Lytle Water Solutions, LLC

DRAFT
for discussion purposes only

SPECIAL STUDY NO. 2 FINAL REPORT: PHOSPHORUS REMOVAL EFFECTIVENESS OF PRFS

PREPARED FOR: Cherry Creek Basin Water Quality Authority
Greenwood Village, Colorado

March 2008

Project No. 1052-05

640 Plaza Drive, Suite 170
Highlands Ranch, Colorado 80129
www.lytlewater.com

Phone: 303-350-4090
Fax: 303-350-4095
e-mail:LWS@LytleWater.com

TABLE OF CONTENTS

SPECIAL STUDY NO. 2 FINAL REPORT: PHOSPHORUS REMOVAL EFFECTIVENESS OF PRFS

INTRODUCTION

The Cherry Creek Basin Water Quality Authority (Authority) is charged with managing the water quality of the Upper Cherry Creek Basin, with a focus on controlling phosphorus inputs to Cherry Creek Reservoir which could adversely impact the quality of the reservoir and its aquatic resources. To that end, the Authority currently encourages local land use entities in the Upper Cherry Creek Basin to construct phosphorus reduction facilities (PRFs), which include structural best management practices (BMPs). Measured phosphorus reductions in these facilities allow local land use agencies to receive credit for the removal of this phosphorus from the basin. However, it is not known if the credit system currently in use for PRFs is accurate, due to the potential phosphorus flow out of these facilities related to seepage to the underlying ground water.

Special Study No. 2 was designed to evaluate if there are significant phosphorus losses out of the PRFs into the underlying ground water that are then reaching Cherry Creek Reservoir, yet credit is being given for the removal of this phosphorus in the PRF.

Previous studies have shown that PRFs will remove phosphorus and other nutrients from the surface water through the detention of the surface flows and subsequent removal through sedimentation and/or plant uptake. However, there is the potential that a portion of the phosphorus removed by these PRFs through the detention of surface water is not permanently removed, but is allowed to infiltrate into the ground water, thereby escaping the PRF and ultimately reaching Cherry Creek Reservoir. This is related to dissolved phosphorus in the water.

Lytle Water Solutions, LLC (LWS) was retained by the Authority in 2005 to conduct Special Study No. 2 to evaluate the issue of phosphorus removal efficiency at three different PRFs located in the Upper Cherry Creek Basin. To evaluate this issue, it was necessary to monitor the phosphorus loads in the ground water upgradient of the existing PRFs and the phosphorus load in the ground water downgradient of the PRFs, then to assess the amount of phosphorus load contributed by the PRF to the local ground water table at each site. In

addition, it was originally planned to evaluate the mass balance of the PRF related to surface water flows to estimate the total mass load being removed by the PRF and compare it to load contributions to the underlying ground water. However, based on the sites ultimately chosen for this study (which will be discussed in a subsequent section), it was difficult to get an accurate assessment of surface water flows at these sites.

In addition, an attendant issue evaluated by LWS as part of this study is the even mean concentration (EMC) for storm events upstream of the PRFs being monitored. This included the collection of eight storm event water quality samples during the course of the study for calculation of the EMCs. While EMCs are typically calculated as flow-weighted concentrations over the duration of the storm, the Authority's Technical Advisory Committee (TAC) decided to collect just one composite sample from each storm event at each PRF. Therefore, while these data are reported as EMCs, the methodology typically used to determine EMCs was not followed for this study at the request of the TAC.

This report details the selection of the PRF sites, installation of the monitoring equipment, and the results of the PRF study, as well as the results of the EMC sampling.

PROJECT APPROACH

Originally, three separate PRF sites in the Upper Cherry Creek Basin were identified by the Authority to be used for this special study. The sites were located in different areas of the basin and were reflective of different PRF technologies. These three sites included the following:

- **Cottonwood-Peoria Pond**: A large, extended detention basin (EDB) that the Authority currently monitors for phosphorus reduction.

- **Pond L-3**: A detention basin operated by the Arapahoe County Water and Wastewater Authority (ACCWA).

- **On-Site Upland Area BMP**: This was identified as possibly an EDB serving a development in Greenwood Village at a site located in the nearby Lone Tree Creek watershed.

Subsequently, the Authority was unable to obtain permission from the owners of Pond L-3 to use this site for the special study. Therefore, the Long Meadows Wet Detention Pond and the Burt-Kuni Car Dealership EDB in Centennial were selected for evaluation as possible replacement sites. However, the Long Meadows site was found to be inaccessible because the development had progressed to the point where physical access was difficult, requiring special drilling equipment. The owners of the Burt-Kuni site could not be contacted, despite the efforts of several parties. Several other sites were then also considered, but difficulties associated with access and owner approval caused delays in the selection of the final PRF sites.

Almost a full year passed before the Authority was able to secure clearance to set up monitoring at three select sites. The sites that were ultimately chosen included the Cottonwood-Peoria Pond, the Trimark EDB, and the Inverness Pond, and Figure 1 shows the locations of these study sites.

Site 1is the Cottonwood-Peoria Pond, a large, enhanced EDB complete with constructed wetlands and located on Cottonwood Creek at Peoria Street (Figure 1). This is one of the sites that the Authority currently monitors for phosphorus reduction.

Site 2 is the Trimark EDB, also located on Cottonwood Creek at Peoria Street, but just south of the Cottonwood-Peoria Pond (Figure 1). This site contains a concrete trickle channel that frequently overtops after storm runoff and is a good example of a standard EDB in the Denver metropolitan area.

Site 3 is the Inverness Pond, located at the confluence of Tributary C and Cottonwood Creek. This site is a good example of an enhanced BMP, since it contains a serpentine, low-flow channel and wetlands in the bottom of the channel.

Based on receiving final approval for these PRF sites, Special Study No. 2 was initiated in November 2006.

MONITORING SYSTEM INSTALLATION

Once the PRF sites were selected, the first step was to establish the ground water monitoring network at each of the PRFs. As part of the monitoring system installation, ground water monitoring wells were installed and surface water flow measuring devices were established at each of the PRFs.

Well Drilling and Completion

To evaluate potential phosphorus transport through seepage from the PRFs into the underlying alluvial aquifer, two downgradient wells and one upgradient well were installed at each site. In addition to these monitoring wells, one additional borehole was drilled at each site to assist in defining the geologic conditions for the calculation of ground water underflow. Test drilling was accomplished with a CME 75 hollow-stem auger rig operated by Layne Christensen, Inc. Drilling began on November 14, 2006 and was completed on November 22, 2006.

At each PRF site, four boreholes were drilled to define local geologic conditions, while only three wells were completed at each site. Drilling logs were prepared as the boreholes were advanced based on drill cuttings returned by the augers. This information was supplemented with split-spoon samples recovered from specific depths in select holes where additional information was needed to confirm inferred geologic descriptions. Although the split-spoon samples were not a part of the original drilling program, this sampling was added to better assist us with geologic descriptions of the subsurface materials. The geologic logs for the Cottonwood-Peoria, Trimark, and Inverness sites are presented in Figures 2 through 4, respectively.

At the completion of the drilling, three of the boreholes were completed as monitoring wells; one well upgradient of the PRF site and two wells downgradient of the PRF site. In general, each well was completed with 2-inch (in) diameter polyvinylchloride (PVC) casing and 20-slot (0.020 in) PVC screen placed opposite the water-bearing intervals. The screened interval was then gravel-packed with 10-20 mesh silica sand and this gravel pack extended above the screened interval by at least 2 feet (ft). The gravel pack was then capped with a bentonite clay seal and the remaining annular space was sealed with cement grout. Each of

the monitoring wells was completed with a flush-mount valve cover box and a watertight, locking j-plug. The well completion details of each of the monitoring wells at the Cottonwood-Peoria, Trimark, and Inverness sites are shown in Figures 2 through 4, respectively.

Well Development and Aquifer Testing

Once the monitoring wells had been installed, each of the wells had to be developed to clear it of drilling fluids so that the well would yield essentially clear, sand-free water. Initial development of the monitoring wells was accomplished by LWS field personnel using an air-lift pumping device. Further development of all of the wells was accomplished with a submersible pump. Development of the wells was continued until the discharge was essentially clear and sand-free. Well development times typically ranged from one to two hours per well.

Following development, the submersible pump was used to conduct short-term pump tests at each of the monitoring wells to determine aquifer hydraulic characteristics. Standard pump test analytical evaluations were used to estimate aquifer hydraulic characteristics from each well. Because of the difficulty in evaluating the aquifer pump test data due to the low flow rates that could be achieved, at each site the aquifer hydraulic characteristics from the three pump tests were assessed and weighted based on the geologic cross-section for the upgradient and downgradient underflow section. A summary of the aquifer hydraulic characteristics used in this study are shown in Table 1.

Surface Water Flow Gaging

As part of this special study, ISCO 6712C automatic water samplers equipped with a pressure transducer (720 module) were used to measure surface water flows and to collect water quality samples associated with storm events. The Cottonwood-Peoria Pond was already equipped with an ISCO sampler, so new equipment installation was only required at the Trimark and Inverness sites. Each of the new ISCO samplers were housed in a lockable shelter to protect them from both weather- and vandalism-related damage and the pressure transducer was routed into the stream channel inside a protective housing, as well.

There was a continuous base flow at the Cottonwood-Peoria site throughout the course of the study, while there was generally flow at the Inverness site, although there were short periods with no flow. Conversely, the Trimark site was dry or had a very small base flow during the course of the study. Average base flow at the Cottonwood-Peoria site was approximately 2 to 4 cfs, while average flow at the Trimark site was less than 0.1 cfs. Flows at the Inverness site showed the most variability; however, there is some question regarding the accuracy of the flow measurements at the Inverness site because every time there was a storm event, the trash rack upstream of the culvert would fill with debris, thereby artificially inflating the depth of water flow going into the culvert. Based on drainage areas, we would expect that runoff at the Inverness site would be lower than at the Cottonwood-Peoria site. However, the flow data indicated just the opposite; that is, generally higher flow conditions at the Inverness site than at the Cottonwood-Peoria site. A summary of the surface flow data collected during the course of this study is presented in Appendix B, along with monthly statistical data regarding minimum and maximum instantaneous flows, as well as minimum and maximum daily flows and average monthly flows.

Surface Water Quality Monitoring

At each of the monthly sampling events, if there was surface water flow either upgradient or downgradient of the PRF, water quality samples were obtained for analysis of total phosphorus, soluble reactive phosphorus, and total dissolved phosphorus. At the Cottonwood-Peoria site, both upgradient and downgradient samples were obtained at every monthly site visit, while at the Trimark site only one water quality sample was obtained during the entire study period. At the Inverness site, water quality samples were also obtained from both the upgradient and downgradient locations at each of the monthly site visits. A summary of the surface water quality data obtained during the study period is presented in Appendix C, Tables C-1, C-5, and C-9.

MONITORING PROGRAM

Once the monitoring wells were installed at the three PRF sites, the start of the water quality monitoring program phase of the study was initiated. Based on our proposal, monthly water quality samples were obtained from each of the nine monitoring wells and additional surface water quality samples were obtained at each of the sites where there was visible surface flow.

The monthly sampling program commenced in December 2006 and was completed in November 2007.

In addition to the monthly sampling, part of the scope of work for Special Study No. 2 was to develop EMCs for up to eight storm events at each of the PRFs. ISCO automatic water samplers were set up at each of the PRF sites to obtain composite samples during each storm event. Since GEI, Inc. (GEI) personnel routinely collected storm water samples at numerous sites in the vicinity of Cherry Creek Reservoir (including the Cottonwood-Peoria Pond, which is part of the study), LWS chose to subcontract GEI to collect the stormwater samples as part of this study. Eight sampling events were obtained by GEI during the course of the study by collecting 24 samples at 15-minute (min) intervals once the ISCO sampler was triggered, thereby obtaining samples at different stages along the flood hydrograph for a total duration of 6 hours (hrs). These samples were then composited into one sample and analyzed by the GEI laboratory, as directed by the TAC. All of the water quality data collected as part of this study are presented in Appendix C.

STUDY RESULTS

The principal focus of Special Study No. 2 was to evaluate the phosphorus removal effectiveness of PRFs relative to the potential loss of phosphorus load to the underlying alluvium that is currently being credited to the PRFs as phosphorus removal. A secondary objective was the estimation of EMCs at the three PRF sites due to storm events which occurred during the course of the monitoring period.

Phosphorus Loading

During the course of the study period from December 2006 until November 2007, 36 samples were collected from the upgradient well and the two downgradient wells at each site. Each ground water sample was analyzed for both total phosphorus and soluble reactive phosphorus. If flow conditions allowed, surface water samples were collected at the upstream inlet and the downstream outlet of each PRF. The surface water samples were analyzed for total phosphorus, soluble reactive phosphorus, and total dissolved phosphorus. A total of 24 samples were obtained from the Cottonwood-Peoria and Inverness sites, while only 1 surface water sample was obtained at the Trimark site. A summary of the water quality data obtained

from both the ground water monitoring wells and the surface water monitoring sites are summarized in Appendix C, Tables C-1 through C-3.

Generally, total phosphorus concentrations in the alluvial ground water were relatively low, with an average total phosphorus concentration of 157 micrograms per liter (µg/L) upgradient of the Cottonwood-Peoria site and a median concentration of 55 µg/L, and an average of 82 µg/L at the downgradient wells, with a median concentration of 23 µg/L. The Trimark site had an average concentration of 61 µg/L and a median concentration of 36 µg/L upgradient of the Trimark PRF, and an average concentration of 50 µg/L and a median concentration of 38 µg/L downgradient of the Trimark PRF. Upgradient of the Inverness site, total phosphorus concentrations averaged 19 µg/L and had a median concentration of 17 µg/L. Downgradient of the Inverness site, the average total phosphorus concentration was 20 µg/L and the median concentration was 18 µg/L.

Phosphorus concentrations in the surface water samples were relatively consistent and were also relatively low. For the Cottonwood-Peoria site, the average total phosphorus concentration was 64 µg/L, while the average phosphorus concentration at the Inverness site was 58 µg/L. There were differences between total phosphorus and total dissolved phosphorus concentrations which indicated some particulate load in the surface water, ranging from 4 to 115 µg/L at the Cottonwood-Peoria site and from 7 to 93 µg/L at the Inverness site. Since most of the sampling was done under base flow conditions, the small variation between total dissolved phosphorus and total phosphorus concentrations was expected. The larger particulate concentrations were observed during the higher flow periods. More surprisingly, the variation between the total dissolved and total phosphorus concentrations in the storm samples collected by GEI had similar particulate concentrations.

Using the water level data and water quality sample data collected during our monthly samplings, we were able to construct a ground water mass balance at each of the PRF sites to evaluate whether there are significant losses of phosphorus from the PRFs to the underlying ground water, which would then move downgradient and eventually reach Cherry Creek Reservoir. To calculate the underflow at each of the PRF sites at both an upgradient and a downgradient location, geologic data from the drilling program were used to construct a geologic cross-section at each site. These cross-sections are presented in Appendix D. The saturated cross-sectional area at each location was then determined during the monthly

sampling based on the water levels being measured at the monitoring wells. Aquifer hydraulic characteristics were developed during the testing phase of the monitoring program and these parameters were then input to Darcy's law to estimate the underflow. The hydraulic gradient was estimated based on water level elevations at the upgradient and downgradient wells at each site.

The expected phosphorus loads that would be lost to the underlying alluvium are the result of two mechanisms, (a) the vertical hydraulic conductivity of the sediments in the PRF which would allow the vertical movement of water from the PRF to the underlying alluvial aquifer and (b) the physical capability of the alluvial aquifer to transmit water downgradient through the aquifer system. While the vertical hydraulic conductivity of the sediments at each of the PRF sites cannot be measured directly, it is expected that these values would be in the range of 1×10^{-3} to 1×10^{-5} ft per day, based on the types of soils present at these facilities. Given these expected vertical hydraulic conductivities, the rate of vertical flow from the PRFs to the underlying ground water is expected to be very low (on the order of a few gallons per minute (gpm)). Losses would be expected to be even less at the Trimark site, as there is typically no driving head to move water into the underlying sediments, except under extreme storm event conditions. Ground water underflows, once in the alluvial aquifer, are also very low. Darcy underflow calculations indicate flows in the range of approximately 5 to 15 gpm at the various PRF sites. Because of these relatively low flow conditions and attendant relatively low phosphorus concentrations, the estimated loads being lost from these PRFs is quite minimal.

Figures 5 through 7 show the phosphorus load change from the upgradient monitoring well to the downgradient monitoring wells at each of the PRF sites studied. In these figures, a negative value on the graph indicates that the phosphorus load actually decreased from an upgradient location to a downgradient location, while a positive value indicated an increase in phosphorus load from an upgradient location to a downgradient location. As Figure 5 shows, there is a very consistent pattern, where the downgradient phosphorus load at the Cottonwood-Peoria Pond is less than the upgradient phosphorus load, although the difference is so minor as to be considered negligible. Similarly, Figure 6 shows the phosphorus mass balance at the Trimark site, where there are several months where the downgradient load increases and several months where the downgradient load decreases. Again, the differences in phosphorus loads are so small as to be considered negligible. Similar results are shown in Figure 7 for the Inverness site. In general, our conclusion is that there is essentially no exchange of phosphorus from

these PRFs with the underlying ground water, as the results show such minimal change that it is well within the error associated with the measurement of underflow and the analysis of phosphorus concentrations.

A surface water mass balance could only be constructed at the Cottonwood-Peoria site, as there was no way to measure the downstream flow at the Inverness site, due to the nature of the EDB, and the Trimark site generally did not have surface flow at any of the monthly site visits. As shown in Table C-1, Appendix C, there generally is phosphorus removal associated with the Cottonwood-Peoria Pond. However, more detailed data regarding the removal rates from this PRF are being recorded by GEI Consultants, Inc.

Because both the Cottonwood-Peoria and Inverness sites have a continuous free-water surface associated with these PRFs, we have estimated the evaporative losses from these ponds. The Cottonwood-Peoria site has a surface area of approximately 1 ac and it is estimated that the average annual evaporative loss from this pond is 3.2 ac-ft. The Inverness Pond has a surface area of approximately 0.6 ac, which would result in an average annual evaporative loss of 1.9 ac-ft.

