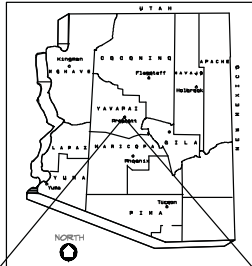
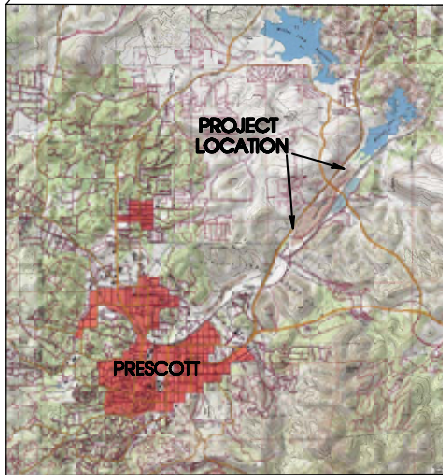


Appendix E - As Built Drawings



LOCATION MAP



Sections 23 - 24, T14N, R2W
Prescott, Yavapai County, Arizona

Watson Woods Riparian Preserve Restoration Project

Arizona Water Protection Fund Project 08-158 WPF

Prepared for: Prescott Creeks
119 Grove Ave
Prescott, AZ 86301

Prepared by: Natural Channel Design, Inc.

AS BUILT DRAWINGS



Granite Creek - Prescott, Arizona

Stream Project Length: 6,000 feet (1.1 sq mi)

INDEX OF DRAWINGS

SHEET NO.	TITLE
1	COVER SHEET: Location, Index, Materials
2	GENERAL NOTES
3	CONSTRUCTION SPECIFICATIONS: Earthwork & Structures
4	CONSTRUCTION SPECIFICATIONS: Revegetation Plan
5	CONSTRUCTION SPECIFICATIONS: Seeding, Mulching, & Fabric
6	PROJECT SITE: Control, Access, Spoil Areas
7	SITE PLAN: Reaches 1 and 2 with Aerial Photo
8	SITE PLAN: Reaches 3 and 4 with Aerial Photo
9	PLAN VIEW: Reach 1 STA 0+00 to 12+00
10	PROFILE and CROSS-SECTIONS: Reach 1
11	PLAN VIEW: Reach 2 STA 12+00 to 28+00
12	PROFILE and CROSS-SECTIONS: Reach 2
13	PLAN VIEW: Reach 3 STA 28+00 to 48+00
14	PROFILE and CROSS-SECTIONS: Reach 3
15	CROSS-SECTIONS: Reach 3 and Reach 4
16	PLAN VIEW: Reach 4 STA 48+00 to 64+00
17	PROFILE and CROSS-SECTIONS: Reach 4
18	DETAILS: Typical Channel & Vegetation Cross-Sections
19	DETAILS: Erosion Fabric & Log, Road Access & Stream Crossing
20	DETAILS: Toe Rock & Brush Trench and Brush Revetment
21	DETAILS: Dormant Pole, Cluster, and Post Plantings
22	DETAIL: Vertical Bundles

MATERIAL LIST

EARTHWORK	
Channel Excavation	8,285 cy
Wetland Excavation	18,570 cy
Fill (floodplains)	14,070 cy
Road Realignment	770 cy
Landscaping (Spoils)	12,015 cy

STRUCTURES	
Toe Rock	420 ft (210 cy)
Temporary Stream Crossing Culvert	1ea-24 in. dia CMP
Brush Revetment	615 ft
Erosion Logs	540 ft (54 logs)
TRM Fabric	70 ft (8 ft width)

VEGETATION	
Willow Cuttings (Aroyo, Coyote)	10440 ea
Cottonwood Posts	215 ea
Seeding	17 ac
Erosion Control Fabric	111 rolls (8'x112')



Construction Period: March 2 to April 8, 2009
Contractor: Prescott Creeks
Subcontractors: Natural Channel Design, Inc
Fann Environmental, LLC
Rob Overacker Contracting LLC
American Conservation Experience

Natural Channel Design, Inc

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DESIGNED BY: T.Moody, M.Wirtanen, C. Helton			
REV	DATE	BY	REVISION
1	12/10/08	MW	Wetland Outlets
3	1-5-10	MW	As-Built

COVER SHEET: Location, Index, Materials

Watson Woods Riparian Preserve

Project #: 08-158 WPF



AS-BUILT DRAWINGS Construction Period 3-2-09 to 4-8-09	
FILE NAME: Watson Woods.pro	DATE: December 20, 2006
PROJECT NO: 05-106-01AZ	SHEET: 1 of 22

GENERAL NOTES

- Topographic maps were prepared in 2005 by Shephard-Wesnitzer by overlaying terrestrial ortho images produced by aerial photography. Some elevation discrepancies may exist due to tree canopy.
- Project survey data provides the most accurate representation of site topographic conditions. All existing conditions are to be verified in the field prior to construction. Any adjustments from the drawings to be made as directed by the ENGINEER.
- All stationing refers to base line of construction and is measured horizontal distance.
- No representation is made as to the existence or nonexistence of any utilities, public or private. Absence of utilities on these drawings IS NOT assurance that no utilities are present. The existence, location and depth of any utility must be determined by the contractor prior to any excavation. Call before you dig, 1-800-STAKE-IT.
- Construction activities will be conducted in a manner consistent with all safety regulations and requirements of Sections 404, 401, and 402 of the Clean Water Act (ACOE), and other permitting required by the City of Prescott, Yavapai County (grading permit), etc.
- Installation shall be constructed to the lines and grades as shown on the drawings or as staked in the field by the ENGINEER, recognizing there is variation in nature.

CONSTRUCTION MANAGEMENT

Construction is timed to allow for the driest conditions, the lowest chance of flood flows, to provide the least disturbance to wildlife and the optimum establishment of native plant species. Earthwork and revegetation activities will be completed in as quick a time frame as possible, reducing the time of disturbance and maximizing the healing of disturbed areas and establishment of native vegetation.

Construction Supervision

Supervision shall be provided for the earthwork, structural and revegetation tasks. Supervisory personnel shall have an understanding of the natural channel design as applied to stream and wetland restoration.

Construction Equipment

The following equipment are expected to be utilized during the construction:

- Backhoe/Trackhoe/Excavator with thumb: Channel and wetland excavation, channel filling, bank sloping, and rock installation.
- Backhoe/Front End Loader: Moving structure rock and various fill
- Dozer: Land smoothing, moving fill and wetland excavation
- Dump Truck: Miscellaneous hauling

Permitting Requirements

No construction shall begin until all necessary permits are obtained.

PROJECT DESCRIPTION

The project design includes enhancing and restoring the channel function of Granite Creek and (re)creating riparian habitats within the Watson Woods Riparian Preserve. The Preserve was historically impacted from gravel mining operations in the mid-twentieth century. The feasibility study identifies treatments such as reshaping of the channel and floodplain, realignment where beneficial, stabilizing banks where appropriate, and establishment of native plant communities along the river corridor where they are now absent.



AS BUILT DRAWINGS

Construction Sequence

The following is a recommended construction sequence:

- Coordinate with Prescott Creeks for scheduling of construction activities.
- Relocate utilities where necessary
- Improve access routes where necessary; reposition 450 ft of access road starting at parking area off of Highway 89 (see SHEETS 3,7,19).
- Construct temporary stream crossing at STA 28+25 (see SHEETS 3,13,19).

REACH 1:

- Excavate new channel alignment (800 ft) starting from downstream working upstream (see SHEETS 3, 6, 9, 10, 18).
- Partially fill old channel (250 ft near STA 0+50) at upstream end to direct stream flow into new channel alignment. Install toe rock (70 ft) and brush trenches (180 ft). (see SHEETS 3, 4, 7, 9, 10, 18)
- Install revegetation practices (see SHEETS 4, 5, 9, 10, 18, 19, 20, 21, 22).

REACH 2:

- In coordination with the City of Prescott Solid Waste Division, remove and dispose of properly all trash and debris near proposed Wetland No. 1 (see SHEET 3).
- Excavate new channel alignment (950 ft) starting from downstream working upstream (see SHEETS 3, 6, 11, 12, 18).
- Partially fill old channel at upstream end (200 ft near STA 13+15) to direct stream flow into new channel alignment. Install toe rock (110 ft at STA 13+00) and brush trenches (190 ft). (see SHEETS 3, 4, 7, 11, 12, 18)
- Partially fill old channel at upstream end (100 ft near STA 18+10) to direct stream flow into new channel alignment. Install toe rock (35 ft at STA 18+05) and brush trenches (75 ft). (see SHEETS 3, 4, 7, 11, 12, 18)
- Excavate Wetland No. 1 (see SHEETS 3, 11, 12, 18).
- Install revegetation practices (see SHEETS 4, 5, 11, 12, 18, 19, 20, 21, 22).

REACH 3:

- Excavate new channel alignment (650 ft) starting from downstream working upstream (see SHEETS 3, 6, 13, 14, 15, 18).
- Partially fill old channel (300 ft near STA 29+15) at upstream end to direct stream flow into new channel alignment. Install toe rock (75 ft) and brush trenches (215 ft). (see SHEETS 3, 4, 7, 13, 14, 15, 18)
- Excavate Wetland Nos. 2 and 3 w/ outlets (see SHEETS 3, 13, 14, 15, 18).
- Install revegetation practices (see SHEETS 4, 5, 13, 14, 15, 18, 19, 20, 21, 22).

REACH 4:

- Excavate new channel alignment (1470 ft) starting from downstream working upstream (see SHEETS 3, 6, 15, 16, 17, 18).
- Partially fill old channel (150 ft near STA 45+15) at upstream end to direct stream flow into new channel alignment. Install toe rock (70 ft) and brush trenches (120 ft). (see SHEETS 3, 4, 7, 15, 16, 17, 18)
- Excavate Wetland Nos. 4, 5, and 6 w/ outlets (see SHEETS 3, 15, 16, 17, 18).
- Install revegetation practices (see SHEETS 4, 5, 16, 17, 18, 19, 20, 21, 22).
- Complete floodplain/terrace smoothing and shaping.
- Implement Revegetation Plan for Critical Planting Areas
 - Seed all disturbed areas and designated critical planting areas
 - Plant dormant cottonwood posts and willow poles in higher flood plain and terrace zone, approximately 3 posts and poles to a hole.
 - See SHEETS 5, 6, 7, and 8 for critical plantings areas.

