inspection type and date, and the date of the Enforcement Notice

8.0 Reference Documents

- 8.1 Stormwater Management Facility Construction Inspection SOP
- 8.2 Erosion and Sediment Control Field Inspection Report Site Inspection Checklist
- 8.3 Enforcement of Soil Erosion and Sedimentation Control and Stormwater Management SOP
- 8.4 Stormwater Management Guidebook 2013, found at:
http://ddoe.dc.gov/sites/default/files/dc/sites/ddoe/page_content/attachments/2013%20SW%20Rule.pdf

| Watershed Protection Division | DOCUMENT NUMBER SOP # WPD-305 | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----------------|-------------|--|---|-----------------------------------|---|------------------------------------|---|---------------------------------|---|--|---|-----------------------------------|---|--|---|--|---|--|---|-------------------------------|---|
| TYPE Inspection and Enforcement Branch | REVISION 0 | | | | | | | | | | | | | | | | | | | | | | |
| TITLE Stormwater Management Facility Construction Inspections | EFFECTIVE DATE MAY 20 2014 | | | | | | | | | | | | | | | | | | | | | | |
| PURPOSE This procedure provides instructions for conducting inspections in the District of Columbia for compliance with stormwater management facility construction regulations. | | | | | | | | | | | | | | | | | | | | | | | |
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| REVISION SUMMARY Revision 0 is new procedure. | | | | | | | | | | | | | | | | | | | | | | | |
| APPROVED BY <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 60%;"> Branch Chief <u></u> Associate Director <u></u> Director <u></u> </div> <div style="width: 35%; text-align: right;"> Date <u>4/1/2014</u> Date <u>4/3/14</u> Date <u>05/20/14</u> </div> </div> | | | | | | | | | | | | | | | | | | | | | | | |

The Inspection and Enforcement Branch (IEB) of the District Department of the Environment (DDOE) Watershed Protection Division (WPD) is authorized to inspect land-disturbing activities in the District of Columbia for compliance with stormwater management (SWM) regulations set forth in Title 21 DCMR Chapter 5, as amended. As part of the requirements of the District of Columbia building permit process, IEB inspectors conduct on-site inspections of SWM facility construction and installation at different stages of construction, as specified in the SWM plan. These procedures set forth the steps for conducting SWM facility construction inspections and for preparing the Final Approval Notice for the facility construction.

1.0 Pre-construction Meeting Requirements

1.1 After obtaining a building permit from the D.C. Department of Consumer and Regulatory Affairs (DCRA), an owner/agent must contact the Inspection and Enforcement Branch (IEB) of the Watershed Protection Division (WPD) at 202-535-2977 to schedule a pre-construction meeting at least 72 hours before beginning construction of the SWM facility.

1.2 The Program Specialist enters the information regarding the pre-construction meeting and inspection request into the IEB data system. In the absence of the program specialist, the Branch Chief or the Branch Chief's designee may be contacted for processing inspection requests. The program specialist's voice mail message should include the Branch Chief's telephone number and the scheduling email address, ieb.scheduling@dc.gov, as alternatives for scheduling pre-construction meetings and inspections.

1.3 To create an assignment, the program specialist enters the following information into the database:

- 1.3.1 Construction permits (building permit, raze permit, etc.);
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1.6. Inspectors receiving pre-construction requests directly from permit holders or their agents should be directed to contact the program specialist at (202) 535-2977, as described on the DDOE plan approval sticker affixed to approved ESC and SWM Plans and also stipulated in the SWM and ESC Guidebooks, DDOE Website, and informational brochure.

2.0 Pre-Construction Meeting

2.1 Once the inspector receives the assignment, it is his/her responsibility to follow up with the owner/agent/contractor/permittee to arrange the pre-construction meeting. The pre-construction meeting is the first step in all stormwater management facility construction inspections.

2.2 Inspections are performed at different stages of construction of the SWM facility. At the pre-construction meeting an inspection schedule and requirements for compliance with District regulations for construction of stormwater management facilities are discussed.

2.3 Inspectors attend the pre-construction meetings to review and discuss the implementation of the SWM plan (SWMP) with the owner/agent of the SWM facility before the start of construction.

2.4 The Inspector prepares a SWM Facility Construction File for the facility that includes:

2.4.1 "General Information" from the storm water approval;

2.4.2 A copy of the Building Permit;

2.4.3 The appropriate Stormwater Management Facility Construction Inspection Report; and

2.4.4 An Erosion and Sediment Inspection Report.

2.5 Any inspector who enters a construction site where the contractor failed to schedule a pre-construction meeting shall ask the permit holders or their agents to contact the IEB at (202) 535-2297 to schedule a pre-construction meeting and, where appropriate, issue an enforcement notice for noncompliance with District regulations as described in the Standard Operating Procedure Enforcement Guidance for failure to schedule a pre-construction meeting.

