Upper Little Colorado River- Water Quality Improvement Project

ADEQ Grant Cycle 15

WQIG #15-005

FINAL REPORT

APACHE NATURAL RESOURCE CONSERVATION DISTRICT
823 E. Main St. - P O Box 329 - Springerville, Arizona 85938
Phone: 928-333-4941 Ext. 106

PROJECT DESCRIPTION

The Upper Little Colorado River {ULCR) is comprised of four 10-digit watershed which drain into Lyman Lake. They are Canero Creek (HUC 1502000104), Coyote Creek {HUC 1502000103), Nutrioso Creek (HUC 1502000101), and South Fork Little Colorado River {HUC1502000102). Sediment contributions are significant enough to influence the capacity of Lyman Lake, a major irrigation impoundment and recreational boating reservoir on the Little Colorado River, and enough to cause water quality impairment of the Little Colorado River. Arizona Department of Environmental Quality {ADEQ) has provided a Water Quality Initiative Grant to the Apache Natural Resource Conservation District (ANRCD) with the purpose of establishing a group of willing cooperators to address and apply best management practices (BMPs) on lands that they manage to achieve sediment reduction. Natural Channel Design, Inc. has provided professional technical assistance and engineering design to the ANRCD in the development, design, and implementation of **BMPs.**

This report describes in detail, the funded projects completed in WQIG Cycle 15 that were focused on limiting the sediment contribution to the Little Colorado River. ANRCD requested proposals from cooperators and prioritized them, paired them with ADEQ funding and constructed **BMP's** in critical areas.

The ULCR has had recognized water quality issues related to sediment yield for several decades. There is a Comprehensive ULCR Watershed Plan in place and recommendations from several reports have generally agreed upon the source of sediment and types of practices required to alleviate sediment yield from the watershed. However, many recommendations have not been implemented due to lack of funding or support from public/private land managers. This project had direct input from land owners and managers as to the types of practices they believe would best benefit the land and their interests. This set of practices was evaluated to assess the potential impact on water quality improvement and cost benefit analysis. A prioritization of potential projects was requested from outside parties made up of professional range consulting companies and Arizona Association of Conservation Districts leadership personnel.

LOCATION

It was the desire of the ANRCD to attempt to have at least one project in each of the four sub-watersheds making up the ULCR. There were numerous projects for each sub-watershed presented for prioritization and funding. The completed projects are located in Figure 1 below in either the Coyote Creek, Nutrioso Creek, or Canero Creek watersheds.

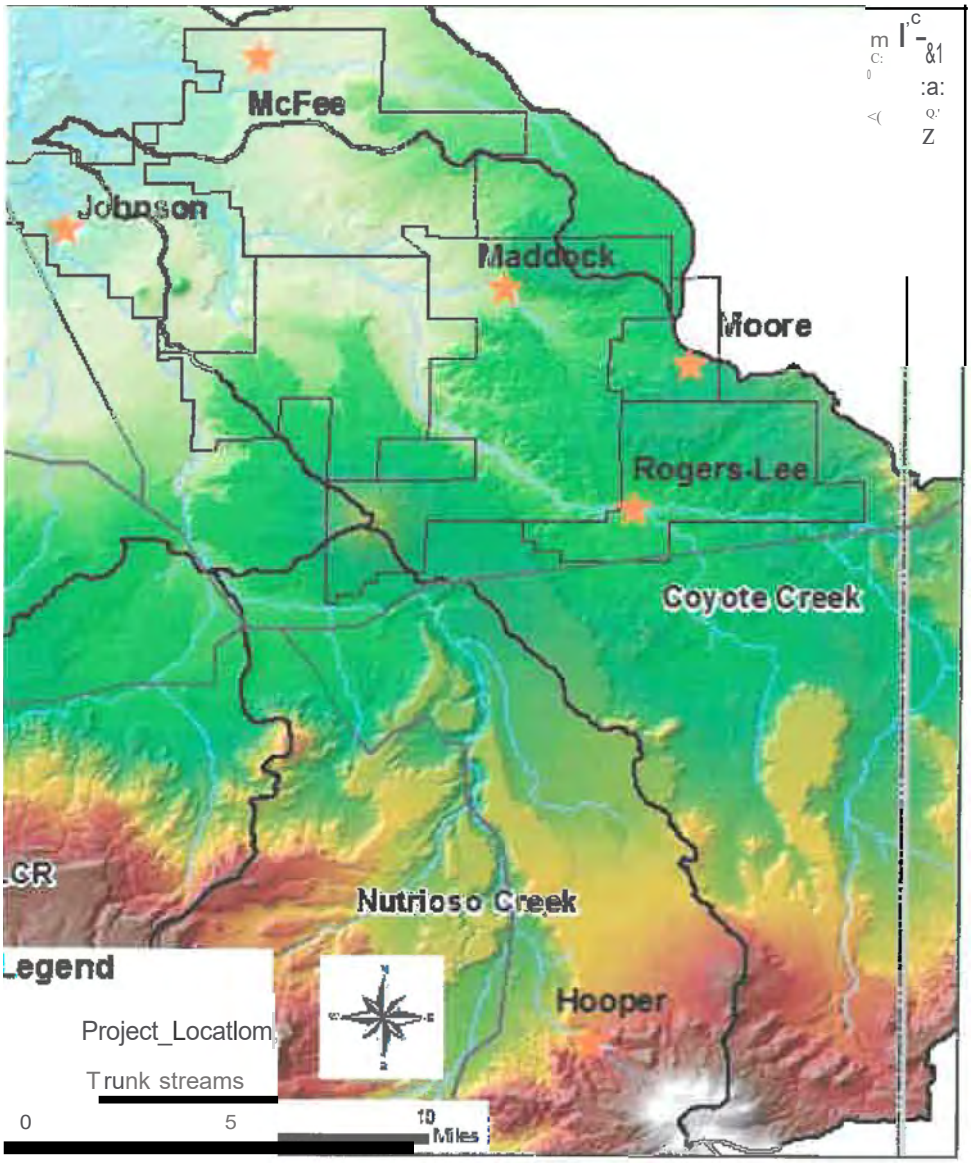

Figure 1.

EXISTING RESOURCE CONDITIONS AND CONCERNS

OWNERSHIP, CLIMATE, GEOGRAPHY AND Soll.S

The majority of land within the watershed is State Trust land that is leased for grazing. It is Important to note that most of the federal lands are in the upper portion of the watershed while state and private lands are in the lower two thirds of the watershed where most of the runoff and sediment yield are generated.

Precipitation in the watershed ranges from 10 to 14 inches annually. Most precipitation occurs as rain during summer monsoon storms. Winter snows are characteristically light. The higher elevations in the southern portion of the watersheds receive more precipitation than the rest of the watershed.

The surface geology of the watershed consists of alluvial and sedimentary deposits interspersed with lava flows. The majority of soils on the watershed are loamy sands of the Clovis-Palma-Hubert association formed from eolian deposits on flat or undulating topography. Rudd (basaltic derivation) and Tours-Jocity soil associations are the next most prevalent. All soil associations are well drained.

The topography of the watershed is generally flat, or rolling with volcanic hills. Drainages can create incised canyons.

Vegetation on the watershed consists of mainly grassland savannas or grass mixed with pinyon /juniper.

SUMMARY OF COMPLETED PROJECTS

The ULCR area had six projects funded through ADEQ with a landowner match. There were projects funded in three of the four targeted 10-digit watersheds. These project tasks included remediation of bank erosion, head cuts, channel incision, and filled or breached sediment basins. Remediation methods used indude bank sloping, rock chute structures, rock **spillways,** and revegetation.

MADDOCK PROJECT

Maddock Lower Tank Incision Looking Across Channel at Dam Breach

Maddock:

The purpose of this project is to construct two stabilized spillways and rehabilitate their associated sediment basins. This analysis and design was undertaken as part of a watershed improvement grant to reduce the sediment yield of Coyote Creek to the Little Colorado River. The work brought two water and sediment control basins back into operation. The two basins are located in series with one basin located directly above the other. The existing embankments were enhanced and a rock lined auxiliary spillway was added at each basin. These spillways arrested head-cuts moving upstream and secured the accumulated sediment in each basin. Additionally an eroding bank was stabilized at the lower basin.

Construction of upper basin showing excavation of rock chute, rebuilding of berm and channel bank sloping.

Maddock basins final construction looking downstream before revegetation.

Maddock basins final construction looking across upstream.

Maddock lower basin rock chute, bank sloping and erosion mats and seeding.

Maddock basins final construction looking down stream. Erosion mats and seeding complete.

Maddock project has been declared complete 08/25/2016. The project consisted of:

730 CY of cut
730 CY of fill
230 CY of 050=12.5 in. rock
12 CY of D50+8 in. rock
440 SY of nonwoven geotextile fabric
Native grass seed mix for 1.0 acre
11 rolls (100 sy each) single net erosion control fabric

UPPER LITTLE COLORADO RIVER HEADWATERS
ADEQ Water Qualtty Improvement Project

PREPARED FOR: Sydney Maddock

GRAM' FUNDING BY:
Altrona Dapartmet it Or EnvlrormN 11a1 Qualty (ADEQ)
WcdarQuallyDIVIlorl

LOCATION MAP

R!ztjfDINI

AS-BUfL1/RECORO DRAWING CERTIFICAT"ION
I HEREBY STATE THAT THE AS-BUILT INFORMATION AS SHOWN WITHIN THIS PLANS IS CORRECT TO THE BEST OF MY KNOWLEDGE. THE AS-BUILT INFORMATION AS PRESENTED IS BASED UPON FIELD OBSERVATIONS AND INFORMATION PROVIDED TO NATURAL CHANNEL DESIGN BY THE CONTRACTOR.

CHRISTOP.t:!.ER.JRESSLER	58521	6122/201 Z
REG. PROFESSIONAL ENGINEER	REG.#	DATE

OW.ER:
a OC Ranch
Svdn 1JOt)dook
P:O Box 669
Springeryjlle AZ 85938
Phone: {602) 686-1590

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g cItto St.
Springeryjlle AZ 85925
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Channel Design, Inc

WcCHN\ conTANT•
aturQr !\Cam Design 1 Inc.
2900 N. West Street., :,uite 5
FlQgstoff 8800-'!-
Phone: (928) 774-2338

RI \C\ ING F\JNF':!f (GENCES:
Environmental Quality
1110 W, Washin.9tgn st.
Phoenlx, AZ 850 7
Phone: (602) 771-4635

NRCS
Natural Reaour"CeS
Conservation Service
230 N. 1at Avenue._ Suite 509
Phone: (602) 280-8801
Phoenix, AZ 8500.:>

INDEX OF DRAWINGS

WORK QUANTITIES

EARTHWORK:	
CUT	730 CY
fill.	730CY
ROCK 50-.::12.!jln.}	230
ROCK D50=Bln,)	12 CY
GEOTE ILE	4-40 SY
GRASS SEED MIX	1 AC
EROSION CONTROL BLANKET	11 ROLLS*
*BASED ON ROLL SIZE Of 8'	112,5'

PLAN LEGEND

Top of Rafurbislled Berm
Dloturbonce (cut and/or nn)
Rock Rlprop
Erovion Control Blanket
Control Point
Existing Flowllne
Proposed Flowllne
Existing Contour (minor)
E i•ti"9 Contour (major)
Design Contour (minor)
Design Contour (major)
Umita of Grading at Cut
Limite at Grading at Fill
Centerline
Detail Id ntifler
Sheet Raference

Natural Channel Design, Inc
2900 N. West Street -1151
F\ogstof, Arizona 86004
(92a) 774-233

DRAWN BY:	M. Keorly & C. Scudieri
DESIGNED BY:	M. Kearl
REVIEWED BY:	M. Kear1Y, C. Tressler

REV	DATE	BY	REVISION

COVER SHEET:
Location, Index & Quantttles

UPPERLCR
ADEQ Water Qualtty Improvement Project
Maddock Ranch

Registered Professional Engineer CERTIFICATE 34587 MICHAEL D. KEARLY Date Signed Arizona U.S.A. Expires 03/31/2018

DATE: 12-02-2015
NCD PROJECT NO: 15-240-AZ
DRAWING NO: CVR01
SHEET NO: 1 OF 8

PROJECT DESCRIPTION

The purpose of this project Is to oonsin,ct stablltzed ■plllwaya & rehciblIHate the two associated sediment bpelh•. Improvement pk,n lncludeai

1J Construct new stable 1p!llway and Inlet/outlet apron• al nor1hem end of th• ulstlng embankments where splUlng hae occured and headcuttlng Is evident,
2) Restore and enhance the existing sediment baeln emb11nkmenh at two basins to enaure proper overflow to the •plllway.
3) Extend ti\• .xretlng embankment at the upp.r basin to capture a ■ma ll side drainage and arTesl an advancing headcul at ■oclated with that drainage.
4) StabUlze existing ovemeep 11nd/or ver11cal slope, at lower sediment basin lo r■duct -■ dlment generation and pr911ent faittler h.adoutttnQ,
5 Remove accu~latod sediment from lower aedlment boaln bottom,
6 Seed all disturbed **areas** and • lllway wlIh native **gra1a seed,**
7 Apply 1lngl1 net fabric to apeoftlc slope■ within the project ore11 lo pr11mote aHd germination,

GENERAL NOTES

1, Site loP,ographlc survey data was collected by NCO on August t'4, 2015.
2. All ex119tlng c ondition■ are to be verified In the fleld prior to constNctlon. If differences tn the alte hove occurred In th• ttme between the lntlal survey and construction, the engineer shall be consulted for any neceasgry modification• lo the design and pl11na.
3. No repre11nt1ftlon 11 made 01 to the extlfence or nonexldence of ar.y ulllllles, public or private. Abnnce of utlllll•• on th•• drowlng1 IS NOT a a■ur ano• that no utlllll•• are preeenl. The exletencef locatlon and depth of any utllly mud be determined by the controotor prior lo any excaY11tlon. Ca I Arlzon11 Blue Stak• before you illa to be lure - dlal 811.
'4. No aondructlon shGIl begin 11ntll all necea■a ry permlla, eo ■ men la, and funding authorization• are obtained.
5. Conslrt.tctlon actlvlltH wtll be conducted In a manner consistent with all safety regulation• and other permllflng required by Arizona suite Land Departmsnt, Arizona Department of nvlronmental Qual!t)t and ather1.
6. lnstaUahcin ■ha ll be conttn.icted to the lines and **grades as** shown on the drawlng• ar as staked In the ft•ld by the ENGINEER or authorized rap_ruenfatlve, nlzln g there la vortotlon tn nature,
7. The total dratrubed area l• approxtmotely 0.7 acre1, therefore II SWPPP Is not required. How-r, the contniclor ■hall **eneure** that oonatructlon actMtl•• are parformed In a m11nner that mlnlmln1 aoll, wal ■r and air pollution uttllzlng standard Best Management Practlcea.

CONSTRUCTION SPECIFICATIONS

The epeclflcatlona lnctud■d heraln Qre pro l/kl■d aa a partlal 11st of oon1tniotlon atQndards and requlrem■nb for lhl• prcJect. A, o cpmpanton to thl• plan ■■ o full compllatlon of applk:able technlcal apeclflcatlona la P.rcvlded. The peraonls) performing the work s all famlllarlz• th■mH lves with those specifications 11nd contact the engineer prior to darting condructlon with any questions or for clarlflcaHon,

EARTHWORK

The earthwork octtvllle• 1holl consist of grading to modify rehabllltate tho the existing aedlment basins, Install armor■d overflow splllwoy, and rehabAltate 11mb1'1niment1.

Excavation

E cayatlon shall be llmlled to sediment ba•ln and ■plllway construction ot 1hown on the drowlnga or os staked In the fleld. No ■xcov ollon shall lak• pl11oe within any Jurtsdlotl11nal are111. Disturbance of existing native vegetation 1h11fl be minimized tc th• gr■atell extent paaillbl• during excovatfon.

Excavated material 1hall be rloced In the apeclfled berm and headcut loccllons aa ahown on the drawings or as staked In !he fleld. Al finished surfaces shall be generally smooth 11nd plea,lng In appaorance ana blend Into surrounding terrain,

L!!!±h!!!L

Jtateriais: All fRI materlala ■ha ll be obl11lned from tho raqulred excOYlltlans and approved borrow sourc11. FIH molerlal1 ■ha ll not contciln aod, brush, roots, perl1hable or frozen materials, tra1h or other debris.

EarthfHI (continued)

.RjIC&ffUlftt: The placement of 1111 matertala ■ha ll follow thHe guldellnea:

- verl1aal bank aholl be slOped bet«• placement of 1111 motar1ol.
- The downslraam, eroded f11ce of th• ■xhnlng embankment shall be stepped as necen11ry prior tc 9lacement of new material P.•r the Included pton• gnd details.

Th• placing ond spreading of flll molerlol ■ha ll be started at the lowed p11lnl and the fill brought up and compacted lo obtain a d1nslfy 1lmllar to the surrounding bank material•.

Material when P.laced shall contain sufficient moisture 10 that a sample token In the hand and aqueezed ■hall remain Intact when releoHd.

For general fnl P.lClCtlmentrth• placing and spreading of fUI m<1terlol •gaJI be dar1ed at th• lowest pornt and the 1111 lwo'UIl up ln hort:rontal layer• not to exceed: •lx 6} Inch•• of loou fhl for WhHI c11mp!lctlon 11nd four \4 Inch•• of loo.. fill for dozer compaction. nstruollon equipment 1hall be op1rated over lhe areas of each layer of flll to Insure that the required compaction ls obtaln1d,

For trench backfllf or flll placement wher11 arge equlP.ment does not have ocoeas, P.11camerri shall be In horlzontal lift■ not tXOHdlng ■lx 16 Inch•• of IOoH 1111 and compa11t1d with approprtcitely 1lzed • pment, auch al a ■h• f, • foot roller a chm•nt on an excavator, Jumping Jock compactor 11r rnf ah l i:, pt ov !o ':,e f :i•-:.;n •now or lea.

Headcuts and gu«1111 deslgnClfed for flhlng and re-contouring shall be filled a■ cloH as posalble to the historic n11tural ground surface, 11nd smoothed and shaped to blend wHh 1h11 surrounding landsc11pe.

All flnl•hed aurfocee shall be generally smooth and pleaalng In appearance and blend Into aurroundlne terrain.

Traeh and Debris Removal

Alt lrllah and debr1a, lnoludlng llrea, old pvc plj>N, lumber, etc. ahall be ramoved from the projects llmlh and dlpo••d of properly,

HEAOCUT STABILIZATION & CUT-OF'F' SWALE ARMORING

Th• hllodout alablllzollon work ehall i:onalat of h111daut excavoNon and bank sloping; furnishing and lnatalnng looae rook Including placement of filter fabrlo. SH SHEETS 5 I! 6 for locatlona ana SHEET 8 for o.talls.

> The site shall be excovated and backfllled to the grades shown on drawlnga. Excavation ahall be llmlted lo the headcut remediation ar■a as shown on the drawing• or as slaked fn th• fteld by the ENGINEER. All fill material shall b■ compacted to the apP.rcxlmale denally of sunroundlng undisturbed areas. Addltlonal ■poll• shall be spread outside the channel and sloped tn such a way os to direct flows to-rd rack'-lined chute.

> Dlaturbance of exlating native vegetation shall be minimized.

> Non-woven 111otextrl1 ahall be pfQced behind the rack. F'abrlc shall be meat the requirements of NRCS MS-AZ-592 l;eofextlle material apeclflcallons for ClaH III nonwoven ge otexllle■• The geotexHle sholl be Joined by averla pplng II minimum of 18 Inches and secured against the undarlylng foundation materlol, Securing pfns lflall be lnal11Hed 01 necel■a ry to pre11nt undue allp poge or movem■nt of the gealextlle. Reoomme.nd 3 16-lnch ste,l bar, pointed on one end and fabrlaafed with a head to retain a lfeel wa■h1,ll' t1.5-'nch dlameterJ. Pin le h shall be not leH than 18 Inches. U- ■hcr.e d pin• are acceptable.

> ::;:le :) b i r: •r811:fucl\me ?ci "! nJ1'1.i :l r'!\i:if e edr.::,h: n: : a11 lhe greClfe1t dimension, /&ck aource shall be 11P.proved by the ENGINEER or outhorlied r■preH nla tlve and hove Cl bulk specific gravity of not less that 2.5 per ASTM C127. Rack ahalt be well graded aa follows:

ROCI< CHUTES

Diameter, In.	Percent Pasaln9
19-25	0100
16-22	085
12-111	050
t0-16	010

CUT-oFF SWAL.£

Diameter, In,	Percent Pa■■lnp
9-12	gigo
-4-8	050
2-6	010

> R:,i:.xft\ ement shall begin at the bottom of slope. Rook ahall not be drapped more than 3 feet onto

> i1oped banks shall be eeeded with n11llve graas, 1111e Sheet 3 for GraH Seed Mix

Natural Channel Design, Inc

2900 N. West Street MS
Flagstaft Arizona 8600
{92ts) 774-2336

DRAWN BY: M. l(ec,ny & C. Scudieri
OESIGNEI)_ BY: M. Kearly
REVIEWED BY: M. Kearly, C. Tressler

REV	DATE	BY	REVISION
	1/ 11/ 161		900:ai.llo

GENEAAL N0IES &
CONSTRUCTION SPEOACATI0NS

UPPERLCR
ADEQ Water Qualtty Improvement Project
Maddock Ranch

Registered Professional Engineer (Civil)
CERTIFICATE NO. 34587
MICHAEL D. KEARLY
Date Signed
ARIZONA U.S.A.
Expires 03/31/2018

UNAUTHORIZED CHANGES & USES: THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE FOR, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

DATE: 12-02-2015
NCD PROJECT NO: 15-240-AZ

DRAWING NO: GEN01

SHEET NO: 2 OF B

EROSION CONTROL BLANKET

Eroolan control blankot shall be lr:dd and anchal'9d over the **seed** to provld• bank P.rotectlon **and a** good environment far Y""S•fatlon regrowtn. tallow manufacturera recommendations for lnslallaffon and ancliorlng, rncludlng anchor trenches and riapllng pattern and rate.

SINGLE NET: Straw, S1ng1e N•t Erosion Cantral Blanket,. that 1n certltled **W••** frH and. mad• with all natural, 100,C blodegradab1e netting. Use AE:C Premier Slngle r1et ECB with tlbreNel netting (American Excelalor) or equlvatenl.

RANGELAND SEE.DING

Dl•l urb■d **areas** wlll **be SHded** with **naffve graasea** and shrubs. **Seeding** actMtln Include lha followln11:

- **Pl'9pal'9 eHdbed wher ■ nHded.** This may Include acarlfylng the **upper** 2 Inch•• of aall **where Hecf** api,llcath,n will occur. Overly compact<id equipment acceH routes may require scarification to 6 Inches.
- SHcl 11an be drllled or bl'Dadcast by hand.
- Seed ehall be lncorporated lnto the aoll, but not more than 0.5 to 1.0-lnch deep.
- Seed ahall be applied unlformly.
- Seeding shall occur before lnstallation of erosion control blanket.

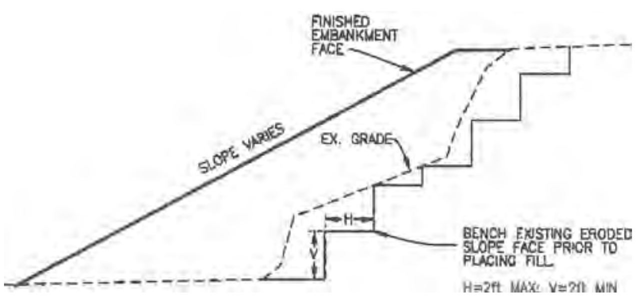
The seeding_ rote• below .,,.. for plantlng by hand broadcaatlng. Seed shall be weed free and ,hall **be** purchased lrom a reputable suppll■r. Tli• grass and shrub eeed mix will 00nal1t of the fallowing species.

Shrub Sc■d Mix

roiirw1n*ii* <u>!alf6ush (Atrlpl ■>< caneacena)</u>	d.25 l6/ac PCS

Graea SHd Mix

1ma l(lBoutelo Q graclila)	7.5 lEiZac PCS
weSTern Whealgrqss Paacopyrum smith)	7 .0 lbZac PLS
Sldeoals Grama l au eloua ourtl endulo	1,5 lbZac PLS
lndlan **Rloe9raH** fAchnatherum **ymeno ilas)**	2.0 lb;tac PLS
	13.0 lb/ac PLS



NOTE: This d1toil applloa to O!!)l embonkn,ont or ••isling olope face whore total heighl io more than 6 fl. for thooe areas whore olope hoigh! is l••• thon 6 fl, slop•• moy **be** loid bock al 2.5:1 or flatter slope prior to plocing ony lm in lieu of stepping,

BANK SLOPING DETAIL

HOT TO SCALE

Coordinate Table

Pt ll-	Northing	Easting	Elev	Desc,
10	1182936.75	9970 93	8830.99	fflUlii
11	1182945,20	997075.58	**8830.99**	
12	11829+2.21	997106.07	6831.00	
13	1182995,19	997128.18	**8839.00**	BERM CENTERLINE
14	1182979.07	997126.99	6BJ9,00	BERM CENTIRUNE
15	1182956,13	997152.40	**8839.00**	B9IM CENTERLINE
16	116286B.41	997158,97	**8839.00**	B M CENW!UNE
17	1182965,34	997189.91	6835.00	TOE DF SLOPE
18	118297•4.-+0	997225.01	6B35,00	TOE OF PE
19	1182972.99	997258.S0	8835.00	TOE OF PE
20	1182940.25	997327.0B	6835.00	TOE OF SIOPE
21	11829t,72	997195.08	8830.97	CHANNEL CENTERLINE
22	11829 .97	997255,06	8831.18	CHANNEL CENTERLINE
23	1182920.51	997297.83	8831.20	CHANNEL CENTERLINE
U	11828114.20	99ps3.40	8831.34	CHANNEL CENTERLINE
	1182820.78	99 351.27	8841,50	BERM CENTERLINE
28	1182903.-N!	**997393.83**	BB+T.50	BERM CENTERLINE
29	11fi872.03	**997389.80**	6B41,50	,, 0RLDPt
30	11 **958.22**	99 387.45	6841,50	
31	1182913.12	99 330.18	B835.30	
32	1182985.25	997088.09	**6838.00**	TOP OF SLOPE
33	1182989.55	997087.24	**883S.99**	TOP OF SLOPE
34	11829n.oo	997104.59	8838.99	TOP OF SLOPE
J5	1182974.23	997120.38	6836.99	TOP OF SLOPE
36	1182972.28	997127.77	6B3B,75	TOP OF SIOPE
37	1182941.41	997062.34	8833.99	TOP OF SLOPE
50	1182989.84	997131.49	BBJ7.00	I s I
51	1182972.31	**99712B.-N!**	**1!838,519**	
52	1182959.59	997142.83	8837.01	
53	1182958,92	997145.BO	8839.00	ROCK §HUIE
54	1182958.94	997118,4S	8831.00	ROCI< HUIE
55	1182958,27	997119.42	8830,00	ROCK CHUIE
56	1182948,22	997130.58	8830.00	ROCK CHUIE
57	11fi9+3,54	997133.S2	8831.00	ig s I
58	11 **94a.84**	987112.72	8BJ0.00	
59	1182938.79	997123.88	8830.00	
80	11828+ -ri	997111.38	6831.00	ROCK CH!fil
81	118293 , 1	997122,52	6831.00	ROCI< CH
62	1182933.59	997119.17	6831.00	ROCI< CHUTE
83	1182943.64	ga TOB.03	6831.00	ROCK CHUIE
e4	1182930.gg	9 138.2B	8831,00	ROCK CHUTE
65	1182975.	997138.e+	8837.00	ROCK CHUTE
ea	1182965.52	997147.97	6837.0D	ROCK CHUTE
87	1182978.	997133.86	BBJ9,00	ROCK C UTE
BB	1182962.	997150.94	8839.00	ROCK CUTE
69	1182901.91	997351.79	6830.32	ROCK CHUTE
70	1182900,70	997381.72	8830.32	ROCK CHtm
71	1182Ba5.B1	997359.91	8830.32	ROCK CH
72	1182887,02	997349.98	81!30.32	ROCK CHUTE
73	1182901.37	9973811.37	88-11.50	rocK CHUTE
!	1182897.38	**99t388,88**	**8839.SD**	OCK CHUTE
	1182882.49	99 387.oe	**8839.51**	ROCK CHUTE
78	1182876.$+	**1197386.60**	88-11.!:iD	ROCK CHUTE
79	1lll Ui	**997349,81**	8831.32	ROCK CHUTE
77		**997382.40**	8833.32	ROCK CHUTE
BO	**1182885.28**	**997347.75**	8831.32	ROCK CHUTE
B1	**1182883.29**	997347.51	6831.31	ROCK CttUTE
82	1182905,27	997324.17	**8831.28**	ROCK CHUTE
83	1182872.61	997358,32	11831.35	ROCK CHUTE
84	1162900.41	997397.29	**6841.50**	ROCK CHUTE
85	1182896,+4	9117391!,SO	**8839,50**	ROCK CHUTE
86	1182B81.55	99 39-1,99	**8839,50**	ROCK CHUTE
B7	1182B77,58	99 39+.51	68-11,50	ROCK CHUTE

NOTE: See Sbeel 4 for project survey information, datum, & coo•dinate grid information.

Natural el Inc

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(92c) 774-2336

DRAWN BY: M. Kear1y **di:** C. Scudieri
DESIGNED BY: M. Koar1v
REvlEVIED BY: M. Kearty, C. Tre•m•r

REv	DATE	BY	RE111s10N
\ 1/	11/ 16	1 •";/,.£	Gross HOO

CONSTRUCTION SPECIFICATIONS, SLOPING DETAIL & COORDINATE TABLE

UPPERLCR

ADEQ Water Qualtty Improvement Project
Maddock Ranch

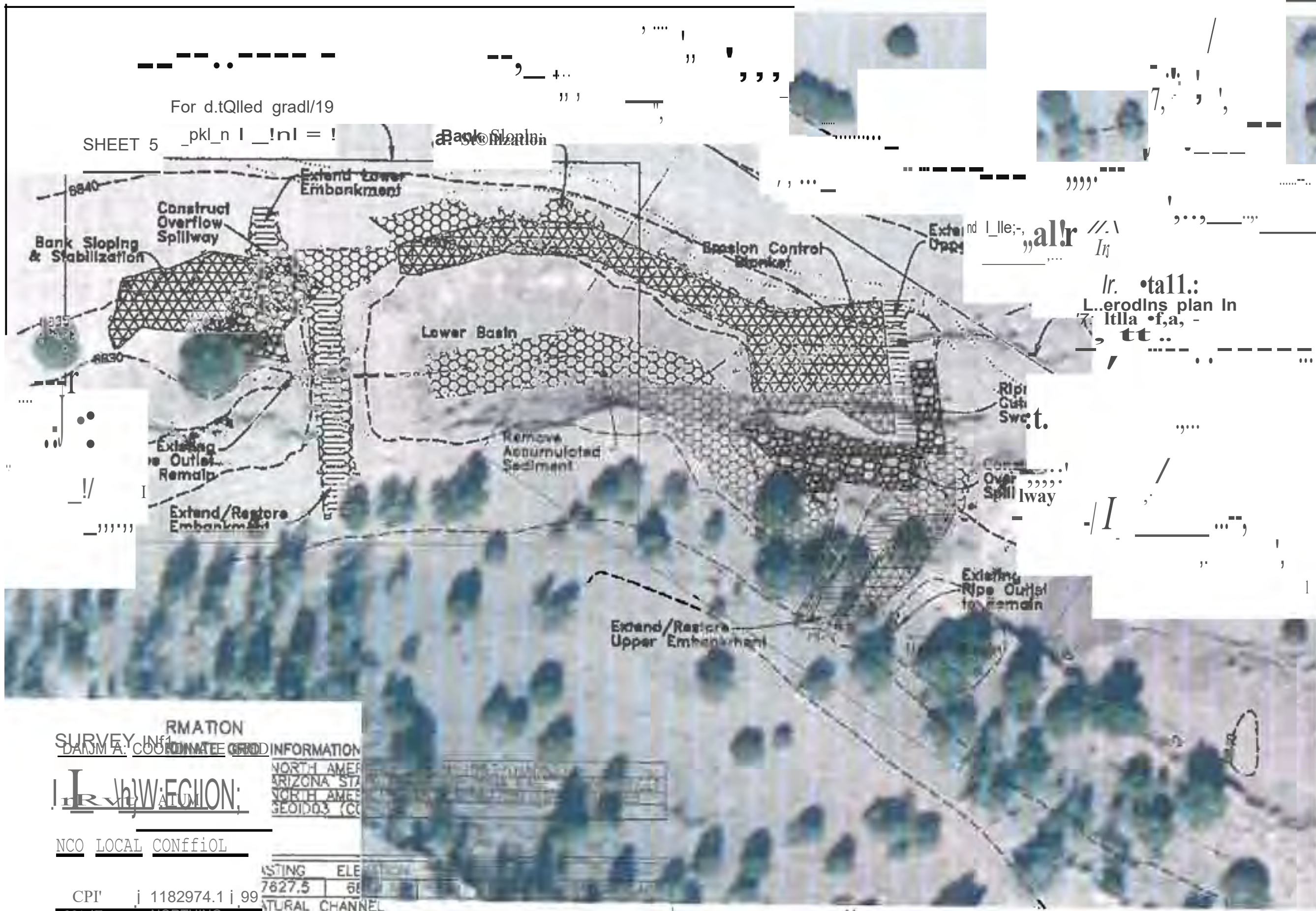
Registered Professional Engineer (Civil)
CERTIFICATE NO. 34587
MICHAEL D. KEARLY
Date Signed 12/2/15
ARIZONA U.S.A.
Expires 03/31/2018

DATE: 12-02-2015

NCO PROJECT NO: 15-240-AZ

DRAWING NO: GEN01

SHEET NO: 3 OF 8



SURVEY INFORMATION

DATUM A: COORDINATE GRID INFORMATION

NORTH AMER...
ARIZONA STA...
NCR H AMER...
GEOID03 (C...

NCO LOCAL CONTROL

NAME	NORTHING	EASTING	ELEVATION
CP1	1182974.1	99...	7627.5	6...

NATURAL CHANNEL
YELLOW CAP MARKED N...

NOTE: NCO LOCAL CONTROL IS SPECIFIC TO THIS PROJECT AND SHOULD NOT BE USED FOR PROPERTY LINES OR OTHER LEGAL BOUNDARY ESTABLISHMENT. SEE SHEET FOR DESIGN CONTROL POINT COORDINATES.

HYDROLOGY SUMMARY

WATERSHED AREA: 559 AC. (0.9 SQ MI)*

METHOD:	Q10 (CFS)	Q25 (CFS)	Q100 (CFS)
TR-55	+9	108	163
NSS (High Elev)	61	96	161
LCI RegiCflal Curve	+7	75	
Average of 3 Methods used for design	52	92	162

- For the lower spillway, it will be assumed that no significant attenuation effect in flow will be realized from the upstream sediment basin. This will be a conservative assumption for design purposes.

ESTIMATED WATERSHED SEDIMENT YEILD

EFFECTIVE WATERSHED AREA: 569 AC. (0.96 SQ MI)*

ESTIMATED ANNUAL VOLUME: 0.18 AC-FT (287 CY)

ESTIMATED 10 YEAR VOLUME: U AC-FT (2B70 CY)

- Sediment storage volume for watershed shared between the two basins.

DESIGN INFORMATION

(INCLUSIVE OF ALL IMPROVEMENTS SHOWN ON SHEETS 5 to 8)

	CUT	FILL	SPREADING
EARTHWORK (CY)	730	730	D
ROCK FOR SPILLWAYS (CY):	230		
ROCK FOR CUTOFF SWALE (CY):	12		

NIT SEDIMENT STORAGE (CY):
UPPER BASIN:
LOWER BASIN:
STORAGE: 3,556*
MAXIMUM EMBANKMENT HEIGHT (FT): 9.6
DESIGN STORM FOR SPILLWAY: 25 YR

* Earthwork totals do not account for shrink/swell.
SPILLWAY ... (with 0.5 ft of freeboard)
- Together, the upper and lower sediment basins will provide enough storage volume for 10 plus years. The volume estimate is to the ...