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DESIGNED BY: T.Moody, M.Wirtanen, C. Helton			
REV	DATE	BY	REVISION
1	5/3/07	SNY	Construction Notes
3	1-5-10	MW	As-Built

GENERAL NOTES

Watson Woods Riparian Preserve

Project #: 08-158 WPF



AS-BUILT DRAWINGS
Construction Period
3-2-09 to 4-8-09

FILE NAME: Watson Woods.pro	DATE: December 20, 2006
PROJECT NO: 05-106-01AZ	SHEET: 2 of 22

CONSTRUCTION SPECIFICATIONS

AS BUILT DRAWINGS

POLLUTION CONTROL and RESOURCE PROTECTION

Construction operations shall be carried out in such a manner and sequence that erosion and air and water pollution are minimized and held within legal limits. The measures and works shall include, but are not limited to, the following:

1. **Diversions:** Standard best management practices will be used to temporarily divert water away from work areas within the active channel. Such diversions shall be temporary and shall be removed and the area restored to its near original condition immediately upon completion of work within the active channel or when permanent measures are installed (i.e. realignment of channels).
2. **Equipment Access and Staging Areas:** Transportation routes for materials, personnel, and equipment to, from, and within the project area shall be limited to access areas located on the drawings or determined in the field. Equipment access to Reach 1 is from the south parking area upstream of project. Access to Reaches 2, 3, and 4 is from the northwest Parking Area following designated routes to each stream reach.
3. **Revegetation:** Impacts to existing vegetation and habitats shall be minimized. All disturbed areas shall be replanted with native vegetation.
4. **Stream Crossings:** Stream crossing points shall be minimized and shall be removed and the area restored to its near original condition when crossings are no longer required.
5. **Equipment Use in Streams:** When stream channel work is necessary, every effort will be made to enter and exit the channel in locations without important vegetation and where impacts do not result in stream bank instability. The use of heavy equipment in the stream will be kept to an absolute minimum.

TEMPORARY STREAM CROSSING

A temporary stream crossing shall be constructed near STA 28+25 to the extent that construction operations can be performed under stable conditions. See SHEET 19 for Detail.

- Install one 24-inch diameter culvert in the channel at STA 28+25
- Prior to back-filling, the pipe shall be firmly and uniformly bedded.
- Place excavated material from Wetland No. 2 over culvert to a depth of 1 ft
- At completion of restoration activities, remove placed material and culvert. Restore to original condition.

STRUCTURES PLAN

Structures shall consist of installing toe rock, brush revetments, and erosion control logs.

Toe Rock with Willow Brush Trench: This structural bank stabilization practice consists of graded angular rock placed along bank sections where the abandoned channel leaves the new channel alignment. Height of rock is about 3 ft above and 2 ft below the channel bed. The bioengineering practice, Willow Brush Trench, is placed behind the toe rock.

- The work shall consist of excavation, delivery of rock, and installation of rock for rock riprap as shown on the drawings or staked in the field by the authorized representative.
- The rock shall be well graded from a minimum of six inches to a maximum size of 12 inches with greater than 50% by weight being larger than 9 inches.
- The rock shall be angular, dense, sound and free from cracks, seams, or other defects conducive to accelerated weathering. The least dimension of an individual rock shall not be less than one-half the greatest dimension.
- The rock source shall be approved by the ENGINEER or authorized representative and have a bulk specific gravity of not less than 1.7 per ASTM C127.
- See SHEET 20 for Detail.

Brush Revetment: Revetment is constructed from whole trees that are wired together and anchored by earth anchors or fence posts. Brush or trees are secured to the streambanks to protect the toe of the bank by slowing velocities and diverting the current away from the bank edges. The revetment also traps sediment from the stream. See SHEET 20 for Detail.

Erosion Control Logs: These flexible logs are made of Coir, Straw, Aspen Excelsior, or other natural materials are installed to protect the streambank by stabilizing the toe of the slope and by trapping sediment. Cuttings and herbaceous riparian plants can be planted into the log and behind it. Secure the logs with 24 to 36 inch long wedge-shaped stakes at 5 foot intervals. Stakes can be driven through center of log or both sides of log and tied with twine.

EARTHWORK

The earthwork shall consist of channel and wetland excavation, channel filling, bank sloping, and floodplain smoothing. See SHEETS 9 through 18. Place spoil as shown on SHEET 6.

Excavation

Excavation shall be limited to the channel realignment, wetland and landscaping as shown on the drawings or as staked in the field. All finished surfaces shall be generally smooth and pleasing in appearance. Disturbance of existing native vegetation shall be minimized to the greatest extent possible during excavation.

Excavated material shall be placed in abandoned sections of the old channel and designated spoil areas (Parking Area, other) as shown on the drawings, SHEET 6, or as staked in the field. Place excess spoil material outside of jurisdictional areas and use in the Watson Woods landscaping master plan. See Table, SHEET 5, for earthwork volume estimates.

Earthfill



Materials: All fill materials shall be obtained from the required excavations and/or approved borrow sources. Fill shall not contain sod, brush, roots, perishable or frozen materials.

Placement: The placement of fill materials shall follow these guidelines:

- Any vertical bank shall be sloped to a minimum of 1:1 before placement of fill material.
- Material when placed shall contain sufficient moisture so that a sample taken in the hand and squeezed shall remain intact when released.
- The placing and spreading of fill material shall be started at the lowest point and the fill brought up and compacted to obtain a density similar to the surrounding ground. Compacted horizontal layers shall not exceed: six (6) inches of loose fill for wheel compaction and four (4) inches of loose fill for dozer compaction. Construction equipment shall be operated over the areas of each layer of fill to insure that the required compaction is obtained.
- Fill shall not be placed on frozen soil, snow or ice.
- Channels designated for filling and re-contouring shall be filled as close as possible to the historic natural ground surface, and smoothed and shaped to blend with the surroundings.
- All finished surfaces shall be generally smooth and pleasing in appearance and blend into surrounding terrain.

Road Realignment

A portion of access road will be realigned starting at the parking area off of Highway 89 traveling east for about 450 feet as shown on SHEETS 6, and 7. The road fill shall be from excess channel and/or wetland excavation. Road material shall be placed in horizontal lifts not exceeding 6 inches of loose fill for wheel compaction and 4 inches for dozer compaction. See SHEET 19 for typical road section Detail.

 <p>Natural Channel Design, Inc.</p> <p>3410 S. Cocopah Dr. Flagstaff, Arizona 86001 (928) 774-1178</p>	DRAWN BY: M.Wirtanen, S.Yard		<h2>CONSTRUCTION SPECIFICATIONS</h2> <h3>Earthwork & Structures</h3>			AS-BUILT DRAWINGS Construction Period 3-2-09 to 4-8-09		
	DESIGNED BY: T.Moody, M.Wirtanen, C. Helton							
	REV	DATE	BY	REVISION		FILE NAME: Watson Woods.pro		DATE: December 20, 2006
	1	5/3/07	SNY	Construction Notes		PROJECT NO: 05-106-01AZ		SHEET: 3 of 22
3	1-5-10	MW	As-Built	Project #: 08-158 WPF				

REVEGETATION PLAN

Revegetation Plan includes native grass seeding (with mulching & fabric), wetland plugs (sedges & rushes), shrubs & tree plantings. Use local native material where appropriate & feasible. Supplemental irrigation (supplied by existing City of Prescott 12" potable water main) may be needed for several years for plant establishment. Irrigating for at least two years will ensure that all woody species and nursery plants will become established and reach the water table (for cottonwood and willow species), and that seeded species germinate successfully.

PLANT MATERIAL PROCUREMENT and HANDLING

Woody Plant Materials:

All woody species shall be native and collected from designated local sources. Coyote willow (*Salix exigua*) and Arroyo willow (*Salix lasiolepis*) will be planted in the Bank and lower Overbank Zone. Red willow (*Salix laevigata*) will be planted in the upper Overbank Zone. Fremont cottonwood (*Populus fremontii*) will be planted in the upper Overbank Zone. Dormant unrooted hardwood cuttings can be taken after leaf fall and before bud burst in the spring. Never remove more than 1/3 of any single donor plant during harvesting. The best rooting success is from cuttings that are disease-free, green plants that are 2-10 years old. The best diameters for pole planting, vertical bundles, and trenches are 1/2 to 1 inch and 2 to 3 inches for post plantings. Cutting length varies depending on the application. It shall be long enough to reach 6 to 8 inches into the lowest water level of the year and high enough to expose at least two to three buds. Cuts shall be made with clean, sharp tools. The bottom end of the stem cutting shall be cut to a 45-degree angle and the tip end shall be cut square across or horizontal to the stem. Trim off all side branches and the terminal bud (bud at the growing tip) so energy will be rerouted to the lateral buds for more efficient root and stem sprouting. Do not trim terminal bud from cuttings for vertical bundles and willow trench until after planted. Trimmed tip ends shall be sealed by dipping in light-colored latex, water-based paint.

Submerge cuttings in water for 3 to 7 days prior to planting to maximize water retention. Do not allow the roots to emerge from the bark. See figure this sheet for riparian planting zones.

INSTALLATION OF WOODY PLANTS

Installation of vegetation shall start when the general excavation operations are being completed.

POLE PLANTINGS and POLE CLUSTERS:

Pole cuttings are placed in the ground deep enough to reach the lowest water table of the year and high enough to expose at least two to three buds. Root primordia will develop when good soil-to-stem contact is made and exposed sections of the cutting will sprout stems and leaves. Dormant cuttings can be planted with a digging bar, auger, water-jet, or if the soil is saturated, they may be pushed into the soil. Pole Plantings are planted in the Bank and Overbank Zone and shall be spaced 4 feet apart in the row. In multiple row plantings, spacing between rows shall be staggered with respect to those in adjacent rows. See SHEETS 21 & 22 for Detail.