3.0 Pre-Inspection Procedures

3.1 Prior to the inspection, the inspector should review available documents, such as permits and copies of the SWMP. Check for any previous inspections, violations and enforcement actions.

3.2 Before going to the site, the inspector must have the necessary inspection materials, such as:

3.2.1 Proper DDOE credentials;

3.2.2 Copies of the permit and appropriate inspection forms;

3.2.3 Field notebook;

3.2.4 Digital camera. Ensure that the date/time stamp is accurate, the battery is fully charged (or take extra batteries), and enough memory is available (or take extra memory cards);

3.2.5 Cell phone;

3.2.6 Computer or tablet (if assigned); and

3.2.7 Personal Protective Equipment, as necessary, such as:

3.2.7.1 Hard hat;

3.2.7.2 Steel-toed boots;

3.2.7.3 Protective goggles; and

3.2.7.4 Protective vest.

3.3 Vehicle. When using a government vehicle, complete an online reservation form. Log in and out the inspection destination and mileage in the logbook that is maintained in the vehicle. Inspectors with an assigned government vehicle must leave the keys for the vehicle with the Branch Chief before going on leave.

4.0 Scheduling Inspections

4.1 Initial Inspection. After the pre-construction meeting and after approval for the construction of the SWM facility has been given, the inspector conducts an initial inspection before construction may begin.

4.2 Inspectors conduct inspections at pre-determined stages of the facility construction, as specified in the approved SWMP and the Stormwater Management Facility Construction Inspection Report, or determined at the pre-construction meeting. DDOE may require additional inspections at a particular stage of construction by specifying that requirement in the pre-construction inspection report or in the report of the pre-construction meeting.

4.3 The owner/operator may not proceed with work past a stage of construction that has been identified as requiring an inspection until:

4.3.1 The inspector inspects the work previously completed, records the inspection event on the appropriate Stormwater Management Facility Construction Inspection Report, and enters the Inspection Event into the BMP tracking database;

4.3.2 DDOE has approved a plan modification that eliminates the inspection requirement; or

4.3.3 DDOE otherwise eliminates or modifies the inspection requirement in writing.

4.4 DDOE shall make reasonable efforts to accommodate a request by the owner/operator for an inspection outside of DDOE's normal business hours if the request:

- 4.4.1 Is made during the DDOE's normal business hours;
- 4.4.2 Includes the information the DDOE requires, including the matters to be inspected, the location of the site work to be inspected, and details for site access; and
- 4.4.3 Includes payment or proof of payment of the after-hours inspection fee.

4.5 If the inspector is not contacted for inspections as determined at the pre-construction meeting and specified on the SWM Facility Construction report, the inspector who conducted the pre-construction meeting or the inspector assigned to the permitted site for SWM facility construction inspections shall conduct an inspection within six months of the pre-construction meeting to obtain an update of the status of the SWM facility construction.

4.6 In order to schedule an inspection required for a stage of construction or other construction event, the owner/agent must contact IEB at least three (3) business days before the anticipated inspection.

4.7 Final Inspection. The owner/agent is responsible for notifying the IEB to request a final construction inspection within one week of completion of the SWM facility. See procedures below for final SWM facility construction approval.

5.0 SWM Facility Construction Inspection Procedures

5.1 Act in a courteous and professional manner. Be on time for the inspection and call the owner/agent if running late. Develop a working relationship with the construction operator or other members of the public at the site.

5.2 Take safety precautions. The inspection of construction sites always poses a certain degree of safety risk. To avoid unnecessary risks, the inspector should be familiar with all safety obligations and practices and should:

- 5.2.1 Use safety equipment in accordance with available guidance and labeling instructions;
- 5.2.2 Maintain safety equipment in good condition and proper working order;
- 5.2.3 Dress appropriately for the particular activity and wear appropriate protective clothing. For example, wear a hard hat when on the construction site;
- 5.2.4 Use any safety equipment customary in the establishment being inspected (e.g., hard hat, safety vest, or safety glasses);
- 5.2.5 Never enter confined spaces unless properly trained, equipped, and permitted (if applicable); and
- 5.2.6 For any safety-related questions, check with supervisor.

5.3 Upon entering a construction site for inspection, the inspector identifies himself by presenting a picture identification with badge to the owner or agent in charge of the construction activity. The following steps should be taken once an inspector arrives on-site:

5.3.2 Introduce yourself as a DDOE inspector, show credentials, and explain the authority and purpose of the inspection. The proper DDOE badge indicates that the holder is a lawful representative of the agency and is authorized to perform inspections. The badge must be presented whether or not identification is requested.

5.3.3 Establish the identity of all responsible parties, including the person you are interviewing, from the owner/contractor. Document the names, titles, address, telephone numbers, and email of all parties with whom you speak during the inspection. Collect business cards if possible.