Event Mean Concentrations

In addition to evaluating phosphorus removal effectiveness of the three PRFs chosen for this study, the Authority also wished to develop EMCs for each of the sites. The ISCO automatic water samplers were set up for this purpose and GEI obtained samples from eight storm events at each of the three PRFs.

Typically, EMCs are calculated by collecting water quality samples throughout a storm event and then weighting the results of these samples based on the flow that occurred when each was sampled, thus providing a flow-weighted concentration. However, in light of the large number of separate samples that would need to be processed and the significant costs associated with their analyses, the TAC determined that the study would, instead, collect one composite sample from each storm event. While this approach does not yield an EMC using standard methodologies, it does provide a measure of the phosphorus concentration experienced in a storm event.

Each storm event sample was analyzed for total phosphorus, total dissolved phosphorus, soluble reactive phosphorus, total nitrogen, total dissolved nitrogen, nitrate/nitrite-nitrogen, and ammonia-nitrogen. A total of 24 samples was taken over the course of the study period from eight different storm events at each of the three PRFs. A summary of these data are presented in Appendix E, Table E-1. As expected, for some storms the difference between total phosphorus and total dissolved phosphorus concentrations was larger for the storm events than for the data collected during our monthly samplings, which primarily occurred during base flow conditions. However, for some storm events, there was a relatively small difference between total and dissolved phosphorus concentrations. At the Cottonwood-Peoria Pond, particulate phosphorus averaged 150 µg/L, while particulate phosphorus averaged 130 µg/L at the Trimark site and 87 µg/L at the Inverness site. Nitrogen concentrations at each of these sites were generally higher than the phosphorus concentrations, with total nitrogen concentrations being as much as an order of magnitude higher than total phosphorus concentrations.

One interesting result of the storm event sampling was that the total phosphorus concentrations were the largest by far at the Trimark site, even though the storm events were of very small magnitude. While the average magnitude of the storm events at the Cottonwood-Peoria site were 25 times larger than the events at the Trimark site, the phosphorus concentrations observed during the storm events at the Trimark site were over twice as large as those observed at the Cottonwood-Peoria site. This may be related to the land use above the Trimark site, which is 100 percent residential and could be related to fertilizer being applied to lawns and areas above the Trimark site.

For each of the PRFs, we estimated land use in the drainage area above the PRF using recent aerial photographs of each drainage area. Table 2 summarizes the land uses above each of the sites.

CONCLUSIONS AND RECOMMENDATIONS

Based on the data collected as part of Special Study No. 2, we would offer the following conclusions and recommendations:

(1) At each of the PRF sites chosen for this study, the underlying alluvial ground water system is limited in areal extent and in its ability to transmit water.

(2) Phosphorus concentrations in both the surface water and the ground water at these PRF sites were generally very low. There were a few exceptions, with significantly increased phosphorus concentrations being observed infrequently in the monitoring wells. It is unknown whether these increased phosphorus concentrations represent actual spikes in concentration or whether they represent anomalous, inaccurate data.

(3) Estimation of upgradient and downgradient phosphorus loading in the alluvial ground water indicates that there are no significant losses from these PRFs to the underlying ground water.

(4) Based on our evaluation of phosphorus loading data, we believe that the credit that is given for the PRFs for phosphorus removal in the surface water is an accurate means to provide credit for these PRFs.

LWS has appreciated the opportunity to conduct Special Study No. 2 for the Authority. If anyone has questions, please do not hesitate to give the undersigned a call.

_____

Bruce A. Lytle, P.E.
President

APPENDIX A
MONITORING HOLE ACKNOWLEDGMENTS

APPENDIX B
SURFACE FLOW DATA AND SUMMARY FLOW STATISTICS

APPENDIX C
WATER QUALITY SUMMARY TABLES

APPENDIX D
CROSS-SECTION DATA FOR UNDERFLOW CALCULATIONS

APPENDIX E
EMC DATA

TABLE 1
SUMMARY OF AQUIFER CHARACTERISTICS

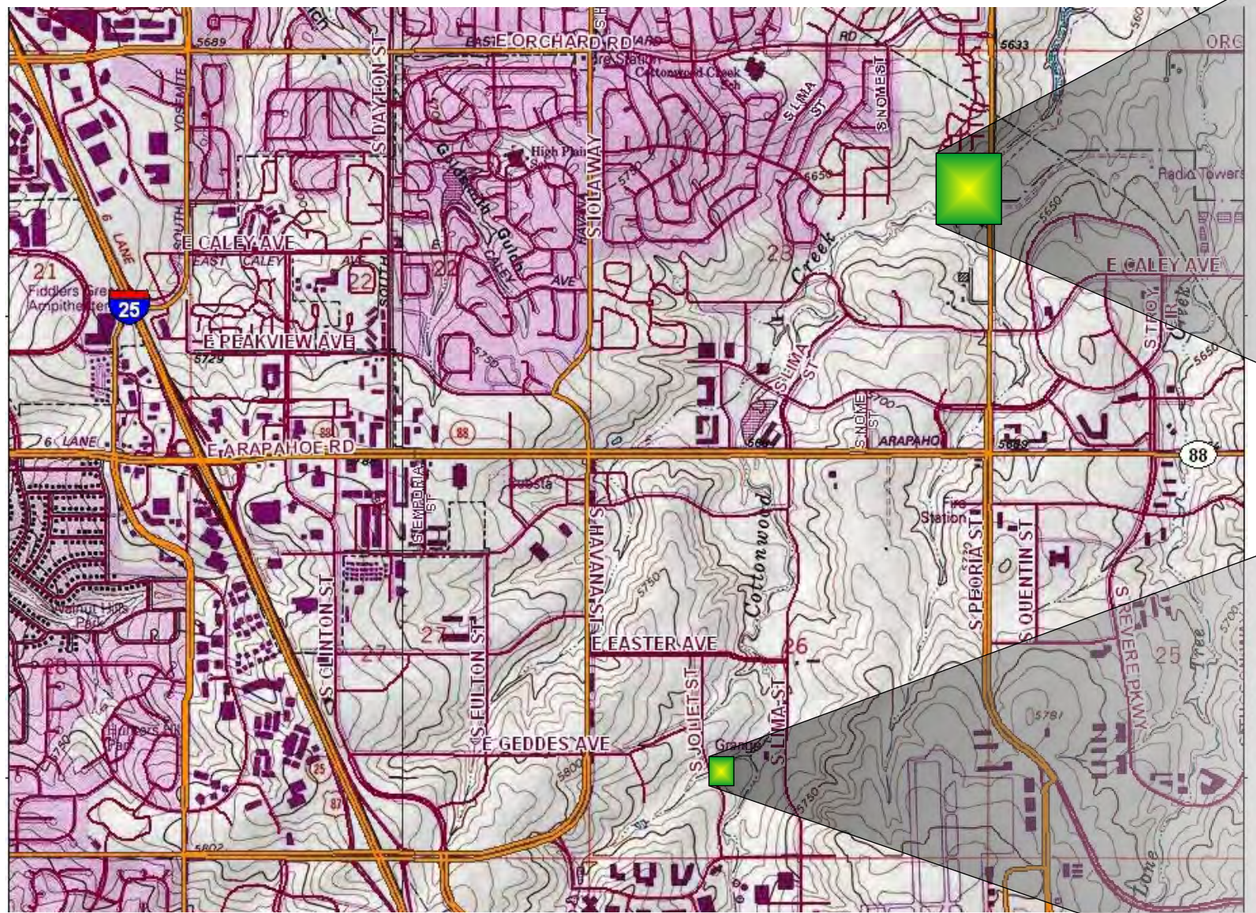
Site	Location	Transmissivity (gpd/ft)	Hydraulic Conductivity (gpd/ft)
Cottonwood-Peoria	upgradient	2,415. [1)]	22.
	downgradient		27.
Trimark	upgradient	3,155 [1)]	33.
	downgradient		34.
Inverness	upgradient	4,470. [1)]	29.
	downgradient		28.

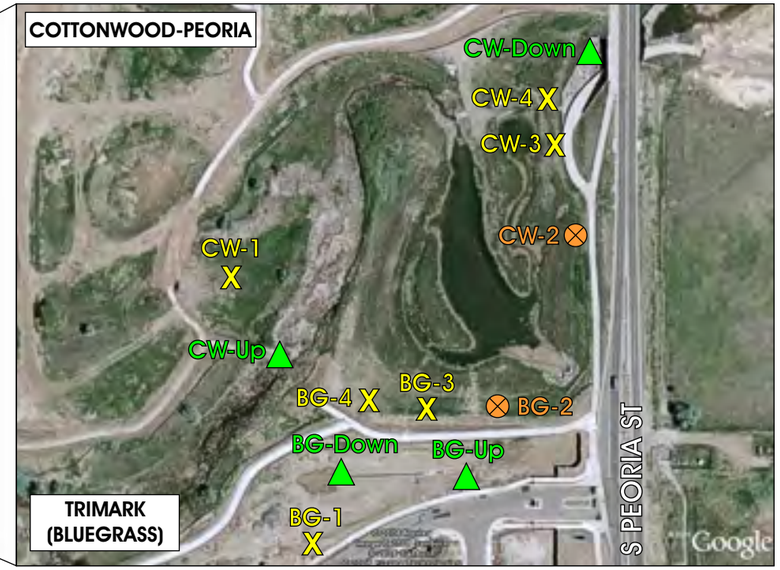
1) Composite transmissivity values were used for upgradient and downgradient locations. Separate hydraulic conductivity values were estimated based on differences in aquifer saturated thicknesses at each location.

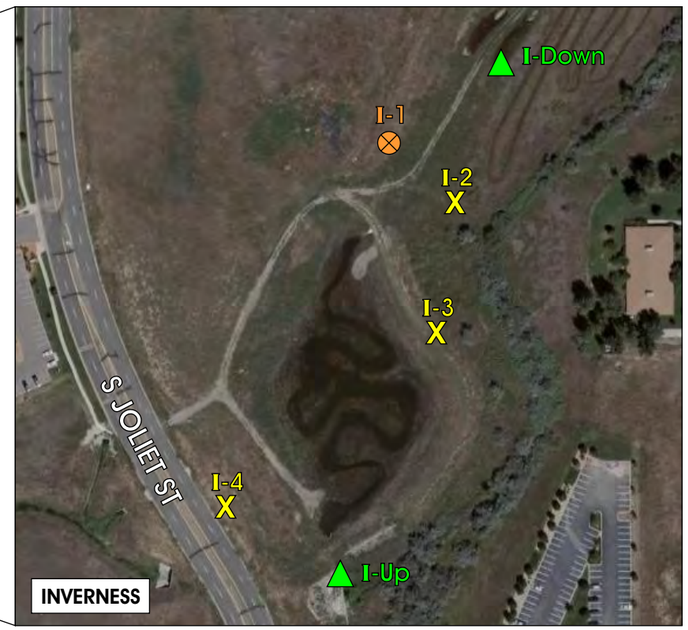
TABLE 2
SUMMARY OF LAND USES

PRF	Land Use [1)]	% of Basin [1)]
Cottonwood-Peoria	Residential	6.
	Commercial	28.
	Golf Course	6.
	Open Space	60.
Trimark	Residential	100.
Inverness	Commercial	38.
	Golf Course	10.
	Open Space	52.

1) Estimated from recent aerial photography on Google Earth.







LEGEND

- CW-1 / X — COMPLETED MONITORING WELL
- BG-4 — BOREHOLE, NO MONITORING WELL COMPLETED
- SURFACE WATER SAMPLING LOCATION
- CONSTRUCTED CHANNEL
- DIRT ROAD/BERM

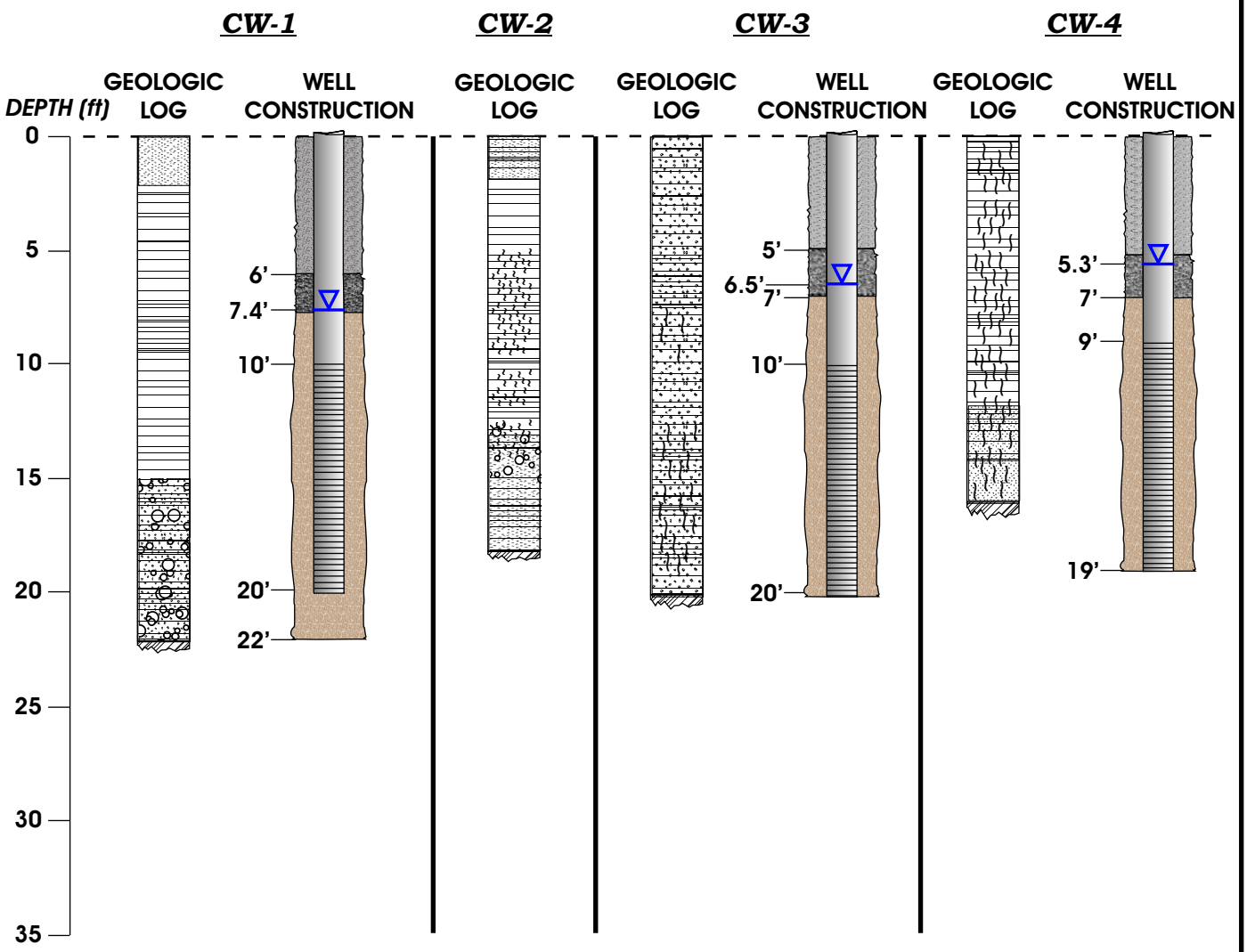
Note: Constructed channel and roads added to aerial of Inverness site.
Locations are approximate.

N

CHERRY CREEK BASIN WATER QUALITY AUTHORITY

PRF STUDY
SITE LOCATIONS

File Name: SiteLocations.cdr		Date: 03/01/2008
Project No.: 1052-05	Drawn By: VAL	Fig. No.: 1



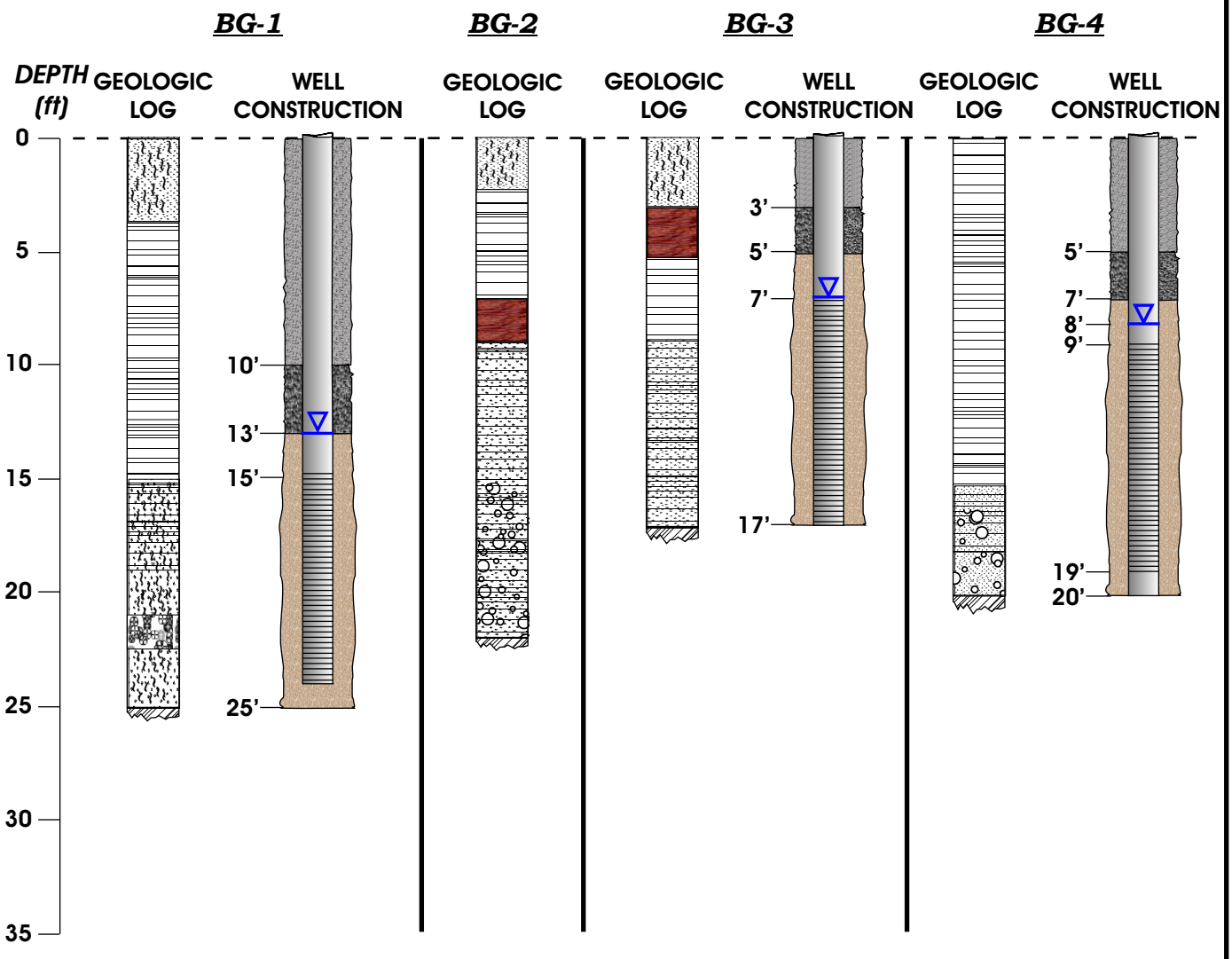
LEGEND

- BEDROCK
- CLAY
- COBBLES
- GRAVEL
- SAND
- SAND & GRAVEL
- SILT
- SILT & CLAY
- SILT & SAND
- STATIC WATER LEVEL
- BENTONITE
- GRAVEL PACK
- GROUT