POST PLANTINGS

This practice involves planting of larger limbs (2 to 3 inches diameter) in clusters of three at 10 foot centers in designated areas. Cottonwood posts will be placed in holes in the Floodplain Zone, excavated to groundwater elevation and backfilled with wet mud. See SHEET 21 for Detail.

BRUSH TRENCH

Brush trench uses bundles of willow cuttings in a buried trench along the top of a bank. This willow "fence" filters runoff before it enters the stream and will help to stabilize the filled channel section. Brush trench shall be installed at or above floodplain elevation behind the toe rock and then every 50 feet within a channel fill section. See SHEET 20 for Detail.

VERTICAL BUNDLES

Vertical bundles are placed in shallow trenches vertically up the slope. It will protect the Bank and Floodplain Zones. Vertical bundle diameters should be from 3 to 6 inches (typically 3 to 6 stems). Bundle heights should be tall enough to extend from about 8 inches into the water table to about 1 foot above the top of the bank. Vertical bundles can be installed on 4 foot centers between waters edge and top of bank. Cuttings are stripped of side branches, tied into bundles, and soaked. See SHEET 22 for Detail.

PLANT MATERIAL PROCUREMENT and HANDLING AS BUILT DRAWINGS

Wild Transplant or Nursery Collection

Wetland plants are readily transplanted because of their well developed root systems and the remaining plants will fill in the harvest hole rapidly. One rule of thumb is to dig no more than 1 sq ft of plant material from a 4 sq ft area. It is not necessary to go deeper than 5 to 6 inches. This will get enough root mass to ensure good establishment at the project site. It will also retain enough of the transplants' root system below the harvest point to allow the plants to grow back into the harvest hole.

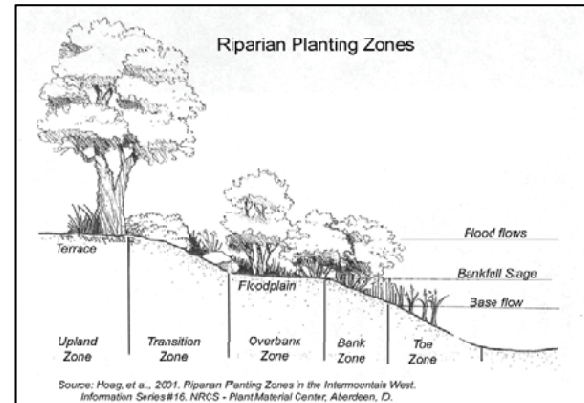
Transplants can be taken at almost any time of the year. Cut the top growth to about 4 to 5 inches above the potential standing water height or 10 inches whichever is higher. If one sq ft of plant material is harvested, it is possible to get 4 to 5 individual plant plugs from the larger plug.

Leaving the soil on the plug increases the establishment rate by about 30%. Beneficial organisms that are typically found on the roots of the wetland plants are important in the nitrogen and phosphorous cycles. These organisms may not be present at the new site. Leaving soil on the plug, however, will increase the volume of material that needs to be transported. There is a chance that weed seeds could be transported in the soil if collected from a weed-infested area. Washed plugs reduce weed seed transport and can be inoculated with mycorrhizae purchased from dealers.

Make sure the length of the plug is related to the saturation zone at the planting site. The bottom of the plug needs to be in contact with the saturation zone. Match the amount of water with the wetland plant species. (Hoag et al 2003). Where possible, plugs and sod shall be grown and harvested locally.

INSTALLATION OF WILD TRANSPLANTS or NURSERY COLLECTION

TRANSPLANT PLUGS: Plant plugs by flooding the planting site. Saturated soil is much easier to plant in than dry soil. The soil should be super saturated so that a hole can be easily dug with a bare hand. Hand planting is more successful with fine soils than with coarse soils. Take the plug trays and place them in a Styrofoam cooler. Cover the roots with water while in transit. At the planting site, drain off most of the water so the cooler will float. Use the cooler to move the plugs around the area as you plant. Plant plugs in the Toe Zone. The plugs can either be chopped with a shovel very rapidly or the plugs can be cut with a small saw so they will easily fit into a predrilled, set diameter hole. To get the right length of plug, lay the large plug on its side on a sheet of plywood and use a saw to cut the bottom off level and to the desired length. After this, stand the plug up and slice smaller plugs off like a cake.



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REV	DATE	BY	REVISION
1	5/3/07	SNY	Construction Notes
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CONSTRUCTION SPECIFICATIONS

Revegetation Plan

Watson Woods Riparian Preserve

Project #: 08-158 WPF



AS-BUILT DRAWINGS
Construction Period
3-2-09 to 4-8-09

FILE NAME: Watson Woods.pro	DATE: December 20, 2006
PROJECT NO: 05-106-01AZ	SHEET: 4 of 22

SEEDING and MULCHING

Disturbed areas will be seeded with native grasses. Prepare seedbed where needed. Seed can be drilled or broadcast by hand. Seed shall be incorporated into the soil, but not more than 1-inch deep. Reseeding may be required for successful plant establishment.

Seed shall be purchased from a reliable supplier. The grass seed mix will consist of the following species as available. The seeding rates below are for broadcast planting. Native grass seed will be applied at a rate of 20 pounds to the acre. Forbs (wildflowers) can be added to seed mix to increase diversity and improve aesthetics. Forbs (wildflowers) that have low maintenance, high survival rate, cold hardy, beautiful colors, and ecologically appropriate (non-invasive) are listed. Estimated area of disturbance is 20 acres.

NATIVE GRASS SEED MIX

Purple three-awn	(<i>Aristida purpurea</i>)	1.0	lb/ac	PLS
Blue grama	(<i>Bouteloua gracilis</i>)	3.0	lb/ac	PLS
Sideoats grama	(<i>Bouteloua curtipendula</i>)	3.0	lb/ac	PLS
Prairie junegrass	(<i>Koeleria macrantha</i>)	1.0	lb/ac	PLS
Alkali sacaton	(<i>Sporobolus airoides</i>)	0.5	lb/ac	PLS
Bottlebrush squirreltail	(<i>Elymus elymoides</i>)	1.0	lb/ac	PLS
Blue wildrye	(<i>Elymus glaucus</i>)	2.0	lb/ac	PLS
Western wheatgrass	(<i>Pascopyrum smithii</i>)	4.0	lb/ac	PLS
Sand dropseed	(<i>Sporobolus cryptandrus</i>)	0.5	lb/ac	PLS
Muttongrass	(<i>Poa fendleriana</i>)	1.0	lb/ac	PLS
Vine mesquite	(<i>Panicum obtusum</i>)	3.0	lb/ac	PLS
Spike dropseed	(<i>Sporobolus contractus</i>)	0.5	lb/ac	PLS
		20.5	lb/ac	PLS

FORBS/HERBS (WILDFLOWERS)

Showy goldeneye	(<i>Helianthus multiflorus</i>)
Arroyo lupine	(<i>Lupinus succulentus</i>)
Eaton's penstemon	(<i>Penstemon eatonii</i>)
Globe mallow	(<i>Sphaeralcea coccinea</i>)
Yellow evening primrose	(<i>Oenothera elata</i>)
Evening primrose	(<i>Oenothera lamarckiana</i>)

Straw Mulch

On gentle to moderate slopes, straw mulch can be applied by hand broadcasting to a uniform depth of 2 to 3 inches. On steep slopes, the straw should be blown onto the slope to achieve the same degree of cover. When applied properly, approximately 20-40 percent of the original ground surface can be seen. The application rate per acre should be about 2 tons (or one 74 pound bale per 800 square feet). Straw should be clean rice, barley, or wheat straw. Mulch containing noxious weeds is not permitted. Straw mulch material shall be stabilized by hand punching, roller punching, crimper punching or equivalent anchoring tool.

Hydroseeding and Hydromulching

A tank mounted truck equipped with a special pump and continuous agitation system is used. The pump forces the slurry through a top mounted discharge nozzle or hose. Tank capacities range from 1000 to 3000 gallons. Water is added first and then the cellulose or wood fiber, tackifier (if used), fertilizer (if used), and seeds. Seed should not be added to the slurry until immediately prior to beginning the operation and not remain in the tank more than 30 minutes. Single application hydroseeding uses 1500 to 2000 pounds of fiber mulch per acre with the seed and fertilizer. Split application hydroseeding uses 500 pounds of fiber mulch per acre with the seed and fertilizer in the first pass followed by an application of 1500 to 2000 pounds of fiber mulch per acre and tackifier (if used). Most tackifiers are applied at 100 pounds of dry ingredients per acre.

Erosion Control Fabric

Fabric made of Jute, Coir, Straw, Coconut or other natural material is laid and anchored over seeding to reduce soil erosion and provide a good environment for vegetative regrowth. Fabric shall be installed for slope protection and seed germination enhancement. See figure on this Sheet 19 for fabric installation.



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DESIGNED BY: T.Moody, M.Wirtanen, C. Helton			
REV	DATE	BY	REVISION
1	12/10/08	MW	Wetland Outlets
3	1-5-10	MW	As-Built

CONSTRUCTION SPECIFICATIONS

Seeding, Mulching, & Fabric

Watson Woods Riparian Preserve

Project #: 08-158 WPF



**AS-BUILT
DRAWINGS**
Construction Period
3-2-09 to 4-8-09

FILE NAME: Watson Woods.pro	DATE: December 20, 2008
PROJECT NO: 05-106-01AZ	SHEET: 5 of 22

AS BUILT DRAWINGS

EARTHWORK VOLUME TABLE

	Excavation (cy)	Fill (cy)	Spoil (cy)
Reach 1	1500	870	630
Reach 2	1485	1000	485
Reach 3	1000	1030	-30
Reach 4	4300	970	3330
Wetland 1	2970	5	2965
Wetland 2 & Outlet	3390	205	3185
Wetland 3 & Outlet	8870	9905	-1035
Wetland 4 & Outlet	895	20	875
Wetland 5 & Outlet	1945	50	1895
Wetland 6 & Outlet	500	15	485
Road Realignment (450 ft)		770	-770
TOTAL	26,855	14,840	12,015

See SHEET 3 for Earthwork Construction Specifications and
SHEETS 6 -17 for PLAN VIEW, PROFILES, and CROSS-SECTIONS.