5.4 The professional engineer of record or agent responsible for certifying the As-built plans for the project may accompany the inspector on facility construction inspections at any time, but is not required to do so.

5.5 Each inspection should be thorough, consistent, and cover all areas of the construction site to ensure compliance with the SWM regulations and that the construction is in compliance with the approved SWMP.

5.6 Document the Inspection. The inspector should document and track all findings at the construction site using inspection checklists, photographs, notes, or written logs. The inspector enters all inspection events into the IEB BMP Tracking Database. This documentation will aid the inspector in supporting enforcement actions, escalating enforcement, or pursuing more stringent penalties if the site is in continuous noncompliance. As much as possible, the inspector should fill out inspection reports while at the construction site being inspected. See Storm Water Management Facilities Inspection Report. All documents should be retained in the SWM site construction file maintained by the inspector or Central Records.

5.6.1 Immediately record observations, conversations, and documentation in the notebook using coherent sentences and precise terminology. The inspection notebook should contain sufficient detail to allow the inspector to complete his/her inspection report and to support observed issues of compliance.

5.6.1.1 Use a bound notebook and record entries in ink.

5.6.1.2 Record facts and pertinent observations. Avoid ambiguity to prevent problems when the information is reviewed at a later date.

5.6.1.3 Do not record personal feelings or terminology.

5.6.2 In addition to completing the inspection checklist, the inspector may record the following types of information that will validate evidence:

5.6.2.1 Weather conditions. Note weather conditions such as snowfalls/rain events prior to and during the inspection;

5.6.2.2 Unusual conditions and problems. Describe in detail unusual conditions and problems;

5.6.2.3 Names and Titles. List the names and titles of the construction personnel and any statements they have made;

5.6.2.4 Permit information. List information regarding the presence or absence of permits on the site; and

5.6.2.5 Samples collected.

5.6.3 When possible, photographs should be taken to document problems and to identify areas where contractors may need to make corrections.

5.6.3.1 Document each photograph so that its content can be identified with the site, date and time, (if a date and time stamp are not set by the camera) who took the photograph, and a short description

5.6.3.2 Photograph, diagram, if necessary, and identify the location of each potential violation or regulatory concern.

5.6.3.3 Photos should be clear, well lit, and at proper range to show that the photo was taken at the inspected site and to show the violation in context.

6.0 Changes to the SWM Plan (SWMP)

6.1 An approved SWM Plan (SWMP) must be on-site at the time of the inspection.

6.2 A person may not change an approved SWMP or its implementation without DDOE approval.

6.3 If the change is not substantial, the owner/operator may secure written approval from the inspector in the field or WPD staff. If an inspector is not sure whether the change is substantial, he or she should see the SWM Guidebook (5.1.2 Resubmission of SWMP) or ask for guidance from the Branch Chief.

6.4 If the change is substantial, the owner/operator must resubmit a revised plan to DDOE for approval of any revisions, alternative designs, or any changes to approved plans.

6.5 A change in an approved plan is substantial if it may result in failure to comply with the SWM requirements or has a significant effect on the discharge of pollutants to the District's waters.

6.6 Substantial and Non-Substantial changes are defined in the DDOE Stormwater Guidebook 2013.

7.0 SWM Facility Construction Inspection Reports

7.1 The SWM Facility Construction Case File should contain:

7.1.1 A copy of the building permit;

7.1.2 Plan approval general information sheet;

7.1.3 All inspection reports with the file number and site address;

7.1.4 Event dates;

7.1.5 Copies of all enforcement notices (if any);

7.1.5 Copies of all enforcement notices (if any);

7.1.6 Photos of the site;

7.1.7 Final Approval Notice; and

7.1.8 Any other information the inspector deems pertinent to the case.

7.2 Inspectors should maintain and update the SWM Facility Construction File in the BMP Tracking Database within 24 hours or one business day of inspection.

7.3 The inspection report documents all inspections and enforcement actions. Record the dates and times of all phone calls made or received regarding the inspections of the site. Describe any follow-up action taken (if any) in response to the calls.

7.4 If a digital camera was used to take pictures, download and authenticate your pictures immediately for your file. Record the following information on each picture:

7.4.1 Name and address of the property and owner/contractor;

7.4.2 When the picture was taken – date and time;

7.4.3 Brief description of the photo; and

7.4.4 Your signature.

7.5 Complete, sign and date the inspection report.

7.6 A signed copy of each inspection report for SWM facility construction is to be given to the owner/agent and maintained in the SWM case file.

8.0 Enforcement of SWM Facility Construction Requirements

8.1 If, upon final inspection, or during any interim inspections, the inspector determines that the owner/agent has failed to comply with the SWMP, the inspector shall use appropriate enforcement action(s) as described in the Enforcement SOP.