CHERRY CREEK BASIN WATER QUALITY AUTHORITY

GEOLOGIC LOGS AND WELL CONSTRUCTION DETAILS COTTONWOOD-PEORIA POND SITE

File Name: CottonwoodPond.cdr		Date: 01/12/2007
Project No.: 1052-05	Drawn By: VAL	Fig. No.: 2



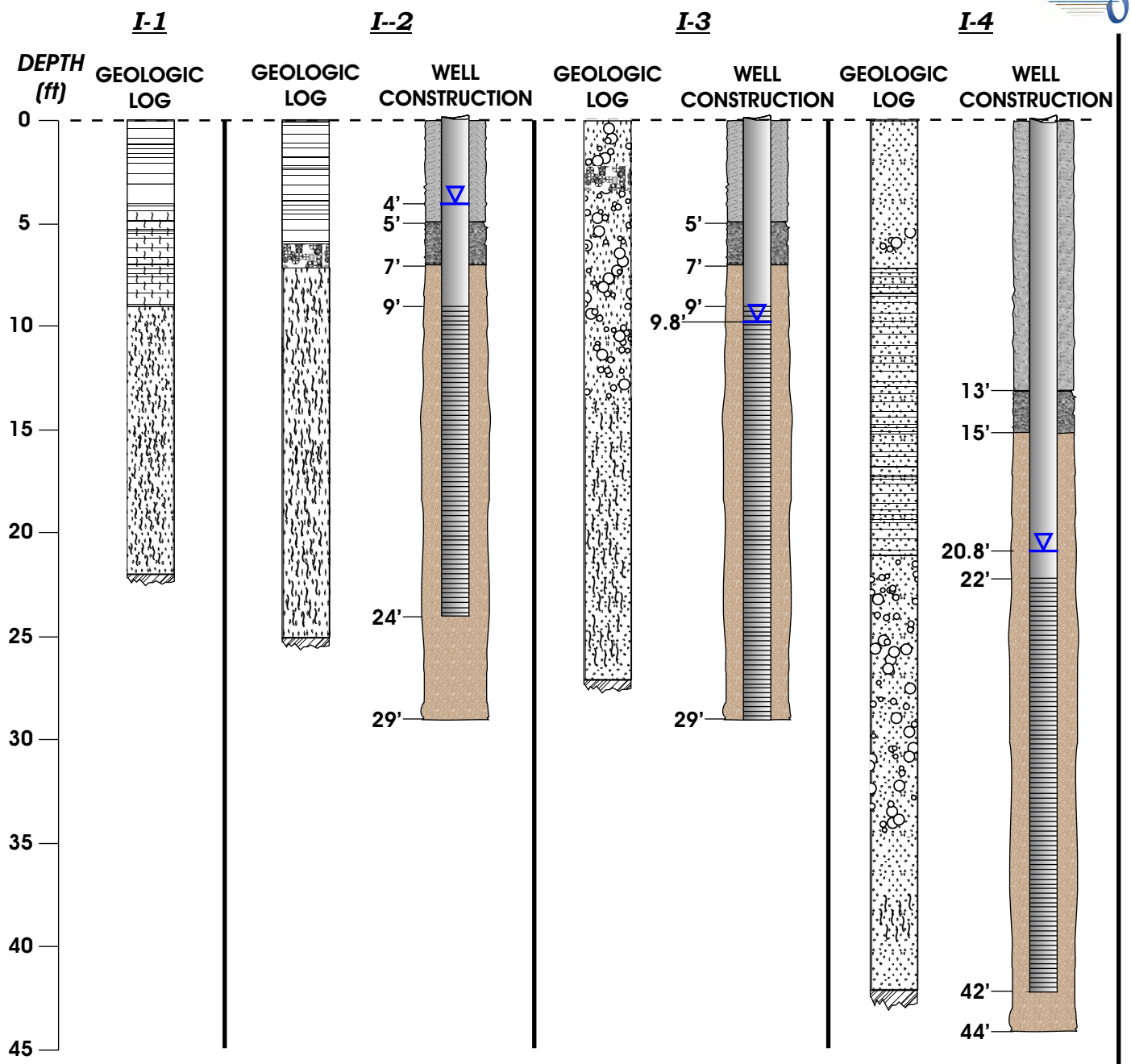
LEGEND

- BEDROCK
- CLAY
- COBBLES
- GRAVEL
- ROCK
- SAND
- SAND & GRAVEL
- SILT
- SILT & CLAY
- SILT & SAND
- STATIC WATER LEVEL
- BENTONITE
- GRAVEL PACK
- GROUT

CHERRY CREEK BASIN WATER QUALITY AUTHORITY

GEOLOGIC LOGS AND WELL CONSTRUCTION DETAILS TRIMARK POND SITE

File Name: Trimark.cdr		Date: 01/10/2007
Project No.: 1052-05	Drawn By: VAL	Fig. No.: 3



LEGEND

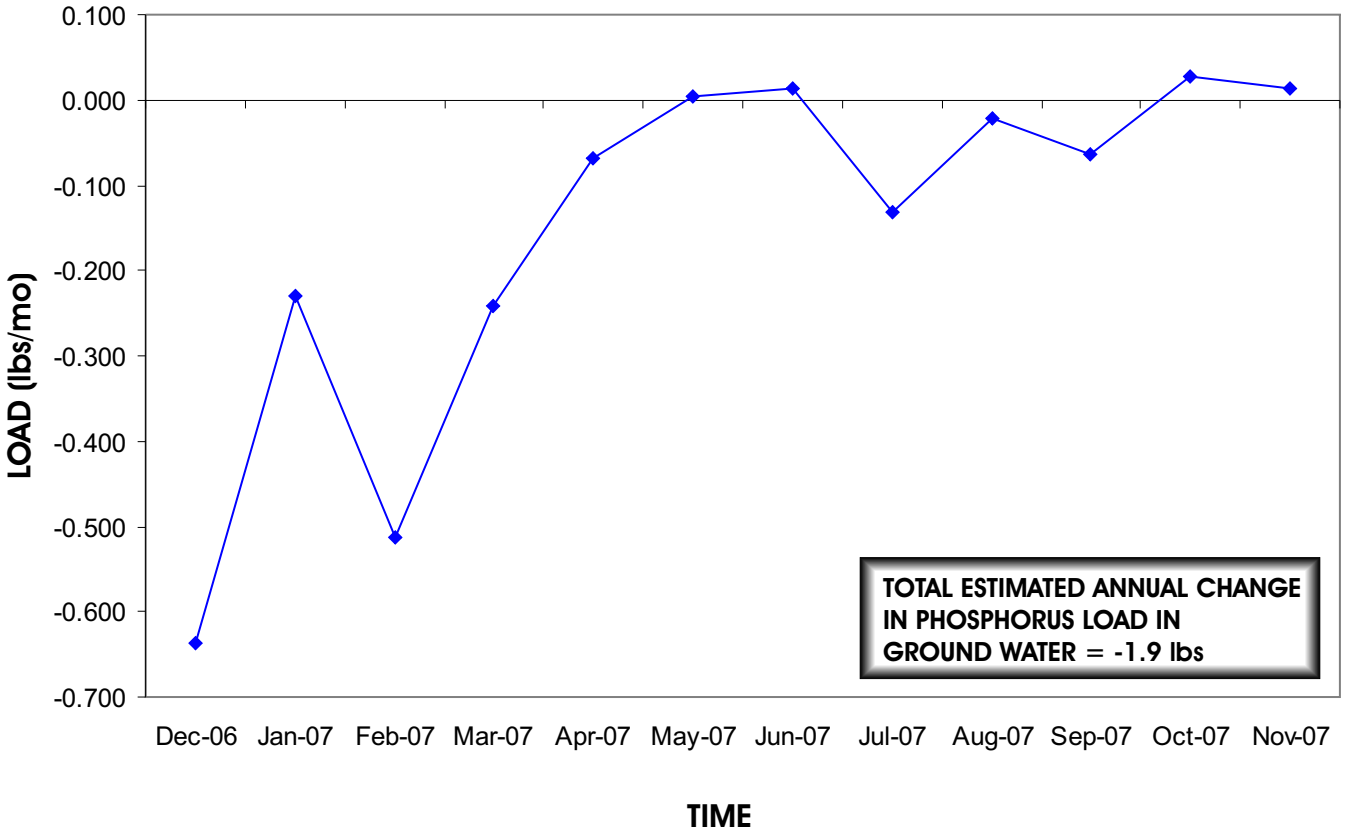
- BEDROCK
- CLAY
- COBBLES
- GRAVEL
- SAND
- SAND & GRAVEL
- SILT
- SILT & CLAY
- SILT & SAND
- STATIC WATER LEVEL
- BENTONITE
- GRAVEL PACK
- GROUT

CHERRY CREEK BASIN WATER QUALITY AUTHORITY

GEOLOGIC LOGS AND WELL CONSTRUCTION DETAILS INVERNESS POND SITE

File Name: InvernessPond.cdr		Date: 01/02/2007
Project No.: 1052-05	Drawn By: VAL	Fig. No.: 4

LOAD CHANGE FROM UPGRADIENT TO DOWNGRADIENT WELL AT COTTONWOOD-PEORIA SITE



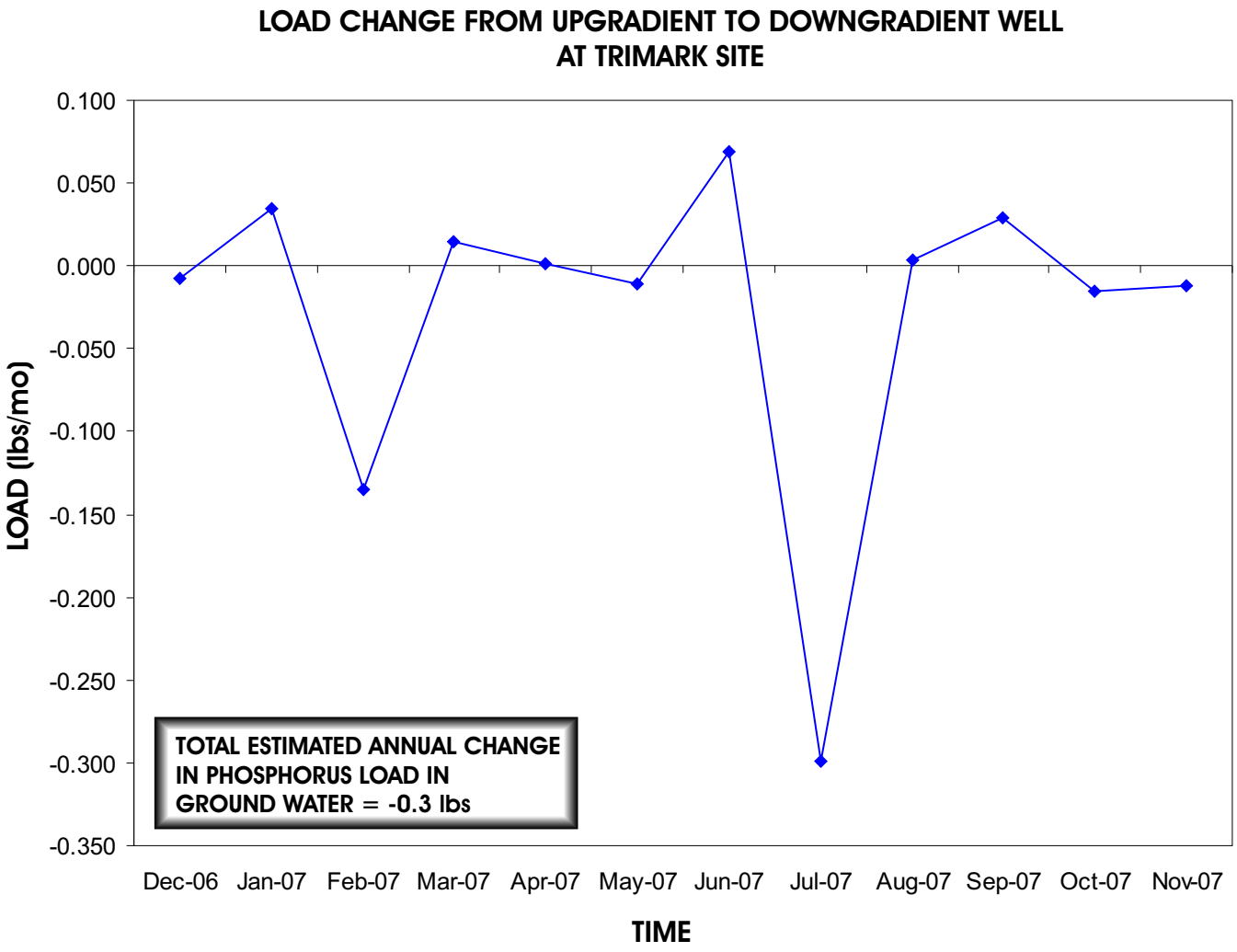
Notes:

1) Positive values indicate an increase in phosphorus load from an upgradient location to a downgradient location; i.e. an input from the PRF, while negative values indicate a decrease in phosphorus load.
2) Negative change in annual phosphorus load to ground water indicates a reduction in phosphorus load downgradient of the PRF.

CHERRY CREEK BASIN WATER QUALITY AUTHORITY

GROUND WATER PHOSPHORUS MASS BALANCE COTTONWOOD-PEORIA SITE

File Name: GW_MassBal_Cot-Peoria.cdr		Date: 02/29/2008
Project No.: 1052-05	Drawn By: VAL	Fig. No.: 5



Notes:

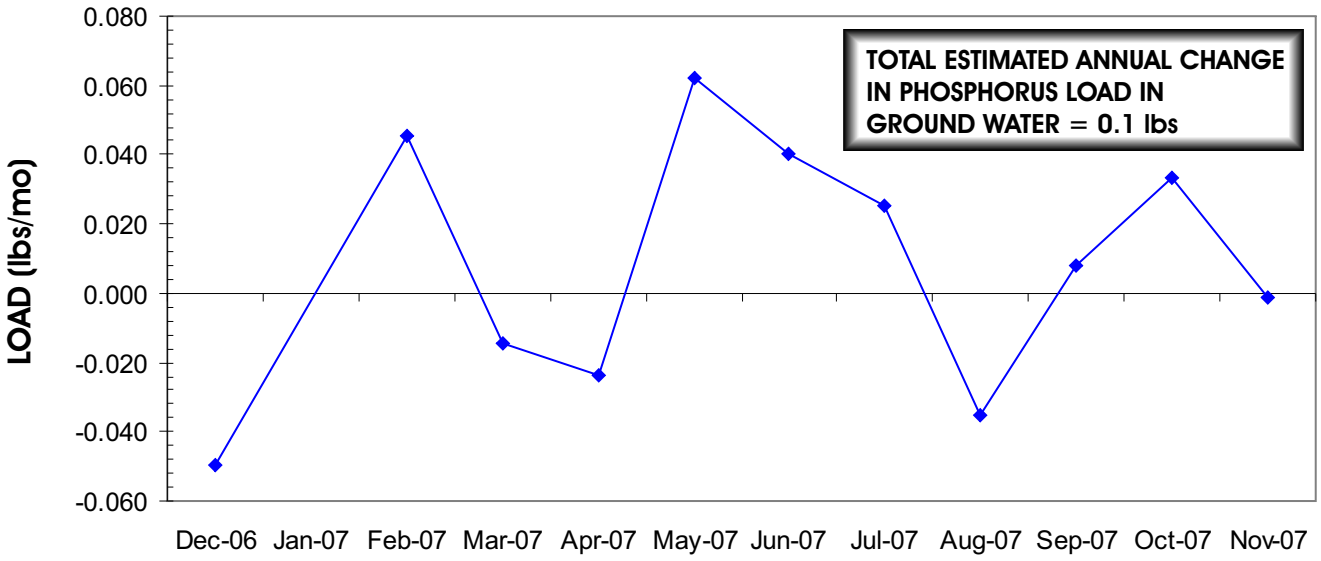
1) Positive values indicate an increase in phosphorus load from an upgradient location to a downgradient location; i.e. an input from the PRF, while negative values indicate a decrease in phosphorus load.
2) Positive change in annual phosphorus load to ground water indicates an increase in phosphorus load downgradient of the PRF.

CHERRY CREEK BASIN WATER QUALITY AUTHORITY

GROUND WATER PHOSPHORUS MASS BALANCE TRIMARK SITE

File Name: GW_MassBal_Trimark.cdr		Date: 02/29/2008
Project No.: 1052-05	Drawn By: VAL	Fig. No.: 6

LOAD CHANGE FROM UPGRADIENT TO DOWNGRADIENT WELL AT INVERNESS SITE



TIME

Notes:

1) Positive values indicate an increase in phosphorus load from an upgradient location to a downgradient location; i.e. an input from the PRF, while negative values indicate a decrease in phosphorus load.
2) Positive change in annual phosphorus load to ground water indicates an increase in phosphorus load downgradient of the PRF.
3) January 2007 data point ommitted due to anamalous flow data.