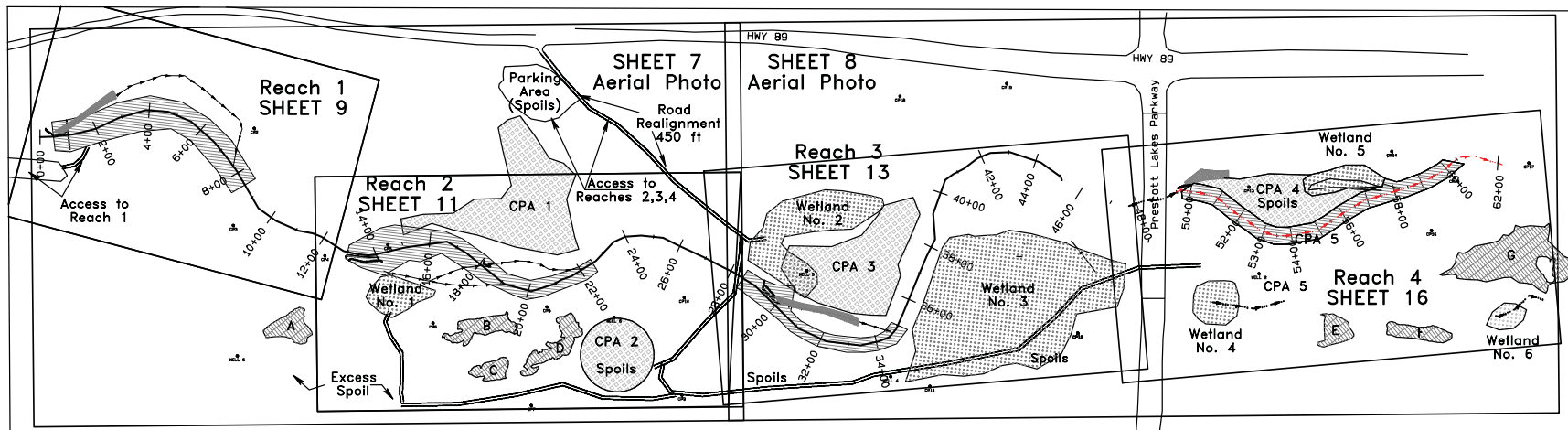
CRITICAL PLANTING AREAS

Critical Planting Area	Seed Area (ac)	Cottonwood Posts	Willow Poles
1	2.8	140	140
2	1.2	60	60
3	2.5	125	125
4	2.0	95	95
5	1.0	50	50
Total	9.5	470	470

Critical Planting Areas

These are areas outside of the main channel construction where little riparian vegetation currently exists. (SHEETS 6,7,8) These areas may receive mechanical smoothing and/or spoils placement. They are to be seeded and planted with cottonwood posts and willow poles with average spacings of 50 cottonwood posts and 50 willow poles per acre.

AS BUILT DRAWINGS



NOTES

1. See SHEETS 7 and 8 for project site layout over aerial photography.
2. REACH 1: See SHEET 9 for Plan View, SHEET 10 for Profile and Cross-Sections.
3. REACH 2: See SHEET 11 for Plan View, SHEET 12 for Profile and Cross-Sections.
4. REACH 3: See SHEET 13 for Plan View, SHEETS 14 and 15 for Profile and Cross-Sections.
5. REACH 4: See SHEET 16 for Plan View, SHEETS 15 and 17 for Profile and Cross-Sections.



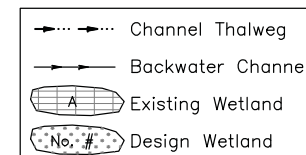
CONTROL POINTS

	Northing	Easting	Elevation	Notes
CP1	1298783.04	542791.37	5204.4	1/2" Rebar, NCD Yellow Cap
CP2	1299121.63	543030.59	5195.0	1/2" Rebar, NCD Yellow Cap
CP3	1298852.39	543253.47	5194.9	1/2" Rebar, NCD Yellow Cap
CP4	1299039.82	543536.53	5191.3	1/2" Rebar, NCD Yellow Cap
CP5	1299238.02	543643.42	5199.6	1/2" Rebar, NCD Yellow Cap
CP6	1299192.69	543958.08	5190.5	1/2" Rebar, NCD Yellow Cap
CP7	1299285.48	544400.21	5202.9	1/2" Rebar, NCD Yellow Cap
CP8	1299542.88	544161.34	5189.4	1/2" Rebar, NCD Yellow Cap
CP9	1299724.57	544699.23	5187.6	1/2" Rebar, NCD Yellow Cap
CP10	1299943.31	544434.63	5192.3	1/2" Rebar, NCD Yellow Cap
CP11	1300430.15	545215.12	5191.4	1/2" Rebar, NCD Yellow Cap
CP12	1300955.47	545389.92	5184.2	1/2" Rebar, NCD Yellow Cap
CP13	1301747.21	545358.51	5174.6	1/2" Rebar, NCD Yellow Cap

CONTROL POINTS

	Northing	Easting	Elevation	Notes
CP14	1302220.12	545571.20	5162.3	1/2" Rebar, NCD Yellow Cap
CP15	1302157.65	545875.91	5171.6	1/2" Rebar, NCD Yellow Cap
CP16	1302336.20	545779.52	5166.5	1/2" Rebar, NCD Yellow Cap
CP17	1302573.89	545901.49	5163.9	1/2" Rebar, NCD Yellow Cap
CP18	1300978.67	544347.86	5189.0	1/2" Rebar, NCD Yellow Cap
CP19	1301301.57	544545.14	5192.9	1/2" Rebar, NCD Yellow Cap
WELL 2	1301586.25	545619.90	5171.0	Top center of well cap
WELL 3	1300341.17	544626.71	No Elev	Top center of well cap
WELL 4	1300342.75	545102.54	5181.9	Top center of well cap
WELL 5	1299706.37	544336.46	5185.8	Top center of well cap
WELL 6	1298579.35	543623.05	5194.1	Top center of well cap

LEGEND



Natural Channel Design, Inc
3410 S. Cocopah Dr.
Flagstaff, Arizona 86001
(928) 774-1178

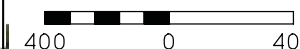
DRAWN BY: M.Wirtanen, S.Yard			
DESIGNED BY: T.Moody, M.Wirtanen, C. Helton			
REV	DATE	BY	REVISION
3	1-5-10	MW	As-Built

PROJECT SITE Control, Access, Spoil Areas

Watson Woods Riparian Preserve
Project #: 08-158 WPF



HORIZ SCALE: 1" = 400'



FILE NAME: Watson Woods.pro	DATE: December 20, 2006
PROJECT NO: 05-106-01AZ	SHEET: 6 of 22

AS BUILT DRAWINGS

Construction Period
3-2-09 to 4-8-09

Match SHEET 7

SHEET 13

SHEET 16



LEGEND

	Channel Thalweg		Design Wetland
	Backwater Channel		Rock Sill
	Existing Wetland		Channel Fill
			Channel Excavation



Photo Date May 2009

**Natural
Channel
Design, Inc**

3410 S. Cocopah Dr.
Flagstaff, Arizona 86001
(928) 774-1178

DRAWN BY: M.Wirtanen, S.Yard			
DESIGNED BY: T.Moody, M.Wirtanen, C. Helton			
REV	DATE	BY	REVISION
3	1-5-10	MW	As-Built

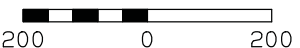
SITE PLAN Reaches 3 and 4 with Aerial Photo

Watson Woods Riparian Preserve
Project #: 08-158 WPF



Expires 3-31-2011

HORIZ SCALE: 1" = 200'



FILE NAME: Watson Woods.pro	DATE: December 20, 2006
PROJECT NO: 05-106-01AZ	SHEET: 8 of 22

AS BUILT DRAWINGS

Construction Period
3-2-09 to 4-8-09

NOTES

1. STA 0+50 to 7+25 620 ft Channel Excavation
Place spoil as shown on SHEET 6.
2. STA 0+25 to STA 1+80 Inlet Protection
Backfill channel, Install Toe Rock and
Brush Trenches
3. Vertical Bundles/Pole Clusters
STA 1+00 to STA 7+50 (LEFT) 650 ft
STA 0+50 to STA 3+00 (RIGHT) 250 ft
STA 6+00 to STA 8+50 (RIGHT) 250 ft
4. Install Floodplain Pole Clusters
STA 3+00 to STA 6+00 (RIGHT) 300 ft
5. Fabric over Seed
STA 1+25 to STA 7+20 (LEFT) 600 ft
STA 0+50 to STA 7+00 (RIGHT) 640 ft
6. STA 1+40 to 2+40 (R) 100 ft Brush Revetment
STA 6+10 to 7+25 (L) 120 ft Brush Revetment
STA 2+20 to STA 3+00 (R) 80 ft Erosion Log

LEGEND

	Channel Thalweg
	Backwater Channel
	Existing Wetland
	Design Wetland
	Brush Revetment
	Toe Rock
	Erosion Log
	Brush Trench
	Vertical Bundles
	Pole Clusters
	Fabric over Seed
	Channel Fill

SHEET Notes

	Note No.
	Ref SHEET

Cross-Section

	XS Label
	Ref SHEET

See SHEET 10 for PROFILE, CROSS-SECTIONS, and QUANTITIES

**Natural
Channel
Design, Inc**

3410 S. Cocopah Dr.
Flagstaff, Arizona 86001
(928) 774-1178

DRAWN BY: M.Wirtanen, S.Yard			
DESIGNED BY: T.Moody, M.Wirtanen, C. Helton			
REV	DATE	BY	REVISION
3	1-5-10	MW	As-Built

PLAN VIEW: Reach 1

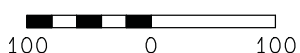
STA 0+00 to STA 12+00

Watson Woods Riparian Preserve

Project #: 08-158 WPF



HORIZ SCALE: 1" = 100'



FILE NAME:

Watson Woods.pro

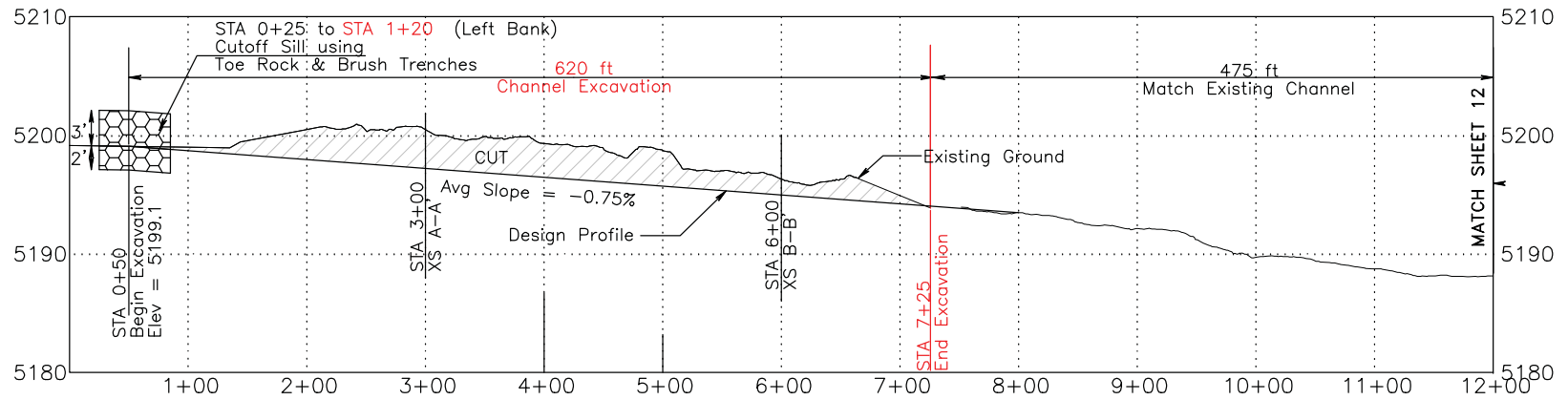
PROJECT NO:

05-106-01AZ

DATE: December 20, 2006

SHEET:

9 of 22



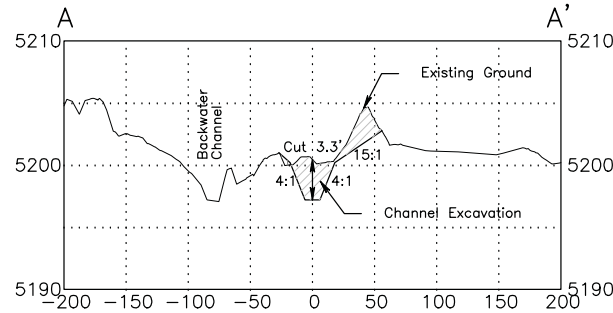
PROFILE: STA 0+00 to STA 12+00 (REACH 1)

AS BUILT DRAWINGS

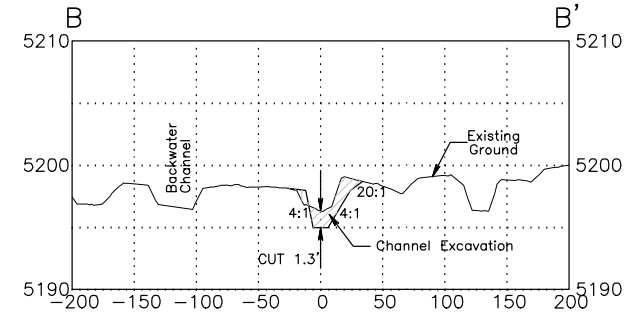
Construction Period
3-2-09 to 4-8-09

REACH 1: MATERIAL QUANTITIES

Toe Rock: 40 cy
Willow Clusters: 533 ea
Vertical Bundles: 65 ea
Seeding: 2 acres
Fabric: 20 Rolls
Brush Revetment: 220 ft
Erosion Log: 80 ft



XS A-A' (STA 3+00)



XS B-B' (STA 6+00)

See SHEET 9 for PLAN VIEW and NOTES



**Natural
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(928) 774-1178

DRAWN BY: M.Wirtanen, S.Yard

DESIGNED BY:
T.Moody, M.Wirtanen, C. Helton

REV	DATE	BY	REVISION
3	1-5-10	MW	As-Built

PROFILE and CROSS-SECTIONS Reach 1

Watson Woods Riparian Preserve

Project #: 08-158 WPF



HORIZ SCALE: 1" = 100'
VERT SCALE: 1" = 10'

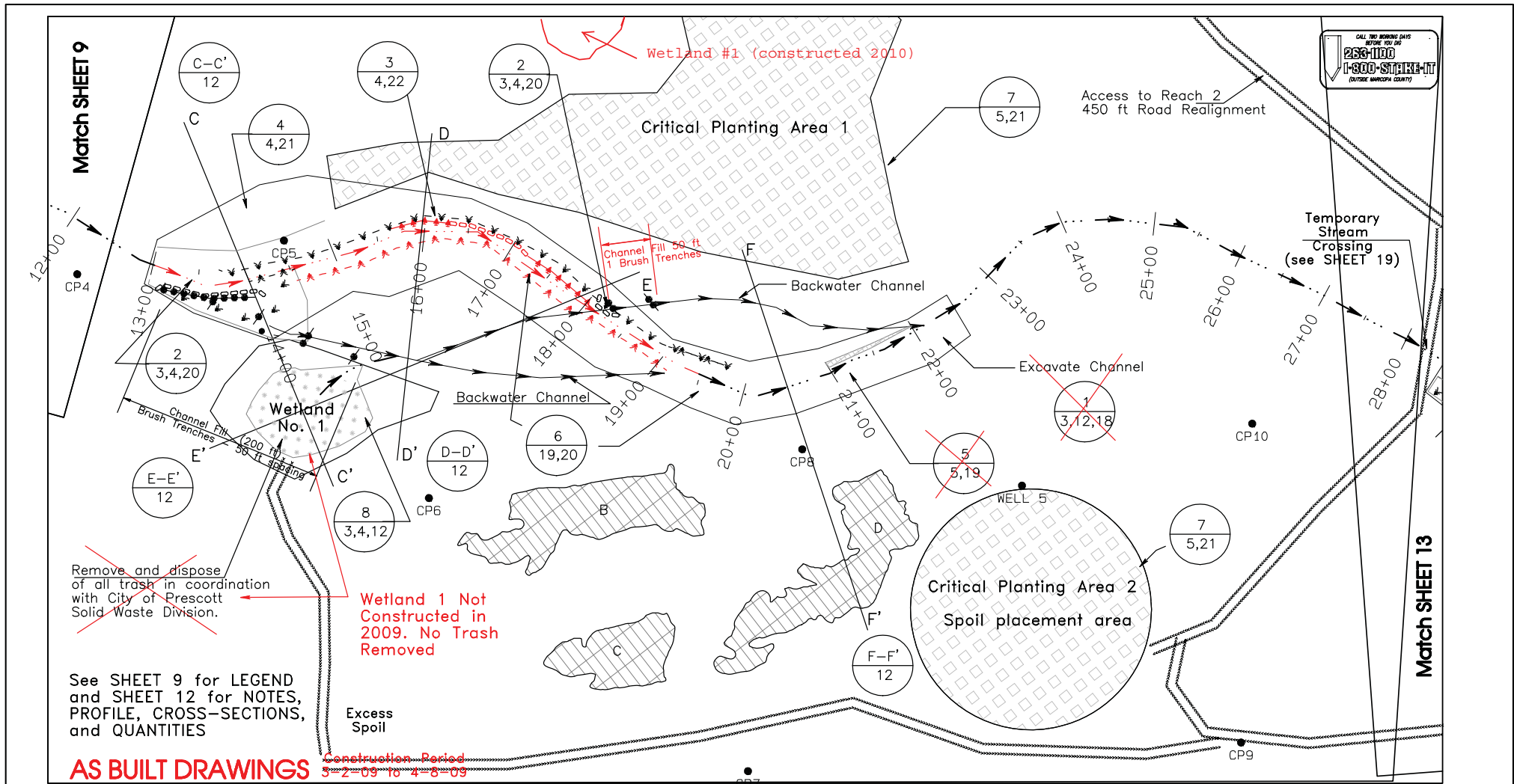





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Watson Woods.pro

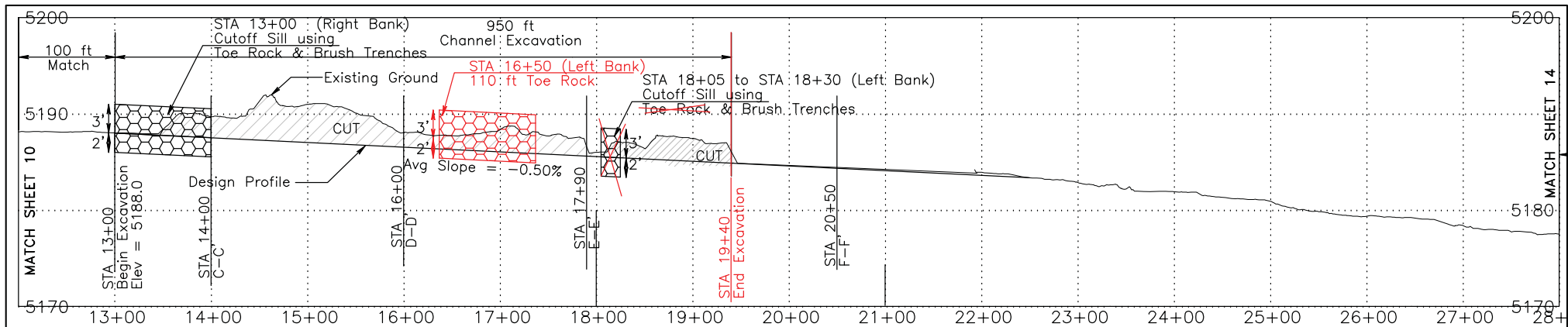
PROJECT NO:
05-106-01AZ

DATE: December 20, 2006

SHEET:
10 of 22



<div>Natural Channel Design, Inc</div> <div>3410 S. Cocopah Dr. Flagstaff, Arizona 86001 (928) 774-1178</div>	DRAWN BY: M.Wirtanen, S.Yard			PLAN VIEW: Reach 2 STA 12+00 to STA 28+00	<div></div> <div>Expires 3-31-2011</div>	HORIZ SCALE: 1" = 100'		<div></div> <div></div>
	DESIGNED BY: T.Moody, M.Wirtanen, C. Helton					FILE NAME: Watson Woods.pro	DATE: December 20, 2006	
	REV	DATE	BY	REVISION		PROJECT NO: 05-106-01AZ	SHEET: 11 of 22	
	1	5/3/07	SNY	Trash Note & Crossing				
3	1-5-10	MW	As-Built	Watson Woods Riparian Preserve Project #: 08-158 WPF				