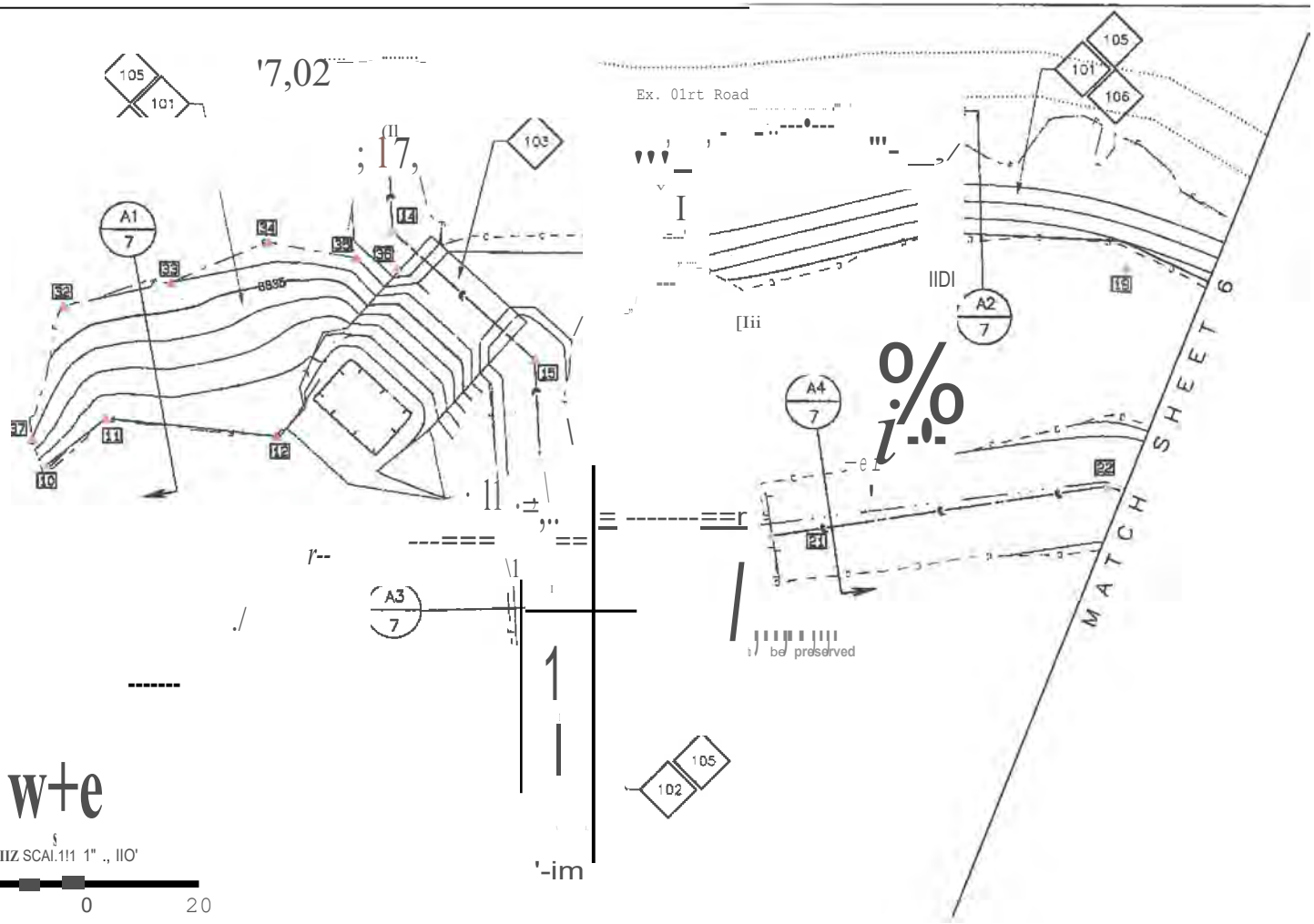
Natural ...
2900 N. West Street 15...
Flagstaff, Arizona 860...
(928) 774-2336

M. Kearly
M. Kearly, C. Tressler
REVIEWED BY
BY | REVISION
Design, Inc. REV | DATE

PLAN VIEW:
Project Overview & Control
UPPER LCR
ADEQ Water Quality Improvement Project
Maddock Ranch

Registered Professional Engineer (Civil)
CERTIFICATE NO. 34587
MICHAEL D. KEARLY
Date Signed 12/2/15
ARIZONA U.S.A.
Expires 03/31/2018

DATE: 12-02-2015
NCD PROJECT NO: 15-240-AZ
DRAWING NO: OVR01
SHEET NO: 4 of



CONSTRUCTION NOTES

0 Slope bonk per the delcilo and control **coordinate$ provided on Sheets 3 and** 7. Earthwork quantified on Sheet 1.

0 (12.0 lf) Construct ti.rm per the details and contn>l coordinates provided on Shaet& 3 and 7.

0 /1 ea) ConotrtJct roe lined chute per detail end antral coordinotee provided on Sheets 3 and B.

0 Remove aediment per the dotolls and control coordlonleo provided on Sheets 3 ond 7. Earthwori< quantified on Sheet 1.

V Seed all dialurbed areas with specified eeod mix. Quantif,ed on Shaet i.

<8 Place slngle net erosion control blanket **p,er monulacturer"s recomendotiona on** oloped bonlcJl from toe of b<lnk to top of b<lnk. Quant lfied on Sheet, •

NOTES:

> d d rat' •:n l i' oc : l[2] **procedures.**

> See Sheet 3 for table **of** control point coorfdinoteo.

Natural Channel Design, Inc
2900 N West Street 151
Flcgstcf Arizcnc 860041
(920) 774-2338

REV	DATE	BY	REVISION

DRAWN BY: M. Kearly & C. Scudieri
DESIGNED BY: M. Kearly
REVIEWED BY: M. Kearly, C. Tressler

PLAN VIEW:

Grading Plan - Lower Half

UPPERLCR
AOEQ Water Quality Improvement Project
Maddock Ranch

Registered Professional Engineer (Civil) CERTIFICATE NO. 34587 MICHAEL D. KEARLY Date Signed 12/2/15 ARIZONA U.S.A. Expires 03/31/2018

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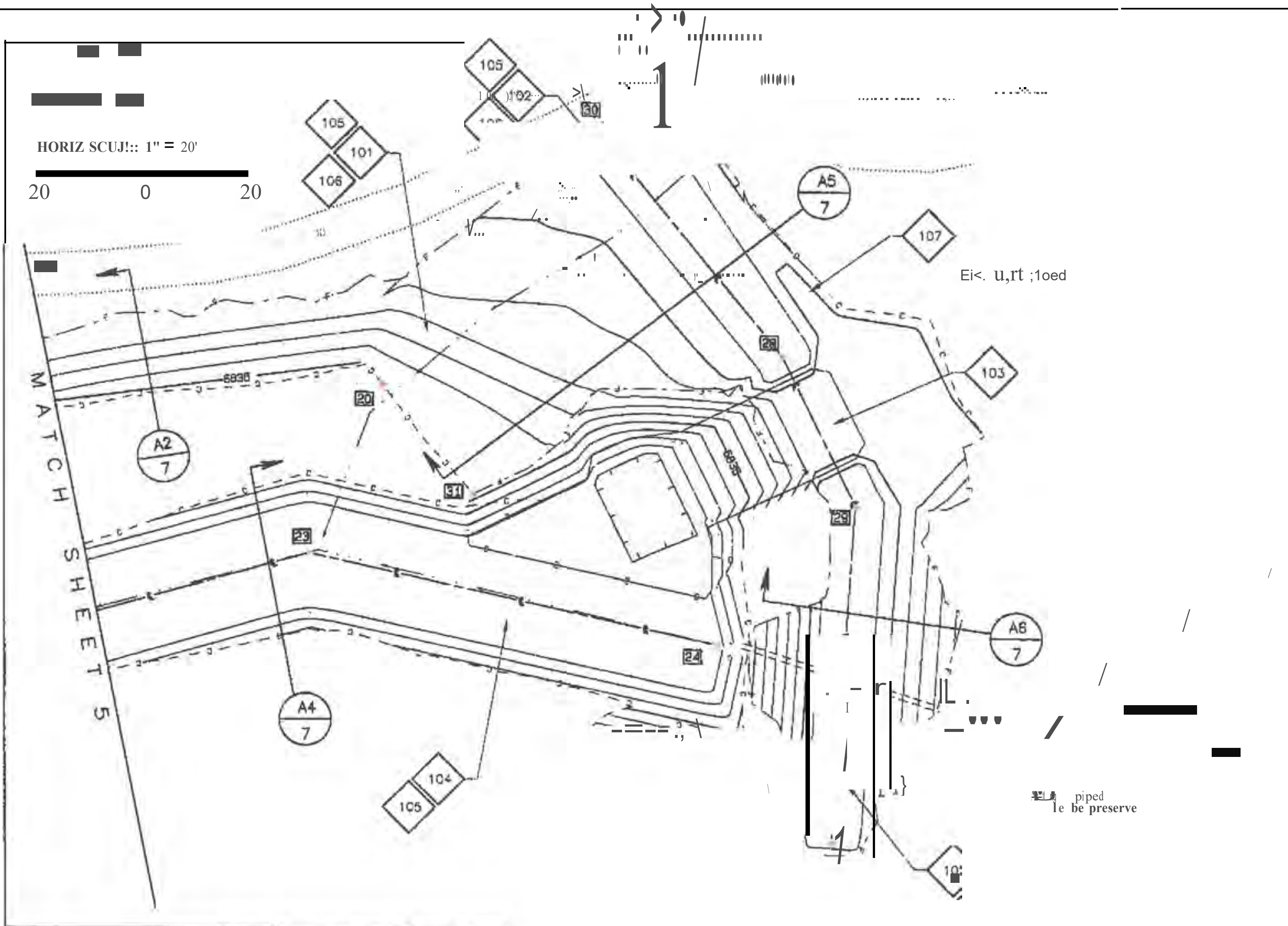
DATE: 12-02-2015
NCD PROJECT NO: 15-240-AZ

DRAWING NO: PLNot
SHEET NO: 5 OF 8



CONSTRUCTION NOTES

Slope bank per the dstono and eontrol

7. Earthwork qucnUfied on Sheet 1.

V (13 II) Construct berm per the details el':'":f nJ° notee provided on

0 coordfnotea provldad on She.ts 3 end

0 (1 oa) Construct rock lined chute per detail end control coordinoteo provfded on Sheets 3 and 8.

0 Remove sediment par the details and control coordtcntas provided on Sheets 3 and 7. Earthwork quantified on Sheet 1.

V Seed ell disturbed areas with apecified seed mo",, Quon \Jfled on Shoot 1.

V Place single net erosion control blanket per manulQcturer's recomendoticns on & 11 a '6'ntft.. { \".'nk to top of

0 (30 lf\ Riprop cutoff swale per details end eontrc1 coordinates on Sheets 3 and 7. Ensure positive flow to reek chuta. See Shoot 2 fD<' rock epeclficatione,

NOTES:

> ; Jr1:" ;1 "f.1ii·lt" .! : 1-2 procedures.

> See Sheet 3 *for* table of control point coorldlnoloo.

DRAWN BY: M. Keany & C. Scudieri
DESIGNED BY: M. Koarlv
REVIEWED BY: M. Kearl•- C. Tneooler

REV	DATE	BY	REVISION

nel
In
2900 N. West Street
Flcgstcf!i Arizona 860'041
(920) 774-2336

PLAN VIEW:
Grading Plan Upper Half

UPPERLCR
ADEQ Water Quality Improvement Project
Maddock Ranch

Registered Professional Engineer (Civil)
CERTIFICATE NO. 34587
MICHAEL D. KEARLY
Date Signed 12/2/15
ARIZONA U.S.A.
Expires 03/31/2018

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DATE: 12-02-2015
NCD PROJECT NO: 15-240-AZ

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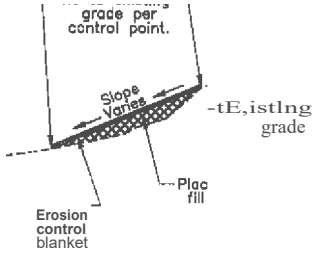
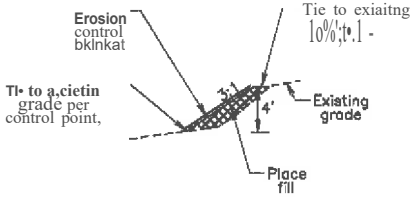
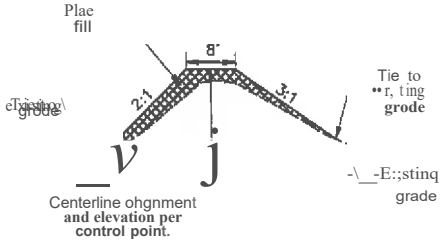
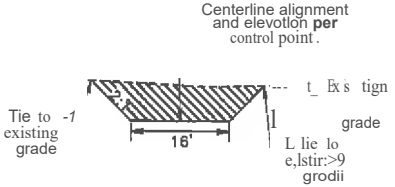
DRAWING NO: PLN02
SHEET NO: 6 OF 8









CROSS SECTION A1

No Scole

CROSS SECTION A2

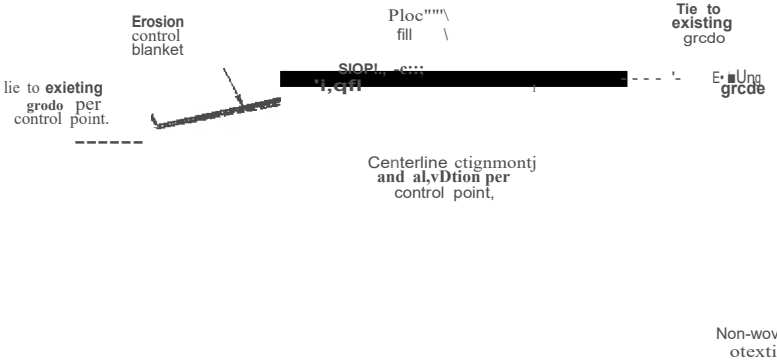
No Scale

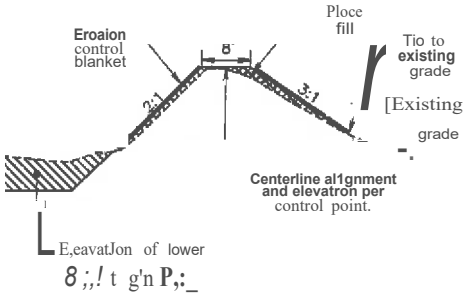
CROSS SECTION A3

No Scale

CROSS SECTION A4

No Sca le





CROS TION NOTES

Fill to be placed per Eorthfill opecilieations, Sheet 2.

•nt en t0 of, hit lirl --:::on control ep. citiootione, Sheets 2 and 3.

See Sheet 3 for control point onfnates.

CROSS SECTION AS

A6

No Scale

CROSS SECTION

No Scale

Inc

2900 N. West Street 115
Flags!aft, Arizona 860'04
{92o) 774-2336

DRAWN BY: IL I< any & C. Scudieri
REVIEWED BY: M. I<-1 C. Tree II III'.

REV	DATE	BY	REVISION

SECTIONS

UPPERLCR

ADEQ Water Quality ImDI'OV8ffl8t'lt Project

Maddock nch

Registered Professional Engineer (Civil)
CERTIFICATE NO.
34587
MICHAEL D.
KEARLY
Date Signed 12/02/15
ARIZONA U.S.A.
Expires 03/31/2018

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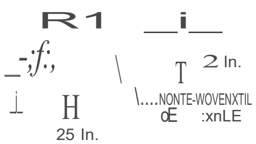
DATE: 12-02-2015

NCD PROJECT NO: 15-240-AZ

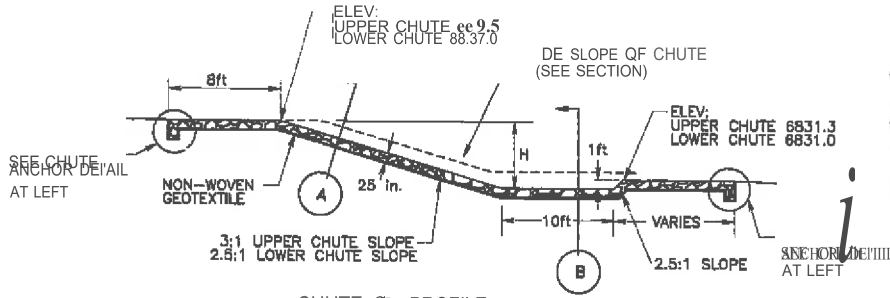
DRAWING NO: DTLO1

SHEET NO: 7 OF 8

ROCK-LINED CHUTE DETAIL

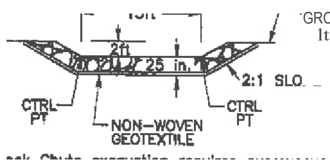


CHUTE ANCHOR DETAIL
(-TO $t:Al.I)



CHUTE ℄ PROFILE

H •
UPPER CHUTE 9-ffi
LOWER CHUTE 7ft



NOTE: Rock Chute excavation r.qulr.,, .,_ .xcavation Into Iha ombanktnent lo **o,mn pn,pw** inaettinQ of the rock al a 1 ft deep channel, Enaur. that aid<> alopea are protected at l111Jat 1 ft above bottom rlprup face.

TYPICAL SECTION @ & @
("DTTIIICA!I)

Rock Specifications

IIUKIIR.IN.	
125	D100
18 - 22	
12 - 11	Dii)
10 - 10	010

Mateltal Quanttllee

QUNIII1Y	INT	ITEM
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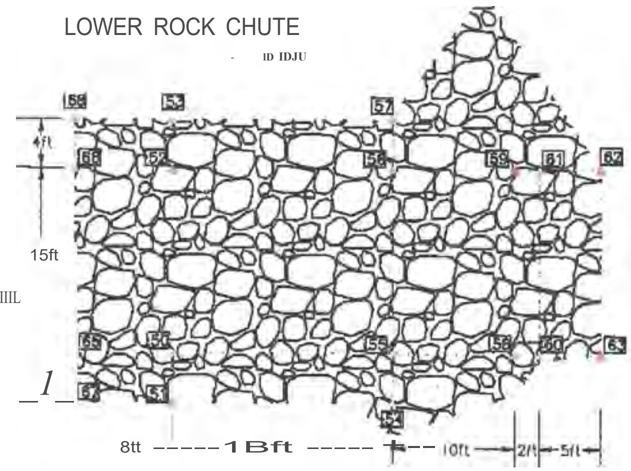
m	CU '11l	A0CI(A-
DM • 12.S In		

NOTES

See Sheet 2 far General Note• & Specificatiana. See Sheet 3 for coordinate table.

1, : - :\ \9e8.:,, an f: toJhe • : : :"- The fill
2. Geat8l<tile aholl be non-wDY8n fabr1c wilh X minimum grob ten1ll1 atr1n11th of 90 lb,, 11r1ater than 501 elongation at failure, a minimum of 40 lb punctur1 litr.n_glh, and a UV reeistonce of 70S 1tren11th r.talned. Geote,rtilo shall be jalned by overlapp,ng a minimum of 18 lnohH and NCUred against tile underlying IDIJndatlon rnataiial.
3. Rack shall be clenN and anaular to alAl-rounde<l In •ha P,. The least dlrn<1nsion of an Individugl rock ohall not t,. 1- 11,an one-11,lrd tti• 11r1ateet dimension. Soun:, of Ille rock wll1 be approved by the EnginNr prior to placetnent. Rack shall be well roded os allown in Iha table. Rocle placemmt anall begin at tho bottom af alape. minima•
t ; tn ntif kri;,i :"h;nf pt: d"f:;; i rel° t0ct betw-. stone■, vo\da and ensure o neat, uniform aurfooe.

LOWER ROCK CHUTE



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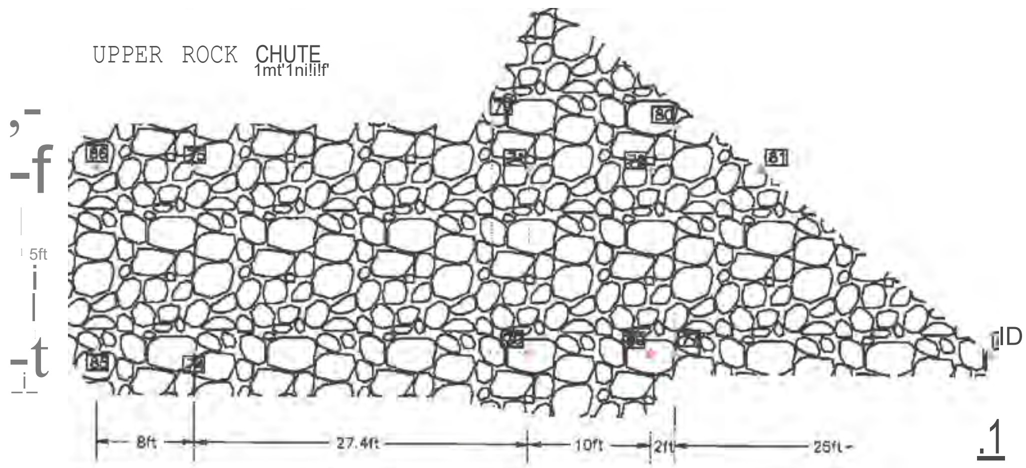
UPPER ROCK CHUTE



Nab.nli	DRAl'ltl BY: M. K1arly & C. Scudieri	ROCK CHUTE DETAILS
anneln■n	DESIONED BY: M. Kearl	
	REVIEWED BY: M. Klllrl)I C Tressler	
	nc REV | DATE | eY | REVISION	UPPERLCR
2900 N. West Street i115		ADEQ Water Quality Improvement Project
Fla91tcft Al"lzonc 860'0 (920) 774-2336		Maddock Ranch

DATE: 12-02-2015
NCD PROJECT NO: 15-240-AZ

DRAWING NO: DTL02
SHEET NO: 8 OF 8

MCFEE PROJECT

One of the head-cuts looking down stream toward Lyman Lake

McFee:

The purpose of this project is to reduce adverse **water** quality impacts from concentrated flow and bank erosion on the McFee Ranch. There were two significant head-cuts and approximately 1,900 feet of eroding bank were repaired. To mitigate the head-cuts and erosion two rock lined chutes were installed and 1,900 feet of eroding banks were sloped. Disturbed areas were seeded and erosion net fabric was installed on the sloped banks and the bottom of the channel.

One of the finished head-cuts looking up stream. Rock chute and bank sloping before revegetation.

Finished head-cut repair, rock chute and bank sloping. Looking down stream toward Lyman Lake. Erosion mats on site for seeding.

The McFee project has been declared complete 9/29/2016. The project consisted of:

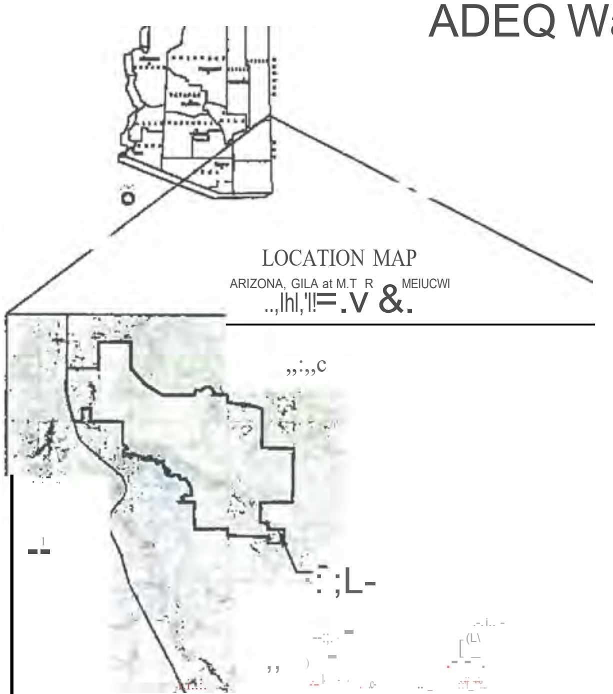
1990 CY of cut
1020 CY of fill
970 CY of spreading
82 CY of D50=9 in. rock
210 SY of nonwoven geotextile fabric
3.0 acres of native grass seed mix
19 rolls (100 sy each} single net erosion control fabric
2.5 acres of mulch

UPPER LITTLE COLORADO RIVER HEADWATERS
ADEQ Water Qualify Improvement Project

PREPARED FOR: Klwln Mcfee

REVISED

RJNDEDBY:
AltliOna Deparlment of Env'.01rnenla QualHy (ADEQ)
Water Qually DM111on



B

LANDOWNER:
Mcfee Cottle Company
Kevin **Mcfee**
Springerville, *Al*

PROJECT AGER:
Apache NR D
Doric Knight
824 E. Main St.
Springervflle, /,J. 85925
Phone: (928) 333-4941

NICAJ. CONSULTANT:
aural Channel Design, Inc.
2900 N. West Street, Suite 5
Flagstaff AZ 86004
Phone: (928) 774-2336

BTIGIP JING FUNDING AGENCIES:
izono eportment of
Environmental Quality
1110 W. Waahin.11ton St.
Phoenix. AZ. 85007
Phone: (602) 771-4635

INDEX OF DRAWINGS

SHEET NO.	TI1IE
	COVER SHEET: Locotion, Index, and Quantitie!
2	GENERAL NOTES &: CONSTRUCTION SPECIFICATIONS
3	CONSTRUCTION SPECIFICATION ,: CONTROL & COORDINATE TAT:jLE
4	PLAN VIEW: Project Overview
5	BANK SLOPING TYPICAL CROSS SECTIONS
6	NORTH ROCK CHUTE DETAILS
7	REVISED SOUTH ROCK CHUTE DETAILS

WORK QUANTITIES

EARTHWORK:	
CUT	1990 *CY*
FILL	1020 CY
SPREADING	970 CY
ROCK (D50=9in.)	82 CY
GEOTEXTILE	210 SY
GRASS SEED MIX	3 AC
EROSION CONTROL BLANKET	19 ROLLS*
MULCH	2.5 AC

•BASED ON ROLL SIZE OF **8'** 112.5'

PLAN LEGEND

	Rock Riprirp		Control Point
	Fill		Propond Flowline
	Cut		Elcieting Contour (minor)
	Bank Slopl		E i•ting Contour (major)

IAS-BUILTTRECOR DRAWING CERTIFICATION
I HEREBY STATE THAT THE AS-BUILT INFORMATION AS SHOWN WITHIN THIS PLANS IS CORRECT TO THE BEST OF MY KNOWLEDGE, THEAS-BUILT INFORMATION AS PRESENTED IS BASED UPON FIELD OBSERVATIONSAND INFORMATION PROVIDED TO NATURAL CHANNEL DESIGN BY THE CONTRACTOR.

CHRISTOPHER TRESSLER 58521 6/22/2017

REG. PROFESSIONAL ENGINEER REG.# DATE

Nab.Ira! nel Inc

2900 N. West Street 11151
Flogstaff, Arizona 86 dO4t
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DRAWN BY: C. Scudieri
DESIGNE!I. BY, C. Tressler
RE\IEWED BY: C. T asler M. Kearl

REV	DATE	BY	RE\11SION
	4/28/16	CS	f&Ch nsion•

COVER SHEET:
Locatton. Index & Quantities

UPPERLCR
ADEQ Water Qualty Improvement Project
McFeeRanch

Registered Professional Engineer CERTIFICATE NO. 58521 CHRISTOPHER TRESSLER (Civil) ARIZONA U.S.A.
EXPIRES: 09/30/2017

DATE: February 16, 2016
NCD PROJECT NO: 15-240-AZ

DRAWING NO: CVR01
SHEET NO: 1 OF 7

@r L.c>ool Pro/ Contra ect

:a.:

CONSTRUCTION NOTES

<8 {2 oa) Can.true\ rack lined chute per detail and control coordinot.a prav,ded an Stl"ta 3 and 6.

<8 Sia banks per the detalla F)l'Dvided on Sheet S. Earthwork quantified an Sh..t 1.

V Seed aft dloturbed areas with •pecilied aeed mix, Quantified on Sheet 1.

<8 Place •inglo net en>aion control blanklrl per monulooturer'• recomendatlana on tae af aloped banks. QUCll'ltlfied on Sheet 1,

<8 Spread excts• spoils on •hollow slope& near channel. Spread ta achieve on a praxim<1ter-,, unlfanm del>th of 5 to 12 in. See c1etail Slleet S.

" Apply mulch over sMded areao except where there l■ erosion control blanket.

NOTE: See c:orlSlructlon specifications, Sheet :Z. and dotail, Sheet 5, for FIi placement procedUres.

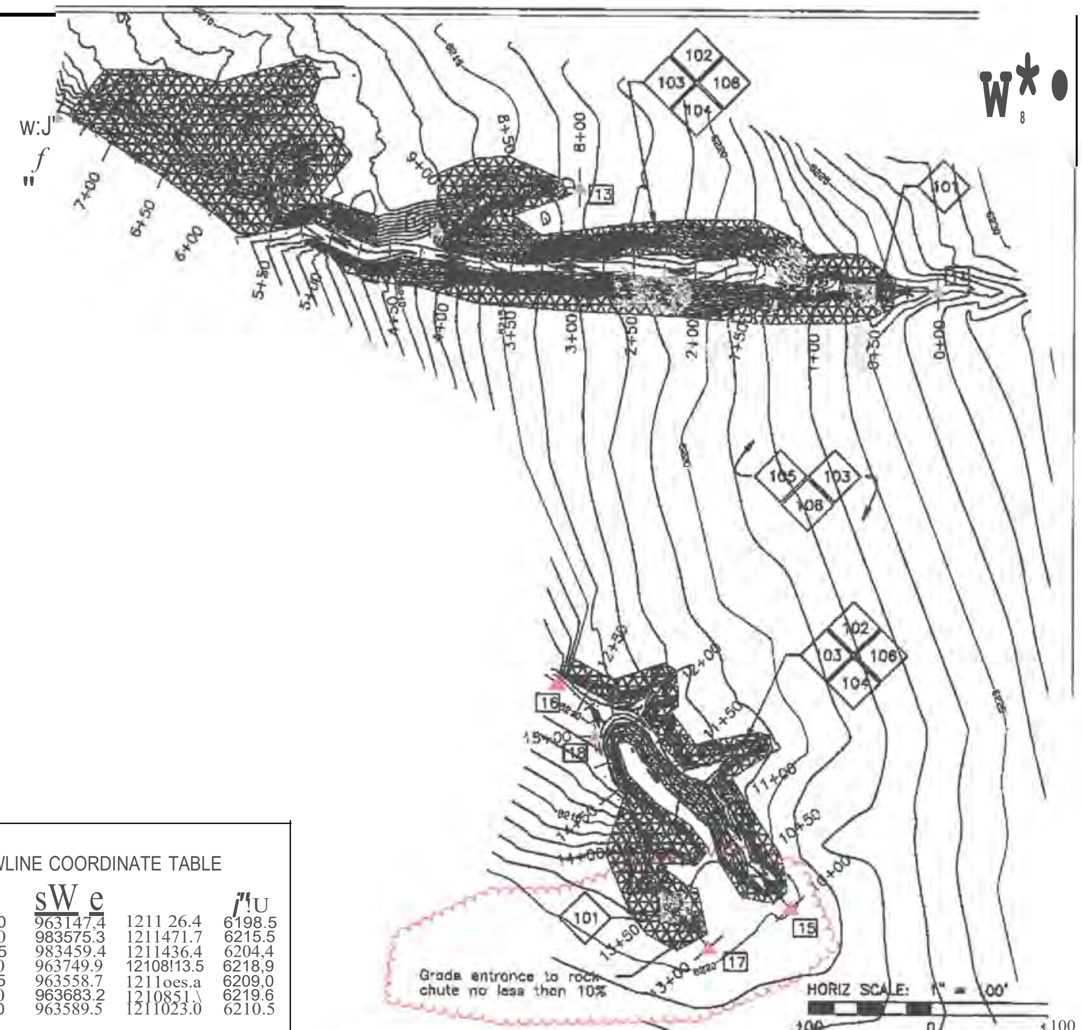
BANK SLOPING TABLE

LEFT SIDE STATION RANGE	SLOPE	RIGHT SIDE STATION RANGE	SLOPE
0+00 to 5+00	2.5:1	o+oo ta 5+40	2.5:1
		5+40 ta 5+65	Transition from 2.5:1 to 10:\
		5+65 ta 7+35	10:1
8+15 to 8+50	8:1	11+15 to 9+20	8:1
8+50 to 9+00	Tronaltlon from 8:1 ta 2.5:1		
10+10 ta 12+25	2.5:1	10+10 to 12+80	2.5:1
13+10 ta 14+05	B:1	13+10 to 14+00	6:\
		14+00 to 14+25	Tran,,ition from B:1 to 2.5:1
		14+25 to 15+10	2.5:1

NOTE: Left ond Righi refers to looking down•treom.

FLOWLINE COORDINATE TABLE

		sW	e	l'!U
12	7+50	963147.4	1211 26.4	6198.5
13	8+00	983575.3	1211471.7	6215.5
14	9+25	983459.4	1211436.4	6204,4
15	10+00	963749.9	12108!13.5	6218,9
18	12+75	963558.7	1211oes.a	6209,0
17	13+00	963683.2	1210851.\	6219.6
18	15+00	963589.5	1211023.0	6210.5



Nalwal ...-Inn Inc

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DRAWN BY: C. SaJdleri

DESIGNED BY: C. Tresoier

!! EVIEWEO BY: C. Treaaler, M. Kearl

REV	DATE	BY	REVISION
	4/?.8/16	CS	South Rod< Chute & dmT. fhaior.15

PI.ANVIEW: Project Overview

IfERICR

ADEQ Water Quallty Improvement Project Mcfee Ranch

CERTIFICATE NO. 58521 CHRISTOPHER TRESSLER Registered Professional Engineer (Civil) Date Signed 08-16-16 ARIZONA U.S.A.

EXPIRES: 09/30/2017

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ARIZONA 811

DATE: February 16S. 201Sl

DRAWING NO.: OVR01

NCD PROJECT NO: 15-240-AZ

SHEET NO: 4 OF 7

PROJECT DESCRIPTION

The purpose of this projecl ie to reduce advel'ff water quality impacts from corn:entrated flow and bank erosion. Improvement plan ir.clucles:

1. Stabilize heodcuts thnx,gh instoljatlon of rocl(lined chutes.
2. stobili%e exl9ting oversteep and/or vertical elopes on channel banks to reduce ,,:,dlm.nt generation and prevent further heodcutting.
3. Seed all disturbed areas and sloped banks with native seed mix.
4. Apply wood mulch over seed except where applying erasion control blanket.
5. Apply erosion control blanket to toe of sloped areos within the project to promote seed germination.

GENERAL NOTES

1. Site topographic survey data was collected by NCO an November 9, 2015,
2. All existing conditions ore ta b• verified In the fleld prior ta construction. If differences in th• site hove occurred In th• time between the intlal survey and construction, the engineer sha be coneulted for any necessary modlfcatlone to the design and plans.
3. No representation is m«le 01 to the existence or none•ietence of any utilitlea, public or private, Absence of utllitiH on these drawings IS NOT assurance that no utilitie!l are present. The existence, location and depth of any utllit,y must be determined by the contractor prior to any excavation. Call Arizona Blue Stake before you dig to be sure - dlol 811.
4. No construction shall begin until ell necessary permita, eaaemt1nts, ond funding authorizations ore obtained.
5. Construction octillities wnl be conducted in o manner cantlistent with all aafety regulations, and other permitting required b)l Arizona Stat• Land Department, Arizona Department of Environmental Quality, ond othere.
6. Installation shall be oon,tructed to the lines and grades as shown an the drawings or oa alaked In the field by the ENGINEER or authorized representative, recognizing there is variation In nature.
7. The total d1aturb-ed area is oppraximately J acres. As tM tofal or eKceeds 1.0 acres, the peraan(s) performing the work will be requlr.d to file a Notice of Intent (NOIJ for atarmwoter di harga with ADEQ prior ta Initiating construction. The pel"9on(s) performing the work shall ensure that carnitruction activities are performed in accordance with the f":Oclices described in the ADEQ Construction Generol Permit Na. AZG201 J-001 and a manner that minimizes sail, water and air pollution utilizin9 ,tandard Beat Management Practices.

CONSTRUCTION SPECIFICATIONS

EARTHWORK

The earthwork activitiea shall consist of grading to install rock lined chutes and slope eroding banks.

Excavation

Excavation ahall be limited to rock linocl chute conlllruction os shown an the drawings 01' as stakecl in the field. No excoVGtlon shall take place 'lrithin any jurisdictional - Oisturbonce of e,cisting native vegetation ■h all be minimized ta the greatest. extent possible during excavation.

Excavated material shall be placed in the specified heodcut locations as shown an the drawings or as staked in the field. All finished surface■ shall be generally smooth and pleasing in appearance ond blend into eurraunding terrain. No haul off of spoil material 18 authorized or will be CO'olered under grant funds.

.£!!!1b1llL

Materials: All fill materials shall be obtained from the required anaite excavations and approved borrow ■ource s. Fill materials shall not contain ■a d, brush, raol9, peri■habl e or frozen materials, trash or other debris.