8.2 Re-inspection. Re-inspection of properties for which there are pending violations is imperative. Violations cannot be considered abated without re-inspection. Unabated items cannot be referred for enforcement action unless it has been verified that the violations still exist and efforts at compliance have not been made. After re-inspection of the facility:

8.2.1 Indicate the item or condition on the deficiency list of the inspection report that has been abated.

8.2.2 Indicate those conditions on the deficiency list that have been partially corrected.

8.2.3 Attempt to contact by telephone the responsible person to ascertain the reason for non-compliance and/or to verify the receipt of orders. If unable to contact the responsible person during working hours, telephone in the evening, early morning, or on weekends. Record the essentials of the call and how, where and when to contact the responsible person in the future.

8.2.4 Take the following action if the responsible person is contacted:

8.2.4.1 If a valid reason is given, recommend an additional reasonable time for compliance.

8.2.4.2 In the absence of a valid reason for non-compliance, proceed with a notice of infraction.

8.2.5 Add the record of the re-inspection report to the case history/file.

8.3 If an inspector discovers a violation at a construction site that they have not been assigned to, he or she should either search the IEB BMP Tracking Database for the assigned inspector or contact his/her supervisor to determine if the site is assigned to another inspector. Prior to taking any enforcement action, the inspector must check with the inspector assigned to the site.

9.0 As-Built Plan Review and Approval

9.1 The inspector provides a signed copy of the Final Inspection Report for the SWM facility construction to the owner/agent, with a notice of the due date that the owner/agent must submit the As-built plans to the IEB for review and approval. A copy of the Final SWM Facility Construction Inspection Report is kept in the case file.

9.2 Within twenty-one (21) days of the final facility construction inspection date, the owner/agent must submit an as-built package containing a Mylar copy of the as-built SWMP certified by a professional engineer licensed in the District of Columbia and the supporting documents specified in the DDOE Stormwater Management Guidebook (SWMG).

9.3 The inspector reviews the As-built plan using the As-built plan checklist or review sheet.

9.4 If the As-built plan does not meet DDOE requirements, it is returned with comments to the project engineer or agent for revision.

9.5 If the As-built plan does meet DDOE requirements and is approved, the arrival date of the As-built is entered into the BMP Tracing Database.

9.6 After receipt and approval of the As-built plan, the inspector prepares a SWM Final Approval Notice (FAN) for distribution to the permit holder and the IEB maintenance team. The FAN is addressed to the owner/agent listed on the building permit and sent within 30 days of the As-built approval date.

9.7 The date of the FAN is recorded in the BMP Tracking Database within one business day of its issuance.

9.8 The inspector submits the As-built Plan and complete SWM Facility Construction File to Central Records for archive within five business days of issuance of the FAN.

8.2.4 Take the following action if the responsible person is contacted:

8.2.4.1 If a valid reason is given, recommend an additional reasonable time for compliance.

8.2.4.2 In the absence of a valid reason for non-compliance, proceed with a notice of infraction.

8.2.5 Add the record of the re-inspection report to the case history/file.

8.3 If an inspector discovers a violation at a construction site that they have not been assigned to, he or she should perform an inspection documenting the violation(s) and contact the inspector assigned to the area and inform them of your intent to issue an Enforcement Notice for the site, and provide the assigned inspector with a copy of the Inspection Report and Enforcement Notice (for the SWM site construction file). The inspector shall then update the BMP tracking database with information about the Inspection type and date, and the date and type of Enforcement Notice.

9.0 As-Built Plan Review and Approval

9.1 The inspector provides a signed copy of the Final Inspection Report for the SWM facility construction to the owner/agent, with a notice of the due date that the owner/agent must submit the As-built plans to the IEB for review and approval. A copy of the Final SWM Facility Construction Inspection Report is kept in the case file.

9.2 Within twenty-one (21) days of the final facility construction inspection date, the owner/agent must submit an as-built package containing a Mylar copy of the as-built SWMP certified by a professional engineer licensed in the District of Columbia and the supporting documents specified in the DDOE Stormwater Management Guidebook (SWMG).

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9.7 The date of the FAN is recorded in the BMP Tracking Database within one business day of its issuance.

9.8 The inspector submits the As-built Plan and complete SWM Facility Construction File to Central Records for archive within five business days of issuance of the FAN.

10.0 Reference Documents

10.0 Reference Documents

10.1 Soil Erosion and Sediment Control Inspections SOP

10.2 Storm Water Management Facilities Inspection Report

10.3 Enforcement of Soil Erosion and Sedimentation Control and Storm Water Management SOP

10.4 Stormwater Management Guidebook 2013, found at:

http://ddoe.dc.gov/sites/default/files/dc/sites/ddoe/page_content/attachments/2013%20SW%20Rule.pdf