NOTES

1. STA 13+00 to 19+40 640 ft Channel Excavation.
2. STA 13+00 Rt (80 ft) Inlet Protection
STA 16+50 Lf (110 ft) toe rock.
STA 18+05 to STA 18+30 (35 ft) Inlet Protection
Backfill channel, Install Brush Trench
3. STA 13+00 to STA 19+50 RIGHT & LEFT) 650 ft
Install Vertical Bundles & Pole Clusters,
4. STA 14+00 to 14+50 (RIGHT) 50 ft
Install Floodplain Pole Clusters
5. STA 13+00 to STA 19+50 (RIGHT & LEFT)
Install fabric over seed.
6. STA 14+10 Rt (40 ft) -Brush Revetment
STA 17+20 Rt (70 ft) -Brush Revetment
STA 15+75 Lf (70 ft) -Erosion Log
7. Critical Planting Areas -
Plant Cottonwood/Willow Posts (Spring 2010)

REACH 2: MATERIAL QUANTITIES

Toe Rock: 95 cy
Willow Clusters: 312 ea
Vertical Bundles: 32 ea
Seeding: 6 acres
Fabric: 14 rolls
TRM Fabric: 70 ft
Brush Revetment: 110 ft
Erosion Log: 70 ft

AS BUILT DRAWINGS

Construction Period
3-2-09 to 4-8-09

Natural Channel Design, Inc

3410 S. Cocopah Dr.
Flagstaff, Arizona 86001
(928) 774-1178

DRAWN BY: M.Wirtanen, S.Yard			
DESIGNED BY: T.Moody, M.Wirtanen, C. Helton			
REV	DATE	BY	REVISION
3	1-5-10	MW	As-Built

PROFILE and CROSS-SECTIONS Reach 2

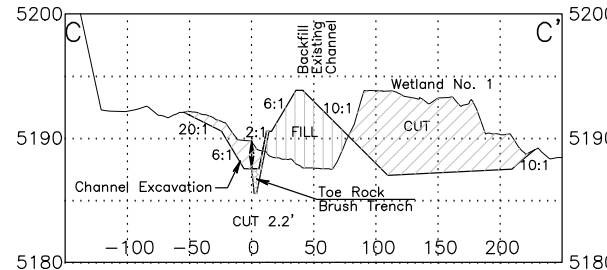
Watson Woods Riparian Preserve
Project #: 08-158 WPF



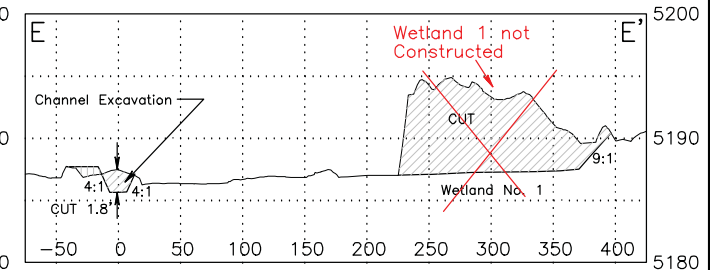
HORIZ SCALE: 1" = 100' VERT SCALE: 1" = 10' 	
FILE NAME: Watson Woods.pro	DATE: December 20, 2006
PROJECT NO: 05-106-01AZ	SHEET: 12 of 21

PROFILE: STA 12+00 to STA 28+00

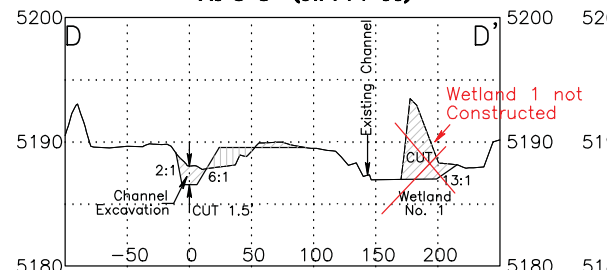
See SHEET 11 for PLAN VIEW



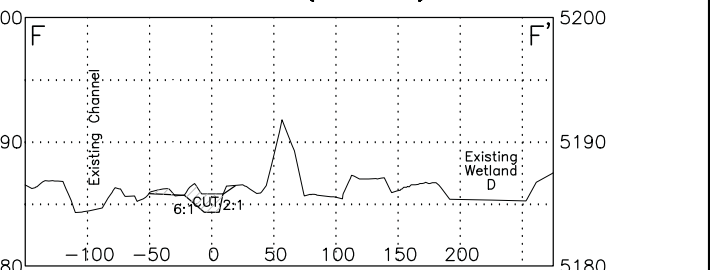
XS C-C' (STA 14+00)



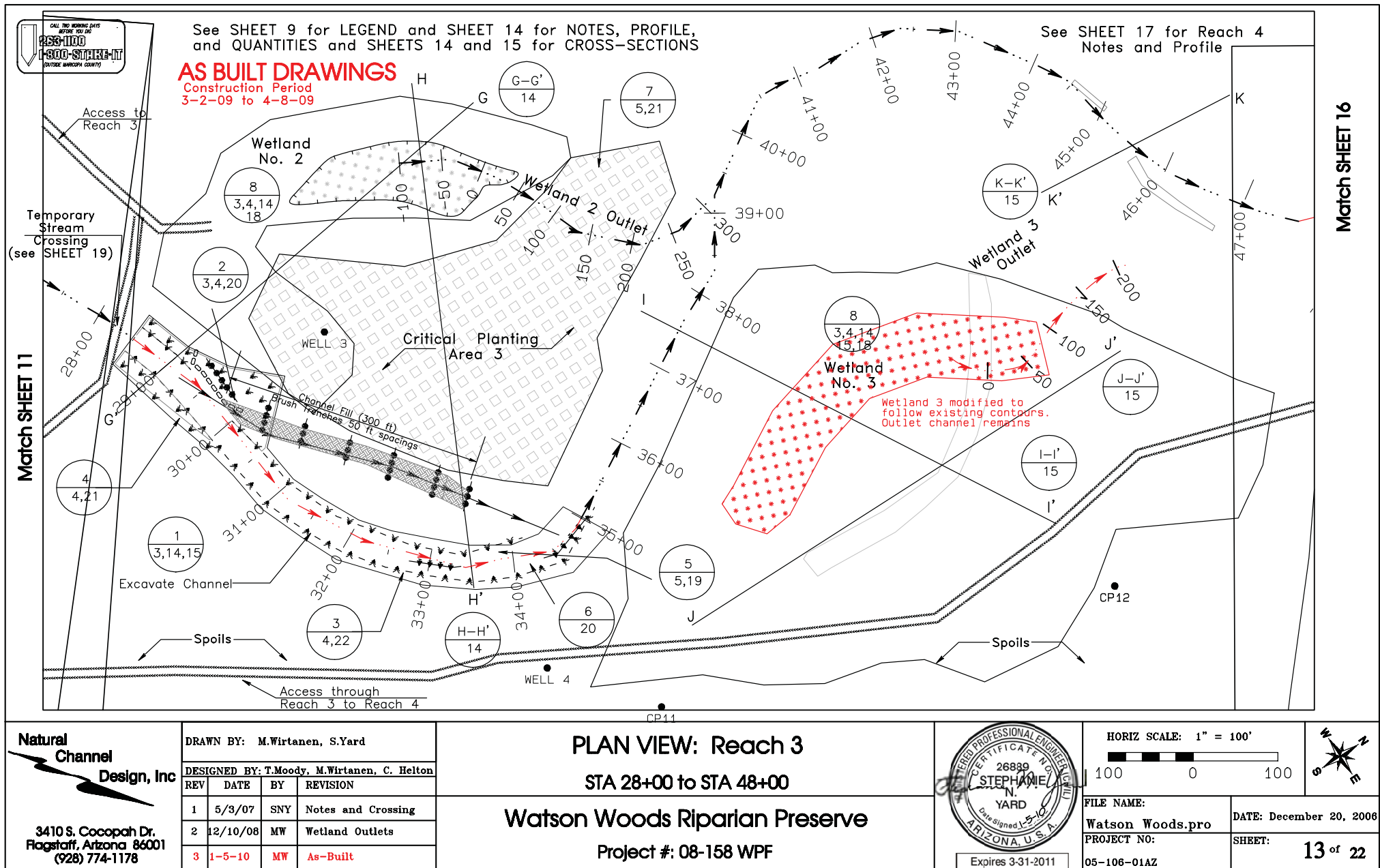
XS E-E' (STA 17+90)