Placement: Th<!: placement of fill materials shall follow these guidelin«i:

. My vertical bonk shall be alaped before Plocement of flll material, see SHEET 5 for detoils.
The downstream, eroded foce of ths existing embankment sholl be steJ)P8d as neceesa,y prior to pklcement or new material per the included plans and details, see SHE'ET 5 for detolls.
The piecing and spreading of fill material ■hall be atarted at the lowest point and the fill brought up and compacted to obtain a density similar ta the surrounding bank material.

Egrthfill ('<:ontinued)

Materiel when placed sha!l contain sufficient moisture 10 that a sample taken in the rn:md and squeezed shall remain intact when releaa,:,d.
For venerol fill placement. the placing and spreading of fill materia1 atuin be started ot the lowest point ond the fill b""-!!!ht up in horizontal layers not to excud: six (6} inches of loose fill for wheel compoctian and four \4-) inches of loose fill for dozer compaction. Ci:lnatruction equiement shall be operated over the areas of each layer of fill ta insure that th• required compact,on i■ obtained.
Far trench backfill or fill placement where large equipment does not have access, placement 1hall be in horizontal lifts not exceeding six (6) inches of k>Ote fill and compacted with Q!)proprimely sized equipment, such a■ a sheepafaot roller attchment on an excavator, jumping Jack compactor or other as approved by the Engineer.
FUI shall not be placed on froien eon, anow or ice.
Headcuta and gunles designated for filling and re-contouring shall be filled as cloee as paSBible to the hl•tortc natural ground surface, and smoothed and shaped to b-lend with the surrounding landscape.
Al1 finiehed surfaces shall be generally smooth and pleasing in appearance and blend into surrounding terroin.

Trash and Debris Removal

All trash and debri1, including tires, aid pvc pipes, lumber, etc. shall be removed tram the projects limits and dipoaed of property.

ROCK LINED CHUTES

The headcut atobilizatlon work ahall consist of headcut excavation and bank sloping; furnishing and installing toose rock including placement of filter fabric. See SHEET 4 far locations and SHEET 6 for Detofls.

The sit• shall be excavated and backfilled to the grades shown an drawings, Excovation shall be limited to the headcut remediation area as shown on the drawings or as staked In the field by the ENGINEER.
All fill material shall be compacted to the approximate density of 1t<,1rrounding undisturbed areas.
Additional spat1s shall be spread outside the work area and •loped in such a way as ta direct flows toward rock-ijned ohute. See SHEET 4 for details.
Disturbance of existing native vegetation shall be minimized,
Non-woven geotextile shall be placed behind the rack. Fabric shall be meet the requirements of NRCS l.4S-AZ-592 Geatextile material speeif,catione far CJ011S lll nanwaven geatelltilM. The geot.e.tile shall be loined by overtappl119 a minimum of 18 inches and secured against the underlying foundation material. Securing pins .,hall be inatolled cs necesao,y ta prevent i,ndue slippage or mov.menl of the geateidile. Recommend 3/ 16-ln<:h ateel bare pointed on one end and fabricated with a heGd to retain a rinl washer. (1.5-,nch diameter). Pin length shalt be not leH than 18 inches. Ll-shaped pins ore acceptable. Rack aha be angular, dense, sound and free from cracks, seams, or other defects conducive to accelerated weathering. The least dimension of on individual rock shall not be less than one-half the greatest dimension. Rock source shall be approved by th• ENGINEER or aulharl%ed representative and nave o bulk specific gravity of not less that 2.5 per ASTM C127. Rock shall be well graded at follows:

Diamster, in.	Percent Passing
13-18	0100
11-16	085
9-1J	050
7-11	D10

Rack placement shall begin at the bottom of slope. Rack shall not b-e dropped mare than 3 feet onto geatelltile.

Nlllnl Inc
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Flagstaff, Arizona 86c50
(928) 774--2336

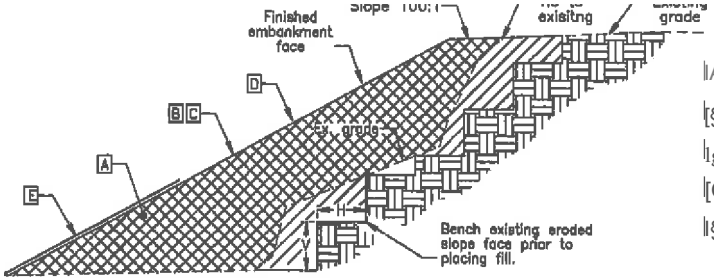
AWN BY: C. Scudieri
DESIGNED BY: C. Treuler
RE'YIEViED SY: C. Trenler M. Keorlv
REV I 01,.TE I sY I REVISION

GENERAL NOTES &
CQNSTRUC110N SPECIRCATIQNS

UPPER LCR
ADEQ Water Quality Improvement Project
Mcfee Ranch

Registered Professional Engineer (Civil)
CERTIFICATE NO. 58521
CHRISTOPHER TRESSLER
ARIZONA U.S.A.
EXPIRES: 09/30/2017

DATE: February 16, 2016
NCO PROJECT NO: 15-240-AZ
DRAWING NO: GEN01
SHEET NO: 2 OF 7



Ha2ft min; V-21\ max

NOIE: Thi■ dotoil applieo to any eml>ankment ar .. 1a11ng slope foce hen total height is more \hon 6 ft. For those areas when slope lllllght ls lees lh<>n 6 ft, **alopes** may **be** !<lid bocic at 2.5:1 or flattor slope prior to placing any fill in lieu of 8teppin9.

BANK SLOPING DETAIL c"or 10 BCAL!)

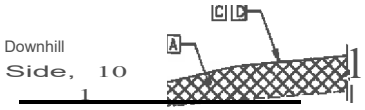
IA) Fill to be placed and compoctad per Eorthfill •pei:ificatrone, Sheet 2.

[§I Slop•• vory, **see** bank oloping table on Sheet 4 for alope.

lg Seed f1t1lshed surface per speciticationa, st\eet 3.

[QI Acply mulch to finished aurloc• per specifIcatrona, Sheet 3.

I§ Apply ero,ion control blanket, on• roll **wide,** to ti>e of alopo per specIttcotrona, She..t 3.



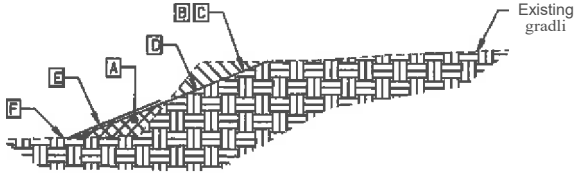
[!I FIii to **be** placed ond compacted per Eortl'lfill specifIcatiol'l9. Sheet 2.

lg Soed flnlahed ourface per epoclflcotlon1, Sheet 3.

liiJ Ac>ply mulch lo finished ourlac• per specifications, Shoot J.

SPOIL SPREADING DETAIL (NOT to SC1U>

NOIE: Slope staking will **be** provid•d by **tile** Eng; ..,, or their **roprooontotlve** i" tho field for thi• project and oe part of the NCO contract wah the ANRCD.



[!I Fill to be placed and compacted pot Eorthfill speclflcotla"•• Sheet 2.

[§I stopea vary, see bank oloping table on Sheet **4** far slope,

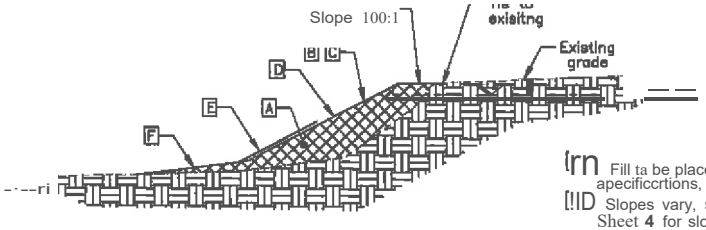
!ID Seed flniahed eurlaea per ■pocificaliona, Sheet J,

[QI Apply mulch to finished eurfoco per •peciftcatlona, Sheet 3

!ID Apply or,1110" contl'l>l blanket, one roll **wide,** to toe of •lop•

If! n, fill elope to exiotlng gf'Qde at 20:1 •1"1'•·

IYPICAL SECTION: CUT & FILL (Nor ,o ICAL£I



[rn Fill ta be placed and compacted per Earthfill apecificcrtions, Sheet 2.

[!ID Slopes vary, **see** bank eloping table on Sheet **4** for slope.

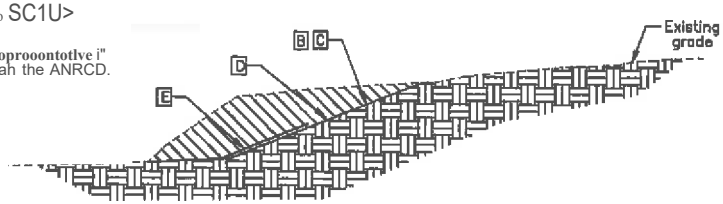
© **Seed** finlshed surface per opecfficatlons, Sheet J,

Iii] ADply mulch ta finished surface per specifIcotlons, Sheet 3.

I§ Apply erosion control blanket, ane roll wide, to toe of elope

[El TI• fill olope to exiotln<.1 grade ot 20:1 a1opa.

IYPICAL SECTION: FILL ONLY (Nor ,o SCIU)



00 Slopes vary, **see** bank sloping tabla on Sheet **4** for **alope.**

I§ Seed finialled surface per apeclfIcatlone, Shoot 3.

[QI Apply mulch to finiehed aurlace p,,r speclflcotlon,, Sheet 3.

[fil Apply erooion control blonke' **one** roll **wide,** to toe of elope

IYPICAL SECTION: CUT ONLY (llorro 11CA1q

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DRA°M'I BY:	C. Scudieri		
DESIGNED BY:	C. Tr1111Sior		
EVIEv.EO BY:	C. Tre• Jor. Lt Keor1		
REV	oAIE	eV	REvis10N

BANK SLOPING IYPICAL CROSS SECTIONS

UPPERLCR

ADEQ Water Quality Improvement Project

McFeeRanch

Registered Professional Engineer CERTIFICATE NO. 58521 CHRISTOPHER TRESSLER Date Signed 02-15-17 ARIZONA U.S.A. EXPIRES: 09/30/2017

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DATE: February 16e. 201e1

NCD PROJECT NO: 15-240-AZ

DRAWING NO: DTL01

SHEET NO: 5 OF 7

EROSION CONTROL BLANKET

Apply erosion control blanket, one roll wide, ot toe of sloped banks. Erosion control blanket shall be laid end ancliored over the seed to provide bank protection and a good environment for vegetation regrowth. Follow manufacturers recommendations for installation and anchoring, including anchor trenches and st.opting pollam and rate.

SINGLE NET: Straw, Single Net Erosion Control Blanket, that In certified wee free and made with all natural, 100'1: biodegradable netting, Use />E.C Premier Single Net ECB with "FibreNet netting (Americon E'.xcc,lslor) or equi110len1.

WOOD MULCH

Native wood mulch shall be applied lo all seeded areas (except where erosion blanket has been applied) to prevent erosion and provide a suitable mlcrocllmote for moisture retention and sead g1rmination and growth,

The size range for shredded mulch particles shall be from 2 to 10 inches. The goal of the application is to create a relatively uniform mulch **bed** mnging from one to three inchea thick. The mulch **bed** must contain enough uncovered **area** (15-20%) to allow germination of **seed.** Over opplicotlon will prevent **seed** germination and growth. Appncatlon is approxlmately 27 cubic yards per acre.

RANGELAND SEEDING

Disturbed **areas will be \lleeded with** native **grosses** and shru . Seeding activities include the foltow!ng:

- Prepare seedbed where needed. This moy include &C0rifying the upper 2 inches of aoll where **seed** application will occur. Overly compacted equipment access routes may require ecorificotion to 6 Inches.
- Seed can **be** drilled or broadcast by hand.
- Unless plccc,d under on erosion control blanket, seed shall be incorporated Into the soil, but not more than 0.5 to 1.0-inch **deep.**
- Seed shall **be** applied uniformly.
- Seeding •han occur before Instollation of eroelon control blanket.

The seeding rates below ore for planting by hand broadcasting. Seed shall be weed free end shall be purchased *1rom* a reputable supplier. Tlie groa. and shrub seed mix will consist of the following species.

ad Mix	
!JlueGron10- (Boutelol.Kl grocllli)	2.5 lb/oc PCS
western Wheatgrass rPoscopyrum smithll)	7.0 lb/.ac PL.S
Sldaoots Gramc (!3oulelouo curtipendulo)	1.5 lb/.ac PL.S
Indian Ricegross {Achnatherum hymenoidea)	2.0 lb/ac PLS
	13.0 lb/ac PLS
'ourwing Saltbush (Atriplex conel!oensi	o.251b7a

HYDROLOGY SUMMARY FOR NORTH ROCK CHUT£

WATERSHED AAf.A:. 175 Ar. (0.3 SQ MI)

METHOD:	Q10 'CFS)	025 {CFS)	0100 {CFS)
TR-55	30	56	80
NSS {High Elev)	29	47	79
LCR Regional Curve	16	23	--
Average of 3 Methods	26	42	BO

HYDROLOGY SUMMARY FOR SOUTH ROCK CHUTE

WATTJISHEO AREA: 100 H; (D.2 SQ MI)

	010 {CFS)	025 (C)	0100 (CF'S)
m-SS	17	32	46
NSS (Hi<;lh Elev)	21	34	58
LCR Re,aionol Curve	12	H5	
Average of 3 Methods	17	27	52

SURVEY INFORMATION

DATUM & COORDINATE GRID INFORMATION

HORIZONTAL DATUM:	NORTH AMERICAN DATUM 1983 (NAD83)
COORDINATE PROJECTION:	ARIZONA STATE PLANE, ARIZONA EAST, SURVEY FEET
VERTICAL DATUM:	NORTH AMERICAN VERTICAL DATUM 1988 (NAVD88)
GEOID MODEL:	GEOID03 (CONUS)

NCO LOCAL CONiROL

IIAME	NORTHING	EASTING	AllO_"!	DESCRIPTION
CPP	1211527.3	962438.2	6207.1	3/8' REBAR W/ Yffi.DW Cl'P YELLOW CAP-MARKED NATURAL CHANNEl..

North Rock Chute Coordir,ote Table

Pt	Easting		
20	963834.		
	963835		
		1211382.1	6223.5
11	963831.7	1211379,9	6223.5
	963B31.9	1211.382.4	6222.5
24	963833.1	1211382.3	6222.5
	963833.4	1211384,8	6223.5
	963824.7	1211380.7	6223.0
V	963825.0	1211383.2	8222.0
	963826.1	1211393.1	6222.0
	963826.4	1211386.6	6223.0
	983800.9	1211383.4	6215.5
	963801.2	1211385.9	6214.5
	983802.3	1211395.8	6214.5
	963802.6	1211398.3	6215.S
M	963789,9	1211384.6	6215.5
	963790.2	1211387.1	8214.5
36	983791.3	U1135'?.1	6214.5
	963791.8	1211399.8	6215.5
	963787.7	1211387.4	6215.5
	963788,9	1211397.J	6215.5

South Rock Chute Coordinate Table

	Easting	Northing	ufW
	6373 2	121ossr.s	
43	63738.1	1210889.5	6219.25
44	963745.5	1210896.2	2Hl.25
45	983747.4	1210B97v,	6219.B
46	963732.2	12101192.	6219.75
47	963734,1	121089	6218.75
4B	963741.5	1210900.7	6218.75
49	963743.3	2ra:8H	g1:ls
50	963721.5		
51	963723.3	2 .B	6212.5
52	963730.7	1210	6212.S
53		121091	6213.5
54	:m	1210911.6	13,5
5s	963718.6	1210913.3	6212.5
5VI	83724 D	1210920.0	12.5
57	963725.9	1210921.6	B
58	98371-4-.9	1210915.1	6213:5
	963722.4-	1210921.8	6213

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Flagstaff, Arizona 8600
{928) 774-2336

DR.AYIN BY: C. Scucllerl			
OESIGWEO BY: C. Tre,sler			
REIIIE\'tEO BY: C. Treaoler M. Kearl			
REV	DATE	BY	REVISION
1	4/,8/16	CS	SoJ\h Rock O,ote:. placement & dimensions

CONSTRUCTION SPECIFICATIONS, CONTROL & COORDINAIE TABLES

UPPERLCR

ADEQ Water Qualtty Improvement Project McFeeRanch

Registered Professional Engineer (Civil) CERTIFICATE NO. 58521 CHRISTOPHER TRESSLER Date Signed ARIZONA U.S.A. EXPIRES: 09/30/2017

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DATE: February 16, 2016

NCD PROJECT NO: 15-240-AZ

DRAWING NO: GEN02

SHEET NO: 3 OF 7

ROCK-LINED CHUTE D£ ·rf ̲ I I

Rock Specfflcaflons

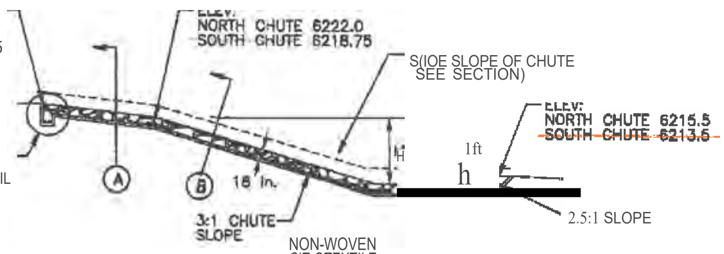
13 - 1a	D1oo
11 - 18	I)8'
9 - 13	D5II
7 - 11	010

NORTH CHUTE:

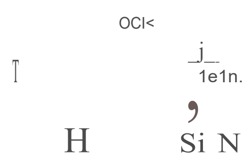
Matellal	QuQnffltea
1 ..IB:!!I..	.mt.
121	90 YD cmmffll,t
41	CU YD A0Cl<-
Dso - In	

SOUTH HUTE:

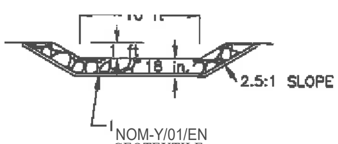
Material	QuanttW
88	IL
" /tu YD	Allq<-! PRAP
D50 = 9 in	



CHUTE q̲ PROFILE
(IIOT TO



CHUTE ANCHOR DETAIL
(NOT TO Sa,a)



NOTE; Rock Chute excavation requires overaKcavotion Into the embankment to enoure proper inoetting of the rock al a 1 ft **deep** channel , Ensure that **side** •lopH are protected at lea,rt 1tt above bottom riprop face,

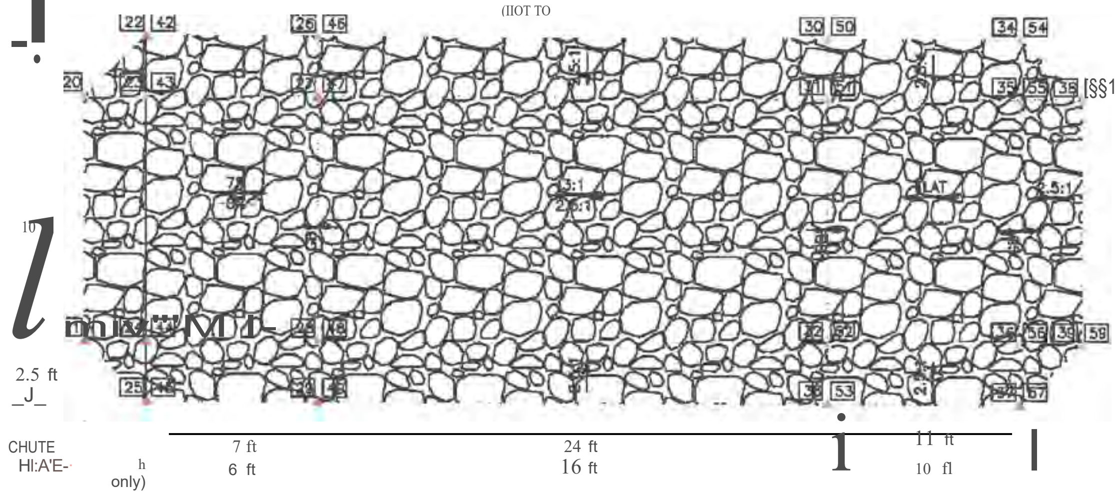
iYPICAL SECTION @, @ & ©
(NaT TO

NO'IE:S

SEE SHEET 2 FOR GENERAL NOTES & CONSTRUCTION SPECIFICATIONS. SEE SHEET 3 roR COORDINATE TABLES.

1. Th i t ₜ₁•,e :.• if' d c p=':f|t dₜₕ :.e,,,l{;'d:t" i:o: n gdrawing. **undistl&'bed** aolls.
2. Geotaxtile ehall meet the requirements of NRCS MS-AZ-592 Geotextile malerlal apeclflcatlana for ClaH Ill nan-woven geotextiles, Geatextile •hall **bl** jalMd by overlapping a m!nImum of 18 inchH and sacur11d agaInot the underlying foundation materlal,
3. Rock eholl **bl** dense and angular to sub-rounded in shape. The least dimenaion of an individual rock ahall not **be** less than one-third the greoteet dlmeneloo. Source of the rock will be approved by the Engineer, prior to plocemenl Roel< ■hall ba well graded as ■ho wi, In the table. Rock placement aholl begin al the bottom *of* alopa,
4. Rock shall not be dropped more than 3 ft onto geotextile fabric,
5. A ouffioient amount of rock ■hall be hand placed to aecure contact between **atones, minimrze votd■ and en■ure a neat. uniform surfaca.**
8. Rock Chute 1tokIng will be pro\'ided by the Engineer or their representative In the field fot' thi1 project and as part of the NCO contract with the ANRCD.

CHUTE PLAN VIEW
(IIOT TO



CRAWN BY: C. Scudieri	
SIGNED BY: C. Trenlar	
RE'JIE BY: C. Tres aler, M. Kearl	
REv DATE BY	RE"1s10N
1 41;8/16 cs	1 oulh Rock Chute: • placement & dimensions

Natural Channel Daalgn, Inc
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Flagstaff, Arizona 8660
(928) 774-2336

NORTH ROCK CHUTE DETAILS

UPPERLCR
ADEQ Water QualHy Improvement Project
McFeeRanch

Registered Professional Engineer
CERTIFICATE NO. 58521
CHRISTOPHER TRESSLER
Civil
Date Signed
ARIZONA U.S.A.
EXPIRES: 09/30/2017

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DATE: February 16, 2016\
NCD PROJECT NO: 15-240-AZ
DRAWING NO: D1L02
SHEET NO: 6 OF 7

ROCK-LINED CHUTE DETAIL

NOT 16 &i

Rock Specifications

DIC METER4 1N.

1J - 18	0100
11- 18	a&,
I - 13	0110
7 - 11	DID

REVISED SOUTH CHUTE:

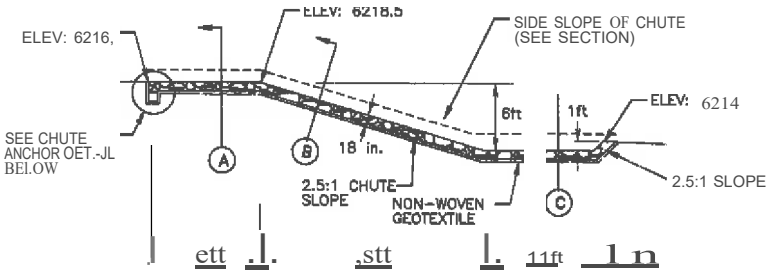
Materlal Quanttflea

.Gllllllllll. .llllll!. ..11111...

SCI ,0 OEOTEXIILE

J3 CII ,-0 ADC-

•8 In



ett .l. .stt l. 11ft 1 n

NOTES

SEE SHEET 2 FOR GENERAL NOTES & CONSTRUCTION SPECIFICATIONS. SEE SHEET 3 FOR COORDINATE TABLES.

1. The site •hall **be** eKcavaled and backfilled to the 9rade• shown on the drawing. The fill material •holl be compacted to the density of the ■um,undln g undisturbed soil$.
2. Cleotmlle ohall meet the reqLllremenl■ of NRCS MS-AZ-592 Geote,rtile material 1pecltlcaUOl"\8 for Claaa III non-WO\len ;eotexUle11. Claolllil<tile aholl **be** jaiM d overtapplng o minimum of 18 inches and aecured against th• underlying foundation material .
3. Rook aholl be dense and angular to oub-raunded in •hope. The leoat dimeneton of on Individual rack shall not be leas than one-third the greatest dimension. Source of the rock will be opproved by the Engineer, prior tD placement. Rock ■hall **be** well graded oo 1hown in the table. Rock placement aholl begin at the bottom of slope•
4. Rock aholl not be dropped more than 3 ft onto geotextlle fabric,
5. A sufficient amount Df rock aholl **be** h<lnd eloced to ■eoure contact **between atones,** minimize voida **and enli.re a neo** unlfo,m aurfoce ,
6. Rock Chute otaktng wlll **be** provided by the £n91neer or their rop.-ntative in tile field for thia project and 01 part of th• NCO contract with the ANRCD.

OCK -l-

T 38 lfl. T 1a1n.

_L H 18 in. _NON-WOVEN GEOTEXTILE

CHUTE ANCHOR DETAIL

(MOTTO SCALE)

be rt r- 2.s n

SLOPE

LNON- N -·-··

GEOTEXTILE

NOTE; Rook Chute excavotiOl"\ requires 0\/el'eKCOvatlon 1nto the embMkment to en•ure proper 1n; eltlnQ of **the** rock at o 1 ft deep channel. Enaure that oide slope• are prolllC!ed ol le01t 1ft above bottom riprop face,

TYPICAL SECTION @, @ & @

(NOT TO IIC.<1£)

CHUTE q_ PROFILE

{IIOT TD

-i-

t

B ft

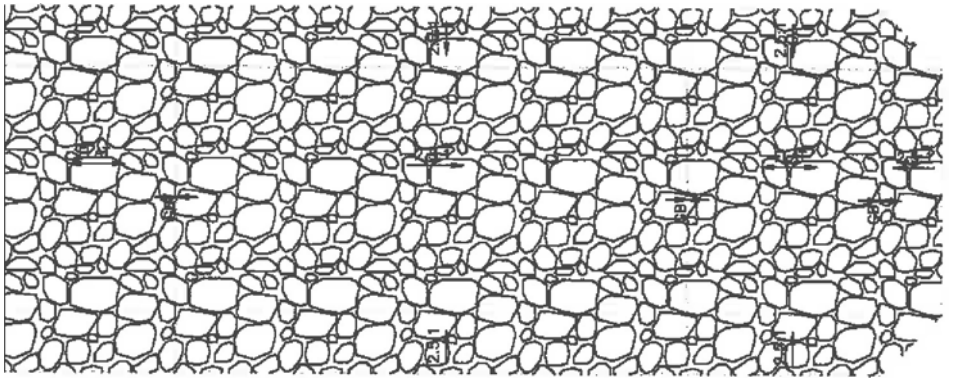
l

2.5 ft

_j___

CHUTE PLAN VIEW

(NOT TO SCALE)



i 6 ft 15 ft i 11 ft _! .s tt.!

Natural Channel Design, Inc

2900 N. West Street ji5 r
Flagstaff, Arizona 86-
(92B) 774-2336

DRAWN BY: C. Scudler1
DESIGNED Il'l': C. Trenler
REVIEI'Im BY: C. Tressler t.l. I<e<lrl

REV	DATE	BY	REVISION
1	4/,·B/16	CS	South Roel< Ct,ute:. placement & dlrnens,ons

REVISED SOUTH ROCK CHUTE DETAILS

UPPERLCR
ADEQ Water Quality Improvement Project
McFeeRanch

Registered Professional Engineer (Civil)
CERTIFICATE NO.
58521
CHRISTOPHER TRESSLER
Date Signed
ARIZONA U.S.A.
EXPIRES: 09/30/2017

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DATE: February 16, 2016

NCO PROJECT NO: 15-240-AZ

DRAWING NO: DTL03

SHEET NO: 7 OF 7

HOOPER PROJECT

Head-cut off Watts Creek looking upstream.

Hooper:

The Hooper project goal was to stop two head-cuts advancing up a tributary to Watts Creek. To halt this advancement through the meadow a rock lined chute was installed on the main channel of the tributary and the side head-cut was filled and re-contoured. To send water to the rock chute and away from the meadow a shallow benn was installed across a section of the meadow and the road. Spoils were utilized to restore the contour of the floodplain. All disturbed areas were seeded with native grass and erosion control fabric was installed on steep areas and channel bottom.

Construction of the rock chute.

Finished head-cut repair looking down stream. Rock chute, bank sloping and erosion mats with reseeding in place.

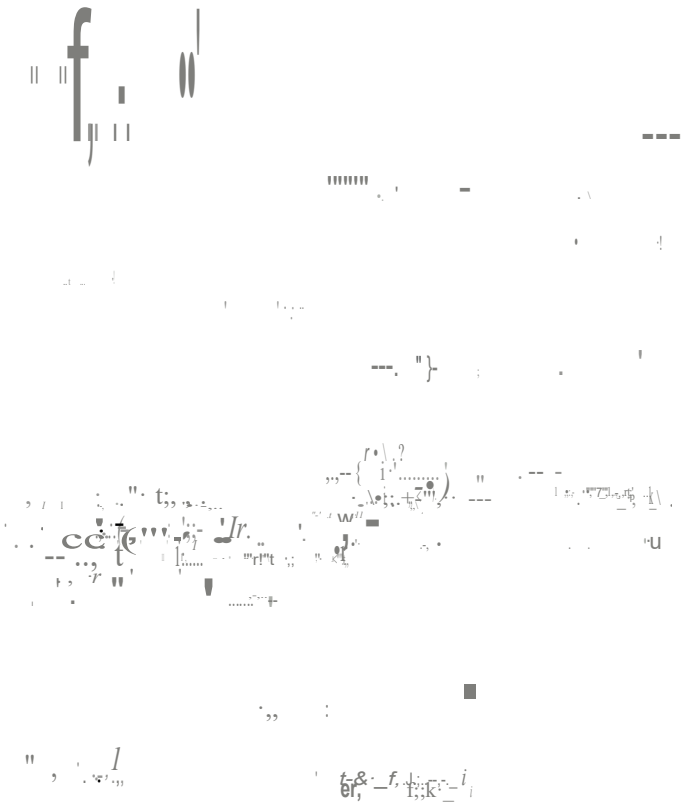
The Hooper project has been declared complete 7/28/2016. The project consisted of:

153 CY of cut
79 *Cf* of fill
90CY of D50=12 in. rock for the stabilized spillway
163 SY non-woven geotextile fabric
0.3 acres native grass seed mix
3 rolls (100 sy each) single net erosion control fabric

UPPER LITTLE COLORADO RIVER HEADWATERS
ADEQ Water Quallty Improvement Project

PREPARED FOR: Jason Hooper

RJNDEOBV:
AIIZ!ona Oepatment *at* EnlitoIIIII8ntal Qualty (ADEQ)
Wala QualtyOlvlllol'l



1:fcNDOWNER·
OO!)er
Jason Hooper

);ROf:TN
pac
B24 E. M'oln St.

928-245-4222

Daric

Spr1ngsrvlleA *Al.* 85925
Phone: (92a) 333-4941

INDEX OF DRAWINGS

WORK QUANTITIES

CU	153 CY
ROCK (D50c12 in.)	90
FIL	79 CY
GRASS SEED MIX	0.3 /I,C,
EROSION CONTROL BLANKET GEOTEXTILE	3 ROLLS* 103 SY

tARTHWORK:
*BASED ON ROLL SIZE OF 8' x 112.5'

urolhann

NHNIC CONr TANT-

Environmental Quality
1110 W. Woshin g ton st.
PhoeniK, AZ 85007
Phone: (602) 771-4635

Rock Chute

Control Point

Fil

e

2900 N. West Street, :suite 5

esig'l., Inc

6,s..... ,,.

. AS-BUILT/RECORDDRAWING CERTIFICATION

/,, I HEREBY STATE THAT THE AS--BUILT INFORMATION AS SHOWN

.,, WITHIN THIS PLANS IS CORRECT TO THE BEST OF MY

Channel

Flagstaff /J,;l,,. 86004

Pho ne: **(928)** 774- 2336

PARTICIPATING FUNDING AGENCIES:

PLAN LEGEND

j _:; _....,...'{. f l

Ari2ona Department of

WN BY: M. Wirtanen

Flagstaff, Arizona 8600
(928) 774-2336

Hooper Ranch

15-240-AZ

1 OF 6

Registered Professional Engineer (CPH)
CERTIFICATE NO.
58521
CHRISTOPHER TRESSLER
Date Signed 02/17/2016
ARIZONA U.S.A.
EXPIRES: 09/30/2017

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DATE:
2/17/16

N
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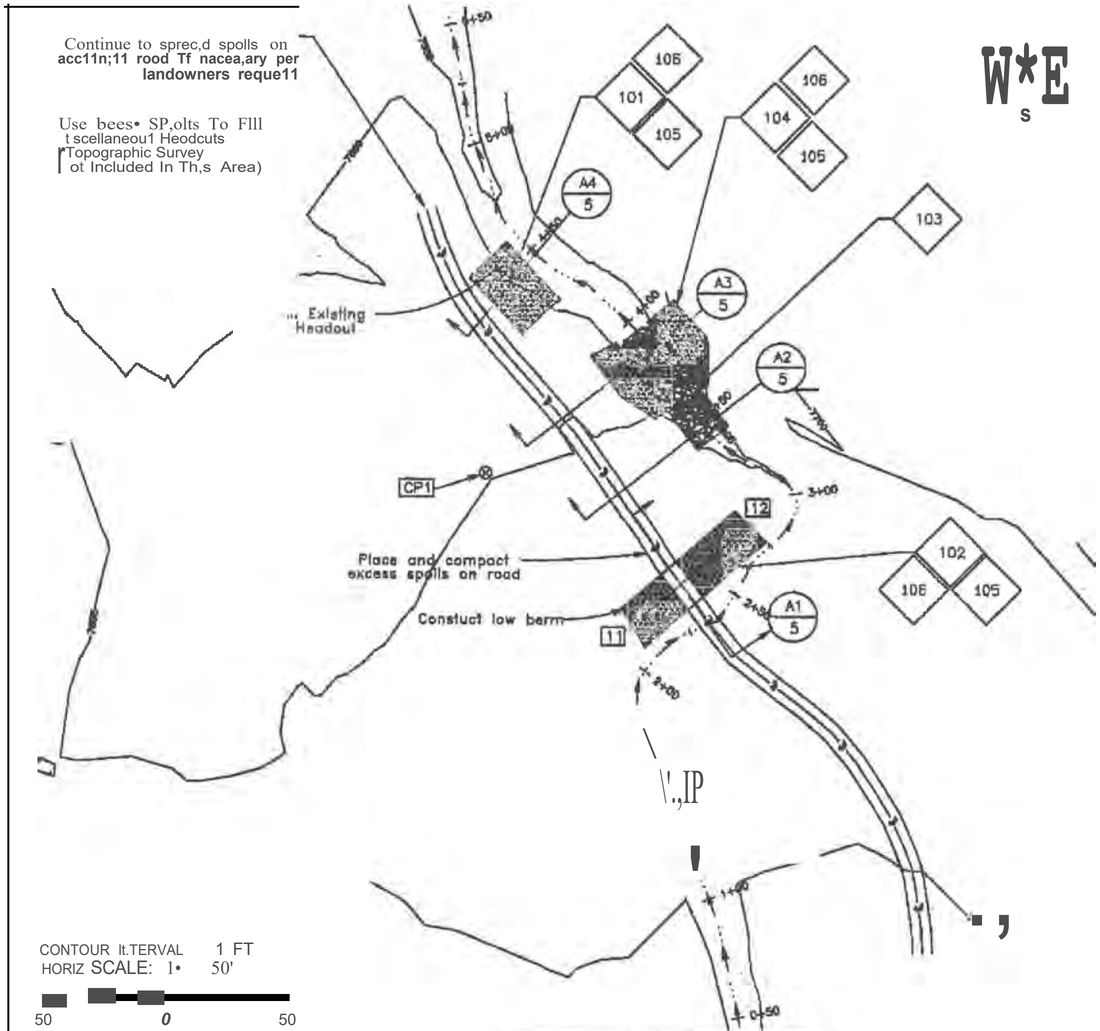

W*E
S

Flii side hoaclcvt per DETAIL on SHT 5.

Ropalr berm along channel por DETAIL on SHT 5,

(1 eo) Construct Rock Uned Cute per DETAIL and Control CoordlnatH on SHTS 3 and 8. Quantified on SHT 1,

Slope banks above rock llne chute per details provided on SHT 5,

1 d o Asisl •;t•i 'i.'tT1J!dw t -1f'.'ci •oed

Place olngle pol erosion control blanket per fi" "cl" "d l:'t {"', ::,fl t ol / • ir, d bank). Quantified on SHT 1.