CHERRY CREEK BASIN WATER QUALITY AUTHORITY

GROUND WATER PHOSPHORUS MASS BALANCE INVERNESS SITE

File Name: GW_MassBal_Inverness.cdr		Date: 02/29/2008
Project No.: 1052-05	Drawn By: VAL	Fig. No.: 7

APPENDIX A
MONITORING HOLE ACKNOWLEDGMENTS

GWS-31
05/04

NOTICE OF INTENT TO CONSTRUCT MONITORING HOLE(S)

Please type or print legibly in black ink

Colorado Division of Water Resources 1313 Sherman St-Rm 821 Denver CO 80203

Phone 303-866-3581 **Fax 303-866-3589**

RECEIVED
NOV 09 2006
WATER RESOURCES
STATE ENGINEER
COLO

Well Owner's Name CHERRY CREEK BASIN WATER QUALITY AUTH. Location: NE ¼, SW ¼, Section 26,

Landowner's Name TOWNERNESS WATER AND SANITATION Township 5 N(S) Range 67 E(W) 6TH PM

County ARAPAHOE

Subdivision N/A

Lot _____, Blk _____, Fig _____

Site/Property Address _____

Mailing Address: (Authorized Individual/or Driller)

Contact BRUCE LYTLE

Company LYTLE WATER SOLUTIONS

Address 640 PLAZA DR. #190

City, State, Zip HIGHLANDS RANCH CO 80129

Phone 303-350-4090 Fax No. 303-350-4095

Hole(s) to be Constructed: Number 5

Estimated Depth ~25 Ft. Aquifer COTTONWOOD ALLUVIAL

Purpose of Monitoring Hole(s) STUDY TO MONITOR PHOSPHORUS LOADS

Approximate Date of Construction 11/14/06

Driller Lic. No. (if applicable) LAYNE WESTERN 1355

Bruce A. Lytle

Authorized Signature

ACKNOWLEDGEMENT FROM STATE ENGINEER'S OFFICE

FOR OFFICE USE ONLY

MH- 46743

Div. 1 WD 8 BAS ____ MD ____

PROCESSED BY Brenda Hoskins

DATE ACKNOWLEDGED 11/09/06

GROUND ELEV _____ USGS MAP # _____

CONDITIONS OF MONITORING HOLE ACKNOWLEDGEMENT

A COPY OF THE WRITTEN NOTICE OR ACKNOWLEDGEMENT SHALL BE AVAILABLE AT THE DRILLING SITE.

Notice was provided to the State Engineer at least 3 days prior to construction of monitoring & observation hole(s).

Construction of the hole(s) must be completed within 60 days of the date notice was given to the State Engineer.

Testing and/or pumping shall not exceed a total of 200 hours unless prior written approval is obtained from the State Engineer.

Water diverted during testing shall not be used for beneficial purposes. The owner of the hole(s) is responsible for obtaining permit(s) and complying with all rules and regulations pertaining to the discharge of fluids produced during testing.

All work must comply with the Water Well Construction Rules, 2 CCR 402-2 Minimum construction standards must be met or a variance obtained.

Well Construction and Test Reports (GWS-31) must be submitted to this office by the licensed contractor or authorized individual within 60 days of the completion of the work.

Unless a well permit is obtained, the hole(s) must be plugged and sealed within one (1) year after construction. An Abandonment Report (form GWS-9) must be submitted within 60 days of plugging & sealing.

The owner of the hole(s) should maintain records of water quality testing and submit this data to the State Engineer upon request.

The monitoring hole number, owner's structure name, and hole owner's name and address must be provided on all well permit application(s), well construction and abandonment reports.

A monitoring hole cannot be converted to a production water well, except for purposes of remediation (recovery) or as a permanent dewatering system, if constructed in accordance with the Water Well Construction Rules and policies of the State Engineer.

THIS ACKNOWLEDGEMENT OF NOTICE DOES NOT INDICATE THAT WELL PERMIT(S) CAN BE APPROVED.

Additional Conditions _____

GWS-51
005/04

NOTICE OF INTENT TO CONSTRUCT MONITORING HOLE(S)

Please type or print legibly in black ink

Colorado Division of Water Resources 1313 Sherman St-Rm 821 Denver CO 80203
Phone 303-866-3581 Fax 303-866-3589

RECEIVED
NOV 09 2006
WATER RESOURCES STATE ENGINEER COLO

Well Owner's Name CHERRY CREEK BASIN WATER QUALITY AUTH. Location: SE ¼ NE ¼, Section 23,
Landowner's Name GREENWOOD VILLAGE. Township 5 N(S) Range 67 E(W) 6TH PM
County ARAPAHOE
Subdivision CHERRY CREEK VISTA SUB 15TH
Lot ____, Blk ____, Fig ____

Mailing Address: (Authorized Individual/or Driller)
Contact BRUCE LYTLE
Company LYTLE WATER SOLUTIONS
Address 640 PLAZA DR. #170
City, State, Zip HIGHLANDS RANCH, CO, 80129
Phone 303-350-4090 Fax No. 303-350-4095

Site/Property Address ____

Hole(s) to be Constructed: Number 9
Estimated Depth ~25 Ft. Aquifer COTTONWOOD ALLUVIAL
Purpose of Monitoring Hole(s) STUDY TO MONITOR PHOSPHORUS LOADS
Approximate Date of Construction 11/15/06

Driller Lic. No. (if applicable) 1355 LAYNE WESTERN.

Authorized Signature

ACKNOWLEDGEMENT FROM STATE ENGINEER'S OFFICE

FOR OFFICE USE ONLY

46744

MH- ____
DIV. 1 WD 8 BAS ____ MD ____

PROCESSED BY Brenda Holsinger
DATE ACKNOWLEDGED 11/09/06
GROUND ELEV ____ USGS MAP # ____

CONDITIONS OF MONITORING HOLE ACKNOWLEDGEMENT

A COPY OF THE WRITTEN NOTICE OR ACKNOWLEDGEMENT SHALL BE AVAILABLE AT THE DRILLING SITE.

Notice was provided to the State Engineer at least 3 days prior to construction of monitoring & observation hole(s).
Construction of the hole(s) must be completed within 90 days of the date notice was given to the State Engineer.
Testing and/or pumping shall not exceed a total of 200 hours unless prior written approval is obtained from the State Engineer.
Water diverted during testing shall not be used for beneficial purposes. The owner of the hole(s) is responsible for obtaining permit(s) and complying with all rules and regulations pertaining to the discharge of fluids produced during testing.
All work must comply with the Water Well Construction Rules, 2 CCR 402-2. Minimum construction standards must be met or a variance obtained.
Well Construction and Test Reports (GWS-31) must be submitted to this office by the licensed contractor or authorized individual within 60 days of the completion of the work.
Unless a well permit is obtained, the hole(s) must be plugged and sealed within one (1) year after construction. An Abandonment Report (form GWS-9) must be submitted within 60 days of plugging & sealing
The owner of the hole(s) should maintain records of water quality testing and submit this data to the State Engineer upon request.
The monitoring hole number, owner's structure name, and hole owner's name and address must be provided on all well permit application(s), well construction and abandonment reports.
A monitoring hole cannot be converted to a production water well, except for purposes of remediation (recovery) or as a permanent dewatering system, if constructed in accordance with the Water Well Construction Rules and policies of the State Engineer.
THIS ACKNOWLEDGEMENT OF NOTICE DOES NOT INDICATE THAT WELL PERMIT(S) CAN BE APPROVED.

Additional Conditions ____

APPENDIX B
SURFACE FLOW DATA AND SUMMARY FLOW STATISTICS

Table B-1
Flow Statistics for All Sites - Special Study #2

Surface Flow Statistics	Average Monthly Flow (cfs)	Maximum Instantaneous Flow (cfs)	Minimum Instantaneous Reading (cfs)	Maximum Daily Flow Reading (cfs)	Minimum Daily Flow Reading (cfs)
December 06 [1]					
Inverness Site [4]					
Trimark Site					
Cottonwood-Peoria Site					
January 07 [1]					
Inverness Site [4]					
Trimark Site					
Cottonwood-Peoria Site [2]	2.05	n/a	n/a	5.53	1.13
February 07 [3]					
Inverness Site [4]	4.27	8.90	0.00	7.99	0.00
Trimark Site	0.02	0.31	0.00	0.08	0.00
Cottonwood-Peoria Site [3]	4.20	n/a	n/a	6.46	1.75
March 07					
Inverness Site [4]	6.22	186.50	0.00	83.08	0.00
Trimark Site	0.02	0.51	0.00	0.29	0.00
Cottonwood-Peoria Site	2.80	n/a	n/a	7.66	1.23
April 07					
Inverness Site [4]	32.62	425.22	0.00	401.32	0.00
Trimark Site	0.05	1.50	0.00	1.01	0.00
Cottonwood-Peoria Site	4.70	n/a	n/a	29.45	1.18
May 07					
Inverness Site [4]	15.59	164.80	0.00	116.76	0.03
Trimark Site	0.16	1.10	0.00	0.53	0.00
Cottonwood-Peoria Site	5.09	n/a	n/a	24.71	1.44
June 07					
Inverness Site [4]	8.16	259.16	0.05	160.89	0.14
Trimark Site	0.11	1.49	0.00	0.46	0.00
Cottonwood-Peoria Site	2.07	n/a	n/a	20.68	0.78
July 07					
Inverness Site [4]	2.31	52.67	0.00	33.22	0.01
Trimark Site	0.06	0.53	0.00	0.34	0.00
Cottonwood-Peoria Site	2.39	n/a	n/a	20.28	0.64
August 07					
Inverness Site [4]	16.53	233.28	0.00	194.89	0.00
Trimark Site	0.14	1.73	0.00	0.53	0.00
Cottonwood-Peoria Site	4.19	n/a	n/a	4.15	0.45
September 07					
Inverness Site [4]	0.32	16.12	0.00	5.82	0.00
Trimark Site	0.04	0.49	0.00	0.28	0.00
Cottonwood-Peoria Site	1.79	n/a	n/a	7.11	1.04
October 07					
Inverness Site [4]	6.35	148.72	0.00	55.96	0.47
Trimark Site	0.04	0.56	0.00	0.44	0.00
Cottonwood-Peoria Site	2.67	n/a	n/a	9.93	1.00
November 07					
Inverness Site [4]	3.68	7.59	3.17	5.03	3.28
Trimark Site	0.00	0.32	0.00	0.04	0.00
Cottonwood-Peoria Site	1.09	n/a	n/a	1.46	0.96
December 07					
Inverness Site [4]	4.19	8.02	3.23	5.76	3.37
Trimark Site	0.02	0.45	0.00	0.11	0.00
Cottonwood-Peoria Site	1.23	n/a	n/a	1.77	0.86

Notes

1 No flow data are available for December and January for the Trimark and Inverness sites. The ISCOs were not installed until mid-January and data collected afterwards were lost after a malfunction of the water level data loggers.

2 Period of record is 1/1/2007 to 1/26/2007 for Cottonwood-Peoria site due to malfunction of water level probe.

3 Period of record is 2/14/2007 to 2/28/2007 for all sites due to malfunction of water level probes.

4 Flow values are estimates based on Manning's Equation. There is an unknown amount of flow interference from the trash rack located at the mouth of the culvert.

Table B-2

Daily Flow Values - Cottonwood-Peoria Site [1]

Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)
1/1/2007	1.76	3/18/2007	1.43	6/2/2007	1.44	8/17/2007	1.38	11/1/2007	1.16
1/2/2007	1.79	3/19/2007	1.40	6/3/2007	1.80	8/18/2007	2.09	11/2/2007	1.16
1/3/2007	1.97	3/20/2007	1.30	6/4/2007	1.53	8/19/2007	1.89	11/3/2007	1.10
1/4/2007	4.62	3/21/2007	1.26	6/5/2007	1.56	8/20/2007	1.70	11/4/2007	1.09
1/5/2007	5.53	3/22/2007	1.23	6/6/2007	1.36	8/21/2007	1.13	11/5/2007	1.08
1/6/2007	3.23	3/23/2007	1.24	6/7/2007	1.16	8/22/2007	2.04	11/6/2007	1.06
1/7/2007	2.20	3/24/2007	7.55	6/8/2007	1.28	8/23/2007	7.15	11/7/2007	1.05
1/8/2007	2.02	3/25/2007	7.66	6/9/2007	1.31	8/24/2007	7.07	11/8/2007	1.06
1/9/2007	2.45	3/26/2007	3.88	6/10/2007	1.14	8/25/2007	3.14	11/9/2007	1.08
1/10/2007	2.61	3/27/2007	1.95	8/11/2007	1.10	8/26/2007	1.53	11/10/2007	1.07
1/11/2007	3.57	3/28/2007	1.54	6/12/2007	5.29	8/27/2007	1.23	11/11/2007	1.03
1/12/2007	1.91	3/29/2007	5.70	6/13/2007	20.68	8/28/2007	1.27	11/12/2007	1.00
1/13/2007	1.45	3/30/2007	5.96	6/14/2007	4.98	8/29/2007	1.21	11/13/2007	1.40
1/14/2007	1.41	3/31/2007	3.59	6/15/2007	1.83	8/30/2007	1.13	11/14/2007	1.11
1/15/2007	1.25	4/1/2007	1.93	6/16/2007	1.39	8/31/2007	1.01	11/15/2007	0.99
1/16/2007	1.24	4/2/2007	1.55	6/17/2007	1.05	9/1/2007	1.05	11/16/2007	1.02
1/17/2007	1.43	4/3/2007	1.45	6/18/2007	0.95	9/2/2007	1.54	11/17/2007	1.02
1/18/2007	1.37	4/4/2007	1.27	6/19/2007	0.88	9/3/2007	5.13	11/18/2007	0.99
1/19/2007	1.22	4/5/2007	1.27	6/20/2007	0.84	9/4/2007	1.78	11/19/2007	1.08
1/20/2007	1.13	4/6/2007	1.52	6/21/2007	0.88	9/5/2007	2.02	11/20/2007	1.16
1/21/2007	1.19	4/7/2007	1.44	6/22/2007	0.99	9/6/2007	7.11	11/21/2007	1.46
1/22/2007	1.20	4/8/2007	2.20	6/23/2007	0.86	9/7/2007	2.12	11/22/2007	1.29
1/23/2007	1.45	4/9/2007	3.09	6/24/2007	0.80	9/8/2007	1.36	11/23/2007	1.08
1/24/2007	1.68	4/10/2007	2.15	6/25/2007	0.76	9/9/2007	1.24	11/24/2007	0.98
1/25/2007	2.04	4/11/2007	1.45	6/26/2007	0.78	9/10/2007	1.89	11/25/2007	1.01
1/26/2007	2.43	4/12/2007	1.27	6/27/2007	1.00	9/11/2007	1.79	11/26/2007	1.04
1/27/2007	2.34	4/13/2007	1.26	6/28/2007	1.03	9/12/2007	1.42	11/27/2007	0.99
1/28/2007	2.01	4/14/2007	1.18	6/29/2007	0.93	9/13/2007	1.28	11/28/2007	1.05
1/29/2007	1.81	4/15/2007	1.28	6/30/2007	0.98	9/14/2007	1.26	11/29/2007	1.00
1/30/2007	1.71	4/16/2007	1.28	7/1/2007	0.86	9/15/2007	1.21	11/30/2007	0.96
1/31/2007	1.68	4/17/2007	6.60	7/2/2007	0.78	9/16/2007	1.17	12/1/2007	0.97
2/1/2007	1.79	4/18/2007	3.49	7/3/2007	0.73	9/17/2007	2.67	12/2/2007	0.95
2/2/2007	4.18	4/19/2007	1.83	7/4/2007	0.64	9/18/2007	2.43	12/3/2007	0.95
2/3/2007	2.41	4/20/2007	1.69	7/5/2007	0.70	9/19/2007	1.90	12/4/2007	0.95
2/4/2007	1.75	4/21/2007	2.09	7/6/2007	0.76	9/20/2007	1.19	12/5/2007	0.86
2/5/2007	1.90	4/22/2007	1.52	7/7/2007	0.81	9/21/2007	1.04	12/6/2007	1.52
2/6/2007	2.62	4/23/2007	1.66	7/8/2007	0.87	9/22/2007	1.12	12/7/2007	1.12
2/7/2007	6.29	4/24/2007	23.58	7/9/2007	0.93	9/23/2007	1.12	12/8/2007	1.02
2/8/2007	6.46	4/25/2007	29.45	7/10/2007	1.00	9/24/2007	1.23	12/9/2007	1.19
2/9/2007	5.56	4/26/2007	24.05	7/11/2007	0.97	9/25/2007	1.48	12/10/2007	1.55
2/10/2007	4.84	4/27/2007	7.70	7/12/2007	1.04	9/26/2007	1.30	12/11/2007	1.55
2/11/2007	5.87	4/28/2007	5.41	7/13/2007	1.10	9/27/2007	1.25	12/12/2007	1.55
2/12/2007	5.50	4/29/2007	3.61	7/14/2007	0.97	9/28/2007	1.16	12/13/2007	1.77
2/13/2007	5.58	4/30/2007	2.68	7/15/2007	0.68	9/29/2007	1.12		
2/14/2007	3.63	5/1/2007	2.11	7/16/2007	0.88	9/30/2007	1.35		
2/15/2007	3.27	5/2/2007	2.55	7/17/2007	0.89	10/1/2007	1.26		
2/16/2007	3.57	5/3/2007	2.79	7/18/2007	0.82	10/2/2007	1.21		
2/17/2007	3.69	5/4/2007	2.17	7/19/2007	1.59	10/3/2007	1.25		
2/18/2007	3.46	5/5/2007	5.03	7/20/2007	1.60	10/4/2007	1.15		
2/19/2007	4.47	5/6/2007	7.43	7/21/2007	2.05	10/5/2007	1.10		
2/20/2007	5.38	5/7/2007	6.26	7/22/2007	7.17	10/6/2007	1.00		
2/21/2007	5.65	5/8/2007	3.80	7/23/2007	2.48	10/7/2007	1.03		
2/22/2007	4.96	5/9/2007	2.08	7/24/2007	1.24	10/8/2007	1.43		
2/23/2007	4.23	5/10/2007	1.78	7/25/2007	1.53	10/9/2007	1.12		
2/24/2007	6.10	5/11/2007	1.57	7/26/2007	5.31	10/10/2007	1.10		
2/25/2007	5.82	5/12/2007	1.53	7/27/2007	6.57	10/11/2007	1.07		
2/26/2007	3.20	5/13/2007	1.48	7/28/2007	20.28	10/12/2007	1.19		
2/27/2007	2.57	5/14/2007	2.19	7/29/2007	5.33	10/13/2007	1.61		
2/28/2007	2.88	5/15/2007	24.71	7/30/2007	1.92	10/14/2007	7.45		
3/1/2007	3.45	5/16/2007	5.36	7/31/2007	1.38	10/15/2007	7.57		
3/2/2007	2.59	5/17/2007	2.32	8/1/2007	1.50	10/16/2007	3.73		
3/3/2007	1.97	5/18/2007	1.82	8/2/2007	23.33	10/17/2007	2.52		
3/4/2007	1.86	5/19/2007	1.54	8/3/2007	5.32	10/18/2007	1.31		
3/5/2007	2.01	5/20/2007	1.61	8/4/2007	7.15	10/19/2007	1.46		
3/6/2007	2.06	5/21/2007	1.44	8/5/2007	5.78	10/20/2007	1.53		
3/7/2007	1.98	5/22/2007	6.15	8/6/2007	27.87	10/21/2007	7.71		
3/8/2007	1.87	5/23/2007	24.31	8/7/2007	7.70	10/22/2007	9.93		
3/9/2007	1.77	5/24/2007	22.00	8/8/2007	5.38	10/23/2007	6.32		
3/10/2007	2.20	5/25/2007	6.24	8/9/2007	2.41	10/24/2007	5.65		
3/11/2007	7.17	5/26/2007	2.51	8/10/2007	1.53	10/25/2007	3.40		
3/12/2007	4.02	5/27/2007	1.87	8/11/2007	1.20	10/26/2007	1.98		
3/13/2007	2.11	5/28/2007	1.65	8/12/2007	1.03	10/27/2007	1.68		
3/14/2007	1.66	5/29/2007	3.18	8/13/2007	1.01	10/28/2007	1.38		
3/15/2007	1.55	5/30/2007	6.27	8/14/2007	1.06	10/29/2007	1.27		
3/16/2007	1.44	5/31/2007	2.09	8/15/2007	1.52	10/30/2007	1.22		
3/17/2007	1.42	6/1/2007	1.53	8/16/2007	1.30	10/31/2007	1.17		