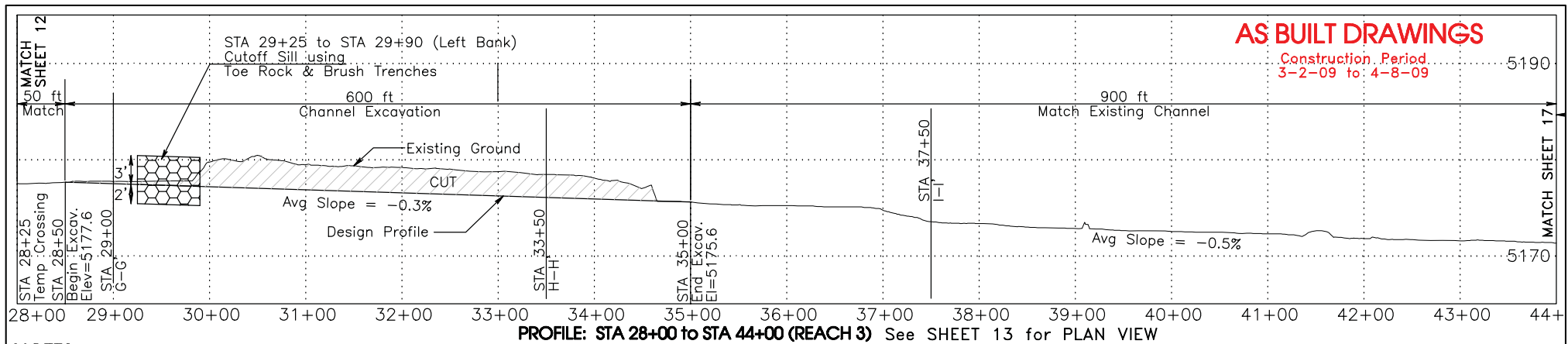


XS D-D'' (STA 16+00)



XS F-F' (STA 20+50)



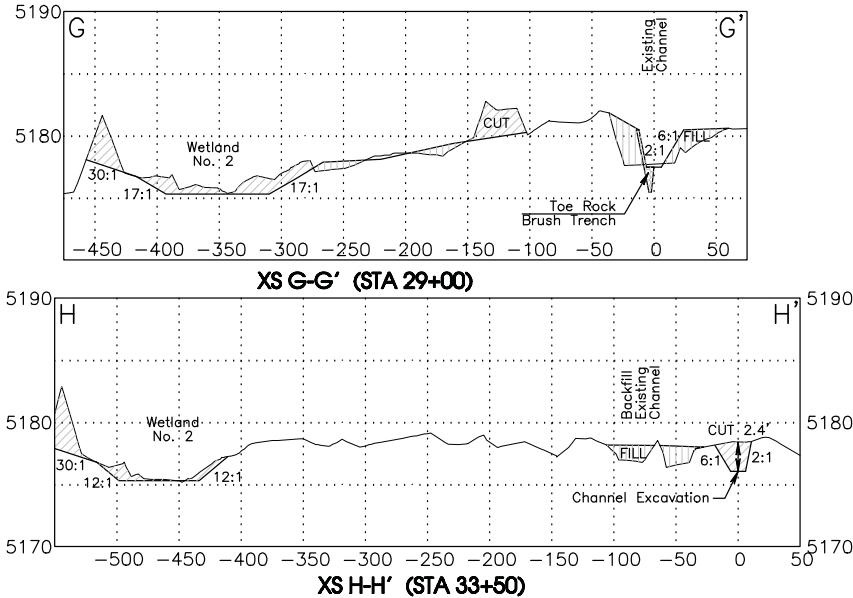


NOTES

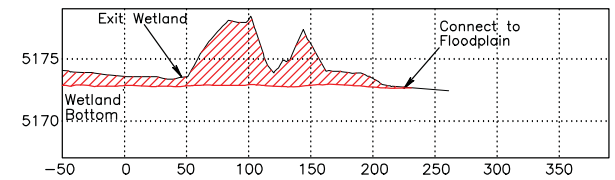
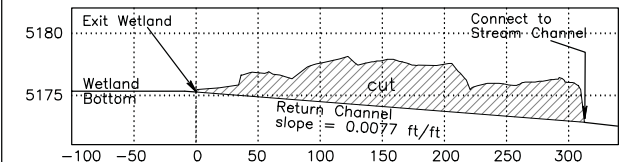
1. STA 28+50 to 34+50 600 ft Channel Excavation. Place spoil as shown on SHEET 6.
2. STA 29+25 to STA 29+90 (80 ft) Backfill channel, Install Toe Rock and Brush Trenches
3. STA 28+50 to 29+25 & STA 30+00 to 31+00 (LEFT) 175 ft, STA 28+50 to 35+00 (RIGHT) 650 ft. Install Vertical Bundles & Pole Clusters
4. STA 28+50 to STA 30+50 (LEFT & RIGHT) 200 ft. Install Floodplain Pole Clusters
5. STA 28+50 to STA 35+00 (RIGHT & LEFT) Install fabric over seed.
6. STA 29+80 (LEFT) 40 ft Brush Revetment. STA 32+70 (RIGHT) 60 ft Brush Revetment. STA 34+50 (RIGHT) 50 ft Brush Revetment.
7. Critical Planting Area (Spring 2010)
8. Excavate Wetland Nos. 2 and 3, with Outlet Channels.

REACH 3: MATERIAL QUANTITIES

Toe Rock: 40 cy
Willow Clusters: 262 ea
Vertical Bundles: 69 ea
Seeding: 7.5 ac
Fabric: 18 ea
Brush Revetment: 160 ft
Erosion Log: 120 ft



Wetland Outlet Channel Profiles



**Natural
Channel
Design, Inc**

3410 S. Cocopah Dr.
Flagstaff, Arizona 86001
(928) 774-1178

DRAWN BY: M.Wirtanen, S.Yard			
DESIGNED BY: T.Moody, M.Wirtanen, C. Helton			
REV	DATE	BY	REVISION
1	12/10/08	MW	Wetland Outlets
3	1-5-10	MW	As-Built

PROFILE and CROSS-SECTIONS Reach 3

Watson Woods Riparian Preserve

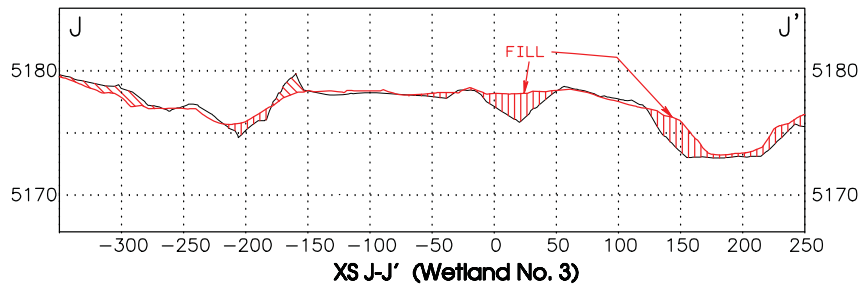
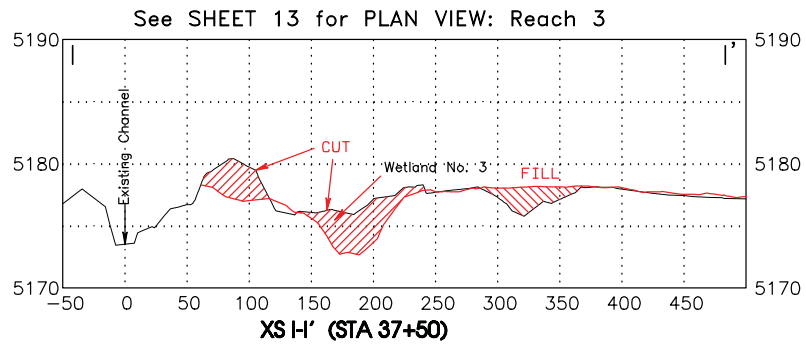
Project #: 08-158 WPF



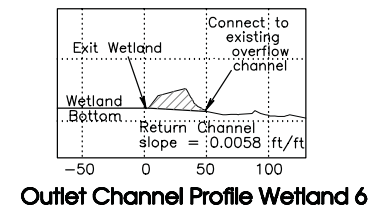
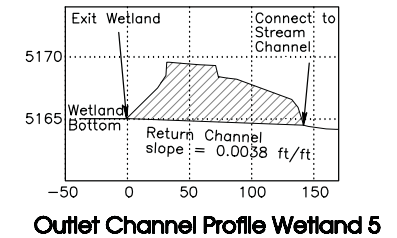
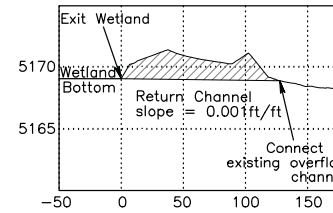
HORIZ SCALE: 1" = 100'
VERT SCALE: 1" = 10'

100 0 100

FILE NAME: Watson Woods.pro	DATE: December 20, 2008
PROJECT NO: 05-106-01AZ	SHEET: 14 of 22

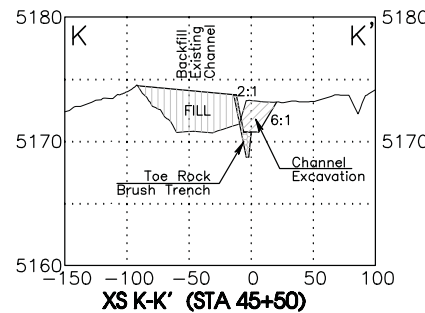
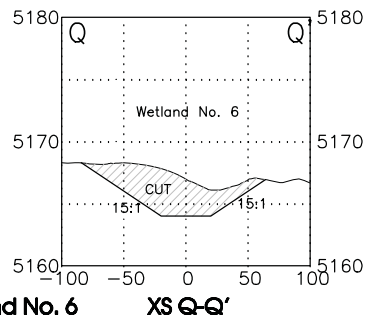
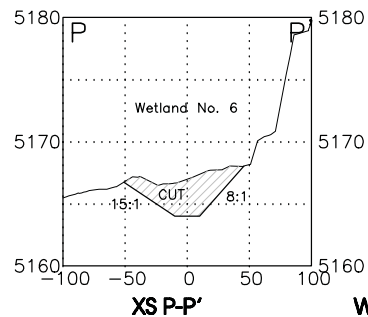