NOTES:

5:taif fus'fo '1-\'IT i.; ! 1io n:proadlnQ procedures.

:tth "ti!"tR<:E •onlative will be prosided by the EnglnHr or during construction per tlho NCO oonlroct

SURVEY INFORMATION

DATUM & COORDINATE GRID INFORMATION	
HORIZONTAL DATUM:	NORTH AMERICAN DATUM 1983 (NAD83)
COORDINATE PROJECTION:	ARIZONA STATE PLANE, ARIZONA EAST, SURVEY FEET
VERTICAL DATUM:	NORTH AMERICAN VERTICAL DATUM 1988 (NAVD88)
GEOID MODEL:	GEOID03 (CONUS)

NCO LOCAL CONTROL

NAME	NORTHING	EASTING	ELEVATION	DESCRIPTION
CP1'	10811673.56	1000597.68	769.U'L	37 RCBAR W/ YELLOW CAP 'YELLOW C"'I' MARK£0 TUAAL CHANNEL

NOTE: NCO LOCAL CONTROL IS SPECIFIC TO THIS PROJECT AND SHOULO NOT BE USED FOR PROPERTY LINES OR OTHER LEGAL BOUNDARY ESTABLISHMENT.

Natural Channel Design, Inc
2900 N West Street 151
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(92a) 774-2336

DRAWN BY: M. Wirtanen
DESIGNEO BY: C. Tros sler, M. Wirtanen
R VIEWED BY: C. Tre o r. M. Kearl

REV	DATE	BY	REVISION

Pl.ANVEW: Project Overview & Con1rol

UPPERLCR
ADEQ Water Qualtty Improvement Project
Hooper Ranch

Registered Professional Engineer (Civil) CERTIFICATE NO. 58521 CHRISTOPHER TRESSLER Date Signed ARIZONA U.S.A. EXPIRES: 09/30/2017

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Call 811 or click Arizona811.com

DATE: 2/17/16
NCD PROJECT NO: 15-240-AZ
DRAWING NO: PLAN01
SHEET NO:

PROJECT DESCRIPTION

The puqiose of this project is to rsduce impocb, from concentrated flow and bank erosion.
Improvement pion \nclucfes:
1. Stabilize headout through installat ion of rock lined chute.
2. Fill lateral heodcut and· prevent wotsr from flowing over bank.
3. Prevent water from concentrating on road.
-4-. Seed all disturbed areas and sloped banks with native **seed** mix.
S. Apply erosion control blanket to sloped areas within the project to promote seed germination.

GENERAL NOTES

1. Site tof)ograpl1io 1urvey data was collected by NCO an November 10, 2015.
2. All existing conditions are to be verlfhsd in the field prior to construction. If differences in the site have occurred in the time between the intial survey and construction, the engineer shall be conaulted for any necessoiy modifications to the design and plans.
3. No representation is made c,s to the existence or nonexistence of any utlllltles, public or private. Absence of utilities on these drown111 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. Co l Arizona Blue Stake before you cllg to be sure - dial 8l 1.
4. No construction eholl begin until all necessary permita, easements, and funding authorizatlona are obtained.
5. eon.tructlon activities will be conducted in a manner consistent with all aofety regulations and other permitting required by Arizona State Land Deportm ent, Arizona Department of Environmental Quality and others.
6. Installaiion ehall be constructed to the lines and gradee ae ehown on the drawings or as •laked in the field b)' the ENGINEER or authorized representative, recognjzlng there la variallon in nature.
7. The total disturbed area is approximately 0.3 core. The pe on\&J perform\no the work shall ensure that construction activities are performed In accordance with the practices detcnbed in the ADEQ Conlltruction General Permit No. AZ02013-001 and o manner that minimiHB soil, water and alr pollution utilizing standard Best Management Practices.

CONSTRUCTION SPECIFICATIONS

EARTHWORK

The earthwork activities shall consist of grading to install rock lined chutos and rehabilltote embankments.

Excavation

Excavation shall **be** nmited to *roclt.* lined chute construction aa shown on **the** drawings or as staked in the field. No excavotion shall take place within any jurisdictional oreos. Disturbance of existing native vegetation sholl be minimized to the greatest el<tent possible during excavation.

Excavated material shall be placed in the specified headout, berm and road fill locations as shown on the drawings or as staked in the field. All finished surfaces shall be generally smooth and pleasing In oppearonce and blend Into surrounding terrain.

EJ!!b.fill...

Materials: All fill materials shall be obtained from the required excavations. Flt\ materials shall not contciln sod, brush, roots, perishable or frozen materials, trash or other debri1.

Earthfill Icontinued)

P\icernent The placement of fill materials shall follow these guidelines:

. Any vertical bank ahafl **be** sloped before placement of fill material.

• The downstream, eroded face of the existing embankment shall be stepped as necessary prior to placement of new material per the Included plane and details.

. The placing and spreading of fill moteriol shall be started at the lowest point and the fill brought up and compacted to obtain a density similar to the surrounding bank material.

Material when P.laced shall contain sufficient moisture sa that a sample token in the hand and squeezed shall remain intact when released.

For 9enera\ f\11 placeme the !)lacing and &[)reading of fill material shpll be started at the lowest pomt and the fill brau t up in horizontal \ayen, not to exceed: six 6) inches tof looae fill for whe.1 compaction and four) inches of loose fill for dozer compaction. Construction equie,nent shaH be operated over the ciréos of each loyer of fill to insure that ths raquinsd compaction ia obtained.

For trench backfill or tnJ Placement where \Arge equipment doee not have access, Placement shall be In horizontal lifts not exceeding aix (6 inches of loose fill and compacted with appropriately sized • ipment, such oa a sheel,sfoot roller of chment on an excavator, jumping jcick compactor or Fit s lla JPg ovig.,gx be tro"z e: 11 snow or ice.

Headcuta and guf:es desfgMted for filling and re-contouring shall be filled as close as poselble to the historic natural ground surface, clnd smoothed and shaped to blend with the surrounding landsccipe.

All finiehed surfaces shall be generally smooth and pleasing in appearance and blend into sunrounding terrain.

Trash and Debris Removal

All trash ond **debris,** Including **tires,** old pvc pipes, lumber, etc. shall **be removed** from the projects limits and dlposed of properly.

ROCK LINED CHUTES

The headcut stciblllizatlon work shall consist of headcut sxcavation and bank eloping; famishing and installing loose mck Including placement of filter fabric. See SHEETS 5 ac 6 for locatlons and SHEET for Details.

The site shall **be** excavated and backfilled to the grad1111 shown on drawing s. Excavation shall **be** limited to the headcut remediation area as shown on the drawings or 01 staked in the field by the ENGINEER. All rnateriql shall be compacted to the approximate density of sunroundfng undisturbed **areas.** Additional spo,ls shall be spread outside the channel and sloped in such o way **as** to direct flows toward rock-lined chute.

Disturbance of existing native vegetation shall be minimized.

Non-woven geotextile shall be fraced behind the rock. Fabric shall be meet the requirements of NRCS MS-AZ-592 Geotextile materio specifications for Class III nonwoven aeotextiles, The geotedlle shall be ioined by overlopplng a minimum of 18 inches and secured against lhe underlying foondation material. Securing pins II insta1\ed oscneceaeory to prevent undue slippage movement of the geotextile.

Recom d 3 16- Inch steel bars pointed on one end and fabricotecf with o heed to retain a stllel washer'.""i'.s- nch diameter). Pin length shall be not teas than 18 inches. U-shoped pins ore acceptable.

Rock shah' be angular, dense sound and free from crocks, seams, or other defects conducive to accelerated weatfierln.9. The teoat dimension of on indi vidual rock shall not be less than one-half the greatest dimension. Rock source shall be approved by the ENGINEER or authorized representati ve and hove a bulk specific gravity of not less that 2.5 per ASTM C127. Rock shall be well graded as follows:

ROCK CHUIES

Diameter, .n.	Percent Passing D100
18 - 22	085
12 - 18	050
10 - 18	010

Rock placement ahafl begin at the bottom of slope. Rock shall not be dropped more than 3 feet onto geotextile.

Sloped banks eholl be seeded with native grass, see Sheet 3 for Grass Seed Mix

NabJraJ Channi jal Design, Inc
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Flogstcfft Arizona sscro
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DESIGNED BY: C. Tressler M. Wirtanen
RE\IIEI'ED BY: M. Kearl C. Treaeior
REV DATE BY RE\1S\OI'I

GENERAL N0IES &
CONSTRUCTION SPEOFICATI0NS

UPPERLCR

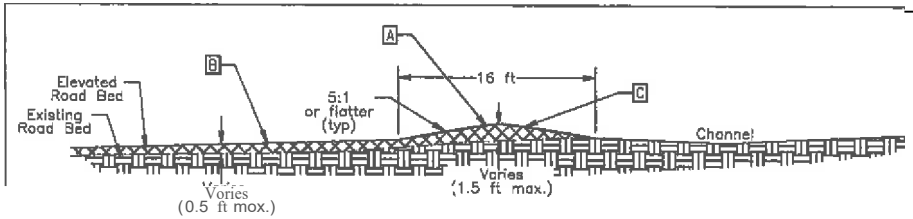
ADEQ Water Qualtty Improvement Project
Hooper Ranch

Registered Professional Engineer (Civil) CERTIFICATE NO. 58521 CHRISTOPHER TRESSLER Date Signed 2/17/2016 ARIZONA U.S.A.

PIRES: 09/30/2011

DATE: 2/17/16
NCO PROJECT NO: 15-240-AZ

DRAWING NO: GENO1
SHEET NO: 2 OF 6



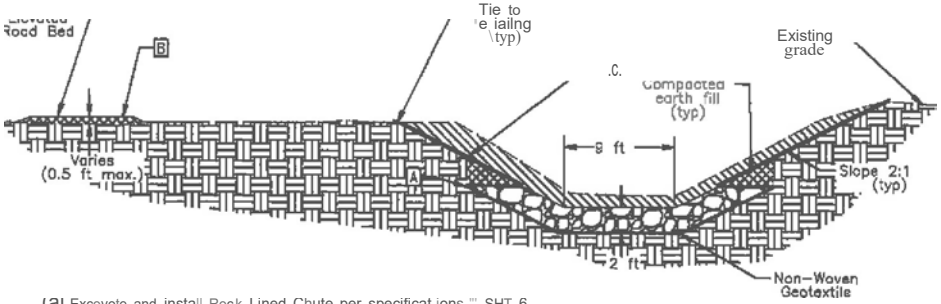
ItJ Repair 1.5 ft hiqh berm along existing chonnel. Fnont and baek •lopes ot 5:1 or !lotter

[ID Place end compact e•cess spoils on roO<l.

(g Seed bare ,oil and cover y.-l th .aingla net erosio n contr<:11 blanket (except along rood), per ape,e:ificotions. SHT 3.

ffi ROAD CENTERLINE AND BERM REPAIR

(NO SCAIE)



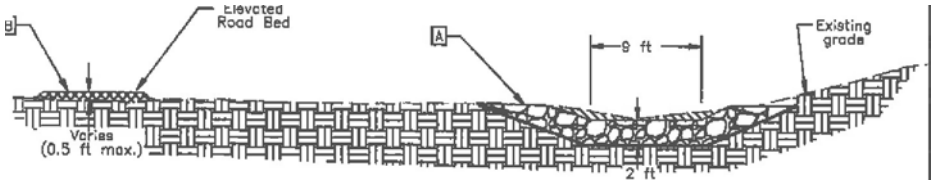
(al Excovote and install Rock Lined Chute per specifications "' SHT 6. Slope upperbanko above neck to 2:1 slope.

(§] Place end compact excaes spoils on road.

(£l foee ni da e . ng i :tr i• ecf[c bt k • cificotions, SHT 3,

@ TYPICAL SECTION: ROCK LINED CHUTE

(NO SCALI:)

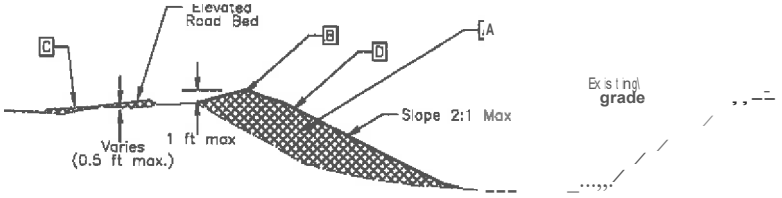


L1J Excavate and InstoH Rock Lined Chute per speeilicctions, ,tlr 6

[ffl Ploee end compact excess spoila o.n rood.

C£ TYPICAL SECTION: ROCK LINED CHUTE AND ROAD F'ILL

(NO SCAL()



[I Fill to be placed end oom octl!ld in side hecdcut par Earl.hfH! specificotiona, SHT 2. Fill shou ld not extend post the ••isling side•lopee, but should ti in ond present o consiotant slope face.

Im Berm up top end of fill GP?• 1 ft to prevent water fnom draining ot this po;n!.

[g Ploce c;ind compact e-xcese spoils on road.

IQ] r:· ni d° e 0 "t:,n:. mib f'on; t + nka\

@ SIDE CUT FILL <Mo sc.u.])

Na1ural CJlannelREI/I Design, Inc

2900 N. West Street /,15
Flogstoft, Arizona 8600"1
{92o) 774-2336

DRAWN BY: M. Wirtonen
DESIGNED BY: c. Tro191er, M. Wirtanen
WED BY: M. Kearlv, C. Tr1111ter

	DATE	eY	RE111s1DN

CROSS SECTIONS

UPPERLCR
ADEQ Water QualHy Improvement Project
HooperRanch

Registered Professional Engineer (Civil) CERTIFICATE NO 58521 CHRISTOPHER TRESSLER Date Signed 04/17/2017 ARIZONA U.S.A. EXPIRES: 09/30/2017

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DATE: 2/17/16
INCO PRCLECI NO: 15-240-AZ
DRAIl!NG NO: XS01
SHEET NO: 5 (Y' 6

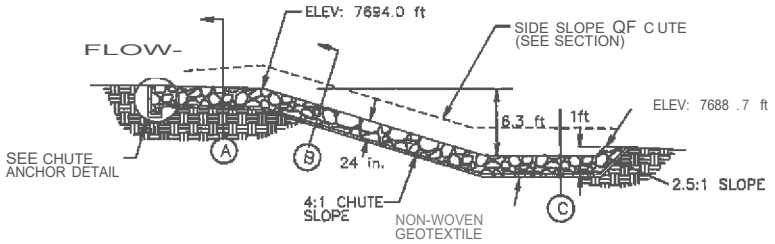
Rock Specificotions

DWJETEA; IM:	G
18 - 24	0100
16 - 22	D85
12 - 1B	DI50
10 - 18	OIO

Materiel Quontities

.!ll!m:t. .lll!!I.	..IIIIL
183	SQ I'O QWTEI(TIL.E
90	CU YD ROCK RIPR,IP

Dsc • 12: rn



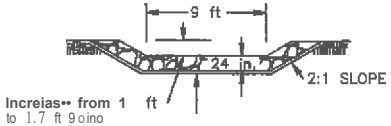
CHUTE q_ PROFILE

(NOT TO ICALE)

NOTES

SEE SHEET 2 FOR GENERAL NOTES &: CONSTRUCTION SPECI FICATIONS. SEE SHEET 3 FOR COORDINATE TABLE.

1. The site 1hall be • cavoted and backfilled to the **gradee** shown en the drawing. Th• fill material sholl be compcotod to tho den,Tly cf the ourroundlng undisturbed **ooilo.**
2. Geotoxtile oholl **be** non-wcvon fabric with a minimum arob tensile strength of 90 lb.1 greater than 50,C elongation ct foiluro, o minimum of 40 lb puncture otren9th, and c UV reo lstcnce of 70,C strenath retained. Gectext ile ohall **fou plg,'-at ri imum of 1 B me hes and secured against the**
3. Rock •hall be oenoe ond angular to sub- r ounded in 1hope. The l1011t dimension on individual roek shall not be le•• than one- th ird the greatestdimens ion. Source of the reek will be approved by the E ineer, erior to
4. Rock shell not be dropped more then 3 ft onto geotextlle fobrle.
5. **A auffici•nt omourit or rock shall ba hand f.laced to Hcur* contcct betwsen stones, minimize voida: ond ensure o nee , uniform surface:,**
6. Layout and slope etoking will **be** provided by the Englr<1or or **authorized repreeeritc tive durir„g construction per tna NCO contract with** the NRCD.



TYPICAL SECTION

{HOT TO SCAL£)

R RAKP_i_

T36 In. T24 in.

NON-WOVEN

_i_ H

18-24In.

GEOTEXTILE

CHUTE ANCHOR DETAIL

(NOT TO SCAU)

t:tft7

LOPE

NON WOVEN
GEOTEXTILE

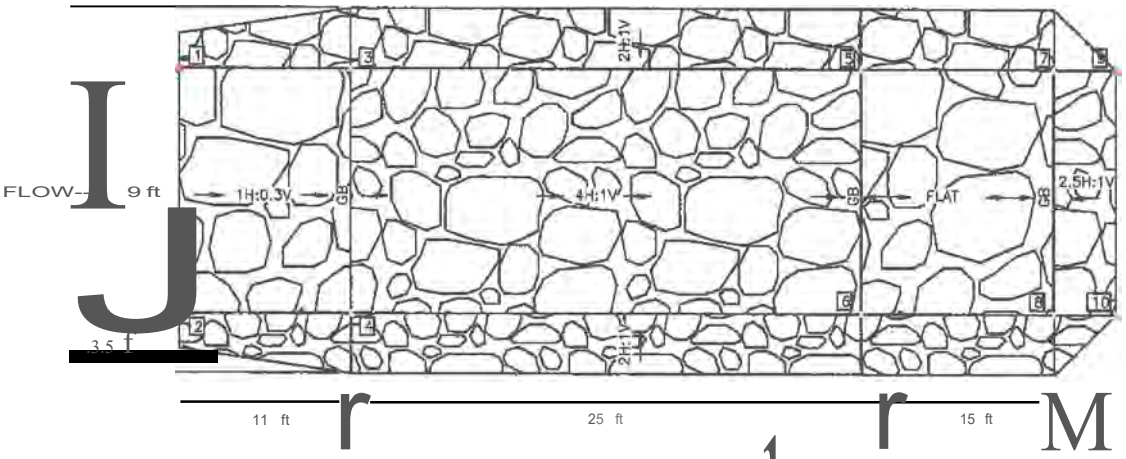
NOTE: Rock Chute e<covation req.-uires overe(cavotion into the embonkment to ensure proper insetting of the rock ot o 1 ft doop chonnel. Ensure thot **side slope• ore pro\oc\ed** at 1ft **at>ove** bottom riprap **face.**

TYPICAL SECTION (} &@

(OT IO SCALE)

ROCK CHUTE PLAN VIEW

(NOT TO **SCALE**)



Natural nel

Inc

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Flaga>cft Arizona 8600·
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DRAWN BY: M. Wirtanen

REI.1E'hm BY:

ROCK CHUTE DETAILS

UPPE Project

ADEQwaterOJally Ralch

Hooper

Registered Professional Engineer (Civil)
CERTIFICATE NO.
58521
CHRISTOPHER
TRESSLER
Date Signed 02/17/16
ARIZONA U.S.A.
EXPIRES: 09/30/2017

DATE: 2/17/16

NCD PROJECT NO: 15-240-AZ

DRAWING NO: DTL02

SHEET NO: 6 OF 6

EROSION CONTROL BLANKET

Erosion control blanket shall be laid ,;ind anchored aver the seed to provide bank protection and a good environment foc vegetation regrowth. Follow manufacturers recommendotione for installation Olld anchoring, Including anchor t,-.nchee ancf stapling pattern and rate.

SINGLE NET: Straw, Single Net Erosion Control Blanket- that in cerlif!ed wee;g free anq made with all natural, 100" biodegradable netting. Use >.£.C Premier Single l'let ECB with FibreNet netting (American Excelsior) or equlvolent.

RANGELAND SEEDING

Disturbed areas will bl!l aeeded with native grasses and ehrubs. Seeding activities includa lhe followlng:

. Pre re seedbed where needed. Thi• l'l1<ly Include scarifying the upper 2 Inches of soil where **a&eil** application will occur. Overly compactei:I equipment oco s routes may ,-.quire scarification to 6 inches.
• Seed can be drllled or broacrcaet l)Y, hand.
Unless P.loced under an erosion control blanket, seed shall be incorporated into the soil, but not more than 0.5 to 1.O-tnch deep.
Seed 1hall be applied uniformly.
Seeding sholl occur before Inetallc:itron of erosion control blanket.

The seeding ratea below are for P.lantlng by hand broadcasting, Seed shaU be weed free and shall be purcllosed lrom a reputable **suppliw.** The graae and shrub seed mix will consl t of the following **species.**

Gmsa_Saad Mik	
BlueCfn1mci (EloutelaRa grac.ha)	2.5 16/.ac PL.S
wntem Wheatgro s Pciscopyrum smith'J')	7.0 11>1/.ac PLS
Sldi,oat Groma ou eloua curtlpendula	1.5 lb1/.ac PLS
Indion Ricegra.. Achnatherum hymenol **ea)**	2.0 lb1/ac PLS
	13.0 lb/ac PLS
Shrub S•ad Milll	
'Fourwincg Scdthush (Atnplex caneacena)	**0.25** 16/ac PCS

HYORO! Qlrr §UMt.Wrl'.

WATERSHED **AAfk** 371 *IC* (0.58 SQ **MI)**

METHOD:	010 (CFSl	025 (CFSl	Q!OO (CFSl
NSS (High Elev)	47	74-	125
LCR Regional Cu,....e	31	41	

Coordinate Tobi•

Pt //	Northing	Easting	Elev	Duc.
1	1 119685.51	1000887.o:/.	7694.J	ROCK CHIJTE
2	9691.04	1000894.15	7594.3	ROCK CHUTE
3	,8mH	1000880.30	7694.0	
4		1000687.43	7694.0	RO fiij
S	1089714.01	1000685.0J	7687.7	
6	1089719.51	10oom,1i	7687.7	K CHIJTE
7	1089725.86	logg 3 2:ie	7687.7	ROCK CHUTE
8	1089731.38	o	7687.7	ROCK CHIJTE
9	183mH8	1000 4.45	7668.7	ROCK CHIJTE
10		1000861.58	7688.7	
11	1089611.07	100D657.73	7697.+	il i r
12	1089651.56	100D706.26	7696.7	

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DESIGNED BY: C, Trusler, t.4. Wirtanen
REI/IEWEO B'I": Jt _Keorly, C. Trenler

REV	DATE	BY	REVISION

CONSTRUCTION SPECIRCATIONS, SEEDING & COORDINATE TABLE

UPPERLCR
ADEQ Water Quality Improvement Project
Hooper Ranch

Registered Professional Engineer (Civil) CERTIFICATE NO. 58521 CHRISTOPHER TRESSLER Date Signed 2/17/16 ARIZONA U.S.A. EXPIRES: 09/30/2017

UNAUTHORIZED CHANGES & USES THE OWNER'S INSTRUMENTS OF SERVICE ARE NOT TO BE CHANGED OR USED FOR ANY PURPOSE OR PROJECT OTHER THAN THE SPECIFIED PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF THE ARCHITECT. UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS WILL RESULT IN FULL RESPONSIBILITY FOR ALL CONSEQUENCES ARISING THEREFROM AND THE ARCHITECT WILL BE RELIEVED OF ANY AND ALL LIABILITY.

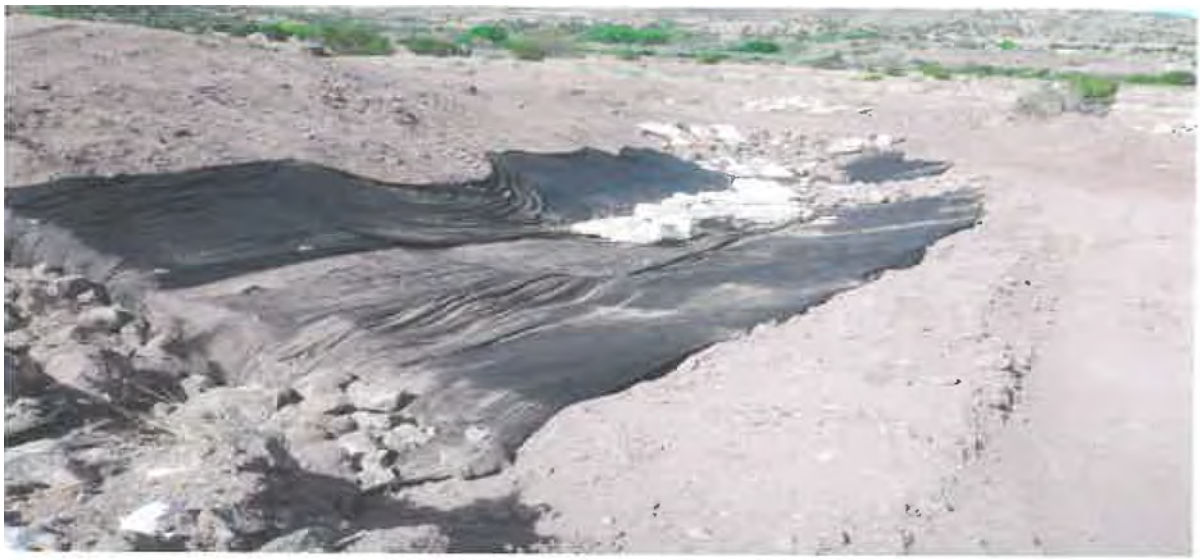
DATE: 2/17/16
NCD PROJECT NO: 15-240-AZ
DRAWING NO: GEN02
SHEET NO: 3 OF 6

Johnson Project

Johnson Sediment basin breeched berm. Looking up stream from little Colorado side.

Johnson:

The project goal was to construct a stabilized spillway, reconstruct a breached sediment basin, and rehabilitate the embankment at the Johnson ranch. The project reconstructed a sediment basin that had reached the end of its service life and had been breached. The breach was allowing stored sediments to move downstream into the Little Colorado River. Accumulated sediment was removed from the basin and a rock lined spillway was installed to arrest the head-cut in the basin. The basin, with maintenance, could store approximately 3,900 tons of sediment from entering the little Colorado over the span of 10 years. All disturbed areas seeded with native vegetation.



Construction of rock chute spillway. Looking **toward** the Little Colorado River.

Finished sediment basin cleanout/repair. Looking across basin to the rock chute spillway.

The Johnson project has been declared complete 6/28/2016. The project consisted of:

4,183 CV of cut
3,075 CY of fill
316 CV of D50=14 in. rock for the stabilized spillway
425 SY of nonwoven geotextile fabric
Native grass seen mix for 1.0 acre

UPPER LITTLE COLORADO RIVER HEADWATERS
ADEQ Water Quclify Improvement Project

PREPARED FOR: Cllfford Johnson

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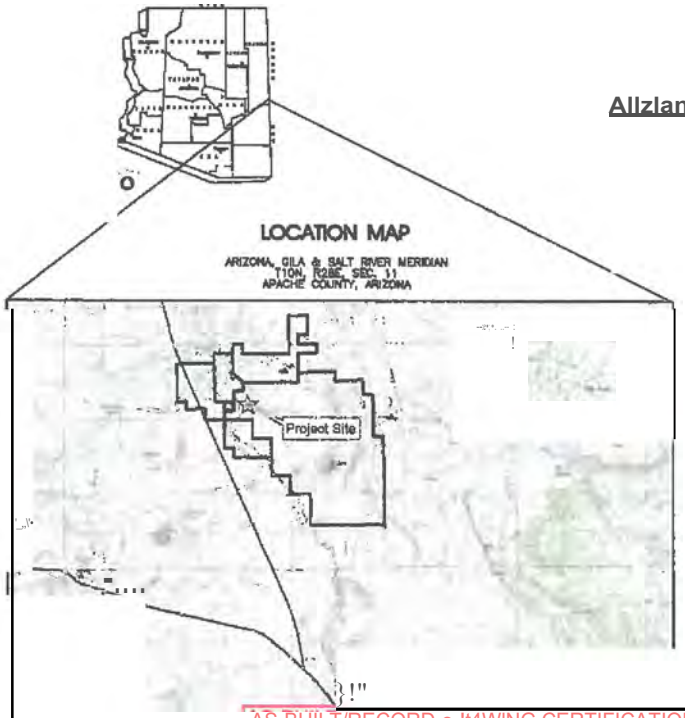
watsQJaltyDMIlorl



LANDOWMER:
JohnshOn Cottle Co.
Clifford Johnson
1852 E. Hopi Dr.
Springerville, Al. 85929
Phone: (602) 920-1155

PROJECT MANAGER.
Apache NRCD
Darlc Knight
824 E, aln st.
Springerville, AZ. 85925
Phone: **(928)** JJJ-4941

TECHNIC. CONSULTANT:
Naturor::hannel Design-' Inc.
2900 N. West Street, :,ulte 5
Flagstaff Al. 86004
Phone: f'.1128) 774-2336

ADNG f\JNPING AGENCIES:
Arizona Department of
Environmental Quality
1110 W. Washington St.
Phoenix, Al. 85007
Phone: (602) 771-4635

INDEX OF DRAWINGS

WORK QUANTITIES

EARTHWORK:	
CUT	4,193 CY
FILL	3,075 CY
ROCK (050=1<4 In,)	316 CY
GE01'EICTIL£	**425** SY
GRASS SEED MIX	1.0 AC

P L A N L E G E N D

[==:J Rock Rlprap

Cut

Detail Ret..-

Detall ShHI
Identifier Refotence

Control Point
Exlatlng Flowline
Proposed Flowlne
Exi•ting Contour (minor)
Exiatlng Contour (major)
Design Contour (minor)
Design Contour (major)

AS-BUILT/RECORD o-!t4WING CERTIFICATION
I HEREBY STATE THAT THE AS-BUiIT INFORMATION AS SHOWN HIN THIS PLANS IS CORRECT TO THE BEST OF MY KNOWLEDGE, THE AS-BUILT INFORMATION AS PRESENTED 1S BASED UPON FIELD OBSERVATIONS AND INFORMATION PROVIDED TO NATURAL CHANNEL DESIGN BY THE CONTRACTOR.

1CHRJSTOPHER TRESSLER — **58521** — 6/22/2011
REG. PROFESSIONAL ENGINEER — REG.# — DATE

Natural Channel Design, Inc

2900 N. West Street 15
Flagstaff, Arizona B6604
(928) 774-2336

DRAWN BY: C.'IRtSSLER		
DESIGNED BY: C. TRESSLER		
REVIEWED BY: !.I, CQrl		
REV	DATE	BY RE\IISION

COVER SHEET:
Location. Index & Quantities

UPPERLCR
ADEQ Water QualHy Improvement Project
Johnson Cattle Company

Registered Professional Engineer (Civil)
CERTIFICATE NO.
58521
CHRISTOPHER TRESSLER
Date Signed 04/07/2016
ARIZONA U.S.A.
EXPIRES: 09/30/2017

UNAUTHORIZED CHANGES & USES
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DATE: 04/07/2016
NGD PROJECT NO: 15-240-AZ

DRAWING NO: CVRD1
SHEET NO: 1 Of 6

PROJECT DESCRIPTION

The purpose of this pro)ect is to rehabilitate a Hdiment basin on a tributary 1,700 feet upstream of it's confluence with the Little Colorado River. The basin provide• Ito f sed,menta thot would otherwise be dl1charged to the Little Colorado Rilfill",

Improvement plan includes:

1. Rehabilitation of existing embankment, that haa breached.
2. Installation of rock llnea chute at spillwoy.
3. Sediment removcll from basin.
4. Seed all disturbed areas and 1loped bank• with native seed mix.

GENERAL NOTES

1. Site topographic survey d<rta was collect&:! by NCD on November 9, 2015.
2. All eKistlnljj conditiooa are to **be** verified In the field prior to construction. If **changes** to the site how occurred in the time between the intlal survey and construetion, the """9ineer shall be conilt.llted for any necessary modifications to the design and plans.
3. No repretentation ls made aa to the existence or noMxl9tence of any utlllties, public or pri\l<lte. Absence of utilities on these drawings IS NOT anurance that no utilitle-s **ar11** presenl The exi1tence, location and dspth of any utility must be dstermlned by the contractor priw to any eKcavation. Coll Arizona Blue stoke before you dig to be sure - dial 811.
4. No construction shall begin until all necessary permits, easements, and funding authorizations are obtained.
5. Construction activities will be conductoo in a m<inne..- consistent with all eofety regulationa and other permitting required by Arizono stats Land Department, Arizona Deportment of Environmental Ouolity, and others.
6. Inatallotion shall **be** constructed to the lines and grades as shown on the drawings or as staked in the field b,Y the ENGINEER or authori2ed repreaen{ative, recognizing there i1 variation in nature.
7. The total d,.turbed area is appra•lmately 1.6 acres. As the total afl(l exceeds 1.0 oore1, the p•raon(s) oerfarrninljj the wori< will be uired to flle a No ice of Intent (NOIJ for atorrnwc:iter discharges with ,\J)EQ prior ta initiating conetructian. The person(aJ performing the work shall **enBUre** that con!ltructian activities ore performed in accordancl!l with **the** practices described In the ADEQ Construction General Permit No. AZG2013-001 and a manner that m,nimizea soil, water and air pollution utlllzing standard Best Management Practices.

CONSTRUCTION SPECIFICATIONS

EARTHWORK

The earthwori< activities shall coneiat of 1jjradin9 to rehabilitate the existing sedlmant ba1in, Install armored overflow spillway and rehabilitate embankment.

Excavation

Excavation shall **be** limited to sediment boaln and spillway construction ae shown on the drawings or aa ,tal<ed in the field. Disturbance of existing notivl!l vegetal:ion 1hall be minimized to the greatest e>dent possible during excavation.

Spoil material shell be placed upon the downstream face of th• embankment repair, as shown on the drawing■ or as etaked in the ftefd. All fini11hed surfaces shall **be** generally smooth and **pa.aaing** in appearance and blend into surrounding terrain. No haul off of spoil material is authorized or will be covered under grant funde,

Materials: All fill materials shall **be** obtained from the **requi.-.cl** onslts eKCOYOliona and approved boN'OW **soun:ee.** Fill mirterials shall not contain **aod,** brush, roots, perishable or frozen materials, troah ar other debris.

Eorthfill (continued)

Placement: The placement of trll material• shall follow these guidellnea:

. Any vertical b<lnl<. aholl be stepped **aa** necessary prior ta pl<lcement of **n;iw** material **per** the included plans and details, •• SHEET 4 for details.

. The placing and •preading *at* fill mote(,al shall be started at Iha lowest point and **tt,e** fill brOU9ht up and compacted to o6toin a density similar to th<!! surroundinljj bank material,

Material when placed sholl contain sufficient moisture so that a sample taken In the hand and squeezed shall remain intact when released.

For general fill placement, the placin.9 **and** spreading of fill material shall **be** started at the lowest point and the fill brou,g ht up In hanzontol loyere not to exceed: six (6) inches of looae till for wheel compaction and four l4) inches of loose fill for dozer compaction. Construction equipment shall be operated over the areas of each layer of fill to inaur11 that the required compaction Is obtained.

Flll shall not be placed on frozen soil, snow or ice.

All finished surfaces shall **be** generally smooth **and** pleasing in appearance and blend Into 1urroundln9 terrain.

Trash and Oebria Ramovol

All trash and debris, Including tires, old PVC pipes, lumber, etc. shall be removed from the pro)eets limlts and dlposed of properly.

ROCK LINED CHUTES

The **1pillway** stabllllzation wari< ■hall consist of ekcavation for the rock lined chut•; furnishing and Installing looli• rack Including placsment of filter fabric. **S•e** SHEET 3 for location• and SH1:.ET 5 for Detolla.

The site shall be sxcavoted and backfllled to the grades shown on drawin9s. EKcovation shall be limited to the spillway area aa shown on ttle drawings or as **atakad** in the field t:>y the ENGINEER.

1',ry neaaary fill material shall be compooled lo the approximate den■il y of surrounding undistunM!d areas. Spoil material shall be placed and compacted upon the downstream face of the embankment repair, as shown on the drawings or as stakl!ld In tha field,

Oi!lturbance of existing native vegstotion shall bl!l minimized.