1) ISCO sampler located downgradient of Cottonwood-Peoria pond.

Table B-3

Daily Flow Values - Trimark Site [1] [2]

Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)
2/14/2007	0.00	5/1/2007	0.00	7/16/2007	0.01	9/30/2007	0.16
2/15/2007	0.01	5/2/2007	0.00	7/17/2007	0.07	10/1/2007	0.00
2/16/2007	0.05	5/3/2007	0.00	7/18/2007	0.00	10/2/2007	0.00
2/17/2007	0.00	5/4/2007	0.04	7/19/2007	0.02	10/3/2007	0.01
2/18/2007	0.03	5/5/2007	0.10	7/20/2007	0.06	10/4/2007	0.08
2/19/2007	0.02	5/6/2007	0.20	7/21/2007	0.21	10/16/2007	0.00
2/20/2007	0.04	5/7/2007	0.08	7/22/2007	0.22	10/17/2007	0.04
2/21/2007	0.01	5/8/2007	0.01	7/23/2007	0.00	10/18/2007	0.00
2/22/2007	0.00	5/9/2007	0.02	7/24/2007	0.03	10/19/2007	0.00
2/23/2007	0.00	5/10/2007	0.01	7/25/2007	0.12	10/20/2007	0.03
2/24/2007	0.08	5/11/2007	0.11	7/26/2007	0.26	10/21/2007	0.44
2/25/2007	0.00	5/12/2007	0.02	7/27/2007	0.14	10/22/2007	0.15
2/26/2007	0.00	5/13/2007	0.07	7/28/2007	0.34	10/23/2007	0.05
2/27/2007	0.00	5/14/2007	0.15	7/29/2007	0.06	10/24/2007	0.00
2/28/2007	0.03	5/15/2007	0.47	7/30/2007	0.05	10/25/2007	0.00
3/1/2007	0.02	5/16/2007	0.24	7/31/2007	0.06	10/26/2007	0.00
3/2/2007	0.00	5/17/2007	0.03	8/1/2007	0.05	10/27/2007	0.00
3/3/2007	0.00	5/18/2007	0.22	8/2/2007	0.20	10/28/2007	0.00
3/4/2007	0.00	5/19/2007	0.17	8/3/2007	0.15	10/29/2007	0.00
3/5/2007	0.00	5/20/2007	0.29	8/4/2007	0.41	10/30/2007	0.00
3/6/2007	0.00	5/21/2007	0.07	8/5/2007	0.31	10/31/2007	0.00
3/7/2007	0.00	5/22/2007	0.32	8/6/2007	0.53	11/1/2007	0.04
3/8/2007	0.01	5/23/2007	0.53	8/7/2007	0.07	11/2/2007	0.00
3/9/2007	0.00	5/24/2007	0.46	8/8/2007	0.07	11/3/2007	0.00
3/10/2007	0.11	5/25/2007	0.14	8/9/2007	0.10	11/4/2007	0.00
3/11/2007	0.08	5/26/2007	0.13	8/10/2007	0.00	11/5/2007	0.01
3/12/2007	0.00	5/27/2007	0.15	8/11/2007	0.06	11/6/2007	0.00
3/13/2007	0.00	5/28/2007	0.02	8/12/2007	0.04	11/7/2007	0.00
3/14/2007	0.00	5/29/2007	0.24	8/13/2007	0.00	11/8/2007	0.00
3/15/2007	0.00	5/30/2007	0.44	8/14/2007	0.01	11/9/2007	0.00
3/16/2007	0.00	5/31/2007	0.09	8/15/2007	0.07	11/10/2007	0.00
3/17/2007	0.00	6/1/2007	0.12	8/16/2007	0.09	11/11/2007	0.00
3/18/2007	0.00	6/2/2007	0.05	8/17/2007	0.10	11/12/2007	0.01
3/19/2007	0.00	6/3/2007	0.44	8/18/2007	0.13	11/13/2007	0.00
3/20/2007	0.00	6/4/2007	0.46	8/19/2007	0.24	11/14/2007	0.00
3/21/2007	0.00	6/5/2007	0.16	8/20/2007	0.06	11/15/2007	0.00
3/22/2007	0.00	6/6/2007	0.17	8/21/2007	0.00	11/16/2007	0.00
3/23/2007	0.00	6/7/2007	0.00	8/22/2007	0.16	11/17/2007	0.00
3/24/2007	0.29	6/8/2007	0.01	8/23/2007	0.26	11/18/2007	0.00
3/25/2007	0.00	6/9/2007	0.02	8/24/2007	0.35	11/19/2007	0.00
3/26/2007	0.00	6/10/2007	0.03	8/25/2007	0.22	11/20/2007	0.00
3/27/2007	0.00	6/11/2007	0.01	8/26/2007	0.22	11/21/2007	0.00
3/28/2007	0.00	6/12/2007	0.35	8/27/2007	0.00	11/22/2007	0.00
3/29/2007	0.16	6/13/2007	0.38	8/28/2007	0.01	11/23/2007	0.00
3/30/2007	0.00	6/14/2007	0.04	8/29/2007	0.09	11/24/2007	0.00
3/31/2007	0.00	6/15/2007	0.03	8/30/2007	0.22	11/25/2007	0.00
4/1/2007	0.00	6/16/2007	0.03	8/31/2007	0.00	11/26/2007	0.00
4/2/2007	0.00	6/17/2007	0.04	9/1/2007	0.00	11/27/2007	0.00
4/3/2007	0.00	6/18/2007	0.01	9/2/2007	0.03	11/28/2007	0.00
4/4/2007	0.00	6/19/2007	0.03	9/3/2007	0.00	11/29/2007	0.00
4/5/2007	0.00	6/20/2007	0.01	9/4/2007	0.00	11/30/2007	0.00
4/6/2007	0.00	6/21/2007	0.02	9/5/2007	0.14	12/1/2007	0.00
4/7/2007	0.00	6/22/2007	0.05	9/6/2007	0.11	12/2/2007	0.01
4/8/2007	0.06	6/23/2007	0.12	9/7/2007	0.04	12/3/2007	0.11
4/9/2007	0.00	6/24/2007	0.16	9/8/2007	0.00	12/4/2007	0.03
4/10/2007	0.01	6/25/2007	0.15	9/9/2007	0.02	12/5/2007	0.00
4/11/2007	0.00	6/26/2007	0.19	9/10/2007	0.01	12/6/2007	0.02
4/12/2007	0.00	6/27/2007	0.17	9/11/2007	0.00	12/7/2007	0.08
4/13/2007	0.00	6/28/2007	0.11	9/12/2007	0.04	12/8/2007	0.00
4/14/2007	0.00	6/29/2007	0.02	9/13/2007	0.04	12/9/2007	0.00
4/15/2007	0.00	6/30/2007	0.06	9/14/2007	0.03	12/10/2007	0.00
4/16/2007	0.04	7/1/2007	0.07	9/15/2007	0.00	12/11/2007	0.00
4/17/2007	0.12	7/2/2007	0.04	9/16/2007	0.03	12/12/2007	0.00
4/18/2007	0.00	7/3/2007	0.01	9/17/2007	0.14	12/13/2007	0.00
4/19/2007	0.00	7/4/2007	0.00	9/18/2007	0.01		
4/20/2007	0.00	7/5/2007	0.01	9/19/2007	0.06		
4/21/2007	0.00	7/6/2007	0.00	9/20/2007	0.00		
4/22/2007	0.00	7/7/2007	0.00	9/21/2007	0.00		
4/23/2007	0.00	7/8/2007	0.02	9/22/2007	0.04		
4/24/2007	1.01	7/9/2007	0.03	9/23/2007	0.00		
4/25/2007	0.40	7/10/2007	0.02	9/24/2007	0.00		
4/26/2007	0.00	7/11/2007	0.00	9/25/2007	0.01		
4/27/2007	0.00	7/12/2007	0.03	9/26/2007	0.05		
4/28/2007	0.00	7/13/2007	0.04	9/27/2007	0.00		
4/29/2007	0.00	7/14/2007	0.04	9/28/2007	0.00		
4/30/2007	0.00	7/15/2007	0.04	9/29/2007	0.28		

1) Flow data were not available between 10/5/07 and 10/15/07
2) ISCO sampler located downgradient of Trimark pond.

Table B-4

Daily Flow Values - Inverness Site [1] [2]

Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)	Date	Flow (cfs)
2/14/2007	6.76	5/1/2007	0.23	7/16/2007	0.28	10/3/2007	0.31
2/15/2007	6.25	5/2/2007	0.24	7/17/2007	0.23	10/4/2007	0.39
2/16/2007	6.32	5/3/2007	0.23	7/18/2007	0.20	10/5/2007	0.34
2/17/2007	7.28	5/4/2007	0.39	7/19/2007	0.41	10/6/2007	0.19
2/18/2007	6.40	5/5/2007	0.58	7/20/2007	0.35	10/7/2007	0.28
2/19/2007	7.55	5/6/2007	18.32	7/21/2007	2.05	10/8/2007	0.46
2/20/2007	7.99	5/7/2007	9.88	7/22/2007	10.20	10/9/2007	0.42
2/21/2007	5.76	5/8/2007	2.05	7/23/2007	0.25	10/10/2007	0.47
2/22/2007	7.04	5/9/2007	0.10	7/24/2007	0.28	10/11/2007	0.57
2/23/2007	1.79	5/10/2007	0.19	7/25/2007	0.33	10/12/2007	0.50
2/24/2007	0.41	5/11/2007	0.18	7/26/2007	3.74	10/13/2007	0.76
2/25/2007	0.27	5/12/2007	0.17	7/27/2007	10.94	10/14/2007	7.15
2/26/2007	0.00	5/13/2007	0.22	7/28/2007	33.22	10/15/2007	9.88
2/27/2007	0.00	5/14/2007	1.32	7/29/2007	3.14	10/16/2007	2.19
2/28/2007	0.00	5/15/2007	116.76	7/30/2007	0.01	10/17/2007	4.43
3/1/2007	0.00	5/16/2007	31.43	7/31/2007	0.02	10/18/2007	4.36
3/2/2007	0.03	5/17/2007	2.76	8/1/2007	0.74	10/19/2007	4.08
3/3/2007	0.03	5/18/2007	0.08	8/2/2007	160.27	10/20/2007	4.15
3/4/2007	0.00	5/19/2007	0.08	8/6/2007	194.89	10/21/2007	55.96
3/5/2007	0.00	5/20/2007	0.10	8/7/2007	85.94	10/22/2007	49.29
3/6/2007	0.02	5/21/2007	0.07	8/8/2007	14.10	10/23/2007	15.33
3/7/2007	0.62	5/22/2007	39.05	8/9/2007	0.98	10/24/2007	8.73
3/8/2007	1.78	5/23/2007	98.50	8/10/2007	0.01	10/25/2007	4.34
3/9/2007	1.24	5/24/2007	111.95	8/11/2007	0.01	10/26/2007	3.86
3/10/2007	0.01	5/25/2007	18.25	8/12/2007	0.01	10/27/2007	3.62
3/11/2007	6.47	5/26/2007	0.92	8/13/2007	0.01	10/28/2007	3.55
3/12/2007	0.00	5/27/2007	0.03	8/14/2007	0.03	10/29/2007	3.62
3/13/2007	0.03	5/28/2007	0.23	8/15/2007	0.06	10/30/2007	3.70
3/14/2007	0.21	5/29/2007	9.92	8/16/2007	0.01	10/31/2007	3.60
3/15/2007	0.15	5/30/2007	18.32	8/17/2007	0.06	11/1/2007	3.52
3/16/2007	0.10	5/31/2007	0.67	8/18/2007	0.09	11/2/2007	3.61
3/17/2007	0.11	6/1/2007	0.14	8/19/2007	0.05	11/3/2007	3.56
3/18/2007	0.18	6/2/2007	0.26	8/20/2007	0.06	11/4/2007	3.54
3/19/2007	0.12	6/3/2007	0.52	8/21/2007	0.02	11/5/2007	3.47
3/20/2007	0.11	6/4/2007	0.41	8/22/2007	24.84	11/6/2007	3.37
3/21/2007	0.04	6/5/2007	0.45	6/23/2007	117.23	11/7/2007	3.28
3/22/2007	0.05	6/6/2007	0.59	8/24/2007	4.49	11/8/2007	3.45
3/23/2007	0.08	6/7/2007	0.46	8/25/2007	0.03	11/9/2007	3.39
3/24/2007	75.05	6/8/2007	0.39	8/26/2007	0.06	11/10/2007	3.43
3/25/2007	83.08	6/9/2007	0.36	8/27/2007	0.00	11/11/2007	3.49
3/26/2007	8.09	6/10/2007	0.37	8/28/2007	0.03	11/12/2007	3.53
3/27/2007	0.21	6/11/2007	0.36	8/29/2007	0.00	11/13/2007	3.61
3/28/2007	0.12	6/12/2007	45.54	8/30/2007	0.00	11/14/2007	3.48
3/29/2007	7.30	6/13/2007	160.89	8/31/2007	0.00	11/15/2007	3.42
3/30/2007	6.55	6/14/2007	25.31	9/1/2007	0.00	11/16/2007	3.60
3/31/2007	0.95	6/15/2007	2.32	9/2/2007	0.16	11/17/2007	3.66
4/1/2007	0.05	6/16/2007	0.24	9/3/2007	0.28	11/18/2007	3.68
4/2/2007	0.01	6/17/2007	0.20	9/4/2007	0.10	11/19/2007	3.65
4/3/2007	0.00	6/18/2007	0.27	9/5/2007	0.42	11/20/2007	3.55
4/4/2007	0.00	6/19/2007	0.24	9/6/2007	5.82	11/21/2007	4.28
4/5/2007	0.03	6/20/2007	0.22	9/7/2007	0.10	11/22/2007	3.85
4/6/2007	0.16	6/21/2007	0.19	9/8/2007	0.04	11/23/2007	3.83
4/7/2007	0.16	6/22/2007	0.26	9/9/2007	0.06	11/24/2007	5.03
4/8/2007	0.28	6/23/2007	0.35	9/10/2007	0.10	11/25/2007	3.67
4/9/2007	0.31	6/24/2007	0.47	9/11/2007	0.10	11/26/2007	3.65
4/10/2007	0.34	6/25/2007	0.52	9/12/2007	0.07	11/27/2007	3.63
4/11/2007	0.08	6/26/2007	0.69	9/13/2007	0.06	11/28/2007	3.84
4/12/2007	0.07	6/27/2007	0.81	9/14/2007	0.10	11/29/2007	4.01
4/13/2007	0.03	6/28/2007	0.77	9/15/2007	0.16	11/30/2007	4.30
4/14/2007	0.15	6/29/2007	0.61	9/16/2007	0.16	12/1/2007	5.01
4/15/2007	0.20	6/30/2007	0.51	9/17/2007	0.17	12/2/2007	5.76
4/16/2007	0.26	7/1/2007	0.55	9/18/2007	0.14	12/3/2007	3.52
4/17/2007	11.69	7/2/2007	0.52	9/19/2007	0.10	12/4/2007	3.39
4/18/2007	2.15	7/3/2007	0.28	9/20/2007	0.06	12/5/2007	3.37
4/19/2007	0.04	7/4/2007	0.24	9/21/2007	0.07	12/6/2007	4.04
4/20/2007	0.28	7/5/2007	0.46	9/22/2007	0.09	12/7/2007	4.16
4/21/2007	0.09	7/6/2007	0.18	9/23/2007	0.09	12/8/2007	3.91
4/22/2007	0.08	7/7/2007	0.75	9/24/2007	0.11	12/9/2007	4.70
4/23/2007	0.10	7/8/2007	0.75	9/25/2007	0.14	12/10/2007	4.85
4/24/2007	259.94	7/9/2007	0.53	9/26/2007	0.20	12/11/2007	4.78
4/25/2007	401.32	7/10/2007	0.33	9/27/2007	0.18	12/12/2007	4.74
4/26/2007	218.44	7/11/2007	0.34	9/28/2007	0.19	12/13/2007	4.48
4/27/2007	67.69	7/12/2007	0.35	9/29/2007	0.15		
4/28/2007	13.08	7/13/2007	0.41	9/30/2007	0.24		
4/29/2007	1.46	7/14/2007	0.20	10/1/2007	0.23		
4/30/2007	0.12	7/15/2007	0.22	10/2/2007	0.28		

1) Flow data were not available between 8/3/07 and 8/5/07

2) ISCO sampler located upgradient of Inverness pond.