Wetland Outlet Channel Profiles



AS BUILT DRAWINGS
Construction Period
3-2-09 to 4-8-09

See SHEETS 13 and 16 for PLAN VIEW: Reach 4



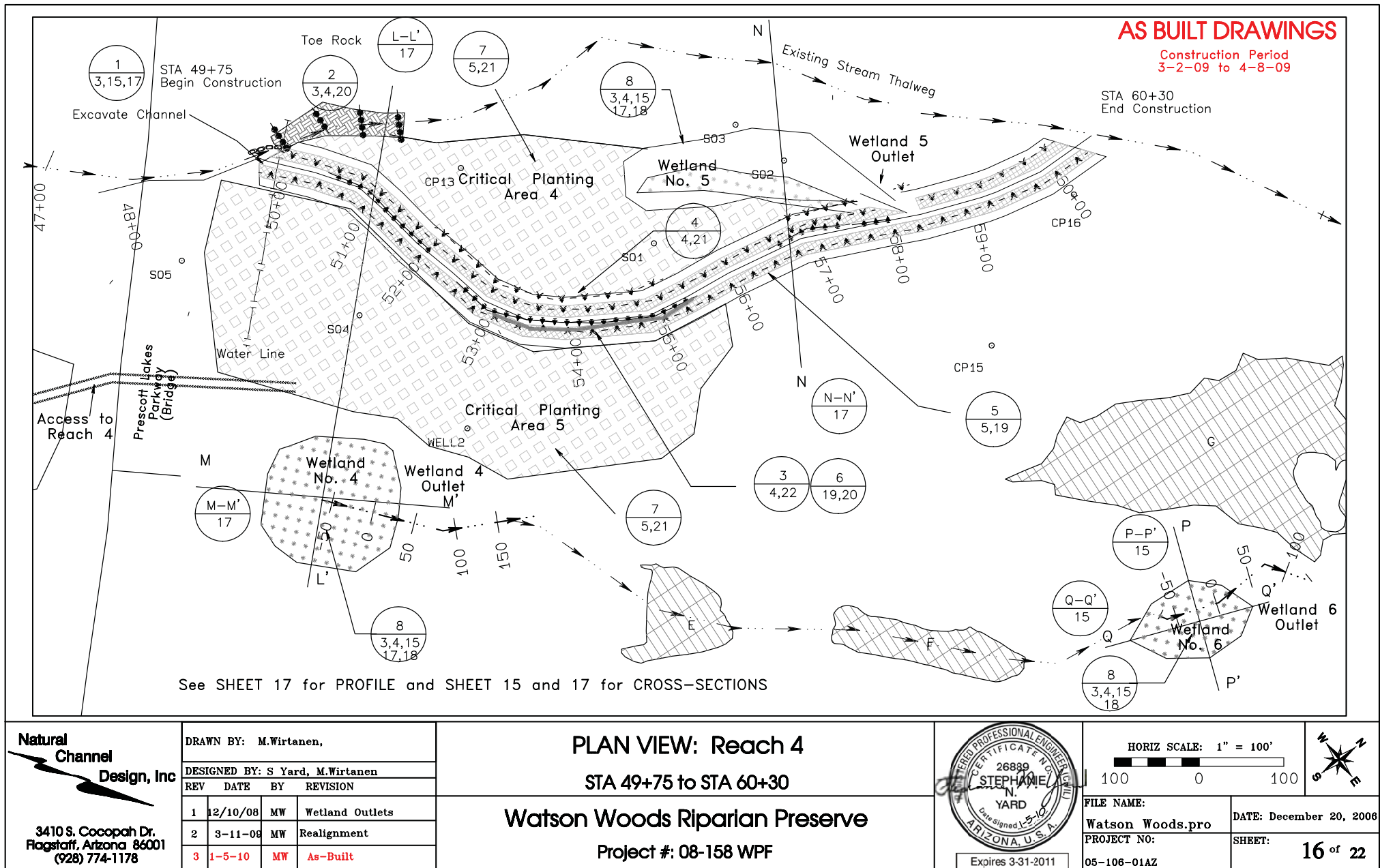
Natural Channel Design, Inc
3410 S. Cocopah Dr.
Flagstaff, Arizona 86001
(928) 774-1178

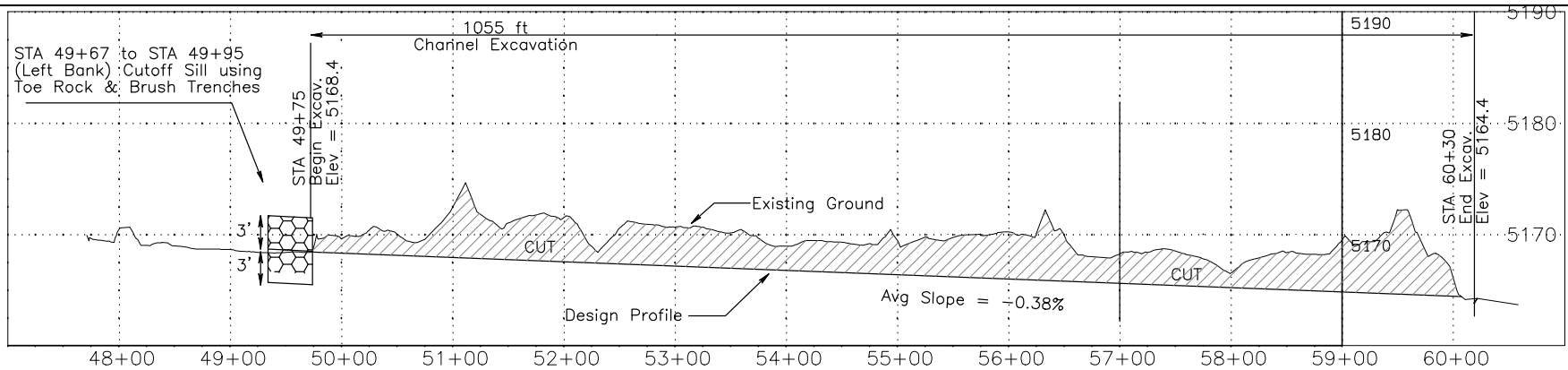
DRAWN BY: M.Wirtanen, S.Yard			
DESIGNED BY: T.Moody, M.Wirtanen, C. Helton			
REV	DATE	BY	REVISION
1	12/10/08	MW	Wetland Outlets
3	1-5-10	MW	As-Built

CROSS-SECTIONS
Reach 3 and Reach 4
Watson Woods Riparian Preserve
Project #: 08-158 WPF



HORIZ SCALE: 1" = 100' VERT SCALE: 1" = 10' 	
FILE NAME: Watson Woods.pro	DATE: December 20, 2008
PROJECT NO: 05-106-01AZ	SHEET: 15 of 22





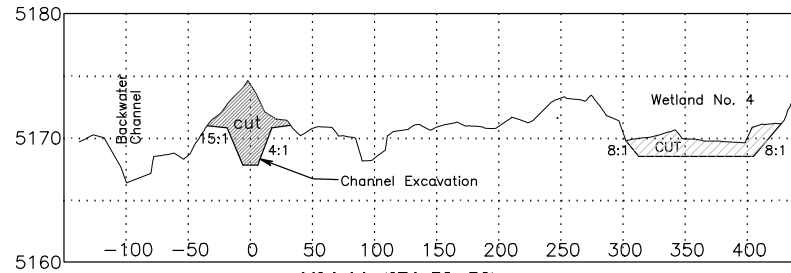
PROFILE: STA 44+00 to STA 60+00 (REACH 4)

NOTES

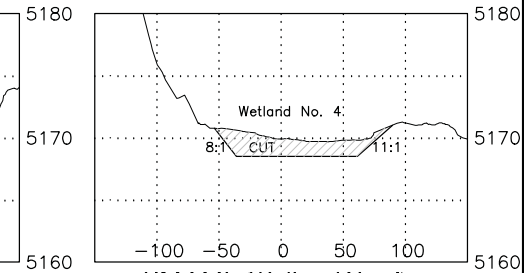
1. STA 49+75 to 60+30 1055 ft Channel Excavation. Place spoil as shown on SHEET 6.
2. STA 49+67 to STA 49+95 (70 ft) Backfill channel, Install Toe Rock and Brush Trenches
3. STA 49+75 to STA 60+30 Right and Left Install Vertical Bundles & Pole Clusters
4. STA 52+00 to 55+00 Left Install Floodplain Pole Clusters
5. STA 49+75 to STA 60+30 (RIGHT & LEFT) Install fabric over seed.
6. STA 53+10 (230 ft) - Coir Log
STA 56+75 (75 ft) - Brush Revetment
STA 57+50 (50 ft) - Brush Revetment
7. Critical Planting Area (4 ac) -scheduled for 2010
8. Excavate Wetland Nos. 4, 5 and 6 with Outlet Channels. Plant wetland plugs and seed -scheduled for 2010

REACH 3: MATERIAL QUANTITIES

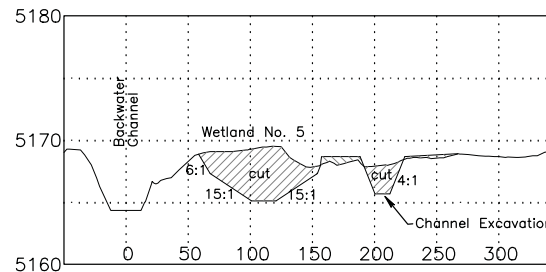
Toe Rock: 35 cy
Willow Clusters: 821 ea
Vertical Bundles: 199 ea
Seeding: 2 ac
Fabric: 33 ea
Brush Revetment: 125 ft
Erosion Log: 230 ft



XS L-L' (STA 51+50)



XS M-M' (Wetland No. 4)



XS N-N' (STA 57+00)

AS BUILT DRAWINGS

Construction Period
3-2-09 to 4-8-09

See SHEET 16
for PLAN VIEW



Natural Channel Design, Inc

3410 S. Cocopah Dr.
Flagstaff, Arizona 86001
(928) 774-1178

DRAWN BY: M.Wirtanen, S.Yard			
DESIGNED BY: T.Moody, M.Wirtanen			
REV	DATE	BY	REVISION
1	3-11-09	MW	Realignment
3	1-5-10	MW	As-Built

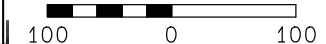
PROFILE and CROSS-SECTIONS Reach 4

Watson Woods Riparian Preserve

Project #: 08-158 WPF



HORIZ SCALE: 1" = 100'
VERT SCALE: 1" = 10'



FILE NAME: Watson Woods.pro	DATE: December 20, 2008
PROJECT NO: 05-106-01AZ	SHEET: 17 of 22