Non-woven geote•tlle ahall be placed behind the roclc. Fabric !!hall **be** meet the requirements of NRCS MS-AZ-592 Geotexlile material • ifo<:0tlons for Class lll nonwoven geoteirtile,. The geoteJCtile shall be Joined by overlapping a minimum of 18 inches and secured against the underlying foundation material, Securing pint shall be installed as neceasaiy to prevent undue slippage or movement of the geotewtile, Recommend 3/16-inch steel bars pointed on one end cod fabricatea with a head to retain a **1tHl** washer. (1.!5-,nch dlamat8t'). Pin length shall **be** not less than 16 Inches. U-shaped pint are acceptable. Rock **at,ol) be** angular, **dense,** sound and free from cracks, Nams, or other defl!!Cts conducive ta accelerated weatnerin g. The least dimension of an Inc!Mduol rock shall not **be** leas than one-half the greatest dimension. Rock source shall be approved by the ENGINEER or authorized representative and nave a bl.Ilk specific gravity of not **leBB** that 2.5 per ASTh1 C127. Rock shall be well graded **as** follows:

Diameter, in.	Percent Passing
	0100
18-25	D85
14-21	050
11-1B	D10

Rocle plocement shall begin at the bottom of elope. Rock shall not be drapped more than 3 **fut** onto geoteJCtile.

Natural

DRAWN BY: C.IRESSI.ER
DESIGNED BY: C. TRESSIER
RE O BY: t.l. Kaorlv
Inc REVI DATE I BY I RE SION

2900 N. West Street **15**
Flagstaff, Arizona 8660
(928) 774-2336

GENERAL NOTES & CONSTRUCTION SPECIRCATIONS

UPPER LCR

ADEQ Water QualHy Improvement Project

Johnson Cattle Compaty

Registered Professional Engineer (Civil) CERTIFICATE NO. 58521 CHRISTOPHER TRESSLER Date Signed 04/07/16 ARIZONA U.S.A. EXPIRES: 09/30/2017

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DATE: 04/07/2016

NNCO PROJECTNo: 115-240-AZ

DRAWING NO: GEN01

SHEET NO: 2 6

EROSION CONTROL BLANKET

Apply erosion control blanket to embankment slopes. Erosion control blanket shall be laid and anchored over the seed to provide protection and o good environment far vegetation regrowth. Follow manufacturers recommendat,ons for inatallation and anchoring, including anchor trenches and stciplIng pattern and rate.

SINGLE NET: Strow, Single Net Erosion Control Blonket, that in cumifled weed free and mode with all natural, 10051 biodegradable netting. Use AEC Premier Single Net ECB with "FlbreNet" netting (American Excelsior) ar equivalent.

RANGELAND SEEDING

Disturbed areas will be seeded with native grosaes. Seeding aattvltios include the following:

Prepare soedbed where needed. This may include scarifying the upper 2 inches of son where seed application will occur. Oveny compacted equipment access routes shall require scarlfieafion to 6 Inches.

. Seed con **be** drilled or broadcg9l by hand.

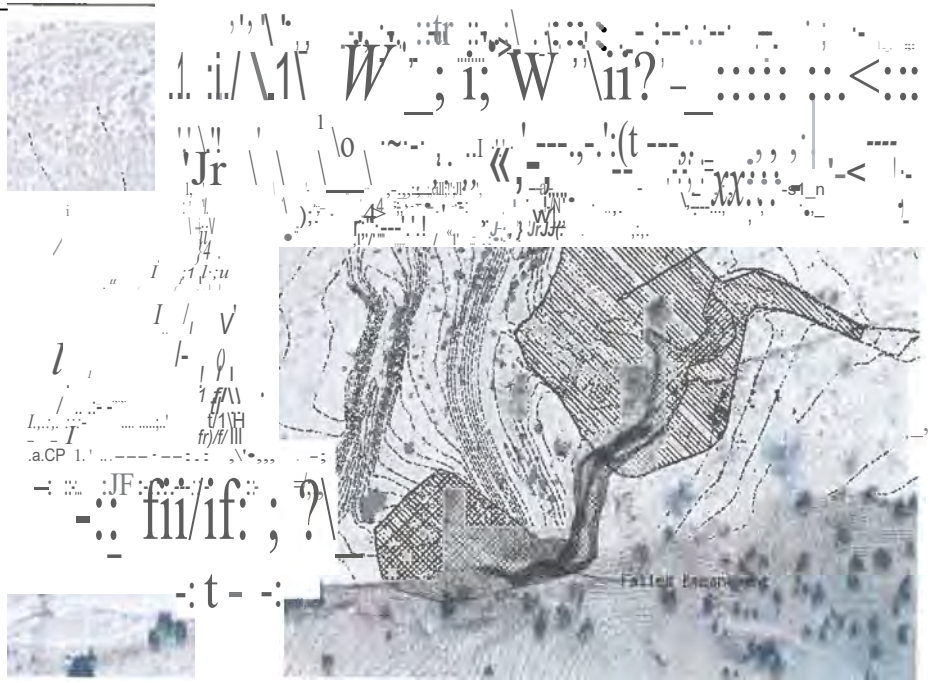
Unless laced under an erosion control blanket, eeed shall **be** Incorporated Into the eoll, but not more than 0.5 ta 1.0-inch deep.

Seed shall be applied uniformlY.

Seeding shall occur **before** Inslollation of erosion control blonket.

The eeeding rates below ore for planting by hand broadcasting. Seed shall be weed free and shall be purchased lrom a reputable supplier. **Tlie** grg"" **Hed** mix will consist of the followtng species:

Im!n Seed MiK	
BfueGra,ima (Boutelouo gracilis)	2.5 16/.ac Pl.s
western Wheatgrass {Pascopyrum smith)	7.0 lb/,oc PLS
Sideoots Gramc (Baulelouo curtipendulol	1.5 lb/,ac PLS
Indian Ricegross (Achnatherum hymeno;aes)	~~2.0 lb/ac PLS~~
	13.0 lb/ac



PROJECT OVERVIEW W+E

BDRIZ SCM.11: 1" = 100'

10 0

SURVEY INFORMATION

DATUM & COORDINATE GRID INFORMATION

HORIZONTAL DATUM:	NORTH AMERICAN DATUM 1983 (NAD83)
COORDINATE PROJECTION:	ARIZONA STATE PLANE, ARIZONA EAST, SURVEY FEET
VERTICAL DATUM:	NORTH AMERICAN VERTICAL DATUM 1988 (NAVD88)
GEOID MODEL:	GEOID09 (CONUS)

NCD LOCAL CONTROL

NAME	NOR".'HING	E"5TING	ELEVATION	DESCRIPTION
CP1	1193617.7	.48989.0	6110.7	WOODEiil STAKE @ FENCE POST

SEE SHEET 5 FOR DESIGN CONTROL POINT COORDINATES.

NalurDlannel

2900 N. West Street #5
Flagstaff, Ari:zonc 860'041
(928) 774-2336

DRAWN BY: C.1RESSLER

DESIGNED SY: C. TRESSLER

REVIEWED BY: M K&arlv

In REV	oATE	BY	REvrs10N

CONffi'RUCTION SPEOFICATIONS. OVERVIEW AND SURVEY CONTROL

UPPERLCR
ADEQ Water Qualtty Improvement Project
Johnson Cattle Company

Registered Professional Engineer (Civil) CERTIFICATE NO. 56521 CHRISTOPHER TRESSLER Date Signed 04/07/16 ARIZONA U.S.A.

EXPIRES: 09/30/2017

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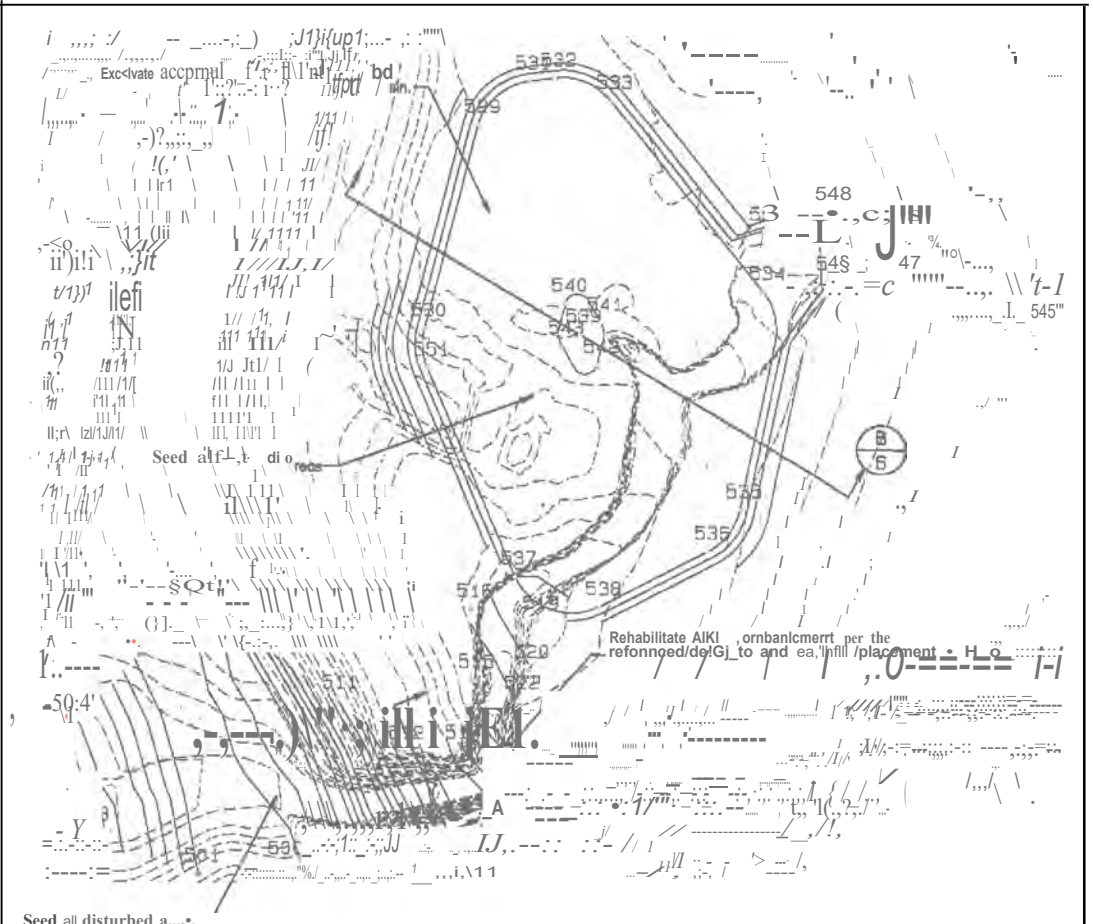
DATE: 04/07/2016

NCD PROJECT NO: 15-240-AZ

DRAWING NO: OVR1

SHEET NO: J OF 6

Coordinate Table - Oesign Elevations			
Pt#	Northing	Easting	1::levation
500	1193494.8	949357.1	6110.0
501	1193491.5	949323.0	6109.5
503	1193508.2	949277.5	6101.5
504	11935.!19. 7	949269.7	6103.1
507	1193581.4	949299.3	6109.5
508	1193599.2	949322.7	6111.3
510	11935B6.5	949347.2	6115.5
511	1193562.7	949379.0	6121.6
512	1193542.2	949406.2	6126.9
514	1193542.6	949429.3	6123.3
515	1193571.6	949434.8	6120.0
516	1193600.6	949434.2	611B.6
519	1193595.9	949461.0	6117.1
520	1193575.7	949457.5	6119.1
521	1193530.4	949451.8	6121.5
522	1193563.0	949453.4	611B.8
529	1193797.8	949436.8	6117.0
530	1193714.9	949414.9	6117.0
531	1193815.6	949457.4	6117.0
532	1193817.0	949467.8	6117.0
533	1193807.9	949490.6	6117.0
534	1193730.8	949553.0	6117.0
535	1193642.0	949543.7	6117.0
536	1193624.9	949530.8	6117.0
537	1193614. 3	949452.1	6117.0
538	1193601.9	949486.6	6117.0
539	1193712.8	949478.1	6116.0
540	1193725.5	949472.4	6116.0
541	1193717.8	949486.7	6116.0
542	1193700.3	949485.3	6116.0
543	1193708.0	949470.9	6116.0
544	1193718.9	949668.6	6121.5
545	1193708.4	949664.9	6121.5
546	1193751.4	949611.1	6119.2
547	1193731.9	949608.9	6119.2
548	1193764.7	949579.8	6118.2
549	1193735.0	949580.3	6118.2
550	1193755.0	949553.0	6122.1
551	1193698.7	949416.1	6117.0



Natural

DRAWN BY: CJRESSLER
DESIGNED BY: C. IRESSLER
REIIIEWED BY: M. Kearl

REV	DATE	BY	REVISION

inc
2900 N. West Street #51
Flagstaff, Arizona 860"04t
(928) 774-2336

PLAN VIEW:
Basin and Embankment Rehabllltatton

UPPERLCR
ADEQ Water Qualtty Improvement
Johnson Coffie Company

Registered Professional Engineer (Civil) CERTIFICATE NO. 58521 CHRISTOPHER TRESSLER Date Signed 04/07/2016 ARIZONA U.S.A.
EXPIRES: 09/30/2017

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DATE: 04/07/2016
NCO PRO..ECT NO: 15-240-AZ

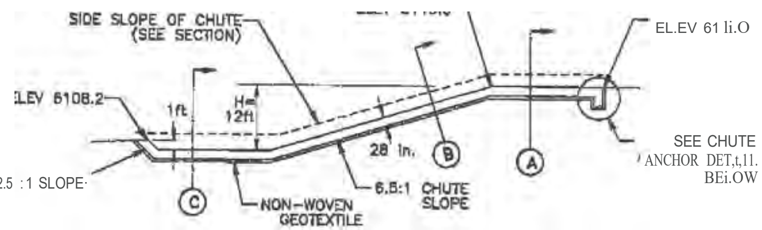
ORA NG NO: PLANO
SHEET NO: 4 OF 6

Rock Specfflcallonl

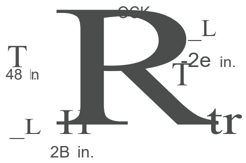
DIOMEIIIL IN.	
21 - 211	D100
H - 26	D8li
I• - 21	D110
11 - 18	DtO

ROCK-LINED CHUTE
PLAN VIEW & DETAILS

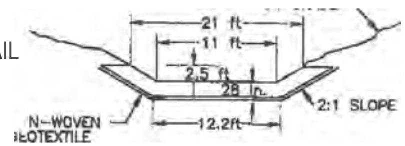
Hvl Il sciU



CHUTE q_ PROFILE
(IIOT TG ICIU)



CHUTE ANCHOR DETAIL
(ll<JT n, SCALE)



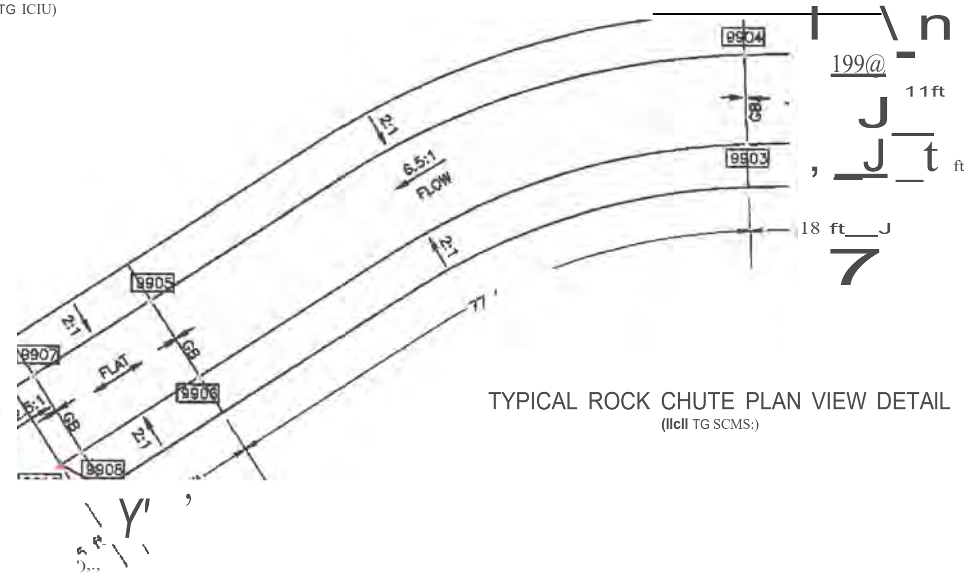
NOTE: Rock Chute ••eovotlon requires o_,,•ccrvotion Into \ha embankment to on1ur• 11roper inaett!ng ot the reek for Q 2.5 ft deep channel. Enaur. that side slopea ore pretected at leaat 2.5 ft Qbove be>ttom rlprcp fQee.

Il'PICAL SECTION @ ,@ &@
(MDT ,O Se.IU)

NOIES

SEE SHEETS 2 & J FOR GENERAL NOTES a; CONSTRIJCTION SPECIACATIONS.

1, Tha site sholl be excawted and bocldlled to the Qrcd"" shown on \ha drawing. Th« fill material 1h<JII be compacted lo th• den01ty of the ■u rr0'Jndlng undllIturbed aofla.
2. GeoterlUe eholl meet tha requirements of NRCS t.1S-AZ-592 Geoterlile material epeeificotlol'lll for Clan II non-wO\'en geotextilu. Geoteictile lohall be Joined by overlappin; o minimum of 1!l inchea and aeeured agalnllt the under1)1irMJ foundatlon material.
3, Rock sholl be den•• ond on;ular to sub-rounded In shape. The leoot dlmenolon of Dn indilrlduol rock lhal1 not be l- than one-third tt,e greomt dimenalon. Soun:e of the reek wlll be approved by the Engineer, prior to placement. Rock 11MIll be well ;roded as •hown in the table. Roe placement •hall begin al th. bottom of elope.
4. Reek shall not be dropped more than 3 ft onto geotextlle fabric.
S. A 911fficient omount of roclc at.all be hand placed to aecure contact between 11011•, minimize l/Glda and en■un o neat. uniform 1urfoc..
6. Rock Chute staking will be provided by the Engineer or their r■pre1entative In the fleld for thi■ project ond aa part of the NCO contract with th• ANRCD.



TYPICAL ROCK CHUTE PLAN VIEW DETAIL
(llcll TG SCMS:)

Coordinate Table				
Pt#	NorthinQ	Easting	Elev.	Descriptor
9901	1193856.8	949416.4	6119.0	Top of Rock
9902	1193845.8	949416.7	6119.0	Top of Rock
9903	1193856.3	949400.3	6 119.0	Top of Rock
9904	1193845. 3	949400.7	6119.0	Top of Rock
9905	1193825. 7	949328.1	6107.0	Top of Rock
9906	1193B16.4	949334.1	6107.0	Top of Rock
9907	1193816. 4	949313.8	6107.0	Top of Rock
9908	1193807. 2	949319.8	6107.0	Top of Rock
9909	1193B14.7	949311.3	6108.2	Top of Rock
9910	1193B05. 5	949317.3	6108.2	Top of Rock

Nelural
1'1Aaif'In
InC
2900 N. We:it Street #5
Flogstoff, Anzono 86004
(928) 774-2336

DRAWN BY: C.TRESSLER
OESIONED BY: .C TRESSLER
REVIEI\ED BY: t.1. Kear1

REV.	DA1E	BY	RE\IISION

ROCK CHUTE DETAILS

UPPERLCR
ADEQ Water Quattty Improvement Project
Johnlon Cattle Company

Registered Professional Engineer (Civil) — CERTIFICATE NO. 58521 — CHRISTOPHER TRESSLER — Date Signed — ARIZONA U.S.A.
EXPIRES: 09/30/2017

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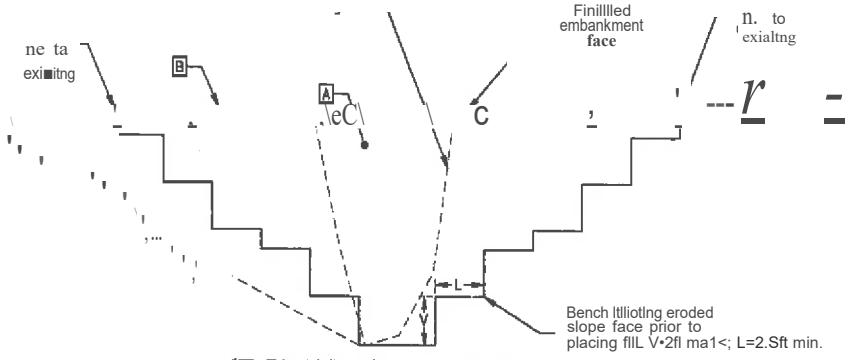
DATE: 04/07/2016
NCO PRCI.EC
115-240-AZ

DRA.NG NO:
SHEET NO: DTL01

5 OF 6

I!] Frll to be placed ond compacted per Earthfill opecifIcotrono, Sheet 2,

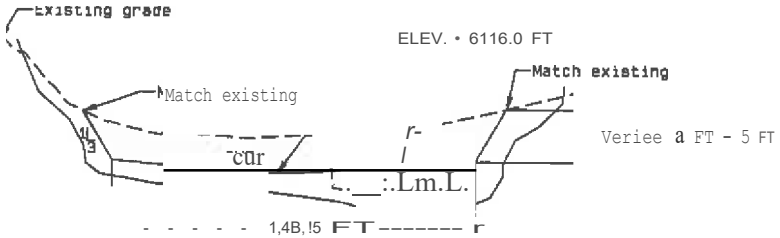
Ifil Seed finlahod ■urface per specifications, Sheet J.



NOTI::: Thia detail applies to any ,mbankrunt or e,cletlng lllope loco whare total height 11 more than g ft. Far thoee area, where alopo height la lese than 6 ft, atop.. may ·be laid bock al 2,5;1 or flott.r elope prior to piecing any fill In lieu of otepp,ng.

ffi EMBANKMENT REPAIR - BANK SLOPING DETAIL

(NOTIO



EB CROSS SECTION - BASIN EXCAVATION

VERT SCAU:: 1" = 10'
HORIZ sc.u.B1 1" = 150'

50 0 50

Natural Channel Dealgn, Inc

2900 N. West Street #5
Flagstaf!i Ari ona B60041
(92t:i) 774-2336

DRA'MII BY: C.TRQ'ISLER
DESIGNED BY; C. IRESSLER
REVIEWED BY: M d

REVI	DAIE	ev	REV1s10N

CRO$SECT10NS:
Basin and Embanlanent Rehablllatfon

UPPERLCR
ADEQ Water Quallty Improvement Project
Johnson cattle Company

Registered Professional Engineer (Civil)
CERTIFICATE NO.
56521
CHRISTOPHER TRESSLER
Date Signed 04/07/2016
ARIZONA U.S.A.
EXPIRES: 09/30/2017

UNAUTHORIZED CHANGES & USES: THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE FOR OR LIABLE FOR UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

DATE: 04/07/2016
NCD PROJECT NO: 15-240-AZ

DRAYING NO: CRSOi
SHEET NO: 6 OF 6

Moore Project

Lower basin berm looking down stream at incised channel. Note drain pipe failure in lower left corner.

Moore:

The purpose of this project was to construct stabilized spillways and remove soils accumulated in three sediment basins at the Moore Ranch. The work performed brought the three existing water and sediment control basins back into operation to allow for sediment retention. The three basins are located sequentially down the valley. The existing embankments were enhanced to restore the top elevation, repair erosion to downstream faces, and include rock lined auxiliary spillways to the basins. All disturbed areas seeded with native vegetation after project completion.

Middle basin looking up stream. Sediment basin overfull, berm eroded and over topped.

LCiwer basin looking upstream. Heavily eroded berm and drain pipe collapse.

Upper basin looking downstream from the berm at the construction of the rock chute spillway. Note the head-cut repair further down the drainage.

Head cut repair in channel just below upper basin with bank sloping.

Upper basin partially complete but under construction still. Recent storm brought some run-off, enough to flow through drainage pipe and Into splash basin on backside of berm. It did not fill enough to run over the rock chute spillway at top right of photo.

Finished rock chute and splash pool on upper basin. Note a culvert extension was added. This photo is prior to revegetation.

Final construction on middle sediment basin looking upstream toward upper basin. Before construction, this drain pipe was at just under ground level and the basin was overfull. This photo was taken standing on the berm looking upstream.

This is looking across and upstream from the bottom side of the middle basin. Pictured is the rock chute spillway and the backside of the basin berm.

Rock chute spillway over middle of berm on lower basin looking downstream Into splash pool. This required a major fill and compaction and bank sloping as well as spoils spreading over the uplands.

Placing the staff gauge on the drain pipe to measure sediment retention on the lower basin. Newly constructed benn and rock chute spillway going over lower basin.

The upper basin has been declared complete. The only additional task is to seed the basin and disturbed area. It is our understanding that this will be performed in July of 2017 when the monsoon season comes.

- Basin excavation totaled approximately 2,475 cy of sediment removed from the basin.
- 525 cy of sediment was excavated from the spillway and catch basin.
- Approximately 325 cy of rock and 400 sy of fabric were placed in the spillway and catch basin.
- 307 cy of sediment was excavated from the lower head-cut.
- Approximately 110 cy of rock and 150 sy of fabric were placed in the lower head-cut.

In total 3,307 *0/* of earth was excavated from the basin and spillway area. Additionally 43S *0/* of rock and S50 sy of geotextile fabric was placed. In total, 3 acres were disturbed.

The middle basin has been declared complete. The only additional task is to seed the basin and disturbed area. It is our understanding that this **will be** performed in July of 2017, to correspond with the start of the monsoon season.

- Basin excavation: totaled approximately 1,550 cy of sediment removed from the basin.
- Spillway excavation: 275 cy of sediment was excavated and 70 cy of fill was placed.
- Spillway rock: approximately 250 cy of rock and 390 sy of fabric was placed.
- Disturbance: 2.5 acres of land was disturbed in total.

In total 1,825 cy of earth was excavated from the basin and spillway area.

The lower basin has been declared complete. The final task is to seed the disturbed areas. This task will take place right before the monsoonal rains, likely at the end of July, 2017.

- Basin and spillway excavation totaled approximately 5,821 cy of cut.
  Spillway rock: approximately 409 cy of rock and 447 sy of fabric was placed.
  Disturbance/Spoil area: 2.3 acres

The as-built suivey was conducted May 2, 2017

UPPER LITTLE COLORADO RIVER HEADWATERS
AZDEQ Water Quality Improvement Project

PREPARED FOR: Freel Moore

LOCATION MAP

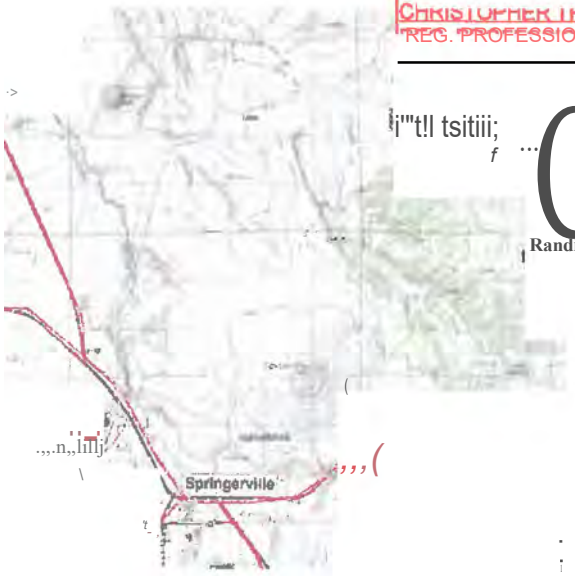
ARIZONA, GILA & SALT RIVER
APACHE COUNTY, ARIZO

RJNDEOBV:
Arll0na &Monrnental Quatty(ADEQ)
QuaDlyDMelon

AS-BUILT/RECORD DRAWING CERTIFICATION
I HEREBY STATE THAT THE AS-BUILT INFORMATION AS SHOWN WITHIN THIS PLANS IS CORRECT TO THE BEST OF MY KNOWLEDGE, THE AS-BUILT INFORMATION AS PRESENTED IS BASED UPON FIELD OBSERVATIONS AND INFORMATION PROVIDEDTO NATURAL CHANNEL DESIGN BY THE CONTRACTOR.

CHRISTOPHER TRESSLER — 18527 — 6/22/2017
REG. PROFESSIONAL ENGINEER — REG. # — DATE

LANDOWNER:
Fred Moore
(contact: Doric Knight)
Phone: (928) 521-9897



i'"t!l tsitiii;
f
CJ
Randi Boundary!

G

Channel Design, Inc

11,8

10 1NRCS

PROJECT MANAGER:
Apache County/Natural Resource Conservation District
Doric Kri_lg t
824 E. r..,r.,n St.
Springery1lle,.)A'Z. 85925
Phone: t92o 521-98 7

Hdural Lahll GP ¥f-:Wil es,gh, Joe.
2900 N. Wit St. Suite 86004
Flagstaff
Phone: (9 774-2336

PROJECT PARTNER:
Arizona Department of Environmental Quality
1110 W. Washington st.
Phoenix, AZ 85007
Phone: (602) 771-4635

PROJECT PARTNER:
Natural Resources Conservation Service
2 0 N. 1st Avenue, Suite 509
Phoenix, AZ 85003
Phone: (602) 280-8801

INDEX OF DRAWINGS

WORK -QUANTITIES

J e tlo S,775 a.y, Cut, 870 c.y. Flii, -4,805 c.y. Spoil
Roe Splllw'J: - 370 c.y.
Ft1tar Fabric Geotextlle - 400 1.y.
Seadlng - ac
Locate and Remov11 •xtstl!')g CMP - 10 If
Install RIHr - 8B If, 161n, CMP -4 If 1Bin. Ct.IP concrete ■and - 37 c.y,

a wo
1,190 c,y. Cut, 362 c.y. FIii, !105 c.y. Spoil
Rock SPIIIIIC - 250 c.y.
Filter Fabric Geote)Cfile - 390 ■.y.
Se■dlng - 11c
Locate and Ext■nd exl1tlng CMP - 10 If

awor'" -
3,445 c.y. Cut, 260 c.y. Flit, 3,185 c,y, Spoil
Rock Spillw - 320 c.y.
•fter Fabric G110textlle - 395 s,y,
eeding - ,2 ac
)Cfand axl ng Ct.IP - 10 If
eadcut Rock Chut, - 110 C,Y,
Recdcut Fnter Fabric/Geotextlle - 150 s.y.

Natural
n.. lnn
Ina

REV	DATE	BY	REVISION

DRAWN BY: M. Keorty
DESIGNED BY: M. Keart
REIIIEWED BY: M. Kearl C. Tre.e 'ller

2900 N. West Street 115
Flags!af!i Arizona 8600
1,920) 774-2336

COVERHET:
Locatton, Index & Quantities

UPPERLCR
ADEQ Water Qualtty Improvement Projeet
Moore Ranch

Registered Professional Engineer (Civil)
CERTIFICATE NO.
34587
MICHAEL D. KEARLY
Date Signed 1/8/2016
ARIZONA U.S.A.
Expires 03/31/2018

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DATE: 1/8/2016
NCD PROJECT NO: 15-240-AZ

DRAWING NO: CVR01
SHEET HO: 1 OF 15

PROJECT DESCRIPTION

The r,urpos■ of Ihla roAect Is to rehobllltate three existing sediment baslna within the Moore Ranch.

1i•s.7frr 1":-o f o u h bosln
2 Stabffi2affon ol head,:uta In exlalIng. aplllway• with 1111 material fram boa\n/1pllway excavat!on
3 R8j:)locem•nt of the CMP outlet af lh• lower ba1In
4 Rehoblllallon and extension of the axl1ttn.11 embankmenls
5 t111taltatlon of auxlllo,y 1ptllwoy1 and rocli" llned chutes
6 Spreading of excH■ aocumulated sediment on slopes adjacent lo th• boalns
7 Sited all disturbed areas .,,th native grasa seed.

GENERAL NOTES

1. Site loP.ographlc 1urvey data was collected by NCO on August 14, 2015.
2. All exl,ting condltions ore t b• verlfm d In the field prior to construct1on. If dlfflrences In the slle have occurred In the time elween e tntlal surv and conatruotron, the englnMr shall be consulted for any necessary modlncat ona to t • design and plans.
3. No representation ts made as to the •x11tenc§ or nonexistence of anr, utlltles, public or r>rivate. Ab■l!lnce of uttntlH or these drawrna,• § MOT aseuronce l ol no ut are resent, The • lstencel r ! , re g f l y "a,m,:'b - er lar 11 • conlrac or prior o any mavo on. Ca
4. No construcllon shall In untll 811 .,..,■,qory permits, eaeement■, and funding authorl20tlon1 are obtoln■d.
5. Conatructlon activities wllt be cr.>nducted In a manner con1lstenl with all safely regulations. ;ncl other permitting rsqulr.d by Arl2ona Stat■ Land Department, Arizona Department of tnvlronmenlol Quallty and others.
6. Installolion sholl be con1.lructed to th■J nea and grades a• sho'l'n on the drawing■ or Qs stoked In th■ field by the ENGINEER or author12 reP-reunfatlve nlzlng there ls vorlollon ln nature.
7. TM total draturbed area Is ap oxlmalely 7.2 acnos. As th tot acea exceeds 1.0 ocrH, the n(s) erfo W1P the we will be ulred ta file a Notice Intent NOIJ far 1!0rmwaler dlscha e■ form lth prlor 19riinmotlni co stru.ctlon. The peraonf's) perfor lng the work ahall ensure 1l;a1 construction cttvltles ore erl orm■cl l accordance wr-th In■ proc lc■a de crlbed ln the ADE CQ!!•lructlQn Cal Perm No. AZG2g113-D01 and o manner thal mlnlmfzee 1011, waler an air pollution utmzlng atandard Bes1 Management Practices.

CONSTRUCTION SPECIFICATIONS

Th■ peclflcotlon• Included herein ore provided as a partlal 11st of con■l f'lJcflon atandard1 and requirements for tnls proJeat. As a cpl'(lpanton to this plan set q full com.pllotton of appltcqble techn10(11 -lflcatlons ts P.rt,vlded. The peraon\•J. performing the work shall famlllorfu th■m■■vl.s wllh lhosa specifications and contact the engineer j)lior to starting construction wltt, any quH tlon■ or for clarlflca ll on.

EARTHWORK

The earthworl(acllYIIIH ahall con1tst of sediment removal from th■ • ming basins, embenkmer.t hfiib l't:: g/s.,iplllwciy bCN construction ond spreading of removed H ment on the slopH adJoc■nl

Excavation

Excovatlon 1hall be llmlled to sediment baatn and eplllway conolructlon, and layback of vertlcol banks In channels leodlng Into the baaln1 aa ahown on th■ drawing■ and aa wlU be stoked In the field. Some excavation will al,o b r utrsd to prepar• overlv •••P ■xlstlng slol)<l■ or to placing new fUl and prior to ernbankrn,nt rshablltlotton. D1111.iri>anoe of exlstlng native vegeta,ton •hall be minimized lo the greateat extent possl■ during excovatlon ,

Excavated material shall be plQc■d In the specified embankment and headcut location■ 01 shown an the drawing• or as staked in the flelcl. All llnlshed surfacH shall be generally 1mooth and pleasing In appearance and blend Into surrounding terrain.

Earthfrtl

Matenals: All 1111 mat ■rlal s shall be obtained from the required excavotlana and OPP.roved borrow sources. T moterlals shall not contain ■ad, bru■h, roots, pt1rl1h abl■ or frozen mat... 1011.

Placement: The Placement of fill molerlol• shall follow these guldetln, a:

- Any vertical bank shall be • oped or 1tepi:ied b•fore plac,ment of fill material.
- The downslream eroded face of the •xt,tlng ,mbonkments shall be stepped prior ta placement of n■w materla1 per the tnoluded pion■ ancl clela ll■•
- Tn■ placlng and si:,r:■adlng of fl\l materlol shalt b■ started at th■ lowest point and the flll brougnl up and llompocted to obtain a den1ttv slmllar to th■ aurroundlng bank material.
- Moferlol, when placed, •hall contain auff\c\enl moialure ao that o sample taken In the hand and squeezed aha remain Intact when rel■aaed.

(contlnuad)

for general fill placement th• placing and •praadlng qf fill material /:halt b• atart■d at the lowest poinl and the fill broiwb/ up In horitontal lay•r ■ not to exceed: six 6) /nchea of loose flll for whHI l:oml'(lction and fqur l4J Inches of loose fill for dozer ccmpocllon. na.ruction equ!pment 1holt be operated D'fllr the anoos of each toyer of flll la lnsur■ that ln• required com on i1 obtained.

For trench baclcf\11 or fill placement where lo equipment does not hove access placement ahall be In hort2ontol IIfl• not exceeding six 6) Inches of looae flN and compacted wltti appropriately slnd equlpment, such as a shee psfoot roller o!tachment on an excavator, Jumping Jock compactor or 1)ther 111 DP.prc,ved by the Engineer.

rlll shall not be placed on fr6zen •ofl, sr,ow or tee.