APPENDIX C
WATER QUALITY SUMMARY TABLES

Table C-1
Water Quality Summary - Cottonwood-Peoria Site

Sample:	Ground Water Samples					Surface Water Samples						
	Flow (cfs) [6]	Concentration		Load (lbs/mo)		Flow	Concentration (µg/L)			Load (lbs/mo)		
		TP [1]	SRP[2]	TP [1]	SRP[2]	(cfs)[4]	TP [1]	SRP[2]	TDP[3]	TP [1]	SRP[2]	TDP[3]
December 06												
Up Gradient	0.011	370	11	0.68	0.02	N/A	37	7	4	N/F	N/F	N/F
Down Gradient	0.010	26	21.5	0.04	0.04	N/A	43	9	5	N/F	N/F	N/F
Delta[5]	-0.001	-344	10.5	**-0.64**	0.02	N/A	6	2	1	N/F	N/F	N/F
January 07												
Up Gradient	0.015	820	8	2.06	0.02	2.16	30	10	23	10.8	3.6	8.3
Down Gradient	0.015	728	21	1.83	0.05	2.05	44	9	14	15.1	3.1	4.8
Delta[5]	0	-92	13	**-0.23**	**0.03**	-0.110	14	-1	-9	**4.2**	**-0.5**	**-3.5**
February 07												
Up Gradient	0.014	261	9	0.55	0.02	4.68	32	7	10	25.0	5.5	7.8
Down Gradient	0.014	18	19	0.04	0.04	4.20	37	4	12	26.0	2.8	8.4
Delta[5]	0	-243	10	**-0.51**	**0.02**	-0.480	5	-3	2	**0.9**	**-2.7**	**0.6**
March 07												
Up Gradient	0.014	123	10	0.29	0.02	3.63	34	17	16	20.6	10.3	9.7
Down Gradient	0.014	19.5	18	0.05	0.04	2.80	36	9	16	16.9	4.2	7.5
Delta[5]	0	-103.5	8	**-0.24**	**0.02**	-0.830	2	-8	0	**-3.8**	**-6.1**	**-2.2**
April 07												
Up Gradient	0.011	59	22	0.11	0.04	5.31	83	17	27	73.7	15.1	24.0
Down Gradient	0.010	22	17.5	0.04	0.03	4.70	69	15	34	54.2	11.8	26.7
Delta[5]	-0.001	-37	-4.5	**-0.07**	**-0.01**	-0.610	-14	-2	7	**-19.5**	**-3.3**	**2.7**
May 07												
Up Gradient	0.014	27	13	0.06	0.03	5.08	71	25	36	60.3	21.2	30.6
Down Gradient	0.014	29	19	0.07	0.04	5.09	74	17	25	63.0	14.5	21.3
Delta[5]	0	2	6	**0.005**	**0.01**	0.010	3	-8	-11	**2.7**	**-6.8**	**-9.3**
June 07												
Up Gradient	0.017	18	13	0.05	0.04	2.27	128	40	47	48.6	15.2	17.8
Down Gradient	0.018	21.5	19.5	0.06	0.06	2.07	69	21	30	23.9	7.3	10.4
Delta[5]	0.001	3.5	6.5	0.01	**0.02**	-0.200	-59	-19	-17	**-24.7**	**-7.9**	**-7.5**
July 07												
Up Gradient	0.012	91	12	0.18	0.02	2.85	201	72	86	95.8	34.3	41.0
Down Gradient	0.012	25	21	0.05	0.04	2.39	225	67	81	89.9	26.8	32.4
Delta[5]	0	-66	9	**-0.13**	**0.02**	-0.460	24	-5	-5	**-5.9**	**-7.5**	**-8.6**
August 07												
Up Gradient	0.015	30	9	0.08	0.02	4.39	79	31	49	58.0	22.8	36.0
Down Gradient	0.015	21.5	20	0.05	0.05	4.19	64	22	31	44.8	15.4	21.7
Delta[5]	0	-8.5	11	**-0.02**	**0.03**	-0.200	-15	-9	-18	**-13.2**	**-7.3**	**-14.3**
September 07												
Up Gradient	0.016	51	12	0.13	0.03	2.08	46	18	30	16.0	6.3	10.4
Down Gradient	0.017	25	23.5	0.07	0.06	1.79	51	11	17	15.3	3.3	5.1
Delta[5]	0.001	-26	11.5	**-0.06**	**0.03**	-0.290	5	-7	-13	**-0.7**	**-3.0**	**-5.3**
October 07												
Up Gradient	0.016	15	8	0.04	0.02	3.34	28	10	14	15.6	5.6	7.8
Down Gradient	0.017	23.5	16.5	0.07	0.05	2.67	40	8	14	17.9	3.6	6.3
Delta[5]	0.001	8.5	8.5	**0.03**	**0.03**	-0.670	12	-2	0	**2.2**	**-2.0**	**-1.6**
November 07												
Up Gradient	0.016	15	10	0.04	0.03	1.32	15	4	11	3.3	0.9	2.4
Down Gradient	0.016	20	21	0.05	0.05	1.09	11	6	6	2.0	1.1	1.1
Delta[5]	0	5	11	0.01	**0.03**	-0.230	-4	2	-5	**-1.3**	**0.2**	**-1.3**

Notes:

1) TP = Total phosphorus.
2) SRP = Soluble reactive phosphorus or orthophosphate.
3) TDP = Total dissolved phosphorus
4) Flows were unavailable during Dec due to ISCO malfunction caused by extreme cold.
5) A negative value indicates a decrease from the upgradient to downgradient values. i.e. downgradient - upgradient.
6) Flows during Feb and Mar are represented by monthly average values.

Table C-2

Field Parameters - Cottonwood-Peoria Site 1 (Up Gradient)

Date	Time	pH	Temp (°C)	Cond (ms/cm)
12/27/2006	14:05	7.09	13.0	1.90
12/27/2006	14:07	7.19	12.4	1.92
12/27/2006	14:08	7.20	12.1	1.91
12/27/2006	14:09	7.21	12.2	1.91
1/25/2007	13:05	7.34	11.8	2.01
1/25/2007	13:06	7.33	12.0	2.00
1/25/2007	13:08	7.31	12.1	2.02
2/28/2007	12:40	7.31	10.9	2.00
2/28/2007	12:42	7.33	10.7	2.10
2/28/2007	12:43	7.30	11.0	2.09
2/28/2007	12:45	7.32	11.0	2.10
3/27/2007	12:10	7.21	12.4	2.07
3/27/2007	12:11	7.23	12.6	2.07
3/27/2007	12:12	7.22	12.4	2.07
3/27/2007	12:13	7.22	12.4	2.07
5/2/2007	9:18	7.12	12.9	1.85
5/2/2007	9:27	7.17	13.1	1.87
5/2/2007	9:28	7.15	12.8	1.87
5/2/2007	9:29	7.16	12.6	1.88
6/6/2007	9:43	7.13	14.3	1.93
6/6/2007	9:44	7.11	13.9	1.93
6/6/2007	9:45	7.12	13.6	1.94
7/2/2007	10:40	7.07	18.0	2.03
7/2/2007	10:42	7.12	15.5	1.96
7/2/2007	10:44	7.14	14.4	1.95
7/2/2007	10:46	7.20	14.8	1.96
7/27/2007	10:54	7.21	14.2	1.95
7/27/2007	10:55	7.25	13.9	1.94
7/27/2007	10:57	7.27	14.2	1.96
9/5/2007	1:50	7.24	15.1	1.92
9/5/2007	1:52	7.20	14.9	1.92
9/5/2007	1:55	7.19	14.1	1.92
9/5/2007	1:57	7.19	14.0	1.92
10/10/2007	11:59	8.01	14.1	2.11
10/10/2007	12:01	7.99	13.2	2.08
10/10/2007	12:02	7.98	12.9	2.05
11/16/2007	12:03	6.27	14.3	2.24
11/16/2007	12:04	6.21	14.0	2.24
11/16/2007	12:07	6.21	14.2	2.25
12/10/2007	1:03	6.29	11.5	2.32
12/10/2007	1:04	6.28	11.8	2.31
12/10/2007	1:06	6.29	11.9	2.31

Table C-3

Field Parameters - Cottonwood-Peoria Site 3 (Down Gradient)

Date	Time	pH	Temp (°C)	Cond (ms/cm)
12/27/2006	14:51	7.26	10.5	2.06
12/27/2006	14:53	7.25	10.8	2.08
12/27/2006	14:54	7.23	11.2	2.06
12/27/2006	14:55	7.21	11.2	2.07
1/31/2007	12:00	7.15	8.2	2.31
1/31/2007	12:03	7.26	7.6	2.20
1/31/2007	12:04	7.23	8.3	2.20
1/31/2007	12:05	7.23	8.4	2.19
1/31/2007	12:06	7.22	8.7	2.18
2/28/2007	11:50	7.20	7.1	2.45
2/28/2007	11:51	7.22	7.2	2.44
2/28/2007	11:52	7.24	7.4	2.41
2/28/2007	11:53	7.25	7.3	2.44
3/27/2007	12:45	7.27	7.2	2.02
3/27/2007	12:46	7.28	7.1	2.02
3/27/2007	12:47	7.30	7.1	2.03
3/27/2007	12:48	7.31	7.1	2.03
3/27/2007	12:49	7.31	7.1	2.02
5/2/2007	9:57	7.15	8.7	2.17
5/2/2007	9:58	7.17	8.5	2.17
5/2/2007	9:59	7.18	8.4	2.17
6/6/2007	10:30	7.03	10.4	2.44
6/6/2007	10:31	7.04	10.2	2.45
6/6/2007	10:32	7.05	10.1	2.45
7/2/2007	11:40	7.04	12.2	2.52
7/2/2007	11:41	7.09	11.9	2.54
7/2/2007	11:42	7.10	11.8	2.53
7/27/2007	10:17	7.20	13.6	2.36
7/27/2007	10:19	7.22	13.4	2.37
7/27/2007	10:20	7.21	13.3	2.36
9/5/2007	12:50	7.28	15.6	1.90
9/5/2007	12:52	7.22	15.6	1.90
9/5/2007	12:53	7.18	15.3	1.89
9/5/2007	12:55	7.16	15.2	1.90
10/10/2007	11:00	7.56	15.5	1.92
10/10/2007	11:02	7.60	15.2	1.91
10/10/2007	11:03	7.64	15.0	1.90
10/10/2007	11:04	7.68	15.0	1.90
11/16/2007	11:02	6.27	14.2	1.86
11/16/2007	11:04	6.24	14.4	1.86
11/16/2007	11:06	6.22	14.4	1.86
12/10/2007	11:54	6.40	12.6	1.92
12/10/2007	11:55	6.37	12.6	1.93
12/10/2007	11:56	6.36	12.7	1.94

Table C-4

Field Parameters - Cottonwood-Peoria Site 4 (Down Gradient)

Date	Time	pH	Temp (°C)	Cond (ms/cm)
12/27/2006	14:32	7.12	5.9	2.11
12/27/2006	14:34	7.20	9.9	2.15
12/27/2006	14:36	7.24	10.1	2.15
12/27/2006	14:37	7.23	10.1	2.15
12/27/2006	14:38	7.28	9.5	2.15
1/31/2007	12:15	7.31	7.1	2.33
1/31/2007	12:17	7.33	7.6	2.33
1/31/2007	12:19	7.32	7.1	2.33
1/31/2007	12:20	7.33	7.5	2.34
1/31/2007	12:21	7.32	7.7	2.33
2/28/2007	11:20	7.24	6.4	2.55
2/28/2007	11:21	7.27	6.4	2.55
2/28/2007	11:22	7.28	6.5	2.54
2/28/2007	11:23	7.30	6.4	2.54
3/27/2007	12:30	6.83	7.5	2.68
3/27/2007	12:32	7.23	7.3	2.68
3/27/2007	12:33	7.22	7.1	2.68
3/27/2007	12:35	7.22	7.0	2.68
3/27/2007	12:36	7.22	7.1	2.68
5/2/2007	10:15	7.18	9.3	2.66
5/2/2007	10:16	7.19	9.1	2.65
5/2/2007	10:17	7.19	9.0	2.64
6/6/2007	10:06	7.05	11.1	2.49
6/6/2007	10:07	7.09	11.2	2.51
6/6/2007	10:08	7.10	11.2	2.48
7/2/2007	11:15	7.09	12.9	2.34
7/2/2007	11:16	7.14	12.8	2.38
7/2/2007	11:17	7.16	12.8	2.33
7/27/2007	10:05	7.08	15.1	2.19
7/27/2007	10:06	7.14	15.1	2.20
7/27/2007	10:07	7.20	15.1	2.19
7/27/2007	10:08	7.23	15.1	2.20
9/5/2007	1:08	7.16	16.6	2.11
9/5/2007	1:10	7.14	16.6	2.11
9/5/2007	1:11	7.13	16.5	2.11
10/10/2007	11:28	7.80	16.6	2.08
10/10/2007	11:29	7.80	15.9	2.05
10/10/2007	11:30	7.83	15.8	2.05
11/16/2007	11:22	6.30	13.9	2.05
11/16/2007	11:24	6.26	14.0	2.05
11/16/2007	11:26	6.28	14.0	2.04
12/10/2007	12:17	6.46	11.8	2.03
12/10/2007	12:19	6.48	12.0	2.02
12/10/2007	12:20	6.42	12.0	2.02

Table C-5
Water Quality Summary - Trimark Site

Sample:	Ground Water Samples					Surface Water Samples [6]						
	Flow (cfs) [7]	Concentration		Load (lbs/mo)		Flow (cfs)[4]	Concentration (µg/L)			Load (lbs/mo)		
		TP [1]	SRP[2]	TP [1]	SRP[2]		TP [1]	SRP[2]	TDP[3]	TP [1]	SRP[2]	TDP[3]
December 06												
Up Gradient	0.008	56	29	0.07	0.04	N/A	N/F	N/F	N/F	N/F	N/F	N/F
Down Gradient	0.008	50.5	30.5	0.07	0.04	N/A	N/F	N/F	N/F	N/F	N/F	N/F
Delta[5]	0	-5.5	1.5	-0.01	0.002	N/A	N/F	N/F	N/F	N/F	N/F	N/F
January 07												
Up Gradient	0.008	60	24	0.08	0.03	N/A	N/F	N/F	N/F	N/F	N/F	N/F
Down Gradient	0.008	85.5	22.5	0.11	0.03	N/A	N/F	N/F	N/F	N/F	N/F	N/F
Delta[5]	0	25.5	-1.5	0.03	-0.002	N/A	N/F	N/F	N/F	N/F	N/F	N/F
February 07												
Up Gradient	0.008	141	29	0.17	0.04	N/A	N/F	N/F	N/F	N/F	N/F	N/F
Down Gradient	0.008	29.5	29.5	0.04	0.04	0.02	N/F	N/F	N/F	N/F	N/F	N/F
Delta[5]	0	-111.5	0.5	-0.13	0.001	N/A	N/F	N/F	N/F	N/F	N/F	N/F
March 07												
Up Gradient	0.008	28	25	0.04	0.03	N/A	N/F	N/F	N/F	N/F	N/F	N/F
Down Gradient	0.008	39	25	0.05	0.03	0.022	N/F	N/F	N/F	N/F	N/F	N/F
Delta[5]	0	11	0	0.01	0.000	N/A	N/F	N/F	N/F	N/F	N/F	N/F
April 07												
Up Gradient	0.002	33	24	0.01	0.008	N/A	N/F	N/F	N/F	N/F	N/F	N/F
Down Gradient	0.002	35.5	23	0.01	0.007	0.055	N/F	N/F	N/F	N/F	N/F	N/F
Delta[5]	0	2.5	-1	0.001	0.000	N/A	N/F	N/F	N/F	N/F	N/F	N/F
May 07												
Up Gradient	0.008	37	32	0.05	0.04	N/A	N/F	N/F	N/F	N/F	N/F	N/F
Down Gradient	0.008	29	27	0.04	0.04	0.155	524	369	430	13.6	9.6	11.1
Delta[5]	0	-8	-5	-0.01	-0.01	N/A	N/F	N/F	N/F	N/F	N/F	N/F
June 07												
Up Gradient	0.008	47	29	0.06	0.04	N/A	N/F	N/F	N/F	N/F	N/F	N/F
Down Gradient	0.008	100.5	22	0.13	0.03	0.114	N/F	N/F	N/F	N/F	N/F	N/F
Delta[5]	0	53.5	-7	0.07	-0.01	N/A	N/F	N/F	N/F	N/F	N/F	N/F
July 07												
Up Gradient	0.014	194	28	0.45	0.07	N/A	N/F	N/F	N/F	N/F	N/F	N/F
Down Gradient	0.013	71.5	22.5	0.16	0.05	0.064	N/F	N/F	N/F	N/F	N/F	N/F
Delta[5]	-0.001	-122.5	-5.5	-0.30	-0.02	N/A	N/F	N/F	N/F	N/F	N/F	N/F
August 07												
Up Gradient	0.008	33	24	0.04	0.03	N/A	N/F	N/F	N/F	N/F	N/F	N/F
Down Gradient	0.008	36	20	0.05	0.03	0.136	N/F	N/F	N/F	N/F	N/F	N/F
Delta[5]	0	3	-4	0.004	-0.005	N/A	N/F	N/F	N/F	N/F	N/F	N/F
September 07												
Up Gradient	0.008	34	28	0.04	0.04	N/A	N/F	N/F	N/F	N/F	N/F	N/F
Down Gradient	0.007	64.5	21.5	0.07	0.02	0.042	N/F	N/F	N/F	N/F	N/F	N/F
Delta[5]	-0.001	30.5	-6.5	0.03	-0.01	N/A	N/F	N/F	N/F	N/F	N/F	N/F
October 07												
Up Gradient	0.008	35	23	0.05	0.03	N/A	N/F	N/F	N/F	N/F	N/F	N/F
Down Gradient	0.007	26.5	17	0.03	0.02	0.04	N/F	N/F	N/F	N/F	N/F	N/F
Delta[5]	-0.001	-8.5	-6	-0.02	-0.01	N/A	N/F	N/F	N/F	N/F	N/F	N/F
November 07												
Up Gradient	0.012	33	30	0.06	0.06	N/A	N/F	N/F	N/F	N/F	N/F	N/F
Down Gradient	0.012	27	23	0.05	0.04	0.002	N/F	N/F	N/F	N/F	N/F	N/F
Delta[5]	0	-6	-7	-0.01	-0.01	N/A	N/F	N/F	N/F	N/F	N/F	N/F

Notes:

1) TP = Total phosphorus.
2) SRP = Soluble reactive phosphorus or orthophosphate.
3) TDP = Total dissolved phosphorus
4) Flows were unavailable during Dec & Jan due to ISCO malfunction caused by extreme cold.
5) A negative value indicates a decrease from the upgradient to downgradient values. i.e. downgradient - upgradient.
6) N/F means no surface flow was observed at our monthly site visit
7) Flows during Feb and Mar are represented by monthly average values.