MRCS Spec;,lflcatlon CS-AZ-23 cddrsnu large aoale flit placemen! and compaction • qulPf!'l■nt. Smaller equipment and P!ladllled methods, 01 appllcable le the ■auipment usad, may be 1ub1tltuted with 11,e !lpprov l 2f the ENGINEER or his representative.

Tll• EN !NEER or his rsprr,sentollve shall be pre •nt during all embankment related ftll placement. Notify he ENGINEER a m nlmum of 3 worklrig days P.rior to 1u0h actMtlea.

All flnlsMd aurfaces shall b■ generally amoctli and pler»lng In appearance end blend Into surrounalng terrain.

NRCS Specification CS-AZ-23 references testing requirements. The ENGINEER or his representative Wlll be present during_embankment related f ll lacem■nt to ensure J>roper compc,cllon procedures are followed and may coll for campocllon !Hltng I deem•d neceaaary.

RANGELAND SEEDING

Dlelurbe<:l areas w\11 be seeded with native gra■ es and shrub• Seeding actlvltre1 Include the following.

- > Prepare Jrtubed where needed. Thi■ moy include scarifying the upper 2 inch•• of Tqil where He<r topP.llcatlon w\11 oacur. Ov■rl compacted equipment accee• routes may require scarification to 6 inches.
- > ■el can be drilled or brl)Q.d alt by hand. ■d shall be Incorqroted fn / the soil, but not more tnon 0.5 to 1.0-inclt deep.
- ed ■hall be oppll uniformly.
- > edtng shall occur afore Installatton of M'oslon control blanket.

The oa■dlna. role• below are for Il!anllD.!l by hand broadcasting. Seed shell b• weed Ire, 11nd ■hall be purchased lrom a reputable supplier. Tlie grou and shrub aeid mix will conal1t of the foltowlng specle•■

dMb1

gSalfbu■h (A) rlbl■x conescens)	0.z!S 16/ac PLS
iross Seed Mix	
Blue Grama (Bouteloua gracilis)	2.5 lb/ac PLS
Western Wheatgrass (Pascopyrum smith)	7.0 lb/ac PLS
..0al	1.5 lb/ac PLS
lon lc :ra:. rfc rtlrr aH)	2.0 lb/ac PLS
	2.0 lb/ac PLS

ROCK LINED CHUTES

The headcut slablllzotton work ahJ1ll consist of heodcul excavQtron and bank aloRlng; furntahln.Q qnd tnotollIng loose rock including placement cf flller fabric, Se■ the Included plan •h■els anll oascclol■d dilalla.

- > Th■ site shall be ■xc,;ivated and backfllled to lh• grades ehown on drawlnga, Excavat!on shall bt llmlled lo the headcut remediation area os 1ho-irn an the drawing• ar a, slaked fn the fleld by lhe ENGINEER. All fill mat•rl, shall be compacted ti tn; OJ>P.roxtmate d•n•lly of surrounding undisturbed areas.
- > d:! n !ct '!. •elh, Wut spread outs de he channel and sloped In euch a woy aa to direct flows Olaturbonce a existing native ve.;etatton shall be minimized.
- > Non-woven cieotext\la. ahall be praclld behind the TQck. fabric shall ba meet the requirements qf NRCS MS-AZ-592 ll eotexttl■ mafertol apeclflc;tf1,ns for Class Ill nonwoven geotextlles, The geot ■xttle 111011 be Joined by overtapplng o minimum of 18 Inches and secured agol"at the underly1ng foundation moterlal. 'Securing plnt {r,liJ:111be Install 01n,ceaeary lo pr1v■nt undue sltp_page or movement of the g■olextlle. Recomm d 3 18-Inch nch diameter). ne Pins shall be pointed on one end and fabricated with a head to retain a steel ■ captable.
- > ag b:e , iW ': sr.a:rucllm.C:,':.ToJ , C:- 1n3 t ..:rl r e .c1r: : ;' \, n . T.01f the greolHI dimens on. /Pook 1oun.1 shall be DP.praved by th■ ENGiNEER or aulhortzed representative and ave a bulk ■peclflc gravity of no! leu that 2.5 per ASTM C127. Rock aha\\ be well graded oa follows:
- > Rock plocem•nt shall begin at Ill• bottom of elope. Rock shall not be dropr>ed more tt,on 3 feet onto geolextlle.
- > Sloped banks tholl be ■eeded wllh native graos, He the apeciflcatlons, thl1 Sheet for GroH SNd Mix

Natural nel Inc

DRAVIN BY: M. Kearty
DESIGNED BY: M. Kear1y
RE'JIEVED BY: M. Kear1" C. Treni ■r

REV!	DATE	eY	REviSION

2900 N. West Street 115
Flagelaffj, Arizona 860'04
(928) 774-2336

GENERAL NOJe &.
CONSTRUCTION SPECIFICATION$

UPP LCR
ADEQ Water Quality Improvement Project
Moore Ranch

Registered Professional Engineer (Civil) — Certificate No. 34587 — MICHAEL D. KEARLY — Date Signed 1/8/2016 — ARIZONA U.S.A. — Expires 03/31/2018

UNAUTHORIZED CHANGES & USES

DATE: 1/8/2016
NCD PROJECT NO: 15-240-AZ
DRAWING NO: GEN01
SHEET NO: 2 OF 15

PROJECT SURVEY INFORMATION

HORIZONTAL DATUM:	NORTH AMERICAN DATUM 1983 (NAD83)
COORDINATE PROJECTION:	ARIZONA STATE PLANE, ARIZONA EAST, SI
VERTICAL DATUM:	NORTH AMERICAN VERTICAL DATUM 1988
GEOID MODEL:	GEOID03 (CONUS)

NCO LOCAL CONTROL

NAME	NORTHING	fASTING	ELE\IAllot,t	DESCRIPTION
CP#1	11_297.5	1017793.7	728T.57	3/B"R W/ YELLOW PLASTIC CAP MARKED "NATURAL CHANNEL"

2Rm ff 1r1 co OL1E81f;.iL ,,f Wsf" f NOT BE f'i'i/ IN TH t,PXM L 0, JNP 4 oFYstc.P,% f rfN,, P ,mcE IAE PR ,bv!VRVI t.IAP "T'o IHE RIGHT.

THE ENGINEER WILL PROI/IDE LOCAL CON'mOL AT EACH OF THE iHREE SEDIMENT N G CONSTRUCTION STAKING ANO FOO F\JTURE REFER£NCE ANO BASIN

SEE SHEETS SPECIFIC TO EACH SEDIMENT BASIN f'OR DESIGN CONTROL COORDINATES.

PROJECT OVERVIEW

W+E

BORIZ SCALE: 1· = 5-00'

500 a 500

PROJECT IEGEND:

C=:J CUT

C==:J C\JT ANO FILL

Riprap / Rock Lined Chule

· · EXISTING FLOW LINE

· · ·– DESIGN FLOW LINE

MAJOR CONTOUR - DESIGN

MIHOR CONTOUR - 0£SIGN

WJOR CONTOUR - EXISTING

MINOR CONTOUR - EXISTING

LIMITS OF' DISTURBANCE (CUT)

LIMITS OF DISTURBANCE (FILL)

DETAIL LOCATOR

DETAIL IDENTIFIER

SHEET REFERENCE

Natural Channel Design, Inc

2900 N. West Street 115
Flogstoft) Arizona 860041
(92o 774-2336

ORA'hN BY: M. Kearly
DESI BY: M. Keor1
REVIEWED BY: MJeorly C. Trenle[

REV	DATE	BY	REVISION

SURVEY CONTROL, PROJECT LEGEND & PROJECT OVERVIEW

UPPERLCR
ADEQ Water Qualtty Improvement Project
Moore Ranch

Registered Professional Engineer
CERTIFICATE NO. 34587
MICHAEL D. KEARLY
Date Signed 1/8/2016
ARIZONA U.S.A.
Expires 03/31/2018

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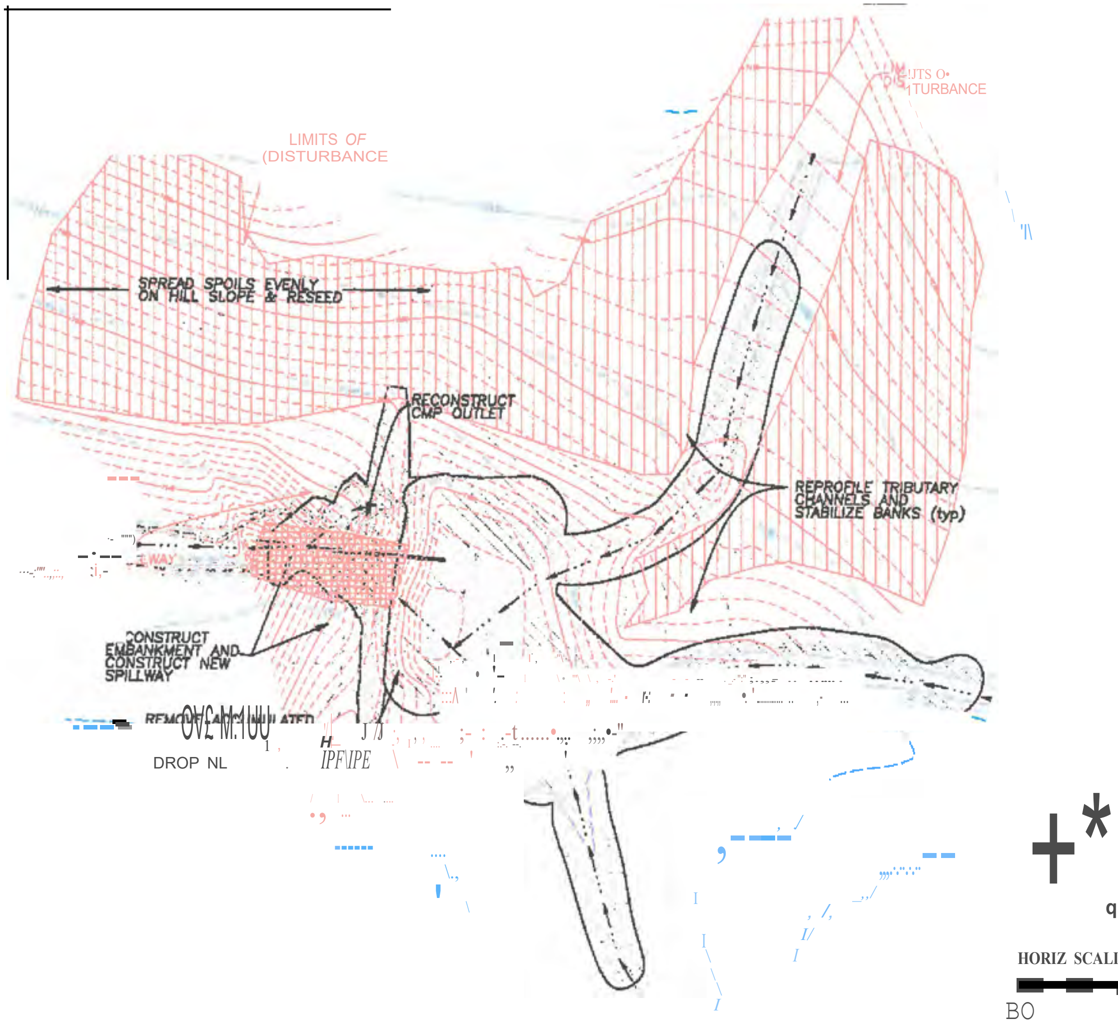
ARIZONA811

DATE: 1/8/2016

NNCO PROJECT NO: 115-240-AZ

DRAWING NO: GEN02

SHEET NO: 3 OF' 15



HYDROLOGY SUMMARY

WATERSHED AREA: 1710 AC (2.67 SQ MI)

PEAK FLOWS*

Method	QHI (Eli)	Q (CElil	Q1QQ (CElil
TR-55	188	346	497
NSS (High Elev)	120	186	312
LCR Regional Curve	93	133	
t,y<i ,of deagn fod*	134	222	405

ESTIMATED WATERSHED SEDIMENT YEILD

EFFECTIVE WATERSHED AREA: 834 (1.30 SQ MI)

ESTIMATED ANNUAL VOLUME: 0.22 AC-FT (358 r:(J"

ESTIMATED 10 YEAR VOLUME: 2.2 AC-FT (3580 t::1')

ESTIMATED EARTHWORK & SEDIMENT STORAGE CAPACITY:

	CUT	FILL	SPREADING
EARTHWORK (r:(J:	5,775	870	+,905

NET SEDIMENT STORAGE (r:(J: 2,688 (7.5 YRS)

MAXIMUM EMBANKMENT HEIGHT (FT): 21.5 (top of embankment to bottom of chute thalweg)
17.0 (spillway to downstream channel

GOVERNING DESIGN STORM FOR SPILLWAY*: 100 YR
* (Based upon NRCS Standard 350)

HORIZ SCALE: 1" = 80'

80 0 80

Natural Channel Design, Inc

2900 N. West Street
Flagstaff, Arizona
(928) 774-2336

DRAWN BY: M. Kearly
DESIGNED BY: M. Kearl
REVIEWED BY: M. Kearl C. Tr-lw

REV	DATE	BY	REVISION

PLAN VIEW:
Lower Basin Overview
ASBUILT

UPPER LCR
ADEQ Water Quality Improvement Project
Moore Ranch

Registered Professional Engineer
CERTIFICATE NO. 34587
MICHAEL D. KEARLY
Date Signed 1/8/2016
ARIZONA U.S.A.
Expires 03/31/2018

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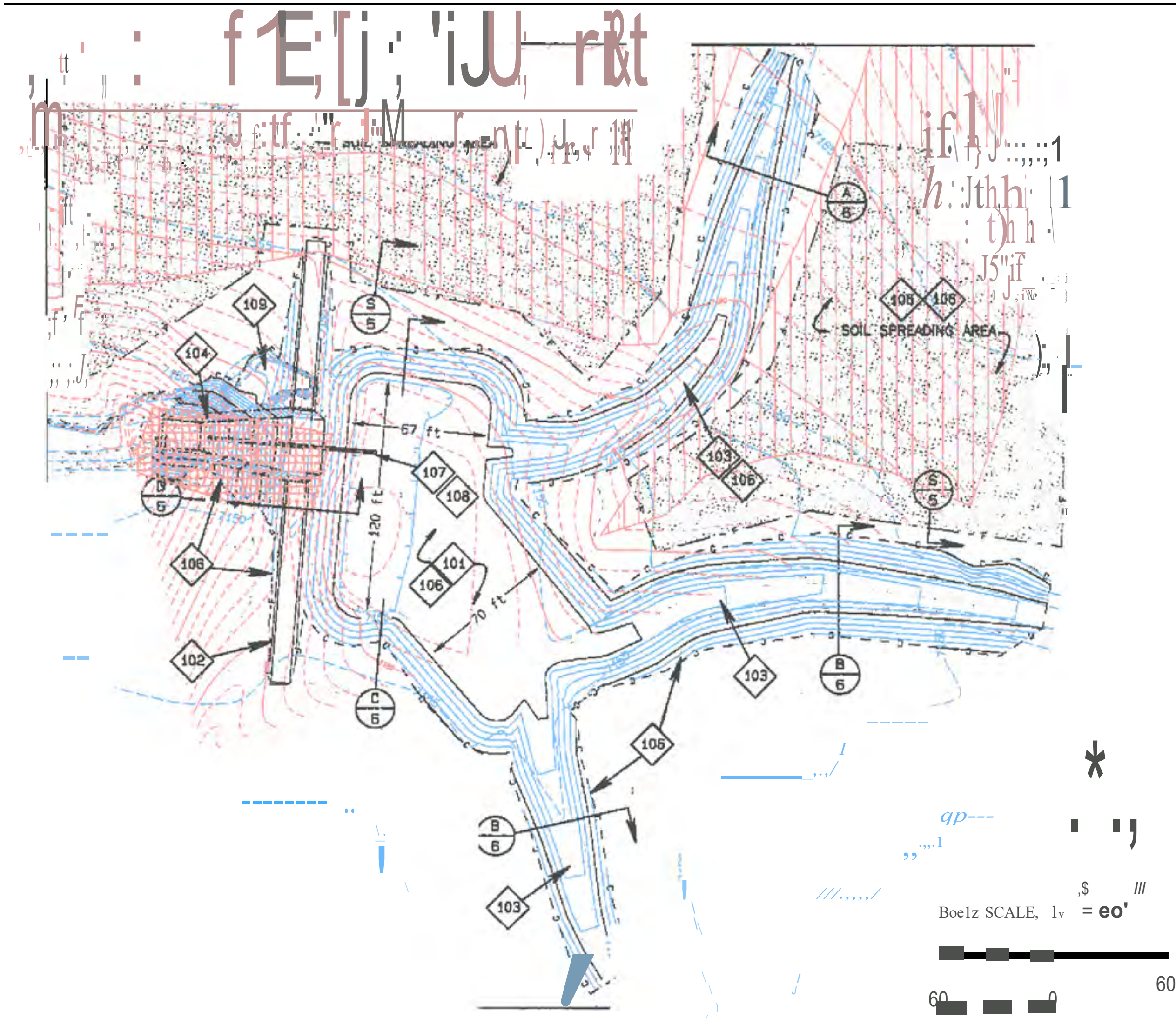
DATE: 1/8/2016

NCD PROJECT NO: 15-240-AZ

DRAWING NO: PLN03

SHEET NO: 4 OF 15



Excawte accuRulated eed'iment from oedlment basin per th• Unu and control d• Ertlmated total ear1hWOI" \'Olumes provided in the table, Sheet 4. See oyout c0TTiral, Sheet 7.

Rehablltoto exlstlnB emba km•n per 11! referenced details and earthfill f ?;en;-: til• g[5. 0rn"•1h:"f bleo p vld:1-rlcs m.r. required I.a acDDmpll"'1

Excavate aix:11.m11lated sediment from channal/tributary b•1ro and lay bock/atabllln: 111da elopea per tho orcas •actlons. Sh• !Olar eaMwork volUmH p(OYided ', th• table, Sheet............• 1ayout Estlmote cantral, Sheet 7,

(370 cy) Can■truet rock llned chute/spillway por detail and aantrol coordJnalH i.rovidtd on Sheiil. 7; locfud, '100 a.y. of filter fabric underlayment.

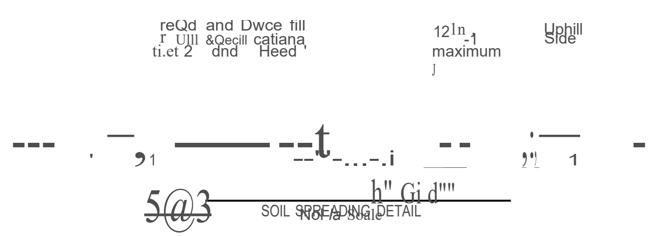
S=od exceee oacumulated sediment from excavated boeln on the generally •I>allow llopes adj to th& ch am el. Plac nt procedurH st,all 7>e per those outlined on ■et 2 41!'1d spread I.a l1h.eve an rox lm<rtaly ..lfbrm depth of 12 In. to S in. Tot.al cre<:1 req d to apr. sediment ea!iri,c,ted to be opproxlmately 2.!I acn,s. Aloo no •I.all S, thio oct.

(4 ac) iwPIY, Blld to all di turbsd areas per the •••ding • ilicationa, Sheet 2 to Include ell cut banks, fill placement and accno routes.

J_ la) Field locote 011d r:amov., ex1•t1CMP outlet P.iP• and rfoer. If eiirtltlg fl:e alignment ill coln.cldent Wilt! tt,enc:h• PIP!'!, -th& trench may b• reused for ,7:,i:.,, I ':,':i, S '.'9• backl,11 lren r the earthwork placement

(88lf 16 in, CMF, i 4 If 1B in. CMP; J7 c.y. concrete oand} Inol,all new 18 ,n. CMP Qut:"', pen the details, Sheet 8, • Include ex Vition, backfill compacti n, a'd filter diaphram' £1r t • Included d.ita • for a oomP,loto P t !l:,1°; coJ]fn' J:ai&t. icou ki pe joints ehal • watertight b)'

Hoadcut Repair Steo elOJ)e in headcut and b<lckfill par tho earthwork cificati0110, Sheet ,'2 Steps In,·• eric filr area may be gt Hori• to I Vert rotlo -r ta cln • on comp actil'.IQ, Sea Sheet 8 at i!)ll Detail COITI.P(lction e ipm IIIIS shal-Γ].9 thl •am• OB spec-lll ror t Dh backfill a• la r equipment will not be able to readily acc11911 he confined apace.



SOIL SPREADING DETAIL
Not to Scale

NIII.ral Inc	DRAY,N BY: M. Kearty	PLAN VIEW: Lower Basin Detall AS BUILT
2900 N. West Street	DESIGNED BY: M. Kearl	UPPERLCR ADEQ Water Qualty io,provement Project Moore Ranch
Flags(8ik) Af i!!.h3i	REVIEWED BY: M. Kearl C, Tre1_1ler	

REV	DATE	BY	REVISION

Registered Professional Engineer (Civil) — CERTIFICATE NO. 34587 — MICHAEL D. KEARLY — Date Signed 1/8/2016 — ARIZONA U.S.A. — Expires 03/31/2018

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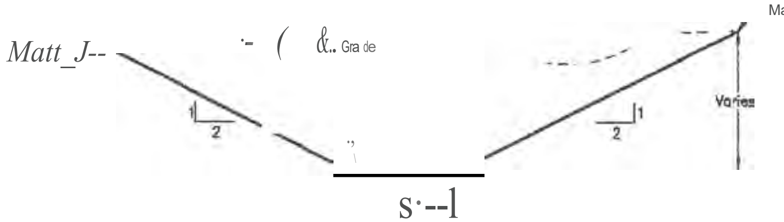
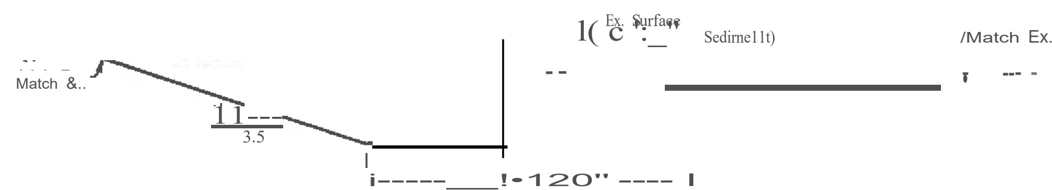
DATE: 1/8/2016
NCD PROJECT NO: 15-240-AZ

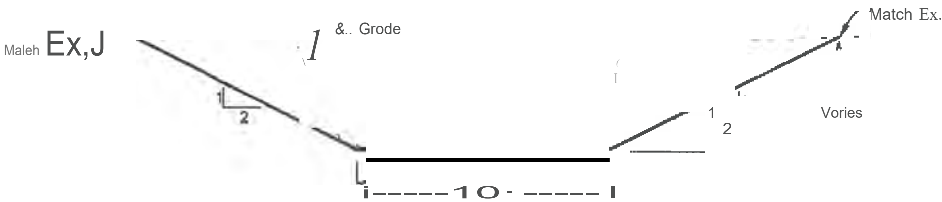
DRAWING NO: PLN04
SHEET NO: 5 OF 15



E TRIBUTARY CHANNEL STABILIZATION
Not To Scale

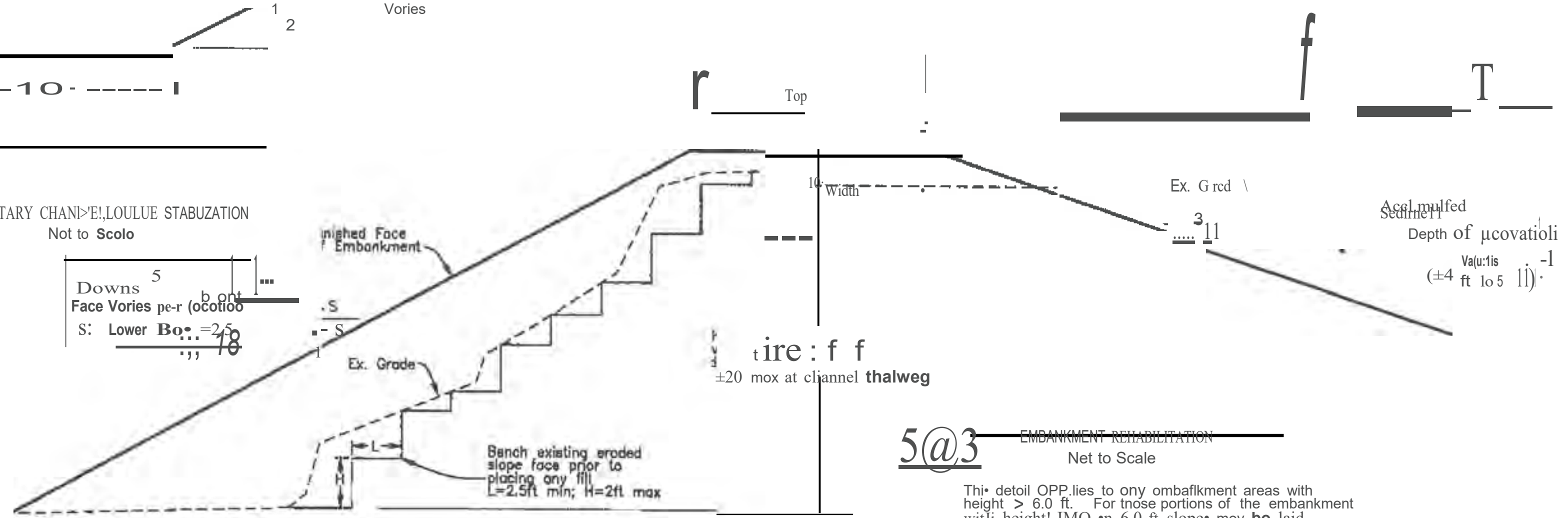


E SEDIMENT REMOVAL FROM BASIN
NOT TO SCALE
'NOTE: 67' width in croo• direction



E

TRIBUTARY CHANNEL STABILIZATION
Not to Scolo



5@3 EMBANKMENT REHABILITATION
Net to Scale

Thi• detoil OPP.lies to ony ombaflkment areas with height > 6.0 ft. For tnose portions of the embankment witJi height! IMO •n 6,0 ft, slope• moy bo laid

DRAWN BY: M. Kearly
DESIGNED BY: M. Kean
REVIEWED BY: M. Keo.-t C. Tres9'.-

REV	DATE	BY	REVISION

Natural Channel Design Inc
2900 N. West Street 115
Flagstaff Arizona 86001
(928) 774-2336

CROSS SECTIONS:
Lower Basin Details

UPPER LCR
ADEQ Water Quality Improvement Project
Moore Ranch

Registered Professional Engineer (Civil)
CERTIFICATE NO. 34587
MICHAEL D. KEARLY
Date Signed 1/8/2016
ARIZONA U.S.A.
Expires 03/31/2018

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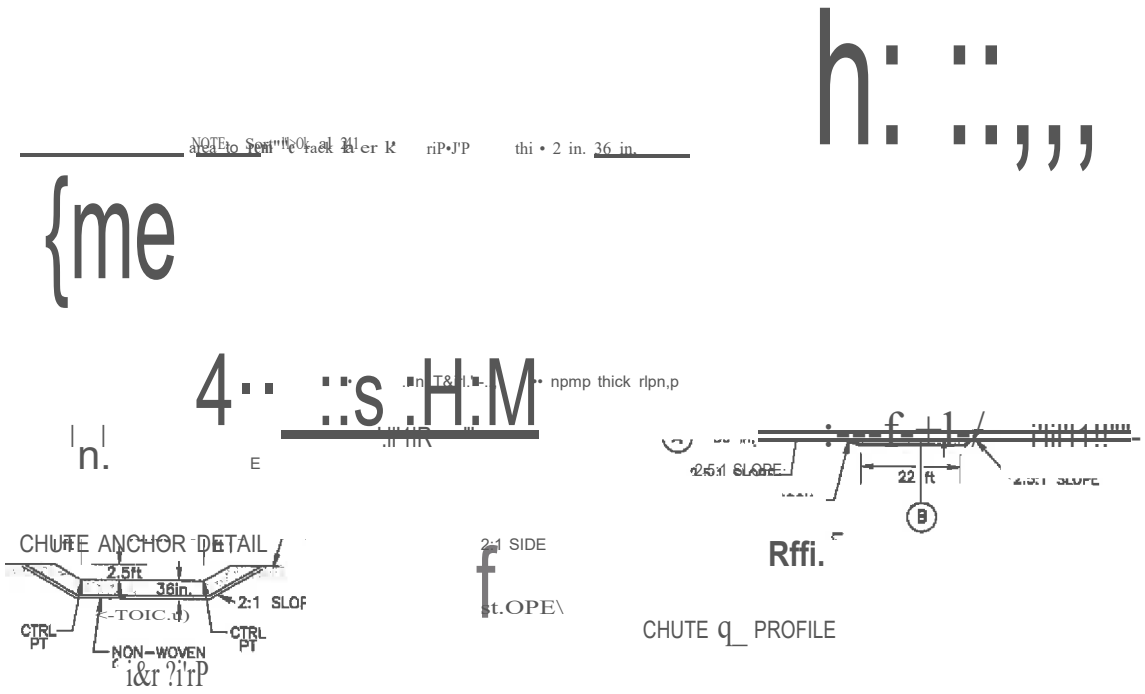
DATE: 1/8/2016
NCD PROJECT NO: 15-240-AZ

DRAWING NO: CRS01
SHEET NO: 6 OF 15



Rock SpecHloal1ons

DIAMETER, IN.	" PASSING
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23 - 32	**D86**
18 - 27	D!50
14 - 23	010

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stn,'

Material QucnttHel

QUANTIlY	UNIT	ITEM
	SQ YD	GEOTEXTILE
370	CU YO	ROCK RIPRAP

A?1f2h3 600

NOTE· Rock Chute e•ecivatlon **requiree** averexoavatlan intQ emDIIOnkment to **er19yn,** proper inaettlr,g o f th•

TYPICAL SECTION @ & (ID

reek at a Z.5 ft deep channel.


LAYOUT SCHEMATIC
N
OSCN.E

Pt #	Northin Eastin Elev Descriptor

ROCK-LINED CHUTE

P L

R C

PROFILE VIEW

O K

O'IES:

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1015630.

1015345. 9

1015 385. 0

10154"2. 1

7149. 5

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7152.9

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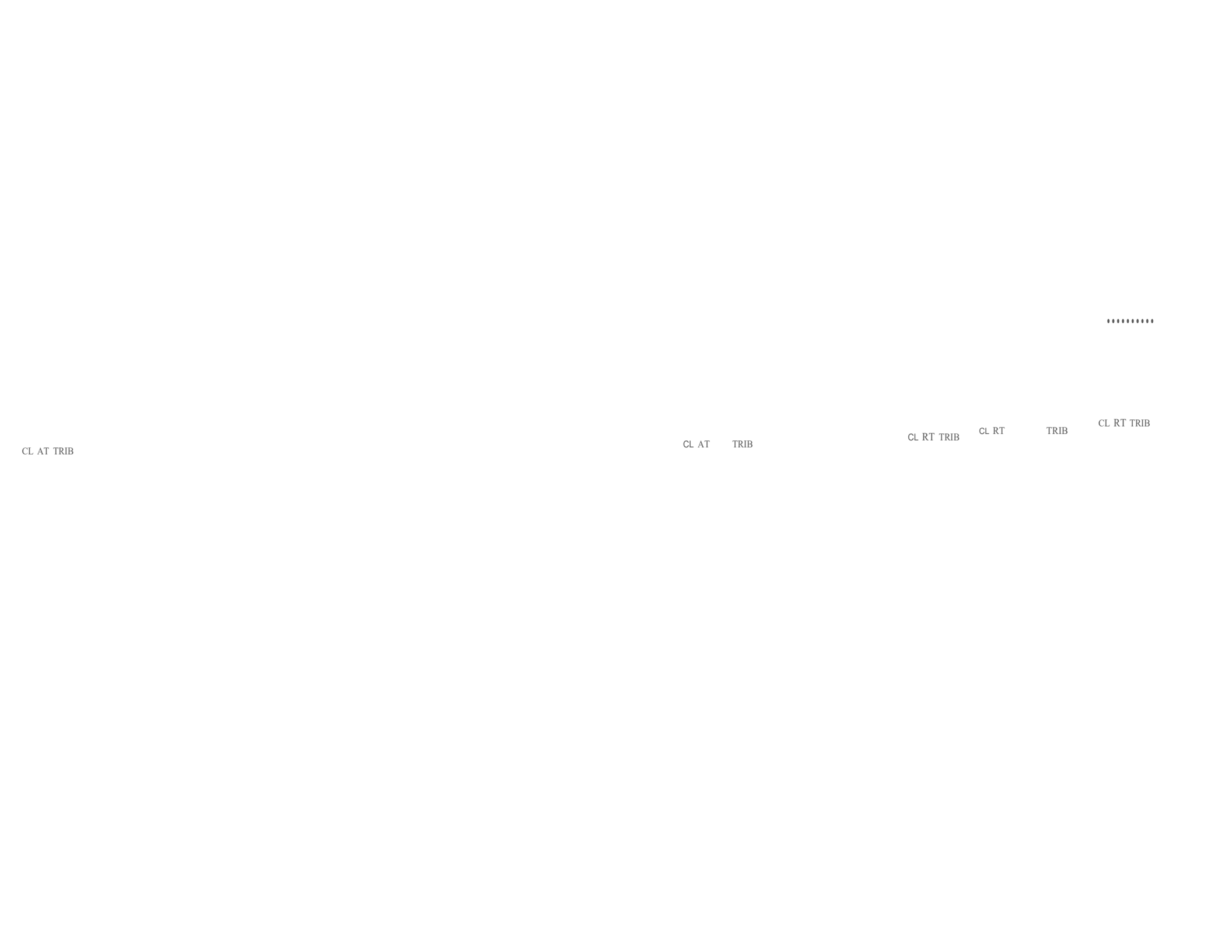
71!52 . 0

CL CHAN/JOE SUJ!'E

7!!53. 7


CL AT TRIB
CL AT TRIB
CL RT TRIB
CL RT
TRIB
CL RT TRIB

CL **MAIN** CHANNEL

CL MAIN CHANNEL

CL **MAIN** CL **MAIN**

CHANNEL

CHANNEL

See Sheet 2 for General Note• & Specifl cationa. See this sheet for coordinate table.