Table C-6

Field Parameters - Trimark Site 1 (Up Gradient)

Date	Time	pH	Temp (°C)	Cond (ms/cm)
12/27/2006	15:26	7.10	10.4	2.59
12/27/2006	15:27	4.12	11.2	2.59
12/27/2006	15:28	7.11	12.1	2.59
12/27/2006	15:29	7.12	12.1	2.60
1/25/2007	9:15	7.24	13.1	2.75
1/25/2007	9:16	7.24	13.3	2.75
1/25/2007	9:17	7.24	13.3	2.75
2/28/2007	13:10	7.13	12.3	2.85
2/28/2007	13:11	7.16	12.5	2.84
2/28/2007	13:12	7.17	12.6	2.84
2/28/2007	13:13	7.18	12.6	2.83
3/27/2007	10:55	7.16	12.9	2.86
3/27/2007	10:56	7.16	12.8	2.86
3/27/2007	10:57	7.14	12.8	2.86
3/27/2007	10:58	7.15	12.8	2.86
4/26/2007	10:15	7.18	13.2	2.73
4/26/2007	10:16	7.19	12.8	2.73
4/26/2007	10:17	7.18	12.7	2.73
4/26/2007	10:18	7.18	12.7	2.73
6/6/2007	11:58	7.02	13.6	2.75
6/6/2007	11:59	7.01	13.0	2.75
6/6/2007	12:00	7.02	12.9	2.77
7/2/2007	12:42	7.10	13.7	2.65
7/2/2007	12:43	7.14	12.9	2.78
7/2/2007	12:44	7.14	12.8	2.79
7/27/2007	11:54	7.24	13.8	2.61
7/27/2007	11:55	7.24	13.9	2.60
7/27/2007	11:56	7.23	13.9	2.61
9/5/2007	2:56	7.23	13.3	2.69
9/5/2007	2:57	7.20	13.2	2.69
9/5/2007	2:59	7.20	13.2	2.69
10/10/2007	1:07	8.16	14.4	2.76
10/10/2007	1:08	8.16	13.6	2.74
10/10/2007	1:10	8.13	13.4	2.72
11/16/2007	1:21	6.22	14.1	2.75
11/16/2007	1:23	6.20	14.1	2.75
11/16/2007	1:24	6.20	14.0	2.74
12/10/2007	2:30	6.26	12.8	2.79
12/10/2007	2:31	6.23	12.9	2.80
12/10/2007	2:33	6.22	13.2	2.72

Table C-8

Field Parameters - Trimark Site 4 (Down Gradient)

Date	Time	pH	Temp (°C)	Cond (ms/cm)
12/27/2006	12:08	7.05	12.3	2.01
12/27/2006	12:10	7.10	12.8	2.00
12/27/2006	12:11	7.12	13.0	2.01
12/27/2006	12:12	7.13	13.0	2.00
1/25/2007	10:12	7.26	11.9	2.15
1/25/2007	10:13	7.29	12.4	2.16
1/25/2007	10:14	7.30	12.6	2.16
2/28/2007	10:52	7.16	11.5	2.33
2/28/2007	10:53	7.17	11.8	2.33
2/28/2007	10:54	7.18	11.8	2.33
2/28/2007	10:55	7.19	11.8	2.33
3/27/2007	11:20	7.17	12.2	2.19
3/27/2007	11:21	7.16	12.1	2.21
3/27/2007	11:22	7.15	12.2	2.20
3/27/2007	11:23	7.14	12.2	2.21
4/26/2007	9:25	7.20	12.4	2.06
4/26/2007	9:26	7.22	12.0	2.07
4/26/2007	9:27	7.24	12.0	2.07
6/6/2007	11:04	7.03	12.7	1.97
6/6/2007	11:05	7.07	12.8	1.97
6/6/2007	11:06	7.07	12.6	1.99
7/2/2007	12:00	6.94	n/a	2.00
7/2/2007	12:01	7.04	12.9	2.00
7/2/2007	12:03	7.08	12.5	2.00
7/27/2007	11:20	7.25	14.0	2.00
7/27/2007	11:21	7.29	13.3	2.02
7/27/2007	11:22	7.28	13.0	2.02
9/5/2007	2:20	7.20	12.9	2.08
9/5/2007	2:21	7.16	13.0	2.08
9/5/2007	2:22	7.14	12.8	2.08
9/5/2007	2:23	7.15	12.9	2.08
10/10/2007	12:24	8.08	13.7	2.28
10/10/2007	12:25	8.07	13.2	2.26
10/10/2007	12:27	8.06	13.0	2.27
11/16/2007	12:37	6.18	13.8	2.35
11/16/2007	12:39	6.18	13.8	2.34
11/16/2007	12:40	6.18	13.8	2.34
12/10/2007	1:35	6.28	13.0	2.40
12/10/2007	1:36	6.26	12.8	2.43
12/10/2007	1:38	6.27	12.6	2.53
12/10/2007	1:40	6.26	13.2	2.53

Table C-9
Water Quality Summary - Inverness Site

Sample:	Ground Water Samples					Surface Water Samples						
	Flow (cfs) [9]	Concentration		Load (lbs/mo)		Flow (cfs)[4]	Concentration (µg/L)			Load (lbs/mo)		
		TP [1]	SRP[2]	TP [1]	SRP[2]		TP [1]	SRP[2]	TDP[3]	TP [1]	SRP[2]	TDP[3]
December 06												
Up Gradient	0.028	51	13	0.24	0.06	N/A	30	14	N/T[6]	N/A	N/A	N/A
Down Gradient	0.029	39	9	0.19	0.04	N/A [8]	31	13	N/T	N/A	N/A	N/A
Delta[5]	0.001	-12	-4	-0.05	-0.02	N/A	1	-1	N/T	N/A	N/A	N/A
January 07												
Up Gradient	0.028	16	10	0.07	0.05	N/A	65	14	23	N/A	N/A	N/A
Down Gradient	0.029	1953	7	9.47	0.03	N/A	34	8	14	N/A	N/A	N/A
Delta[5]	0.001	1937	-3	9.40	-0.01	N/A	-31	-6	-9	N/A	N/A	N/A
February 07												
Up Gradient	0.029	17	14	0.07	0.06	4.27	22	8	14	15.7	5.7	10.0
Down Gradient	0.03	26.5	8	0.12	0.04	N/A	99	4	6	N/A	N/A	N/A
Delta[5]	0.001	9.5	-6	0.05	-0.03	N/A	77	-4	-8	N/A	N/A	N/A
March 07												
Up Gradient	0.029	17	11	0.08	0.05	6.22	36	18	21	37.4	18.7	21.8
Down Gradient	0.03	13.5	7	0.07	0.04	N/A	43	6	14	N/A	N/A	N/A
Delta[5]	0.001	-3.5	-4	-0.01	-0.02	N/A	7	-12	-7	N/A	N/A	N/A
April 07												
Up Gradient	0.029	19	10	0.09	0.05	32.62	67	29	44	365.5	158.2	240.0
Down Gradient	0.03	13.5	6.5	0.07	0.03	N/A	133	58	71	N/A	N/A	N/A
Delta[5]	0.001	-5.5	-3.5	-0.02	-0.02	N/A	66	29	27	N/A	N/A	N/A
May 07												
Up Gradient	0.029	13	13	0.06	0.06	15.59	23	22	35	60.0	57.4	91.2
Down Gradient	0.03	25	9.5	0.13	0.05	N/A	50	3	27	N/A	N/A	N/A
Delta[5]	0.001	12	-3.5	0.06	-0.02	N/A	27	-19	-8	N/A	N/A	N/A
June 07												
Up Gradient	0.03	23	13	0.12	0.07	8.16	83	57	68	113.3	77.8	92.8
Down Gradient	0.031	30	8.5	0.16	0.04	N/A	36	6	17	N/A	N/A	N/A
Delta[5]	0.001	7	-4.5	0.04	-0.02	N/A	-47	-51	-51	N/A	N/A	N/A
July 07												
Up Gradient	0.024	11	12	0.04	0.05	2.31	154	89	108	59.6	34.4	41.8
Down Gradient	0.023	18	9	0.07	0.03	N/A	103	38	65	N/A	N/A	N/A
Delta[5]	-0.001	7	-3	0.03	-0.01	N/A	-51	-51	-43	N/A	N/A	N/A
August 07												
Up Gradient	0.028	17	11	0.08	0.05	16.53	75	52	59	207.4	143.8	163.1
Down Gradient	0.028	9.5	8	0.04	0.04	N/A	74	5	9	N/A	N/A	N/A
Delta[5]	0	-7.5	-3	-0.04	-0.01	N/A	-1	-47	-50	N/A	N/A	N/A
September 07												
Up Gradient	0.03	16	14	0.08	0.07	0.32	49	20	35	2.6	1.1	1.9
Down Gradient	0.032	16.5	5	0.09	0.03	N/A	70	4	23	N/A	N/A	N/A
Delta[5]	0.002	0.5	-9	0.01	-0.04	N/A	21	-16	-12	N/A	N/A	N/A
October 07												
Up Gradient	0.033	13	11	0.07	0.06	6.35	24	8	17	25.5	8.5	18.1
Down Gradient	0.035	18	15.5	0.11	0.09	N/A	44	0[7]	14	N/A	N/A	N/A
Delta[5]	0.002	5	4.5	0.03	0.03	N/A	20	-8	-3	N/A	N/A	N/A
November 07												
Up Gradient	0.031	12	15	0.06	0.08	3.68	16	11	8	9.8	6.8	4.9
Down Gradient	0.033	11	9.5	0.06	0.05	N/A	22	2	9	N/A	N/A	N/A
Delta[5]	0.002	-1	-5.5	0.00	-0.02	N/A	6	-9	1	N/A	N/A	N/A

Notes:

1) TP = Total phosphorus.
2) SRP = Soluble reactive phosphorus or orthophosphate.
3) TDP = Total dissolved phosphorus
4) Flows were unavailable during Dec -Feb 14th due to ISCO malfunction caused by extreme cold.
5) A negative value indicates a decrease from the upgradient to downgradient values. i.e. downgradient - upgradient.
6) Inverness surface water was not tested during December for TDP.
7) Below detection limit
8) No open channel downstream of PRF to facilitate measuring flow.
9) Flows during February, March and April are represented by monthly average values.

Table C-10

Field Parameters - Inverness Site 2 (Up Gradient)

Date	Time	pH	Temp (°C)	Cond (ms/cm)
12/27/2006	9:50	7.28	11.6	1.93
12/27/2006	9:52	7.25	12.0	1.94
12/27/2006	9:54	7.23	12.0	1.93
12/27/2006	9:56	7.22	12.0	1.94
1/25/2007	14:43	7.33	10.2	2.05
1/25/2007	14:44	7.32	10.5	2.05
1/25/2007	14:45	7.34	10.5	2.05
2/28/2007	10:29	7.18	8.9	2.48
2/28/2007	10:30	7.25	8.6	2.45
2/28/2007	10:31	7.26	9.0	2.45
2/28/2007	10:32	7.24	9.1	2.45
3/27/2007	10:06	7.08	8.9	2.59
3/27/2007	10:07	7.11	8.9	2.58
3/27/2007	10:08	7.12	8.9	2.58
3/27/2007	10:09	7.13	8.9	2.58
4/26/2007	8:37	7.21	8.9	2.64
4/26/2007	8:38	7.21	8.9	2.64
4/26/2007	8:39	7.21	8.9	2.63
6/6/2007	7:54	7.03	10.2	2.53
6/6/2007	7:55	7.02	10.1	2.53
6/6/2007	7:56	7.03	10.1	2.53
7/2/2007	9:40	7.05	11.7	2.32
7/2/2007	9:41	7.07	11.4	2.32
7/2/2007	9:42	7.08	11.5	2.30
7/27/2007	9:23	7.18	12.9	2.05
7/27/2007	9:24	7.18	12.8	2.05
7/27/2007	9:25	7.20	12.8	2.05
9/5/2007	11:56	7.30	14.6	2.00
9/5/2007	11:59	7.21	14.4	1.96
9/5/2007	12:01	7.17	14.1	1.96
9/5/2007	12:03	7.18	14.1	1.96
10/10/2007	10:34	7.55	14.4	1.85
10/10/2007	10:35	7.56	14.4	1.84
10/10/2007	10:36	7.58	14.3	1.84
11/16/2007	10:18	6.32	14.1	1.87
11/16/2007	10:20	6.29	14.0	1.86
11/16/2007	10:22	6.28	14.1	1.85
12/10/2007	11:20	6.43	13.1	1.88
12/10/2007	11:23	6.43	13.2	1.89
12/10/2007	11:24	6.42	13.2	1.90

Table C-11

Field Parameters - Inverness Site 3 (Down Gradient)

Date	Time	pH	Temp (°C)	Cond (ms/cm)
12/27/2006	16:12	7.08	13.2	3.00
12/27/2006	16:14	7.06	14.0	3.00
12/27/2006	16:16	7.06	14.0	3.00
12/27/2006	16:18	7.05	14.0	3.00
1/31/2007	13:10	6.85	9.8	3.25
1/31/2007	13:15	7.99	11.6	3.17
1/31/2007	13:17	7.11	11.4	3.17
1/31/2007	13:19	7.13	12.1	3.17
1/31/2007	13:20	7.15	12.0	3.16
2/28/2007	8:57	7.13	10.5	2.96
2/28/2007	8:58	7.16	10.6	2.96
2/28/2007	8:59	7.16	11.0	2.95
2/28/2007	9:00	7.17	10.9	2.97
3/27/2007	8:57	7.07	10.1	2.93
3/27/2007	8:58	7.07	10.1	2.93
3/27/2007	8:59	7.14	10.2	2.92
3/27/2007	9:00	7.15	10.1	2.93
3/27/2007	9:01	7.12	10.1	2.93
4/26/2007	8:12	7.11	9.2	2.88
4/26/2007	8:13	7.20	9.7	2.80
4/26/2007	8:14	7.21	9.6	2.80
4/26/2007	8:15	7.21	9.7	2.80
6/6/2007	8:20	6.93	10.4	2.73
6/6/2007	8:21	6.94	10.4	2.73
6/6/2007	8:22	6.96	10.2	2.73
7/2/2007	9:19	7.00	11.3	2.76
7/2/2007	9:20	7.00	11.4	2.80
7/2/2007	9:21	7.00	11.2	2.80
7/27/2007	9:03	7.00	12.5	2.62
7/27/2007	9:04	6.98	12.5	2.62
7/27/2007	9:05	6.98	12.4	2.62
9/5/2007	11:28	7.29	14.0	2.82
9/5/2007	11:30	7.19	13.8	2.82
9/5/2007	11:32	7.16	13.7	2.81
10/10/2007	10:14	7.04	14.5	2.93
10/10/2007	10:15	7.15	14.2	2.94
10/10/2007	10:16	7.21	14.2	2.93
10/10/2007	10:17	7.26	14.1	2.91
11/16/2007	9:40	6.43	15.0	2.96
11/16/2007	9:42	6.25	14.9	2.96
11/16/2007	9:45	6.21	15.0	2.94
11/16/2007	9:47	6.18	15.0	2.94
11/16/2007	9:48	6.19	15.0	2.94
12/10/2007	11:00	6.30	14.2	2.95
12/10/2007	11:01	6.29	14.3	2.95
12/10/2007	11:02	6.30	14.3	2.94

Table C-12

Field Parameters - Inverness Site 4 (Down Gradient)