212

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21

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1. The lllte shall exC0110U1d and backfilled to the groda shown on the dr<Jw:fil, The fill

213

a

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1015518,0		7154.4	CL	OE SLOPE
	1015274. 2	7160. 7		
1015296. 0		7149.5	CHAN/T	CL CHAN. /TOE SLOPE

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2. moterlol shal • compactad to the d of e aurroundir,g ndlat *d* s s.

g,.ater than elongation at faliuni, a minimum of 40 lb punctun, litrenath, and a UV

3. o

resliilonoe of 70" stninath retained. Geotextile aholl be Joinsd by. o""rtoppliig o minimum

c

of 18 lnctwJ■ qnd aecurild a,,ialnat the underly, foundation latel1<11.

k

lel'IINI angular ta aub-round	in ahop.a.	e leost dim1nlllon of on	217	222	1174950.	936.3 1175077,2
			218		8	11750
			219		117	83.3

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TOE OF

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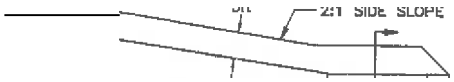
SLOPE



2900 N. West Street M5

InC REV DATE BY RE\IISION

I'\Aalt1'' R£VIEWED BY: M. Keo<l C. Tr-

Registered Professional Engineer (Civil)
CERTIFICATE NO.
34587
MICHAEL D.
KEARLY
Date Signed 1/8/2016
ARIZONA U.S.A.
Expires 03/31/2018

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DATE:
1/8/2016

N
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t----+----+--+ ---------- 1
UPPERLCR
ADEQ Water
Lower Basin Rock Chute and Layout Control

Improyement Project

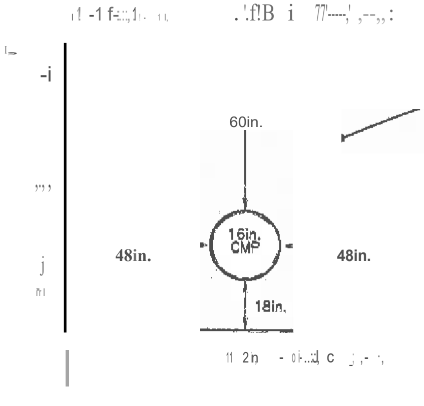
Moore Ranch

NCO PRO.ECT NO: 15-240-AZ

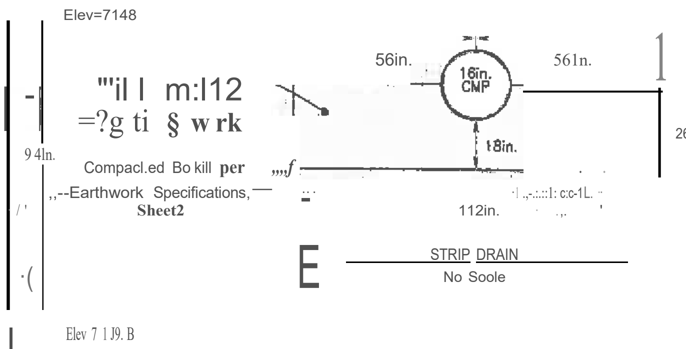
SHEET HO:

DTLOt

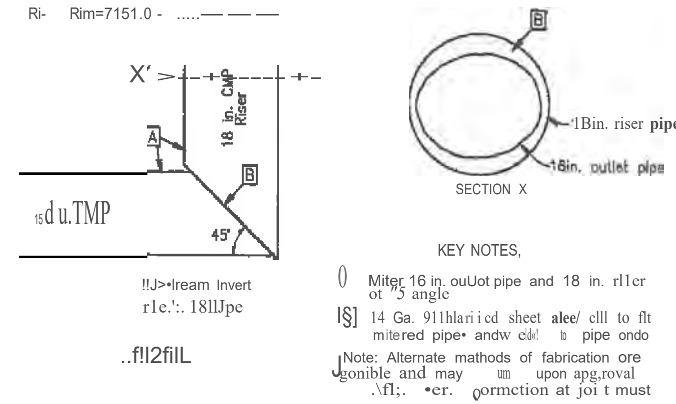
DRAWING NO:



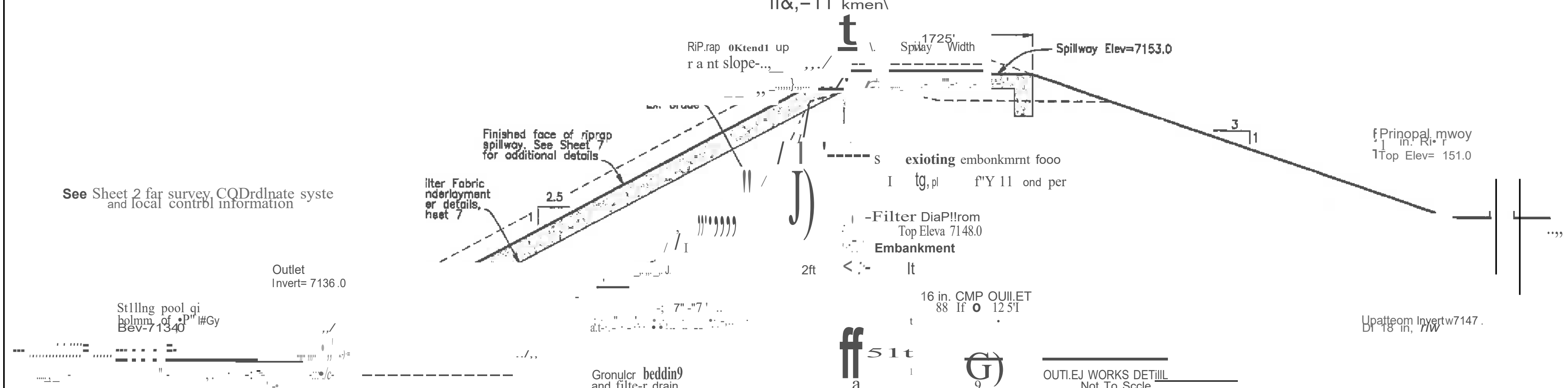
FILTER DIAPHRAM
No Scale



STRIP DRAIN
No Soole



OUTLET PIPE/ RISER CONNECTION FABRICATION
No Scale



See Sheet 2 for survey Coordinate system and local control information

OUTLET WORKS DETAIL
Not To Scale

DRAWN BY:	M. K.arly	
DESIGNED BY:	M. Kearl	
REVIEWED BY:	M. Kearly, C. Tresoler	
Rev	Date	By / Revision
1		

2900 N. West Street
Flagstaff, Arizona 8600'
(.920 774-2336

DETAILS:
Lower Basin - Filter Diaphram & Outlet Pipe

UPPER LCR
ADEQ Water Quality Improvement Project
Moore Ranch

Registered Professional Engineer (Civil) — Certificate No. 34587 — MICHAEL D. KEARLY — Date Signed 1/8/2016 — ARIZONA U.S.A. — Expires 03/31/2018

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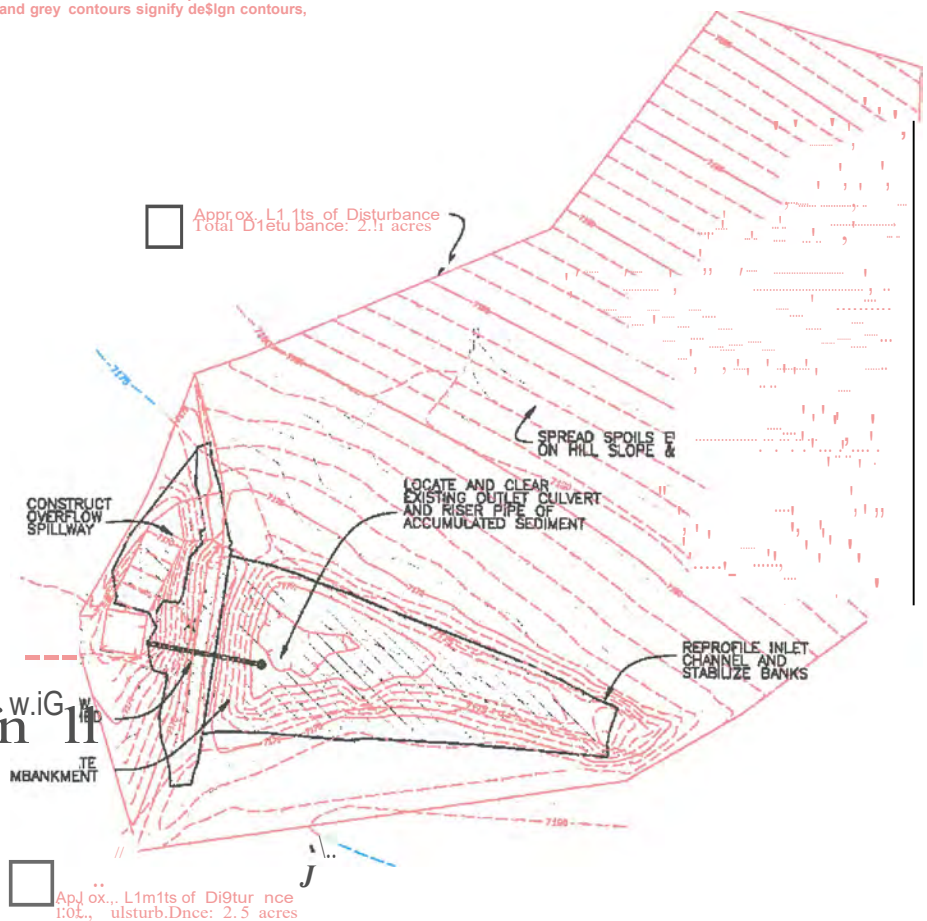
DATE: 1/8/2016

NNCO PROJECT: 115-240-AZ

DRAWING NO: DTL02

SHEET NO: 8 OF 15

L1.1 }la Built item-a shown fn red on planset.
Slue and grey contours signify de$lgn contours,



HYDROLOGY SUNMARY

WATERSHED AREA: an AC (1.37 SQ MI)•

.MfJI::IOII:..	OJO {CFS}	02 (QESI	QI!J!J	"-Elil
IR-55	98	180		2511
NSS (High Elev)	79	125		209
LCR Regional Curve	58	BO		
t""roga of 3 d•	78	128		234

used for deaign

• It la aaeumed that no significant atte tive effect in flow rama b : .!'oo u tf etro md<l fg mP M' :! •- Thia

ESTIMATED WATERSHED SEDIMENT YEILQ

EFFECTIVE WAIERSHEO AREA: B78 AC (1.37 SQ MI)"

ESTIMATED ANNUAL VOLUME: 0. 16 AC-FT (253 CY) PER YEAR

ESIUMTED 10 YEAR VOLUME: 1.60 AC-FT (2630 CY)

· aiTn •ttr: a °l„in:Jl::: uW."v ·, atti"f p: : : nt

ESTJMAJJP EAATHW!JBK ANO SEDIMENT STORAGE CAPACITY

	CIJT	FIJL	SPREADING
EARTHWORK (CY):	Bf)-		-84I&---

EARTHWORK BALANCED (Cv): 1,550

NET SEDIMENT STORAGE (CY): 1,182 **0** SPILLWAY ELEV•7175.0

MAXIMUM ElolBAIIIIKt.4ENT HEIGHT {m: 11.g (IQP of embankment to bottom of chute)
8. (aplllwoy to **down1treom** channel thalweg)

GOVERNING DESIGN STORM FOR SPILLWAY CAPACITYb : 100 YR

°(Baeed upon NRCS Standard 350)

°In eonce.rt with tho I.lllper sediment basin, thQ middle *o.nd* upper ba■in■ will prcVlde enough oforage volume for an eatlmafed 1o.J yean,

BORIZ SCALI: 1" = eo·

60 0 60

Natural Channel Design, Inc

2900 N. West Street 115
Flags.taf)Ari:zong 8600
t92c 774-2336

ORA BY: M. Keorly
!DESIGNED BY: M. Kaarfy
IRE\11EWE0 BY: M. Kearly, C. Tre••lor
IREY I DATE I BY I REV1slON
MK BuM

Field o• built ourvey pe,foJ:lllAd
by NCO staff on 2/20/17

PLAN VIEW:
Mlddle Basin Overview
AS BUILTS

UPPERLCR
ADEQ Water Qualtty Improyement Project
Moore Ranch

Registered Professional Engineer (Civil) CERTIFICATE NO 34587 MICHAEL D. KEARLY Date Signed 1/8/2016 ARIZONA U.S.A. Expires 03/31/2018

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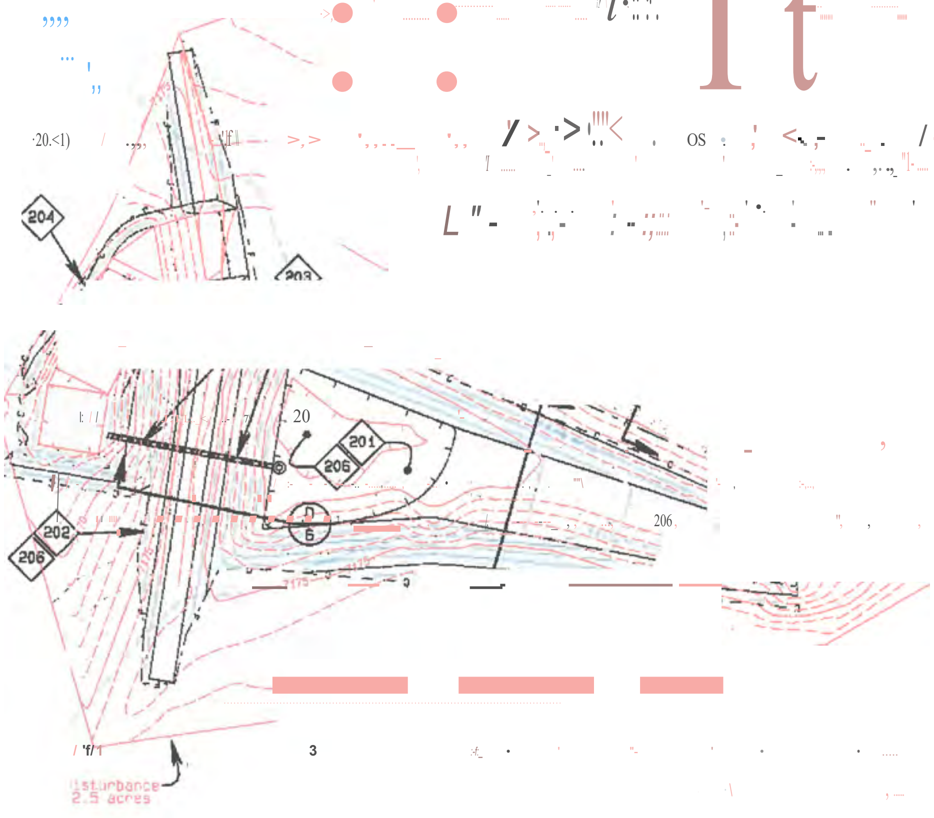
DATE: 1/8/2016

NNCO-PRO..ECT NO: 115-240-AZ

DRAWING NO: PLN03

SHEET NO: 9 CF 15

nS_ It items -1h011,,n In red on onset
Blue and grey eonlou1 signify dasian contou



t 8p .':1 'g J J Tgi 1 l

Estima.ted total aarthwork 11011lme ■ provided on '/§fieet 9. See layout n<l ccntrol, Sheet 11.

Rehabilitate • •ittl nq embankment per the reference detao1s ond earthlil\ locemant • •alllcatiooa, Sheet 2. Earthwork 110luma required accompli • h thla taek is 'included in the tables provided, Sheet 9.

jl\,ut

locate exlstinq pl1><1 rlaer and outlet p V rlfy \ocat!on on<l cloar

brisnand seijlr'n6nl from pipe , Add C:MP extenajon end of existing pipe

101 and extend to dllcharge at face of refurt>iohod embon m•nt,

: 0 ft above bottom of riprap at Station 7167.0. Note upstream to thia pion in that location.

(250 CY) Con d} rock med 'j'\ule/apill ay r de\a1 and con gl gft7'f r 'r b.cf un 1 . 2 ,n. nprap and s.y,

ate,tfo hbeof Qb mtgte/! d'.!! aJe . o rit·'B toil -s uretment

DATE:
1/8/2016

Registered Professional Engineer (Civil)
CERTIFICATE NO. 34587
MICHAEL D. KEARLY
Date Signed 1/8/2016
ARIZONA U.S.A.
Expires 03/31/2018

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t!]o; ouiii'nid on Sheet 2 a'fc spread to achie'lAan 2f. oximately

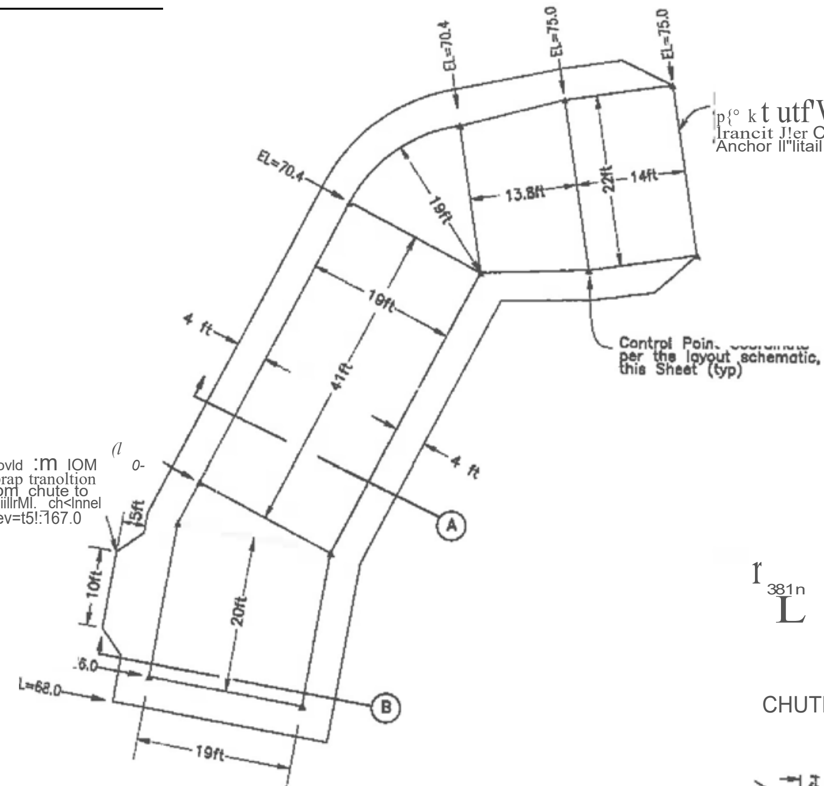
,>

t x. Surface

Ex.

i 3

NOT TO SCALE



ROCK-LINED CHLITE
PLAN VIEW & DE

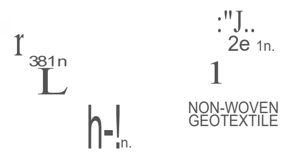
:,:-::1a C Cfn o fo;h th\1f c :'J' hut.i.

Rock Spectrlcattor IS

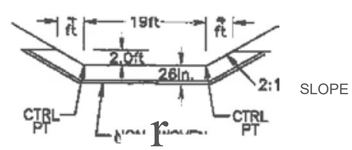
Rlprap thckl19H	26in.
01.olHEl'ER, IN.	IC Po\SSINC
20 - 28	D100
17 - 23	085
13 - 20	050
10 - 17	0\0

Material Quanffltes

QUANTilY	UNIT	1TEM
385	SQ YD	GEOTEXTIL.E
250	CU YD	ROCK RIPRAP

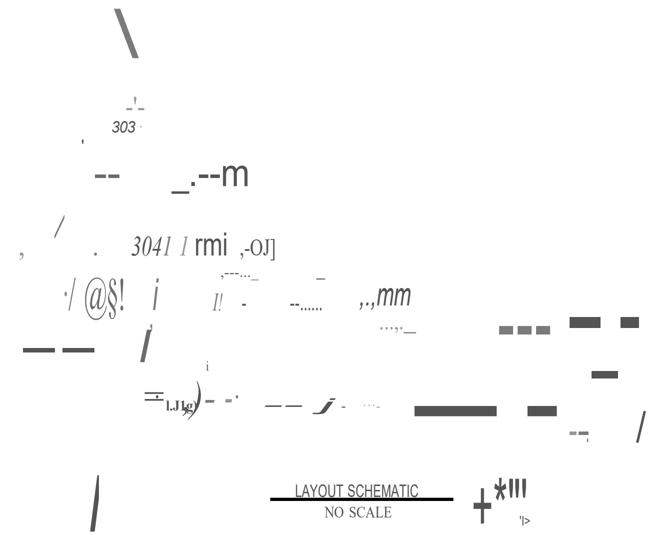


CHUTE ANCHOR DETAIL
(NOT Tll SCAIL)



NOTE: Rock Cn.Jte exotMltion ...quire■ ovorexCGIIOtlon lnlo -tho embonkment to ensure proper inaetting of tho rock at a 2-4- in. deep channel.

TYPICAL SECTION @ & @
(NOT TO Sc,u)



LAYOUT SCHEMATIC
NO SCALE

Middle Ba,In Lavout Coordinates Table

Pt f	NortMna	Ea,t1na	Elev	☐escr 1ot or
301	1174399. 4	1015789.6	7175.0	SPILLMAY
302	1174417. 4	1015802. 3	7275.0	SPILLWAY
303	1174426 , 5	1015790. 9	7H5.0	SPILLWAY
304	1174407, 5	1015778.2	7175.0	SPILLWAY
305	1174416. 7	1015767.8	7170.4	CHUTE-ANGLE POINT
306	1174403. 7	i01572i. I	7166.0	CHUTE-BOTTa-t
307	1174391. 9	1015712. 9	7166. 0	CHUTE-BOTT{)'l
30B	117440B.0	101 701. 2	7166. 0	CHUTE-BOTT!l'l
309	1174421. 7	1015723. 0	7166.0	CHUTE-BOTTOM
310	1174434. 7	1015761. B	7170. 4	CHUTE-ANGLE POINT
3U	11744311.2	1015778. B	7170. 4	CHUTE-ANGLE PT
312	1174419. 8	1015717 . 3	7I66.0	CHUTE-BOTTOM
313	1174325. 6	101567!5. 6	7175.0	Cl El'SAN<t-!ENT
314	1174399. 8	1015777. 4	7175.0	CL EMBANKt.!Etff-AP
315	1174466. 9	1015825.2	7175. O	CL EMBANKMENT
3J6	1174337. 3	1015734. 1	7170.0	BASIN BOTTOM
317	1174369. 7	1015778. 5	7170.0	BASIN BOTTOM
318	117 316.1	1015002. 5	7170.0	BASIN BOTTOM
319	1174209 . 4	10158!18, 5	7170.0	BASIN BOTTOM
320	1174201. 9	1015845.5	7170.0	BASIN BOTTOM
321	1174301. 1	1015776,6	7J70.0	BASIN BOTTOM
324	1174402.1	1015779.0	7175,0	CL EMBANKMENTiSPILI
325	1174426. 5	1015796 . 4	7175.0	CL EMBANKMENT@SPILL

Se■ Sheet 2 fDf' survey coor !nate system and local control information

Nalurll "!.,,,." II'IC
2900 N West Street 65
Flogstaft) A.mono 6a0
(928 774-2336

☐RAWN BY: .... Keorly
OESIGI@ BY: lol, Kearl
REVIEWED BY: M. l<elll'l C. Treoaler

REV	DATE	BY	REVISION

DETAILS:
MIddle Basin - Rock Chute and Layout Control

UPPERLCR
ADEQ Water Quality Improvement Project
Moore Ranch

Registered Professional Engineer (Civil) CERTIFICATE NO. 34587 MICHAEL D. KEARLY Date Signed 1/8/2016 ARIZONA U.S.A. Expires 03/31/2018

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DATE: 1/8/2016
NCD PROJECT NO: 15-240-AZ
DR-"MNG NO: DTL03
SHEET NO: 11 OF 15

HYDROLOGY SUMMARY'.

WATERSHED AREA: 820 AC (1.28 SQ MI)

METHOD:	Q1Q {CE:i)	!:12 (CElil	II]QII (CFS)
'TlHr	93	171	2<15
NSS (High Elev)	76 55	120	201
LCR Regional Curve	--	_7	-
hle e of 3 Mtods (uaed for design	75	122	223

PRELIMINARY SEDIMENT YEIhP

EFFECT11/E WAIERSHED AA£k B76 K; {1.37 SQ MI)"

ESTIMATED ANNUAL VOLUME: 0.18 AC-FT (253 cY) fER YEAR

ESTIMATED 10 YEAR VOLUME: 1.60 AC-FT (2581 CY)

a Tn •:wrn: a !at .insidl 1,'\° pb.i · r..r uIP.: t.sedlment

PfIELIMI/W!Y DESIGN INFQRMr'IJQH

	CUT	Fill.	SPREADING
EARIHWORI< {CY):	J,445	260	3,185

NET SEDIMENT STORAGE (cY), 1,432°0 spillway elev-7191.5

MAXIMUM EMBANKMENT HEIGHT (Fl): j2,5 flop of emban,k. to bot. of chub,) 0.0 (splllwoy tc d/s chonnel thal g}

GOVERNING DESIGN STORM FOR SPIU.WAYb: 100 YR
b(Bosed upon NRCS Standartl 350)

• In corteert with the middle aedlment basin, the twp bcsins will provide enough etctage volume for an eat,moted 10.3 yeara

HORIZ SCALB, 1 = 80'

60 0 60

Natural Channel Design, Inc.

2900 N. West Street ,115
Flags!aft) Arizona 8600•
{920 774-2336

DRAWN BY: M. Kearly
DESIGNED BY: M. Kearly
REVIEWED BY: M. Kearly, C. Tressler

PLANVIEW: Upper Basin Overview

UPPERLCR
ADEQ Water QualHy Improvement Pro:lect
Moore Ranch

Registered Professional Engineer
CERTIFICATE NO. 34587
MICHAEL D. KEARLY
Date Signed 1/8/2016
ARIZONA U.S.A.
Expires 03/31/2018

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DATE: 1/8/2016

NNCO PRo.£CT NO: 115-240-AZ

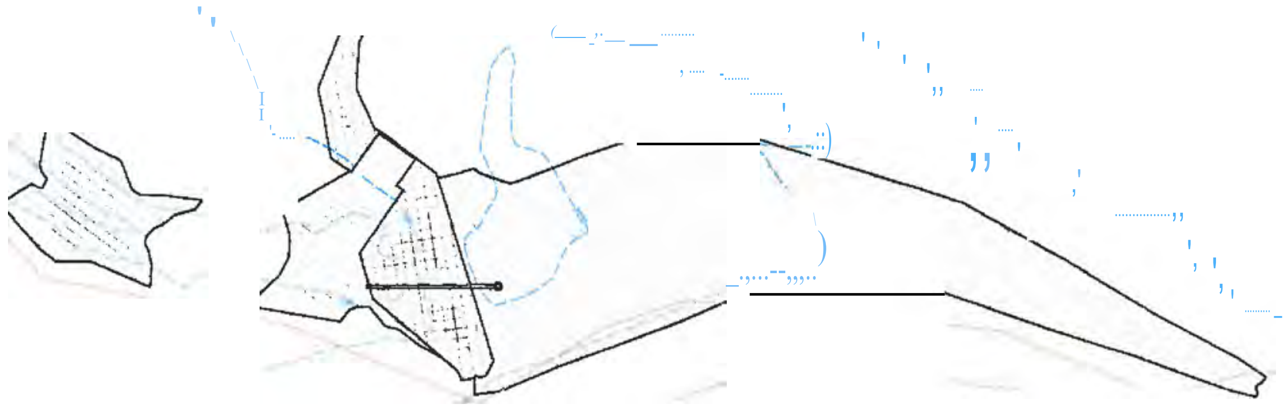
DRAVIING NO: PLNOS

SHEET NO: 12 OF 15

N • sheet created to capture ths 11m1ts of d1sturbanc tram the roJect. surve cond13ted drm gl k c p m-cY!t Pt sm Seeding L!'\derstood to be scheduled for JufV or at beginning of onsoon season, giving the se d the be t chance of surv1val.

i.7 Lim!ts of D!stvrbance

L.:...J 'rot al Disturbance: 3 ecrei15



Lr. 7...J T'ota i Oistu g grb nce te. 3 Acres

HORIZ SCALE: 1" = 80'

60 0 60

Natural Chan el Inc

2900 N. West Street JS Fl ags!a fft) Arizona 860'0 l92o 774-2336

DRA'M-1 BY: M. l<l!<lrly
DESIGNED BY: M Kearlv
REVIEl'IED BY: M. Koorlv. C. Tressler

REv	oATE	eY	RE s10N
?./0/17	MK	14•	lilnflt

flel ya C ui \o r y fJa ,"!J'ed

PLAN VIeN:
Upper Basin Umlts of Disturbance
AS BUILTS

UPPERLCR
ADEQ Water Quality Improyement Project
Moore Ranch

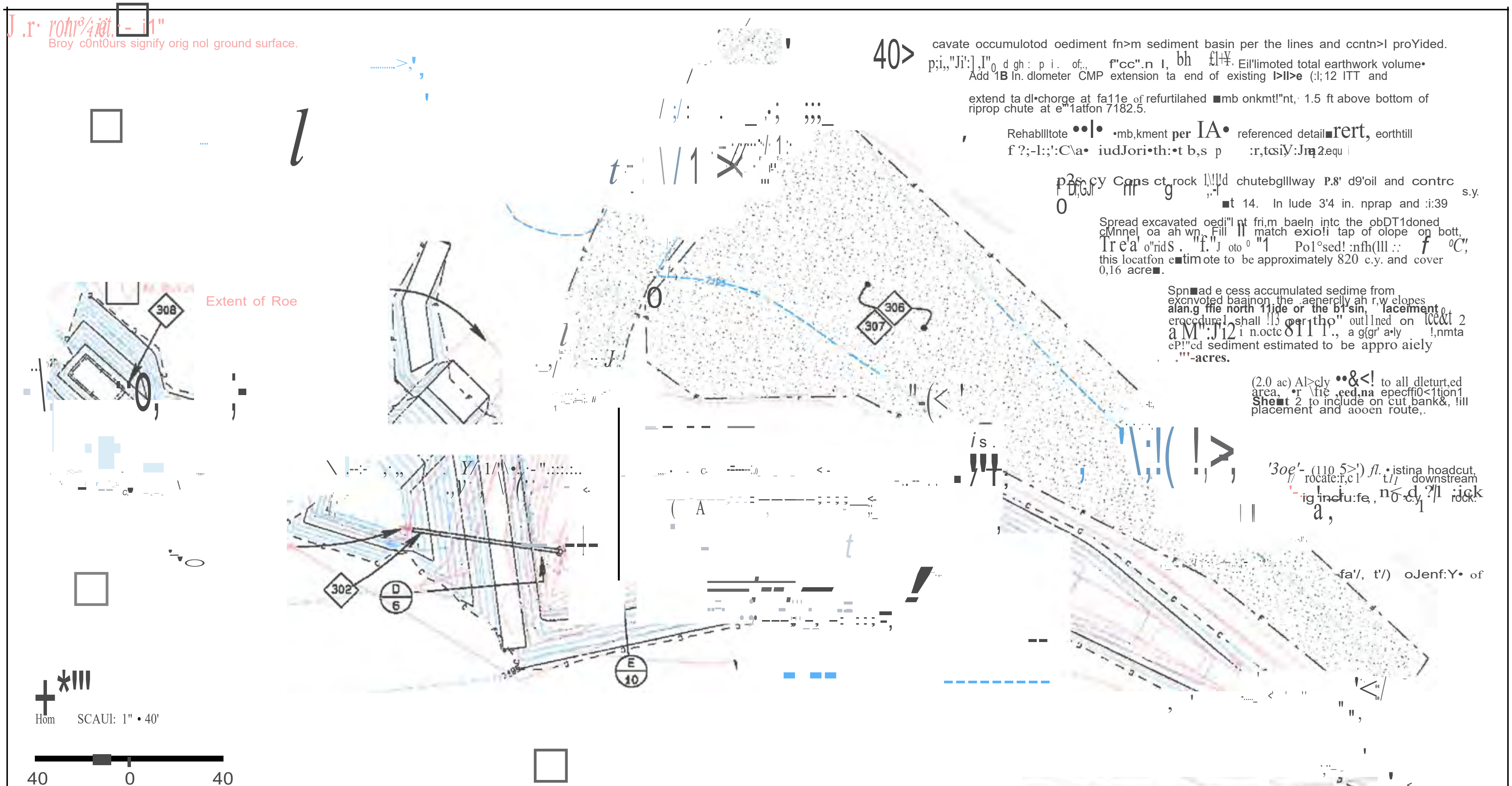
Registered Professional Engineer (Civil)
CERTIFICATE NO. 34587
MICHAEL D. KEARLY
Date Signed 2/9/2017
ARIZONA U.S.A.
Expires 03/31/2018

UNAUTHORIZED CHANGES & USES

DATE: 2/9/2017
NCD PROJECT NO: 15-240-AZ

ORAWJHG NO:

SHEET NO: 1JA OF 15



Natural Channel Design, Inc

2900 N. West Street 65
Flags,toft) Arlz9na 86{i04I
t92o 774-2336

DRAYIN BY:	M. I<ear1}"
OESLED BY:	M. Kearly
REVIEWED BY:	M. Kearly, C. Tressler

REV	DATE	BY	REVISION
	2/ /17	MK	As Built

Fle,d cs bullt otJrvey p f2rrned by NCO staff on 2/8/17

PLAN VIEW:
Upper Basin Detail
J:,,SBUILTS

UPPERLCR
ADEQ Water Qualtty Improyement Project
Moore Ranch

Registered Professional Engineer (Civil) CERTIFICATE NO. 34587 MICHAEL D. KEARLY Date Signed 1/8/2016 ARIZONA U.S.A. Expires 03/31/2018

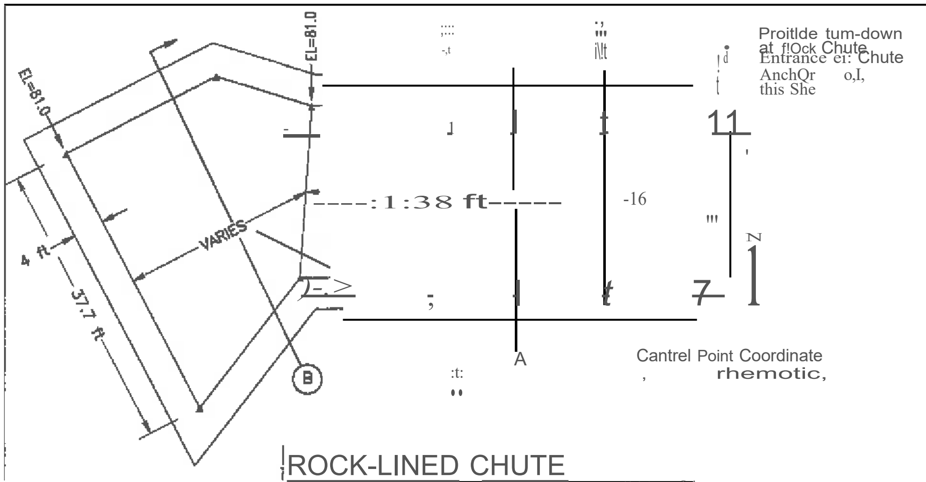
UNAUTHORIZED CHANGES & USES

DATE: 1/8/2016

NCO. PROJECT NO: 115-240-AZ

DRAWING NO: PLN06

SHEET NO: 13 OF 15



ROCK-LINED CHUTE
PLAN VIEW

tt ." 1 ct o ;loii'h th sf fl l °6hute.

LAYOUT SCHEMATIC
NO SCALE

Rock Speclftcatlons

Rlprap thcknesa ,. 34in.

DIAMETER IN.	" PASSING
26 - 34	0100
2.Z - 31	DBS
17 - 26	050
14 - 22	010

Mat flal Quan1ffles

	UNIT	ITEM
395	SQ YD	GEOTEXTILE
325	CU YO	ROCK RIPRAP

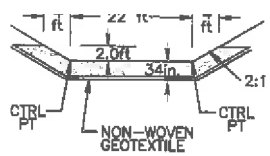
Illloer 8Hin Lavout Coor inat1s T ble

Pt f	Northlno	Eastina	Elev	Deseriotar
401	1173430 . 8255	10163 29 . 5:!B9	7196.BO	BASIN BOTTOM
402	1173432, 1357	!016335. 3841	7196. BO	BASIN BOTTOM
403	1173597 . 3691	1016305. 0406	7191. 90	BASIN BOTTOM
404	1173694, 6862	1016265. 4310	7189. 10	BASIN BOTTOM
4<15	11 73736 . 81 34	1016235 . 4163	7187.75	BASIN BOTTOM
406	I 173B01, 9529	1016168. 1345	7187 . 75	BASIN BOTTOM
407	I'73744. 6998	1016124. 4758	7187.75	BASIN BOTTOM
40B	1173694, 6687	1016203.27B7	7187.75	BASIN BOTTOM
409	11 73670 . 4130	!016236.1880	7'89.10	BASIN BOTTOM
410	1173'591.8131	IO16286.8753	7191,90	BASIN BOTTOM
411	li7374!.BH3	1O1srn4. Q7BB	7193. 50	CL TOP EMBANKMENT
412	Ii 73818, 0466	1D16183 . 1131	7193,50	CL TOP EMBANKMENT
413	1173856, 0880	1D16182 . 3127	7193.50	CL TOP EMBANKMENT
414	117 '3,!,77 . 98:J9	1016179 . 0073	7193. 50	CL TOP EMBANKMENT
415	H 73889 . 2849	1016206. 0601	7193.50	CL TOP EMBANKMENT
416	1173748.B191	1016104.0348	7193.50	EDGE OF EMBANKMENT
417	H 73803. 0914	1016106. 9947	7182.00	E□GE RIPRAP 2: I SLOPE
418	H 73808 . 6976	1016106. 2395	7181.00	BOTTOM OF CHUTE
419	H 73841. 1339	1016082, 1 49	7181. 00	BOTTOM OF CHUTE
420	li 7385!. 1670	1016108. 2606	7181. DO	BOTTOM OF CHUTE
421	1173847, 4883	1016120. 463.2	7181. 00	B□TTOM OF CHUTE
422	1173848. 2923	1016157. 4545	7191. 50	SPILLWAY
423	i 17384B. 6554	1016173. 4268	7191. 50	SPILLWAY
424	1173826. 6-446	1016173 ,9049	7191.50	SPILLWAY
425	1173826, 2975	1016157. 9326	?191.50	SPILLWAY
426	1173825, 4516	ID16H9. 0155	7181.00	B OTTOM OF CHUTE
427	1173821. 494'1	1016121.0282	7182. 00	E□BE AIPRAP 2:1 SLOPE
428	1173B19 . 6B72	10 16158 . 0762	7193.50	EDGE OF EMBANKMENT
429	1173852. 4005	1016162. 3902	7193. 50	CL TOP EMBANKMENT
430	1H3822. 4071	1016163. 0213	7193.50	CL TOP EMBANKMENT

See Sheet 2 ID!' local control and &lK'¥ey coordinate syst,n information

4LR '
T
48 in
LJ
NON-WOVEN
GEOTEXTILE
34 In.

CHUTE ANCHOR DETAIL
(NOT TO sc.uJ



SLOPE€:

NOTE½ Rock Chute eKoovatlon requires ove":rtcavatron a"1.b'1r.k'd1: J lia r proper ins in; of the

TYPICAL SECTION @
(NOT TO SCAI.E)

SLOPE

TYPICAL SECTION @
(NOT TO SCALE)

Natural .- lli'M!l Inc
2900 N. West Street
Flogs,toffA) Arizona 86 •
{92a 774-2336

DRAWN BY: M. Kearl.r
OESIGNEO BY: M. Keatl
REVIE BY; M. Kean, C. Tressler

REV	DATE	BY	RE\IISION

DETAILS:
Upper Basin - Rock Olute and Layout Control

UPPERLCR
ADEQ Water Quality Improvement Project
Moore Ranch

Registered Professional Engineer
CERTIFICATE NO. 34587
MICHAEL D. KEARLY
Date Signed 1/8/2016
ARIZONA U.S.A.
Expires 03/31/2018

UNAUTHORIZED CHANGES & USES

DATE:
1/8/2016
NNCO PRo.ECT NO:
115-240-AZ

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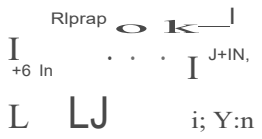
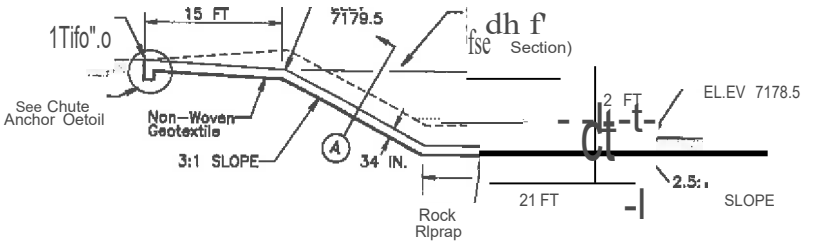
DRAWING NO.
DTL04
SHEET NO:
14 OF 15



CHUTE ANCHOR DETAIL
(NOTTII



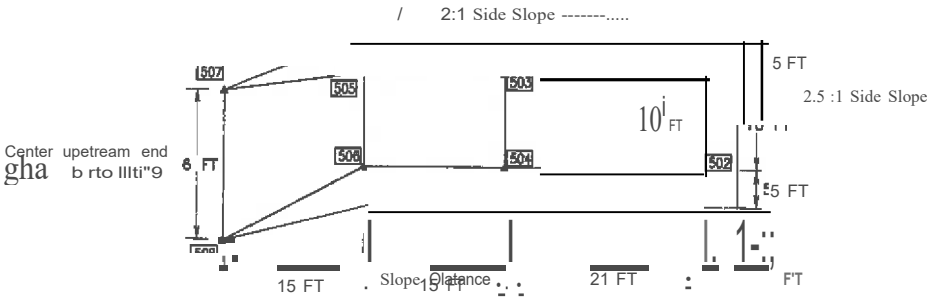
CHUTE q_ PROFILE

7At10 ,t. Rr-

S 'tr :1 SLOPE

NOTE: Roa Chute mcCGvatlon **requirea** overexca:-:9tlon Into **the** channel bottom ta **,nsura** praper inaetting of the rock at a 2 ft. **deep** channel.

TYPICAL SECTION @ & @
(NOT TII SCALE)



CHUTE PIJ\N VIEW
{Nor TO SCA1£)

ROCK-LINED CHUTE
PLAN & PROFILE VIEW

Rock Spaclftcallcns

Rlprap thckness • 34in.

DIAMETER, IN.	,c: PASSING
26 - **34**	D100
22 - 31	085
17 - **25**	050
14 - 22	010

MaterlC11 Quantftles

QUANTITY	UNIT	ITEM
SQYD		GEOIDTILE
110	CU YD	ROCK **RIPRAP**

:fe."";:i;t **o htrth\s**tn.: 6 twte.

Rock (ute Levout C ntrol Coordii ates				
Pt f	Northino	Ea!tina	levation	Descr1ator
SO;	1173960. I	1016051.B	7174. 50	Bottom
502	1173960. 7	i0i60ei. 7	7174. 50	Batto11
603	1173939. 1	1016053.2	7174. 50	Bottom
04	1173939.8	1016063.1	7H4.50	Bottom
505	1173924. 2	1016D5-'1 2	7179.5D	Top et angle Poin
5<16	1173924. 8	1D1606-4.1	7i79.5D	Top at angle poin
5117	1173S09.	1016057. 1	71B0. DD	Upper End
508	1173910.4	1016073. 1	7180.00	Uhher End

Natural Channel Design, inc

2900 N. West Street /15
Flogs!aft) Arizona 8600•.
t920 774-2336

REV	DATE	BY	REVISION

DRAWN BY: M. Kearl
DESIGNED BY: M. Kearly
REVIEWED BY: M. Kearly, C. Treesler

DETAILS:
Upper Basin - Rock Chute at Headcut

UPPERLCR
ADEQ Water Quallty Improvement Project
Moore Ranch

Registered Professional Engineer (Civil)
CERTIFICATE NO.
34587
MICHAEL D. KEARLY
Date Signed 1/8/2016
ARIZONA U.S.A.
Expires 03/31/2018

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DATE: 1/8/2016
NCD PROJECT NO: 15-240-AZ

DRAWING NO: DTL05
SHEET Ho. 15 OF 15

ROGERS PROJECT

Looking across Coyote Creek at vertical banks and a head-cut in the foreground. Left side of picture shows a previous ADEQ funded project during 2015. This is a continuation of that work.

Rogers:

The purpose of this project was to reduce impacts of concentrated flow and erosion on the banks of Coyote Creek. To achieve this goal the banks of coyote creek were sloped for approximately 650 feet. Additionally a rock lined chute was installed were concentrated flow created a head-cut entering the main Coyote Creek channel. Erosion control fabric and native seed was placed on sloped banks. The old dilapidated fence was removed, reconstructed new and put on line to reduce impacts to the project.

Sloping the banks of *Coyote* Creek in preparation of erosion matting and reseeding. View is looking down Coyote Creek from the south bank.

Head-cuts moving upland off the main channel of Coyote Creek. These will be mediated with rock chutes.

Rock chute to stabilize and arrest the head-cut. Looking up chute from Coyote Creek channel. Photo before revegetation.

The Rogers project has been declared complete 9/28/2016. The project consisted of:

3,273 cy of cut
2,992 cy of fill
55 CT rock
130 SY nonwoven geotextile fabric
11 rolls (100 sy each) single net erosion control fabric
2 rolls (100 sy each) double net erosion control fabric
550 linear feet of barbed wire fence

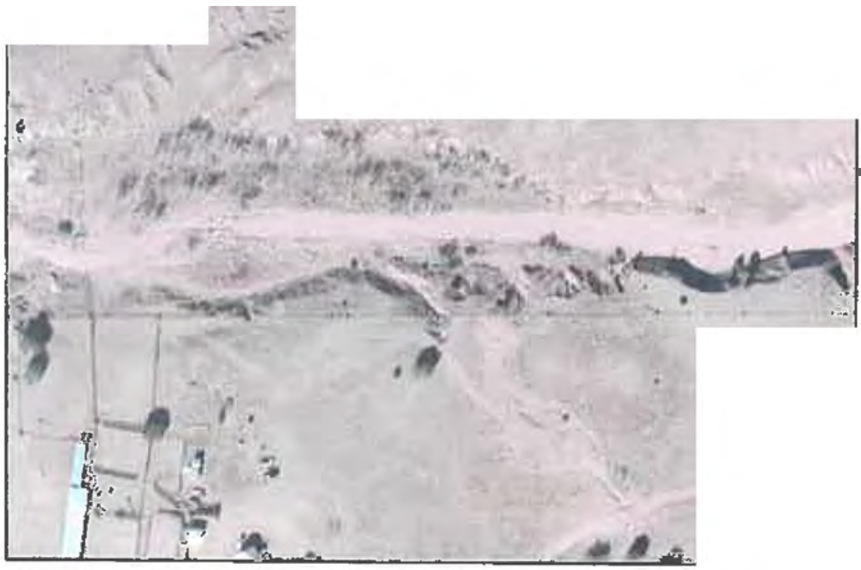
AS-BUILT PLANS

Upper LIttle Colorado River Water Qualtty Improvement Project

PREPARa::> FOR: Baine Rog911 - E<Rmch

R.JNDEDBV:
Amona Depertment d Enwonrnenlal Qdly (ADEQ)
WaterQdtyOMIlan

MIZONO, IIIIA It SALT- MDIDLIK



AS-BUILT/REORD DRAWING CERTIFICATION
I HEREBY STATE THAT THE AS-BUILT INFOR ATION AS SHOWN WfTHIN IHESE PLANS IS CORRECT TO THE BEST Of MY KNOWLEDGE. THE AS-BUILT INFORMA110N fRESEITTED IN BASED UPON FIELD OBSERVATIONS ANO INFORMATION PROVIDED TO NATURAL CHANNEL DESIGN BY THE CONTRACTOR.

&bNxt
TRESSLER ENGINEER
1..1.2|8'016

LANDOWNER:
E Lazy A Ron:h
Elaine Rogers
PO Box 1840
Springerville J.:Z. 8593B
Phone: (928) 245-1572

PROJECT MANIIGER:
ApQche County NRCD
Doric Knight
824 E. Main St
Springerville, ,i. 85925
Phone: (928) 333-49-4-1

TECHNICAL CO'JSULT T:
Natural Channel Desgn, Inc.
2900 N. West St., Sulte 5
Flagltaff 86004
Phone: (928) 774-2336

FUNDING AGENCY:
Arizona Department of Environmental Quality
1110 W. Woshin gton st.
Phoenix, AZ 85007
Phone: (602) 771-4635

INDEX OF DRAWINGS

SHEET ND,	TfTLE
	COVER SHEET: Location, IndeK, and t.laterlals List
2	GENERAL NOTES & CONSTRUCTION SPECIFICATIONS
3	PLAN VIEW
4	CROSS SECTIONS
5	DETAIL: Rock-lined Chute COORDINATE TABLE
6	PLAN VIEW NORTH BANK SLOPING

WORK QUANTITIES

EARTHWORK:	
CUT	3,273 CU YD
FILL	2,992 CU YD
ROCK	55 CU YD
GEOTEXTfLE	130 SQ YD
GRASS SEED MIX	1.0 AC
EROSION CONTROL BLANKET	
SINGLE NET *	11 ROLLS
DOUBLE NET •	2 ROLLS
FENCE	550 LF

• BASED ON ROU. SIZE OF' 8' x 112.5'

LEGEND:

	EX. IWOR- : 0>1T1)1.JR (5 FT)		PROPER"TY UNE
	EX. MINOR CONTOUR (1 FT)		EROSION CONTROL BLANKET
	FINISH M.t.JOR CONTOUR / FINISH MINOR CONTOUR		CONTROL PO.NT
			CUT
	ORDINARY H.GH WArol w.RK		FILL
	EX. FLOWUNE / QESIGN FLOWUNE		ROCK RIP RAP
	BANK SLOPING ARE.A.		
	SPOIL BERM AREA		
--X----X--	FENCEUNE	0	CONSTRUC110N NOTE

DRAWN BY: J. FLEISHMAN, C. SCUDIERI
D IGNEO BY: M KEARLY
REVIEWED BY: C. TRR

REV	DATE	BY	REVISION
1	1/11		CAS
7/	22/16	CT	As Built

2900 N. West St, Ste 5
Flagstaff, Arizona 86004
(928) 774-2336

COVER SHEET: LocaHon, Index & Quanttttes

Upper LIttle Colorado River
Water Qualtty Improvement Project
Rogers Ranch

Registered Professional Engineer (Civil) CERTIFICATE NO. 34587 MICHAEL D. KEARLY Date Signed 11/18/16 ARIZONA U.S.A. Expires 03/31/2018

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DATE: JULY 22, 2016
NCO PROJECT NO. 15-240AZ
DRAWING NO: CVR01
SHEET NO: 1 OF 6

PROJECT DESCRIPTION

Th• purpose of this proj lstorecluc• tmpaola from concenffilted flow and erosion on the bank• of the Coyote Creek Wash tn Apache County, AZ. One ■lgnlftcont headout on the aoulh bank In the prleot oreo ls aotlvely erodlng and n" d■ repair. Thia lmprov•ment pion Includes:
1 llcmk stabllzallon hear h•<1dcuts through re■loplng and Hedlng.
2 Headcut ■tobmzatlon through lnslollatlon of o rock-llned chllle.

GENERAL NOTES

1. Site survey data wo, collected by NCD on Augu,n 13, 2015.
2. All existing conditions ore to be verified In Uie fleld prior to construclton. Any cllscrepancles shall be brougnt to th• attention of the ENGINEER prior lo starting earthwork.
3. Ho repraHntotlon ls made a, lo the exletenc• or nonexl•tence of any 1.1ttlttn, publlc or privet■• Absence of utHltlee on the■- drawing• IS NOT asauranoe that utHltl■• are not present. Th■ exl■t ence, loccrllon and ci■p!h of any utllty mu■t be determined by th• oontractor prtor lo any ■xcavaflon. Call before you dlg, !111 or 1-800-STAKE-IT.
-4, No con■trucll on ehoU begin until all neceeeory permit• ond ■aH m•nte ore obtained.
5. Construollan aclvllle■ win be oonducled In o monner conalet■nt wtth all safely regulatlon•.1. and other permtttlng required by Arizona Slota Land Depcutm■nt, Arizona D19ortment of l:.llYlronmentol Quallty, and ol+lera.
15. Thia work •hc:ill be constructed to lh• llne■ and ;rodes o• ehown on the drawing• or as ■toked In the field by the ENGINEER or authorl1ed reprHentatlve, recognizing there l■ Yarlotlon In nature.
7. Conlltructlon activities ■ha ll be per!orm■d In c:i monn ■r that mlnlmb:ea aoU, water and olr pollutlon.

CONSTRUCTION SPECIFICATIONS

The ap1olflcotlon1 Included herein are provided 01 o partial 11st of con1tructlon standard■ and requirements for lhla proJ1ot, As o companion to this pion a■,, o full compKotton of oppltcabl■ technlcGl apectflcc:itlona l■ provided. The p■reon(1) performing the worl< 1holl fomllloriz1 them- ■1- with tho.. apeclflc c:itl on■ and cont<1cl the englnHr prior to ■tarting con■truc tlon wllh any question■ or for clorlfloatlon.

EARTHWORK

Th• earthwork octlvltl■■ ahall conal■t of bank eloping, apoll area■, and debrta removal.

E•oovotlon

Exoovotlon 1holl be Dmlted lo bank sloping and debris remOYOl as shown on the drawings or os ■t oked In the fl■ld, No e•coYallon shall toke place wlt+iln any Jurladlcllonal areas. Disturbance of existing native v1gelotlon outside the llmlte of construotlon ■hall be minimized to th greatest extent posslble during IXCOYOtlon.

Excavated material shall be plooed In th• ■paci fi ed berm loccrllon■ and bank sloping area■ o■ ahown on the drawings or as ■lci ked In the fl■ld. All finished surfaces shall ba generally amooth and plea,tng In c:ippearo11<11.

.!9db!llL

Jlatenals: All fill mciterlals shall be obtained from the required e eavatlon1 and approved borrow source■• Flii mot■ rlols shall not contain sod, brush, root■, p ertahobl■ or fronn mot■rl ala, trCl■n or oth■r debris.

Flaoanwnt: The placement of fill mat■rlols ,hall follow these guklallna:

- Any vertlcal bank ■hall b• 1lop1d before plaeemenl of flll material.
- The existing surfao■ 1holl be ■tripped of vegetation, tro ■h and other deleterlou1 material• prior to ploclng any flll.
  The placlng c:ind apreadlng .of tm moterlal shall be storied at the lowest point and th■ flll brought up and compoct.d to obtain o denalty slmllar to the surrounding bank moterlal.
  Materlol when placed shall cantoln sufficient moisture ■o tho! o sample taken In the hand and ■qu aezed shall remain lntact when released.
  The placlng and apnadlng of ftll material shall be ■t arted at the lowat ratnt and the flll brought up In horlzontal layers not lo • c••d: six (6) Inches of loosa flll for whee compoctlon and four (-4) Inches of loose fill for dozer comrocffon. Con■tructlon equipment she1ll be operated over the area■ of each layer of ftll la lnaure lha the required compaction ls obtained.
  Flii shall not be Dlaoed on frozen aoll, mow or Ice.
  Gullies designated for flllln; and re-contouring shall be filled as cloH as poselble to the historic: natural ground surface, and smoothed and shaped to blend with the surrounding landacope.
  All flnlahecl 1urfooes shall b• generally ■m ooth and pleasing In appearance and blend lnto surroundtng t•rroln,

HEADCUT STABILIZATION

The heodcut stoblllzotlon work shall con■l■t of heodcui excavation and bank slOl)lng; furnishing and ln■ta lll loose rock lncludlng placement of filler fobr!c. See SHEET 3 for location and SHEET 5 for Detolle,

> The ■lt■ shall be 1xcaYoled and bockfllled to the 9radea shown on dra wing■, Excavation shall b■ llmlted to the heodcut remediation area as shown on the drawings ar 01 staked ln the flald by the ENGINEER. All fill mot■rlal shall be compacted to tt,e appro•lmote denetly of surrounding undl■turbed areas. Addlllonol spells shall be spread outside the ohannel and sloped ln 1uah o wtry aa to direct flow■ toward roak-llnsd ehut■•

> Dl■lu rbona e of exl,ttnQ noHv• vegetation ehc:ill be minimized.

> Non-wOY.n g■otextlle shall be pfoo■d behind the rock, Fobrla ■hall be meet the requirements of NRCS MS-AZ-592 Geotextlle mc:it ertc:il speclflcallona for Closs lll nonwoven geot■xttl es. Th• geotextlle shall be Joined by overlopplng o mlnlll".um of 18 Inches and -■cured ogoln■t the underlylng foundation motertol. Securing pin■ sflc:ill b• lnstalled as n■cn aary to prevent 1.1ndue allppag■ or movem■nt of the geotextlle,Recommend 3/16-lnoh et••l ban pointed on one and and fabrlcafed with a head to retain a steel washer. (1.5-lnch dle1met1r}, Pin length shall be not l•• than 18 lnchN, U-shoped pin■ are acceptable.

> Raclc shall be angular, dense, 1011nd and free from croaksl seam•, or other defects conducive to acael■rot■d weathering. The l■a1t dlmenelon of on lndlvldua rock shall not be lea■ than one-half the greoted dtmenalon. Rock ■ou r:: ■ skoll be approved by the E:NGINEtR or authorized reprwsentc:ith,1 and hOY■ o bulk 1peelflc grovtly of not lesa that 2,5 per ASTM C127. Rock aholl be w■ll groded oa follows:

Diameter, In.	Percent Passing
'i'Hi"	D100
13-1&	DBS
10-15	D50
8-13	D10

> Rocle placement shall begtn ot the bottom of elope. Rock shall r,ot be dropped more than 3 feet onto geote tlle.

> Sloped banks ahaU be seeded with notlve 11ra s1■1 an dshrubs, HI below for I ■ed mix

EROSION CONTROL BLANKET

Erosion control blanket 1holl bl lold <1nd anchored over the ••ed lo provide bonk protection and o goad environment for vegetation regrowth. follow monufooturers recommendations far tn1tallotlon and anchoring, lncludlng anchor tnnchea and 1toplln9 paHern and rate.

SINGLE NET: Stra w Sln11l• Net Erosion Control l!lonlcet, that ln cort111•d weei free and made with all natural, 100" blodegradab1[1]e netting. Uea AEC Premier Slngle N<ll ECB with FlbreNet netting {American Exc■l■lor) or equlvolent,

DOUBLE NO: straw/Coconut Bland, Double N■t Erosion Control Bianka! {70" Strow, 30X Coconut fibers), that ln certified weed free and mode with all natural, 100" blodegrodab■lnetting, U■e AEC Premier Siraw/Cooonut ECB with "F"lbr ■Het" netting (American Excelalor) er equlYOJerlf,

RANGELAND SEEDING

Dl■turb ed areas wlll b■ seeded with native groHH and 1hrub1. Seeding a<:lMttes lnclude th■ following:

> Prepare a edb■d where needec. Thi• may lnclude scarifying the uppw 2 lnch11 ol soll where I■ei:f

> appllootlon wlll oceur. Ov■rly compacted equipment aoce11 routes may require ■carlfcotl on to 6 Inches, Seed con be drilled or broadcc:ist by hand.

> Seed shall be Incorporated Into the 1011, but not more than 0.5 lo 1.0-lnch deep.

Th• gra11 and ehrub •••d mix will conelst of the followlng 1peclH. The sHdlng ratH below ar■ for planting by hand broc:idcosttng, Seed shclll be purchased from a reputable supplier.

Shn!Liud Mix	
raiirwing Soltbu■h (Afrlp :ex a<1nesoan1)	0,25 lb}ac PLS
ad Mix	
IllueGriiima (Boulelouc:i gracllls)	2.5 lb/ca Pls
Western WheolgroH CP01capyrum emlthr,)	7,0 lb/ac PLS
Sldeoats Grama (Bouhtlo o curtl ■ndulo	1.5 lbZoc PLS
Indlan Rlc egro■o (Achnatherum ymeno d■1)	2.0 lb/ac PLS
	13.0 lb/ac PL.S

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DESIGNED BY: M. KEARLY
REVIEWED BY: J. TRESSLER

REV	DATE	BY	REVISION
1	11/11/16	CAS	Cont.truct.-on. GeotexNl• ik Sttedi'ng ape,cificotlona
2	7/22/1s	CI	M Built

GENERAL NOIES & CONSTRUCTION SPECIRCATIONS

Upper Llt11e COiorado River
Water Quallty lmprovement Project
Rogers Ranch

MICHAEL D. KEARLY 34587 — Registered Professional Engineer (Civil) — ARIZONA U.S.A. — Expires 03/31/2018

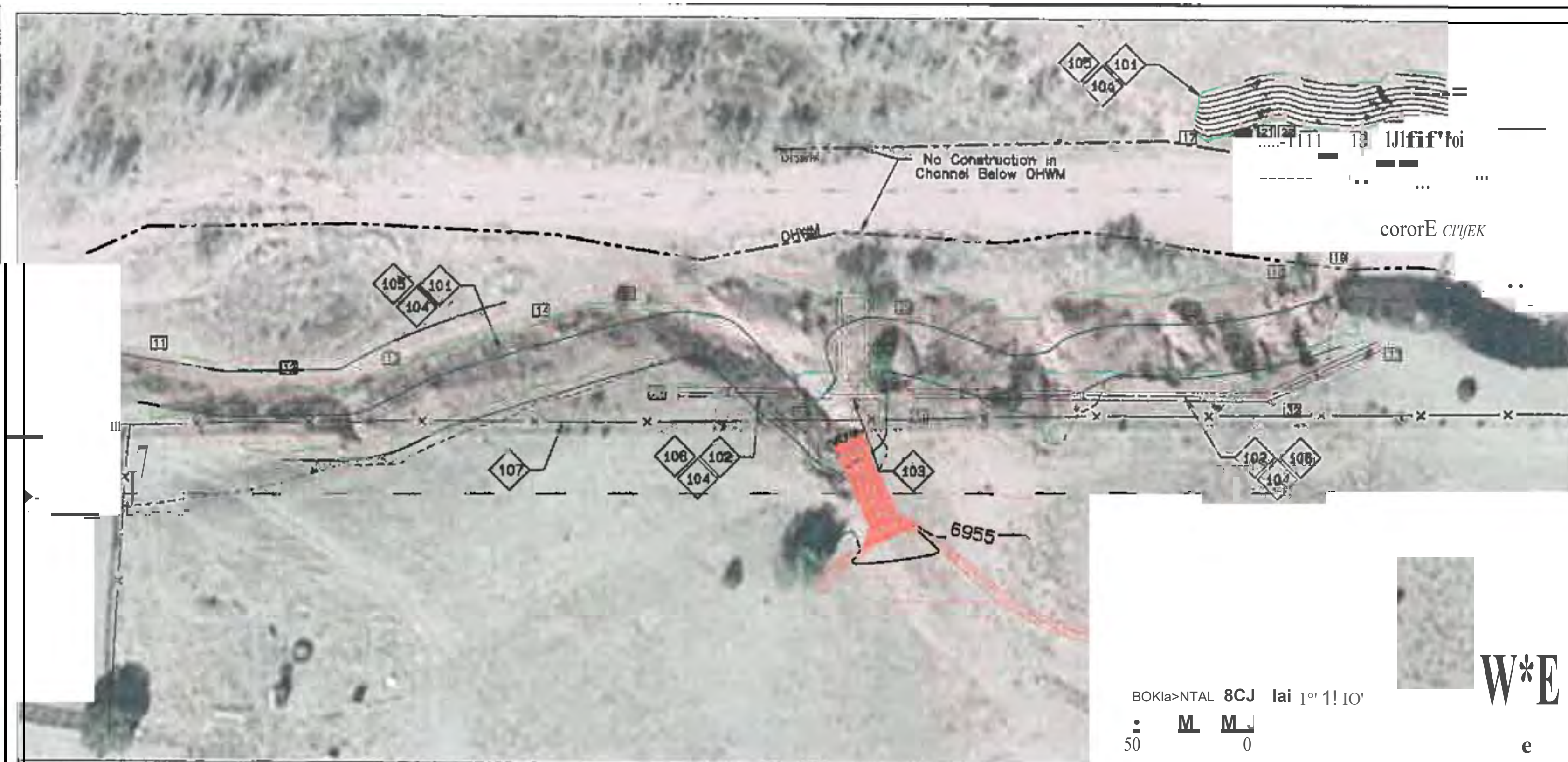
UNAUTHORIZED CHANGES & USES: THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE FOR, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

DATE: JULY 22, 2016

NCD PROJECT: 115-240AZ

DRAWING NO: GENO,

SHEET NO: 2 OF 6



CONSTRUCTION NOTES

.101: Oreo= ':o at::ail• l)tOYided on Sheot. 4 and !5, Earthwork quanttfted on Sheet 1.

(280 lf) Construct ■poll 6;,rn, rer the detcill■ contro coordinate■ provided on Sheete 4 and 5. En■ure po1itl11e flow along •outh toe of berm to rock chute.

(1 ea) CcnlllNct rock Wned chute per detcill and control coordtnatn provided on Sheet 5.

(1 oc) Seed all dl■t urb ed OAICIS with apealfled Hed mix.

(1010 ag yd) Place eingle nat erc,ron control blanket per monufocturar'a recomend\otlon■ on ■loped bank, rrcm lDe of bank to top of bank.

(150 eq yd) ace double net ercaton conltJ>l blanket per monu1'octurer'• recomendatlant, Center an toe of berm alope per detail on Sh■et 5, betw_, PT 31 and PT 32.

(550 lf) Remove and replace in-kind, existing, 8-lllrand bort)ed wire fence along the length of project on •outh alape,

Qogo Wat.c Act (c:w>.) Cemeliance:

A 40+ permit has not been aPl'llod fc,- r■lat!Ye to tlila protect 9• the lmlta of con■t.ructlcr, ■hown are oublde the limit of the Ordln_ol)l High Watlf" t.lork \OHWM).

To ensure conttnued compliance with the CWA:

- The ENGINEER will provide taking prior ta the alert of conalructlon ID delineate the OHWM limita.
- All conelructlon ac!M tle■ are ID be k9P.t out of the limits of the OHWM.
- 1:¹..:%":r... th\ &ºd!'o "Mt b."" º cm t ¹Q f; i.r:· o - ''ri':r.

DRAWN BY: J. fl.EIS-llolAN, C. SCUDIERI			
DESIGNED BY: M. KEARLY			
REVIEWED BY: C. TRESSLER			
REV	DATE	BY	REVISION
2	7/22/16	CT	As Built

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PLAN VIEW

Upper Little Colorado River Water Quality Improvement Project Rogers Ranch

Registered Professional Engineer (Civil) Certificate No. 34587 MICHAEL D. KEARLY Date Signed 11/4/16 ARIZONA U.S.A. Expires 03/31/2018

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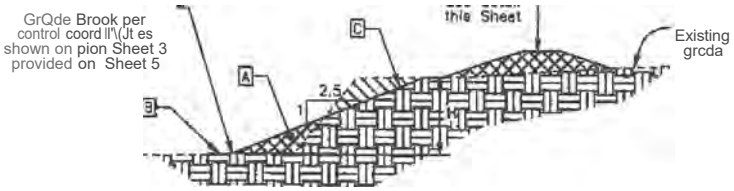
DATE: JULY 22, 2016

NCD PROJECT NO: 15-240AZ

DRAWING NO: PLN01

SHEET NO: 3 OF 6



lfil Fill to be placed per Eorthfill epecificctlons, Sheet 2.

!ID Tie fill slope to esisting grade at 20:1 slope.

1£] Seed and apply slngle net erosion control lobric **to finished surface per specificotions. Sheet 2.**

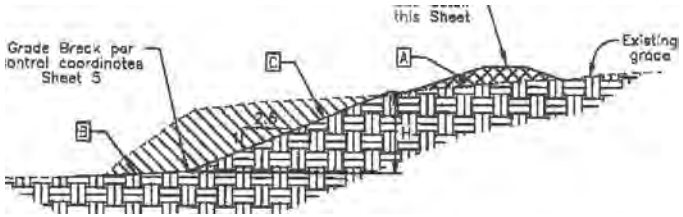
TYPICAL SECTION: CUT & FILL **(NOT TO IICi.EI**

H c

From PT 11 to PT 12: H tronaitions from 6 ft to 8.4 ft

rrom PT 12 to PT 19: H - **8.4** ft

' On North slope: H = 6 ft

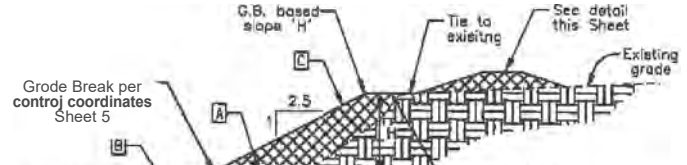


0 Fill to be placed per Eorthfill spocificafon•, Sheet 2.

I§] Ti<, !ill slope to exi•tlng grode ot 20:1 slope.

lg **Soed** and apply single net eroolon control fabric **to finished surfoce per epeciflcatlons. Sheet 2.**

TYPICAL SECTION: CUT ONLY **CNCII TO 1CWJ**



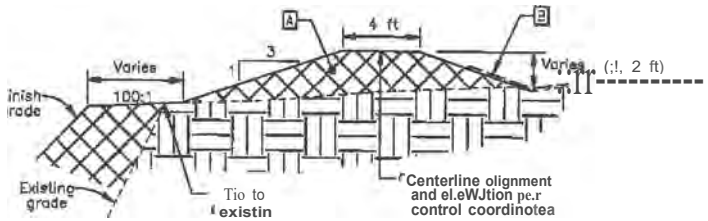
g] Fill to be placed per Eorthfill •peciflcotlans, Sheet 2.

[ID Tie fill slope to oxisting grad• at 20:1 slope.

1£1 Seed ond apply •lngle net erosion control fobri<: **to tinishfld surface per specifications, Sheet 2.**

TYPICAL SECTION: FILL ONLY **(NOT 10** ICAU!J

Constr-uct berm where shown or. pion to direct flows to rock lined chute. Provide fine grading O!l necessary to ensure pMitive drainage to rock lined chute without any oreas of stond1ng water.



le] Fill to be placed per Earth/ill specificotiono, **Sheet** 2.

!ID Place double not 1rosion control blanket clang edge of berm. **Center fobric on toe of slope.**

SPOIL BERM DETAJL (NOT TO ICA4.c)

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ORA BY: I. FLEISHMAEI, C. SCUDIERI
OESIGNED BY: **M.** KEAALY
R€VIEI\ED BY: C. IR£SSLER

REV	DAIE	BY	REVISION
2	17/22/16	CT	As Built

CROSS SECTIONS

Upper Uttle Colorado River
Water Quallty Improvement Project
Rogers Rcric:h

Registered Professional Engineer (Civil)
CERTIFICATE NO.
34587
MICHAEL D. KEARLY
Date Signed 11/10/16
ARIZONA U.S.A.
Expires 03/31/2018

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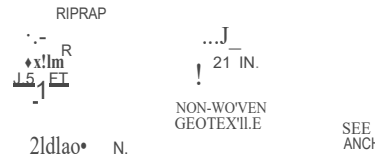
DATE: JULY 22, 2016

NNal PROJECT N 115-240AZ

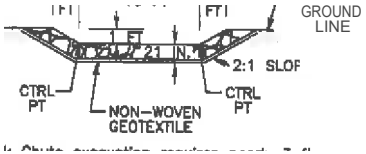
DRAWING NO: DTL01

SHEET NO: 4 OF 6



CHUTE ANCHOR DETAIL
(NOT TO IICALE)

CHUTE q_ PROFILE



NOTE: Rock Chute 9KC0YCltion **r9qufrea** MD J ft of cut before rock la placad to **ensure** a 1 ft **deep** channel.

TYPICAL SECTION @ & @
(HOT TO leAIE)

2.5 ;1 SIDE SLOPE

gc'l 2FT
--12 FT

sLO_I' fl ANCE

CHUTE PLAN VIEW

ROCK-LINED CHUTE
PLAN & PROFILE VIEW

Rock Specfflcatlone

DIAMETER, IN,	,C PASSING
15 - 21	0100
13 - 19	085
10 - 15	050
8 – 1J	010

Materlal QuarttHe8

QUANIITY	UNIT	rm,1
	SCYIJ	GEOTEXTILE
55	CU '!'O	**ROCI< RIPRAP**

D_{50} - 11 ;n

NOTES

SEE SHEET 2 FOR GENERAL NOTES & CONSTRUCTION SPECIFICATIONS

1. THE SITE SHM.L BE EXCAVATED AND BACKFILLED TO THE GRADES SHOWN ON **ORAMNG.** THE FILL MATERIAL SHALL **BE: COlolPACTm** TO THE DENSITY Of" SURROUNDING UNDISTURBED **N!£AS.**
2. GEOTEXTILE SHALL BE NON-WOVEN FABRIC WITH **A** MINIMUM GRAB TENSILE SIRENGTH Df
   R J:rES eirli E,RA: I UI J8s R INED BY O\IERI..APPIHG A MINIMUM OF 18 INCHES AND SECURED AGAINST THE UNOERLYING FOUNDATION MATERIAL.
3. ROCK SHALL BE DENSE AND ANGUI.AR TO SUB-ROUNDED IN SHAPE, THE I.EAST DIMENSION OF AN INDIVIOUAI.. ROCK SHAU. NOT BE LESS THAN ONE-THIRD THE GREATm DIMENSION. SOURCE OF ROCI< WILL **BE** APPROVED PRIOR TO PLACEMENT. ROCK SHALL BE WELL GRADED AS SHOWN IN TABLE.
4. ROCK PLACEMENT SHALL BEGIN AT THE BOTTOM OF SLOPE.
5. ROCK SHALL NOT BE DROPPED MORE THAN 3 FT ONTO GEOTEXTILE.
6. A SUFF1CIENT AMOUNT OF ROCI< SHA.LL BE HANO PLACED TO SECURE CONTACT BE'TWEEN STON£5 ANO INSURE **A** NEAT, UNIFORM SURFACE.
7. FINISHED SURFACE OF STONES SHA.LL BE PER THE ELEVATIONS IHOICATEO BY THE CONTROL POINT COORDINATES, EXCAIIATIDN TO SUBGRADE WILL BE REQUIRED TO EMBED ROCI< A.ND ACHIEVE ANAL GRADES.

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REI/	DATE	BY	RE\olSION
2	7/22/16	CT	As Bui'

DRA.IW'i BY: I.FI.EISHMAN, C, SCUDIERI
Q_E S'GNEO BY: M. KEARLY
RE',IIEWEO BY: !RESSLER

DETAIL: Rock·LIned Chute
COORDIANTE TABLE

Upper utfle Colorado River
Water QuaUty Improvement Project
Rog81S Ranch

Registered Professional Engineer (Civil)
CERTIFICATE NO.
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MICHAEL D. KEARLY
Date Signed 11/15/16
ARIZONA U.S.A.
Expires 03/31/2018

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DATE: JULY 22, 2016
NNCO PRO.ECT NO: 115-240AZ
DRA.\'IIHG NO: DTL02
SHEET N<I: 5 OF