Date	Time	pH	Temp (°C)	Cond (ms/cm)
12/27/2006	10:22	6.80	12.9	1.98
12/27/2006	10:23	6.92	13.1	1.99
12/27/2006	10:24	6.95	13.4	1.99
12/27/2006	10:25	6.96	13.2	1.99
1/25/2007	13:57	7.46	12.9	1.95
1/25/2007	13:58	7.44	13.1	1.96
1/25/2007	13:59	7.43	13.0	1.96
2/28/2007	8:30	7.16	12.1	1.95
2/28/2007	8:31	7.16	12.5	1.96
2/28/2007	8:32	7.16	12.6	1.96
2/28/2007	8:33	7.16	12.5	1.96
3/27/2007	7:56	7.10	12.5	2.03
3/27/2007	7:57	7.11	12.6	2.04
3/27/2007	7:58	7.08	12.6	2.03
3/27/2007	7:59	7.08	12.6	2.04
4/26/2007	7:38	7.05	12.4	2.35
4/26/2007	7:39	7.08	12.4	2.34
4/26/2007	7:40	7.08	12.3	2.34
6/6/2007	8:50	6.93	12.4	2.30
6/6/2007	8:51	6.91	12.2	2.30
6/6/2007	8:52	6.91	12.2	2.31
7/2/2007	8:46	7.02	12.8	2.48
7/2/2007	8:47	7.03	12.5	2.48
7/2/2007	8:48	7.04	12.6	2.50
7/27/2007	8:35	6.70	13.4	2.45
7/27/2007	8:38	6.86	12.6	n/a
7/27/2007	8:39	6.90	12.6	2.41
7/27/2007	9:41	6.92	12.7	2.42
9/5/2007	10:45	7.19	13.3	2.23
9/5/2007	11:00	7.22	12.9	2.21
9/5/2007	11:02	7.15	12.9	2.20
9/5/2007	11:03	7.19	12.7	2.19
10/10/2007	9:48	6.84	12.9	2.14
10/10/2007	9:50	6.91	12.7	2.13
10/10/2007	9:51	7.02	12.5	2.12
10/10/2007	9:52	7.00	12.4	2.12
11/16/2007	9:12	6.16	13.2	2.00
11/16/2007	9:13	6.20	13.1	1.99
11/16/2007	9:14	6.18	13.2	1.98
12/10/2007	10:28	6.29	13.3	1.99
12/10/2007	10:30	6.27	13.2	1.97
12/10/2007	10:31	6.26	13.2	1.97

APPENDIX D
CROSS-SECTION DATA FOR UNDERFLOW CALCULATIONS

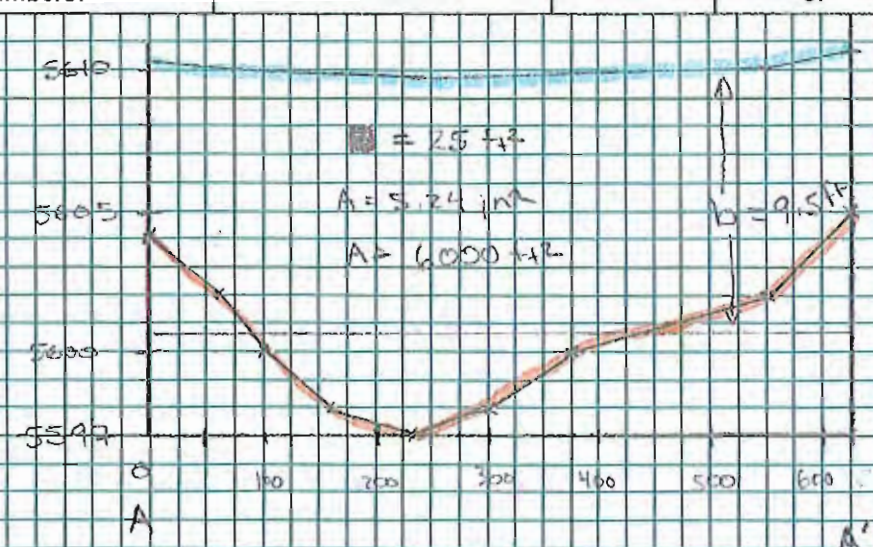
Name: Cottonwood A-A' Description: 625' long	Section/Page Numbers:	Problems:	Date:	Page of

Water Levels

	X	Y
A-	0	5610.25
	75	5610.00
	230	5609.8
	560	5610.0
A'	625	5610.5

Bedrock Elev.

	X	Y
A	0	5604
	60	5602
	105	5600
230	160	5598
	230	5597
	300	5598
	375	5600
	560	5602
	625	5604



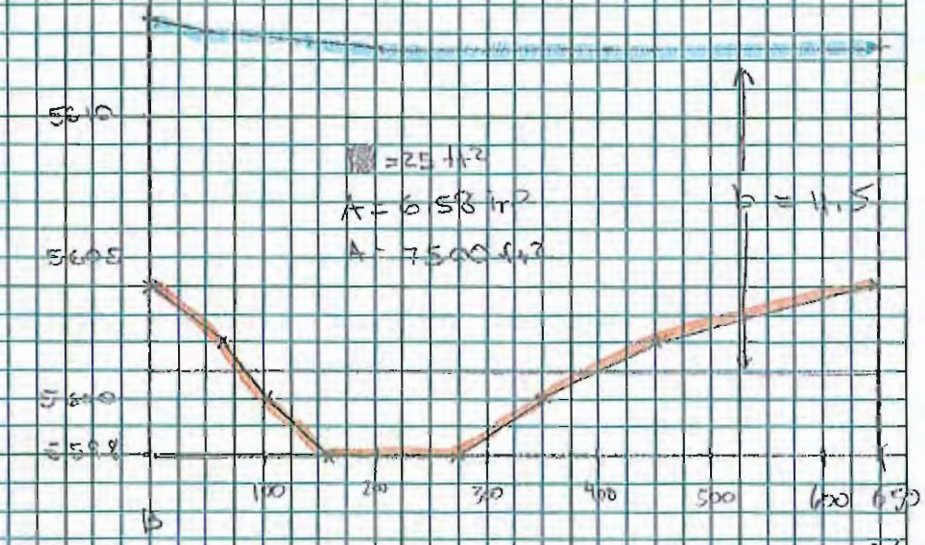
Cottonwood B-B' = 650ft

Water Levels

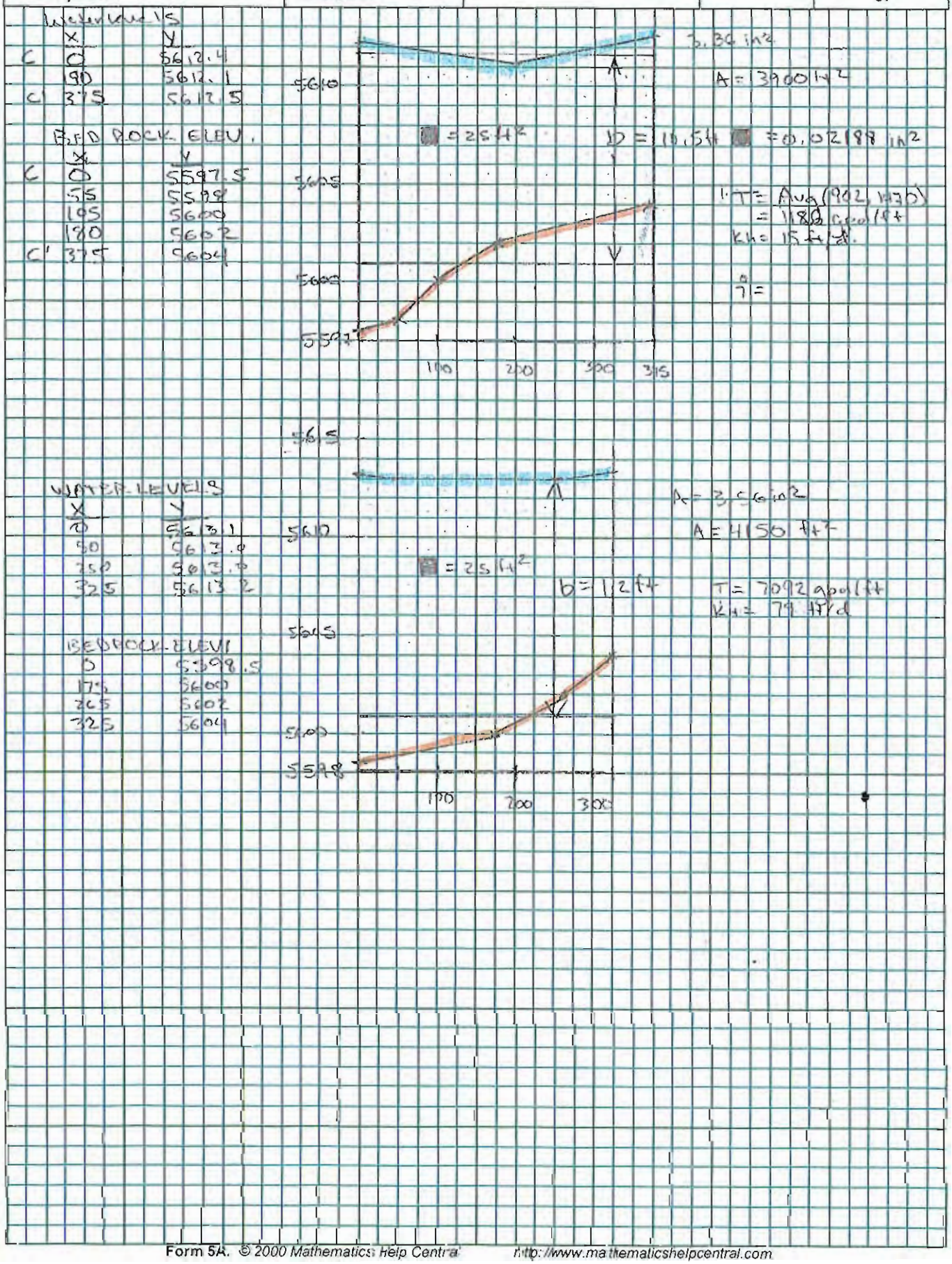
	X	Y
B	0	5613.5
	60	5613.0
	200	5612.5
B'	650	5611.5

Bed Rock Elev.

X	Y
0	5604
65	5602
105	5600
165	5598
270	5598
350	5600
450	5602
650	5604



Name: Trimark Cross Sec. Description:	Section/Page Numbers:	Problems:	Date:	Page of



Name: Description:	Section/Page Numbers:	Problems:	Date:	Page of

Bedrock — Section A-A' @ Intersection

X	Y
0	5681
60	5673
170	5675
355	5679
450	5678

Water levels @ A-A' Intersection

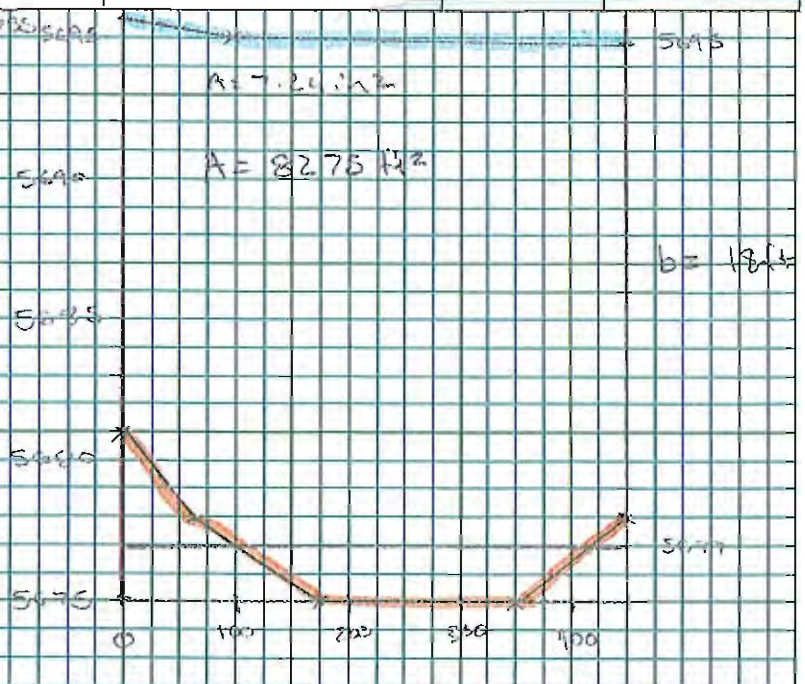
X	Y
0	5685.8
100	5695
450	5694.9

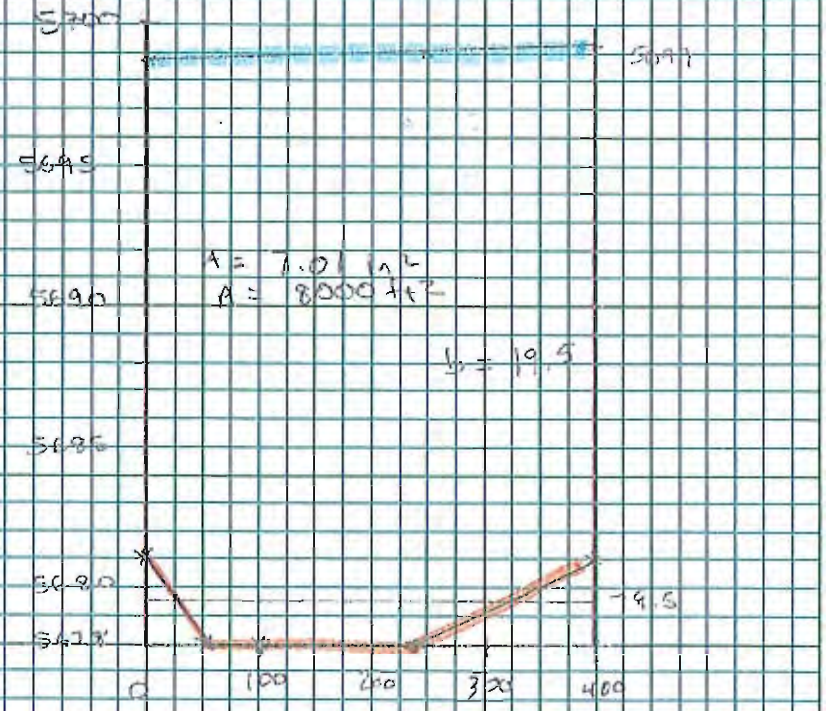
UP GRADIENT
Section B-B' Intersection
Bedrock

X	Y
0	5681
55	5678
235	5678
400	5681

Water levels

X	Y
0	5698.7
265	5699.0
400	5699.3





APPENDIX E
EMC DATA

Table E-1

Event Mean Concentrations (EMC) [1]
Cottonwood-Peoria Site

Site Name	Date Collected	Storm Volume [2] (ac-ft)	Total Phosphorus (µg/L)	Total Dissolved Phosphorus (µg/L)	SRP (µg/L)	Total Nitrogen (µg/L)	Total Dissolved Nitrogen (µg/L)	Nitrate/Nitrite - Nitrogen (µg/L)	Ammonia - Nitrogen (µg/L)
Cottonwood-Peoria	4/24/2007	11.69	380	64	50	1464	776	313	200
Cottonwood-Peoria	5/15/2007	12.25	138	30	16	1390	1048	530	107
Cottonwood-Peoria	6/13/2007	10.26	179	91	73	1616	1342	951	20
Cottonwood-Peoria	7/26/2007	2.63	217	105	96	2255	1821	764	196
Cottonwood-Peoria	8/2/2007	11.57	192	61	44	1624	1052	460	22
Cottonwood-Peoria	8/6/2007	13.82	304	109	107	1487	919	504	29
Cottonwood-Peoria	8/24/2007	3.51	183	85	51	1455	980	553	26
Average of All Storm Events		9	228	78	62	1613	1134	582	86
Method Detection Limits (µg/L)		n/a	2	2	2	2	2	2	3

1) EMC calculations did not follow standard procedures. Multiple Storm samples were obtained, then composited and one set of concentration data were obtained for each storm. Therefore, No flow weighting was done on these samples.
2) Storm volume is for the time frame of sample collection (6hrs), using ISCO flow measurement data.

Table E-2

Event Mean Concentrations (EMC) [1]
Trimark Site

Site Name	Date Collected	Storm Volume [2] (ac-ft)	Total Phosphorus (µg/L)	Total Dissolved Phosphorus (µg/L)	SRP (µg/L)	Total Nitrogen (µg/L)	Total Dissolved Nitrogen (µg/L)	Nitrate/Nitrite - Nitrogen (µg/L)	Ammonia - Nitrogen (µg/L)
Trimark	4/24/2007	0.63	413	268	254	2286	1967	1002	330
Trimark	5/15/2007	0.34	1088	821	742	3723	3048	826	636
Trimark	6/13/2007	0.41	485	318	269	2011	1391	305	136
Trimark	7/26/2007	0.21	463	359	336	2344	1937	361	340
Trimark	8/2/2007	0.18	490	354	316	2250	1836	374	242
Trimark	8/6/2007	0.56	312	236	246	1270	1077	222	163
Trimark	8/24/2007	0.25	510	495	375	1354	1181	187	37
Average of All Storm Events		0.37	537	407	363	2177	1777	468	269
Method Detection Limits (µg/L)		n/a	2	2	2	2	2	2	3

1) EMC calculations did not follow standard procedures. Multiple Storm samples were obtained, then composited and one set of concentration data were obtained for each storm. Therefore, No flow weighting was done on these samples.
2) Storm volume is for the time frame of sample collection (6hrs), using ISCO flow measurement data.

Table E-3

Event Mean Concentrations (EMC) [1]
Inverness Site

Site Name	Date Collected	Storm Volume [2] [3] (ac-ft)	Total Phosphorus (µg/L)	Total Dissolved Phosphorus (µg/L)	SRP (µg/L)	Total Nitrogen (µg/L)	Total Dissolved Nitrogen (µg/L)	Nitrate/Nitrite - Nitrogen (µg/L)	Ammonia - Nitrogen (µg/L)
Inverness	4/24/2007	190.17	190	59	42	1249	915	332	169
Inverness	5/15/2007	72.34	88	50	28	1105	1021	365	98
Inverness	6/13/2007	120.93	124	63	42	1454	1210	428	164
Inverness	7/26/2007	3.95	123	91	77	1106	959	164	15
Inverness	8/2/2007	98.64	245	100	88	1690	1139	318	81
Inverness	8/6/2007	102.18	227	101	90	1542	739	186	16
Inverness	8/24/2007	101.64	245	110	64	1681	1127	509	50
Inverness	10/15/2007	8.57	98	71	54	3088	2918	2382	92
Average of All Storm Events		87	168	81	61	1614	1254	586	86
Method Detection Limits (µg/L)		n/a	2	2	2	2	2	2	3

1) EMC calculations did not follow standard procedures. Mulliple Storm samples were obtained, then composited and one set of concentration data were obtained for each storm. Therefore, No flow weighting was done on these samples.
2) Storm volume is for the time frame of sample collection (6hrs), using ISCO flow measurement data.
3) Volume is an estimate due to flow interference from the trash rack located at the mouth of the culvert.